OPERATION AND INSTALLATION MANUAL

HYDRAULICALLY CONTROLLED VARIABLE PITCH PROPELLERS (CONSTANT SPEED)

V506

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ATTENTION

FOR OWNERS, USERS AND SERVICE STAFF

This installation and operation manual contains descriptions, technical informations and instructions for operation and maintenance of V508 and V510 propeller type series.
All activities associated with propellers operation and maintenance must be practices according to this manual. Activities exceeding scope of this manual, shall be practices only by manufacturer or authorized service centre.

CAUTION

All activities contains in this manual shall be practices only by persons with commensurating qualification !
Breach of the operating instructions and procedures in this manual, exceeding of rated operational terms or performance limits can cause incorrect propeller function !
Manufacturer or authorized service centre doesn´t bear any responsibility for damages incurred non performance instructions or procedures stated in this manual !

SERVICE DOCUMENTATION

Product user is responsible for this manual up-dating according to issued changes. Latest revision of this manual is freely disposable at ***www.aviapropeller.com.***
See this website for service letters, bulletins and advisories associated with propellers in this manual.

NOTICE

Illustrations, pictures and drawings in this manual are only by example for displayed object and it´s not to be regarded as binding on any propeller type or her section.

GUARANTEE

Guarantee conditions for each one propeller are determined in contract of purchase.

THANK YOU FOR CHOOSING AVIA PROPELLER PRODUCT.

Properly maintained it will give you many years of reliable service.

LIST OF REVISIONS

Revision number	New pages issue date	Revised pages	Date
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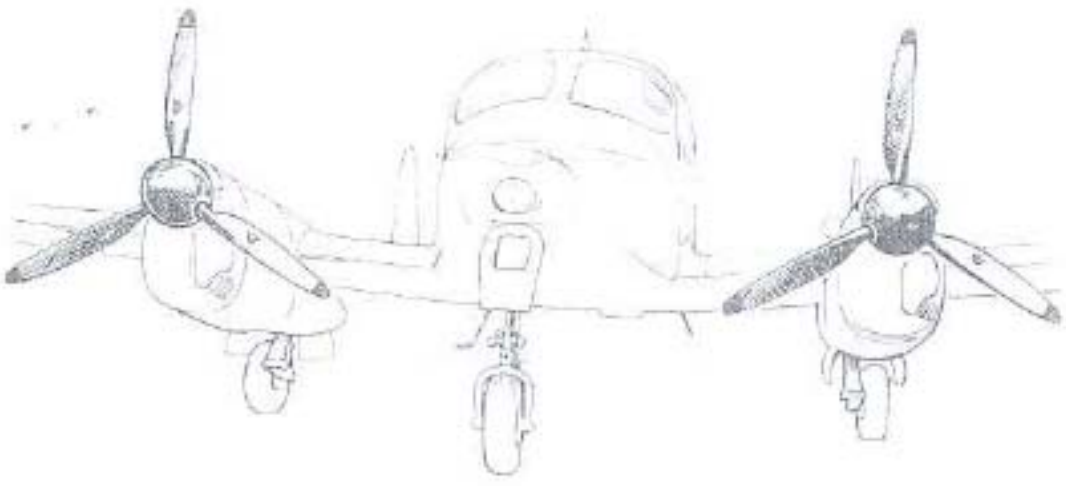


Fig.1 - V506 airscrew on the L200D aircraft

AIRWORTHINESS LIMITATION

This Airworthiness Limitations Section is EASA approved in accordance with Part 21A.31(a)(3) and CS-P40(b) and 14 CFR Part 35.4 (A35.4). Any change to mandatory replacement times, inspection intervals and related procedures contained in this section must also be approved.

A. Life Limits

(1) The life limit should be established for certain part of the propeller assembly. This limit requires the replacement of such part after a specified number of hours of operation (TSN, Time Since New).

(2) This section summarizes the life limited parts of propeller models covered by this manual.

(3) Below mentioned life limits of the parts apply to all of propeller models and propeller-aircraft-engine combinations, unless specifically noted otherwise.

(4) **Life limited parts of V506 series propellers**

Part	Life limit
Blade	5800 hours
Hub	5800 hours
Blade bushing	5800 hours
Outer ring	5800 hours
Fork	5800 hours
Oil distributor flange	5800 hours (oil distributors V506-6, V506-6.1, P7900) 6000 hours (oil distributor LUN7902-1)

INTRODUCTION

A. Statement of Purpose

This publication provides operation, installation and line maintenance information on the Avia V506 Series propellers.

Propellers in this manual are used on piston engines M337.

Installation, removal, operation and trouble shooting data is included in this publication. However, the airplane and engine manufacturer's manuals should be used in addition to this information.

B. Overhaul

For overhaul intervals of all Avia propellers refer to latest issue of Avia Service Bulletin No.1 available at Avia Propeller website at www.aviapropeller.cz.

The overhaul interval is usually referred to as Time Between Overhaul (TBO).

The TBO limit is based on operation limit expressed in hours of operation and on calendar limit expressed in calendar months. The overhaul should be accomplished if one of this limit is acquired, whichever occurs first.

The overhaul is periodic process performed at specific intervals in which the propeller is disassembled and inspected. Damaged parts are repaired or replaced. All sealing elements are replaced. Corrosion preventive coatings of the parts are renewed. Propeller is reassembled, adjusted and balanced.

The overhaul shall be accomplished only by Avia Propeller or authorized service station in accordance with latest revision of the Overhaul manual mentioned in section „Related Documents“ in this chapter.

C. Related Documents

(1) Avia Manual E-1641 (61-10-41) - Overhaul Manual

(2) Avia Manual EN-1370 (61-10-70) - Overhaul Manual for Metal Blades

(3) Avia Service Bulletin No.1
Includes an overhaul intervals of all Avia propellers. Available on Avia website at www.aviapropeller.cz.

(4) Other Avia service documents (Service Bulletins, Service Letters, Service Advisories) which may relate to propellers in this manual are available on Avia website at www.aviapropeller.cz.

D. Part Replacement

Only original part is necessary to use if any is needs to replace due to its damage or loss. Contact propeller manufacturer to original part information and/or delivery.

NOTE:
Not all propeller parts can be replaced in the field. Only some outside mounted parts as the flange o-ring and the connecting hardware (screws, nuts, cables etc.) can be replaced in the field.

Some other parts can be replaced in the field only by persons trained and approved by propeller manufacturer.

Contact propeller manufacturer for more information.

TERMINOLOGY APPLIED HEREINAFTER

In order to make all special terms involved in this Service Manual exactly clear and plain, the right sense of them will be explained in this chapter.

A i r s c r e w u n i t is a general term used for the complete airscrew including the pitch control and speed governing elements.

M i n i m u m b l a d e p i t c h a n g l e means the minimum pitch angle, which can the airscrew blades be changed (set up) to by the speed governor during a flight. This blade pitch angle is limited by a mechanical stop installed in the airscrew servomechanism. Minimum blade pitch angle can be adjusted by turning the airscrew blade in blade shank cuff after having released the respective blade shank cuff clamping strip.

M a x i m u m b l a d e p i t c h a n g l e means the maximum pitch angle, which can the airscrew blades be changed (set up) to by the speed governor during a flight. This blade pitch angle is limited by a hydro-mechanical stop of the airscrew servomechanism and corresponds to the maximum permitted flight velocity of the aircraft.

R a n g e of maximum (minimum) s p e e d c o n t r o l l e d means the highest (lowest) speed range which can be set up and duly controlled by the speed governor.

S p e e d e q u i l i b r i u m is a steady speed condition at which r.p.m. of airscrew or engine are equal to r.p.m. set up by the speed governor.

F e a t h e r i n g p o s i t i o n means the airscrew blades having been set up to the forward minimum resistance pitch position when the engine is not running. This blade pitch position is limited by a special mechanical stop in the airscrew servomechanism.

A i r s c r e w o v e r s p e e d means an instaneous short-durating speed deviation over the speed value set up by the speed governor at any change of engine or airscrew operational regime.

S p e e d c o n t r o l i n s e n s i b i l i t y means a maximum deviation value of actual airscrew speed compared to the speed value set up which the speed governor is not able sensitively to respond to in changing the airscrew blade pitch quite exactly.

S p e e d s e l e c t o r is a control lever arranged in the cockpit, controlling the prestress of the speed governor spring.

LAYOUT OF AIRSCREW UNIT

The model VJ 6.506 airscrew unit has been designed for air operation on L 200 D double-engined aircraft, provided with M 337 engines, which have been properly modified to be able to operate with hydromatic airscrews.

Power oil, necessary for operational changing the blade pitch angle,is supplied from the engine lubrication system by means of the airscrew speed governor pump.The oil lubricating all movable parts of the airscrew hub,as well as the return oil and leakage oil,too, are lead away to the engine crankcase.

VJ 6.506 airscrew unit incorporates the following group assemblies:

1. V 506 hydromatic airscrew
2. V 506-6 power oil distributor
3. LUN 7810 speed governor
4. LUN 7841 auxiliary feathering pump
5. LUN 7881 hydro-electric pitch control mechanism
6. LUN 7876 control box
7. Connecting parts (hoses) of hydraulic system

Individual group assemblies of the airscrew unit are interchangeable. Should any of them become damaged,it can easily be replaced

for a new one. Log-sheet of the new (replaced) assembly should be attached to the "Airscrew Log Book", wherein every realized spare parts replacement should be entered under the heading "Other Records".

PRINCIPAL TECHNICAL DATA OF AIRSCREW UNIT

Engine speed:	take-off	2750 r.p.m.
	nominal	2600 r.p.m.
	cruising	2400 r.p.m.
Engine output:	take-off	210 hp
	nominal	170 hp
	cruising	140 hp
Range of controllable speed		2250-2750 r.p.m.
Insensitivity of speed governing circuit		max. $\pm$ 20 r.p.m.
Time taken at feathering the blades during a flight		max. 10 sec.
Time taken at unfeathering the blades and setting them up to the maximum pitch angle		max. 5 sec.
Airscrew and control instruments are operating quite reliably:		
	at aircraft network voltage of	21 - 30 V
	at altitude above sea level of	0 - 6000 m MSA
	at ambient relative humidity	30 - 98 per cent
	at ambient open-air temperature	from -45°C-grade up to +50°C-grade
Weight of:		
	airscrew unit	41 kg
	service tools incl.tool bag	10 kg
	transport carton (box)	12 kg
	airscrew unit incl.the transp.box I (main)	63,5 kg
	airscrew unit incl.the transport box II	53 kg
Dimensions of transport box		900x450x525 mm

Airscrew unit is operating reliably at applying any of the following oil sorts recommended for lubricating the M 337 aeroengines: LB 22 C, Aero Shell Oil 120, Esso Aviation 120, LB 18 C, MS 20, Aero Shell Oil 100, Esso Aviation 100.

DESCRIPTION OF INDIVIDUAL GROUP ASSEMBLIES

MODEL V 506 AIRSCREW

1. Design and Application

Model V 506 Airscrew is a constant-speed and variable-pitch hydromatic propeller provided with three interchangeable duralumin blades. Within the controllable speed range is this airscrew operating as a single-acting one and, when feathering,as a double-acting one. This model of airscrew has been designed to be applied to reduction-gearless aeroengines of maximum power upto 250 hp, having a conical or a flanged crankshaft nose. The blade pitch changing range of this airscrew model enables the blades to be set up into emergency (i.e.feathering) position if necessary and, therefore, this airscrew an also be applied to multi-engined aircraft. This airscrew model is provided with an effective blade liquid de-icing system.

Air-service reliability od V 506 airscrew is moreover strengthened by a blade-pitch locking gear, which, on one hand, is mechanically safelocking the instaneous set-up blade pitch position in case of any eventual decrease of power oil pressure and, on the other hand, hydraulically safe-locking the airscrew-blades against any undesirable contingent feathering motion.All moving parts of the airscrew are perfectly lubricated with oil supplied in the airscrew hub inner space. Thus any other additional lubrication of individual airscrew parts is quite unnecessary.

2. Technical Data (Specification)

Design of airscrew . . . . . Feathering,constant-speed and variable-pitch model

Blade pitch changing system	Hydromatic
Working type	Tractor airscrew
Max. engine power	250 hp
Max. airscrew speed	2750 r.p.m.
Location of servomotor	in airscrew hub
Max. pitch range	$68^{\circ}30'$
Blade pitch angle at the take-off position stop	16°
Blade setting angle at the maximum pitch position stop	$34^{\circ}30'$
Blade pitch angle at the feathering position stop	$84^{\circ}30'$
Sense of rotation	Anticlockwise
Number of blades	Three
Blade construction material	Duralumin D 1 T
Blade profile	Clark Y
Max. width of blade	137 mm
Blade thickness at the check section	7.6 mm
Airscrew diameter	1750 mm
Drawing-No. of blade	V 506-1
Airscrew polar (mass) moment of inertia	0.1615 kg.m./sec^2
Weight of proper airscrew	32.60 kg

3. Description of Airscrew

Model V 506 Airscrew incorporates tha following assemblies:

a) The airscrew blade 1 (Fig.2) is manufactured of a duralumin forging.It is screwed in the blade shank cuff 2 so as to allow the position tally mark"a" stamped on the blade root to coincide with the tally mark "b" stamped on the upper conical area of the blade shank cuff edge or at a max. distance of 1 mm above the cuff edge.The blade is locked in position through clamping the sleeve 3 by means of respective bolt 4 and retaining nut 71, applying thereto a force torque M_k =

6 up to 6.5 kg.m. The blade root is sealed by a rubber packing ring 5.

b) The airscrew hub assy comprises the proper airscrew hub, blade root bearing and hydromatic blade pitch control servo-mechanism. The airscrew hub 6 itself is designated by the respective type-mark and work-No. of the airscrew unit. The airscrew hub absorbs all arising centrifugal forces as well as bending or torsion stress moments of the rotating airscrew blades and transfers the engine crankshaft torque onto the airscrew. To the airscrew hub rear wall is attached the rear cover 7. The airscrew is fixed to the flange 47 by means od stud bolts 8 and nuts 9.

The airscrew blade bearing assy is composed of blade root bearing liner 2, outer ball bearing force 10, bearing balls 11 and a bronze thrust ring(insertion ring)12. This blade bearing assy is fitted by its outer bearing race 10 to the airscrew hub neck (branch) and tightened up by a torque of value M_k = 35 up to 40 kg.m. and secured against loosening by a lock screw 13. On the bottom end of the blade root bearing liner 2 is forced a flange provided with a carrier pin 14, which is turn-locked by lock pins 15. On the carrier pin is slidingly fitted a slide block ("stone") 16 that is slided in a carrier 17. This slide block 16 is secured against falling-out by a support ring 18 and a lock ring 19. The carrier is guided along by means of three longitudinal guides 20. The carrier guides are fitted by means of dowels 21 to the rear cover 7 as well as to the front cover 22 and, simultaneously, this is to serve as a supporting base for setting the mounting prestress of the blade bearing. This blade bearing prestress has been attained by means of the prestressing screw 23 which is tightened up by a torque M_k = 1.5o up to 2.oo kg.m. This screw is leaned against a hardener washer 24 and locked by a safety piece 25.

The hydrometic blade pitch control servo-device is an independent assembly. This is fitted to the airscrew hub frnnt part 6 by means of the screw 26, applying thereto a tightening torque of value M_k = 20 up to 25 kg.m. This assembly is secured against loosening by the look screw 27. Position of this mechanism is determined by centering pins 28. The blade pitch control servo-mechanism comprises two cylinders, the outer one 29 of which is fixed (immovable) and the inner one 30 is movable (sliding).

The inner cylinder acts there as a piston - in a range of the airscrew speed (r.p.m.) controlled. The piston 31 is under normal blade pitch setting conditions hydro-locked and in the inner cylinder 30 can move only then when changing a normal blade pitch to or out of the feathering position. This operating combination enables to attain the maximum blade pitch changing power at a minimum power oil pressure in a range of normal flight blade pitch positions and also an encreased blade pitch setting speed when changing a normal flight blade pitch to the feathering position. In the rear wall of the inner cylinder 30 is fitted a nozzle for supplying oil to the airscrew hub assy to lubricate there all of its movable parts. From the airscrew hub assy is this lubricating oil conducted away through the rear cover oil valves 7 and through the insertion piece oil passages to the engine crankcase. The front cover 22 acts there as well as a setting stop of the maximum blade pitch angle (cruising regime). By means of the piston rod is the piston 31 connected with carrier 17 and is sliding along the bearing tube 32.

The bearing tube is attached to the outer cylinder 29 and anchored (supported) in the airscrew hub rear cover 7. This bearing tube is secured against releasing by the screw 33 and sealed by a packing ring. The front end shoulder (step) of the bearing tube serves there as a setting stop of the minimum blade pitch angle

(i.e.take-off regime). In the bearing tube is installed the distributing piping 34 which divides the tube inside space in two parts.Through the inner section of this piping is there supplied power oil for setting the airscrew blades to the maximum pitch angle(i.e. cruising regime) and, on the other hand, through the outer part of the piping meant above -is supplied power oil for setting the blades to the minimum pitch angle (i.e.take-off regime). In the front section of the bearing tube 32 is installed a safety valve 35 for safety-locking the blade pitch angle set-in in any case of an accidental failure of the airscrew speed governor,as f.e. when its drive is broken or similarly.The valve slide 36 which opens the safety valve in case of changing the blade pitch set-in to the minimum setting angle (take-off regime), is slidingly fitted on the front part of the distributing piping 34. The safety valve gets closing by means of the screw 37 which is sealed by packing rings 38 and locked by a circlip 39. A certain asset of this system is a quite simple design of the safety valve and, besides, also a possibility of taking the valve at any airscrew unit inspection out the bearing tube front part 32 without any dismounting it.All movable parts are sealed by rubber packing rings.

c) The airscrew spinner comprises two parts. The rear part 40 is centered and attached to the airscrew hub rear part by means of six screws 41.

The front part 42 is centered to the airscrew front part by means of a centering flange 43 and to the spinner rear part is attached by nine fastening screws 44, being equally spaced one from each other at a uniform distance round the whole circumference.In the spinner front part is fitted(riveted) an oil heater together with an insulation insert 45 for cooling the power oil of the blade pitch control servomechanism.The spinner rear part 40 is provided with orifices for fixing the balancing pads(balan-

ce weights) which are to balance the whole airscrew unit when rotating.

d) The airscrew blade de-icer comprises an oil slinger 57 fitted to the spinner rear part 40. To this oil slinger is supplied through a pipe from engine the de-icing fluid which at rotating move of the airscrew is forced by centrifugal forces to the oil slinger periphery. On this oil slinger periphery are fitted (welded on) pipes 58, which the de-icing fluid is conducted through to the small de-icing fluid tank 59. From there the de-icing fluid is lead through another pipe to the airscrew blade leading edge surface. The small de-icing fluid reservoir is attached to the blade root liner sleeve 3.

A general description in detail of this de-icer is also to be found in the "Manual for operating, servicing and maintenance of the L-200 D aircraft".

POWER OIL DISTRIBUTOR

1. Application

The power oil distributor supplies power oil from the outer part of engine to the blade pitch control servo-mechanism.

2. Specification

Marking	V 506-6
Operating pressure	5 up to 8 kg/sq.cm.
Maximum pressure	15 kg/sq.cm.
Power fluid	engine oil
Maximum oil temperature	95° C
Maximim speed	2800 r.p.m.
Weight of empty distributor	2600 grammes

3. Description

The power oil distributor is composed of the rotor and housing.

The distributor rotor (Fig.2) comprises a flange 47, on which a bush 48 is forced. The surface of this bush is provided with ring grooves ground-in wherein oil sealing bronze rings 49 are fitted. The flange 47 is attached to the rotor shaft by a nut 51, having been applied thereto a tightening torque of value M_k= 30 up to 35 kg.m. Into 6 holes of the flange are forced driving hollow pins 50 which are to transfer the torque from the flange 47 onto the airscrew hub 6.

The distributor housing 52 is provided with two power oil feed inlets, through which power oil is conducted from the engine outside to the pertinent oil distributing groove of the distributor rotor. From these rotor oil distributing grooves is the power oil conducted through outlets to the respective oil passages of the insertion piece 54 and from there distributed to the airscrew hub manifold. In the distributor housing is forced an insertion piece 53. The oil seal rings 49, as a result from their prestress setting, are pressed closely to the cylindrical wall of the insertion piece 53 orifice around its whole circumference. In this way there is attained a desirable sealing of the distributor rotor power oil. Lock ends of the oil seal rings are each to other turned through an angle of 180°. Oil which may leak still around the oil seal rings is drained through slots 55 and through the passage 56 away.

LUN 7810 AIRSCREW SPEED GOVERNOR

1. Application

The LUN 7810 apparatus is an indirect, centrifugal speed regu-

lator of the V 506 hydromatic three-bladed airscrew, including a hydro-intensifying element.

This speed governor maintains r.p.m. of the airscrew so that at any change of effective r.p.m., resulting from various outdoor effects, delivers a corresponding quantity of power oil to the airscrew unit and in this way changes the blade pitch angle so that actual r.p.m. corresponds with the preselected ones.Adjusting the airscrew speed controlled (preselected) is executed by varying loading and unloading (releasing) the governor spiral spring by means of an operating handwheel. Control is carried out by means of the RPM-preselector located in the cockpit.

This speed governor cooperates in common with the LUN 7881 hydroelectric pitch control device and with the LUN 7841 auxiliary feathering pump. The governor piston valve is designed so that turning the control handwheel to the other extreme position ("feathering")has to result in a positive opening of the power oil passage for setting up the coarse blade pitch.

The speed governor is fitted with a compensating safety spring which in case of accidental rupture of the control cable maintains r.p.m. of power unit(engine) in preselected range of speed limit, i.e. approximately in a range of cruising RPM limit.

2. Specification

Type marking	LUN 7810
Kind of drive	Engine drive
Sense of rotation (when looking at the speed governor from the side of its drive)	Clockwise
Control of governor	Mechanically
Power fluid supplied	Engine oil
Inlet power oil pressure	3.5o up to 4 kg/sq.cm.
Maximum outlet power oil pressure . .	15 up to 16 kg/sq.cm.

Turning angle of the control handwheel:

a) from the "Take-off" position (i.e.1375 r.p.m.) to the "Start-of-r.p.m.-regulation" position (i.e.1125 r.p.m.)	21° up to 25°
b) and from the "Take-off" position to the "Feathering" position	68°, minimum
In case of accidental rupture of the handwheel control cable are r.p.m. of the M-337 aero-engine maintained by this governor at a limit of	2250 up to 2500 r.p.m.
Weight of empty speed governor (dry weight)	2000 grammes, max.

3. Description

The LUN 7810 airscrew speed (r.p.m.) governor is composed of three assemblies: of governor oil pump assembly together with the front cover, the governor housing assembly with the governor shaft and counter-weights and, finally, of the governor rear cover assembly with the control wheel (pulley).

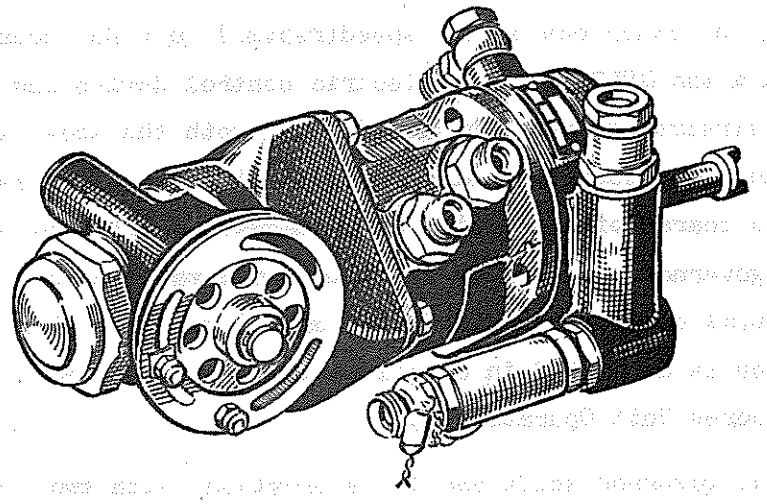


Fig. 3 - The LUN 7810 airscrew speed (r.p.m.) governor

In the governor oil pump housing 1 (Fig. 4) and in the governor front cover assy 2 is installed the governor oil pump which comprises a driving shaft 3 and a driven gear wheel 4.The power oil enters the pump through the lateral inlet branch 5.

The power oil is forced out of the governor pump upwards under the reduction valve 6 and also through the oil passage 7 of the governor housing 8 as well as through the three ports 9 of the governor shaft 10 into space between the slide valve collars 11. When the slide valve is just being in the equilibrium position, i.e. when both the slide valve collars 12 and 13 are just closing the blade fine pitch (⊀) setting up oil passage 14 and the blade coarse pitch (⊁) setting up oil passage 15,the power oil is moving the slide valve 16 of the reduction valve 6 which is adjusted to a pressure value of 15 up to 16 kg/sq.cm and then the oil returns to the oil pump intake space through the passage 17.Thus the power oil circulates at this operation in the governor oil pump housing only.

