



MK9M

Repair Manual



MK9M5B - MK9M8B - MK9M5D - MK9M8D



General Pump is a
member of the
Interpump Group



Ref 310074 Rev. B
01-20

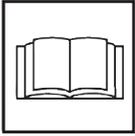
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1. INTRODUCTION

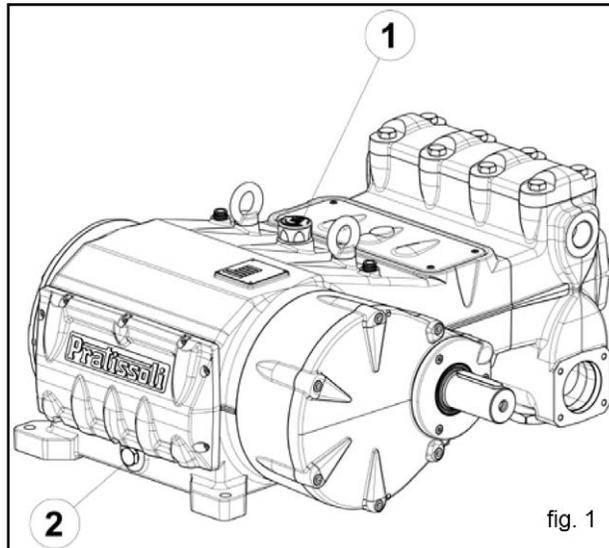
This manual describes the instructions for Repairing MK9 Series pumps, and must be carefully read and understood before performing any repair intervention on the pump. Correct use and adequate maintenance is fundamental for the pump's regular operation and long wear. General Pump declines any responsibility for damage caused by the misuse or the non-observance of the instructions described in this manual.

2. REPAIR INSTRUCTIONS



2.1 Crank Mechanism Repair

Crank mechanism repair operations must be carried out after draining the oil from the crankcase. To drain the oil, remove the oil refill cap (1, Fig. 1), and then the draining plug (2, fig. 1).



Exhausted oil must be collected in an appropriate receptacle and disposed of in designated locations. In absolutely no case may it be disposed of in the environment.

2.1.1 Crank Mechanism Disassembly

The correct sequence is the following

Completely drain the oil from the pump, then remove the key from the shaft (1, fig.2).



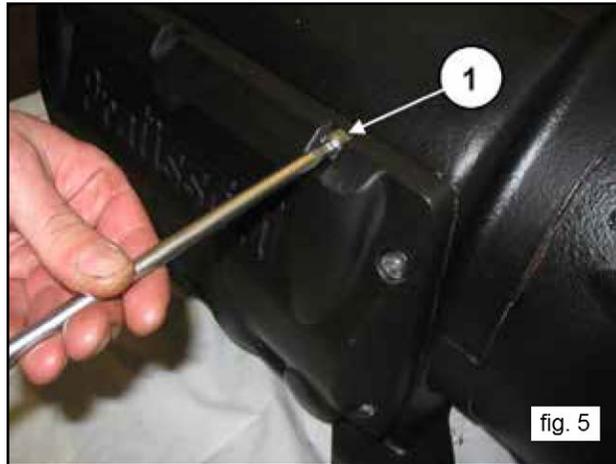
Unscrew the reducer flange fastening screws (1, fig. 3) and remove the flange from the shaft.



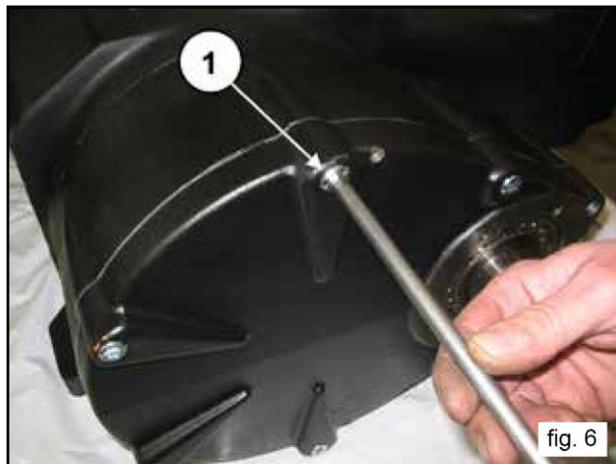
On the opposite side, unfasten the screws (1, fig. 4) and then remove the bearing cover.



Disassemble the crankcase cover by unfastening the relevant screws (1, fig. 5).



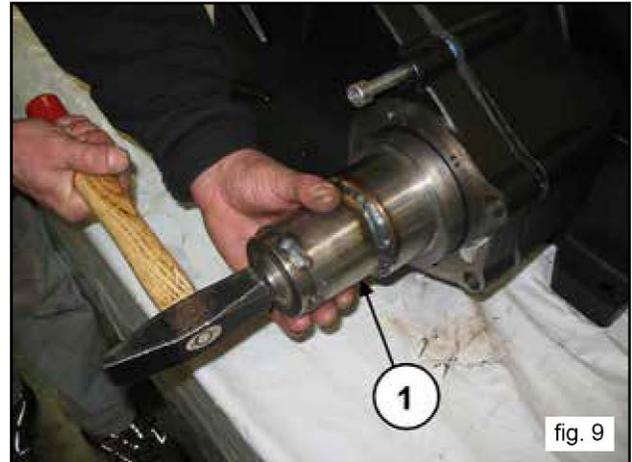
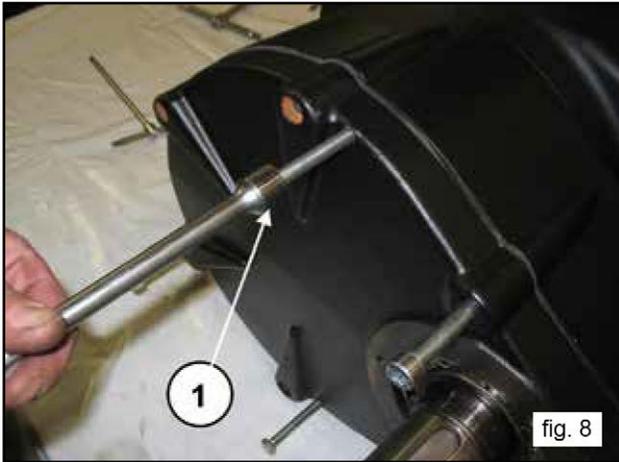
Unfasten the reducer cover screws (1, fig. 6).



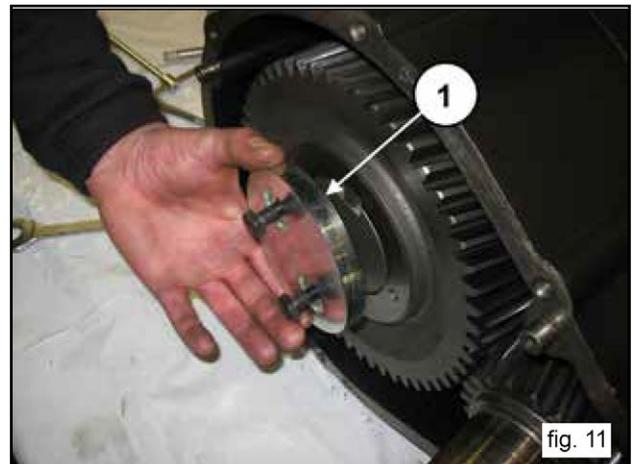
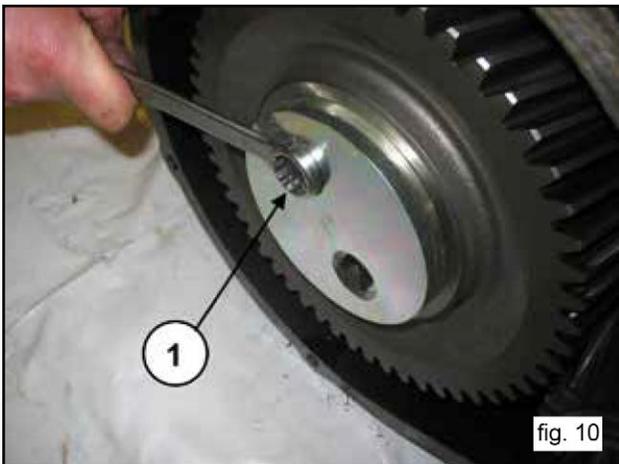
Insert 3 dowels, or 3 M8 threaded screws (1, fig. 7) in the appropriate holes to aid extraction, and two sufficiently long M10 screws in order to support the cover (2, fig. 7).



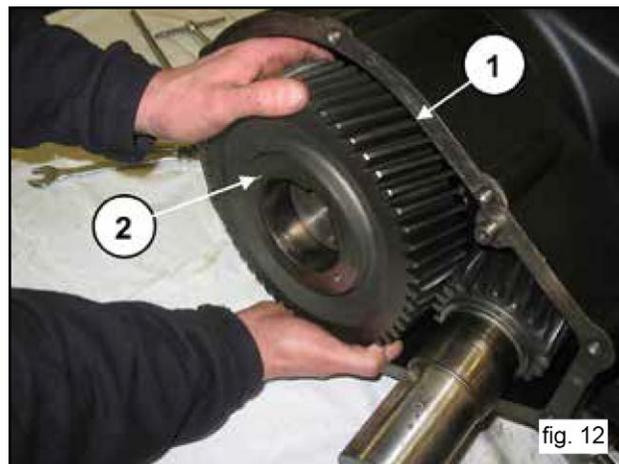
Screw on the 3 threaded screws (1, fig. 8) and simultaneously, using the appropriate tool (#F27516700), hammer on the tool itself so that the bearing remains on the pinion when extracting the cover (1, fig. 9).



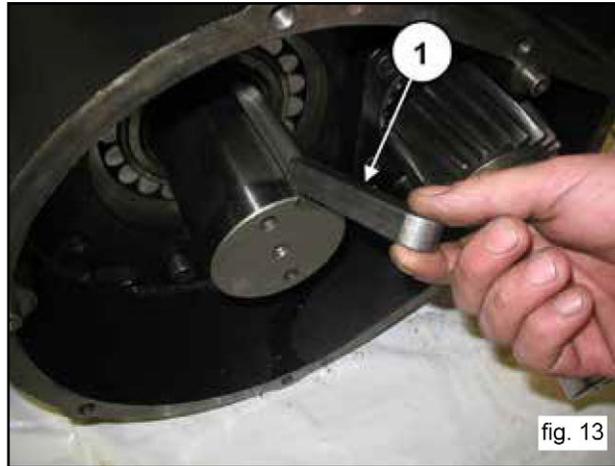
When this operation is complete, remove the reducer cover and then slip off the bearing from the pinion. Remove the screws that fasten the ring gear stopper (1, fig. 10), and remove the stopper itself (1, fig. 11).



Remove the ring gear (1, fig. 12). If necessary, use a slide hammer applying it to the 2 M8 holes (2, fig. 12).



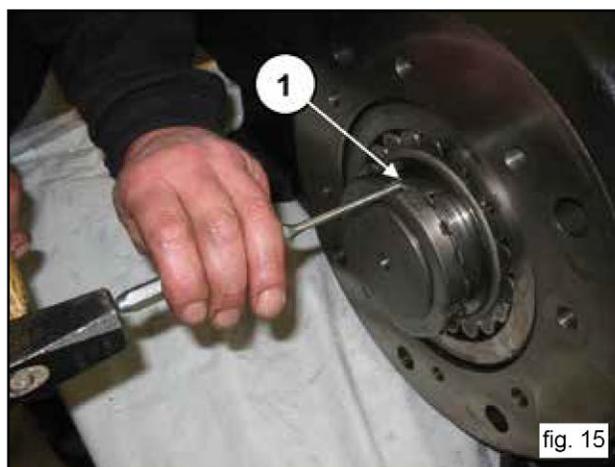
Remove the key from the shaft (1, fig. 13).



