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KANGO
electric hammers

Service Handbook for Type 2500 Breaker

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CONTENTS

LIST OF ILLUSTRATIONS

SECTION 1 GENERAL NOTES

1.1 Introducing the Type 2500 Breaker

1.1.1 The Type 2500 Breaker has been introduced as a replacement for the Type 1800 Breaker. The new machine has been designed to benefit the owner and user in a number of ways:

(1) double insulation, as used on all other Kango hammers and a large majority of portable tools, gives maximum protection to the operator from electrical failures;

(2) improved operator comfort;

(3) servicing is simplified by modular construction methods;

(4) lubrication is with grease throughout, regular checking of fluid levels is no longer necessary;

(5) uses standard implements, available anywhere, as used with pneumatic and hydraulic breakers.

1.1.2 Since the Breaker is of a totally new design only a small number of screws and other parts are taken from the present Kango range. The part numbers of new components all fall in the 05XXX group.

1.2 Power Supply Cords

The Type 2500 Breaker is double-insulated and, for most markets, is fitted with a two-core power supply cord. For some markets the Breaker must be fitted with a three-core cord; refer to Section 13.2.5 for instructions on connection of the earth (grounding) wire.

SECTION 2 DEFECTS AND REMEDIES

Symptom	*Possible Cause*	*Remedy*
Motor fails to run	Faulty supply socket	Test and repair, or renew
	Faulty connection socket	Test and repair, or renew
	Faulty power supply cord	Test and repair, or renew (see Section 3.1)
	Fuses blown	Check cause and renew
	Brushes sticking	Find cause and rectify
	Brushes worn out	Renew (see Section 3.3)
	Defective Switch	Renew (see Section 3.2)
	Armature or Field Coil defective	Test and renew, as necessary
	Defective internal wiring	Test and repair, or renew
Motor speed low	Mains voltage low	Check voltage
	Armature defective	Test and renew, as necessary
Motor speed high	Mains voltage high	Check voltage
	Defective hammer mechanism	Examine and repair
	Field coil defective	Test and renew, as necessary
Motor hot, or sparks excessively	Defective hammer mechanism	Examine and repair
	Ventilating slots choked	Clean out
	Incorrect assembly	Dismantle and reassemble in accordance with instructions
	Brushes worn	Renew (see Section 3.3)
	Brushes sticking	Find cause and rectify
	Commutator worn	Re-machine (see Section 5.1)
	Armature or Field Coil defective	Test and renew, as necessary
	Voltage too high	Check voltage
	Armature rubbing in Field Coil	Examine and repair, or renew
Motor runs correctly but no hammer blows are struck, or blows are weak	Breaker cold, grease thick	Switch on and off, allowing the mechanism to come to rest before switching on again, until blows are struck
	Defective hammer mechanism	Examine and repair

SECTION 3 ON-SITE REPAIRS

3.1 Replacing a cut or damaged power supply cord

3.1.1 Remove four screws and take off the Switch Cover.

3.1.2 Disconnect the bottom ends of the two Trigger Return Springs and pull out the Switch Actuator.

3.1.3 Remove four screws and take off the Switch Box Cover followed by the Switch Seal.

3.1.4 Lift the Switch out of the Switch Box Insert and disconnect the leads of the Power Supply Cord.

3.1.5 Loosen the two cord grip Screws.

3.1.6 Remove the Cord and Cord Guard from the Switch Box and separate the Cord from the Cord Guard.

3.1.7 Prepare the new Cord by slipping the Cord Guard over it and cutting back the outer sheath and leads to the dimensions shown in Figure 1. Having bared each lead for 20 mm as shown, solder the ends and form them into hooks around the shank of the Switch terminal screw.

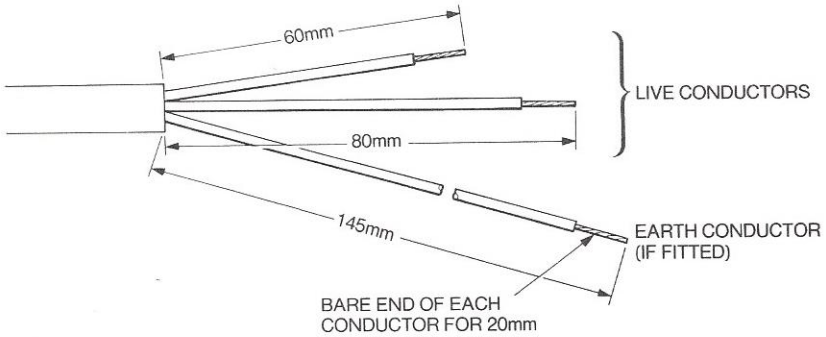

Figure 1 Preparing the Power Supply Cord

3.1.8 Position the cord in the channel on the right-hand side of the Switch Box and clamp it in position using the Cord Grip and two Screws such that approximately 10 mm of the outer sheath appears above the top end of the Cord Grip.

3.1.9 Fit the leads of the Power Supply Cord to the Switch, ensuring that the switch is to be located in the Switch Box Insert with the word "OFF" towards the top of the Breaker. The shorter of the leads then goes to the upper terminal; the longer one to the lower terminal.

3.1.10 Carefully position the Switch into the Insert whilst ensuring that the leads drop into the slots left for them in the walls of the Insert. Replace the Switch Seal over the Switch toggle.

3.1.11 Hold the Cord Guard in position in the Switch Box whilst the Power Supply Cord is pushed into an "S" shape within the box. The Switch Box Cover should then be placed in position and secured with four screws.

3.1.12 Re-fit the Switch Actuator by pushing it up through the rectangular hole in the Switch Handle whilst the Switch toggle is in the 'ON' (i.e. down) position, the top of the Switch Actuator being held towards the Trigger and the bottom towards the Switch. This ensures that the top of the Switch Actuator registers correctly in the socket of the Lever. When the Actuator is sufficiently high, push it towards the Switch so that it engages over the Switch toggle. Re-connect the lower ends of the Trigger Return Springs to the Switch Actuator. See Figure 22.

3.1.13 If necessary, adjust the linkage via the trigger adjusting screw so that the switch is not loaded by the linkage at either end of its travel.

3.1.14 Replace the Switch Cover and secure with four screws.

3.2 Replacing a defective Switch

3.2.1 Remove four Screws and take off the Switch Cover.

3.2.2 Disconnect the bottom ends of the two Trigger Return Springs and pull out the Switch Actuator.

3.2.3 Remove four Screws and take off the Switch Box Cover followed by the Switch Seal.

3.2.4 Lift out the Switch and disconnect the four leads.

3.2.5 Connect the leads to the new Switch, ensuring that the toggle points upwards when the Switch is "OFF". Note that the leads from the field coil both go to the left-hand side of the Switch whilst the Power Supply Cord leads go to the right-hand side.

3.2.6 Replace other components as detailed above in 3.1.10 to 3.1.14.

3.3 Renewing the carbon brushes

3.3.1 After approximately 200 hours of normal use the Carbon Brushes should be checked for wear. Proceed as follows:

3.3.2 Remove four Screws and lift off the Top Cover.

3.3.3 Remove the two rectangular Brush Caps, each is held by one screw and a slot is provided for levering off the Caps with a screwdriver.

3.3.4 Use a wire hook, formed as shown in Figure 2, to lift the end of the Brush Spring and then pull out the Carbon Brush by its flexible lead.

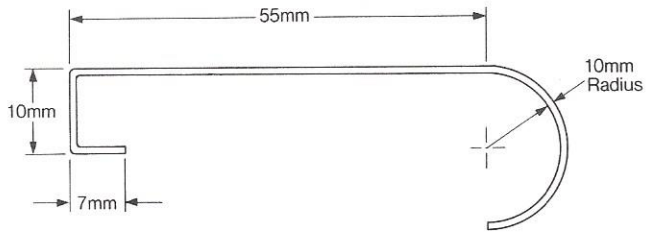

Figure 2 Wire Hook

3.3.5 Inspect the Carbon Brush for:

(1) Free sliding fit in the Brush Holder.

(2) Smooth contact face with the Commutator.

(3) No chipping of the edges.

(4) No excessive burning of the edges.

(5) Overall length must be greater than 15 mm.

If it fails any of these checks then the Carbon Brush should be renewed as follows.

3.3.6 Remove the terminal Screw and take away the old Carbon Brush.

3.3.7 Lift the Brush Spring and insert a new Carbon Brush, checking that it is a free-sliding fit in the Brush Holder and noting that it will only fit into the Brush Holder one way round because of the large chamfer on one corner and the equivalent shape on the Brush Holder.

3.3.8 Release the Brush Spring and check that it presses on the angled face of the Carbon Brush.

3.3.9 Replace the Terminal Screw ensuring that both the Brush flexible lead and the field coil lead are securely clamped. Push the brush flexible lead away from the terminal to ensure that it will not be trapped by the Brush Cap.

3.3.10 Replace the Brush Caps followed by the Top Cover, checking that the four Top Cover Inserts are in place.

SECTION 4 NOTES ON SERVICING THE BREAKER

4.1 Service Tools

4.1.1 In order that servicing be carried out to the required standard, repair staff should be equipped with the full set of Service Tools as listed in Section 16 and additional equipment as shown below.

4.1.2 For the fitting and removal of Bearings and a few other components, a small arbor press is required which should have a $\frac{1}{2}$" bore in the press ram.

4.1.3 For the testing of electrical components:

(1) a 4 kV Flash Tester such as Foster Transformers, Type B4, list No.8220

(2) a Megger such as Evershed and Vignoles, Type BM7, Battery 'Megger' Tester, catalogue No.40050

(3) an Armature Growler such as Crypton, Model CY 20

(4) an Avometer, such as the Model 8, Mark 5.

4.2 Greasing the Breaker

It is recommended that the Breaker should be cleaned out and repacked with grease at intervals of not more than 200 hours running.

When regreasing it is a good policy to completely strip down the Breaker and examine all components, completely removing all the old grease and replacing it with a fresh quantity. Before re-assembling the Breaker, the total weight of 0.6 kg of Kango Hammer Grease should be put into a clean container and only that grease used for repacking the Breaker.

4.3 Tightening of threaded components

All items requiring tightening have been allotted a torque and these are listed in Section 15. The necessary Service Tools to carry out these operations are listed in Section 16.

4.4 Complete strip-down

4.4.1 If the Breaker is to be thoroughly inspected then it should be completely stripped down as detailed in the following sections.

4.4.2 Servicing is simplified if the Breaker is first split into two halves, each of which can then be readily handled on the work bench.

4.4.3 Whilst the complete Breaker is standing on the Service Stand, remove the Top Cover, Switch Cover, both Handles and the Switch Actuator.

4.4.4 Remove four screws to allow the Switch Box assembly to be lifted out of the way.

4.4.5 Remove the Circlip and Thrust Washer from the big-end assembly through the Switch Box mounting hole.

4.4.6 Remove four main assembly screws from the Barrel-to-Main Casting joint and the two halves may now be separated.

4.4.7 The Connecting Rod, complete with Piston and Striker can be removed from the Crankshaft by sliding sideways. The Main Casting can now stand on a bench either on its lower face or upside down on two cast features provided for this purpose.

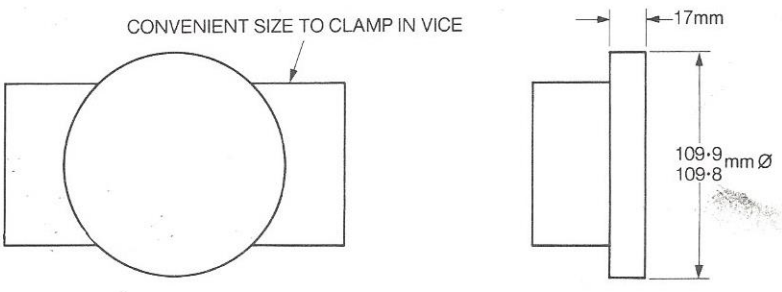

Figure 3 Mounting block for Main Casting

4.4.8 If it is found to be convenient a mounting block can be made up which will allow the Main Casting to be mounted above a bench vice and improve accessibility for servicing. Figure 3 gives the important dimensions of such a mounting block.

4.5 General comments on servicing of Needle Roller Bearings

4.5.1 Ensure that all contact surfaces on press, tools and components are free from burrs and swarf. If they are not, it will not be possible to fit the bearings squarely which will result in rapid failure.

4.5.2 Before fitting a new bearing, examine it for missing rollers and cleanliness.

4.5.3 Never hammer a bearing into position; this will damage the outer shell and lead to early failure.

4.5.4 Always apply pressure to the lettered face of the bearing, never to the other face as this will collapse the bearing shell.

4.5.5 If the bearing offers undue resistance while pressing in, examine it for skewed rollers or trapped swarf. Check for burrs or bruising on the bearing housing.

4.5.6 The use of the correct Service Tool will give accurate location for all bearings.

4.5.7 Bearings should always be checked after assembly by locating the relevant component in the bearing and ensuring that it rotates freely.

SECTION 5 DISMANTLING THE MOTOR

5.1 The Armature assembly

5.1.1 Remove four Screws and lift off the Top Cover.

5.1.2 Remove the two rectangular Brush Caps, each is held by one screw and a slot is provided for levering off the Caps with a Screwdriver.