In case of changing the blade pitch angle set up, the power oil passes either the blade fine pitch 18 or the coarse pitch 19 setting up branch out of the speed(r.p.m.) governor housing further on to the LUN 7881 hydro-electric control device and finally to the airscrew servo-mechanism.Opening both the above mentioned blade pitch operating oil passages (i.e. the airscrew blade fine and coarse pitch setting up passages) is effected by means of the governor slide valve 11 which is moved in both ways by centrifugal counter-weights fitted on the governor shaft. This operation is described in detail in the chapter "Description of the Airscrew Unit Operation".

The speed governor shaft end 10 is provided with two swinging centrifugal counter-weights 20 which are supported by a ball bearing 21 fitted on the governor slide valve 11. The governor

shaft 10 is driven by the gear wheel 22 fitted on the driving gear wheel hub 4. The governor shaft is locked against any possible axial motion by the two lock rings 23 and 24. The centrifugal counter-weights 20 are fitted on needle bearings 25. The bearing needles are locked against falling-out by lock rings 26. Against centrifugal forces of both the counter-weights effects there the loading force of the taper-shaped spring 27 which is installed there between the spring rest 28 and the speed(r.p.m.) preselector liner 29.

The r.p.m. preselector liner 29 is moved in both ways by turning the control wheel (pulley) 30 which is fitted and key-locked on the r.p.m. preselector shaft 31. This r.p.m. preselector liner slides in the speed governor rear cover assy 32 which is provided with a take-off r.p.m. setting up stop 33 and with a cap nut 34. Between the cap nut 34 and the r.p.m. preselector liner is installed an equalizing (compensating) spring 35. On the control whell 30 is fitted a removable take-off r.p.m. setting up stop 36 together with a fixing screw 37 and a nut 38 to attach the operating cable.

In the speed governor housing 8 is installed a connecting branch 39 for draining the returning oil from the airscrew hub assy to the engine oil collector (crankcase oil sump). To the oil pump housing 1 under the reduction valve 6 is attached a check valve 40, provided with a ball 41. In case of feathering the airscrew blades(i.e.when changing the blade pitch set up to the feathered position), the power oil is conducted from the LUN 7841 feathering pump further on through the connecting branch 42, through the governor slide valve and through the blade coarse pitch operating oil passage to the airscrew hub servomechanism and, also through the connecting branch 43 to the LUN 7881 hydro-electric control device.

LUN 7841 AUXILIARY FEATHERING PUMP

1. Application

The LUN 7841 auxiliary feathering pump is a separately operating device, being provided with its own driving electromotor and oil filter installed in the oil intake space of the pump.

This pump is used to feather and unfeather the airscrew blades. This oil pump is not provided with any own relief valve. The maximum power oil pressure is there limited by means of the LUN 7810 speed governor relief valve. The power oil is there supplied by self-falling down from the engine oil tank to the pump oil inlet.

Operation of this feathering pump is started by shifting the r.m.p. preselector hand lever (carried out by the operator in the cockpit when going to feather the airscrew blades) or, on the other hand, by pressing down the LUN 7876 control box push-button (when unfeathering the blades). After having the airscrew blades already been feathered, the feathering pump operation is stopped (switched off) automatically by a limit switch of the LUN 7881 hydro-electric control device - just after having attained the limit position of the airscrew servomechanism. In case of unfeathering the airscrew blades is, on the other hand, operation of this feathering pump stopped by releasing the control box push-button .

This auxiliary feathering pump is installed on the fire-proof bulkhead (partition) of the aircraft fuselage. Oil for this feathering pump is supplied from the engine oil tank, being taken in through a low-pressure flexible pipe of 10 mm dia. Power oil to the LUN 7810 speed (r.p.m.) governor is then conducted through a low-pressure flexible pipe of 6 mm dia.

2. Specification

Feathering pump driven by the electromotor of type	LUN 2304
Sense of rotation, when viewing the device from the side of electromotor .	clockwise
Limit of power oil pressure	15^{+1} kg/sq.cm.
Nominal operating voltage	27 V
Maximum operating amperage	15 A
Minimum quantity of oil to be delivered at voltage of 27 V, at operating pressure of 15 kg/sq.cm. and at oil temperature of 35 C + 5 C toler.	1.1o litre/minute
Operation regime of the device	interrupted, short-timed
Time limit of operation at maximum operating pressure	10 sec.
Intervals of operation interruptions (between individual circuit-reconnections)	60 sec.

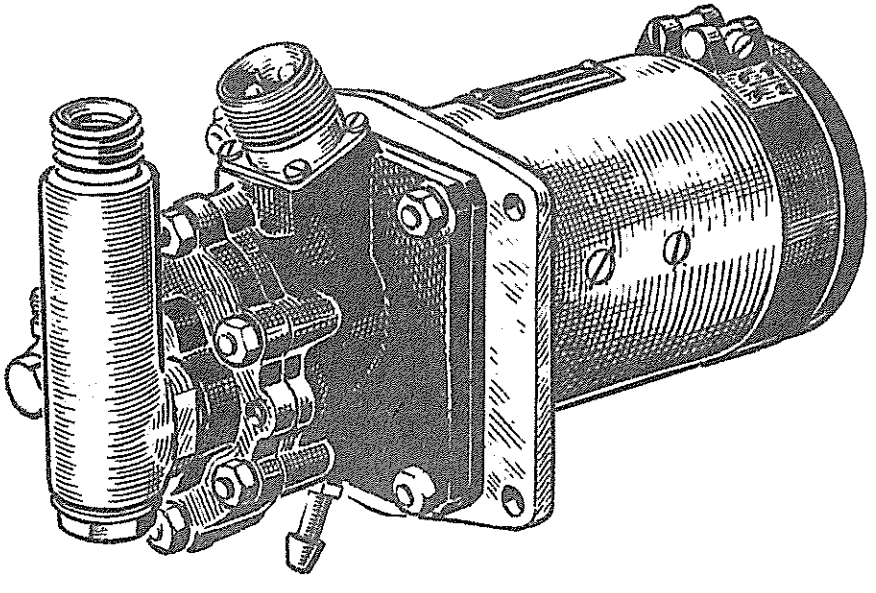


Fig. 5 - Auxiliary feathering pump, type LUN 7841

After every five circuit-reconnections comes in a stillstand interval to cool the driving electromotor down to an ambient temperature degree +5°Centigrade toler.

Operative position of the device . . . . . horizontal

Incline of the supply oil piping recommended to be kept between the engine oil tank and the feathering pump . . . . . at least 200 mm

Weight empty of the device . . . . . maximum 1550 g

3. Description

The LUN 7841 auxiliary feathering pump comprises an electromotor 1 (Fig.6), a pump housing 2, a pump cover 3, a gear pump 4 and 5, oil intake filter 6 and a socket plug for circuit connection.

The gear pump assy comprises a pair of gear wheels 4 and 5 fitted inside the pump housing 2.The torque of the driving electromotor 1 is transmitted by means of spur claw clutch 8 onto the driving gear 4.The clutch 8 prevents the driving gear from any

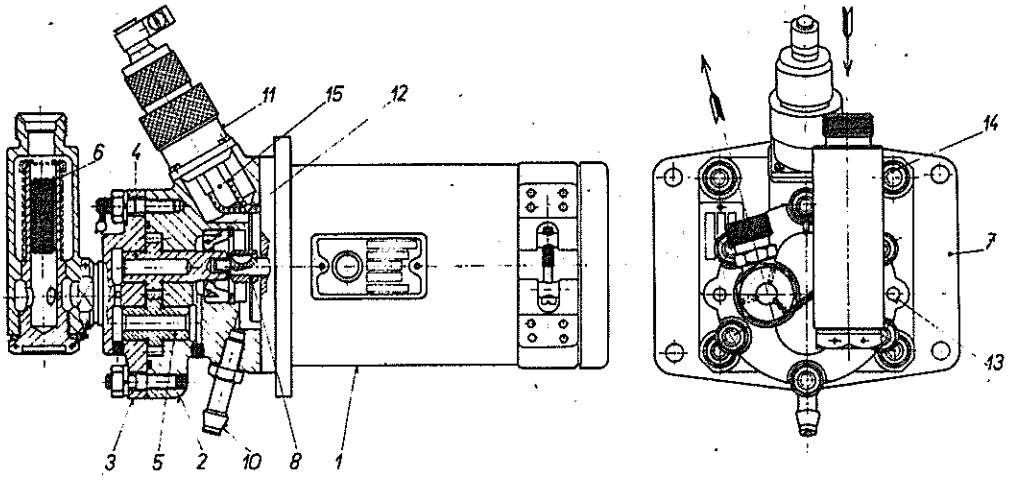


Fig.6 - Section view of the LUN 7841 auxiliary feathering pump

possible non-axial (lateral) motion. The gearing is there lubricated with the oil got on owing to leakage.

Feathering pump housing 2 and cover 3 are made of a light metal alloy. Oil for lubricating the gearing is conducted through passages to the intake space of the pump. The driving shaft is sealed by a packing ring 12 which is release-locked by a spring lock washer. The pump cover 3 is attached to the pump housing by means of six retaining nuts 14. The right and true position of this cover is secured by the two centering pins 13. The pump space in front of the electromotor is vented through the venting branch 10 which is connected with the engine cowl outer space by a hose and through the venting outlet 15 drilled in the pump housing upper part. To this upper part of the pump housing is attached a two-pole socket plug 11 to which are brazed on the electromotor connecting cables. These cables are connected along the channel of the pump housing flange.

The electromotor 1 is a standard direct-current motor of a rated voltage of 27 V. Transmission of torque is there carried out by means of the clutch 8 slided on the driving motor shaft. The electromotor is joined with the pump housing by means of a flange and four retaining bolts 14. These bolts jointly attach also the fixing flange 7 of the whole device to the electromotor flange.

The oil filter 6 is of a sieve-type one and installed in the intake space of the pump. It comprises a casing screwed in the front cover and, a removable filter screwed in the filter casing. The upper part of the filter casing serves as well as a branch of the oil tank connecting hose.

LUN 7881 HYDRO-ELECTRIC CONTROL DEVICE

1. Application

The hydro-electric control device is a safeguarding device installed in the oil piping system of the V 506 airscrew.

This appliance has a double service function. At a normal operation (running) of the airscrew when it is controlled by the speed (r.p.m.) governor, this control device prevents the airscrew blades from any undesirable accidental feathering and, on the other hand, at needed feathering the blades, this control device produces an impulse to stop (switch off) the operation of the auxiliary feathering pump after having attained the limit pitch position of the airscrew blades.

The control device is installed on the right-hand side of the M 337 engine crankcase, located on the final lug of the crankshaft roller bearing fitting hole. The device is connected with

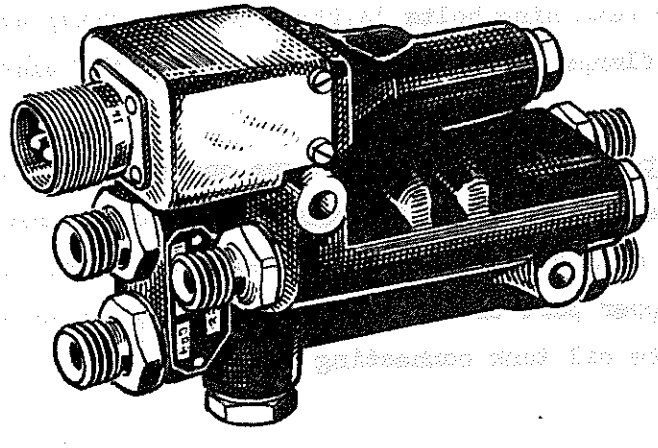


Fig. 7 - The LUN 7881 hydro-electric control device

the airscrew hub by means of four low-pressure tubes of 6 mm dia. Power oil from the auxiliary feathering pump is supplied thereto by means of another rubber tube of 4 mm dia.

2. Specification

Operating oil pressure (needed to stop the operation of the feathering pump)	$13^{+0.5}$ kg/sq.cm.
Rated (nominal) voltage of the control circuit	27 V
Rated amperage of the control circuit	1 A
Weight empty of the control device	maximum 420 g.

3. Description

The hydro-electric control device (Fig. 8) is composed of the oil distributor housing assy 1, the control slide valve 2, check valve 6 and of the limit switch with a socket plug to connect the device with a supply network.

The oil distributor housing 1 is a forging of a light metal alloy. All the oil passages therein are bored. All spaces, which are there to be vented, or from which oil penetrating therein owing to leakage is to be drained out, are connected with the engine crankcase by means of passages.

The control slide valve 2 is slidingly fitted in a guide bush 3 which is forged in the oil distributor housing 1. In the primary (initial) position is this slide valve holded down by prestress of the spring 4. At feathering or unfeathering the airscrew blades the power oil supplied from the auxiliary feathering pump moves the slide valve forth to the opposite limit position. The slide moving of this slide valve is limited by the dead stop of the cap screw 5.

The check valve 6 is of a two-way, ball-type one.

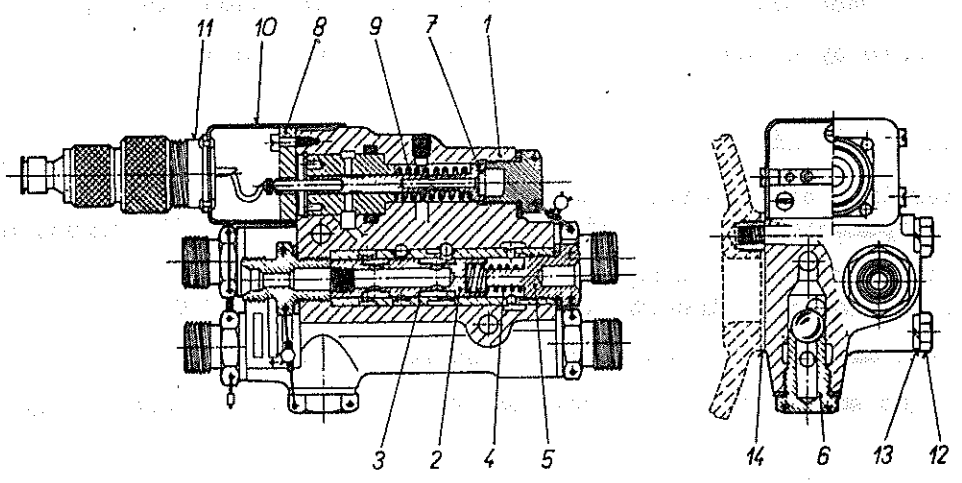


Fig. 8 - Section view of the LUN 7881 hydro-electric device

The limit switch is composed of a circuit-breaking slide valve 7 and a proper oil circuit-breaker 8. The circuit-breaking slide valve is loaded by the spring 9 which is holding the slide valve down in the primary position up to a certain oil prassure moment of limit value respectively. After having attained the specified oil pressure limit value, the power movement of the slide valve is operatively transmitted onto the oil circuit-breaker 8. This circuit-breaker, after having just feathered the airscrew blades, breaks automatically the control circuit of the auxiliary feathering pump driving motor. This limit switch (oil circuit breaker) is protected by an enclosure 10, whereon a two-pole socket plug 11 is fitted to connect the device with a supply network.

The control device is attached to the engine crankcase by means of bolts 12 and washers 13. The bearing surface is sealed by a gasket 14.

LUN 7876 CONTROL BOX

1. Application

The LUN 7876 control box is applied to double-engined aircraft in order to control feathering pumps of both the airscrews in going to feather or unfeather the airscrew blades, as necessary.

2. Specification

Operating voltage	20 up to 28 V
Rated (nominal) voltage	27 V
Maximum operating amperage	15 A
Insulating resistance at a standard medium	minimum 20 M-Ohm
Weight	maximum 500 g.

3. Description

The control box comprises a base, a control panel and a protecting cover.

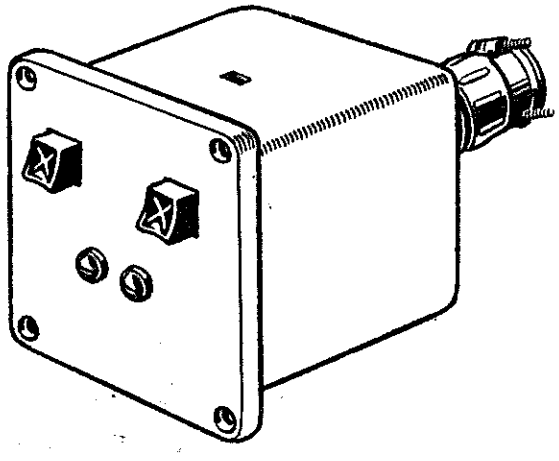


Fig. 9 - The LUN 7876 control box

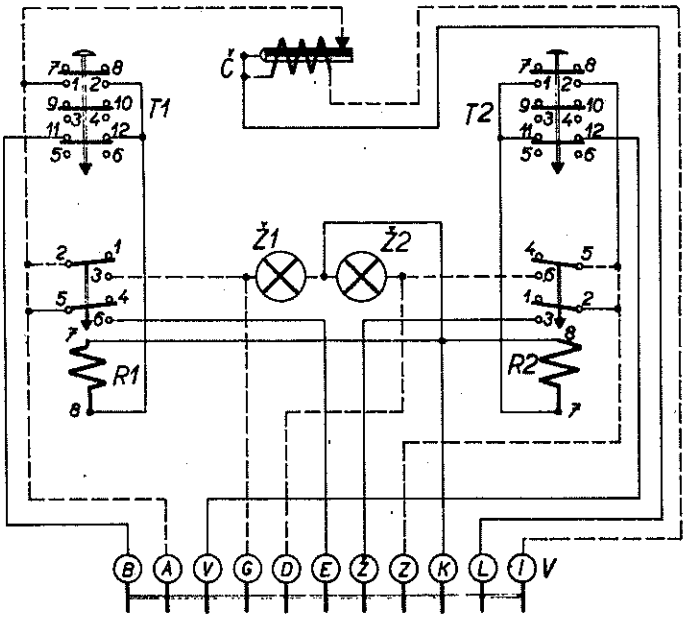


Fig. 10 - Wiring diagram of the LUN 7876 control box

In the upper part of the control box base are fitted two push-button blade feathering switches and a little lower two electromagnetic switches. Between them are installed two pilot lamp sockets and above them a time relay. To the rear part of this base is attached(riveted on) a stirrup provided with a 11-pole socket plug.Along both sides of the stirrup is made a stamping-down for sliding a spring safety piece therein. In the control panel are made two square holes for the green-coloured pilot lamp protecting glasses. The switch push-buttons are ochre-coloured and marked "X".

The push-button switch, pilot lamp and the electromagnetic switch fitted on the L.H. side of the control box are intended for actuating the port airscrew and both the switches as well as the pilot lamp installed on the R.H. side are intended to actuate the starboard airscrew.The time relay is, in the other hand, designed to actuate in common both the airscrews.

The electromagnetic switch is intended to switch the operation of the LUN 7841 auxiliary feathering pump.It is switched on by means of the LUN 3211 switch of the r.p.m. preselector lever when going to feather the airscrew blades and,on the other hand, switched on again by pressing down the control box puxh-button when going to anfeather the airscrew blades. This control box push-button has to be pressed down during all the operating time needed to unfeather the airscrew blades. The time relay is set in operation at feathering the blades only (at changing the blades into the feathered position only) and is also intended to switch off the r.p.m. preselector lever switch.Any feathering or unfeathering the sirscrew blades is signalized by the green light of the pilot lamp.

The wiring diagram of the control box kindly see in fig.10.

HYDRAULIC SYSTEM

The hydraulic system of the airscrew unit is interconnected by means of low-pressure flexible tubing applied for aircraft installations in compliance with ČSN 13 7821.3 (Czechoslovak Standard Specification).This piping being anyhow displaced or transferred is prevented from any possible soiling by a suitable protecting enclosure.In order to prevent some tubes from chattering they are fixed to steady parts of the aircraft fuselage and to the engine crankcase.

For the interconnections of the hydraulic system there are applied the following flexible pipes (see the Hydraulic system diagram fig.11):

+) Marking	Inside dia. X length (in mm.)	Flexible pipe installed therein is intended to interconnect:	
1	6 x 470	Speed (r.p.m.) governor	Engine lubricating oil pump
2 and 3	6 x 275	Speed governor	Hydro-electric control device
4 and 5	6 x 990	Hydro-electric control device	Airscrew hub
6	6 x 200	Speed governor	Engine oil collector
7	10 x 1000	Oil tank	Auxiliary feathering pump (port engine)
7	10 x 1200	Oil tank	Auxiliary feathering pump (starboard engine)
8	6 x 500	Auxiliary feathering pump	Speed governor
9	4 x 350	Speed governor	Hydro-electric control device

+) Marking (pos.Nos. of fig.11)

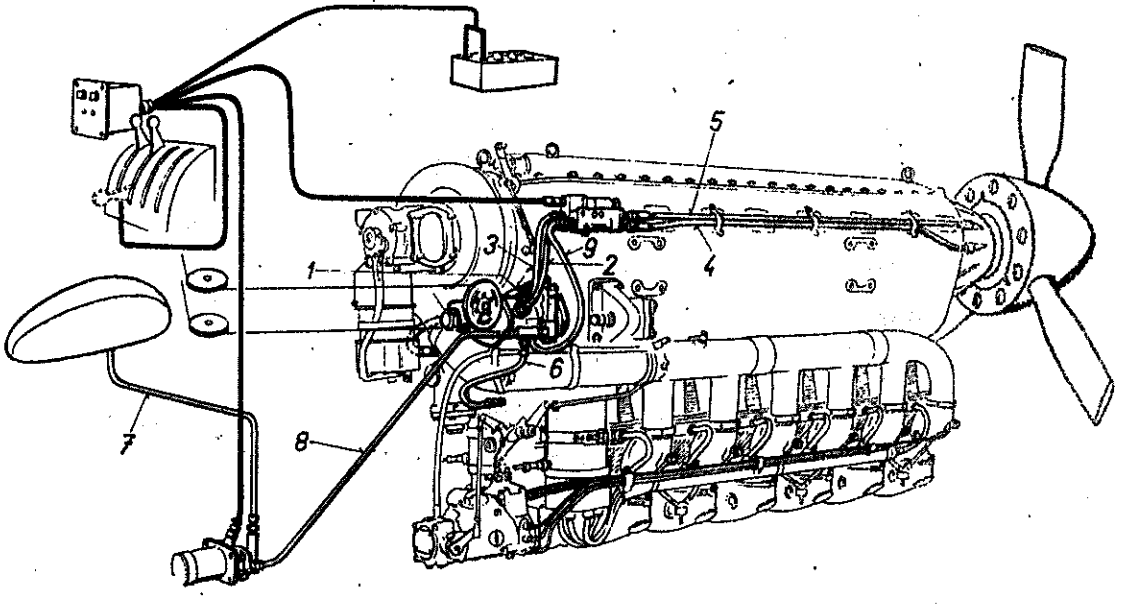


Fig. 11 - Diagram of the hydraulic system

EIECTRIC WIRING

Individual instruments of the airscrew unit are connected with the current supply by means of usual connectors. The current circuit of each airscrew unit is provided with a separate automatic over-current circuit-breaker.

The electric wiring diagram kindly see in fig. 12.