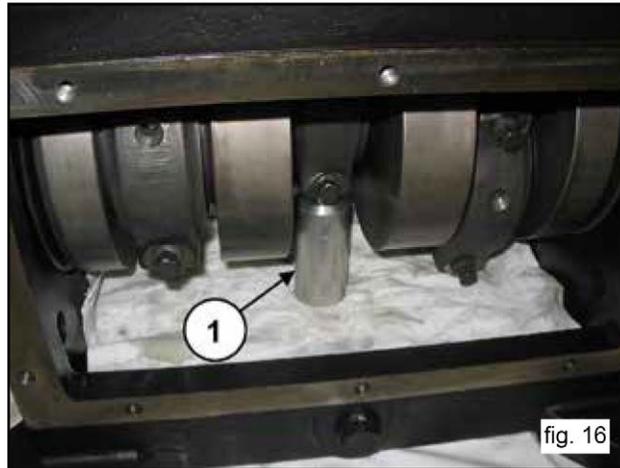
Remove the pinion by using a slide hammer applying it to the M14 hole (1, fig. 14).



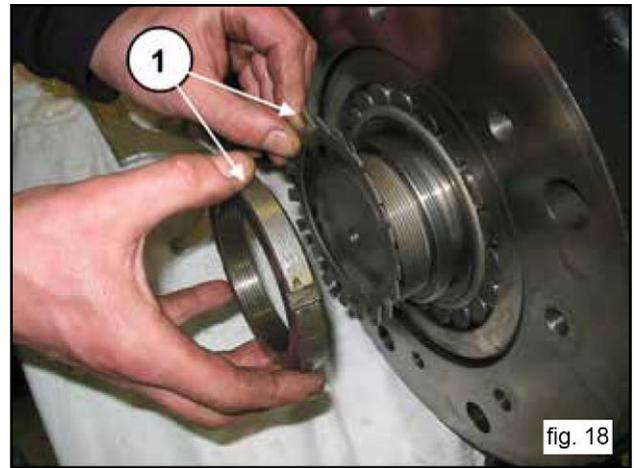
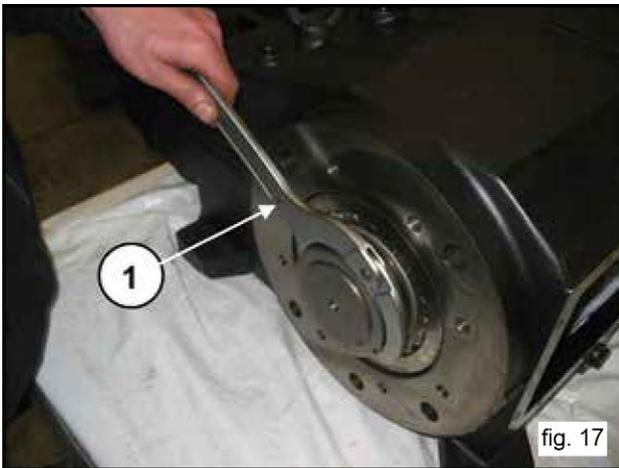
Lift the safety washer key (1, fig. 15)



Insert a spacer under the connecting rod to block shaft rotation (1, fig. 16).



Using an appropriate wrench, unscrew and remove the ring nut (1, fig. 17) and then remove the safety washer (1, fig 18).



Screw a SKF KM19 type ring nut onto the pressure sleeve (1, fig. 19), then loosen the sleeve using an appropriate wrench (1, fig. 20).



On the opposite side, unfasten the reducer case screws (1, fig. 21), and then remove the case (1, fig. 22).



Unscrew the connecting rod screws (1, fig. 23).



Disassemble the connecting rod caps with the split bearings; be particularly aware of disassembly order.



The connecting rod caps and the related connecting rods must be reassembled in the exact order and coupling as during disassembly.

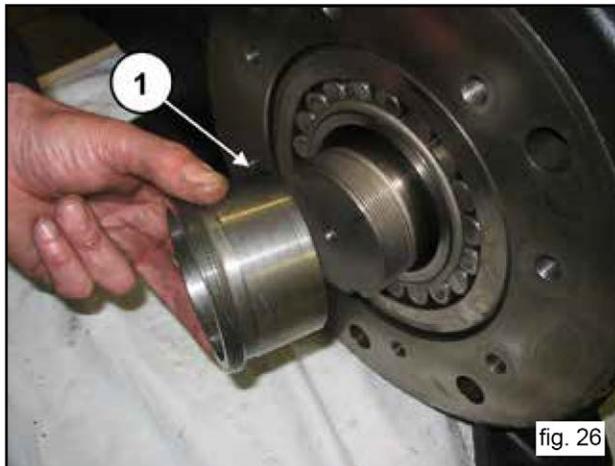
To avoid error, caps and connecting rods are numbered on one side (1, fig. 24).



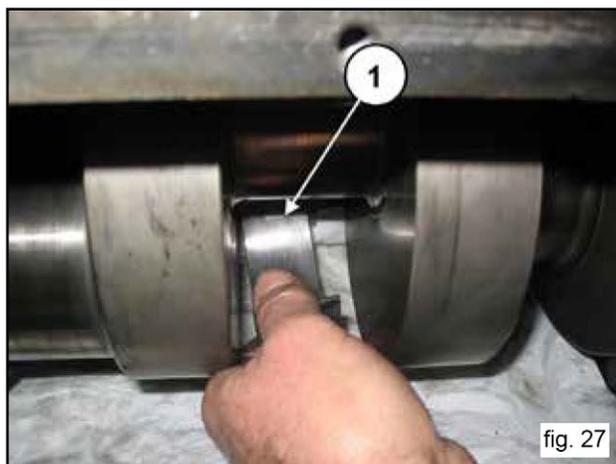
Push the connecting rods forward in the direction of the hydraulic side in order to push out the crankshaft. Use the appropriate tool (#F27566200) to facilitate this operation (1, fig. 25)



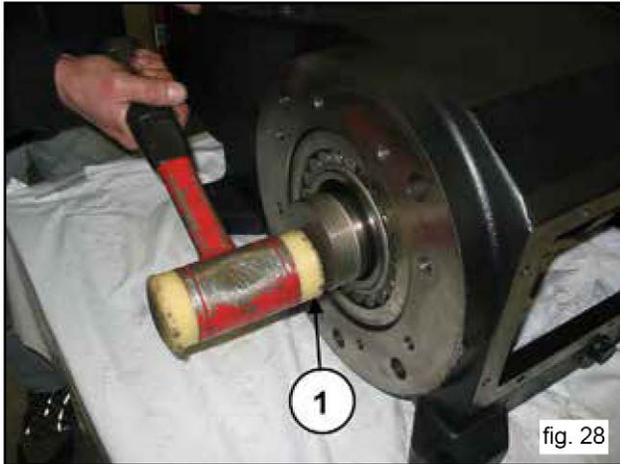
Remove the pressure sleeve (1, fig. 26).



Remove the upper split bearings of the connecting rods (1, fig. 27).



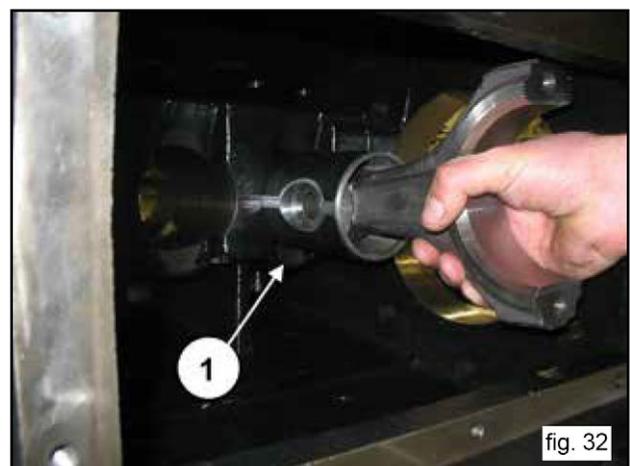
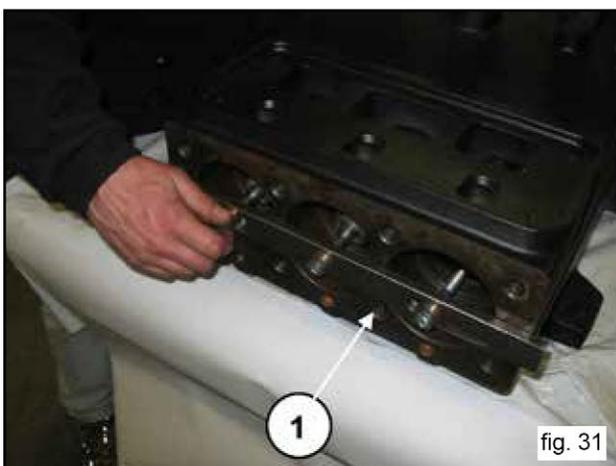
Remove the crankshaft with the help of a extractor hammer on the PTO side (1, fig. 28). Remove the shaft and the bearing (1, fig. 29).



On the opposite side, extract the bearing (1, fig. 30)



If the replacement of one or more connecting rods or plunger guides is necessary, please operate as follows: Unfasten the screws with the tool (#F27566200) to unlock the connecting rods (1, fig. 31) and therefore extract the connecting rod-plunger guide units from the opening behind the crankcase (1, fig. 32).



Couple the connecting rods with the previously disassembled caps; be sure to refer to numbering (1, fig. 33).



Remove the two seeger rings that block the plunger pin by using the appropriate tool (1, fig. 34).



Remove the pin (1, fig. 35) and then remove the connecting rod (1, fig. 36).



To separate the rod from the plunger guide, unfasten the M6 hexagonal-head screws with a special wrench (1, fig. 37).



2.1.2 Crank Mechanism Assembly

Proceed with assembly by reversing the procedure indicated in paragraph 2.1.1.

The correct sequence is the following:

Connect the rod to the plunger guide

Assemble the rod to the plunger guide.

Insert the plunger guide rod into its seat on the plunger guide (1, fig. 38) and join the rod to the plunger guide by the means of 4 m6 x 20 screws (1, fig. 39).



Block the rod using a clamp, and proceed with calibration using a torque wrench (1, fig. 40) as indicated in paragraph 3. "SCREW CALIBRATION"



Insert the connecting rod in the plunger guide (1, fig. 36) and then insert the pin (1, fig. 35). Apply the two seeger rings using the correct tool (1, fig. 34).



Make sure that conrods, plunger guides and wrist pins can move freely after being assembled together.

Separate the caps from the connecting rod; correct coupling is guaranteed by the numbering on the side (1, fig. 33). After verifying the perfect cleaning of the crankcase, insert the connecting rod-plunger guide unit inside the cylinders of the crankcase (1, fig. 32).