5.1.3 Remove the two terminal Screws from the Brush Holders.

5.1.4 Remove four Screws and take off the Switch Cover.

5.1.5 Disconnect the bottom ends of the two Trigger Return Springs and pull out the Switch Actuator.

5.1.6 Remove four Screws and take off the Switch Handle assembly.

5.1.7 Remove three Screws clamping the Bearing Holder and pull out the complete assembly of the Armature together with the Fan, Bearing Holder and Brush Holder Assembly.

5.1.8 The Spring Anchor complete with two Trigger Return Springs can be removed from the Bearing Holder.

5.1.9 Pull back the Brush Springs and remove the Carbon Brushes from the Brush Holders. If the Brushes exhibit any of the following faults then they should be replaced:

(1) sticking in the Brush Holder

(2) rough or badly grooved contact face with commutator

(3) edges chipped away

(4) trailing edges badly burnt and breaking up

(5) overall length less than 15 mm.

5.1.10 Inspect the Armature sub-assembly for signs of damage or wear. The Ball Bearing in the Bearing Holder is of the shielded type and cannot be re-lubricated, if it shows any signs of wear or roughness it should be replaced.

5.1.11 To test the electrical condition of the Armature (see Section 8.3) or to service the Bearing Holder assembly, the latter must be removed from the Armature.

5.1.12 Use the Split Sleeve 07313 to hold the Armature lamination pack in a vice whilst the Fan Locknut is removed. The Plain Washer, Fan and Bearing Holder can then be pulled from the Armature spindle.

5.1.13 If either the Pinion or the adjacent Bearing Inner Ring are worn or damaged, then Pinion Nut 07390 should be used to remove the Pinion. This is held on to the Pinion using Screw 01976.

5.1.14 The Bearing Inner Ring is a light interference fit on the Armature spindle. To remove it two small flats should be ground on so that it can be held in a vice. The Armature can then be twisted and pulled until it is free.

5.1.15 The Brush Holder Assembly should be checked to ensure that the Brush Holders are not damaged or badly burnt and that they are still firmly rivetted to the plastics plate. If new parts are necessary then a complete Assembly should be fitted; no attempt should be made to re-rivet the components.

5.1.16 If the Armature is electrically and mechanically sound but the commutator is dirty it can be refurbished as follows after the surface grease has been removed:

(1) On a small lathe, mount the armature between centres and turn the brush track diameter by the minimum amount necessary to clean it up. On no account should this diameter be allowed to go below 42.25 mm; this is the minimum size at which the strength of the commutator can be guaranteed.

(2) Polish this diameter with fine emery paper.

(3) Clean out the slots between the commutator bars to a depth of about 0.8 mm using a piece of hacksaw blade, taking care not to scratch the surface of the commutator.

5.2 The Switch assembly

5.2.1 Having removed the Switch Cover and Switch Actuator, four Screws should be removed to allow the removal of the Switch Box Cover and Switch Box assembly.

5.2.2 Lift off the Switch Seal.

5.2.3 Remove the Switch from the Switch Box Insert and disconnect all four leads.

5.2.4 The Switch Box and O-Ring may now be removed from the Main Casting, the Switch Box Insert taken out and the Cord Grip loosened to allow the removal of the Power Supply Cord. It is not essential to take off the Cord Grip for this operation.

5.3 The Switch Handle assembly

5.3.1 The Switch Handle need only be dismantled if the linkage is broken or noticeably sticky due to dirt having found its way in.

5.3.2 Firstly, use Standard Allen Key 07349 to completely remove the trigger adjusting Screw from the top of the Trigger, and remove the Trigger Cap which is held on by two Screws.

5.3.3 Remove the Trigger Retaining Plate by loosening the two screws alternately; this allows for the retaining tabs to be left as they are, bent over the screw heads.

5.3.4 The lever assembly will then drop out of the Switch Handle. The Trigger Pivot is a loose fit and is readily slipped out to separate the Trigger. The Tension Pin must be knocked out with a suitable punch and hammer to separate the Adjusting Link and Lever.

5.4 The Field Coil assembly

5.4.1 Having removed the Armature sub-assembly (see Section 5.1) and the Switch Box assembly (see Section 5.2), the Field Lead Grommet should be lifted from its slot and removed from the field leads.

5.4.2 The Motor Housing containing the Field Coil can then be removed from the Main Casting by levering with a pair of large parallel-blade screwdrivers between the machined face of the casting and the moulded lugs on the Motor Housing.

5.4.3 Remove two Screws, secured by Locknuts, to allow the Field Coil to be withdrawn from the Motor Housing.

5.4.4 The Field Coil and its leads should be inspected for any signs of physical damage caused either by debris in the cooling air flow or by rubbing between armature and field coil and should be electrically tested as described in Section 8.4.

SECTION 6 DISMANTLING THE GEARBOX AND HAMMER MECHANISM

6.1 Covers and Layshaft Gears

6.1.1 Remove four Screws and take off the plain Handle.

6.1.2 Remove six Screws and take off the Gear Case Cover and Gear Case Cover Gasket. Check the condition of the Felt Disc in the Gear Case Cover and replace if it is soaked with grease.

6.1.3 Slide the Layshaft Gear Assembly off the Layshaft, followed by the Thrust Needle Roller Bearing and two Thrust Washers.

6.1.4 When the Crankshaft Gear has also been removed (see 6.2.3 below), replace the Layshaft Gear Assembly and check for wear of the two Needle Roller Bearings in the bore. If the Bearings need replacing, the worn ones may be removed using Dismantling Press Tool B7360 to push both Bearings through from one end. See Figure 4.

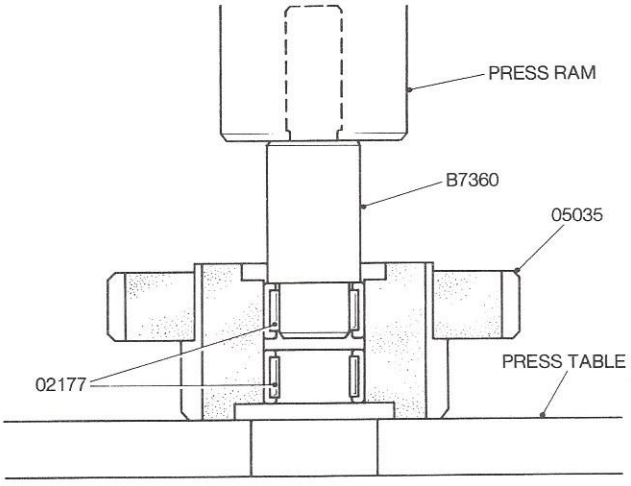

Figure 4 Removing the Layshaft Gear Needle Roller Bearings

6.2 The Crankshaft assembly

6.2.1 To remove the Crankshaft it is essential that the Switch Box and Connecting Rod assemblies should first have been removed; see Section 4.4.

6.2.2 The Crankshaft Locknut is removed using Hexagon Socket 07355 and Torque Wrench 02355. To prevent the Crankshaft from rotating during this operation the Extension Bar 07393 (or a similar piece of steel rod) should be located in the Main Casting so that one side face of the Crankshaft counterbalance weight is loaded against it. The end of the extension bar will drop conveniently into the cast rectangular recess which is visible above the Crankshaft in the centre of the casting.

6.2.3 When the Locknut is removed, the Crankshaft Gear and Square Key will slide off. If these are tight then a soft-faced mallet may be used to knock the threaded end of the Crankshaft. The Crankshaft should be withdrawn through the Switch Box hole in the Main Casting.

6.2.4 Examine the Crankshaft Gear for signs of wear or damage to the teeth and replace if necessary.

6.2.5 Examine the Crankshaft for damage, in particular the two Bearing Inner Rings. Should they be worn or cracked and require replacement then it might be necessary to grind through them in one place in order to break them open for removal.

6.3 The Layshaft Carrier assembly

6.3.1 Remove three Screws and take off the Layshaft Carrier sub-assembly.

6.3.2 Examine all components for wear or damage.

6.3.3 Use Assembly Press Tool 07384 to check that the Layshaft has not moved in the Layshaft Carrier, these parts are press-fitted together. If the Shaft has moved or is excessively worn, then both parts should be replaced. Do not fit a new Layshaft into a used Layshaft Carrier or vice versa.

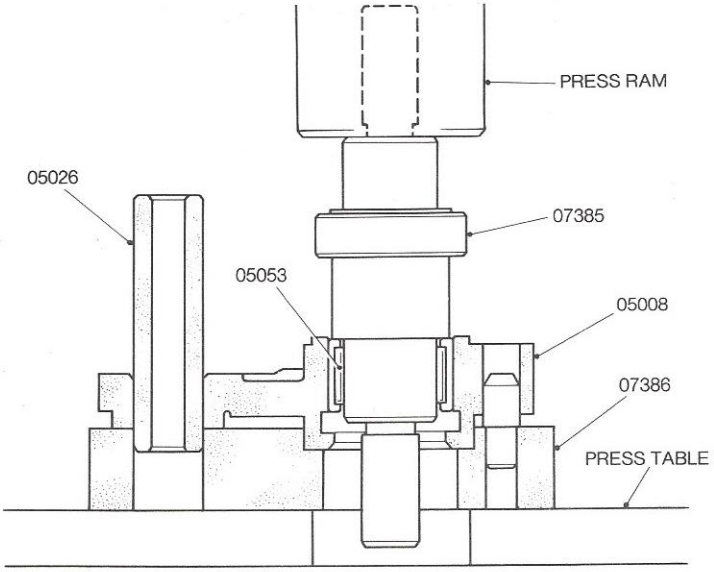

Figure 5 Removing the Layshaft Carrier Needle Roller Bearing

6.3.4 If the Needle Roller Bearing should need replacing then the Layshaft Carrier should be placed on the Dismantling Press Tool 07386 on the base of the press. Use the larger end of Dismantling Press Tool 07385 to push the Bearing out with the press. See Figure 5.

6.4 The Crankshaft Housing assembly

6.4.1 Remove three Screws and take out the Crankshaft Housing sub-assembly.

6.4.2 Inspect both bearings for damage or wear and replace if necessary. Use Internal Circlip Pliers 02369 to remove the circlip which holds the ball bearing in place.

6.5 The Connecting Rod and Striker assembly

6.5.1 To remove this sub-assembly, the Switch Box must first be removed from the Main Casting (see Section 5.2).

6.5.2 Remove the big-end Circlip through the switch box hole in the Main Casting.

6.5.3 Separate the Main Casting from the Barrel and the sub-assembly of Connecting Rod, Piston and Striker may now be removed from the big-end by sliding sideways.

6.5.4 To remove the Striker from the Piston, grip the shank of the Connecting Rod in a vice and then pull the Striker off by hand. Do not use any other tools.

6.5.5 A suction should be felt as the Striker is removed indicating that the Piston Seal is in effective condition. If this is not felt then the Seal must be replaced.

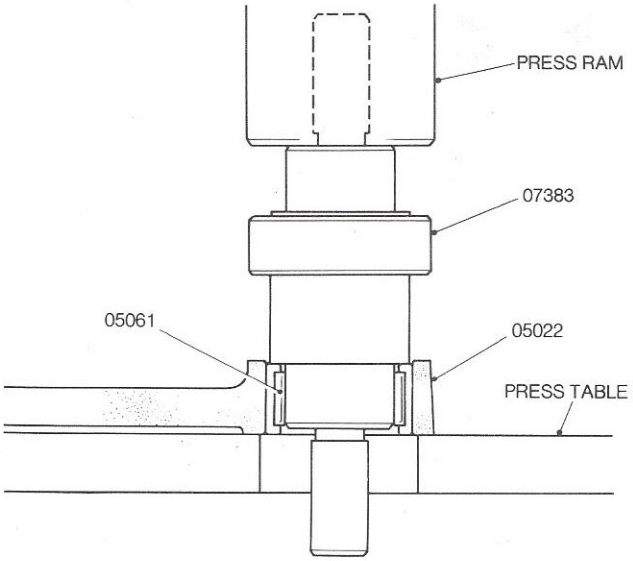

Figure 6 Removing the Connecting Rod Needle Roller Bearing

6.5.6 Examine the Piston and Piston Seal for wear or damage and replace if necessary.

6.5.7 Remove two O-Rings from the Piston to allow the Gudgeon Pin to slide out and separate the Connecting Rod.

6.5.8 Check the Piston, Gudgeon Pin and Connecting Rod for wear in this assembly.

6.5.9 Re-fit the Connecting Rod to the Crankshaft and check the big-end assembly for wear. Replace the bearing if excessive wear is apparent, using the larger end of Dismantling Press Tool 07383 to push the Bearing out of the Connecting Rod. See Figure 6.

6.5.10 Inspect the Striker for wear or damage, particularly in the ground bore and on the striking face. Replace if necessary.

SECTION 7 DISMANTLING THE TRANSMITTER

7.1 The Nosepiece assembly

7.1.1 Grip the Barrel, close to the Buffer Housing, in the jaws of a vice and remove four screws to separate the Nosepiece.

7.1.2 Check the operation of the Latch mechanism by hand to ensure that it opens and closes readily and that it is held in each position by the spring load.