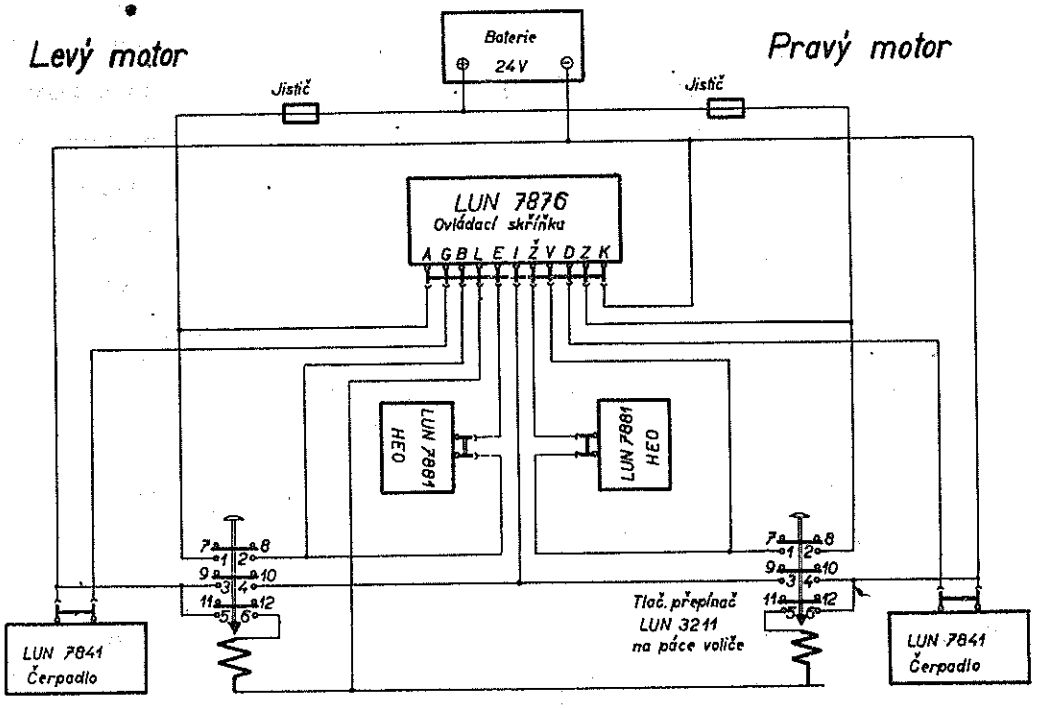


Fig. 12 - Wiring diagram of the VJ 6.506 airscrew unit

Translation of the Czech terms applied in fig. 12:

Levý motor - Port engine	Pravý motor - Starboard engine
Baterie 24 V - Battery 24 V	Ovládací skříňka - Control box
Jistič	- Over-current circuit-breaker
Čerpadlo	- Pump (Feathering pump)
Tlač.přepínač na páce voliče	- Push-button blade feathering switch

O P E R A T I O N O F T H E A I R S C R E W U N I T

Principle of the constant-speed variable-pitch airscrew operation may be generally described as follows:

At any deflection of the true engine speed from the speed(r.p.m.) desired and set up, the speed governor is transmitting an impulse to the airscrew servo-mechanism which suitably adjusts the true n p.m. of the engine to the speed value desired(preselected) by adequate changing the blade pitch angle. In case of increasing the engine r.p.m.is the airscrew blade pitch angle changed to a coarser one and, on the other hand,in case of decreasing the true engine speed is the blade pitch angle changed to a finer one. After having achieved the desired(preselected) r.p.m. value returns the speed governor mechanism back to its central,i.e. equilibrium position.

In the foregoing chapter of this Manual has been described the design principle of all structural elements of the airscrew unit.For a better understanding of operation of the individual devices and the airscrew mechanism itself will further in this chapter described in detail the operation of the whole airscrew unit, whereby description being ready accompanied with the respective diagrams.

SPEED EQUILIBRIUM (kindly see fig.13)

In case of the speed equilibrium state the true speed of engine accords exactly with r.p.m. desired and set up by means of the r. p.m.preselector 31. Under this working condition is the centrifugal force of the LUN 7810 speed governor counter-weight 23 conformable to the prestress of the adjusting spring 25. Both the oil outlet ports of the speed governor are now closed by the slide val-

ve 22 back to the pump intake space. As in this case no power oil is supplied to the airscrew servo-mechanism, the airscrew blade pitch angle set up is not changed, too.

OPERATION OF THE AIRSCREW UNIT

IN CASE OF INCREASING THE ENGINE SPEED (kindly see fig.14)

In case of getting the engine speed increased above the r.p.m. value desired and set up by the preselector is just adequately getting increased the centrifugal force of the speed governor counter weight 23 which is forcing the slide valve 24 to move against the governor spring 25.

Thus the middle space of the slide valve becomes connected with the oil port 18, where flows the power oil delivered by the pump 21. Through this inlet port is the power oil conducted to the LUN 7881 device, where the oil stream is distributed partly to the piping 12 and partly to the central passage of the check valve 15 wherefrom the oil streams on through the control slide valve bore 14 into the piping 13. The power oil is conducted further through the piping 12 and 13 to the oil distributor attached to the engine front cover and, from there further to the airscrew servomechanism. The power oil supplied through the piping 12 is streaming through the middle bore 8 to the lock valve 7, where the oil lifts the valve admission ball up from its seat and goes on to the space A of the airscrew servomechanism. The oil pressure is acting against the faces of the inner cylinder 2 and of the piston 1 and thus is at the same time moved the driving dog changing the airscrew blade pitch angle to a coarser one. Thus is mutually increased the power absorbed by the airscrew and the engine speed begins to decrease. The airscrew blade pitch angle becomes finished at the moment of getting decreased the centrifugal force of the counter-weight 23 whereby the slide valve 24 closes both the outlet oil ports.

The power oil supplied at the same time through the inlet passage 13 in the space B of the airscrew servomechanism, presents a simple but an efficient prevention from any undesired accidental change of the airscrew blade pitch into feathered position. The inner cylinder 2 having come ond contacted the cover 3 there is acting an equal operating oil pressure of both sides of the piston 1 so that the blade pitch changing force gets neutralized by a counter-force of equal value and also by the torque of all the airscrew blades. Thus is there a reliable security that at any accidental deffect of some airscrew part can occur no undesired change of the airscrew blade pitch to feathered position and the scheduled flight can be finished without any risk.

OPERATION OF THE AIRSCREW UNIT

IN CASE OF DECREASING THE ENGINE SPEED (kindly see fig.15)

In case of undesired decreasing the engine speed, the prestress value of the spring 25 exceeds the centrifugal force value of the counter-weight 23 and thus the slide valve 24 is being dislocated to enable free streaming of the power oil from the slide valve middle space to the passage 19. Through this passage flows the power oil to the check valve 15 and from there on through its middle port as well as through the slide valve bore 14 in the piping 13. From the distributor is the power oil comducted away to the annular space 8 and to the space B of the airscrew mechanism where the oil is forcing against the back side of the piston 1 and the inner surface of the cylinder 2. In order to enable changing the airscrew blade pitch angle to a finer one there has to be opened free streaming of the power oil, forced out of the space A by the torque of airscrew blades, by means of the cylinder 2 and piston 1. The lock valve 7 is opened by means of the power oil stream conducted through the port 5 to back space of the lock valve slide 6 which having been dislocated lifts the lock valve ball up from its

seat. The flow of power oil is from there conducted away through the middle bore 9 to the piping 12 and then through the port 18 to the speed governor oil sump 20.

Having achieved the engine speed preselected as desired becomes the centrifugal force of the counter-weight 23 again fully conformable to the prestress value of the spring 25 and the slide valve 24 closes the speed governor outlet oil ports.

FEATHERING THE AIRSCREW BLADES (kindly see fig.16)

Feathering the airscrew blades is being introduced by shifting the engine speed preselector lever 31 over the slidable stop as far as to the extreme position.At this lever shifting is the slide valve 24 positively moved by the sliding liner 26 to the blade coarse pitch setting-up position. Having reached the extreme position of the speed preselector lever, the push-button 32 provided with an electromagnetic arrestment (LUN 3211 - preselector lever switch) is for a moment pressed down. Thus becomes connected the control circuit of the relay unit 33.After having depressed this push-button,the speed preselector lever is by the spring forced a certain short distance back. The push-button provided with the LUN 3211 electromagnetic arrestment is kept connected by means of a time-relay 38 which is switched on by contacts of the push-button 32. The relay unit 33 switches on the electromotor of the LUN 7841 auxiliary feathering pump and lights up the pilot lamp 34,signalling thus setting the pump in operation. After about 5 up to 7 seconds the time-relay 38 disconnects the switch 32. The relay unit 35 continues, however, being connected. The auxiliary feathering pump draws in oil from the engine oil tank 36 through a sieve oil filter 36 and delivers it through the piping 28 and check valve 29 to the middle space of the slide valve 24 where it is mixed with the oil delivered by the pump 21 during the engine operation. At

the same time is the control slide valve 14, which is connected with the feathering pump by means of tubing 30, displaced by the power oil of the feathering pump to the opposite extreme position. The power oil is conveyed through the port 18 partly just to the piping 12 and partly to the central passage of the check valve 15. As the control slide valve is just being in the opposite extreme position, this oil passage is now closed by the slide valve and therefore all the power oil flows to the airscrew servomotor through the piping 12 only. During this operating cycle is pressure-loaded only the space A of the airscrew servomechanism and, therefore,after having seated the inner cylinder 2 onto the cover 3 can the piston 1 continue moving on until it contacts the inner cylinder rear wall.At this moment is the hydraulic pressure inside the circuit getting increased and this after having achieved pre-adjusted limit value dislocates the piston of the switch 16. At this piston displacement is being by means of the switch 17 disconnected the control circuit of the relay unit 33 and thus also switched off the auxiliary feathering pump as well as the pilot lamp 34.

The oil forced out of the space B is conveyed away through the passage 8, piping 13,control slide valve bore 14 and through an outlet passage 19 to the oil sump 20.

UNFEATHERING THE AIRSCREW BLADES (kindly see fig.17)

Unfeathering the airscrew blades and re-adjusting them to a normal cruising position is effected also by means of power oil of the LUN 7841 auxiliary feathering pump. Before each setting this pump in operation there has to be the speed preselector lever 31 adjusted to an optional flight position. Having set up the desired position of the speed preselector lever, the spring 25 displaces the slide valve 24 to its operating position of the blade fine pitch setting.

The operating circuit of the auxiliary feathering pump becomes and continues being connected by pressing down the LUN 7876 control box push-button 35 until it is being released again. As long as this push-button is pressed down, connection of the relay unit 33 is signalled by the pilot lamp 34.Power oil of the auxiliary feathering pump dislocates the control slide valve 14 and flows through the check valve 29 in the middle space of the slide valve 24.From there it is conveyed on through a passage 19 and the control slide valve 14 to the piping 13.Having passed this piping the power oil is conveyed to the space B of the airscrew servomechanism wherein it is forcing against the back surface of the piston 1 and further through the port 5 against the slide of the lock valve 6,too.After having opened the lock valve,the power oil forced out of the space A is conveyed through the contral hole 9,piping 12 and finally through the port 18 in the speed governor oil sump 20.

After having started rotating of the airscrew can the auxiliary feathering pump operation be switched off by releasing the push-button 35 in order to transfer thus further control of changing the airscrew blade pitch as desired to the speed governor which then automatically adjusts the airscrew blade pitch in accordance with the engine speed preselected.

OIL CIRCULATION AND LUBRICATION SYSTEM

In order to prevent the oil operating inside the airscrew servomechanism from any congelation,a flow of warm oil is at each change of the airscrew blade pitch admitted in the space B whereby a little quantity of this warm oil is taken away through the lubricating nozzle 4 to the airscrew hub inside space.Thus is there achieved a continual interchange of the warm oil and besides, this oil is there also used to lubricate all movable parts of the airscrew mechanism.This design arrangement substantially increases service

life of movable parts and makes unnecessary to carry out there any attendance and maintenance by the ground engineering staff. The lubricating oil is conveyed away out of the space C through check valves 10 and an outlet passage 11 to the space D wherefrom it is drained in the crankcase oil sump.

AIRSCREW SPEED AND BLADE INTERLOCKING GEAR

Service reliability of the V 506 airscrew has there been positively increased by a perfect locking gear enabling to finish quite safely every scheduled flight even in case of any accidental failure of a control circuit section.

This locking gear, fitted in the airscrew servomechanism, eliminates occuring of any engine overspeeding or undesired airscrew blade pitch changing in case of decreasing the power oil pressure down under a certain pressure value. In such a case the lock valve ball of this locking gear closes immediately the space A of the airscrew servomechanism and prevents thus the airscrew from any undesirable changing the blade pitch angle to a finer one.

This locking gear, preventing the airscrew blades from any undesired accidental feathering, is on the other hand set in operation at each changing the airscrew blade pitch angle to a coarser one. This has been realized by functional connection of both servomotor working spaces. Process of this functional interconnection is specified herein under the heading "Airscrew unit operation in case of increasing the engine speed" (page 35).

In case of rupture of the speed governor control cable, a suitable service speed as desired is automatically set up by means of a counter-balancing spring 27 which keeps the engine speed to a value as preselected and set up.

MOUNTING THE AIRSCREW UNIT ON THE AIRCRAFT

TRANSPORT OF AIRSCREW UNIT

For transport of airscrew unit (i.e. the airscrew proper plus its accessories) is there used a millboard case where minor corrugated pasteboard boxes with separate airscrew unit assemblies or subassemblies, respectively, are put in. These minor boxes of separate airscrew assemblies or parts are in the main millboard case duly secured against any undesired displacing by means of suitable corrugated pasteboard stay reparators.

To each twin-engined aeroplane are supplied both complete airscrew units in two transport millboard cases, the main of which is marked by "I" and the other by "II" signs. Inside each of them is boxed one airscrew unit, whereby there in the main case are in addition also put the LUN 7876 control switch box, service tool kit and this Manual of Service Instructions which all are common to both airscrew units.

It is absolutely not allowable to transport cased airscrew units or parts of them in open platform wagons being unprotected against weather detrimental effects or in wagons transporting just any corrosion-causing substances. In some individual cases only may be exceptionally permitted to dispatch assembled or disassembled airscrews in a suitable soft casing by air mail.

A proper boxing arrangements of separate airscrew unit assemblies and its accessories inside the transport millboard case is shown in fig.18.

Boxing arrangement of individual airscrew unit assemblies and sub-assemblies in the transport millboard case (showed in fig.18):

Marking*)	Contents of separate boxes	Notes
1	Transport millboard case, proper	
2	Airscrew blades, 3 pieces	
3	Airscrew hub incl. the spinner assy	
4	Speed governor, type LUN 7810	Boxed separately in proper cartons
	Auxiliary feathering pump, type LUN 7841	
	Hydro-electric pitch control device, type LUN 7881	
	Power oil distributor, Dwg.-No. V 506-6	
	Separate (unassembled) parts of the airscrew and its accessories	
	Spare parts to the airscrew unit	
5	Separate (unassembled) parts of the airscrew unit	
	Service tool kit	

*) Ref.No. of separate boxes inside the transport case

REMOVING THE ANTICORROSIVE COATING (UNPRESERVING)

The V 506 Airscrew

Airscrews, intended to be mounted onto aircraft during 48 hours after having been dispatched by the manufacturer, are generally not grease-preserved. Otherwise, airscrews having been preserved with an anticorrosive protecting grease coat should before mounting them onto aircraft be duly unpreserved as follows:

a) Airscrew preserved for a 6-months' period

All external surfaces should be cleaned with a wiping rag moistened in some clear non-ethylized benzine.

b) Airscrew preserved for a one- up to two-years' period

After having removed the airscrew spinner (i.e. airscrew front guard) should the airscrew hub be put on a suitable supporting rest placed in a grease sump receiver(vessel) wherein the anti-corrosive preservative compound, when being removed from airscrew surfaces, as well as the cleaning agents spent at the unpreserving procedure are to be collected. The preservative grease coating should be scraped off from the airscrew surface

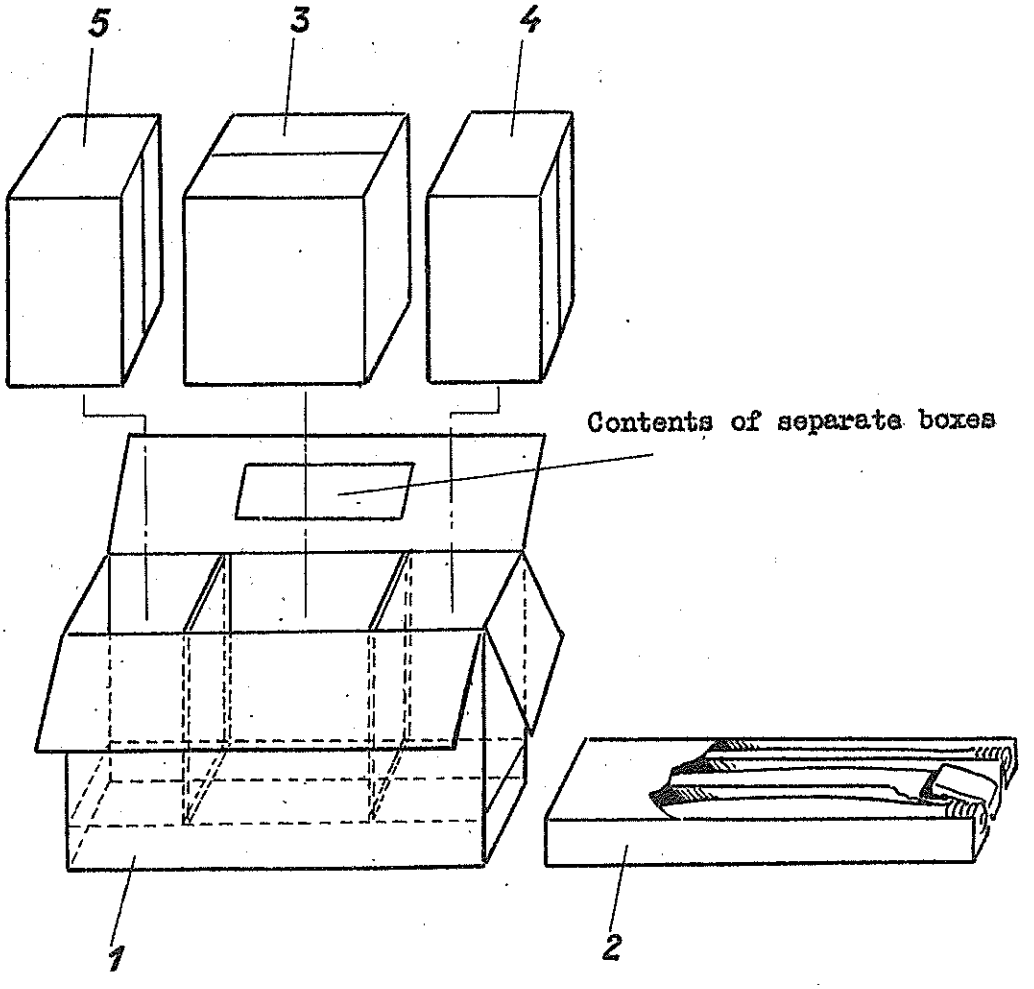


Fig. 18 - Transport millboard case of the VJ 6.506 airscrew unit

by means of a wooden scraper. Residual surface preservative coating is then still to be wiped off by means of a clean rag moistened in some clear non-ethylized benzine.

Caution:

When washing the blade root cuffs strictly see to avoid any leaking of benzine applied to in the space between the blade root cuff and the outer blade root bearing race, i.e. into space where the rubber packing ring is fitted in. This seal ring if getting anyhow swollen might cause a difficult blade pitch changing and thus, of course, a faulty operation of the complete airscrew unit.

Airscrew blades should be unpreserved by the same way as mentioned above.

The V 506-6 power oil distributor after having taken the distributor motor out of the distributor stator should be washed in a clear bath and then thoroughly dried up by means of dry compressed air.

The LUN 7810 speed governor

When unpreserving the hydraulic speed governor, its inside space is to be rinsed with clear aero-oil of the type M 18, warmed up to 70° up to 90° centigrades, whereby the governor driving shaft should be slowly rotated by hand. External surfaces are to be cleaned with a wiping rag moistened in benzine and finally the governor should thoroughly be dried up by means of compressed air.

The LUN 7841 feathering pump

In order to unpreserve internal surfaces of the auxiliary feathering pump, clear aero-oil of the type M 18, warmed up to 70° up to 90° centigrades, should be poured in through the inlet branches or this oil may be pumped through the pump housing by switching on the pump electromotor for a short time, respectively.

External surfaces are to be cleaned with a wiping rag moistened in benzine and then to be dried up by means of dry compressed air. Before mounting it on aircraft, inside space of the pump is to be filled with aero-oil of the type M 18. Carrying out this unpreservation, the operator must not let the oil and cleaning benzine leaking in the inside space between the electromotor and the pump or, in the electromotor proper, respectively.

The L U N 7 8 8 1 hydro-electric control device

This device is being unpreserved by rinsing the internal space and surfaces, using thereto some clear oil. After having done this operation, inside space of the device is to be filled up with the aero-oil, type M 18. The outer surface of the device should be cleaned with a wiping rag moistened in benzine and finally dried

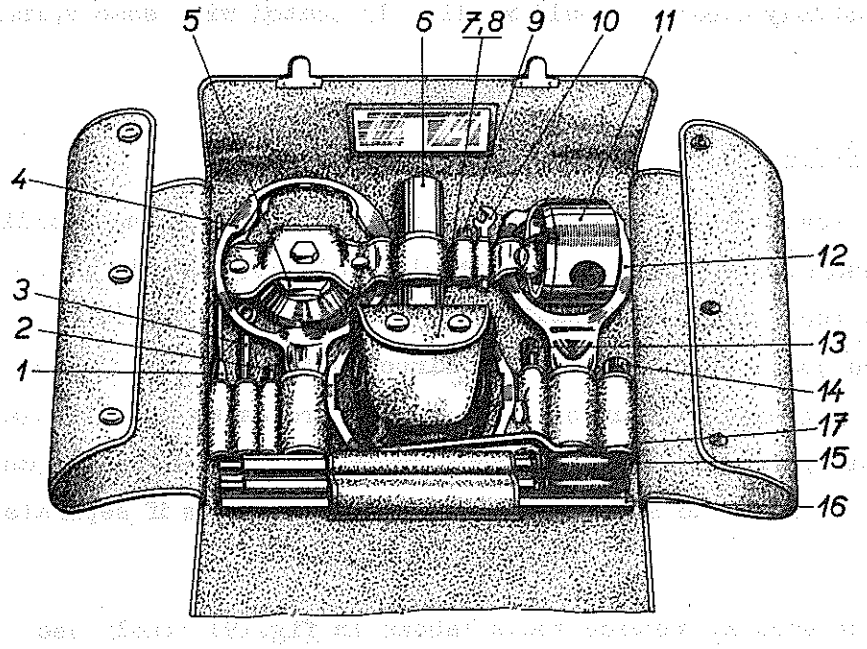


Fig. 19 - Service tool kit of the VJ 6.506 airscrew unit

up by means of dry compressed air. Thereby has not any oil cleaning benzine leak in the switch.

The LUN 7876 control box

Outer surface of this airscrew accessory should be unpreserved also with a wiping rag moistened in benzine and then dried up by means of compressed air. Thereby has not any cleaning benzine to leak in sections of the device electric installation.

Note

For washing all the above mentioned airscrew accessories is to be used come clear and non-ethylized benzine only. Unpreserved devices are, however, allowed to be stored not longer than 24 hours. Inlet branches of the instruments after having been unpreserved their inside spaces have to be protected by covers till fitting in aircraft. The airscrew and its accessories after having been unpreserved and duly cleaned should be slightly coated with some spindle oil.

SERVICE TOOLS

Special service tools are including a special centering facility (ring) generally supplied in a suitable tool kit (shown in fig.18). Standard tools are, of course, therein not included. Should in some cases the commercial user of this airscrew type - using his own torque appliances - be unable to keep to torques as specified (and individually digned on each torque spanner), the airscrew manufacturer is ready to supply suitable torque spanners if separately ordered.

Summary of special service tools (shown in fig.19) kindly see the next page.

Ref.Nos. of items	No. of pieces	Nos.of spanners	Nomenclature	Sign to be noted
1	1	-	Screw driver - applied to airscrew spinner fitting screws	
2	1	-	Remover of filament lamps	
3	1	12	Single-ended socket wrench - used to speed governor hydraulic system bolt nuts	
4	1	6	Special spanner - applied to oil distributor flange bolt nuts	
5	1	8	Oil distributor rotor remover	
6	1	1	Special spanner - for tightening the cylinder bolt	X)
7	1	10	Centering inlet piece - of the oil distributor housing	
8	1	9	Socket remover - of oil sealing rings	
9	1	4	Spanner - for tightening the cylinder cap screw	
10	1	11	Single-ended spanner - for fitting the speed governor to the engine	
11	1	7	Spanner - for fixing the oil distributor rotor to the propeller shaft	
12	1	2	Spanner - for tightening the blade root ball bearing outer race	X)
13	1	3	Spanner - for adjusting the blade root ball bearing prestress	X)
14	1	5	Spanner - for tightening the blade root cuff (liner)	
15	2	-	Tubes furnished with tommy bars (grips) of tubular wrenches	
16	2	-	Extension tubes (adaptors) of tubular wrenches	
17	1	13	Spanner - for tightening the airscrew fixing nuts	

X)Sign to be noted: Thus herein marked items(spanners) are intended to be used for mounting,dismounting and servicing the airscrew unit on the airsraft.

MOUNTING THE AIRSCREW ON THE ENGINE

The airscrew proper, airscrew blades, power oil distributor, separate parts of the airscrew and the service tool kit take out of the transport case. All these parts of airscrew unit should then be put on a clean plate in order to avoid any soiling or injuring of them. A due positioning of the airscrew hub after having removed it out of the transport case is shown in fig. 20.

Then is to be removed the spinner front part from the airscrew hub.