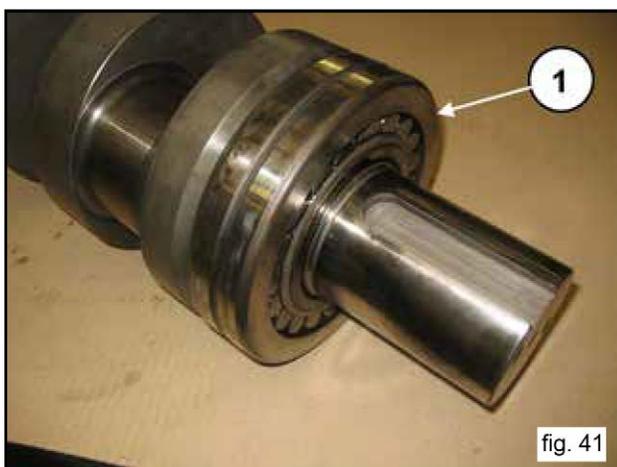
The insertion of the connecting rod-plunger guide unit inside crankcase must be done by positioning the connecting rods with the numbering visible from above.

Block the three units using the correct tool, #F27566200(1, fig 31).

Pre-assemble the bearing, PTO side, on the shaft (1, fig. 41) and assemble the bearing on the opposite side on the crankcase (1, fig. 42).



The bearing in fig. 42 has a tapered internal ring. Verify that the taper goes from the outside towards the inside in order to allow the subsequent insertion of the sleeve.



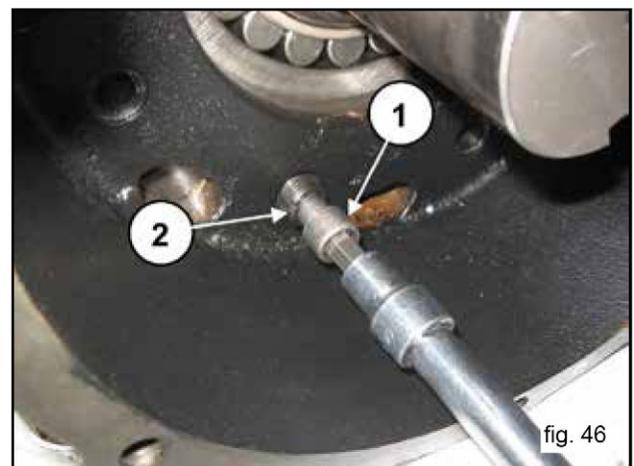
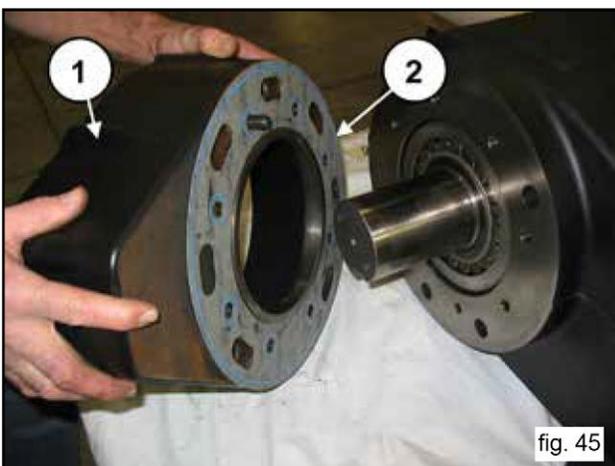
Insert the shaft (1, fig. 29) until the pre-assembled bearing is aligned with the edge of the crankcase (1, fig. 43).

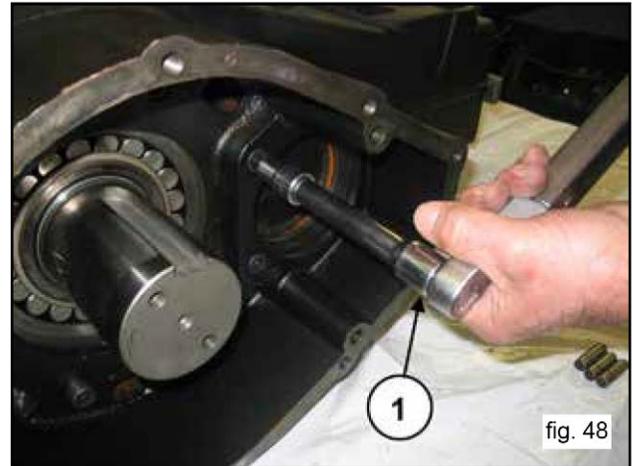
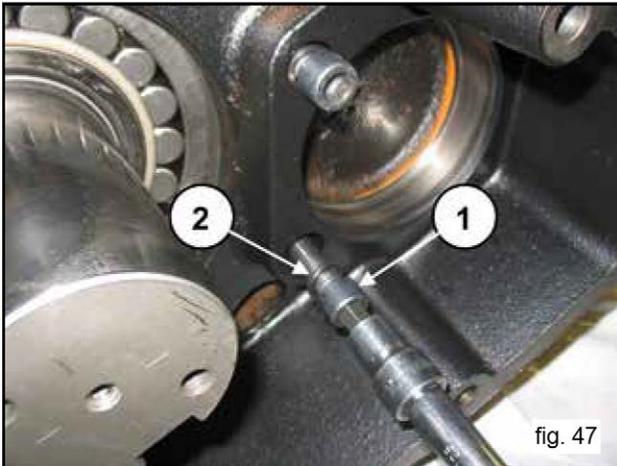


Manually insert the pressure sleeve to maintain the shaft alignment (1, fig. 44).



Mount the reducer case (1, fig. 45) and the related gasket (2, fig 45) using the 6 M12 x 40 screws (1, fig. 46), the 2 M12 x 50 screws (1, fig. 47) and the Ø12 Grower washers (2, fig. 46 and fig. 47). Calibrate the screws with a torque wrench (1, fig. 48) as indicated in paragraph 3. "SCREW CALIBRATION"





Completely insert the pressure sleeve on the shaft from the opposite side of the PTO (1, fig. 49 and fig. 50).

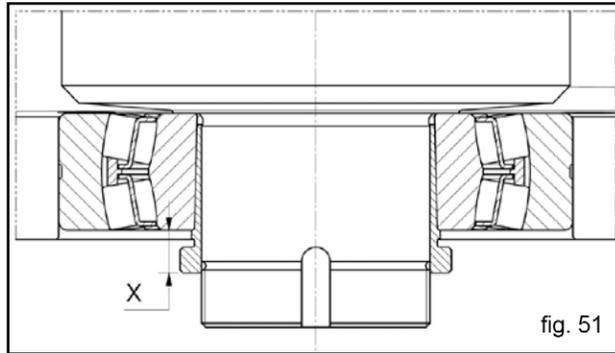


Pressure sleeve insertion must be done without oil or lubricants.

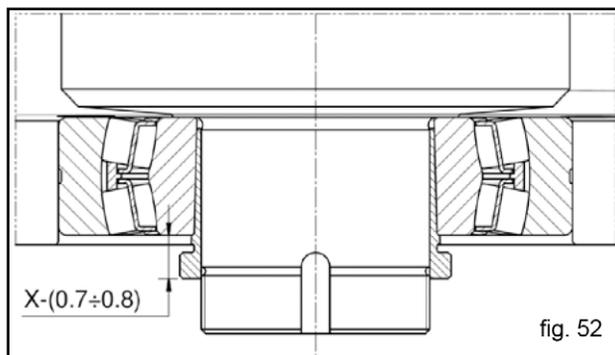
Insert the sleeve until the external surface (tapered) couples perfectly with the inside of the bearing. During insertion, be sure that the bearing remains in contact with the shaft shoulder.

Measure the dimension "X" indicated in fig. 51.

Measure the dimension "X" indicated in fig. 51.



Screw the ring nut and fasten the sleeve until the dimension "X" is reduced by a value ranging between 0.7 and 0.8 mm (fig. 52).



Unscrew the ring nut, insert the safety washer (1, fig. 53) and completely screw the ring nut (1, fig. 54); then fold the washer's locking key (1, fig. 55).



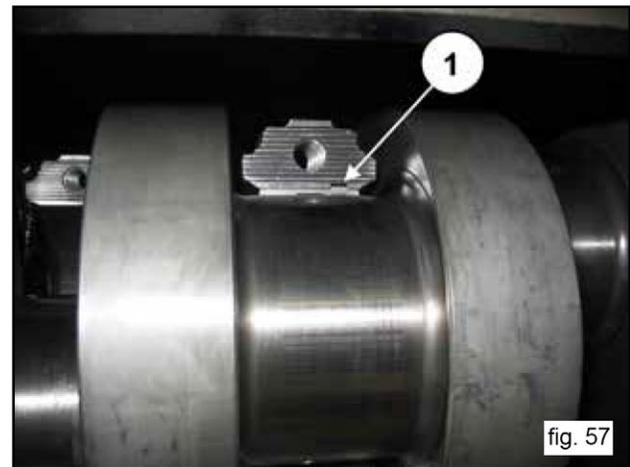


Remove the device that blocks the connecting rods using #F27566200 (1, fig. 31).

Insert the upper split bearings between the connecting rods and the shaft (1, fig. 56).



In order to correctly assemble the split bearings, be sure that the split bearings' reference key in the appropriate seat on the connecting rod (1, fig. 57).



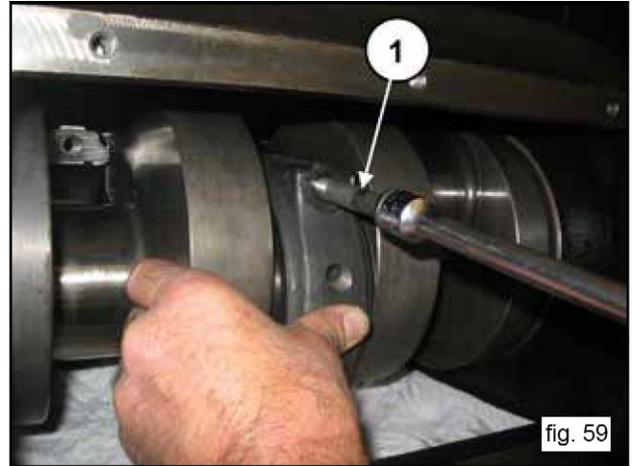
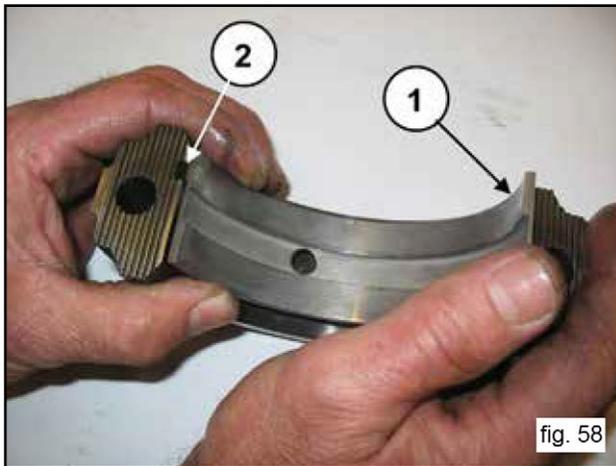
Apply the lower split bearings to the caps, (1, fig. 58) being sure that the split bearings' reference key is positioned in the appropriate seat on the cap (1, fig. 58).

Fasten the caps to the connecting rods using the M12 x 1.25 x 87 screws (1, fig. 59).



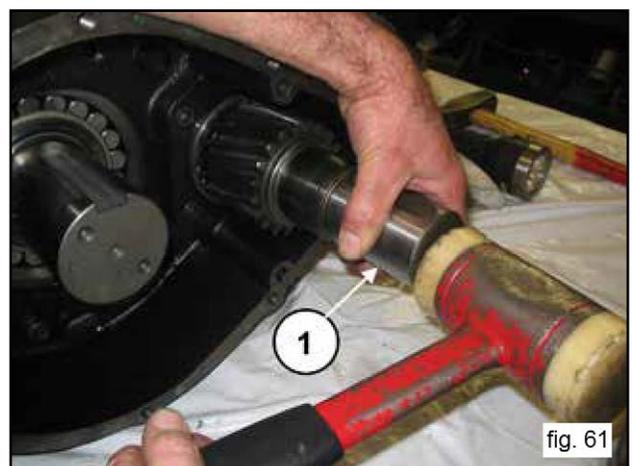
Pay attention to the correct assembly of the caps. the numbering must face upwards.