7.1.3 To dismantle the Latch, use the Dismantling Press Tool 07370 to press the Tension Pin out of the Nosepiece and then remove the Latch, Latch Plunger and Latch Spring. Examine all components for wear and replace if necessary.

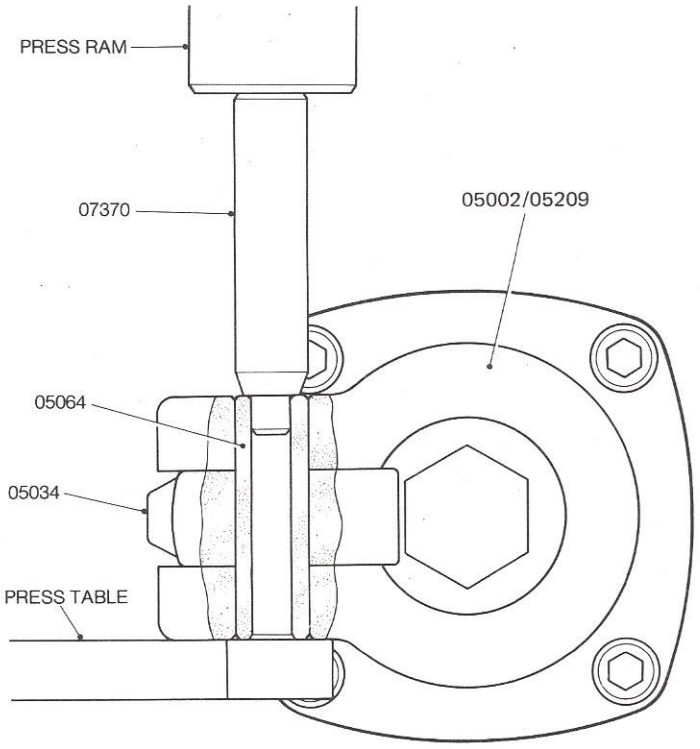

Figure 7 Removing the Latch Tension Pin

7.1.4 The idling Buffer may be removed from the Nosepiece either by levering with screwdrivers or by banging the Nosepiece on to a concrete floor. The Buffer should be replaced if it is badly worn or distorted.

7.1.5 Check the hexagon bore of the Nosepiece for wear or damage. The Nosepiece need only be replaced if this bore is severely worn such that the implement can rotate, or if it is broken.

7.1.6 Remove any pieces of the four Retaining Rings from the holes in the Nosepiece. These should be renewed each time the Screws are replaced.

7.2 The Barrel and Buffer Housing assembly

7.2.1 Remove the Buffer Housing from the Barrel. On very early Breakers, with serial numbers up to 250200, an increase of Barrel length was achieved by adding a Spacer between the Buffer Housing and Barrel. Ensure that this Spacer is kept with the Barrel if the latter is to be used again.

7.2.2 Examine the Barrel, particularly in the bore, for wear or damage. Minor marks should be cleaned out so that the Barrel need only be replaced if very severely worn.

7.2.3 Remove any pieces of the four Retaining Rings from the upper holes in the Barrel. These should be renewed each time the Screws are replaced.

7.2.4 Push the Anvil out of the Buffer Housing and examine the Anvil O-Ring for wear or damage.

7.2.5 Examine the Recoil Buffer without removing it from the Buffer Housing. If it is severely marked or damaged then it can be levered out with a screwdriver and replaced.

SECTION 8 ELECTRICAL TESTING AND WIRING DIAGRAMS

8.1 Notes on Electrical Testing

8.1.1 Double insulation provides two layers of insulation, between current carrying parts and the metal casing of the Breaker. The insulating layer which prevents current from flowing between parts which must be maintained at different potentials is known as the Basic Insulation. Should the basic insulation fail at any point, the Breaker will still be safe because of the second layer, which is known as the Supplementary Insulation.

8.1.2 Owing to the very high quality of the insulation used in Kango Breakers it is possible for the basic insulation alone to withstand extremely high test voltages, even though the supplementary insulation may have sustained mechanical damage. It is also possible for the supplementary insulation to withstand extremely high voltage in the event of local failure of the basic insulation. Provided that a single layer of insulation (basic or supplementary) exists at every point, it would be possible for the Breaker to give a normal performance, but under these circumstances it would no longer be double insulated. This could particularly apply to the armature and field coil, i.e. the windings might be in direct local contact with the laminations. Before the machine is returned to the user it is essential to test both the basic and the supplementary insulation independently in accordance with the recommendations of CEE 20 and BS 2769: Portable electric-motor operated tools, as described in the following paragraphs.

8.1.3 The method of testing the electrical strength of the Armature and Field Coil is given below and uses the Flash Tester mentioned in Section 4.1.3. The recommended test voltages should be applied as follows:

(1) initially not more than half the prescribed voltage should be applied, it should then be raised rapidly to the full value

(2) the full voltage should be maintained without breakdown or flashover for a few seconds.

8.2 Checking and cleaning of Motor components

During prolonged use in dirty conditions it is possible for a continuous layer of electrically conductive dust to build up on the surface of the insulating components. If such a layer of dirt is allowed to build up unchecked it may greatly lower the efficiency of the insulation. It is therefore essential that all oil, grease, dust and dirt should be removed from all motor parts whenever a Breaker is returned for repair. Insulating components should also be checked for cracks or other mechanical damage which might impair their efficiency. If in doubt – REPLACE.

8.3 Testing the Armature

8.3.1 Supplementary Insulation
Apply 1250 volts rising to 2500 volts A.C. between laminations and spindle (A) as in Section 8.1.3.

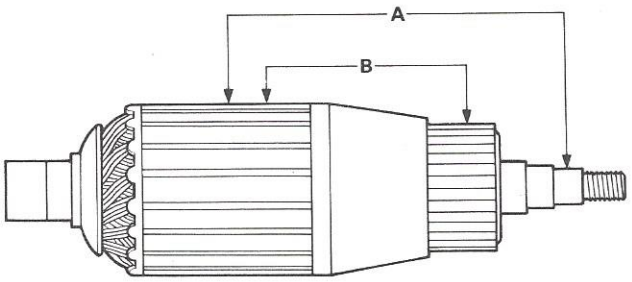

Figure 8 The Armature insulation testing points

8.3.2 Basic Insulation
Apply 750 volts rising to 1500 volts A.C. between commutator segments and laminations (B) as in Section 8.1.3.

8.4 Testing the Field Coil

8.4.1 Supplementary Insulation
To test the Supplementary insulation of the Field Coil, place the Field Coil in the Motor Housing and place the Motor Housing in the Main Casting. Ensure that the four field leads are not in contact with the laminations or with the Main Casting and ensure that no contact occurs between the bared ends and the flash test probes or the operator duing testing. Apply 1250 volts rising to 2500 volts A.C. between the Field Coil laminations and the Main Casting, as in Section 8.1.3.

8.4.2 Basic Insulation
For each of the two field windings, twist the bared ends of the switch leads around the eyelet of the brush lead and apply 750 volts rising to 1500 volts A.C. between the lead ends and the laminations, as in Section 8.1.3.

8.5 Testing the complete Breaker

8.5.1 Electric Strength
With the Breaker completely assembled and with the Switch "ON" (use Type 1800 Idling Buffer 03820) apply not more than 2000 volts initially and then raise quickly to 4000 volts between the Main Casting and one of the pins of the Plug on the Power Supply Cord. WARNING – TAKE CARE NOT TO TOUCH THE OTHER PIN OF THE PLUG DURING THIS TEST AS IT WILL ALSO BE LIVE. The full voltage of 4000 volts should be maintained without breakdown or flashover for a few seconds.

8.5.2 Insulation Resistance
With the Breaker completely assembled and with the Switch "ON", apply 500 volts D.C. by means of a "megger" from the Main Casting to either pin of the Plug on the Power Supply Cord. The resistance shown should be greater than 4 megohms.

8.5.3 Earth Continuity (for Breakers with 3-core Power Supply Cords)
Using the Megger or other means, measure the resistance from the Main Casting to the earth (grounded) pin of the plug on the Power Supply Cord. The measured resistance should not exceed one ohm (1Ω).

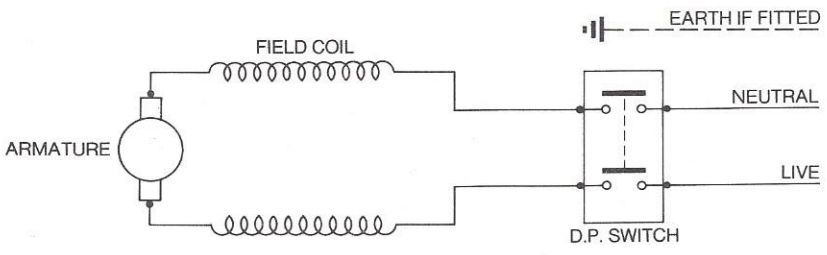

Figure 9 Wiring Diagram for the motor

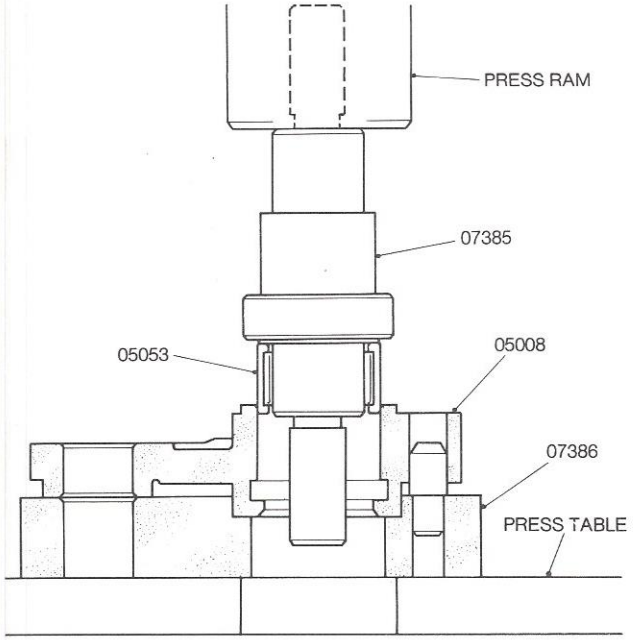

Figure 10 Assembly of the Layshaft Carrier Needle Roller Bearing

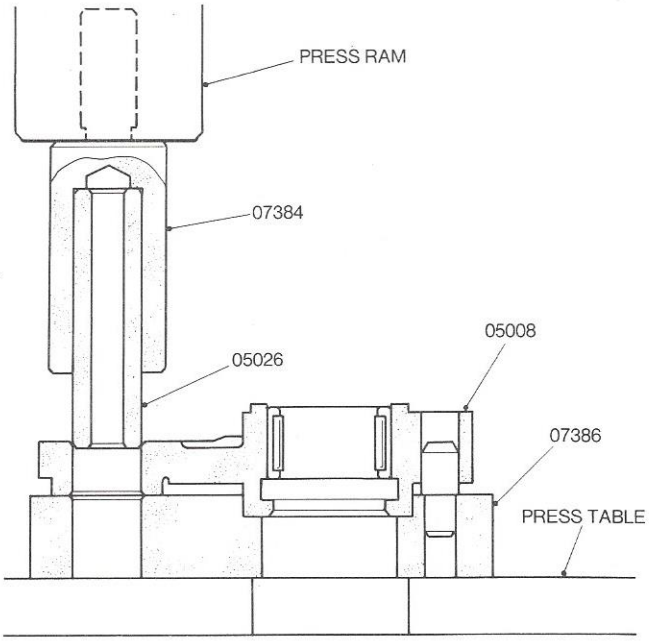

Figure 11 Assembly of the Layshaft to the Layshaft Carrier

SECTION 9 ASSEMBLING THE MAIN CASTING

9.1 The Layshaft Carrier assembly

9.1.1 Place the Layshaft Carrier on the Assembly Press Tool 07386 such that the small pin enters the top screw hole of the Carrier.

9.1.2 Place the Needle Roller Bearing on the Assembly Press Tool 07385. Note that this tool is double-ended for use also as a Dismantling Press Tool; the Bearing should be placed on the smaller end.

9.1.3 Locate the Needle Roller Bearing in the mouth of the hole in the Layshaft Carrier, centralise the assembly under the press ram and press the Bearing in until the Assembly Press Tool touches the Layshaft Carrier. See Figure 10.

9.1.4 With the Layshaft Carrier still on the Assembly Press Tool 07386, place the Layshaft into the Assembly Press Tool 07384 and locate the end of the Layshaft in the Layshaft Carrier.

9.1.5 Centralise the assembly under the press ram and press the Layshaft in until the Assembly Press Tool touches the Layshaft Carrier. See Figure 11.

9.1.6 Fit the Felt Ring to its groove in the Layshaft Carrier.

9.1.7 Fit the Layshaft Carrier assembly to the Main Casting, ensuring that the end of the Layshaft properly enters the hole in the Main Casting. Secure with three Screws.

9.2 The Crankshaft Housing assembly

9.2.1 Stand the Crankshaft Housing on its small end on the base of the press, locate the Ball Bearing squarely in the mouth of the bore and place Assembly Press Tool 07368 onto the Bearing. Centralise the assembly under the press ram and install the Bearing until it is pushed up against the shoulder in the Housing bore. See Figure 12.