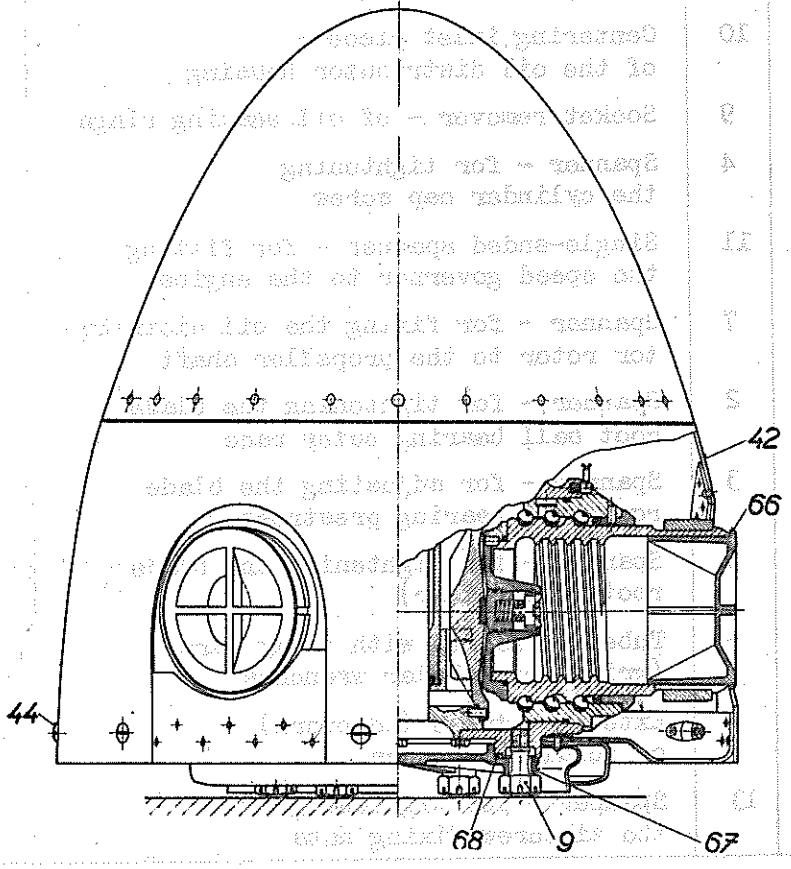


Fig. 20 - Due positioning of the airscrew hub after having taken it out of the transport case.

Mounting the oil distributor housing

Prior to mounting the airscrew on the M 337 engine remove the protective bearing lid from the engine front cover and put it provisionally off to the airscrew accessories or separate parts. Nuts and lock washers fixing the protective bearing lid use for fixing the power oil distributor housing 52 (shown in fig. 21). The old and spent seal ring of the protective bearing lid 60 replace for a new one. Then slide the auxiliary centering facility(taper-faced ring) in the oil distributor housing. The tapor-faced hole of

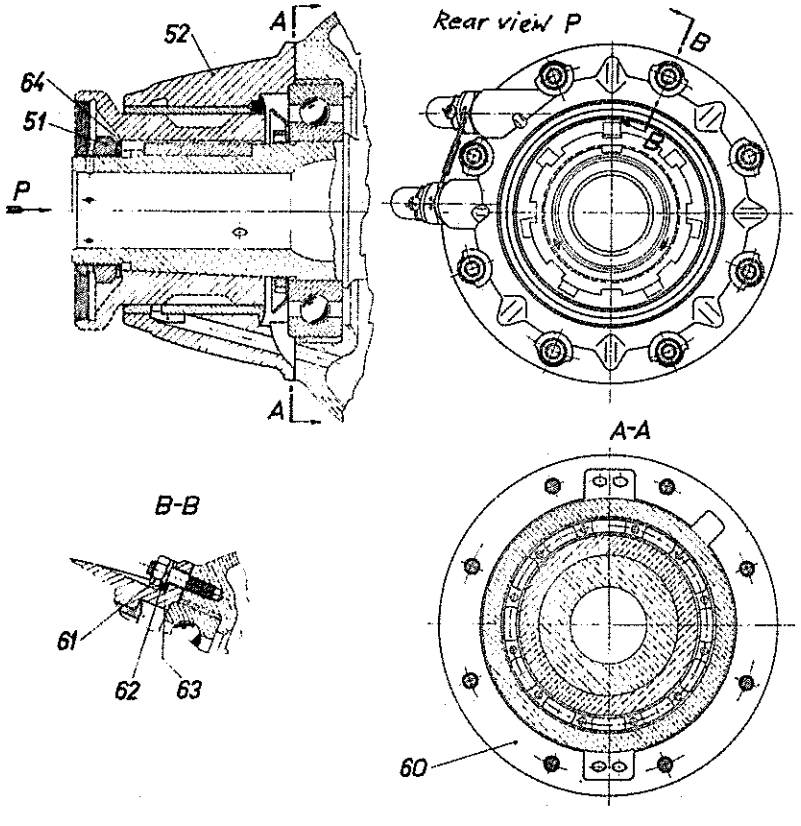


Fig.21 - Mounting the power oil distributor onto engine crankshaft

this auxiliary centering ring as well as the engine crankshaft tapered end should be, of course, duly cleaned before. Then draw the auxiliary centering ring tightly onto the crankshaft tapered end by means of the tightening nut 51. Between the nut and the auxiliary centering ring should be fitted a washer 64. The oil distributor housing is then to be fixed to the engine by means of nuts 61 resting on spring washers 62. Additionally to this between each spring washer and the oil distributor housing should be fitted in another washer 63. After having duly fixed the oil distributor housing to the engine there should the auxiliary centering ring be removed off by the remover No. 8 and onto the distributor housing should now be slided a felt ring, taken from the airscrew separate parts (shown in fig. 22, marked by ref.sign "c"). This felt ring before fitting it in should, however, be moistened in some clear benzine for about 5 minutes period.

M o u n t i n g t h e o i l d i s t r i b u t o r r o t o r

First remove the plug from the crankshaft inside space. Then verify the true height of the intermediate flange slot and height of the engine crankshaft spline. Here has to be kept an actual clear-

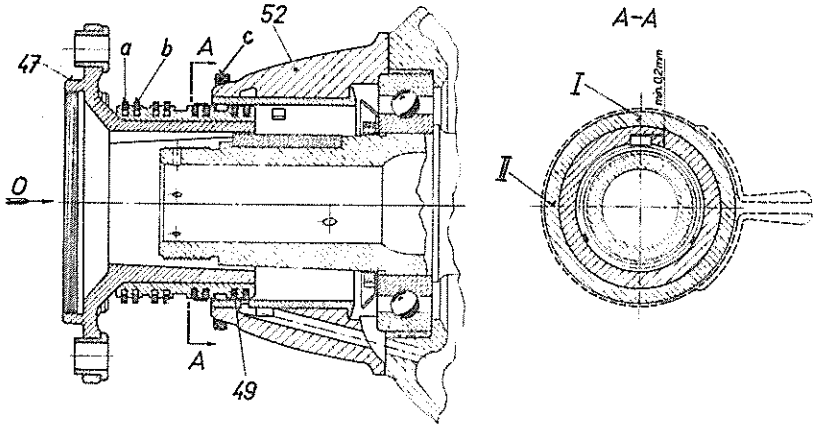


Fig. 22 – Mounting the oil distributor rotor on the engine

ance of at least 0.20mm(0.00787 in.).Apply a thin layer of graphite paste to the crankshaft cone surface. The oil seal rings of the oil distributor rotor should be lubricated with machine oil and the rotor tapered orifice is to be cleaned with an unsoiled wiping rag. The lock slit of the oil seal ring "a" should be adjusted to position I and the lock slit of the oil seal ring "b" to position II(as shown in fig.22).Lock slits of the other six oil seal rings are to be positioned 180° in opposite each to other. When sliding the rotor into the power oil distributor housing 52 there is necessary to clamp the first couple of the oil seal rings by means of the clamping sleeve 9 and to force the rotor forwards axially aiming at "o"(as shown in fig.22). After the first couple of clamped oil rings have already been slided in the oil distributor housing inlet orifice when the clamping sleeve (clamping the first couple of oil rings)is stopped at the next still unclamped couple of oil rings,release the clamped ring sleeve and clamping the next couple of rings,continue fitting the oil distributor rotor in the way just mentioned above.

On the engine crankshaft fit now the washer 64(its chamfered edge side should be facing the rotor flange) and screw on the tighten-

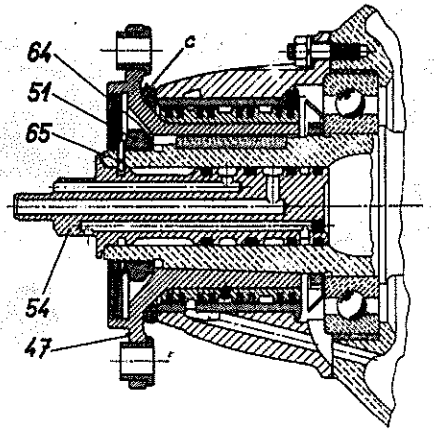


Fig.23 - Fixing the oil distributor rotor and the insertion piece

ing nut 51 (as shown in fig. 23). The oil distributor rotor after having been slided on the crankshaft should be tightened by means of the spanner No.7 applying thereto a torque value M_k = 30 up to 35 kg.m. When retightening the nut 51 apply the spanner No. 6 to the rotor flange in order to hinder undesired turning of the engine crankshaft using thereby an adequate counter-force(as shown in fig. 24). At this fitting operation should, however, be in short lever arms of the spanners No. 6 and 7 fitted extension tubular adaptors(otherwise kept in the service tool kit together with the spanners). Into the crankshaft bore slide the insertion piece 54 (shown in fig.23). The nut 51 should be locked by means of spring lock ring 65.The crooked lock of the lock ring has to fit into the respective recess of the insertion piece 54. Thus becomes the insertion piece secured and locked against any sliding out of the crankshaft orifice.Now the felt ring should be slided over between the rotor flange and the oil distributor housing face(as shown in fig. 23).

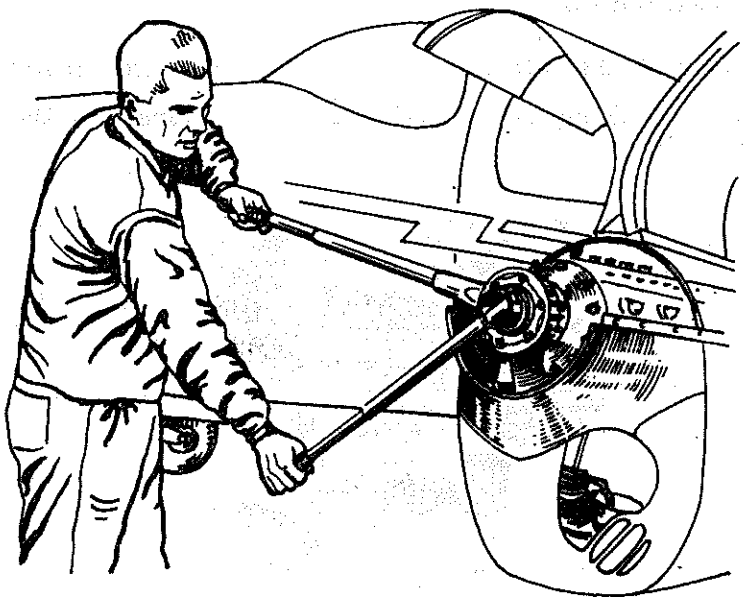


Fig. 24 - Tightening the power oil distributor rotor onto the engine crankshaft

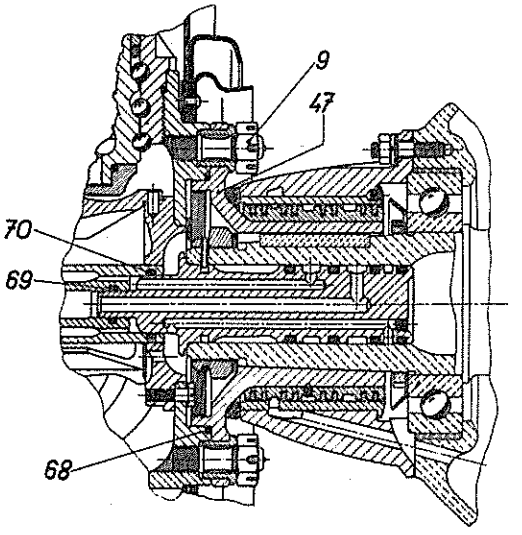


Fig. 25 - Fitting the airscrew hub to the engine flange

Attachment of airscrew to the rotor flange

Loosen the bolt 4 (shown in fig. 2) and take the plastic (silon) protective cover 66 (shown in fig.20) out of the blade root cuff. Then loosen the nuts 9 and remove the other plastic(silon) protective cover 67. These protective covers should be deposited to the airscrew accessories and reserved for the next re-use. Clean the centering surface as well as the face of the oil distributor rotor flange 47 and slide the rubber seal ring 68 on the rotor centering periphery surface(as shown in fig.25).Inspect the surface smoothness of the insertion piece 54 (shown in fig.23). Duly clean the rear part of the airscrew hub and inspect whether inside the airscrew hub the rubber seal rings 69 and 70 have been fitted.

The airscrew hub is to be fitted to the engine flange so that any of the blade cuffs should be thereby positioned in the direction of the reference marking "o" viewed from the "P" section face (as

shown in fig.2),applying a moderate forward forcing. At this operation pay attention to avoid any possible jamming of the airscrew hub and risk of squeezing the oil seal rings 69 and 70 inside the airscrew hub (kindly see fig.25). Attach the airscrew hub to the engine flange by means of nuts 9 and the spanner No.13.These nuts should be locked with the aid of cotter pins dimensioned 2x22 mm, conformable to ČSN 02 1781.02 Standard.

F i t t i n g o n t h e a i r s c r e w b l a d e s

When mounting the blades on the airscrew hub (as shown in fig.2) has the airscrew servomechanism to be adjusted at the feathering position stop.The airscrew manufacturer himself generally sets up this position of the airscrew servomechanism just before wrapping and boxing the airscrew unit in the transport case.

Wipe dry and clean the inner surface of the blade root cuff and screw the airscrew blade 1 into this cuff. The cylindrical part and thread of the blade root should before fitting it also be wiped dry and duly cleaned.Thereby the respective rubber seal ring,supplied and stored in common with the other separate parts of the airscrew unit,should be fitted on,too. In order to make this fitting operation easier, the rubber seal ring before fitting on should be slightly coated with some lubricating grease.After having screwed the airscrew blade in the blade cuff should the tally mark "a" of the respective airscrew blade mutually with the tally mark "b" of the blade cuff (to be seen on the blade cuff tapered surface) exactly come into line. The lower edge of the tally mark "a" should be seen as high as just at the upper edge of the blade cuff,but not higher than 1 millimetre above this upper edge.Thereafter the airscrew blade should be fixed in this position by means of the blade cuff clamping sleeve 3. This clamping sleeve should be fitted on closely at the upper edge step of the blade root cuff 2 and should thereby be adjusted so that the tally mark "d" of the

clamping sleeve must exactly come into line with the tally mark "c" od the blade root cuff (to be seen on the cylindrical part of the blade root cuff edge step).The airscrew blade having been set up to this proper position, the blade root cuff clamping sleeve should now be finally tightened with the aid of the bolt 4 and nut 71,applying thereto a tightening torque value of M_k= 6 up to 6.50 kg.m. The nut is then to be locked by a cotter pin of dimensions 3 x 25 mm.,conformably to ČSN 02 1781.02 (Czechoslovak Standard).

Caution:

Due fitting position of the nut locking cotter pin should be adjusted conformably to fig. 2. To tightening the blade root cuff clamping sleeve is to be applied the spanner No.5, assembled with the respective extension tubular adaptor.

Installation of blade de-icer

The little blade de-icing reservoir 59 should be fitted to the blade root cuff clamping sleeve 3 (shown in fig. 2).

Important note: The reference fitting part No. stamped or marked on the de-icing fluid reservoir just applied should be in accord with the reference part No. stamped on the respective airscrew hub branch!

The blade de-icing fluid reservoir should be attached to the blade root cuff clamping sleeve by means of two screws M 5x6 mm. according to ČSN 31 3106.3 (Czechoslovak Standard) and one another screw M 4 x 6 mm. according to the same Standard. These screws should be locked by suitable lock washers. The outlet splash pipe of the de-icing fluid reservoir has to be fitted quite close to the airscrew blade surface. Then recheck the distance between the de-icing fluid inlet pipe and the lower edge of the de-icing fluid reservoir. This distance should be kept to 1.50 up to 2.50 mm.(i. e. 0.006 up to 0.010 in.) as specified.

Thereafter recheck once more due securing of all airscrew blade joints as well as exact position aligning of the above mentioned tally marks.The tally mark "a" should be exactly position-aligned with the tally mark "b" and further, the tally mark "c" aligned with the tally mark "d".

Fitting-on the airscrew spinner front part

The surface of the airscrew spinner rubber centering ring 43 should be slightly oiled and the airscrew spinner 42 is to be fitted on cylinder 29 and to the spinner rear part 40. The fitting tally marks of the front and rear airscrew spinner should be accurately aligned each to other.

The airscrew spinner front part when being fitted should be first fixed only providionally by means of the nine fixing screws 44 (shown in fig.20),supplied in common with the other separate parts of the airscrew unit.Then should be these screws duly retightened step by step in such order as shown in following fig.26.

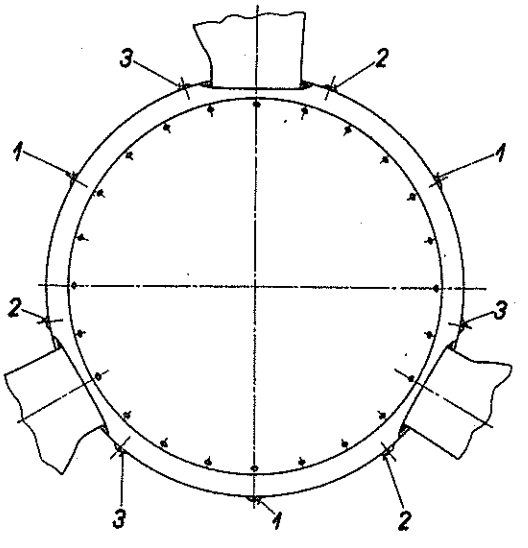


Fig. 26 - Scheme of correct retightening the airscrew spinner fixing screws

Important note:

The airscrew spinner nose is made of duralumin metal sheet being 0.4 mm. thick. Therefore it is allowable to force the spinner front part backwards just by face hand-pressing the spinner nose backwards only, not by any side hand-forcing. There is also not permitted to push the aeroplane backwards (when rolling the aeroplane without the engine running), if needed to move it a little back, by hand-pressing onto the airscrew spinner!

FITTING THE SPEED GOVERNOR ON THE ENGINE

The airscrew speed governor is to be mounted on the M 337 aeroengine in the space of the engine housing rear part - between the air compressor and the suction piping - as shown in fig.27.

Before mounting the speed governor onto engine, its surface should be inspected whether anyhow not injured and whether all seals attached to are there in order.

First remove the protective cover of the speed governor driving shaft, clean the bearing surface completely with the centering shoulder and then also clean the governor driving shaft itself by means of a brush or a wiping rag moistened in pure benzine. There on the bearing surface are not allowable any impact marks projecting the bearing surface and the centering shoulder. Prior to mounting there should also be tested rotating of the governor driving shaft to establish whether it is duly smooth and trouble-free. Should this shaft rotating be, however, anyhow difficult or ununiform or, even if it is not able to rotate at all, there would not be permissible to install such a faulty speed governor onto engine.

Note: When going to rotate the governor driving shaft, the pulley control wheel should be turned clockwise in order to prevent thus the driving shaft from undesired increasing its motion resistance

owing to compression of the governor spring.

Remove the speed governor drive protecting cover 1 (shown in fig. 27) completely with its gasket and place them in common with the respective nuts to the aircraft separate accessories box to be stored on. The governor drive bearing surface as well as governor drive centering shoulder should be then cleaned with an unsoiled wiping rag moistened in pure benzine and these two surfaces should thereby also be inspected, whether there are any impact marks upon or not. In order to facilitate the mounting of this device onto engine, we recommend to remove first the air compressor suction piping elbow from the engine. Thereby, of course, the disassembled suction piping should be prevented from any possible inside soiling. This device can, however, be mounted on and the air compressor suction piping elbow dismounted by a qualified worker only.

After having unscrewed the hollow screw 3 and the lateral branch 4 fit the speed governor to the bearing surface provisionally without the gasket 2 (shown in fig.27).

Note: The lateral branch 4 has to be unavoidably dismounted as the air compressor would cause a difficult fitting-on of the speed governor onto engine. Fittings and the tapped hole of the speed governor pump housing should always be kept clean in order to prevent thus the speed governor itself from any inside impurifying. The speed governor driving shaft claw has to be turn-positioned so that it comes conformably just in line with the keyway of the speed governor driving gear at the engine.

Pushing the speed governor close to the bearing mate-surface (engine contact surface) should be made easier by slow hand-turning round the airscrew. The speed governor should fit quite tightly to the contact mate-surface without any play around. Then take the speed governor down, duly fit the gasket 2 (stored among the go-

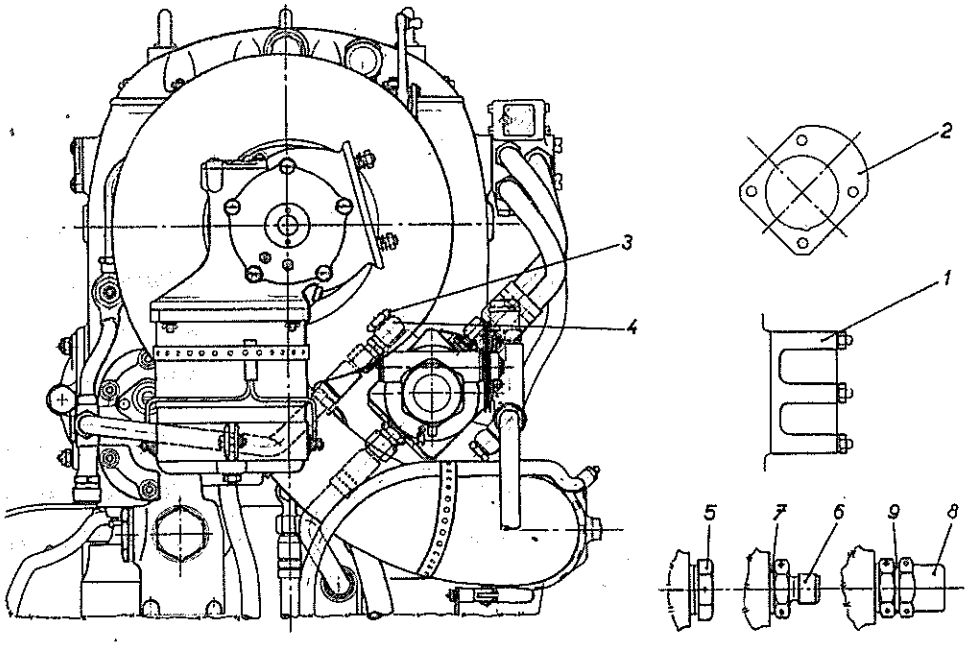


Fig. 27 - Fitting the airscrew speed governor onto engine

vernor separate parts) on the governor bearing mate surface (i.e. engine contact surface) and then replace the speed governor back close to the engine contact surface.The governor is now to be fitted by means of four nuts and respective lock washers, taken from the speed governor separate parts.

Note: This sort of nuts applied is of a light-weight nut class and, therefore,more applicable to this purpose than heavier self-locking nuts. For tightening these nuts apply the special spanner No.11 which is to be found in the service tool kit of the airscrew unit.

The hollow screw 3 and the lateral branch 4 in common with seal rings should now be refitted to the speed governor. Retighten the hollow screw by the special spanner No. 12 from the airscrew service tool kit.

Important notice: Seal rings of the governor lateral branch and

of the hollow screw have to be quite faultless.The lateral branch should be duly tightened by the hollow screw in order to prevent thus the branch seal ring from any possible oil leakage which might cause an undesired parasitic air by-suction at changing the air-screw blade pitch.

Unscrew the plug 5 located at the engine oil sump (oil collector) and put it off to the aircraft separate accessories.Then take the reduction connecting branch 6 (of M 12x1.50 mm./M 14x1.50 mm.dia.) and the seal ring 7 (of 16 mm./12 mm.dia.) and fit them on.

From the speed governor should be then removed all protective rubber covers preventing the fittings from soiling. - The hydraulic system should be installed conformably to the instructive diagrammatic fig. 11.

INSTALLATION OF AUXILIARY FEATHERING PUMP

The auxiliary feathering pump should be attached to the anti-fire partition wall front side by means of a flange 7 fitted to the feathering pump electromotor (as shown in fig.6). This attachment is to be made by means of four screws in common with the respective nuts M 5 mm. and nut washers. The joining parts are boxed together with the airscrew (feathering pump) separate parts.

After having fitted the pump remove the protective covers from the inlet branches, then screw on the oil inlet and outlet piping as instructed in fig. 11. Finally connect the current supply socket with the pump electromotor socket plug.