Tighten the screws with a torque wrench as indicated in the "SCREW CALIBRATION" chart of paragraph 3. The con-rod screws should be tightened at the same time.

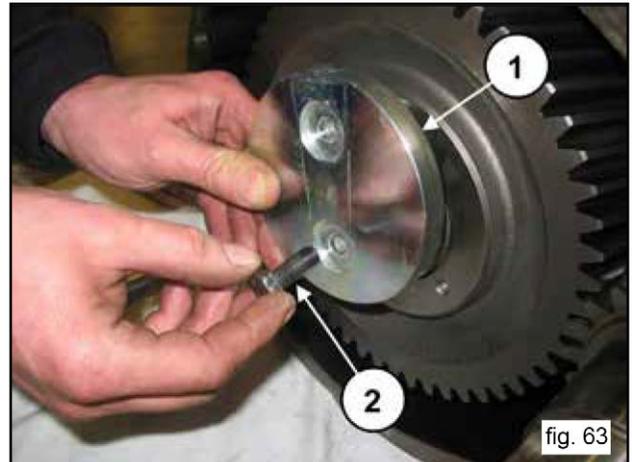
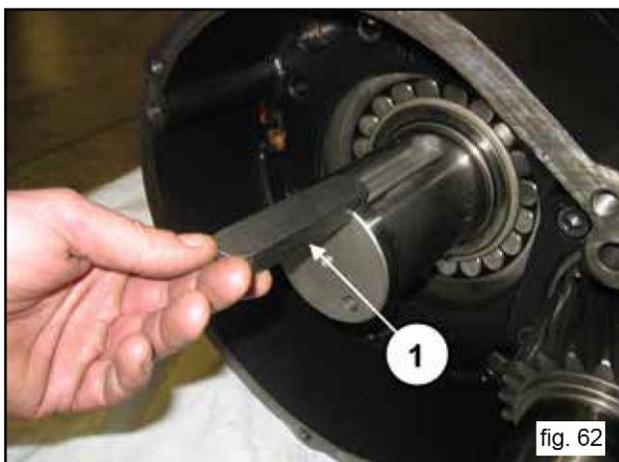


Once tightened on the crankshaft, make sure that con-rods have axial clearance in both direction.

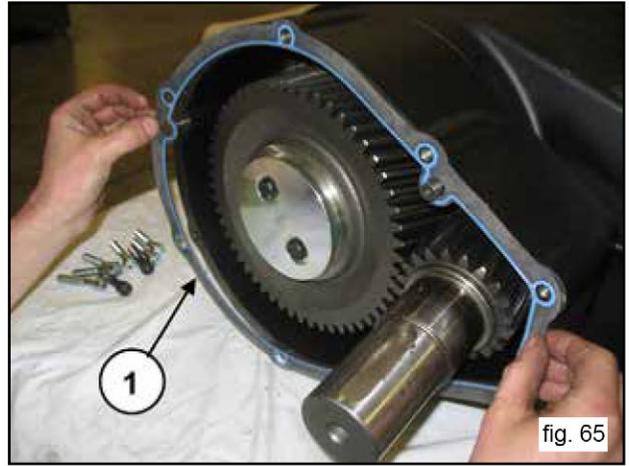
Preassemble the bearing on the pinion (1, fig. 60) and fully insert the pinion in the seat on the reducer case (1, fig. 61) by using a extractor hammer.



Apply the 22 x 14 x 100 key in the seat on the shaft (1, fig. 62) and insert the ring gear on the shaft. Fasten the ring gear stopper (1, fig. 63) using the 2 M10 x 25 screws (2, fig. 63). Calibrate the screws with the torque wrench as indicated in paragraph 3 "SCREW CALIBRATION".



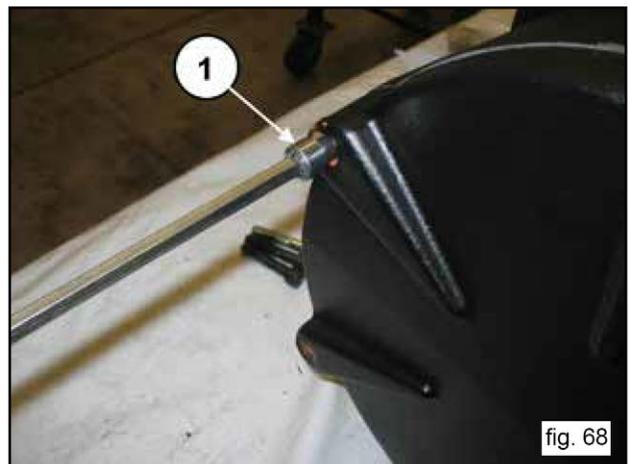
Apply the 3 Ø 12 x 40 pins to the reducer case (1, fig. 64) and insert the gasket (1, fig. 65).



Assemble the bearing on the reducer cover (1, fig. 66).



Assemble the reducer cover (1, fig. 67) and fasten it using 8 M10 x 50 screws (1, fig. 68). Use a stopper to avoid the bearing coming out of the seat (1, fig. 69). Calibrate the screws with the torque wrench as indicated in paragraph 3 "SCREW CALIBRATION".

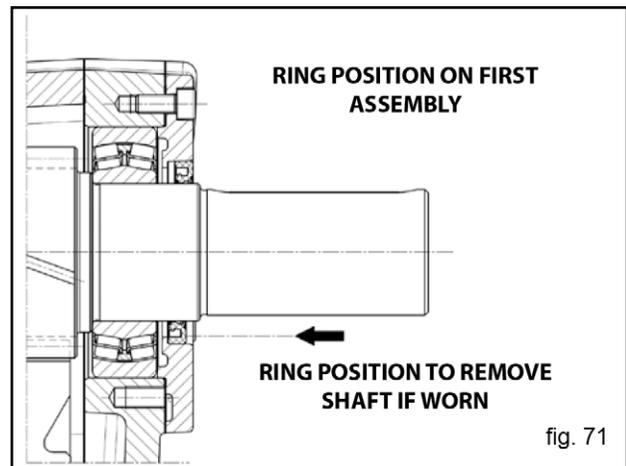
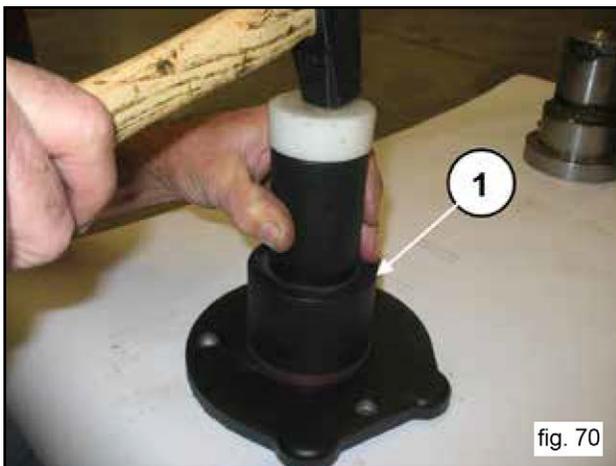




Insert the oil seal inside the reducer flange using the proper tools, #F27515900 and #F27548200 (1, fig. 70). Before proceeding with oil seal assembly, verify the conditions of the sealing lip. If replacement is necessary, position the new ring as indicated in fig. 71.



If the shaft presents diameter wear corresponding to the sealing lip, to avoid the need for grinding it's possible to position the ring as indicated in fig. 71.

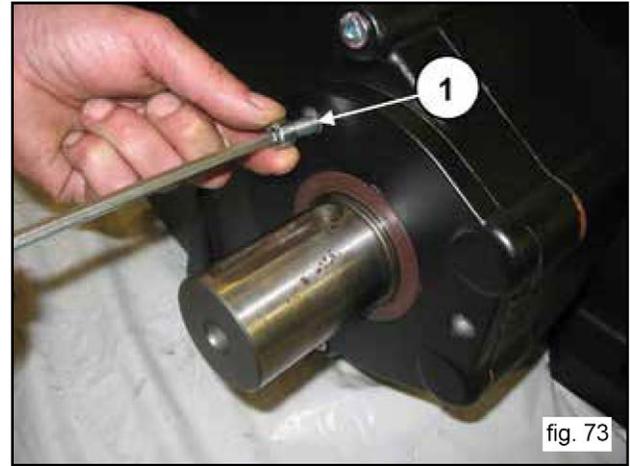
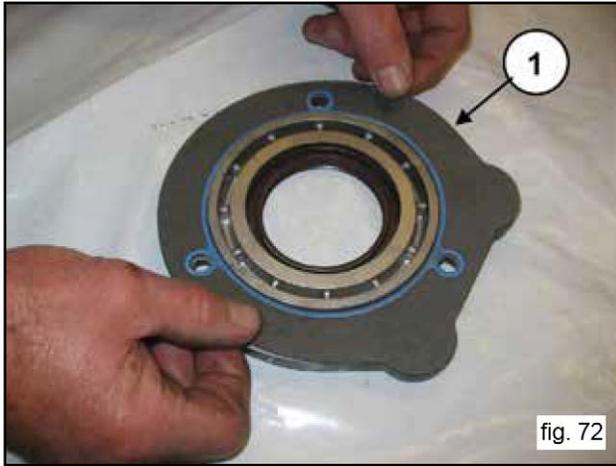


Apply the reducer flange with its gasket to the reducer case (1, fig. 72) and fasten it using 3 M8 x 18 screws (1, fig. 73).



To avoid damaging the oil seal, pay particular attention when inserting the flange on the pinion.

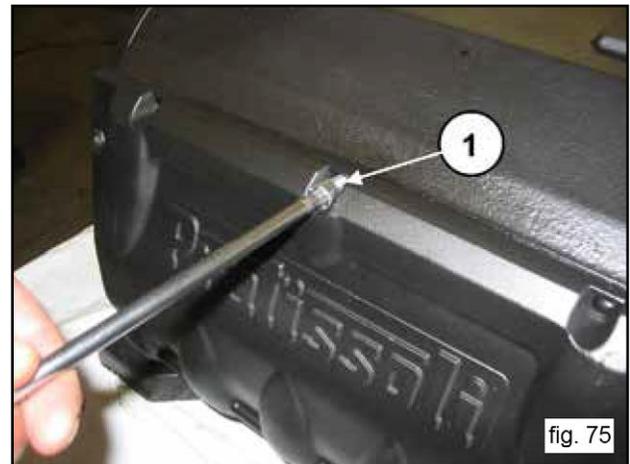
Calibrate the screws with the torque wrench as indicated in paragraph 3 "SCREW CALIBRATION".



Insert the key 16 x 10 x 90 in the pinion.

Insert the O-ring in the rear cover (1, fig. 74) and fasten it to the crankcase using 10 M8 x 18 screws (1, fig. 75).

Calibrate the screws with the torque wrench as indicated in paragraph 3 "SCREW CALIBRATION".



Assemble the bearing cover (and related gasket) (1, fig. 76) using 8 M12 x 30 screws (1, fig. 77).
Calibrate the screws with the torque wrench as indicated in paragraph 3 "SCREW CALIBRATION".