9.2.2 Fit the interal Circlip to retain the Ball Bearing in the Crankshaft Housing.

9.2.3 Stand the Crankshaft Housing on its large end on the base of the press. Place the Needle Roller Bearing on the Assembly Press Tool 07371 and locate the Bearing in the mouth of the bore. Centralise the assembly under the press ram and install the Bearing until the Assembly Press Tool touches the Crankshaft Housing. See Figure 13.

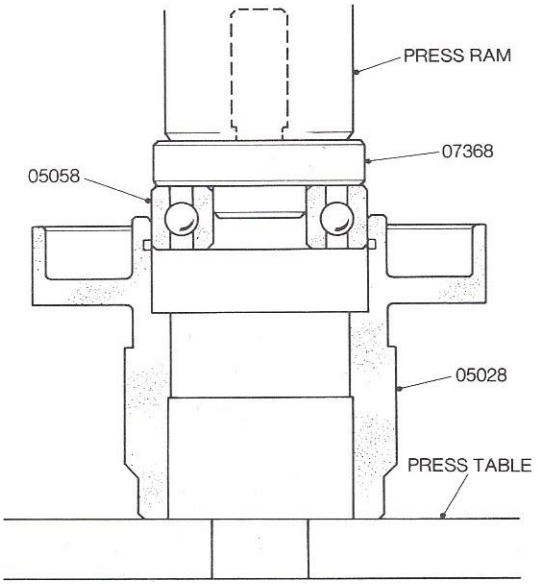

Figure 12 Assembly of the Crankshaft Housing Ball Bearing

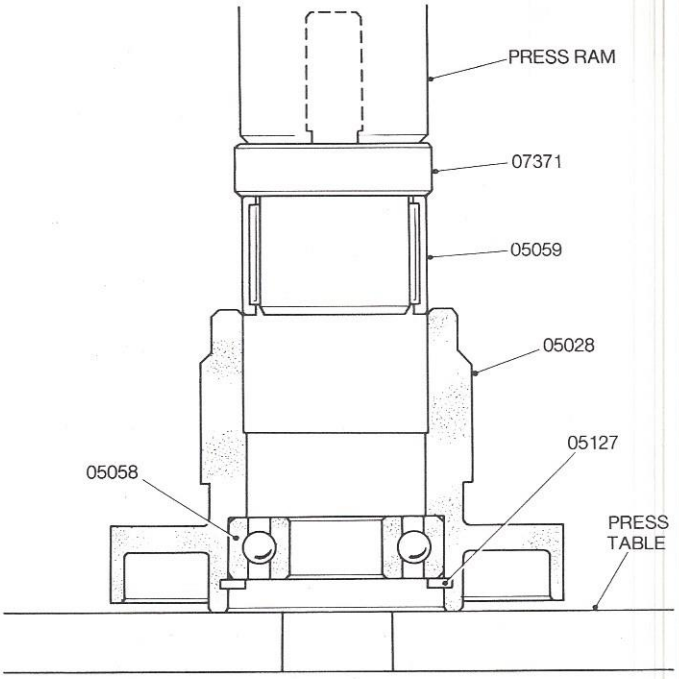

Figure 13 Assembly of the Crankshaft Housing Needle Roller Bearing

9.2.4 Fit the Crankshaft Housing assembly to the Main Casting and secure with three Screws. Note especially that the Housing should be rotated and fixed such that the side with the incomplete flange is towards the top of the Main Casting.

SECTION 10 ASSEMBLING THE MOTOR

Warning: Great care should be taken to avoid damage to the Armature, Field Coil, plastic mouldings and other electrical safety components in handling and assembly. The failure of such components can defeat the purpose of double insulation and endanger the user.

10.1 Armature and Field Coil voltage colour code

For quick visual identification of the voltage for which any armature or field coil is intended, each is marked with a paint colour code as shown below. If a winding is intended for more than one voltage, then each of the relevant colours is applied.

Voltage	*Paint Colour*
100	Yellow
110	Green
120	Red
125	Purple
200	White
220	Blue
240	Grey

10.2 The Field Coil assembly

10.2.1 Before assembly the Field Coil should first be checked for:

(1) physical damage to windings or leads resulting in exposed or fractured conductors

(2) no blockage of the two bolt holes

(3) no excess impregnating resin in the bore

(4) correct voltage as given by both the data printed on the laminations and the colour code painted on the windings

(5) security of the double insulation, as described in Section 8.4.

10.2.2 Prepare the switch leads of the Field Coil as shown in Figure 14. The ends of the leads should be thoroughly tinned before forming into loops and there must then be no loose strands.

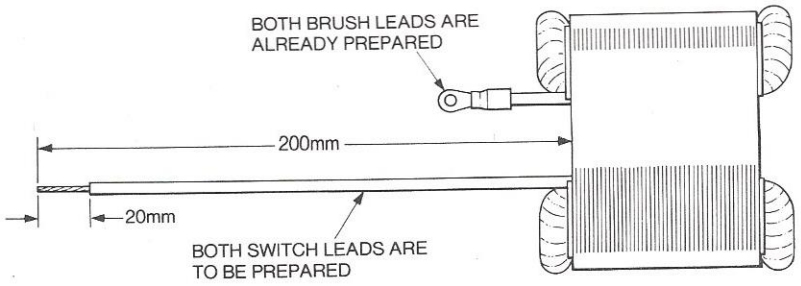

Figure 14 Preparation of the Field Coil switch leads

10.2.3 Slide the Field Coil into the bore of the Motor Housing, the end from which the leads emerge being towards the brush apertures. Line up the bolt holes in the Field Coil with those in the Motor Housing but ensure that the two switch leads are nearer to the rectangular cut-out where the Field Lead Grommet is located.

10.2.4 Secure the Field Coil into the Motor Housing with two Screws and two Locknuts.

10.2.5 Slide the Motor Housing assembly into the Main Casting, rotating it so as to align the three fixing holes and the slot for the Field Lead Grommet with the mating parts of the Main Casting. The Motor Housing will be a free fit in the casting over most of its length but will be tight for about the last 6 mm where it is accurately located at either end.

10.3 The Bearing Holder assembly

10.3.1 Place the Bearing Holder on the base of the press with the angled face upwards. Locate the Ball Bearing in the mouth of the bore in the Bearing Holder and place the Assembly Press Tool 07367 on to the Bearing.

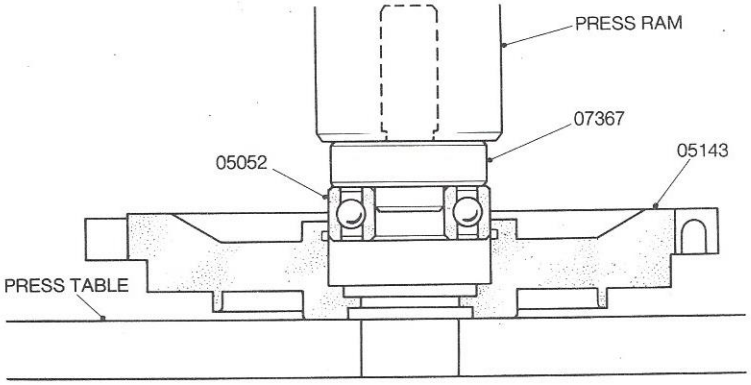

Figure 15 Assembly of the Bearing Holder Ball Bearing

10.3.2 Centralise the assembly under the press ram and press the bearing in to the shoulder in the Bearing Holder. See Figure 15.

10.3.3 Fit the internal Circlip to retain the Ball Bearing.

10.3.4 Locate the Brush Holder Assembly to the underside of the Bearing Holder, locating two lugs on the Brush Holder Assembly in to mating slots in the flange on the Bearing Holder.

10.4 The Armature assembly

10.4.1 Before assembly the Armature should first be checked for:

(1) physical damage to the windings, laminations, bearing diameters or commutator

(2) correct voltage as given by both the data stamped on the laminations and the colour code which is painted on to the commutator

(3) cleanliness and adequate undercutting of the commutator, if refurbishing is required this may be carried out as described in Section 5.1.16

(4) security of the double insulation, as described in Section 8.3.

11.1.8 Clamp this assembly with the Locknut. To prevent the Crankshaft from rotating whilst the Locknut is tightened the Extension Bar 07393 (or a similar piece of steel rod) should be located in the Main Casting so that one side face of the Crankshaft counterbalance weight (NOT the big-end Thrust Washer!) is loaded against it. The end of the extension bar will drop conveniently into the cast rectangular recess which is visible above the Crankshaft in the centre of the casting.

11.2 The Layshaft Gears and Cover

11.2.1 Stand the Layshaft Gear Assembly on the base of the press and locate one Needle Roller Bearing in the mouth of the bore.

11.2.2 Clamp the Assembly Press Tool 07369 into the press ram, centralise the assembly under the press ram and press the bearing in until the Assembly Press Tool touches the Layshaft Gear Assembly. See Figure 19.

11.2.3 Turn the Layshaft Gear Assembly over and repeat the above procedure to press a second Needle Roller Bearing into the other end of the bore.

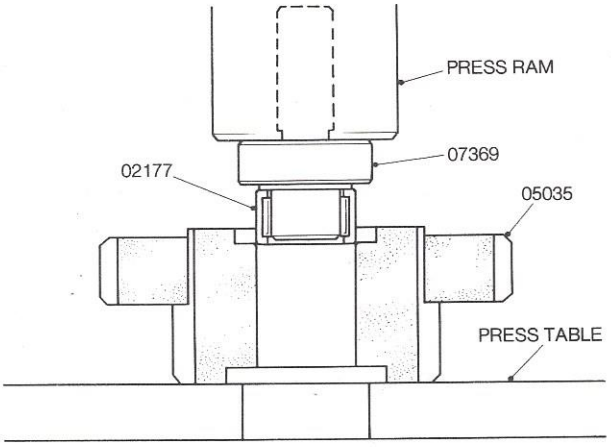

Figure 19 Assembly of the Layshaft Gear Needle Roller Bearings

11.2.4 Lubricate the assembly of one Thrust Needle Roller Bearing and two Thrust Washers and place these onto the Layshaft.

11.2.5 Pack the bearings in the Layshaft Gear Assembly with Kango Hammer Grease and fit this assembly to the Layshaft, rotating it as necessary to bring the two pairs of gears into mesh.

11.2.6 Fit the Felt Disc to the end of the layshaft bore in the Gear Case Cover. Pack the Gear Case Cover with Kango Hammer Grease to about half of its depth.

11.2.7 Smear the Gear Case Cover Gasket with Kango Hammer Grease and locate it on the Main Casting. Fit the Gear Case Cover noting that it locates in three places on the Layshaft Carrier, the Layshaft and the Crankshaft Housing. Fix the Gear Case Cover with six Screws, four long and two short.

11.3 The Connecting Rod and Striker assembly

11.3.1 Smear a Needle Roller Bearing with Kango Hammer Grease and locate it onto the smaller end of the Assembly/Dismantling Press Tool 07383. Place the bearing into the mouth of the bore of the Connecting Rod, centralise the assembly under the press ram and press the bearing in until the Assembly/Dismantling Press Tool touches the Connecting Rod. See Figure 20.

11.3.2 Grease the Piston Seal with Kango Hammer Grease and fit it, without the aid of any tools, to the Piston, checking that it does not become twisted.

11.3.3 Grease the Gudgeon Pin and its location in both the Connecting Rod and the Piston with Kango Hammer Grease. Fit the Piston to the Connecting Rod with the Gudgeon Pin which is then fixed in the Piston using two O-Rings. Fill the cavity in the top of the Piston with Kango Hammer Grease to provide a lubricant reservoir for the Piston assembly.

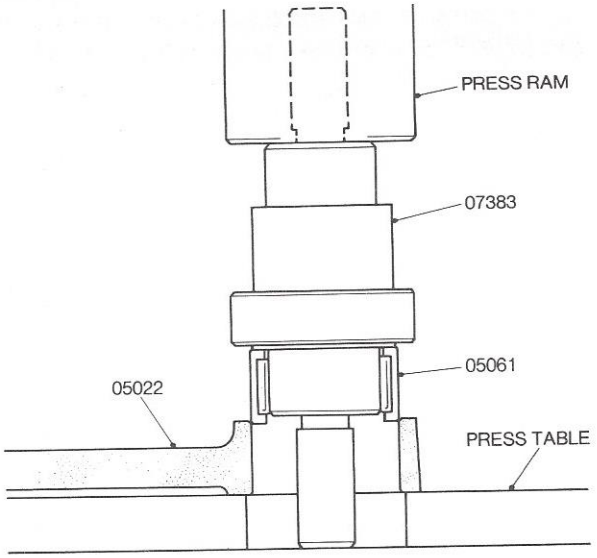

Figure 20 Assembly of the Connecting Rod Needle Roller Bearing

11.3.4 Grip the shank of the Connecting Rod in a vice with the Piston upwards. Smear the Piston skirt with Kango Hammer Grease and place about 1 c.c. on the crown of the Piston. Ensure that the air grooves are kept free of grease.

11.3.5 Smear the bore of the Striker with Kango Hammer Grease ensuring that the air ports are kept clear. Push the Striker over the Piston until the enclosed air pressure is released, the Piston Seal then ensures that the Striker will stay on the Piston.