In order to verify due connection we recommend prior to connecting oil outlet pipe with the speed governor branch 42(shown in fig.4) to switch on the feathering pump for a short time by pressing down the push-button of the LUN 7876 control switch box. As the first suction cycle of this pump will not be achieved immediately after

having been switched on, the pump electromotor should be switched on several times each for about 10 seconds period, being successively intervalled in 30 seconds period each to other.

Prior to this fitting work there should be inspected whether the gauged venting hole 15 (of 0.50 mm.dia.), located on the red-coloured R.H.side of the socket lug, is not clogged.

In order to secure a perfect dripping of oil leaked through owing to untightness of the pump driving shaft seal ring 12, it is recommended to connect the oil drip connecting branch 10 of this device with the outer space of the engine cowl by means of a rubber hose (shown in fig. 6).

INSTALLATION OF HYDRO-ELECTRIC BLADE PITCH CONTROL DEVICE

The LUN 7881 blade pitch control device is to be fitted on the last fitting hole lug of the crankshaft bearing, located at the crankcase R.H.side.Prior to mounting this device unscrew the protective cover from this lug and place it in common with the respective fixing screws to the aircraft separate accessories.The packing 14 of this protective cover (as shown in fig.8),if not injured at removing the cover, can be later used again at reassembling this device.Should,however, this cover packing be anyhow damaged, use better a new one which is there to be found among the separate parts supplied to this device.

The device should be attached by means of two bolts 12 (M 5 x 48 mm.) and locked by spring washers 13. Prior to mounting on this device re-inspect the venting holes made in the device base plate whether any of them is not choked or soiled inside.

The respective oil piping should be fitted to this device in the sequence as follows:

The upper branch of the device rear section connect with the speed governor front outlet branch (i.e. power oil passage intended for setting-up the airscrew blade fine pitch) and the lower branch of the device rear part connect with the governor rear outlet branch (i.e.power oil passage intended for setting-up the airscrew blade coarse pitch). After this having been done and duly secured, connect the middle branch of the device rear part with the lateral branch 43 of the speed governor check valve body 40 (shown in fig.4). Finally,the upper branch of the device front part connect with the power oil distributor housing upper branch and by the same way should there also be connected the lower branches of both mentioned parts.

This installation work would then be finished after having connected the current supply socket with the socket plug of the device. A detail summary of the oil piping to be applied and a scheme of the hydraulic system piping arrangement (shown in fig. 11) are to be found herein on page 32.

MOUNTING THE CONTROL BOX

The control switch box is located on the cockpit control panel, being attached to it by means of four screws and fixing nuts of M 4 mm. size which are supplied in common with each control box. The control box having been fitted to the cockpit instrument panel and the respective aircraft current supply socket having been conducted with the mating socket plug, located in the control switch box rear wall, this fitting work has got finished.

Note: When fitting the control box,it should be positioned so that its pilot lamps are arranged in the lower line and the control push-buttons above them in the upper line on the control box face, as shown in fig. 9.

INSTALLATION OF HYDRAULIC SYSTEM

The hydraulic system should be installed in the way as shown in fig.11, by means of the piping supplied in common with each air-screw unit.The piping protective enclosures should be removed off not sooner than immediately before fitting them to the respective branches of individual devices. The piping, where might arise the risk of their undesirable reciprocating movements, should be securely attached to the engine cowl or engine bed by means of some clips. The pipe No.7 should be fixed to the airplane wing rib by means of a clip. The pipes Nos. 2, 3 and 8, when being installed on the aircraft,should be enveloped with some protective insulating tape on those surface sections where coming in contact with

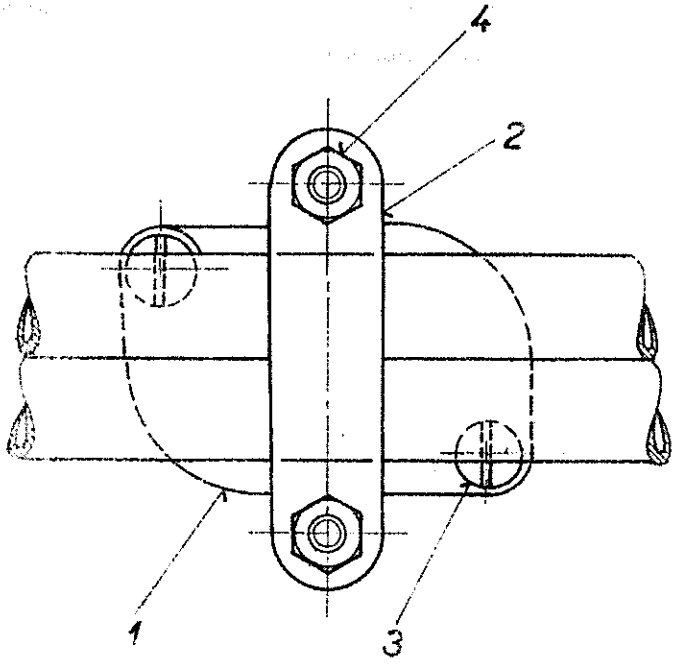


Fig. 28 - Bracket-fastening of the oil piping to the engine crankcase

the engine oil piping or electric wiring systems. The pipes Nos. 4 and 5 (shown in fig. 11) are to be attached on three spots to engine crankcase by means of brackets 1 and stirrups 2 (shown in fig. 28) which are to be found among the other separate parts of the airscrew unit. The brackets are to be fixed onto the 1st, 3rd and 5th fitting hole lug of the crankshaft bearing, there should be unscrewed the plugs (protective covers) from the lugs and in common with the cylindrical-head screws should be deposited for the next use.These brackets should be attached by means of fixing screws 3, deposited with the other airscrew separate parts,applying thereto also the respective seal rings of the mentioned plugs (protective covers). These pipes having been put onto the bracket beds should there be fixed by means of the stirrups 2 and nuts 4 in common with spring washers.

These pipes having been finally attached and connected, their cap nuts should be still duly locked.

A D J U S T I N G A N D C H E C K I N G T H E A I R S C R E W U N I T O P E R A T I O N

ADJUSTING

After having assembled completely the whole airscrew unit adjust it as required and check up its operation.

First fit on the control cable, functionally connecting the speed governor control pulley-wheel with the speed preselector lever. Thereto should be applied the practice as follows (shown in fig. 29):

1. Set the speed preselector lever to the "Take-off" position (i. e. maximum airscrew speed) close to the position stop.
2. Loosen the control cable arresting lock bolt 3 of the speed governor control pulley-wheel 1 by unscrewing a little the fixing nut 2.
3. Turn the speed governor control pulley-wheel round to the marked "Take-off" position (i.e. maximum airscrew r.p.m.). Thereby the "Take-off" position limit stop 4 of the governor control wheel should be close in contact with the mating "Take-off" position limit stop 5 fitted on the speed governor rear cover.
4. Put the control cable 6 in the ring groove of the speed governor control pulley-wheel so that the cable should pass contactfully through the slot 7 to the control cable arresting lock bolt 3.
5. Then duly tighten the control cable in the aircraft fuselage and verify whether duly set up the "Take-off" position of the speed governor control wheel and of the speed preselector lever,

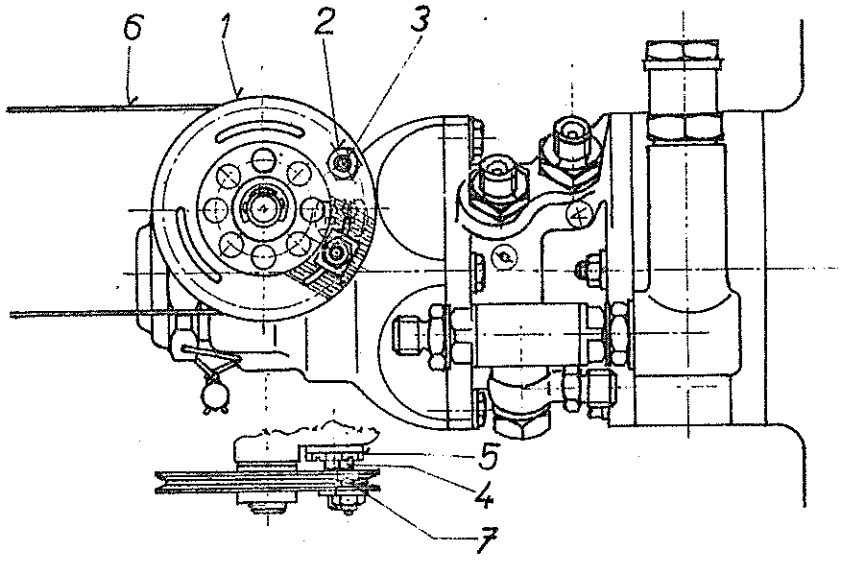


Fig. 29 – Adjustment of the speed governor control mechanism

too. Thereby the governor control wheel has to be set up close to the position limit stop and the preselector lever set up close in front of the position limit stop.

6. Retighten the self-locking nut 2 of the lock bolt 3 arresting the control cable.

Having finished this fitting and adjusting work check up speed governor control operation which should be conformable with the following conditions:

a) the speed governor control operation should be quite infinitely fine and trouble-free, without any dead travelling.

b) at shifting the speed preselector lever from the "Take-off" position over to the "Feathering" position the speed preselector lever should depress the respective push-button sooner than the

speed governor control wheel contacts fully onto the position limit stop inside the governor. Thus is there secured a right control function and eliminated any possible power injure of the control wheel. The total travelling angle of the speed preselector lever from the "Take-off"position over to "Feathering" position should correspond with the speed governor control pulley-wheel maximum angle in a range of 68°.

c) When having been set up the "Take-off" position, the speed governor control wheel should thereby close contact the position limit stop and the speed preselector lever itself should be located close in front of the position limit stop.

DE-AERATING

Prior to checking up the operation of an airscrew unit which has been mounted on the engine for the first time, that airscrew unit should be completely de-aerated at the engine test.Control of the airscrew unit is herein described further under the heading "Airscrew unit in air service".

De-aeration of the airscrew unit should be carried out in the following way: At an engine boost pressure value of 660 mm.Hg. (i.e. 26.00 in.Hg.) column execute 10 shifting cycles (10 dislocatings) of the speed preselector lever from the "Take-off" position over to the "Start of speed governing" position (i.e. to the "Feathering" limit stop) and vice versa.In order to make this de-aerating ideal, the airscrew blades have to be set up at least three times onto the "Feathering" position and vice versa(as described herein under the heading "Airscrew unit in air service".

OPERATIONAL CHECK TEST AND ADJUSTMENT

The airscrew operation and adjustment should be verified at the engine test and during a test flight, too. The individual check operations to be performed are these as follows:

a) at the engine test

1. Having set full throttle with the supercharger running shift the speed preselector lever gradually from the "Take-off" (i.e. maximum r.p.m.) position to the "Start of speed governing" position and vice versa. The true airscrew speed has thereby exactly to follow the speed preselector lever shifting in correspondent decreasing or increasing the airscrew speed. At any shifting position of the speed preselector lever should not occur a lasting fluctuation of the airscrew speed.
2. The minimum airscrew speed governed (controlled) is equal to value of $n_{min} \leq 2250$ r.p.m. Should the boost pressure be reduced by 100 mm.Hg. (i.e. 4 in. Hg.) column, the airscrew and engine speed should thereby remain constant (unchanged).
3. In case of simultaneous shifting the levers of both the speed preselectors should also the speed of both the aircraft airscrews change approximately at the same moment and the speed stabilization to the r.p.m. preselected and preset up should be achieved during the same time, too.
4. When setting the airscrew blades to the "Feathering" position (allowable set up at 1200 r.p.m.) should the preselector lever, after having been released and being just spring forced back, be returned 1 cm. back from the limit stop position. The speed preselector lever should not be arrested too much, as the feathering pump might in such a case con-

tinue running even if the blade feathering pitch setting were finished.

After having released (disarrested) the speed preselector lever, the airscrew blades continue pitch-changing (this operation is signalled by the control green pilot lamp being just switched on) and after having set up to the "Feathering" position the control box green signal lamp gets switched off. When the airscrew blades by depressing the respective control box push-button are thereafter getting unfeathered again, the green signal lamp is being switched on as long as the control box push-button is being pressed down.

5. Having set full throttle with the supercharger running and having thereby the airscrew preselector lever set up to the maximum r.p.m. position (i.e. "Take-off" position), this maximum airscrew speed should equal to a value of $n_{max} = 2700_{-100}$ r.p.m.

Note: For adjusting the maximum r.p.m. value on the airscrew speed governor is never conclusive the ground engine test but the flight test. After having finished first engine test inspect duly all hydraulic installation connections on tightness. Should at the engine test be established any faults, these should be remedied according to respective instructions specified herein further under the heading "Defects on VJ 6.506 airscrew unit, their causes and remedy".

b) during the flight test

1. First take-off is to be performed with the speed preselector lever being set up to an airscrew speed value a little lower than the standard take-off airscrew speed. No sooner than after having achieved a safe flight altitude may the preselector lever be shifted fully to the take-off (maximum) air-

screw speed limit. This maximum airscrew speed limit should be kept to a value of n = 2750 ± 20 r.p.m.

2. When changing the forward flight velocity of the aircraft (without any throttle changing) has the airscrew speed to be kept to the value preselected and set up within a tolerance range of ± 20 r.p.m. On any of the engine running regimes must not get in a lasting fluctuation of the airscrew speed.

3. After having switched on the feathering of airscrew blades and having released the speed preselector lever, there should also be automatically switched on the green signal lamp of the control switch box and after having achieved the blade feathering pitch, the control box signal lamp should be automatically switched off again. The period needed for changing the airscrew blades to the feathering position must not exceed 10 seconds.

Note: After having finished the flight test, there should be inspected all the airscrew unit instruments and connections on external tightness. Thereby are, there, however, not to be viewed as faults the following effects:

a) the airscrew blade cambered and flat sides being grease-dimmed owing to a slight centrifugal spraying of the lubricating grease out of the blade root cuff and ball bearings;

b) presence of oil in the airscrew spinner oil spray sump and the V 506-6 power oil distributor surface being oil-dimmed - unless there is any extensive oil-dimming of the engine front section and the engine cowl surface.

AIRSCREW UNIT IN AIR SERVICE

ENGINE TEST

Starting and testing the engine are to be performed after having the speed selector lever set up to the rront shift position (i.e. the maximmm airscrew speed position). Having warmed up the engine and having done all preparative operations specified for engine servicing and testing, check up the airscrew speed governor operation at a boost pressure of about 660 mm.Hg (i.e.26 in.Hr, column. Set the airscrew speed preselector lever to the minimum airscrew speed position (as near as close to the feathering position stop) and after having reduced the airscrew speed return the preselector lever back again. This operating cycle should be carried out twice or three times separately on each of both airscrews in order to introduce warm engine oil fully into the airscrew unit piping. At the first engine test should every day be repeated the airscrew blade feathering as follows:

By a suitable throttle governing adjust the speed of both engines about to 1200 r.p.m. After having unlocked the feathering position stop shift the speed preselector lever as far as to the limit stop and then release the lever again. The control box green signal lamp becomes switched on, signalling thus the airscrew blade feathering operation. During this blade pitch change is the airscrew speed getting reduced. The airscrew continues rotating even after the airscrew blades have already been set to the feathering pitch. After having attained the blade feathering position, when the control box green lamp becomes switched off, shift the speed preselector lever quite forward and by means of the respective control box push-button should the airscrew blades be unfeathered again.

The push-button should be thereby pressed down as long as about for a 6 up to 8 seconds period. The airscrew becomes thus changed (set up) to the maximum flight pitch angle and the speed of this respective airscrew becomes thereby a little reduced if compared to airscrew on the other operating engine. For several seconds open then full throttle in order to change the airscrew blades at a higher speed to the take-off blade pitch. Prior to setting the other airscrew blades to the feathering pitch adjust (reduce) the speed of both engines by an adequate throttle governing approximately to 1200 r.p.m.

Check of airscrew speed
(to be carried out before each aircraft take-off!)

Applying full throttle and the supercharger running, having thereby the airscrew speed preselector lever set up quite forward, the maximum airscrew speed should attain a value of 2700 -100 r.p.m. After having the airscrew preselector lever shifted again backwards as far as close to the feathering position stop, the airscrew speed should become reduced at least to 2250 r.p.m.

The testing period of an airscrew mounted on the engine, applying thereto the supercharger running, should be limited as short as possible, just so as any testing the airscrew being set up to the feathering position.

Important notice: The maximum airscrew speed at the engine test is not controlled by the speed governor, as the airscrew speed preselector lever is just set at the minimum blade pitch position stop. The maximum airscrew speed at full throttle may change a little conformably to the engine power under various specific atmospheric conditions. When taking off and after having achieved a slow aircraft forward flight speed, the maximum airscrew speed should increase up to 2750 r.p.m. and to this value should the speed be kept on by the speed governor control.

TAKE-OFF

Before taking-off shift the airscrew speed preselector lever to the maximum speed position (i.e.quite forward).Just at the beginning of the aircraft take-off should be opened full engine throttle . At the aircraft rolling along the take-off runway and also at beginning of the climbing operation the speed governor controls and keeps the airscrew speed to 2750 r.p.m. After having achieved a safe flight altitude reduce the airscrew speed by shifting the speed preselector lever to a value of 2600 r.p.m.During the climbing operation is this speed value controlled and kept on within a tolerance range ± 20 r.p.m. by the speed governor.The engine control should be effected according to operating instructions specified for the engine operation.

FLIGHT

Separately at all steady flight regimes adjust the speed of both aircraft airscrews by shifting the speed preselector levers to a speed value corresponding with the engine running regime.The speed governor controls and keeps the airscrew speed preselected within a tolerance range ± 20 r.p.m., regardless of any forward speed changes nor of any atmospheric turbulence. The range of minimum speed controlled is about 2250 r.p.m. The airscrew blade setting up range is selected so that the cruising speed of airscrews is kept to a constant value even in case of a considerable change of aircraft velocity by changing the aircraft attitude. Having adequately throttled the engine running down, the airscrew speed is controlled and kept to a constant value up to the maximum airscrew speed applied to the nose dive.

Important notice: When operating the engine running throttle (gas mixture admission) everybody should bear in mind this as follows:

When throttling the engine running down, the speed governor controls the speed preselected so that it operationally unloads the airscrew running up to the minimum pitch angle position. When going on throttling the engine running down, the airscrew speed is getting reduced. Any opening of the engine throttle from this regime up should be carried out precautiously in order to prevent a hazard overspeeding of the airscrew. As the strongest acceleration of the M-337 engine is getting concentrated just at the beginning of the throttle shifting motion, the engine throttle may be opened in the first third of the whole shifting range during 2 up to 3 seconds. Further throttle opening may already be carried out quite quickly.

LANDING

Prior to landing should both speed preselector levers be set to the tally mark corresponding with the airscrew speed value of about 2400 r.p.m. Having the engine throttled down, the speed governor changes the airscrew blade pitch angle to a minimum one and thus the airscrew is effectively braking the forward flight speed. The airscrew thus becomes operationally quite unloaded and later after having opened the engine throttle again, thereto are applicable the same operational instructions as for the throttle governing during a flight.

In case of a broken (interrupted) landing operation should be followed the principle of a slow and precautious opening the engine throttle in the first third of the throttle lever shifting range i.e. during the first two seconds may the throttle lever be shifted very slowly and thereafter only may the lever be already shifted quite quickly. Thereby the engine speed becomes increased for a short period to 2600 up to 2700 r.p.m. (separately according to

the throttling up velocity as well as according to the forward flight speed). Then the engine speed becomes constant at the speed value preselected, i.e.at 2400 r.p.m.Thereafter only is the engine speed allowed to be set up to the maximum value of 2750 r.p.m. by shifting the airscrew speed preselector lever forwards.

Note: Owing to a great acceleration of the M-337 aeroengine and a rather small moment of inertia of the V 506 airscrew, after having opened the engine throttle when being the airscrew operation unloaded, there occurs a short-term airscrew overspeeding about by 300 r.p.m. above the speed value preselected.Therefore the preselected lever should before landing be set up to the respective tally mark (i.e.about to 2400 r.p.m.). In case of having the preselector lever bean set up to the take-off speed position, there might occur a hazard overspeeding of the airscrew if the engine throttle be anyhow opened.

FEATHERING

The airscrew during a flight in case of any accidental engine fault should be feathered in the following way:

Slide the feathering position stop away and shift the speed preselector lever as far as to the limit stop. The control box green signal lamp becomes switched on to signal the airscrew blade feathering. After having achieved the feathering blade position, the feathering pump becomes automatically switched off and the control box green signal lamp also becomes switched off. Period needed for finishing the blade feathering operation is shorter than 10 seconds.

When shifting the speed preselector lever to the feathering position stop you will feel an increased resistance (especially to the end of the motion) to shifting motion of this lever which should

be smoothly overcome. After having released the speed preselector lever, this lever being spring-effected is returned a little back by about 10 millimetres off the limit position. For this reason the preselector lever should not be arrested (fixed) too much.

Any feathering of the airscrew blades for training or demonstrating purposes should be carried out in the same way as mentioned above. After having reached the airscrew speed of about 1200 r.p.m. switch off the ignition operation. Before any unfeathering the airscrew blades should the engine running be throttled down to idle run in order to prevent thus the airscrew from overspeeding at full starting the engine. Then shift the speed preselector lever to the flight speed range position (i.e. in front of the feathering position stop) and by depressing the respective control box push-button switch on the feathering pump operation. Thus you change the airscrew blade feathering position to a normal operating position. Continue pressing down the push-button for about 6 seconds, whereby the control box green pilot lamp is starting to signal again changing of the airscrew blade pitch set up. After the airscrew blade pitch has got sufficiently reduced and the airscrew is thereby turning the crankcase, there the ignition operation may be switched on again. Should, however, the engine be cooled through as much as the airscrew is not able to rotate itself slowly being effected by air streaming, there may be used engine starter.

The feathering pump driving electromotor is intended to be applied to a short-period operation only. Therefore it is necessary to wait at least for about 3 minutes before each feathering the airsrew blades being repeated.

The airscrew blade feathering procedure to be applied at the engine test is specified herein under the heading item "Engine test". Any ground airscrew blade feathering, whereby the engine is not running (at standstill), may be performed in a most necessary case.

only, e.g. when removing the airscrew down from the engine. Blade feathering should be performed only at an oil temperature exceeding + 10° centigrades. In the range of oil temperature +10° up to +30° centigrades is recommended to feather the airscrew blades at the engine standstill by means of respective control box push-button, having thereby the speed preselector lever set up about 1 centimetre behind the movable stop. After having achieved the feathering position switch off the auxiliary feathering pump operation by releasing the respective control box push-button. As the feathering operation period is at a lower oil temperature always longer than otherwise in a normal case, it is recommended to interrupt the blade feathering operation after 15 seconds' operation of the auxiliary feathering pump and to finish it as late as after about 1 minute's interrupting interval.

Important notice: Should, however, the control box green signal lamp even after having achieved the blade feathered position and having stopped the feathering pump electromotor n o t become switched off, break the control circuit of the feathering pump by a short-time switching-off and a switching-on of the automatic circuit breaker of the airscrew, located at the ceiling control panel, in order to prevent thus the feathering pump driving electromotor from any possible burning. Should the green signal lamp become switched off before the airscrew blades become set up to the feathering pitch, it would be necessary to shift the speed preselector lever back to the "Feathering" position.

S E R V I C I N G
A N D P E R I O D I C A L I N S P E C T I O N S

There are in fact quite little demands on ground servicing of this airscrew unit as its maintenance consists of periodical inspections only. All movable components of the airscrew mechanism and also the other airscrew control circuit parts are automatically lubricated partly with oil leaked therein owing to untightness and partly with oil being brought in through a lubricating nozzle from the airscrew unit pitch control oil circuit. This suitable design arrangement secures a true operation of the complete airscrew mechanism and helps thus to increase substantially the service life of all moving airscrew parts. The lubricating oil is conveyed off to the engine crankcase.

PRE-FLIGHT INSPECTION

Before each flight should be examined smooth shifting of the speed preselector lever, due tension of the airscrew speed governor pulley-wheel control cable and inspected the airscrew blades as well as the airscrew spinner.

POST-FLIGHT INSPECTION AND SERVICING

At the end of every air-service day duly inspect condition of the airscrew blades, spinner, tightness of the power oil distributor and of the airscrew unit control and gauge appliances.

The airscrew blades as well as the airscrew spinner should be wiped with a rag moistened in some pure benzine. When wiping the air-

screw blades turn each blade when being just rubbed off so that it would be tip-positioned vertically downwards. Thus would be there eliminated any possible penetrating of the washing benzine between the blade root bearing outer race and the blade root cuff down to the rubber seal ring space.

At the oil-tightness inspection of the power oil distributor should be also inspected on oil-tightness the front section of the engine whether it is not excessively oil-dimmed. Some oil drip from the spinner oil slip ring down to the engine cowl front part, after having stopped the engine running, is really no fault.