Complete the assembly of the crank mechanism by applying the plugs and lifting eyebolts with the related sealing O-ring.

Fill the crankcase with oil as indicated in the Owner's Manual, paragraph 7.4.

2.1.3 Refurbishing the crank mechanism

TABLE UNDERSIZED DIAMETERS FOR CRANKSHAFT AND CON-ROD BUSHINGS			
Max. Undersize (mm)	Upper half bushing p/n	Lower half bushing p/n	Crank pin grinding measures (mm)
0.25	F90931100	F90930100	Ø 92.75 0/-0.03 Roughness Ra 0.4 Rt 3.5
0.50	F90931200	F90930200	Ø 92.50 0/-0.03 Roughness Ra 0.4 Rt 3.5

TABLE OVERSIZED DIAMETERS FOR CRANKCASE CYLINDER BORES AND PLUNGER GUIDES		
Max. oversize (mm)	Plunger guide p/n	Crank pin grinding measures (mm)
1.00	F79050543	Ø 81 H6 + 0.22/0 Roughness Ra 0.8 Rt 6

2.2 Fluid End Repair

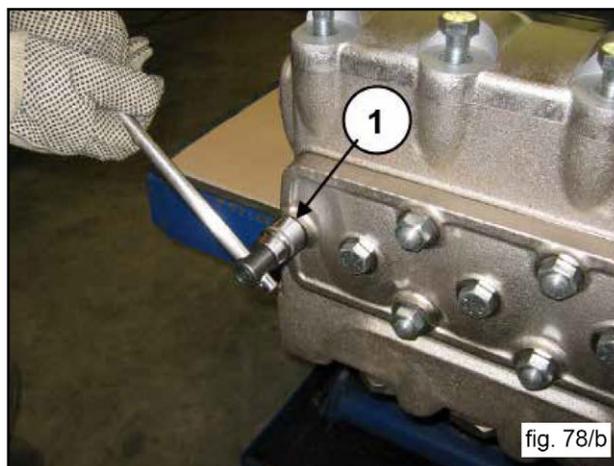
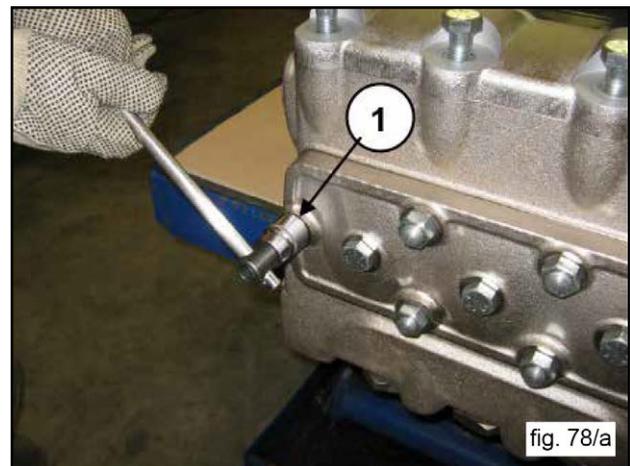
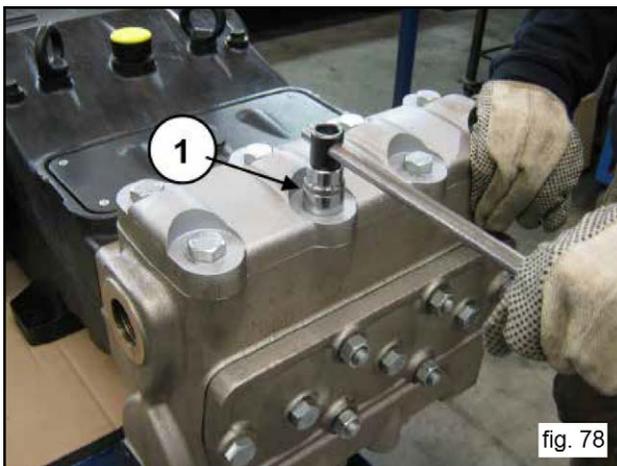
2.2.1 Valve Units

2.2.1.1 Dismantling valve units for MK9M5B and MK9M8B pumps.

Operations are limited to inspection or replacement of valves, if necessary.

Proceed as follows to extract the valve units:

- A) Unscrew the 8 M16 x 55 screws of the valve cover (1, fig. 78), the 5 M16 x 55 screws of the front cover (1, fig. 78/a) and the 4 nuts M16 (1, fig. 78/b) of the valve cover.



Then remove the covers (fig. 79).



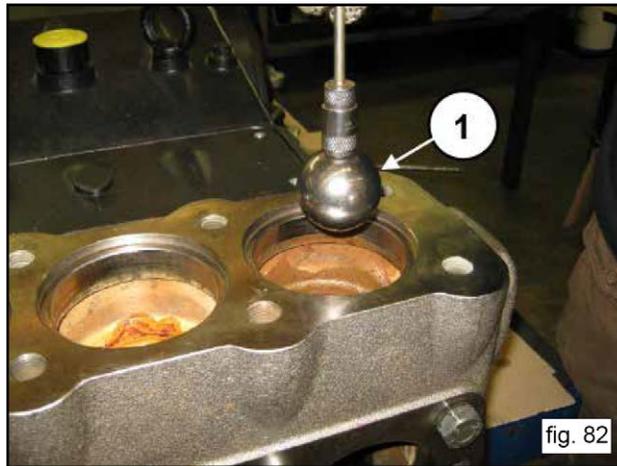
B) Remove the valve plugs by using a M10 extractor hammer (1, fig. 80).



C) Remove front plugs by using a M16 extractor hammer (1, fig. 81).



D) Extract the balls using a magnet or other tool (1, fig. 82).



E) Extract the valve housing using the tool #F27926900 (see mechanical drawings in paragraph 4.1) as indicated in fig. 83 and fig. 83/a.



Before working as per point E, make sure that the plunger is at bottom dead center.



Repeat points D) and E) to extract the balls and valves housing from the inlet valve units (fig. 84).



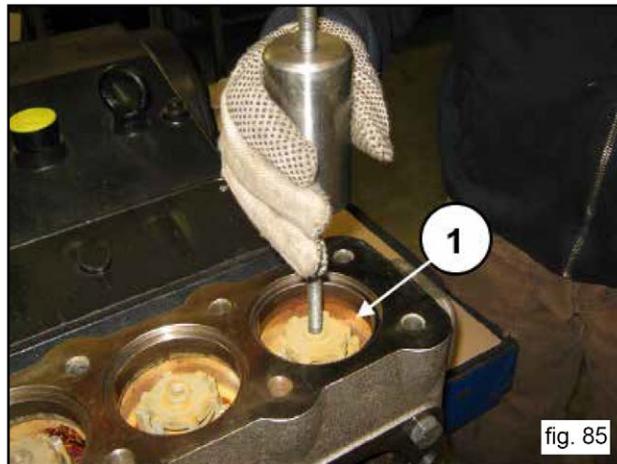
2.2.1.1 Dismantling valve units for MK9M5D and MK9M8D

Operations are limited to inspection or replacement of valves, if necessary.

Proceed as follows to extract the valve units:

Carry out the indications of points A), B), and C) of par. 2.2.1.1.

- D) Extract the outlet valve guide, springs and ball valve with an extractor hammer to be applied on the M10 hole of the valve guide (1, fig. 85).



- E) Extract the valves housing using tool #F27926900 (see mechanical drawings in par. 4.1) as indicated in fig. 86 and fig. 86/a.



Repeat points D) and E) to extract the valves parts and valves housings from the inlet valve units (fig. 87).



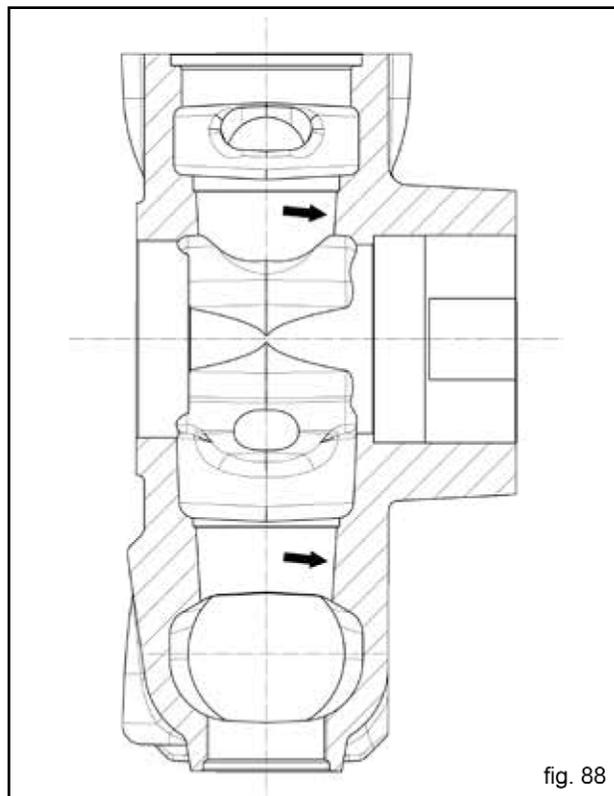
2.2.1.3 Head Assembly - Valve Units



Pay careful attention to state of wear of the various components; replace them if necessary. An indication of estimated component replacement intervals is present in the table of fig. 9 in chapter 11 of the Owner's Manual. It is plausible to think that the state of wear of the components will be strongly correlated with the type of fluid and the percentage of the presence of soild residues. At each valve inspection, replace all valve units and valve plug O-rings.



Before repositioning the valve units, clean and perfectly dry the relevant seats in the head indicated by the arrows (1, fig. 88).



To reassemble the components, invert the operations previously listed in point 2.2.1.1 for pumps MK9M5B and MK9M8B, or in point 2.2.1.2 for pumps MK9M5D and MK9M8D; in summary:

Pumps MK9M8B and MK9M8B:

Assemble the inlet and outlet valve seats using the tool #F27764000, (see mechanical drawing in par 4.1), ensuring that the tapered surfaces of the seats are locked in the tapered seats present on the head (fig. 89 and fig. 90).

Now position the ball in the housing (1, fig. 91), reassemble the valve caps and, at the front, reposition the valve covers. At the front, calibrate the respective M16 x 55 screws and M16 nuts with torque wrench as indicated in chapter 3 "SCREW CALIBRATION".



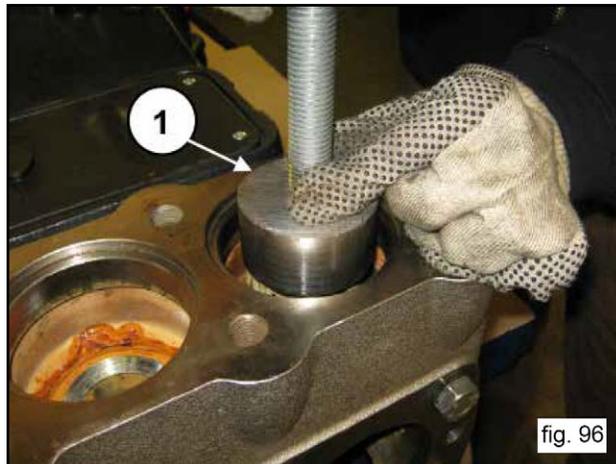
Pumps MK9M5D and MK9M8D:

Assemble the inlet and outlet valve units (fig. 92 and fig. 93) making sure not to invert the previously disassembled springs.

To facilitate insertion of the valve guide in the housing, use tool #F27764000 (see mechanical drawing in par. 4.1) (fig. 94) and use a hammer, acting on the whole circumference.