11.3.6 Stand the Main Casting upside down on the bench, two cast features are provided to make it stable. Pack the Connecting Rod Needle Roller Bearing with Kango Hammer Grease and fit the Connecting Rod assembly to the crankpin, the longer hub of the Connecting Rod going towards the Crankshaft.

11.3.7 Retain the Connecting Rod assembly on the Crankshaft with the Thrust Washer and external Circlip.

11.3.8 Use the Grease Gun 07388 to put a little more grease through the Hydraulic Nipple and ensure that the Crankshaft bearings are fully packed.

SECTION 12 ASSEMBLING THE BARREL AND TRANSMITTER

12.1 The Nosepiece assembly

12.1.1 Stand the Nosepiece upside down on the bench. Lubricate the Latch Spring and Latch Plunger with Kango Hammer Grease and drop them into the hole in the Nosepiece in that order.

12.1.2 Holding the Latch in the "closed" position, push it down with the hand against the load of the Latch Spring so as to align the pivot hole with the similar holes in the Nosepiece. Push the Assembly/Dismantling Press Tool 07370 through all three holes.

12.1.3 Place the sub-assembly on its side on the base of the press with the smaller diameter of the Press Tool uppermost. Locate the tapered end of the Tension Pin over the upper end of the Press Tool. Centralise the assembly under the press ram and push the Tension Pin through all three holes until it is flush at the upper end. The Press Tool will fall out during this assembly. See Figure 21.

12.1.4 Check the operation of the Latch before proceeding. It should be possible to operate it by hand, the spring load holding it at either end of its travel.

12.1.5 Lubricate the Buffer with Kango Hammer Grease and locate it, tapered face uppermost, in the groove at the top end of the Nosepiece.

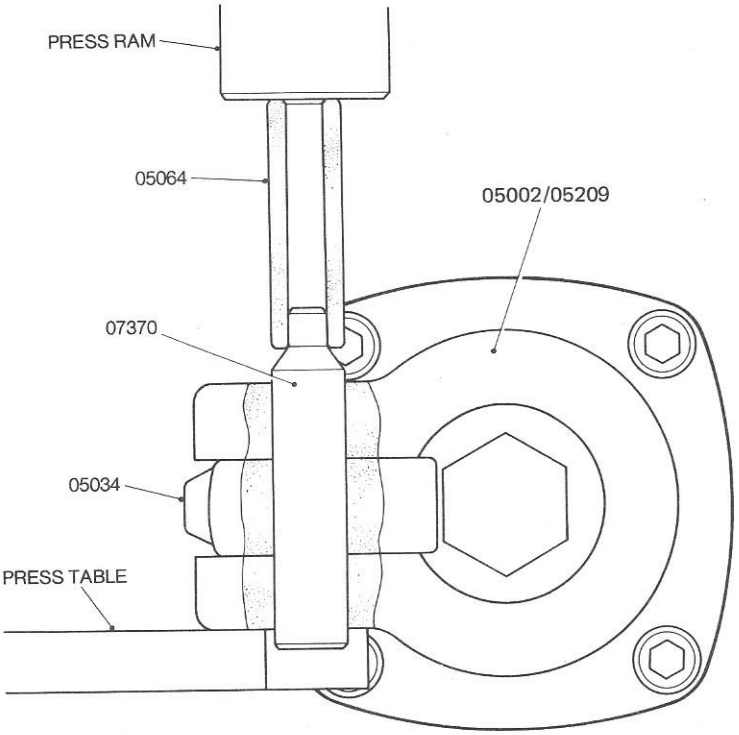

Figure 21 Assembly of the Latch Tension Pin

12.2 The Buffer Housing and Anvil assembly

12.2.1 Lubricate the Recoil Buffer with Kango Hammer Grease and push it into its location in the Buffer Housing.

12.2.2 Lubricate the O-Ring with Kango Hammer Grease and fit it to the external groove on the Anvil.

12.2.3 Smear Kango Hammer Grease over the outside of the Anvil and the inside of the Buffer Housing and assemble the two together, taking care that the Anvil O-Ring is not damaged during assembly.

12.3 Completion of the Transmitter

12.3.1 Hold the Barrel in a vice, gripping it close to the bottom end and taking care not to overtighten and distort it.

12.3.2 Fit a Barrel Gasket Bottom to the upper side of the Buffer Housing flange and place the Buffer Housing and Anvil assembly in the bottom end of the Barrel.

12.3.3 Place four new Retaining Rings in the counterbored holes in the Nosepiece and fix this assembly to the end of the Barrel assembly using four Screws. Note that the Latch should be in line with one of the narrow sides of the Barrel top flange.

12.3.4 To apply the necessary tightening torque to the four Screws the Barrel may be gripped in a vice, close to the Buffer Housing, but care should be taken in case it slips.

12.3.5 Place the Barrel sub-assembly on the Service Stand 07344 and fit the Barrel Gasket Top to the upper flange. The Main Casting sub-assembly may now be lowered onto the Barrel from above, ensuring that it is rotated such that the Fan is aligned with the Latch.

12.3.6 Fix the two halves of the Breaker together using four Screws, each fitted with a new Retaining Ring.

12.3.7 To apply the necessary tightening torque to the four Screws, the Service Stand may be restrained with the feet whilst the Torque Wrench is used.

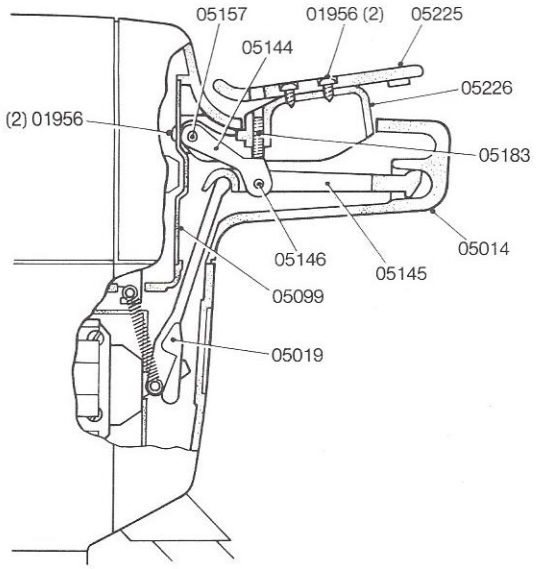

Figure 22 Assembly of the Switch linkage

SECTION 13 ASSEMBLING THE SWITCH MECHANISM

13.1 The Switch Handle assembly

13.1.1 Fix together the Adjusting Link and Lever by pressing the Tension Pin through the two components. See Figure 22.

13.1.2 Add the Trigger to the assembly using the Trigger Pivot to retain the components. See Figure 22.

13.1.3 Slide the lever assembly into the Switch Handle so that the end of the Lever locates in the lower of the two recesses in the end of the handle and the bosses on the Trigger locate in the sockets at the open end. See Figure 22.

13.1.4 Fit the Trigger Retaining Plate and secure with two Screws. Use a pair of pliers to bend the tabs over the heads of the screws, preventing them from loosening and touching the Fan.

13.1.5 Fit the trigger adjusting Screw to the Trigger, installing it until the top end is just below flush with the Trigger surface.

13.1.6 Fix the Trigger Cap to the Trigger with two Screws.

13.2 The Switch Box assembly

13.2.1 Pass the Power Supply Cord through the Cord Guard and then prepare the end of the cord as shown in Figure 1. The ends of the leads should be thoroughly tinned before forming into loops and there must then be no loose strands.

13.2.2 Connect the Power Supply Cord leads to the switch, both leads going to the same side of the Switch and the shorter one to the terminal nearer to the end marked "OFF". This end of the Switch will go towards the top of the Breaker.

13.2.3 To help the assembly of the Switch Box, the Trigger Return Springs may be pushed into the fan blades to keep them clear of the work area.

13.2.4 Connect the Field Coil switch leads to the other two Switch terminals, either way round.

13.2.5 Fix the Power Supply Cord into the Switch Box using the Cord Grip and two Screws. Place the Cord such that about 10 mm of the outer sheath appears on the upper side of the Cord Grip.

Note: if a three-core Power Supply Cord is fitted because of local regulations, then the earth (grounded) lead should be placed through the slot in the wall of the Switch Box close to the Cord Grip and fixed to the Main Casting using a terminal Screw and Spring Washer. See Figure 23.

13.2.6 Lightly grease the large-diameter O-Ring with Kango Hammer Grease and locate it in the groove on the back of the Switch Box.

13.2.7 Place the Switch Box in its recess in the Main Casting, ensuring that the lower flange of the Field Lead Grommet is pulled down and is fitted into its locating slot.

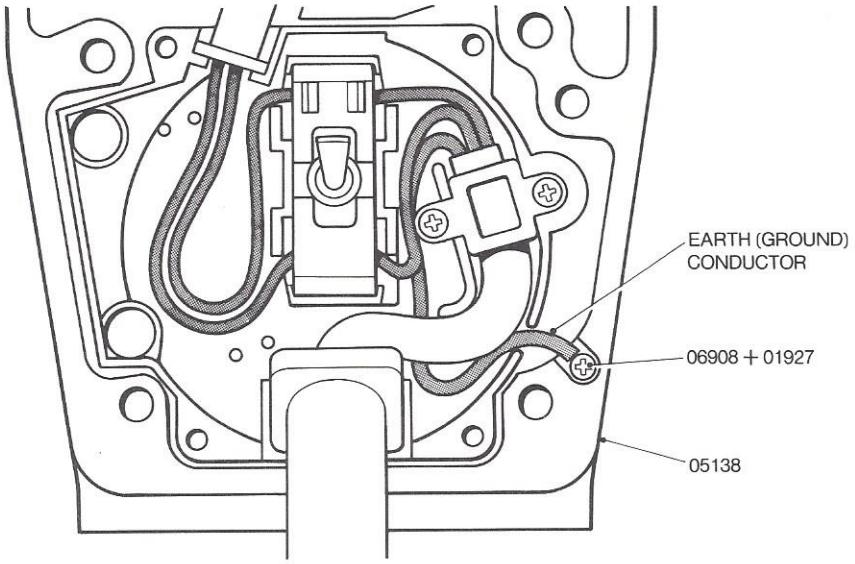

Figure 23 Fitting of a three-core Power Supply Cord

13.2.8 Locate the Switch Box Insert into the Switch Box, the four projections locating into the two moulded slots in the base of the Switch Box. Note that it will only fit one way round.

13.2.9 Push the Switch into the Switch Box Insert while taking care to guide the four leads such that they are not severely bent or otherwise damaged.

13.2.10 Fit the Switch Seal over the top of the Switch.

13.2.11 Form the Power Supply Cord into an 'S'-bend inside the Switch Box, locate the flange of the Cord Guard in its recess in the Switch Box and fit the Switch Box Cover over the whole assembly and secure it with four Screws.

13.3 Completion of the Switch linkage

13.3.1 Release the two Trigger Return Springs from the Fan blades.

13.3.2 To fit the Switch Handle assembly and Switch Actuator, first push the top end of the Actuator through the hole in the lower side of the Handle and locate it into the socket on the end of the Lever. See Figure 22.

13.3.3 With the Switch "ON" (down), place the Handle on to the Main Casting and locate the lower end of the Actuator over the Switch Seal at the same time. Fix the Switch Handle to the Main Casting using four Screws.

13.3.4 Fit the bottom ends of the Trigger Return Springs to the projections on the Switch Actuator.

13.3.5 Carry out the final adjustment of the switch linkage by first holding the Trigger Cap down until the outer end touches the Switch Handle. In this condition move the trigger adjusting Screw until the Switch Actuator moves down to put the Switch "ON" and then moves a slight amount further. This should ensure that the Switch is not loaded by the Actuator at either end of its travel and that excessive operator load is absorbed by the Handle and not the Switch.

SECTION 14 FINAL ASSEMBLY AND TESTING OF REBUILT BREAKERS

14.1 Covers and Plates

14.1.1 Fit the Switch Cover to the Main Casting using four Screws, two long and two short.

14.1.2 Fit the plain Handle to the Main Casting using four Screws.

14.1.3 Place the Top Cover over the Main Casting and push it into place, locating the bottom of either side in the machined groove in the Main Casting.

14.1.4 Drop the Top Cover Inserts into the four holes in the Cover and fix the assembly using four Screws.

14.1.5 If new Plates are being fitted, place them as follows:

Data Plate on the Switch Cover

Name Plate on the Gear Case Cover

Caution Plate on the Top Cover.

14.2 Mechanical Testing

Note: All tests must be carried out at the voltage shown on the Data Plate of the Breaker.

14.2.1 Starting from cold
Being grease lubricated, the Breaker may be sluggish in delivering blows when first switched on in cold weather. Keep the tool pressed against the work and let the motor run. Blows may be weak at first but as the Breaker warms up they will become progressively stronger.

If no blows at all are struck or the blows cease, switch off and on at intervals allowing the mechanism to come to rest before switching on again.

If the Breaker cannot be made to strike blows by this procedure, the probable cause is that the Striker ports are filled with grease. The Main Casting must be removed from the Barrel and the surplus grease removed.

14.2.2 Idling
When the Breaker has been warmed up by hammering on a point or chisel, lift the Breaker off the work. Blows should cease at once and the motor speed increase slightly, i.e. the Breaker should 'idle'.