Duly inspect on oil-tightness also the hydraulic piping of all airscrew unit appliances as well as the current supply sockets whether duly connected. All airscrew unit appliances should be duly wiped with a wiping rag.

INSPECTION AND SERVICING AFTER FIRST 10 OPERATING HOURS

After first 10 hours of airscrew unit operation should be checked up the nut 51 (shown in fig. 2) whether duly tightened. This nut has to be retightened by a torque moment of 30 up to 35 kg.m. This nut tightening operation is, however, possible to be carried out after having removed the airscrew spinner front part and the airscrew assy itself, too, from the power oil distributor flange. The dismantling procedure is specified herein further under the heading "Dismounting the airscrew unit from the aircraft".

Prior to retightening the above mentioned nut there is necessary to remove the safety pin 65 and to slide the insertion piece 54 out of the engine crankshaft (as shown in fig.23). Having the insertion piece 54 been removed from the crankcase, the respective rubber seal rings should thereby not anyhow come in contact with petrol or benzine substances. The airscrew should then be reas-

sembled according to instructions specified herein under the previous heading "Mounting the airscrew unit on the aircraft".

At the same time should also be inspected the airscrew servomechanism and the airscrew hub oil tightness.

Then should be retightened the joining parts of all airscrew unit appliances.

Result of this inspection should be finally noted in the Airscrew Log Book.

INSPECTION AND SERVICING AFTER EVERY 100 OPERATING HOURS

At this inspection should be checked up the blade pitch setting play (this is to be kept within a tolerance of 30°), oil tightness of the airscrew hub, any damage of the de-icing fluid reservoir as well as the power oil distributor housing nuts whether duly tightened. In order to enable performing of this inspection there should be first removed the airscrew spinner front part before.

Then should also be examined retightening of the joining parts of all airscrew unit appliances and the inlet piping, too. At the same time should duly be inspected the oil leakage, if any, through the oil piping sheathing.

After having this inspection and examination been finished, the results thereby established are to be recorded in the Airscrew Log Book.

AIRSCREW SERVICING AT CHANGING THE ENGINE OIL

At any oil change of the engine lubricating system should be the oil filter element 6 of the auxiliary feathering pump (shown in fig.6) rinsed in some pure benzine bath. After having screwed the filter element in the oil filter casing, secure it by means of some binding lock wire.

ANTICORROSIVE PRESERVATION AND STORAGE OF AIRSCREW UNIT

In order to secure a reliable operation of the airscrew unit it should be duly and skillfully treated. Besides of the above specified standard daily as well as the other periodical inspections and servicing there should also be strictly followed instructions concerning the anticorrosive preservation of the airscrew unit in case of a temporary taking it out of air service.

The airscrew unit has to be always kept in good condition. The metal non-lacquered parts of the airscrew assy should be from time to time carefully inspected whether on its surface are not any corrosive spots. The lacquer-coated airscrew surfaces should also be duly protected against any possible injuring.

The airscrew unit preservation should be made as follows:

1. In case of interrupting the air service of an aeroplane for a standstill period not exceeding 1 month, there should be carried out a short-term preservation of the airscrew blades with some pure engine oil. Should the aircraft be parked in an open parking place for a storage period exceeding 14 days, it is recommended to preserve the airscrew according to the following paragraph, item 2.

2. In case of a temporery putting the airscrew unit out of the air service for a storage period exceeding 1 month but not exceeding 6 months, the airscrew unit should be duly grease-preserved on order to prevent it from corrosion. Prior to the preservation should the airscrew unit be always regularly inspected regardless of operating hours having already covered. Recommended procedure of the airscrew preservation is as follows:

   a) Remove the airscrew spinner and preserve the external sur-

face of the whole airscrew unit by means of engine oil mixed with 4% up to 6% of ceresine wax. Having this done, reassemble the airscrew spinner and lubricate the tightening bolts with engine oil. The airscrews at this storage should be protected by suitable plastic protective coatings. Periodical preservation inspections should be carried out after every 14 days' storage period.

Note: The preserving agents before being applied have to be warmed up for a period of 30 minutes at a temperature of 105° up to 115° centigrades.

b) All metal non-painted surfaces of airscrew unit appliances should be slightly lubricated with some pure engine oil.

3. Should the presupposed period of the aircraft out-of-service storage exceed 6 months but not exceed 1 year, inspect the condition of the preservative coat and, if need be, restore this anticorrosive protecting coat according to instructions specified under the item 2a) and duly treat the engine. When starting the engine at the inspection of the engine anticorrosive protecting coat, set the airscrew blades several times to the feathered position and vice versa. After having stopped the engine running again, duly restore the surface preserving coat of the engine.

4. In case of temporary putting an airscrew unit out of air service for a storage period exceeding 1 year, it would be necessary to dismount the complete airscrew unit, to carry out a long-term preservation and to store it in a suitable plastic protective covering. A long-term preservation of airscrews should skillfully make either the airscrew manufacturer or an airscrew service centre only, or it might be carried out by a commercial user's airscrew specialist according to special manufacturer's

instructions. Main principles for carrying out the long-term airscrew preservation are following:

Before starting to preserve an airscrew clean its surface with some wiping rag being moistened in pure benzine.

Outer surfaces of an airscrew should be preserved by means of a mixture of aerooil with addition of 4% up to 6% ceresine wax. before being applied, this preservative solution should be boiled at a temperature of 105° up to 115° centigrades until stopping the foam (moisture content) precipitation. This preservative solution should be best applied onto the airscrew surfaces by means of a suitable brush or a paint brush.

Inner surface of the airscrew should be preserved by oil rinsing the inner spaces of the airscrew assembly, applying thereto engine oil warmed up to a temperature of 60° up to 70° centigrades and then forced into inlet branches of the airscrew unit appliances. After having done this preserving operation protect the inlet branches with some protective covers.

The individual airscrew assemblies and parts of them having been duly preserved, should be packed in some waxed paper, boxed in cartons and put into a common plastic (PVC) coating. Finally it should be put and stored in the transport millboard case.

It is recommended to put in these separate transport cases small bags filled up with "Silikagel" hygroscopic salt. Condition of such a stored airscrew unit, effected by the ambient air humidity, should be there checked up by a hygrometer being put inside the plastic (igelit) coating.

TRANSPORT OF AIRSCREW UNIT FOR REPAIR AND OVERHAUL

Should a defect on the airscrew be established or the period prescribed for carrying-out the overhaul expire, the individual parts

of the airscrew or the whole airscrew unit should be dispatched to the maker's factory for overhaul or repair.

When sending individual airscrew unit assemblies (appliances) to the manufacturer, a suitable packing material and an adequate surface preservative should be applied in order to eliminate any interdamaging or possible rusting of those separate airscrew parts dispatched. To each airscrew appliance sent to the factory for repair or overhaul should be enclosed the "Airscrew Log Book" properly filled up and, if need be, also all separate parts seriously damaged as well as all remainders of them. When sending the airscrew log book alone, there should be duly followed the "General Instructions" of the above mentioned log book, page 2. Every exchange of an airscrew appliance should also be noted in the airscrew log book to be filled up by the commercial user of the airscrew.

When sending the whole airscrew unit for repair or overhaul to the maker's factory, there should be dispatched all parts of it, including the oil piping, too. Any incomplete airscrew unit or any incomplete of the airscrew assemblies sent for overhaul to the maker's factory, will there be fully completed on account of the commercial user. For sending complete airscrew units or airscrews alone there should be used the original transport cases. Thereto should also be enclosed the respective airscrew log book properly filled up according to general instructions specified in the log book on page 2.

Any emergency landing of the aircraft should also be recorded in the airscrew log book. If the airscrew unit is still covered by a non-expired guarantee period, the whole airscrew unit should be skillfully inspected and examined in the maker's factory before putting the airscrew in air service again. This inspection should after having been finished also be noted in the airscrew log book.

In case of putting the airscrew unit again in air service without having been duly inspected before, such an airscrew unit will be eliminated out of the manufacturer's guaranteed service period.

D I S M O U N T I N G T H E A I R S C R E W U N I T F R O M T H E A I R C R A F T

DISMOUNTING THE AIRSCREW

Unscrew the fastening screws 44 (shown in fig.2) and dismount the airscrew spinner front part 42.This spinner part should be removed off applying thereto a moderate crowing (prizing) by a screw driver, set for this operational purpose at the spots of the three spinner front part cut-outs for the blade roots(shown in fig.30).

At this crow-removing of the spinner front part cautiously avoid to deform the de-icing fluid pipes and even the de-icing fluid pockets (reservoirs) attached to the blade root cuff clamping sleeves. The airscrew mechanism lever should be set up to the "Feathering" position stop in the way as instructed under the item "Blade feathering".If the hydro-oil temperature is not exceeding + 10° centigrades, it should be warmed up before feathering the airscrew blades in the way as specified in the "Flight operation instructions of L 200 D aircraft".Then dismount the de-icing fluid pockets (reservoirs) 59, unlock and release the retightening nuts 71 and unscrew the individual airscrew blades by turning them clockwise. Into each blade root cuff should be fitted the respective plastic (silon) protective covering 66 (shown in fig. 20) and fix them by a slight tightening the nuts 71.

Unlock and unscrew the nuts 9 and carefully remove the airscrew hub from the power oil distributor fixing flange. Into the airscrew hub rear section put the silon (plastic) protecting cover 6 in common with the seal ring 68(shown in fig.20) and retighten it

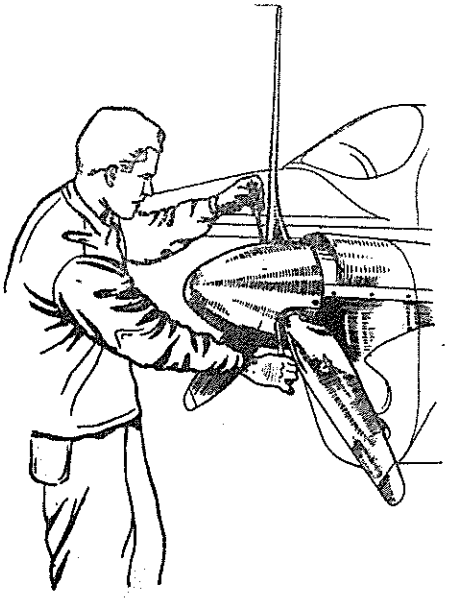


Fig. 30 - Dismounting the airscrew spinner front part

by means of the nut 9.

Remove the spring lock ring 65 (shown in fig. 23) from the nut 51 and slide the insertion piece (shown in fig.31) out of the crankshaft. Release and unscrew anti-clockwise the nut 51 and take off the nut washer 64 (as shown in fig.23).This nut should be loosened by the same way and by applying those service tools, as applied to retightening the rotor (see fig.24).

With the aid of the spanner No.7 screw the remover No. 8 into the rotor flange (see fig.32).Onto the remover screw 72 should be fitted the tubular extension adapter provided with a grip and then by turning the remover screw release the rotor. At this removing operation should be hindered any rotating of the engine crankshaft in the way as shown in fig. 33. After having released the rotor, slide it out of the power oil distributor housing.

Unscrew the oil inlet piping from the power oil distributor housing and plug the inlet branches of the power oil distributor housing by means of protecting covers.Then unscrew the nuts and remove the power oil distributor housing itself.

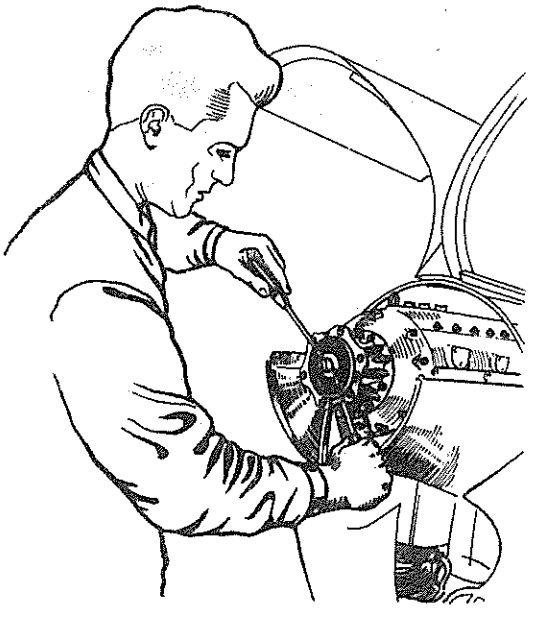


Fig.31-Removing the insertion piece out of the engine crankshaft

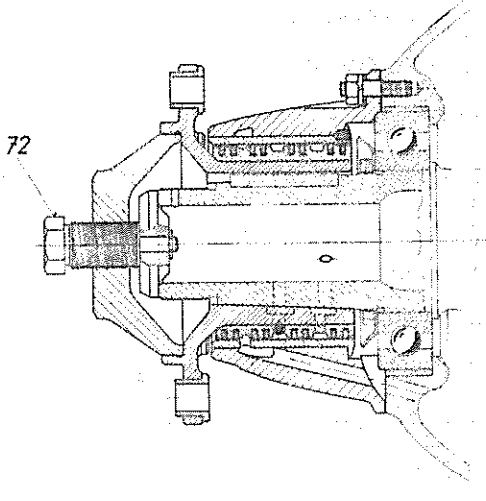


Fig. 32-Proper applying of the remover for dismounting the rotor

Fit the airscrew spinner front part onto the airscrew hub and fix it slightly by the respective screws. The airscrew hub as well as the power oil distributor should then be boxed in proper cartons and the separate airscrew parts in common with the airscrew blades should be finally put in the original airscrew transport case.

Boxing arrangement of separate airscrew assemblies, subassemblies and parts inside the transport pressboard case is shown in fig.18.

DISMOUNTING THE HYDRAULIC PIPING

Disassemble all piping of the airscrew unit and plug it suitably. After having detached the hose connecting the oil tank with the auxiliary feathering pump, the oil tank outlet branch should be suitably plugged.

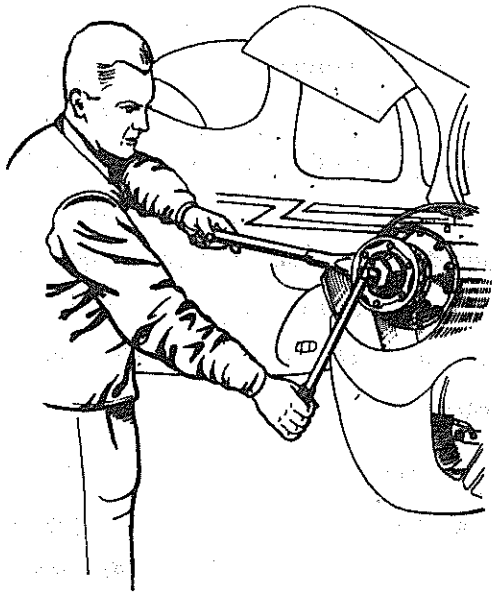


Fig. 33 - Proper dismounting of the power oil distributor rotor from the engine crankshaft

Remove the piping brackets from the engine crankcase. The bracket fitting holes in the crankcase wall should be plugged by protective caps, which have been removed from there before fitting-on the brackets. The piping and respective brackets should be then boxed in a proper carton and finally put in the airscrew unit transport millboard case.

DISMOUNTING THE AIRSCREW SPEED GOVERNOR

When going to dismount the airscrew speed governor from the engine there should be first taken down the control cable from the speed governor control pulley wheel. Then remove the hollow screw 3 (shown in fig. 27) as well as the lateral connecting branch 4. To this dismounting operation should be applied the special spanner from the airscrew tool kit.

With the aid of this special spanner loosen and unscrew the nuts fixing the speed governor to the engine and by a slight taping (knocking) on the speed governor housing release and take it off the engine. The gasket should be put together with the respective nut and lock washers in a suitable paper bag. The governor housing contact surface and the governor driving shaft should be protected by a safeguard. The hollow screw 3 and the lateral connecting branch 4 together with seal rings should then be refitted onto the speed governor and all inlet branches should be protected by suitable rubber caps.

The airscrew unit bearing flange on the engine side should also be protected by a safeguard which is supplied together with the engine accessories. It is then to be fixed by means of original nuts and respective washers. The reduction coupling 6, fitted in the engine oil collector, should be covered by a seal plug 8 and a seal ring 9.

Finally the airscrew speed governor assembly should be boxed in a carton and put in the airscrew unit transport case.

Separate parts of the speed governor should be put in a paper bag.

DISMOUNTING THE AUXILIARY FEATHERING PUMP

Disconnect the current supply socket from the socket plug of this feathering pump, take off the lateral cover and unscrew the fixing bolt nuts. After having removed the pump, its branches should be protected by suitable caps. Separate parts of this pump as well as the feathering pump itself should be boxed in cartons and then put into the airscrew unit transport case.

DISMOUNTING THE HYDRO-EIECTRIC PITCH CONTROL MECHANISM

Detach the current supply socket from the socket plug of this pitch control device and unscrew the fixing bolts. Thus opened fitting hole for fixing this device to the engine crankcase should be plugged by the original protective cover. For fixing this cover should be used the original tightening screws. All oil branches of this device should be covered by protective caps.

Then should this control device be boxed in a carton and put in the airscrew unit transport case.

All separate parts of this device put in a paper bag.

DISMOUNTING THE CONTROL BOX

Disconnect the current supply socket from the socket plug of this device, unscrew the fixing screws and take the device off. Then put this control switch box in a carton and put it in the airscrew transport case. All separate parts are to be put in a paper bag.

Note: Paper bags filled with the separate parts of all airscrew unit assemblies should be boxed in a common single carton and thus put in the original transport millboard case of the airscrew unit together with the respective service tool kit. All protective covers, caps and plugs should be put to the airscrew or aircraft accessories to be stored in common with them.

REPAIRS PERMISSIBLE TO BE CARRIED OUT BY THE COMMERCIAL USER

AIRSCREW SPINNER ASSEMBLY

Any injuring of the airscrew spinner may be caused owing to a surface dish-pressing (extending down) or owing to a crack in the blade-root cut-out edge of the spinner front part. This damage can be repaired in the following way:

A surface dish-pressing of the spinner front part of 5 mm. maximum depth and of 6 sq.cm. maximum surface area should be cold straightened in this way by means of a wooden tool, applying thereto a suitable supporting pad. It is permissible to repair no more than two surface injurings of this kind.

Note: The repair like this is very difficult because the spinner front section is closed by a brace and can be accessed only through the relieved holes.

A fissure can usually appear at the half-round cut-outs intended for the airscrew blade roots. Should the crack not exceed 10 mm., it is possible to stop its extending by drilling a small hole of 2 mm.dia. just at the top end of it. Should the crack established be, however, exceeding 10 mm., there would be necessary after having drilled the end-hole of 2 mm.dia. to stiffen the cracked spot by a duralumin shim (pad) of 1 up to 1.50 mm. thickness. This reinforcing shim has to be fixed by 4 duralumin annealed rivets of 1.60 up to 2.60 mm.dia. or by steel rivets of 1.40 up to 2 mm.dia.

Note: In order to respect the original true balance of the airscrew spinner front part, the stiffening shim as well as the rivets ap-

plied should be weighed before. Should their weight exceed 20 grammes, there would be necessary to rivet a balancing shim of the same weight to the opposite side, too, in order to keep on the original proper balance of the spinner. There is otherwise also permissible to balance the spinner being repaired by attaching some balancing metal pads to the spinner rear part if there is a balancing appliance at hand.

In case of any injuring the spinner rear part, the airscrew has to be dismounted and the whole spinner assy replaced for a new one. In such a case should, however, the balancing pads or shims be also replaced and attached from the original airscrew spinner to the new one, being located on the same spinner spots.

AIRSCREW BLADES

Surfaces of the propeller blades showing any traces of impacts, scratches or scores, caused by projected ground sand particles and pebbles, should be rectified by means of a fine file or by smoothing the surfaces with some fine emery paper. Damaged leading and trailing edges may be repaired down to a maximum depth of 1 mm. and not exceeding a length of about 10 mm. Any injured spot of the blade rear (push-side) and front (suction-side) sides should be repaired by a similar procedure. On these blade surfaces areas are permissible following repairs to be done:

Beginning from the blade radius R = 250 mm. up to the blade tip of each airscrew blade is permitted to make not more than five surface repairs. Maximum tolerable depth of a blade surface damage of a total blade surface area of 5 sq.cm. may not exceed 0.70 mm. Thereby the distance between separate spots repaired must reach at least 100 mm. and the surface area of those spots repaired should not exceed 1 sq.cm. The blade root parts, namely the cylindrical surface of each blade root, must not be repaired at all.

Should there be ascertained a great number of blade surface damaged spots, i.e. many deformations caused by impacts or cuts, or in case of a blade distortion, such blades should be dispatched to the maker's factory or, otherwise, such repairs should be carried out according to special maker's instructions conformable to a previous agreement between the airscrew manufacturer and the commercial user.

In some special cases (e.g. repair of airscrew blades needed in order to be able to take off from the place of aircraft emergency landing) is exceptionally permitted to straighten the distorted airscrew blades being cold (not heated up). Determination of maximum permissible further service time of airscrew blades straightened in cold state depends exclusively on values specified in the respective diagram, fig. 34.

Recommended check procedure:

1. Apply a rule of 100 mm. length to the longitudinal axis of the distorted airscrew blade rear side(i.e. push-side) and by means of a depth gauge check up the maximum blade deflection value "a", measured between the rule edge and the blade surface and, at the same time, measure also the blade thickness "t" just at the spot of blade distorting deflection.
2. The blade deflection value "a", established in the way as mentioned above, should then be looked up on the diagram horizontal axis in fig. 34. At that point should then be plotted a perpendicular as long as it reaches and crosses the curve of the blade thickness "t".
3. Opposite to this crossing point on the vertical axis is there able to read the period permissible for further service of the respective cold-straightened blade.
4. The distorted airscrew blade should be measured at several bla-

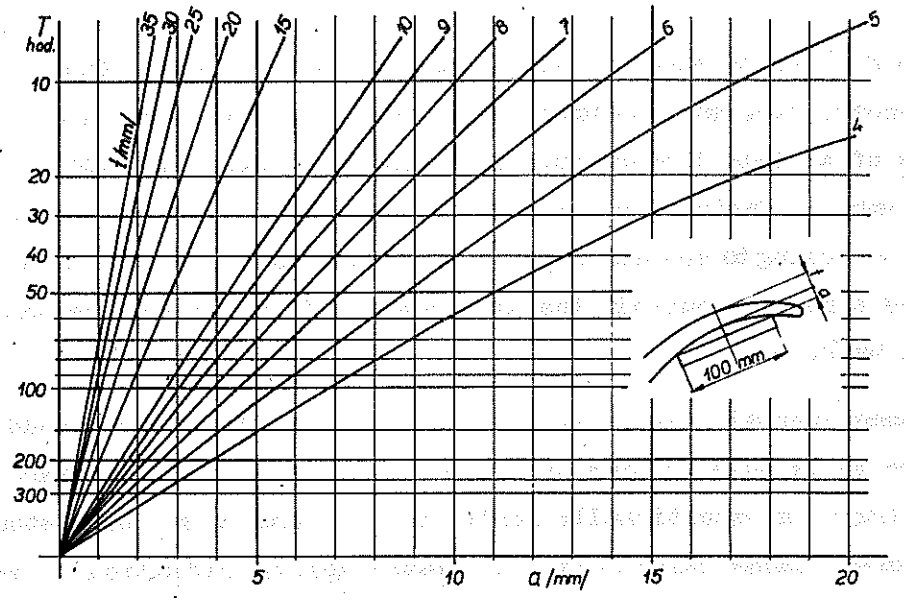


Fig.34-Diagram applied to correct cold-straightening the airscrew blades and to determination of the permissible further air service period of cold-straightened airscrew blades

Signification of individual quantities applied in this graph is following:

a (specified in mm.) = maximum tolerable distorting deflection of airscrew blades, measured from the length chord b = 100 mm.;

t (specified in mm.) = airscrew blade thickness in the blade deflection measured;

T (specified in hours) = maximum permissible further service time of airscrew blades after having been straightened in cold state.

de surface spots conformably to the above items 1 up to 3 and for determination of the period permissible for further air service should there be respected a minimum time period only.

5. After having passed the permissible service period of the cold-straightened airscrew blades, determined conformably to the above items 3 and 4, the airscrew blades should be handed over

for carrying-out a skillfull heat treatment.

REPLACEMENT OF AIRSCREW BLADES FOR NEW ONES

When replacing the airscrew blades for new ones there should be exchanged all the three blades,i.e. full blade series,but in that case only, if there is at hand an appliance for airscrew static balancing (shown in fig. 35).

Mounting process

Procedure of airscrew blade mounting is herein specified under the heading item "Fitting-on the airscrew blades".

After every replacement of the airscrew blades (always full blade series should be exchanged!)should the airscrew assy be statically balanced on a balancing mandrel of the counter-balancing appliance.