Assemble the inlet and outlet valve units using tool #F27764000, (see mechanical drawing in par. 4.1), ensuring that the tapered surfaces of the seats are locked in the tapered seats present on the head (fig. 95 and fig. 96)

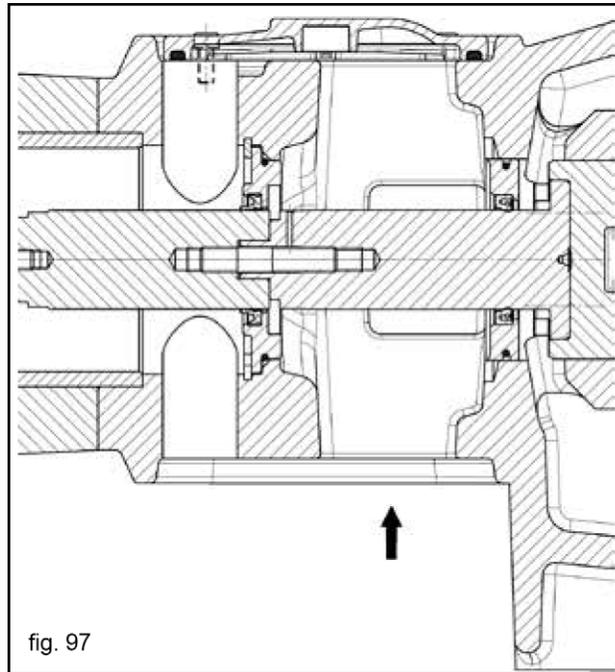


Reassemble the valve caps and, at the front, reposition the valve covers. At the front, calibrate the M16 x 55 screws and M16 nuts with a torque wrench as indicated in chapter 3 "SCREW CALIBRATION".

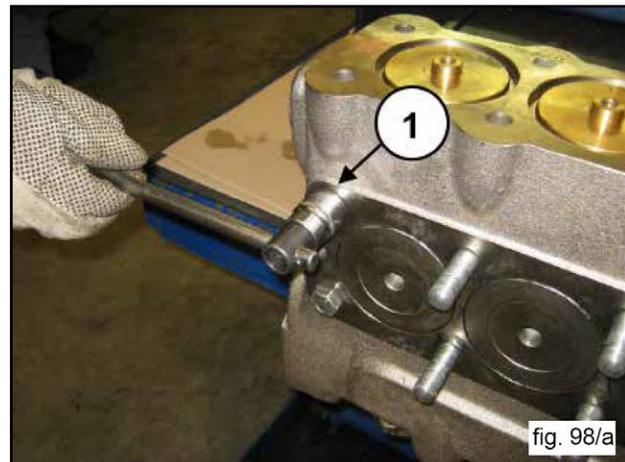
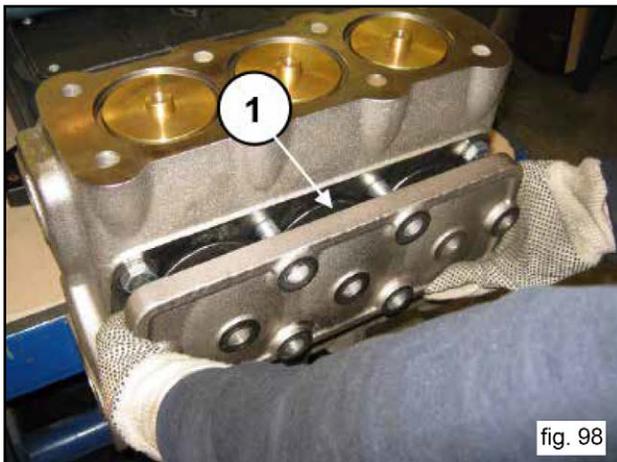
2.2.2 Wiper

2.2.2.1 Disassembly

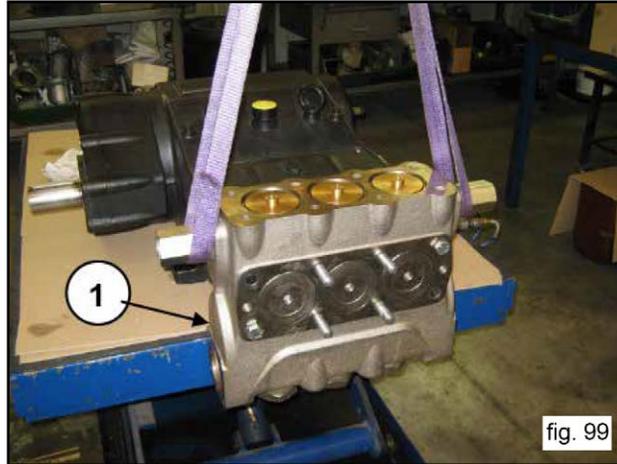
Wiper replacement is necessary whenever bentonite leaks are detected from the second drainage chamber presents in the crankcase (fig. 97). The estimated component replacement intervals is present in the table of fig. 9 in chapter 11 of the **Owner's manual**.



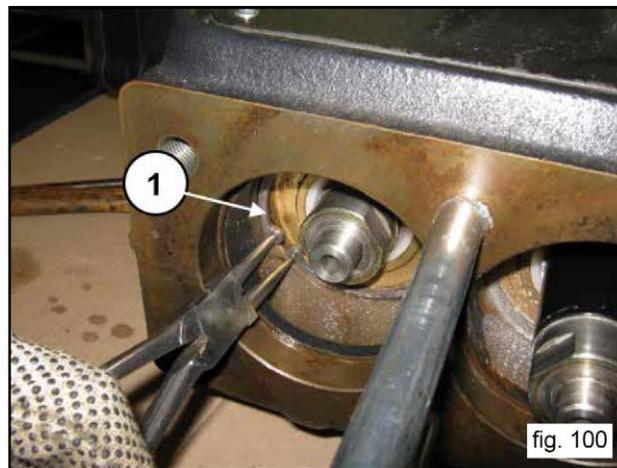
Remove the front cover as indicated in (1, fig. 98), unscrew the 4 screws M16 as indicated in (1, fig. 98/a).



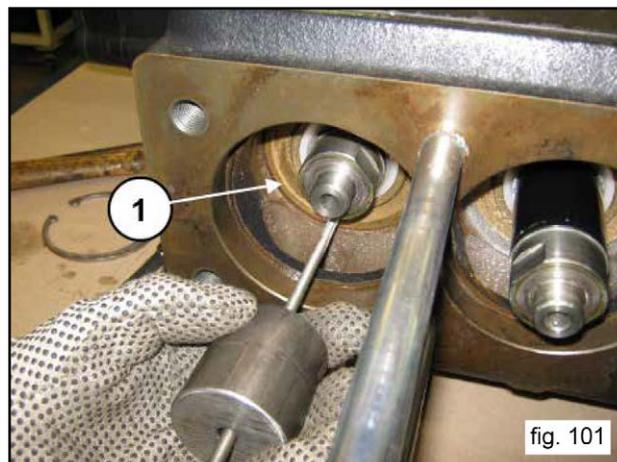
Remove the head from the crankcase (1, fig. 99).



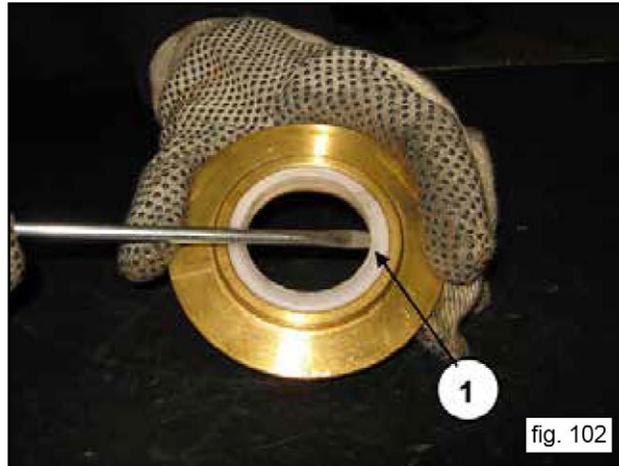
Remove the seeger rings Ø92 (1, fig. 100).



Extract the wiper support. To facilitate the extraction it is possible to use the front holes M5 to apply a threaded rod with extractor hammer (1, fig. 101).



Remove the wiper using a simple tool as indicated in (1, fig. 102), making sure not to damage the housing. If necessary, remove the plunger spacer before removing the wiper support (see par. 2.2.3.1).



If the plunger guide seal ring needs replacing, the oil seal cover removal is as follows: Unscrew the two screws locking the oil seal cover (1, fig. 103).

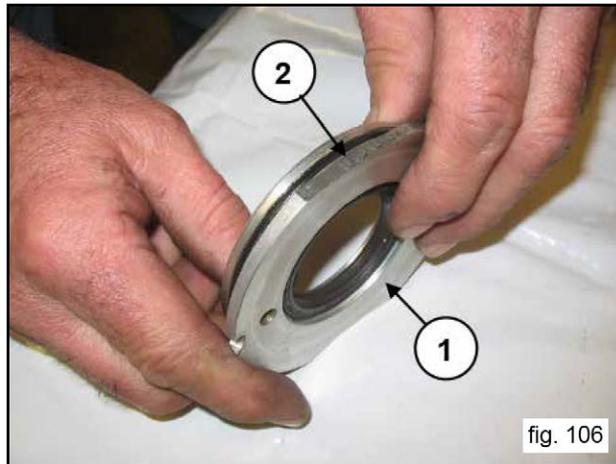


Position the guide plunger at bottom dead center, screw the extractor #F7516400 included the M5 adapter #F27516500 in the holes in the cover (1, fig. 104) and remove the cover from the pump seal through the upper openings for the crankcase (1, fig. 105).



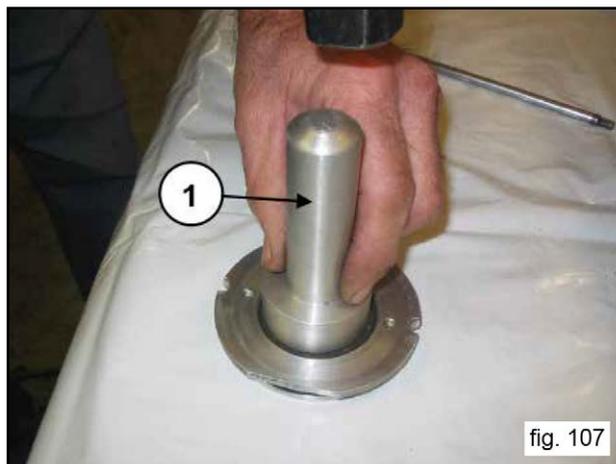


Replace the oil seal (1, fig. 106) and the outside O-ring (2, fig. 106).

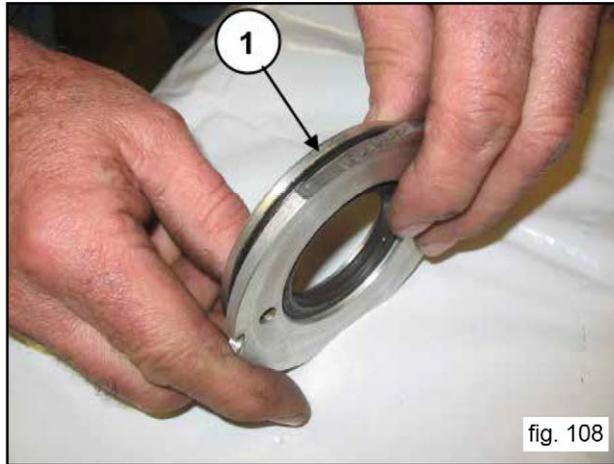


2.2.2.2 Wiper Reassembly

To replace the wiper, proceed as follows:
Mount the oil seal in the oil seal cover (1, fig. 107) using tool #F27910900.