14.2.3 Pick-up
Let the Breaker run idle and then drop it back on to the implement. Blows should start at once and the motor speed decrease slightly, i.e. the Breaker 'picks up' the load.

14.2.4 Performance
With the Breaker thoroughly warmed up and driving a worn point or chisel into concrete, it should take input power from 2200 to 2300 Watts. Do not let the implement become wedged into the concrete or an unduly low reading may be obtained.

14.3 Electrical Testing

14.3.1 Test the electrical strength and insulation resistance of the complete Breaker as described in Section 8.5.

14.3.2 In the case of Breakers fitted with a 3-core Power Supply Cord, test for earth continuity as described in Section 8.5.3.

14.4 The Breaker Test Rig

14.4.1 In order that repaired Breakers can be thoroughly tested after servicing, a running-in rig is available which is used to check the tools under conditions of continuous loading for short periods of time without requiring an operator.

14.4.2 The complete rig, which is a conversion of the rig used for the earlier Type H and 1800 Breakers, is available as part number 09155; further details can be obtained on request.

SECTION 15 LIST OF TORQUE SETTINGS AND SERVICE TOOLS USED ON EACH COMPONENT

Note: Torque settings are given in units of Newton metres (Nm) which are marked on each of the Torque Wrenches specified in Section 16.

Part No.	*Description*	*Torque (Nm)*	*Service Tools required*
01956	Trigger Cap Screw Trigger Retaining Plate Screw	1.25	02390, 07328, 07329
01975	Cord Grip Screw	1.25	07328, 07331, 07332, 07352
01987	Brush Cap Screw	1.25	07328, 07331, 07332, 07352
05002	Nosepiece (32 mm)	–	07370
05008	Layshaft Carrier	–	07384, 07385, 07386
05022	Connecting Rod	–	07383
05023	Crankshaft	–	07380, 07381, 07382
05024	Pinion	40	01976, 02355, 02390, 07313, 07319, 07390
05028	Crankshaft Housing	–	02369, 07368, 07371
05035	Layshaft Gear Assembly	–	B7360, 07369
05105	Crankshaft Housing Screw Layshaft Carrier Screw	40	02355, 07333, 07394, 07399
	Gear Case Cover Screw Switch Cover Screw	25	
05106	Gear Case Cover Screw Switch Cover Screw	25	02355, 07333, 07394, 07399
	Handle Screw	40	
05107	Bearing Holder Screw Top Cover Screw	5.0 3.5	02391, 07328, 07330
05110	Nosepiece Screw Barrel Screw	115	02355, 07334, 07344, 07393, 07395, 07399
05117	Fan Locknut	40	02355, 07313, 07389
05118	Crankshaft Locknut	70	02355, 07355, 07393, 07399
05123	Connecting Rod Circlip	–	02301
05143	Bearing Holder	–	02369, 07367
05179	Hydraulic Nipple	7	02366, 02368+07387 or 07388*, 07397
05183	Trigger Adjusting Screw	–	07349
05192	Field Coil Clamping Locknug	1.75	07328, 07335, 07347, 07396
05209	Nosepiece (28 mm)	–	07370
06908	Terminal Screw	1.25	02390, 07328, 07329
06917	Switch Box Screw	2.0	02390, 07328, 07329
Part of 05098 Part of 03908	Switch Terminal Screw	1.25	07328, 07331, 07332, 07352

*See Section 16

SECTION 16 ILLUSTRATED LIST OF SERVICE TOOLS (see Figure 24)

Part No.	*Name*	*For use with*
01805	Grease Pump	01806
01806	Kango Hammer Grease (12.5 kg tin)	Lubrication of gearbox and hammer mechanism
01808	Kango Hammer Grease (500 gm tin)	Lubrication of gearbox and hammer mechanism
01976	M4 x 16 mm Pozi-Pan Screw	07390
02301	External Circlip Pliers	05123 Circlip
02355	Torque Wrench 25—135 Nm ($\frac{1}{2}$" sq. drive)	Several other parts; see below
02366	Torque Wrench 5—33 Nm ($\frac{3}{8}$" sq. drive)	07397 on 05179 Hydraulic Nipple
*02368	Grease Gun	07387 on Crankshaft lubrication
02369	Internal Circlip Pliers	05125, 05127 Circlips
02390	Pozidriv Screwdriver, No.2 Point, 10" Shank	01956, 01976, 06908, 06917 Screws
02391	Pozidriv Screwdriver, No.3 Point, 6" Shank	05107 Screw
07313	Split Sleeve	Armatures
07319	$\frac{7}{8}$" BSF Hexagon Socket	02355, 07390, 01976 on 05024 Pinion
07328	Rotary Torque Wrench 0.5—5 Nm ($\frac{1}{4}$" sq. drive)	Several other parts; see below
07329	Bit Adaptor, Pozidriv No.2 Point (Replacement Bit = P/No. 07377)	07328 on 01956, 01976, 06908, 06917 Screws
07330	Bit Adaptor, Pozidriv No.3 Point (Replacement Bit = P/No. 07378)	07328 on 05107 Screw
07331	Bit Holder	07332
07332	Screwdriver Bit	07328 on 01975, 01987 and Switch Screws
07333	Standard Allen Key, 6 mm AF	05105 and 05106 Screws
07334	Standard Allen Key, 10 mm AF	05110 Screws
07335	Standard Allen Key, 5 mm AF	01990 Screws
07344	Service Stand	
07347	Converter, $\frac{1}{4}$" sq. skt. to $\frac{3}{8}$" sq. plug	07328 and 07396 on 05192 Locknut
07349	Standard Allen Key, 2.5 mm AF	05183 Screw
07352	Parallel Tip Screwdriver	01975, 01987 and Switch Screws
07355	24 mm Hexagon Socket, $\frac{1}{2}$" sq. drive	02355 on 05118 Locknut
B7360	Dismantling Press Tool	Layshaft Gear Assembly: Needle Bearings
07367	Assembly Press Tool	Bearing Holder: Ball Bearing
07368	Assembly Press Tool	Crankshaft Housing: Ball Bearing
07369	Assembly Press Tool	Layshaft Gear Assembly: Needle Bearings
07370	Assembly: Dismantling Press Tool	Nosepiece: Tension Pin
07371	Assembly Press Tool	Crankshaft Housing: Needle Bearing
07380	Assembly Press Tool	Crankshaft: Bearing Inner Ring (Big End)
07381	Assembly Press Tool	Crankshaft: Bearing Inner Ring (Main)
07382	Assembly Press Tool	Crankshaft: Bearing Inner Ring (Main)
07383	Assembly: Dismantling Press Tool	Connecting Rod: Needle Bearing
07384	Assembly Press Tool	Layshaft Carrier: Layshaft
07385	Assembly: Dismantling Press Tool	Layshaft Carrier: Needle Bearing
07386	Assembly: Dismantling Press Tool	Layshaft Carrier: Layshaft: Needle Bearing
*07387	Hydraulic Nozzle	02368 on Crankshaft lubrication
*07388	Grease Gun	Crankshaft lubrication
07389	17 mm Hexagon Socket, $\frac{1}{2}$" sq. drive	02355 on 05117 Locknut
07390	Pinion Nut	02355, 07319, 01976, 07313 on 05024 Pinion
07393	Extension Bar, 12" long, $\frac{1}{2}$" sq. drive	02355, 07395 on 05110 Screw
07394	Hexagon Bit Adaptor, 6 mm AF, $\frac{1}{2}$" sq. drive	02355 on 05105, 05106 Screws
07395	Hexagon Bit Adaptor, 10 mm AF, $\frac{1}{2}$" sq. drive	02355, 07393, 07399 on 05110 Screws
07396	10 mm Hexagon Socket, $\frac{3}{8}$" sq. drive	07328, 07347 on 05192 Locknut
07397	9 mm Hexagon Socket, $\frac{3}{8}$" sq. drive	02366 on 05179 Hydraulic Nipple
07399	Extension Bar, 6" long, $\frac{1}{2}$" sq. drive	02355 in various applications

*Lubrication of the Crankshaft may be done using the Grease Gun 07388 which is ready for use, or alternatively the Hydraulic Nozzle 07387 may be fitted to the existing Grease Gun 02368 making it equally suitable.

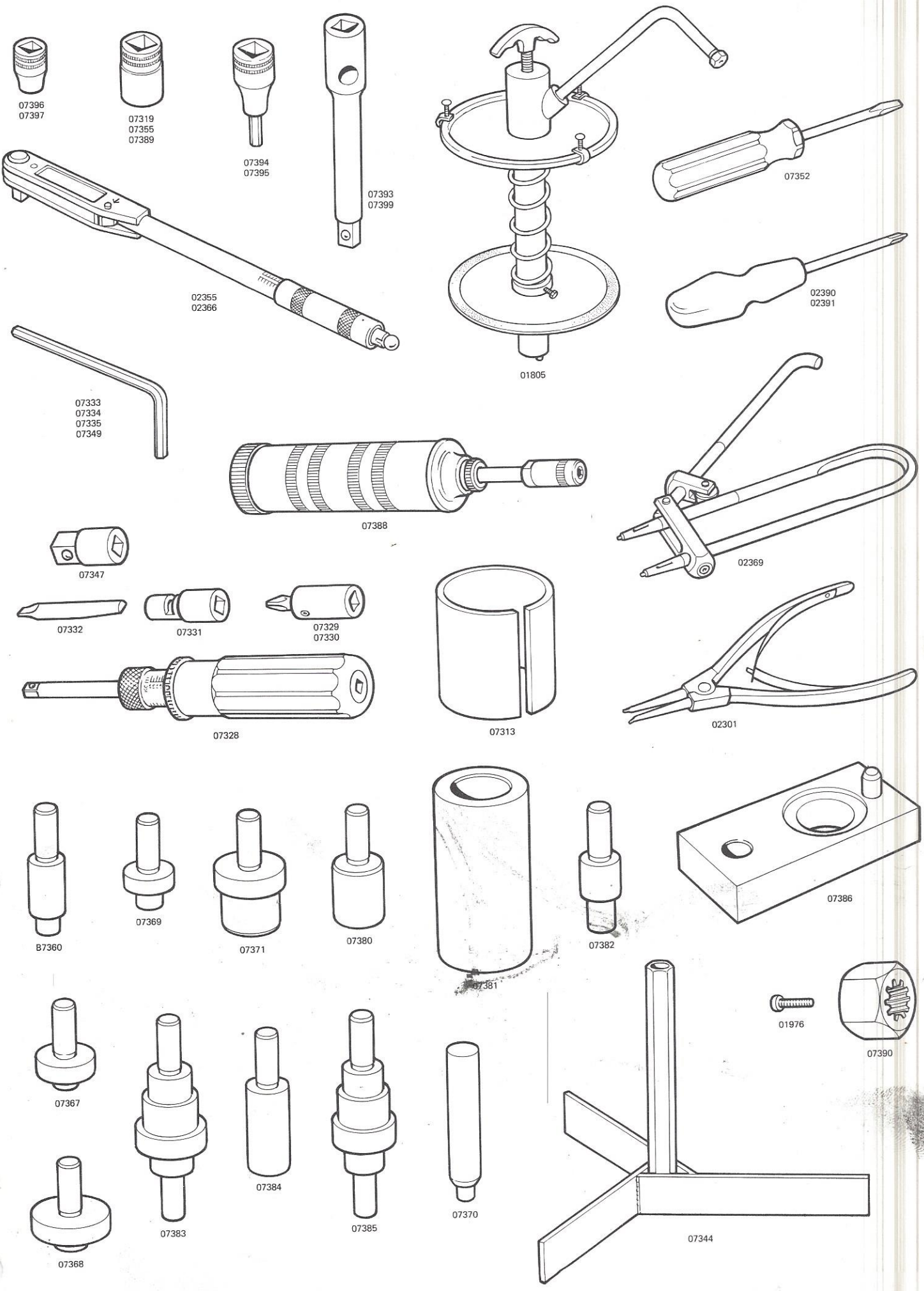

Figure 24 Service Tools

SECTION 17 ILLUSTRATED LIST OF PARTS

Note: Some components are only available in packs of certain quantities. For details of these refer to the Kango Spare Parts Price List.