Note: The airscrew assy should be balanced without the power oil distributor and without the spinner front part,too.Unlock and remove the cap screw,take out the lock valve and drain all oil contents out of the airscrew servomechanism. When balancing the airscrew it should be quite empty, oil-free.

BALANCING THE AIRSCREW BLADES

Set the airscrew blades by hand to the minimum pitch angle setting stop.Thereafter gradually turn the airscrew round so that by each turning one of the blades is positioned vertically downwards. The other two blades should thereby be positioned upwards. Ascertain the most overbalancing blade and counter-balance it at the opposite side by suitable balancing pads (shims) 46 (as shown in fig. 2). These counter-balancing pads should be attached to the spinner rear part fixing flange 40. Maximum tolerable non-balance

of the airscrew blades is there specified to 2 gm.(gramme-metres).

Then set by hand the airscrew blades over to the maximum flight pitch angle setting stop (i.e. at $34^{\circ}\ 30'$ if measured at the airscrew blade ideal check section R = 675)and check up the airscrew counter-balance in the same way as at the preceding airscrew blade adjusting to the minimum pitch angle.

Note: When turning round the airscrew blades, there must be taken off the safety lock valve before.

After having finished the airscrew balancing operation adjust the airscrew servomechanism to the blade feathering stop, install the lock valve, retighten the cap screw applying thereto a torque moment of value $M_k = 6$ up to 6.50 kg.m. and lock the cap screw by the respective safety piece.The airscrew assy should then be mounted onto engine in that way as specified herein under the heading item "Mounting the airscrew on the rotor flange".

REPLACEMENT OF CONTROL BOX PILOT LAMP FOR A NEW ONE

First remove the protective glass from the control box face. Then apply the signal lamp remover (stored in the service tool kit) to the signal lamp, press slightly on and by turning it clockwise can the signal lamp be taken out. Then put a new signal lamp into the remover, press it slightly down and by turning anti-clockwise can the signal lamp be fitted in. After having this done, refit the protective glass to the control box face.

EXCHANGE OF AUXILIARY FEATHERING PUMP DRIVING MOTOR CARBON BRUSHES

Dismount the auxiliary feathering pump in the way as specified herein under heading item "Dismounting the auxiliary feathering pump". Plug the hose connecting the oil tank with the feathering

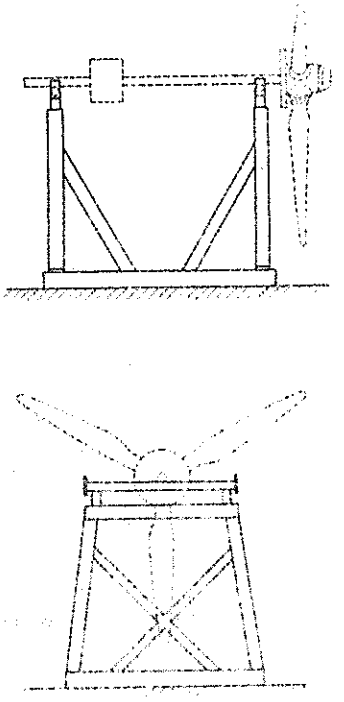


Fig. 35 - Appliance for airscrew static balancing

pump.Take off the electromotor carbons protective bands and detach the old brushes.Examine the surface contact of the new carbons to the motor collector surface. The contact surface of the carbons should amount approximately 75% of their total area, otherwise their contact surface should be duly adapted conformably to the mating collector surface. Then fix the protective band of the carbons and install the feathering pump conformably to herein specified item "Mounting the auxiliary feathering pump".

EXCHANGE OF POWER OIL DISTRIBUTOR PROTECTIVE FELT INSERTION PIECE

The protective felt insertion piece of the power oil distributor should be replaced for a new one approximately after every 300

operating hours of the airscrew. Should, however, even after this period be still sufficiently soft, filling thus fully the space between the rotor and housing of the power oil distributor, it would be not necessary to exchange it. The respective installing procedure is specified herein on page 50.

CHECK OF AIRSCREW BLADE PITCH SETTING-UP PLAY

The airscrew blade pitch setting-up play should be examined in the following way:

Force each airscrew blade to one of the blade pitch setting limit position. This position should be then tally-marked by means of a sharp pencil conformably on the blade root bearing outer race and the blade root cuff. Thereafter should be the same airscrew blade turned close to the opposite blade pitch setting position and the distance between both tally marks should be then measured. Every 0.70 mm. of this distance between both tally marks corresponds with 1° of the pitch angle setting. All three airscrew blades of each airscrew unit should be examined in the same way like this.

Summary of operations to be done at disassembly, reassembly or repair of individual airscrew unit assemblies

Usual disassembly reassembly, repair or exchange of	Specification of operations to be done	Procedure specified herein under heading
Airscrew	De-aeration of airscrew unit	De-aeration
	Engine operation test	Airscrew unit in air service
Power oil distributor	De-aeration of airscrew unit	De-aeration
Speed governor	Airscrew unit adjusting	Adjusting and checking the airscrew unit (in full extent)
	De-aeration of AU	
	Engine operation test	
Auxiliary feathering pump	De-aeration of airscrew unit	De-aeration
	Blade feathering check	AU in air service (Blade feathering)
Hydro-electric blade pitch control device	De-aeration of airscrew unit	De-aeration
	Blade feathering check	AU in air service (Blade feathering)
Control switch box	Blade feathering check	AU in air service (Blade feathering)
At any repair of the hydraulic system	De-aeration of airscrew unit	De-aeration
At any repair of the electric equipment	Blade feathering check	AU in air service (Blade feathering)
Exchange of the engine oil	De-aeration of airscrew unit	De-aeration

Note: AU = airscrew unit

D E F E C T S O F V J 6. 5 0 6 A I R S C R E W U N I T -
T H E I R C A U S E S A N D R E M E D Y

I. VIBRATIONS OF ROTATING AIRSCREW

1. Individual airscrew blades are not uniformly set up:

   Inspect whether all tally marks "a", "b" and "c" of the airscrew blades are properly set up and adjust the blades according to instructions specified herein under the item "Mounting the airscrew blades". Inspect, whether reference numbers of individual blades and of airscrew hub branches are mutually conformable.

2. The airscrew is not fully counter-balanced:

   Dismount the airscrew and reweigh individual blades. Replace the airscrew for another one.

3. The engine is not sufficiently fixed to the aircraft fuselage:

   Inspect and improve the engine attachment to the engine bed. At this engine fixing improvement should be followed instructions specified in the manual "Techn. description, operation and maintenance of the M-337 aeroengine".

II. ENGINE, BEING TESTED AT FULL THROTTLE WITH SUPERCHARGER RUNNING, IS NOT ABLE TO ATTAIN SPECIFIED SPEED (2700-100 R.P.M.)

1. The speed governor control cable is ruptured or quite slack:

   Exchange or repair the control cable respectively and adjust it according to herein specified heading item "Adjusting the airscrew unit".

2. The speed selector lever is not duly set to the "Take-off" position:

   Set the speed preselector lever to the right operational position.

3. The speed preselector lever comes to the "Take-off" position sooner than the speed governor control pulley-wheel:

   Adjust the airscrew control mechanism conformably to herein specified chapter "Adjusting the airscrew unit".

4. The airscrew blades are set up to an excessively coarser minimum pitch angle:

   Inspect whether all tally marks of the airscrew blades are set up correctly as required and adjust the blade pitch setting according to instructions specified herein under the heading item "Mounting the airscrew blades".

5. Faulty speed indicator:

   Examine the speed indicator.

6. Unsuitable kind of fuel:

7. Unsufficient engine compression:

8. The engine is too much heated or cooled:

9. Faulty ignition:

10. Incorrectly adjusted clutch of the supercharger transmission:

    6. - 10. Kindly see the instructive chapter "Engine running defects, their causes and rectification" of the manual "Techn. description, operation and maintenance of the M-337 aeroengine".

Important notice: Maximum airscrew speed at the engine test is not controlled by the speed governor, because the airscrew blades are set up to the minimum(fine) pitch angle position stop. Maximum airscrew speed at full throttle may be rather variable conformably to the engine power depending on various atmospheric conditions. At take-off, after having achieved a little forward velocity, the airscrew speed increases up to 2750 r.p.m. and this speed value is furtheron kept on and controlled by the speed governor.

III. SPEED SELECTOR LEVER GOT UNABLE "TO PRESELECT" R.P.M. REQUIRED WITHIN THE CONTROLLABLE SPEED RANGE

1. The speed governor control cable is ruptured or slack:

   Exchange or repair the control cable respectively and adjust it according to herein specified item "Adjusting the AU".

2. Faulty speed governor:

Replace the speed governor for a new one.

3. Defective operation of the airscrew servomechanism:

Exchange the airscrew.

4. Defective operation of the power oil distributor:

Exchange the distributor for a new one.

IV. ENGINE, RUNNING AT A STEADY CRUISING SPEED, IS NOT ABLE TO ATTAIN OR, ON THE OTHER HAND, IS EXCEEDING MAXIMUM SPEED (2750 R.P.M.)

1. The speed governor is not correctly adjusted:

Adjust correctly the "Take-off" position stop of the speed governor. (Any moving this stop by a distance of 1 mm. results in a change of airscrew speed by 40 up to 50 r.p.m.)

Replace the speed governor for a new one.

Note: The speed governor should be exchanged or adjusted only in the case, if there are no defects like those specified herein under the previous Item II.

V. AN AIRSCREW, COMPARED TO THE OTHER MATING ONE, REVEALS TO DEVELOP A SUBSTANTIALLY MINOR PITCH-CHANGING RATE TO LOWER R.P.M. (TO COARSER BLADE PITCH)

(Both mating airscrews should be tested in common at the same time)

1. Defective operation of the speed governor pressure-reducing valve:

Replace the speed governor for a new one.

2. Defective power oil distributor (not sufficiently oil-proof):

Exchange the oil distributor.

VI. AN AIRSCREW, COMPARED TO THE OTHER MATING ONE, REVEALS TO DEVELOP A SUBSTANTIALLY MINOR PITCH-CHANGE RATE TO HIGHER R.P.M. (TO FINER BLADE PITCH)

(Both mating airscrews should be tested in common at the same time)

1. Uncorrectly set up blade root cuff clamping sleeve:

Adjust correctly all blade root cuff clamping sleeves as required, respecting thereby due setting positions of the tally marks and, inspect whether the spinner front part is not anyhow damaged.

VII. OIL UNTIGHTNESS OF HYDRAULIC SYSTEM

1. The pipe unions and oil piping are not sufficiently retightened:

Retighten and lock them duly as required.

2. Defective pipe union seal rings:

Exchange the seal rings and duly lock the pipe unions.

VIII. CONTINUOUS AIRSCREW SPEED FLUCTUATION AT SOME OF THE FLIGHT REGIMES

1. Presence of air penetrated in the hydraulic system (piping):

Recheck all the airscrew hydraulic installation, above all the oil supply to the speed governor. Duly seal the hydraulic installation and de-aerate the airscrew unit assy according to instructions specified herein under the item "De-aeration".

2. Defective operation of the speed governor:

Exchange the governor for a new one.

IX. LASTING FLUCTUATION OF THE TAKE-OFF AIRSCREW SPEED AT FULL ENGINE THROTTLE WITH SUPERCHARGER RUNNING, IN A RANGE EXCEEDING THE TOLERABLE SPEED LIMIT ± 25 R.P.M.

1. Incorrectly adjusted clutch of the supercharger transmission:

Should be adjusted conformably to operating instructions of the M-337 aeroengine.

X. AIRSCREW SPEED EVEN AT A STEADY FLIGHT REGIME IS GETTING SELF-INCREASED OR SELF-DECREASED

1. The speed preselector lever is not sufficiently arrested:

Arrestment of the speed preselector lever should be improved (retightened).

XI. AIRSCREW BLADES ARE UNABLE TO BE FEATHERED

1. The speed preselector lever is not set up correctly to the position required (and therefore cannot be switched on the "Feathering" push-button of the control box):

Adjust the airscrew control mechanism conformably to herein specified chapter "Adjusting the airscrew unit".

a) After having set the preselector lever to the "Feathering" - position are the airscrew blades enabled to be feathered simply by depressing the control push-button marked "Unfeathering".

2. Defective airscrew unit electric wiring:

Inspect and examine the airscrew electric wiring.

3. Defective "Feathering" push-button in space of the speed preselector lever:

Exchange the faulty push-button for a new one.

b) The airscrew blades are unable to be feathered at the engine test neither by means of the speed preselector lever, nor by depressing the "Feathering" push-button (the control box green signal lamp is switched on).

4. Congealed oil in the feathering pump oil supply piping:

The auxiliary feathering pump should be switched off by the automatic airscrew circuit-braker, located at the cockpit ceiling control panel; then should be warmed up the engine and the airscrew feathering operation should be tested again.

5. Defective operation of the hydro-electric blade pitch control device:

Replace this device completely for a new one.

6. Ruptured or slackened speed governor control cable:

Repair or axchange and adjust the control cable conformably to herein specified chapter "Adjusting the airscrew unit".

c) The airscrew blades are unable to be feathered (the control box green signal lamp cannot be switched on)

7. Faulty electric wiring of the airscrew unit:

Check up and duly repair the airscrew unit electric wiring

XII. OPERATION OF AUXILIARY FEATHERING PUMP IS NOT AUTOMATICALLY GETTING SWITCHED OFF AFTER EACH BLADE FEATHERING CYCLE HAVING BEEN FINISHED

(The control box green signal lamp continues being switched on)

1. The speed preselector lever is too much arrested:

Release the arrestment of the speed preselector lever as much as the respective push-spring would be able to remove (shift) the speed preselector lever by about 10 mm. off the "Feathering"position (see herein specified chapter "Adjusting the airscrew unit".

2. Defective operation of the hydro-electric blade-pitch control device (air-blast circuit-breaker):

Replace this device completely for a new one.

Should, however, an operational fault of this device occur during a flight, there would be necessary to switch off immediately the airscrew electric circuit by the automatic circuit-breaker change-over switch, located at the cockpit control panel.

XIII. AIRSCREW BLADES ARE NOT ABLE TO BE UNFEATHERED

1. The speed preselector lever is not set up to due flight operating position(the control box green signal lamp is thereby switched on):

The speed preselector lever should be adjusted to the propre operating position.

2. Faulty electric wiring (the control box green signal lamp is thereby switched off):

Examine and repair the airscrew unit electric wiring as required.

3. Congealed oil in the feathering pump oil supply piping:

Adjust by hand the airscrew blades to the fine pitch angle in the following way:

Unlock and unscrew the cap screw 37 (see fig. 2), remove the lock valve 35 and adjust the airscrew blades slowly by hand to the minimum pitch angle position stop. Then refit the lock valve as well as the cap screw back and fit in both the seal rings 38. Finally retighten the cap screw 37 by a torque moment of value M_k = 6 up to 6.50 kg.m. and lock it by the lock piece 39.

4. A defect on the speed governor:

Replace the speed governor for a new one.

XIV. UNTIGHTNESS OF POWER OIL DISTRIBUTOR

Any oil leakage out of the power oil distributor owing to its untightness is usually revealed in oil-spray surface dimming the engine cowl inner or outer side, too. This fault does not effect anyhow the operation as well as the air service reliability of this airscrew unit. Any oil-dimming of the engine cowl inner surface side need not be anyhow remedied unless this is not revealed in space of the engine cylinders and exhaust pipe. In case of a more extensive and larger oil-dimming of the engine cowl outer surface side even after a short flight operation (i.e. after about 45 minutes of flight operation), when the oil-dimming spray reaches as far as to the aircraft wing, there should be carried out a thorough inspection of the power oil distributor as follows:

Dismount the airscrew and then disassemble the power oil distributor itself. Inspect due fitting of separate seal ring lock gaps (they should be mutually turned in opposite each to other by 180°). Then should be also inspected the circumference surfaces of the seal rings, whether there are not any scores, grooves, any lead coating scaled off or any other mechanical surface damages.

Should there be revealed no defects on the power oil distributor, reassemble and remount it back again. Should,

however, the oil leakage be revealed even after this inspection and reassembly of the oil distributor, replace it for a new one and dispatch it for overhaul or repair to the manufacturer's factory.

XV. UNTIGHTNESS OF AIRSCREW SERVOMECHANISM

An oil-leakage out of the airscrew hub cylinder front section should be remedied in the following way:

First unlock the lock piece 39, then retighten the cap screw 37 by a torque moment of value M_k = 10 kg.m. and finally refit the lock piece 39 back.

For retightening the cap screw 37 should be used the spanners Nos. 4 and 5 as well as the tubular extension adaptors provided with a grip, deposited in the service tool kit.

List of Free (not assembled and separately wrapped) Parts

Supplement II

to be applied to mounting the VJ 6.506 Airscrew Unit on an aeroplane

Index No.	Nomenclature	Drawing or Standard No.	Units per assy	To be applied to
1	Hydraulic oil piping	see the detailed list of piping on page	7	airscrew unit hydraulic system
2	Oil piping bracket	VJ 6.506-1	3	fixing the oil tubing to engine
3	Tapped connect.socket	6 ČSN 31 3825.31	1	oil supply to eng.oil collector
4	Stop nut	M14x1,5 ČSN 31 3803.31	1	closing the socket (ind.no.3)
5	Seal ring	14x18 ČSN 02 9310.3	1	nut M 14x1,5
6	Seal ring	12x16 ČSN 02 9310.3	1	connect.socket (ind.no.3)
7	Airscrew flange nut	V 506 - 0001	1	fastening the rotor flange to engine crankshaft
8	Lock ring	V 506 - 0002	1	securing the nut V 506-0001
9	Nut	V 506 - 0003	6	fixing the airscrew hub
10	Packing	V 506 - 0004	1	sealing the oil distributor body
11	De-icing fluid pan	V 506 - 0010	3	distribution of de-icing fluid
12	Oil distributor element	V 506 - 0030	1	distribution of power oil
13	Screw	V 506 - 4002	9	fixing the front spinner
14	Flange retaining nut washer	V 410 - 2103	1	nut V 506 - 0001
15	Lock washer	V 410T - 3302	3	locking the bolt M 4x6
16	Seal ring	V 415.1 - 10.06.1	1	packing the airscrew hub and the flange
17	Seal ring	66x56 ČSN 02 9280	3	airscrew blade root
18	Screw	M5x6 ČSN 31 3106.3	6	fixing the part Dwg.No.V506-0010
19	Screw	M4x6 ŠSN 31 3106.3	3	fixing the part Dwg.No.V506-0010
20	Lock washer	5 ČSN 31 3288	6	locking the screw M 5x6
21	Washer	6,4 ČSN 02 1701.14	8	attachment of oil distrib. body
22	Split pin	3x25 ČSN 02 1781.02	3	locking the sleeve (cuff) bolt
23	Split pin	2x22 ČSN 02 1781.02	6	locking the nuts D.No.V 506-0003
24	Gasket	7810-0021	1	under the LUN 7810 device
25	Nut	7810-0023	4	attachment of the LUN 7810 dev.
26	Washer	6,1 ČSN 02 1740.04	4	the nut Dwg.No. 7810-0023

List of Free (not assembled and separately wrapped) Parts
to be applied to mounting the VJ 6.506 Airscrew Unit on an aeroplane (continued)

Index No.	Nomenclature	Drawing or Standard No.	Units per assy	To be applied to
27	Bolt	M4x18 ČSN 02 1157	4	attachment of the IUN 7876 dev.
28	Self-locking nut	M 4 LDN 3217	4	-"-
29	Washer	4,3 ČSN 02 1701.14	4	the nut M 4 LDN 3217
30	Bolt	M5x12 ČSN 02 1103	4	attachment of the IUN 7841 dev.
31	Sef-locking nut	M 5 LDN 3217	4	-"-
32	Washer	5 ČSN 02 1701.20	4	the nut M 5 LDN 3217
33	Gasket	P 7881 - 0009	1	the IUN 7881 device
34	Screw	M5x48 ČSN 02 1101/8G	2	attachment of the IUN 7881 dev.
35	Washer	5,1 ČSN 02 1740.04	2	the screw head M 5x48
36	Lock wire	Ø 0.8x4000 ČSN 1094/I	1	locking the connecting parts (oil piping)
37	Preventative insert	V 506 - 0005	1	power oil distrib. D.No.V506-6
38	Screw	M5x15 ČSN 02 1157	6	attachment of the oil pip. bracket

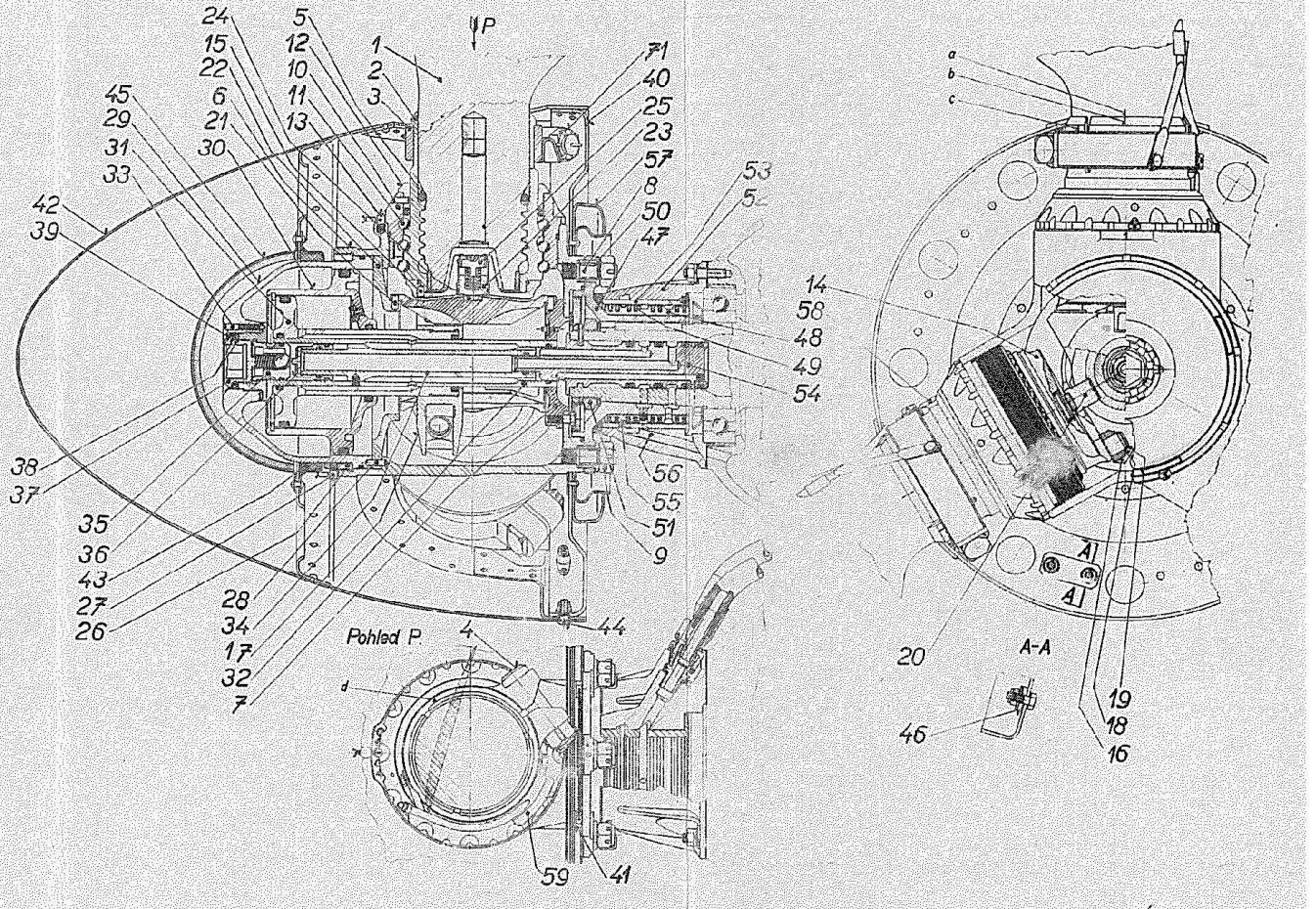
Comment: The above quoted free (not assembled) parts of separate group assemblies are put in separate bags which are cased in a carton box.