Position the O-ring (1, fig. 108) in the seat of the oil seal cover and insert the assembly mounted in the crankcase into the seat.



Make sure that the cover completely enters its seat (1, fig. 109) being careful not to damage the lip of the seal ring.

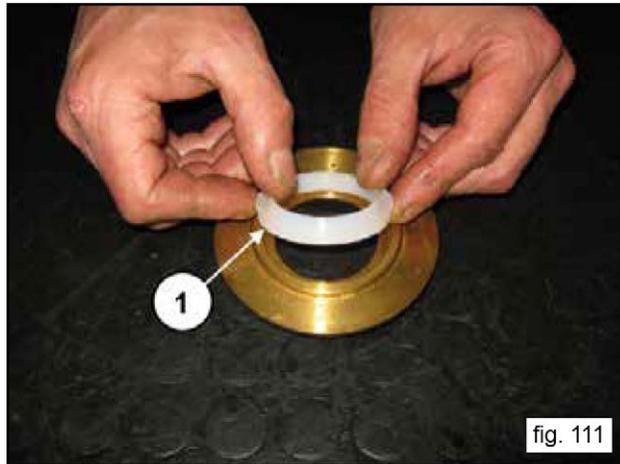


Screw in the oil seal covers using 2 M6 x 14 screws (1, fig. 110).

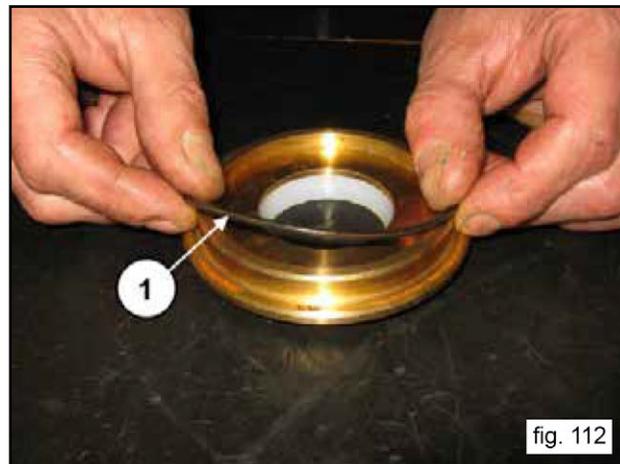


Calibrate the screws with a torque wrench as indicated in the par. 3 "SCREW CALIBRATION".

Assemble the wiper in the housing on the support (1, fig. 111) using a tool as necessary and taking care not to damage the seal lip.



Position the O-ring on the wiper support (1, fig. 112).



Insert the support with scraper, after lubricating the sliding area on the plunger guide (fig. 113).

If removed, replace the plunger spacer unit after lubricating the sliding zone on the plunger spacer (see par. 2.2.3.2). Make sure not to damage the seal lip.



Reposition the head on crankcase.

Fasten the head, tightening the 4 M16 screws and then replace the front cover.

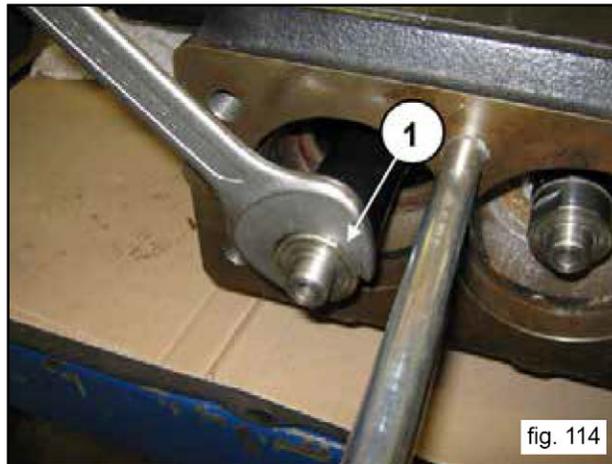
For torque requirement and tightening sequences follow the instructions contained in chapter 3 "SCREW CALIBRATION".

2.2.3 Plunger Spacer

2.2.3.1 Plunger Disassembly

The plunger spacer does not require any routine maintenance. Maintenance is limited to visual checks only.

After removing head, release the spacers as shown in (1, fig. 114).



Check and verify the wear condition of the sliding area on the plunger spacer and replace if necessary.

2.2.3.2 Plunger Reassembly

Fit the plunger spacer on the pump and tighten (1, fig. 115).



If the replacement is being carried out with the wiper already assembled, lubricate the sliding zone and make sure, during insertion, not to damage the wiper seal lip.
For torque requirements follow the instructions in chapter 3 "SCREW CALIBRATION".

2.2.4 Plunger Seal

2.2.4.1 Plunger Seal Disassembly

Plunger seal replacement is necessary whenever heavy bentonite leaks are detected from the opening under the crank case.

The indication of estimated component replacement intervals is present in the fig. 9 in chapter 11 of the **Owner's Manual**. The state of wear of the components will be strongly correlated with the type of fluid and the percentage of the presence of solid residues.

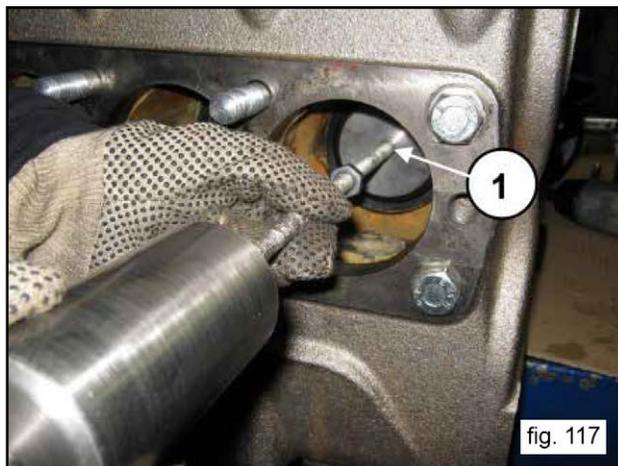
To extract the plunger seal, bring the entire unit to Top Dead center and operate as follows:

Remove the front cover as indicated in fig. 98.

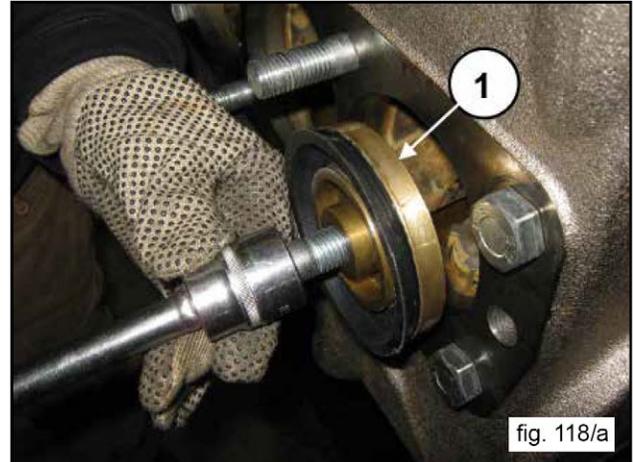
Remove the front plugs by means of an M16 extractor hammer (fig. 81).

Unscrew the M8 screws on the plunger unit and remove them together with the seal fastening bush (1, fig. 116).

If necessary, it is possible to use the M10 hole to extract the fastening bush seal with an extractor hammer (1, fig. 117).



Using a M16 cover screw, tighten using a T-handle wrench on the seal support so that it acts as an extractor (1, fig. 118), once the seath has come out, extract the pack, consisting of the support and the plunger seal (1, fig. 118/a).



The O-ring on the seal support should be replaced at each disassembly.

2.2.4.2 Plunger Seal Reassembly

Assemble the plunger seal with the seal support (on which the O-ring will be replaced), the seal fastening bushing and the M8 screw (fig. 119).



Lubricate the plunger seal with abundant OCILIC 250 silicone grease #F12001600 (fig. 120).



With the aid of a T-handle wrench, insert the plunger seal pack inside the cylinder (1, fig. 121) with the plunger spacer unit at TDC, making sure not to damage the seal lip.

Screw the M8 screws in so that the seal pack positions itself in the seat and tighten it with the torque requirements in chapter 3 "SCREW CALIBRATION".



2.2.5 Cylinder

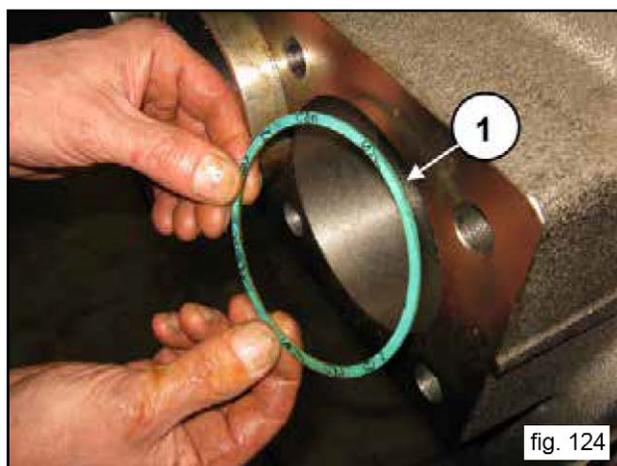
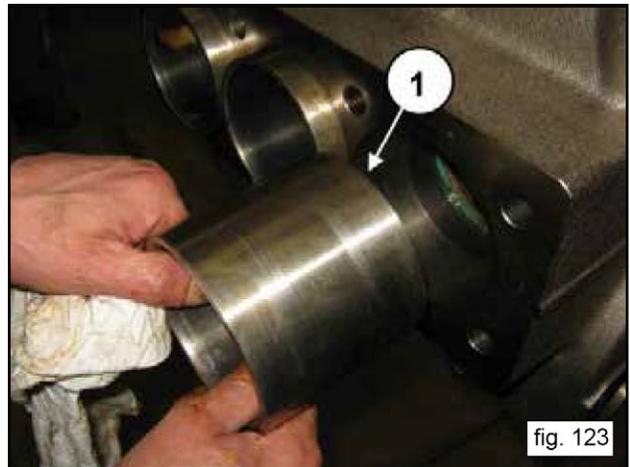
2.2.5.1 Cylinder Disassembly

Cylinder replacement is necessary whenever consistent bentonite leaks are detected from the opening under the crankcase. It is plausible to think that the state of wear of the component will be strongly correlated with the type of fluid and the percentage of the presence of solid residues.

Proceed as follows to extract the liner:

Remove the front cover as indicated in fig. 98 and unscrew the M16 screws as indicated in fig. 98/a.

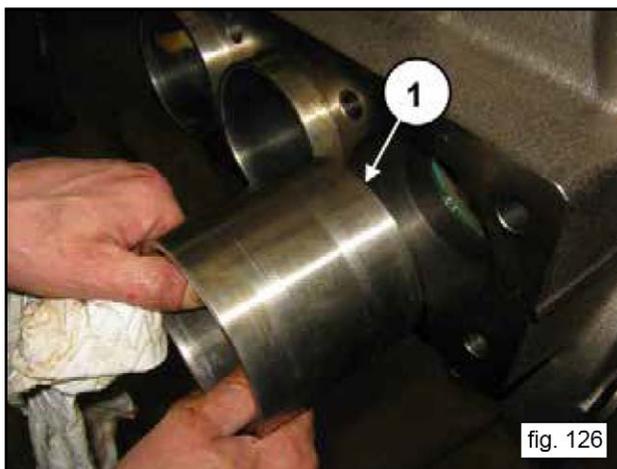
Separate the head from the crankcase (fig. 122) and extract the liner (1, fig. 123), with the aid of adjustable pliers, and the relative seal (1, fig. 124).