17.1 Top Cover, Handles and Switch assembly (see Figure 25)

†00905 Cord, 2 core, 3 m, with moulded plug to CEE7, Standard Sheet XVII
†00944 Plug, (USA/Canada markets only)
†01915 Screw (8)
†01927 Spring Washer (for earthed (grounded) Breakers)
†01956 Screw (4)
†01975 Screw (2)
†03908 Switch (USA markets only)
†03935 Cord Grip
05010 Switch Box
05011 Switch Box Cover
05012 Top Cover
05014 Switch Handle
05015 Handle
05017 Top Cover Insert
05019 Switch Actuator
05038 Switch Cover
05098 Switch (not USA markets)
05099 Trigger Retaining Plate
05101 Switch Seal
05104 O-Ring
05105 Screw (2)
05106 Screw (10)
05107 Screw (4)
05137 Cord, 2 core, 3 m, (UK Markets)
05144 Adjusting Link
05145 Lever
05146 Tension Pin
05157 Trigger Pivot
05183 Screw
05187 Switch Box Insert
05223 Cord, 2 core, 5 m, (Canada only)
05225 Trigger Cap
05226 Trigger
05231 Cord Guard
05243 Cord, 3 core, 5m (USA markets only)
†05913 Plug, BS4343/CEE17, 16 Amps, for 200–240 Volts
05920 Plug, BS4343/CEE17, 32 Amp, for 100–125 Volts
05929 Plug, Switzerland Type 12
†06225 Data Plate (Double Insulated)
†06226 Data Plate (Earthed/Grounded)
†06294 Caution Plate (Earthed/Grounded)
†06295 Caution Plate (Double Insulated)
†06908 Screw (for earthed (grounded) Breakers)
†06917 Screw (4)

†Used on other Kango Hammers or Breakers

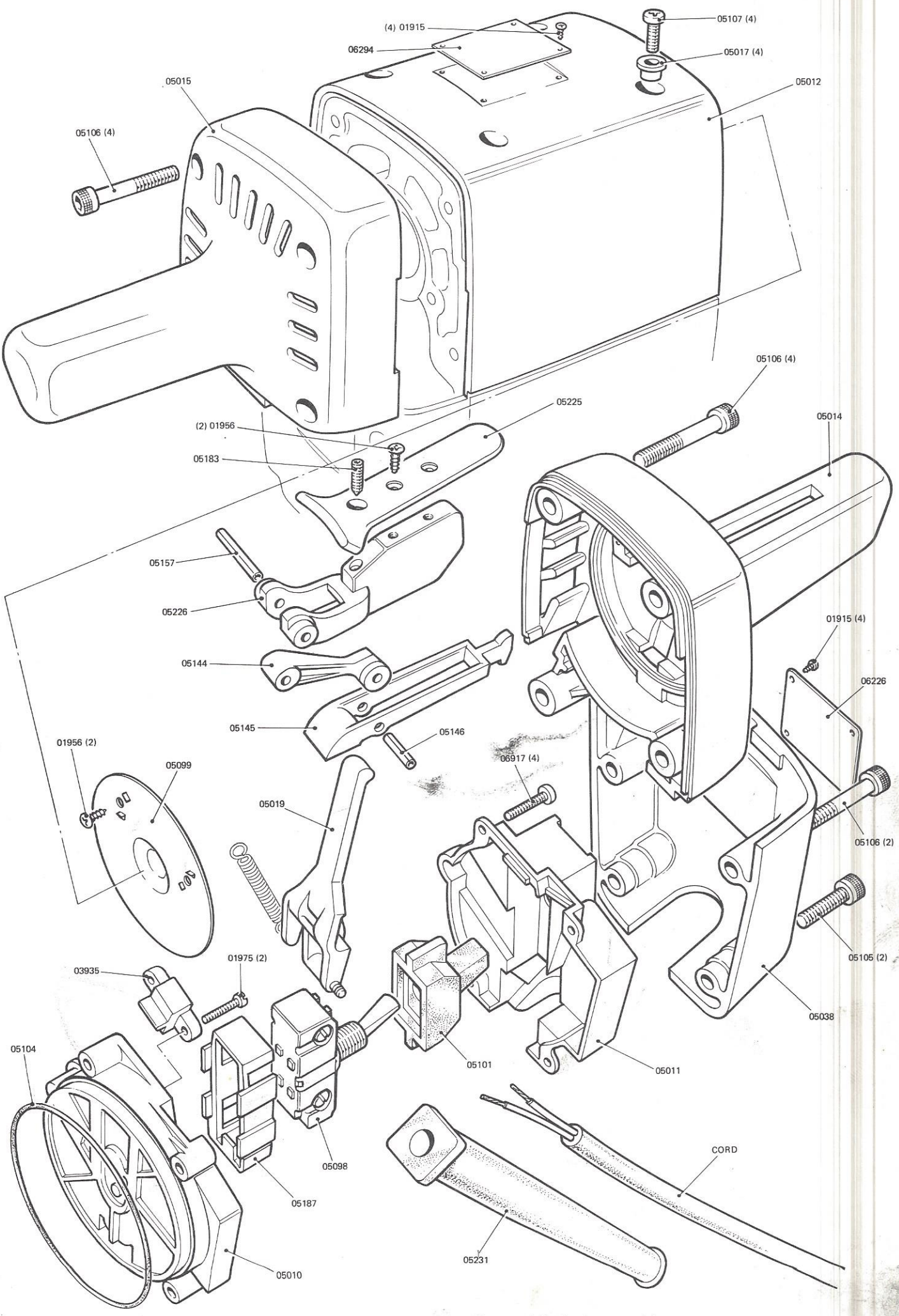

Figure 25 Top Cover, Handles and Switch assembly

17.2 Motor (see Figure 26)

†01987 Screw (2)
†01990 Screw (2)
†04320 Terminal Pad (2)
05007 Motor Housing
05020 Trigger Return Spring (2)
05024 Pinion
05025 Pinion Spacer
05044 Brush Spring (2)
05045 Brush Holder Assembly
05052 Ball Bearing
05079 Armature 110/120 Volt
05083 Armature 220/240 Volt
05091 Field Coil 110 Volt
05092 Field Coil 120 Volt
05095 Field Coil 220 Volt
05096 Field Coil 240 Volt
05097 Carbon Brush (2)
05102 Field Lead Grommet
05107 Screw (3)
05117 Locknut
05125 Circlip
05128 Spring Anchor
05129 Brush Cap (c/w 04320) (2)
†05133 Plain Washer
05143 Bearing Holder
05182 Fan
05192 Locknut (2)
†06908 Screw (2)

†Used on other Kango Hammers or Breakers

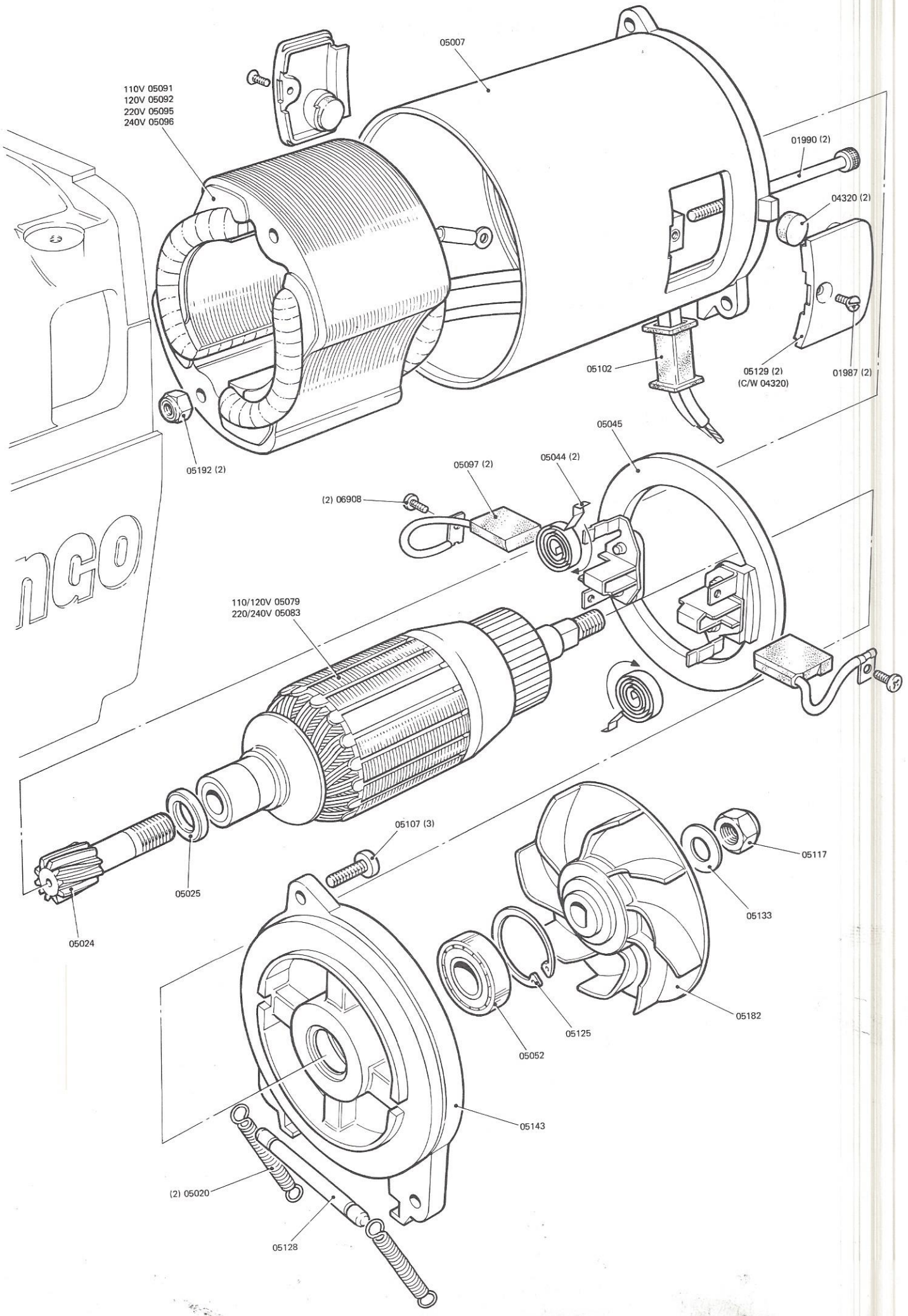

Figure 26 Motor

17.3 Main Casting, Gearbox and Crankshaft (see Figure 27)

†01915 Screw (4)
†02177 Needle Roller Bearing (2)
05000 Main Casting
05008 Layshaft Carrier
05021 Gear Case Cover
05023 Crankshaft
05026 Layshaft
05028 Crankshaft Housing
05031 Crankshaft Gear
05035 Layshaft Gear Assembly
05053 Needle Roller Bearing
05056 Thrust Needle Roller Bearing
05057 Thrust Washer (2)
05058 Ball Bearing
05059 Needle Roller Bearing
05060 Bearing Inner Ring
05062 Bearing Inner Ring
05063 Thrust Washer
05105 Screw (8)
05106 Screw (4)
05111 Gear Case Cover Gasket
05116 Felt Ring
05118 Locknut
05124 Rectangular Section Ring
05127 Circlip
05138 Main Casting Grounded (for earthed (grounded) Breakers)
05179 Hydraulic Nipple
05181 Square Key
05221 Felt Disc
06213 Name Plate

†Used on other Kango Hammers or Breakers

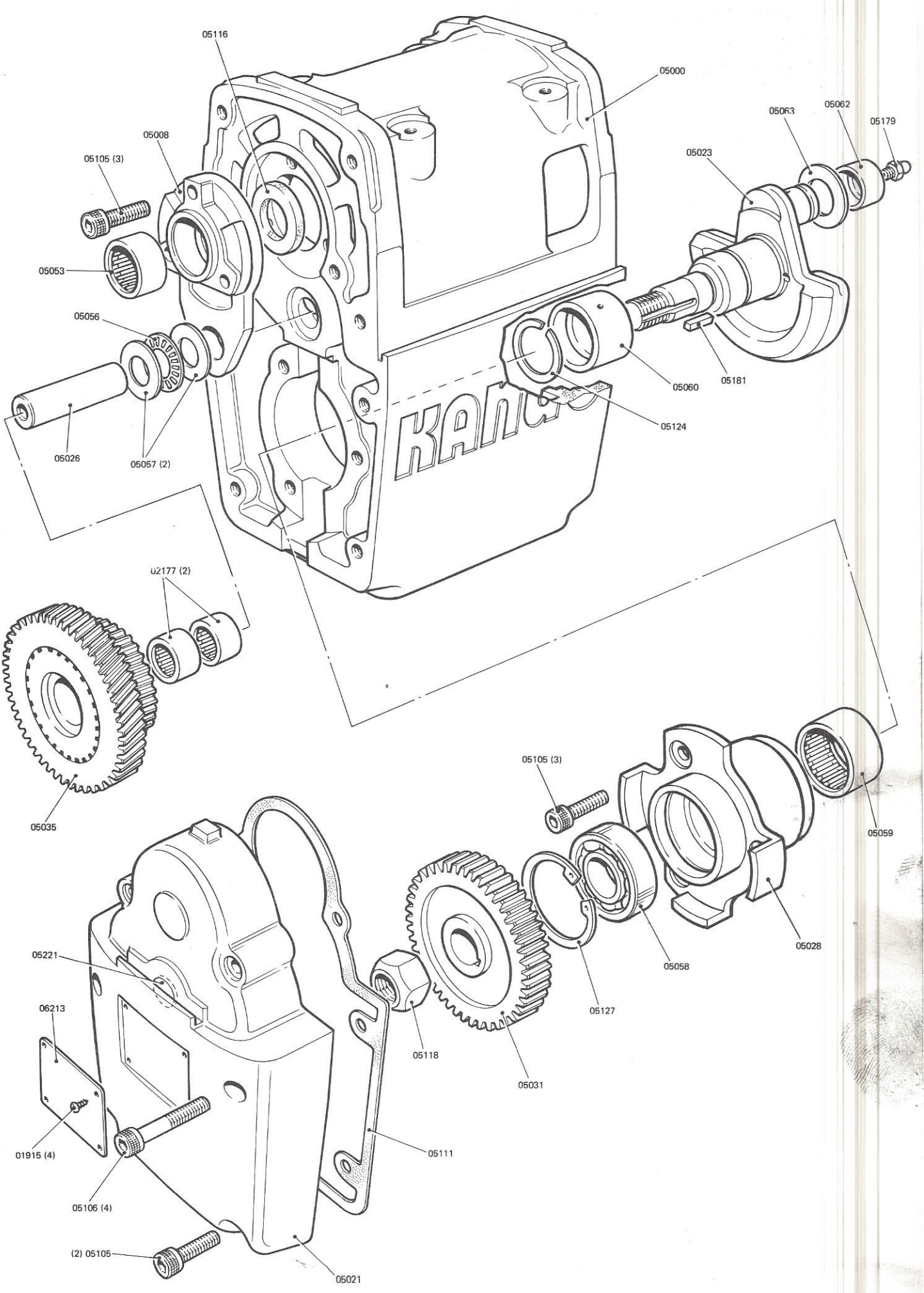

Figure 27 Main Casting, Gearbox and Crankshaft

17.4 Hammer mechanism (see Figure 28)

†03705 Gudgeon Pin
05022 Connecting Rod
05061 Needle Roller Bearing
05063 Thrust Washer
05110 Screw (4)
05112 Barrel Gasket Top
05123 Circlip
05132 Retaining Ring (4)
05211 Piston
05242 Barrel
05244 Striker
†07211 O-Ring (2)
†07212 Piston Seal