List of Spare Parts

Supplement III

of the VJ 6.506 Airscrew Unit

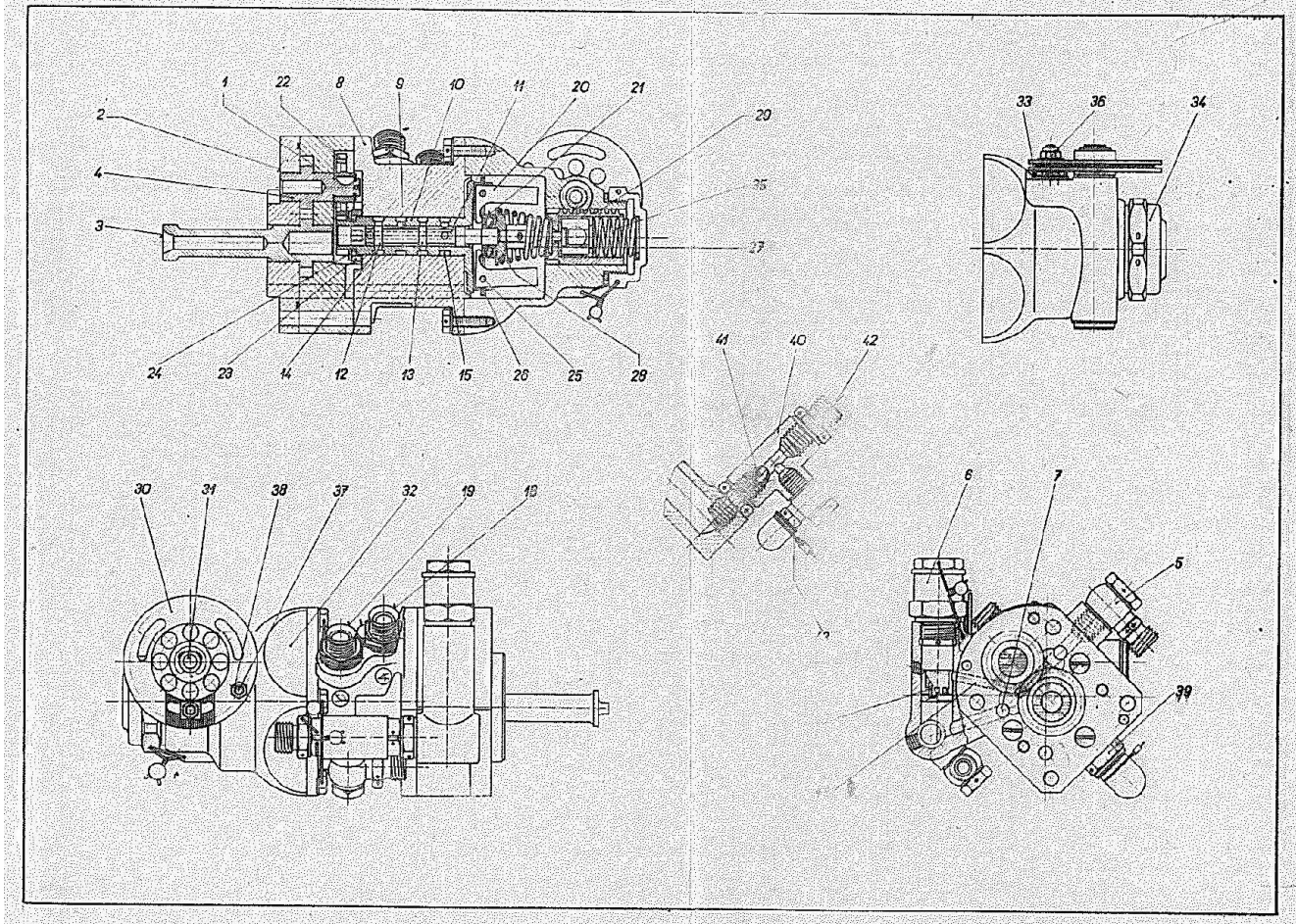
Index No.	Nomenclature	Drawing or Standard No.	Units per assy	To be applied to
1	Nut	V 506 - 0003	2	V 506 airscrew
2	Screw	V 506 - 4002	9	-"-
3	Lock washer	V 410T - 3302	3	-"-
4	Seal ring	GA 77.019	4	-"-
5	Lock washer	5 ČSN 31 3288	4	-"-
6	Screw	M5x6 ČSN 31 3106.3	3	-"-
7	Screw	M4x6 ČSN 31 3106.3	1	-"-
8	Splint	3x25 ČSN 02 1781.02	3	-"-
9	Splint	2x22 ČSN 02 1781.02	6	-"-
10	De-icing fluid pan	V 506 - 0010	1	-"-
11	Seal ring	OD 01 - 121	1	-"-
12	Seal ring	452.066	1	-"-
13	Seal ring	V 415.1-10.06.1	1	-"-
14	Packing	V 506 - 1004	1	V 506-6 power oil distributor
15	Nut	M6 ČSN 31 3202.2	4	-"-
16	Washer	6,1 ČSN 02 1740.04	8	-"-
17	Washer	6,4 ČSN 02 1701.14	4	-"-
18	Seal ring	12x18 ČSN 02 9310.3	3	LUN 7810 speed control
19	Seal ring	10x14 ČSN 02 9310.3	2	-"-
20	Lock ring	7 ČSN 02 2929.02	1	-"-
21	Carbon brush	309-9542.08/61	2	LUN 7841 subsidiary pump
22	Signal lamp	24 V, 2 W	2	LUN 7876 control box
23	Safety insert	V 506 - 0005	2	V 506-6 power oil distributor



Obr. 2 - Řez vrtulí V 506

Fig. 2 - Section view of the V 506 airscrew unit (a chart)

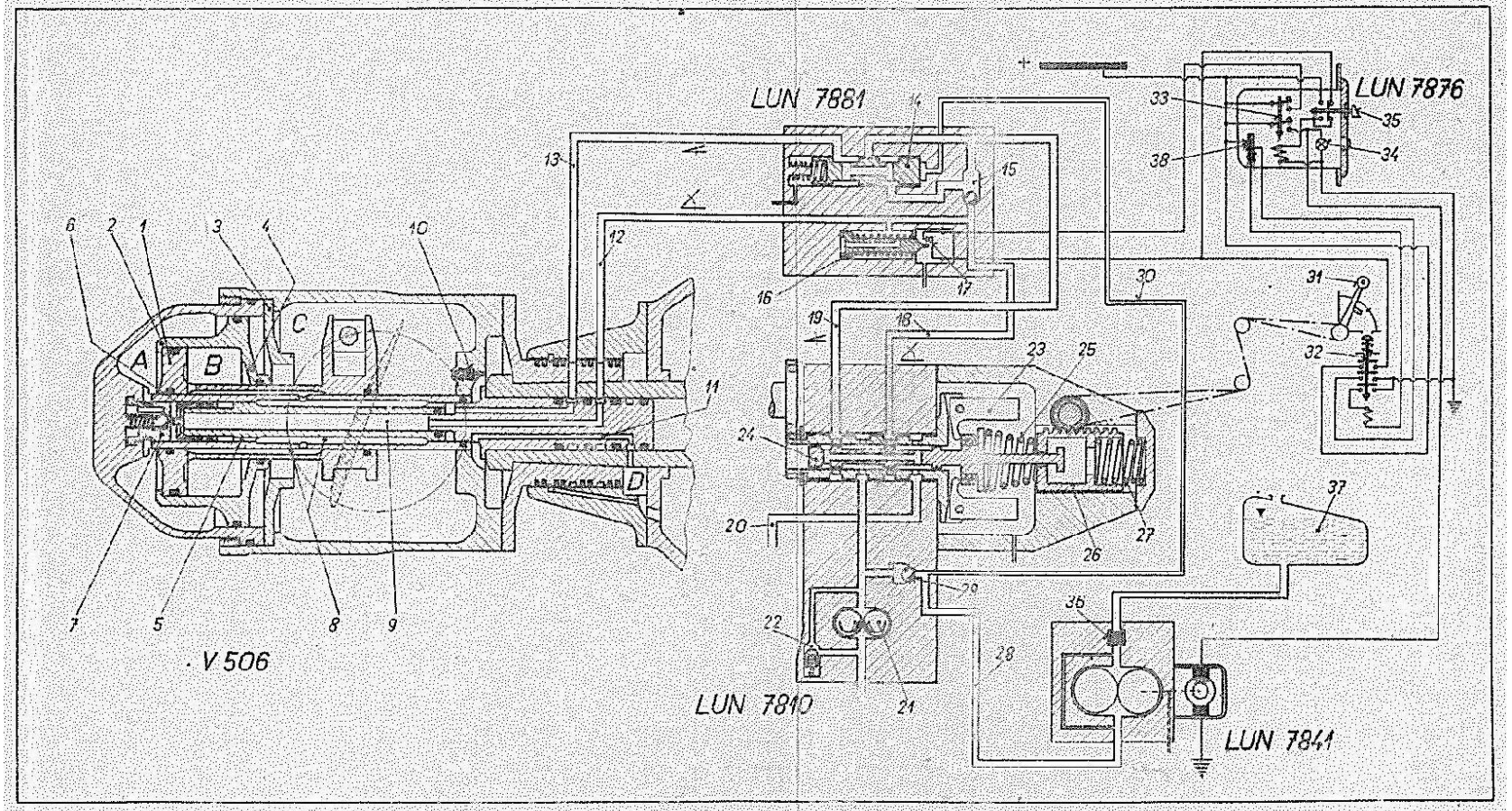
Fig. 4



Obr. 4 - Řez regulátorem otáček LUN 7810

Fig. 4 - Section view of the LUN 7810 speed governor

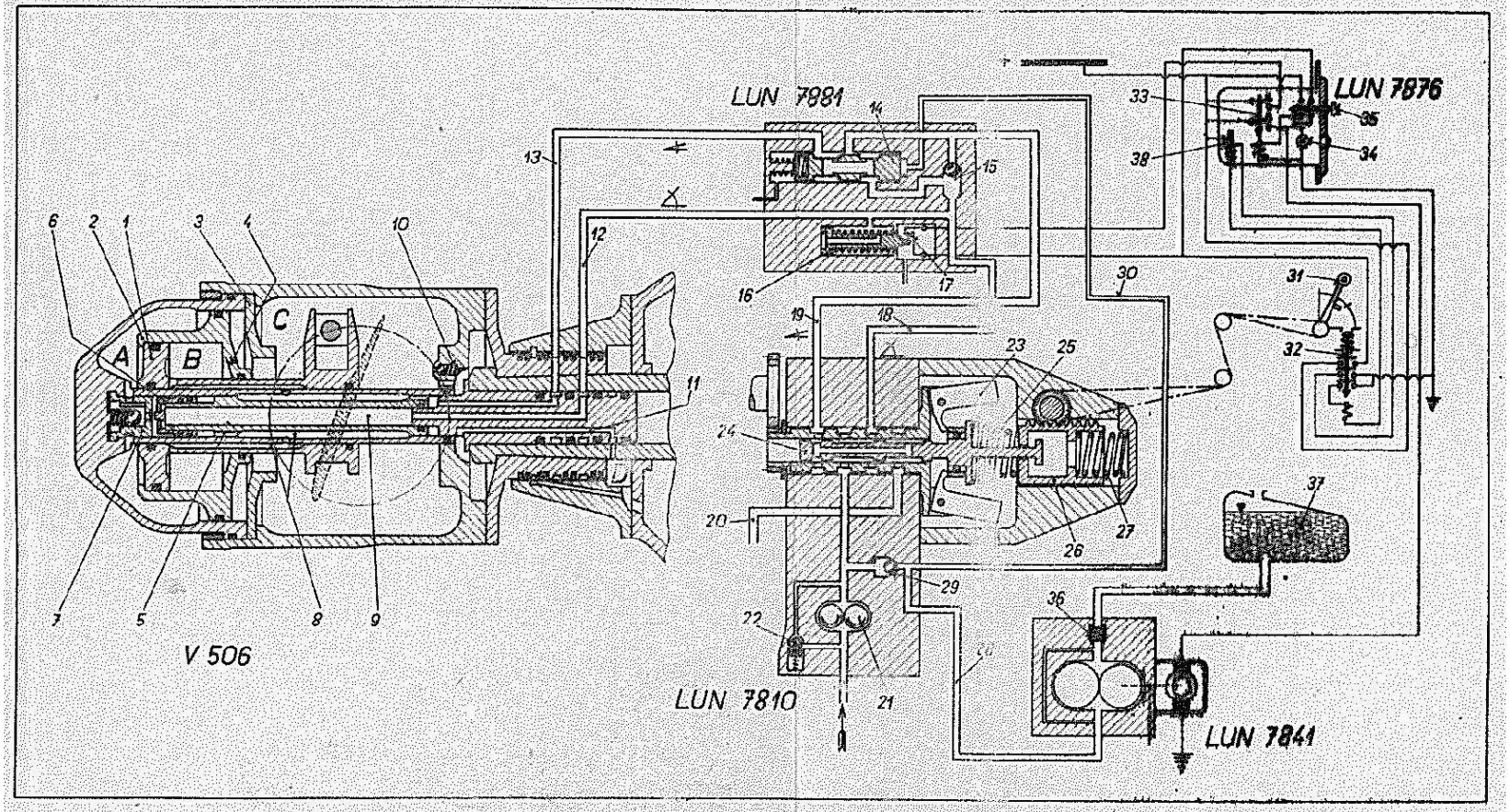
Fig. 13



Obr. 13 - Činnost vrtulové jednotky při rovnovážném stavu

Fig. 13 - Scheme of airscrew unit operation at the state of speed equilibrium

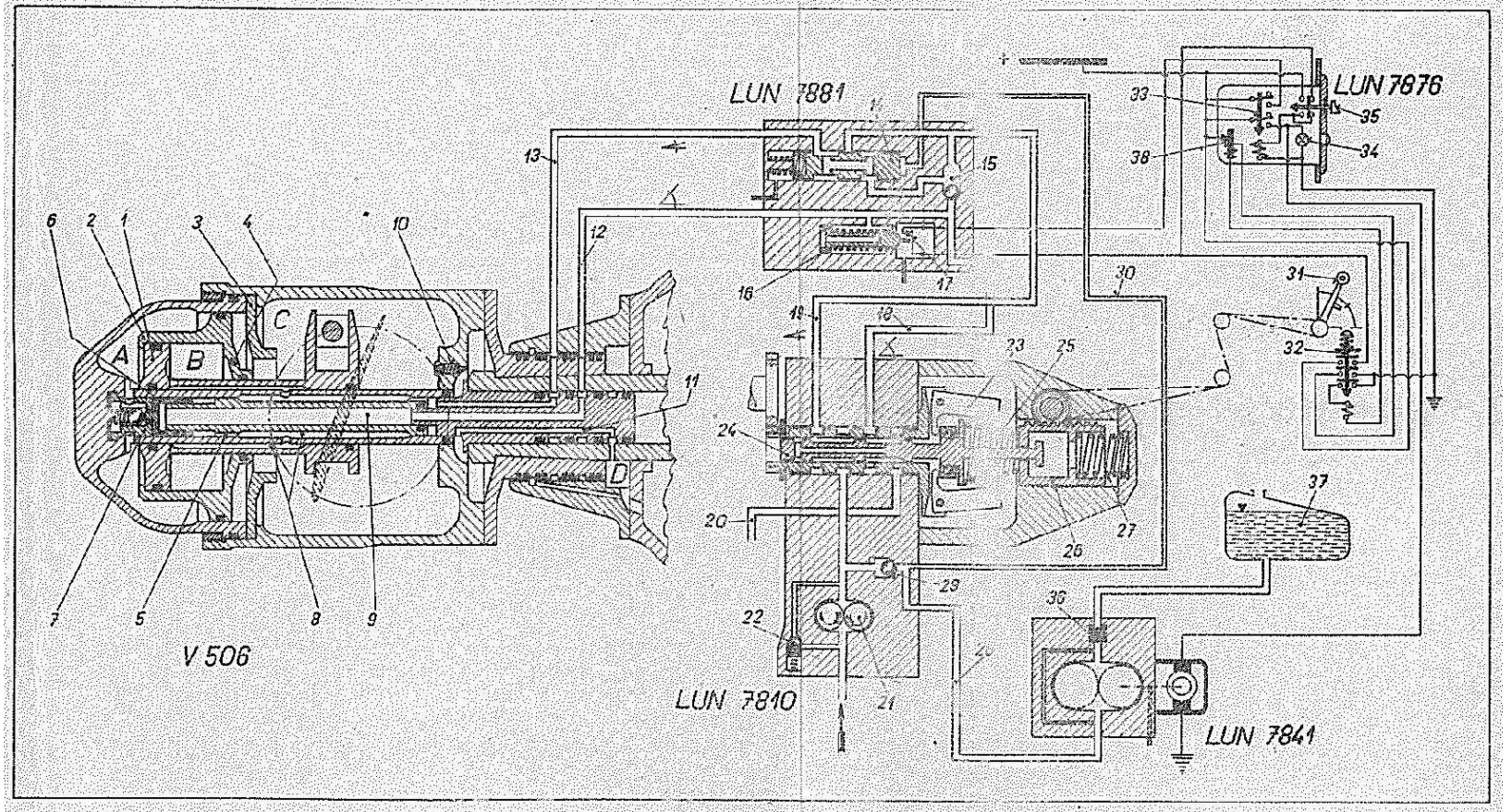
Fig. 14



Obr. 14 - Činnost vrtulové jednotky při zvýšení otáček

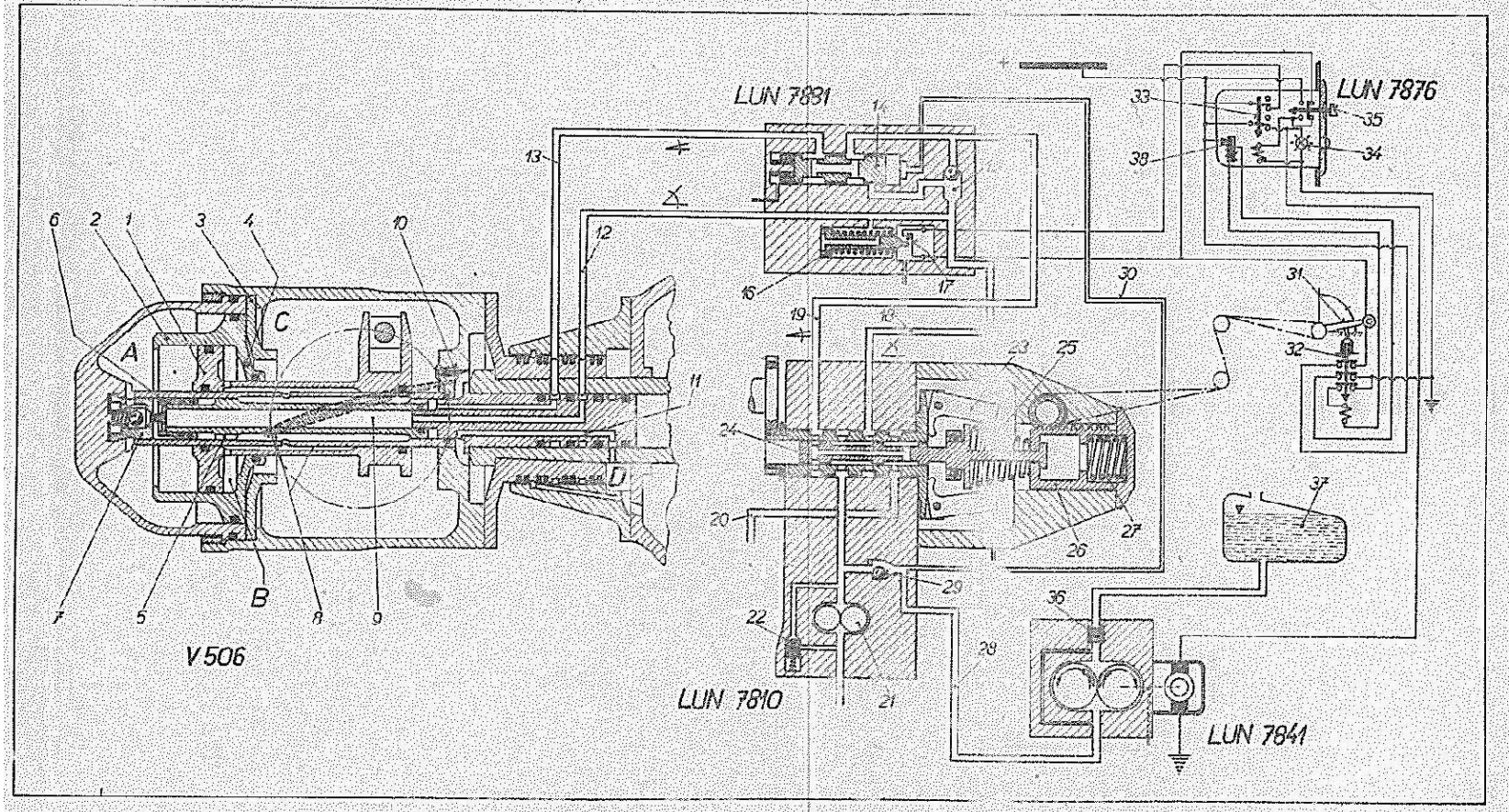
Fig. 14 - Scheme of airscrew unit operation in case of increasing the engine speed

Fig. 15



Obr. 15 - Činnost vrtulové jednotky při snížení otáček

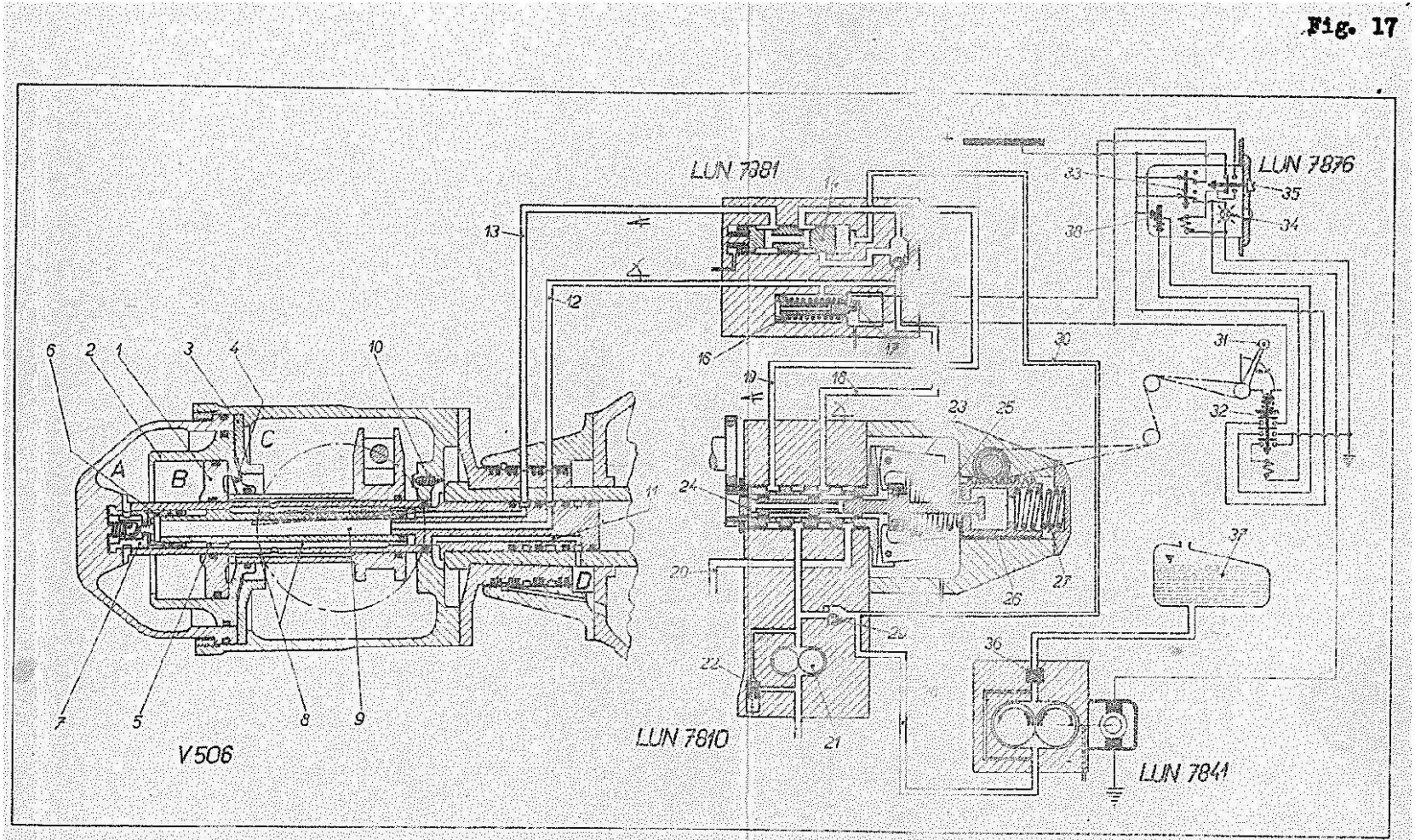
Fig. 15 - Scheme of airscrew unit operation in case of decreasing the engine speed



Obr. 16 - Činnost vrtulové jednotky při přestavení do praporové polohy

Fig. 16 - Scheme of airscrew unit operation at feathering the blades

Fig. 17



Obr. 17 - Činnost vrtulové jednotky při přestavení z [illegible]aporové polohy

Fig. 17 - Scheme of airscrew unit operation at unfeathering the blades