2.2.5.2 Cylinder Reassembly

To replace the cylinder and the head, proceed as follows:

Insert the seals in the cylinder seat on the head (1, fig. 125) and also cylinders (1, fig. 126).



Assemble the head. Torque requirements and sequences are contained in chapter 3 "SCREW CALIBRATION".

3. SCREW CALIBRATION

Screws are to be fastened exclusively using a torque wrench.

Description	Exploded View Position (From Owner's Manual)		Fastening Ft. Lbs.	Fastening Nm
	MK9M5B MK9M8B	MK9M5D MK9M8D		
Crankcase cover screws M8x18	42	50	14.8	20
Crankcase plug G1/2x13	43	51	29.5	40
Reducer flange screw M8x18	42	50	14.8	20
Reducer cover screw M10x50	58	66	33.2	45
Ring gear stopper screw M10 x 25	53	61	33.2	45
Reducer case screw M12x40	63	71	54.2	73.5
Reducer case screw M12x50	52	60	54.2	73.5
Upper and lower cover screw M6x14	30	38	7.4	10
Bearing cover screw M12x30	78	86	29.5	40
Connecting rod screw M12x1.25x87	41	49	55.3*	75*
Plunger guide screw M6x20	37	45	7.4	10
Oil seal cover screw M6x14	30	38	7.4	10
Plunger fixing screw M8x45	20	28	14.8	20
Front cover nut M16	8	13	59**	80**
Head screw M16x220	29	37	147.5**	200**
Stud bolt M16x234	9	14	29.5	40
Front cover and valves cover M16x55 screws	11	16	147.5**	200**
Stud bolt M10x40	27	35	***	***
Plunger spacer	28	36	29.5	40
Plug G2"	1	1	73.8	100

* Screws should be tightened at intermediate incremental values

** The head and cover fixing screws and nuts must be tightened with a torque wrench, lubricating the threaded shank, respecting the order shown in the diagram in fig. 127

*** The stud bolts must be locked on the casing (M16x234) and on the plunger spacers (M10x40) with loctite 243, #F12006400.

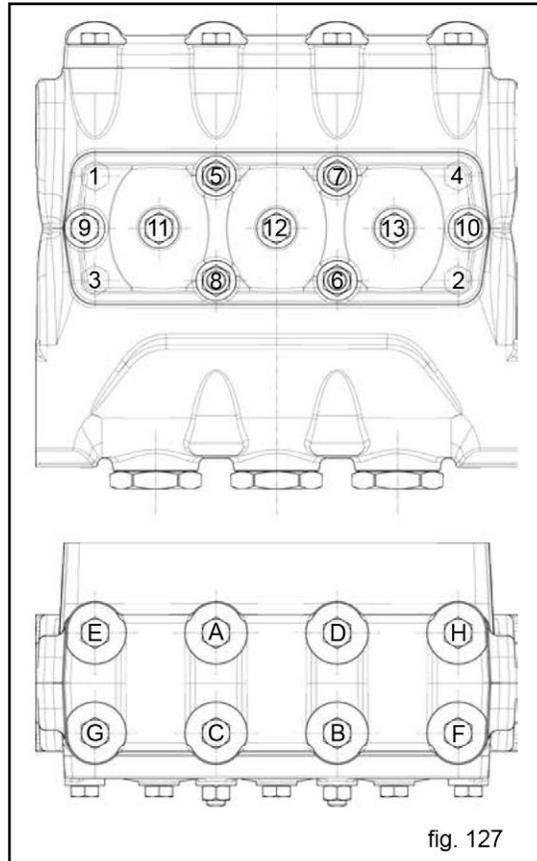
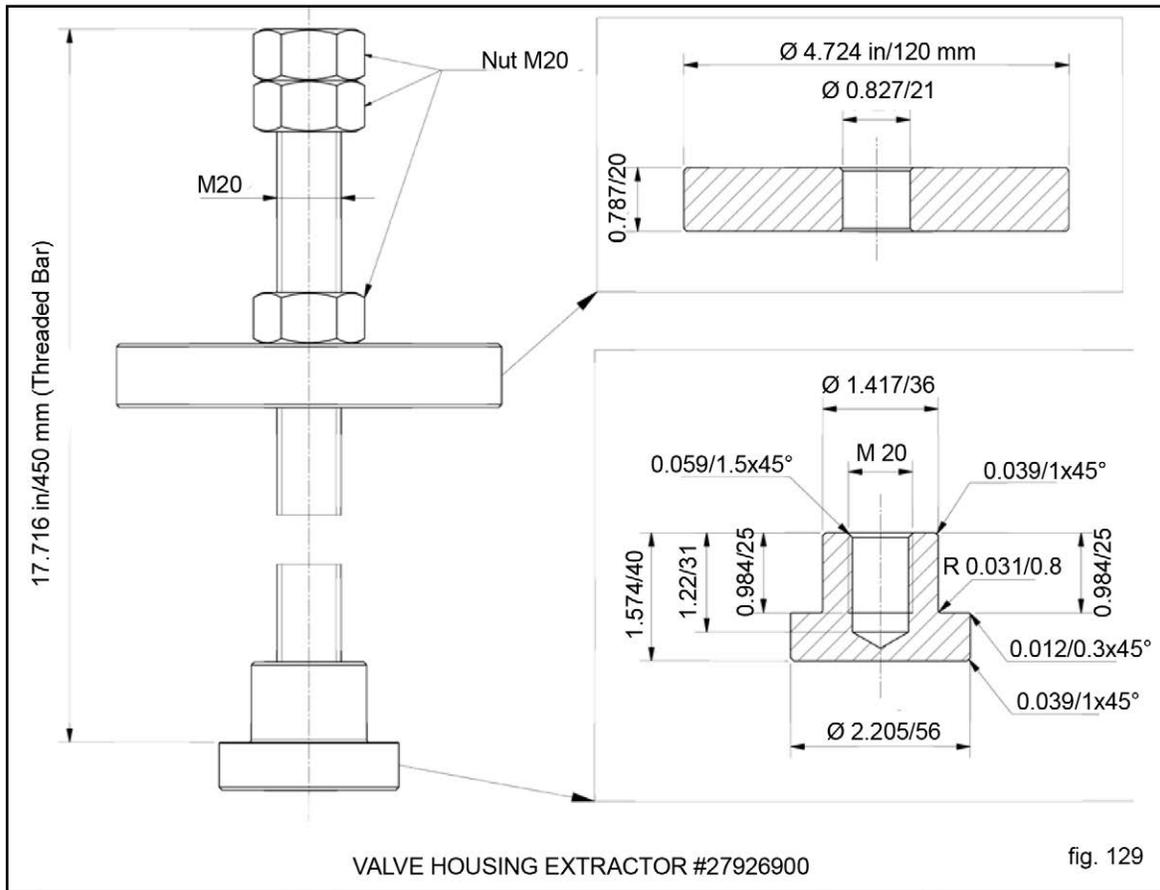


fig. 127



5. REPLACING THE CON-ROD FOOT BUSHING

Proform cold-driving of the bushing and the subsequent work keeping in mind the dimensions and tolerances shown in fig. 130 below.

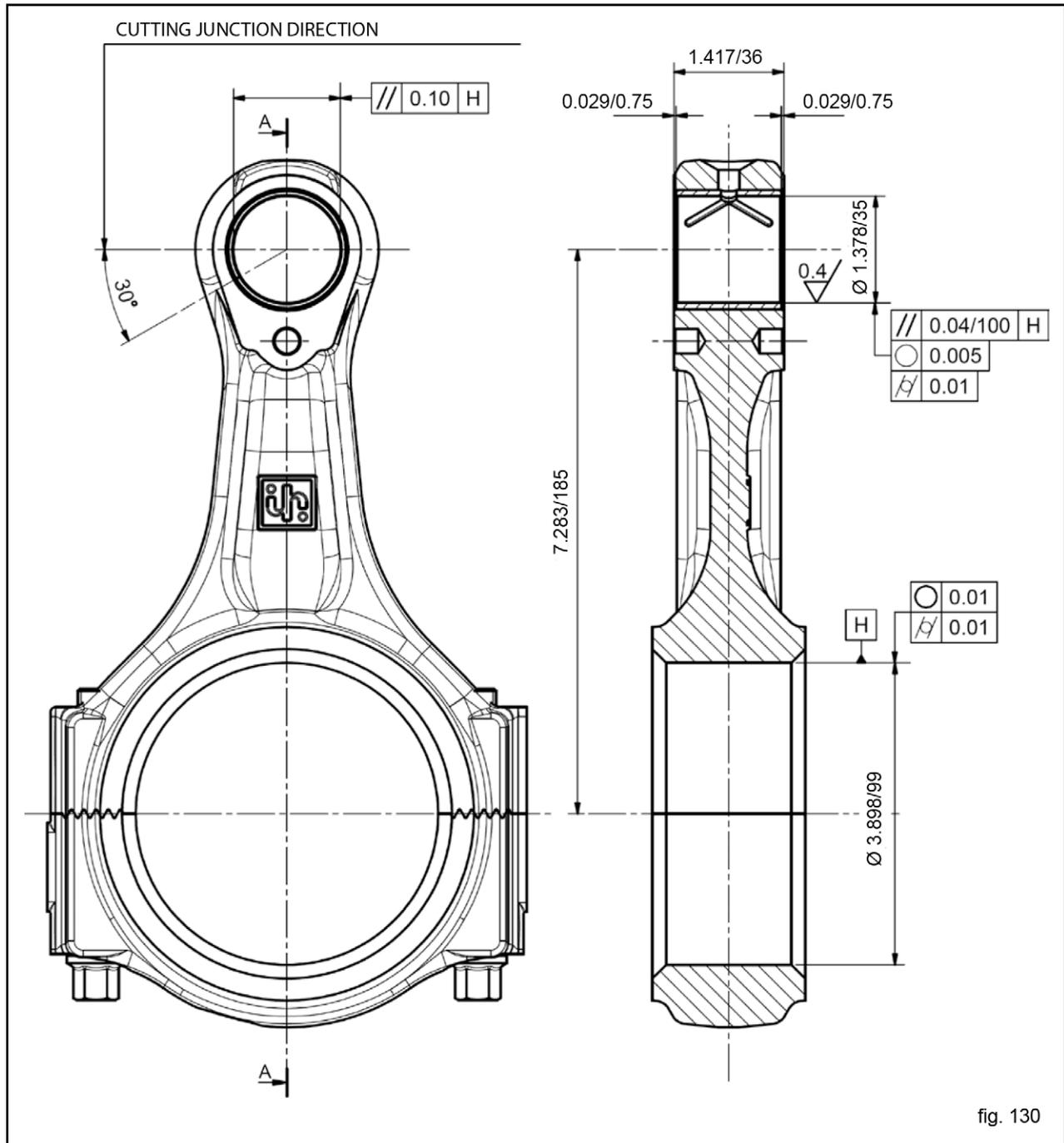


fig. 130

MAINTENANCE LOG

HOURS & DATE

OIL CHANGE							
GREASE							
PACKING REPLACEMENT							
PLUNGER REPLACEMENT							
VALVE REPLACEMENT							



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