†Used on other Kango Hammers or Breakers

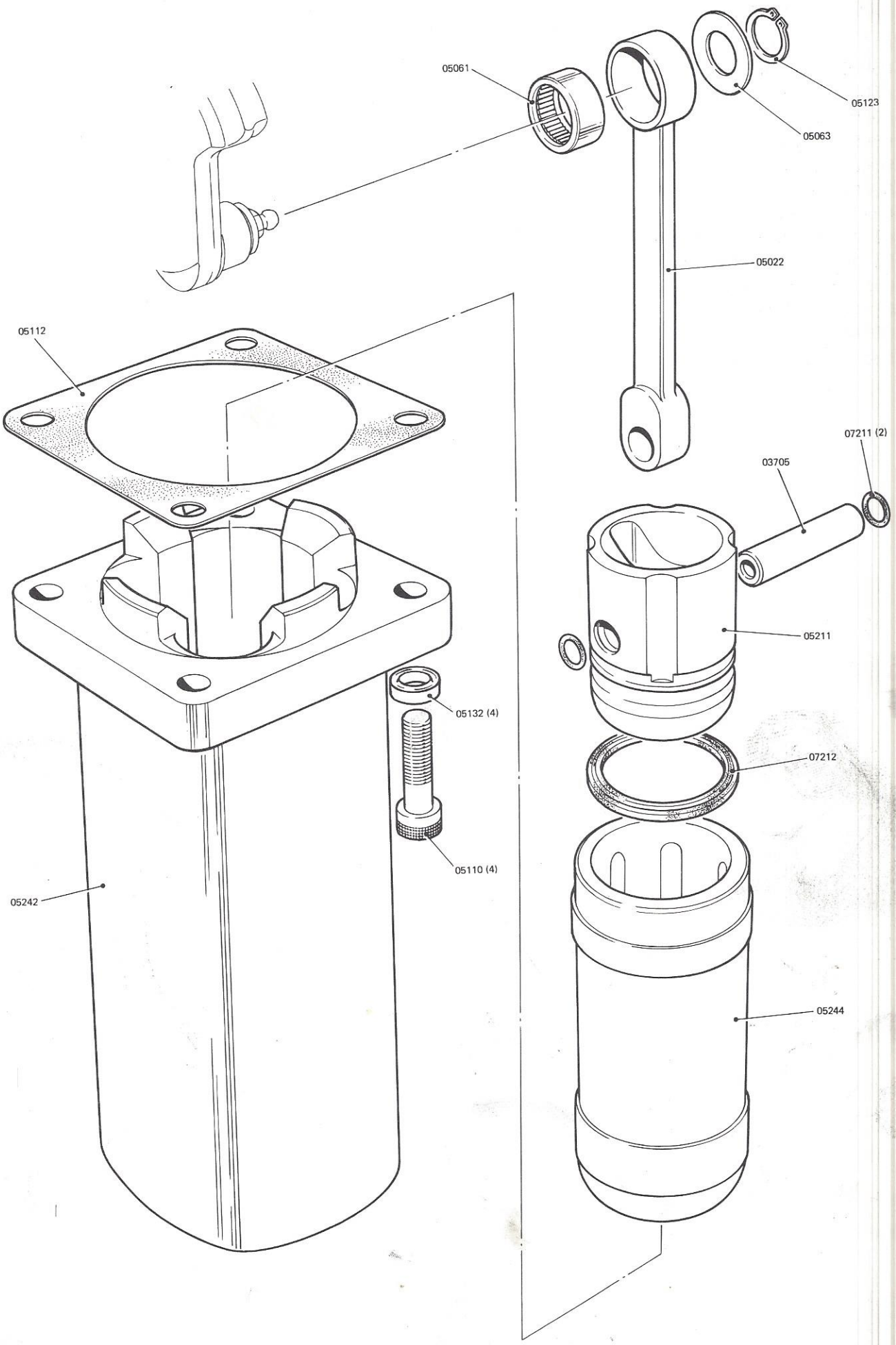

Figure 28 Hammer mechanism

17.5 Transmitter (see Figure 29)

†03817 O-Ring
05002 Nosepiece (32 mm)
05004 Recoil Buffer
05005 Buffer Housing
05006 Anvil
05034 Latch
05064 Tension Pin
05110 Screw (4)
05113 Barrel Gasket Bottom
05132 Retaining Ring (4)
05135 Latch Plunger
05136 Latch Spring
05196 Buffer
05209 Nosepiece (28 mm)

†Used on other Kango Hammers or Breakers

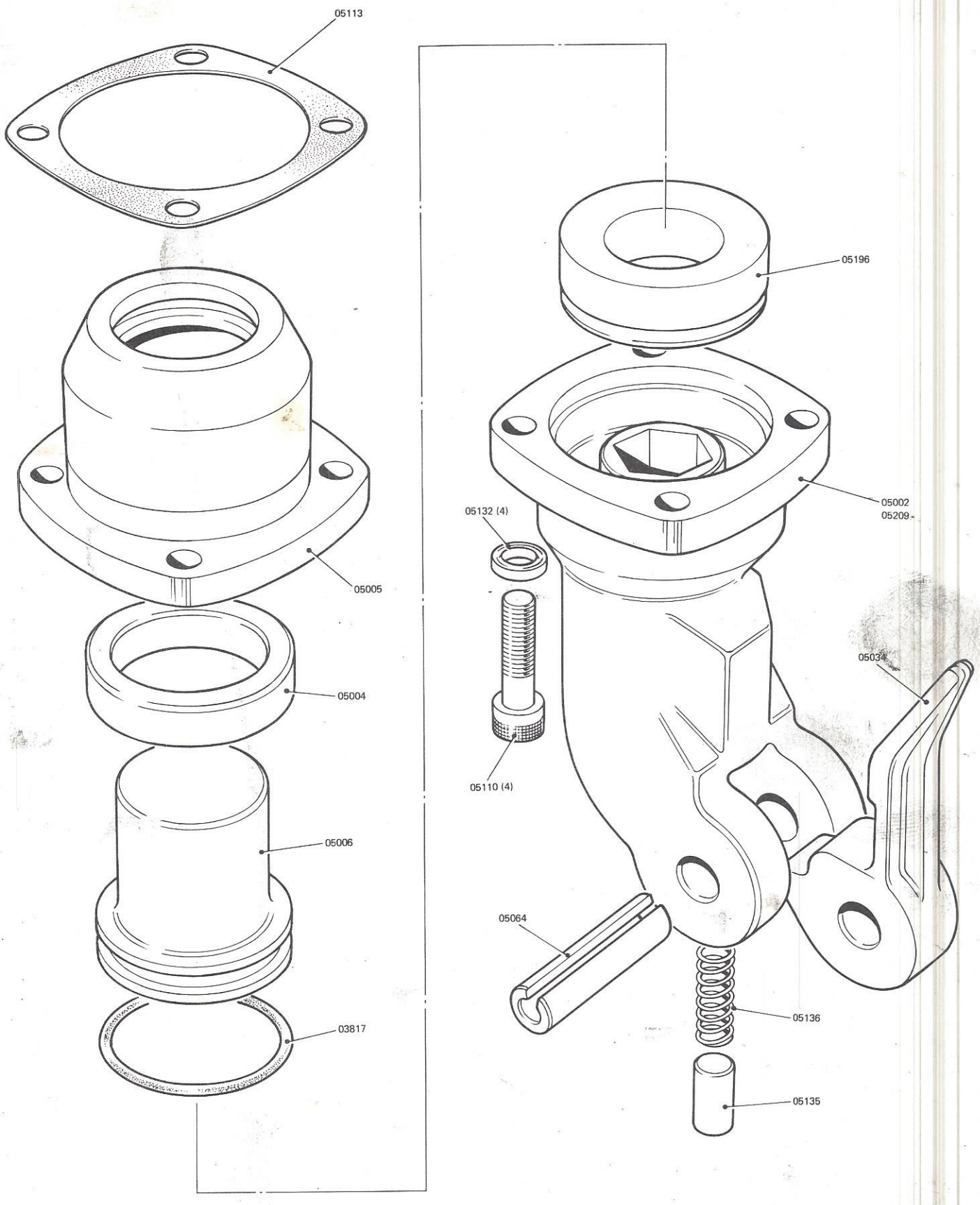

Figure 29 Transmitter

SECTION 18 IDENTIFICATION OF STANDARD PARTS

18.1 Screws, Locknuts and Washers

01915 Plate Fixing Screw	No. 2 x $\frac{3}{16}$'' Pozi-Pan self-tapping screw
01956 Trigger Cap Screw Trigger Retaining Plate Screw	No. 8 x $\frac{3}{8}$'' Pozi-Pan 'Hi-Lo' Screw
01975 Cord Grip Screw	M4 x 20 mm Cheese Head screw
01987 Brush Cap Screw	M4 x 10 mm Raised c/sk screw, lock-patched
01990 Field Coil Clamp Screw	M6 x 100 mm Socket Head Cap Screw
05105 Crankshaft Housing Screw Layshaft Carrier Screw Gear Case Cover Screw Switch Cover Screw	M8 x 25 mm Socket Head Cap Screw, lock-patched
05106 Gear Case Cover Screw Switch Cover Screw Handle Screw	M8 x 45 mm Socket Head Cap Screw, lock-patched
05107 Bearing Holder Screw Top Cover Screw	M6 x 20 mm Pozi-Pan Screw, lock-patched
05110 Nosepiece: Barrel Screw Barrel: Main Casting Screw	M12 x 45 mm Socket Head Cap Screw
05117 Fan Locknut	M10 Prevailing Torque Self Locking Nut
05118 Crankshaft Locknut	M16 Prevailing Torque Self Locking Nut
05132 Retaining Ring	M12 'Dubo' Retaining Ring
05133 Plain Washer	M10 Steel Washer, zinc plated
05183 Trigger Adjusting Screw	M5 x 20 mm Cone Point Socket Set Screw
05192 Field Coil clamp Locknut	M6 Prevailing Torque Nut
06908 Terminal Screw	M4 x 8 mm Pozi-Pan Screw
06917 Switch Box Screw	M5 x 25 mm Pozi-Pan Screw

18.2 Bearings

02177 Layshaft Gear Bearing	Torrington FJ-1512
05052 Armature Ball Bearing	Nachi 6202 ZZ
05053 Pinion Bearing	Torrington FJ-2216
05056 Layshaft Thrust Bearing	Torrington FNTA – 1528
05057 Layshaft Thrust Washer	Torrington FTRA – 1528
05058 Crankshaft Ball Bearing	ISO Ref: BRL – 020
05059 Crankshaft Needle Bearing	Torrington FJ – 3526
05060 Crankshaft Bearing Inner Ring	Torrington RIR – 30 35 26 – OH
05061 Connecting Rod Bearing	Torrington F-2516
05062 Crankshaft Bearing Inner Ring	Torrington RIR – 20 25 17 – OH
05063 Crankshaft Thrust Washer	Torrington FTRA – 2035

18.3 Springs, Pins and Circlips

05020 Trigger Return Spring	Extension Spring, $1\frac{7}{8}$'' long x $\frac{1}{4}$'' outside diameter
05064 Latch Tension Pin	Spring Pin, 18 mm diameter x 65 mm long
05123 Connecting Rod Circlip	External Circlip for 20 mm shaft diameter

05124	Crankshaft Inner Ring Clip	External Circlip for 30 mm shaft diameter
05125	Bearing Holder Circlip	Internal Circlip for 35 mm bore diameter
05127	Crankshaft Housing Circlip	Internal Circlip for 47 mm bore diameter
05136	Latch Spring	Compression Spring, $1\frac{5}{8}$" long x $\frac{5}{8}$" long
05146	Switch linkage Tension Pin	Spring Pin, 5 mm diameter x 20 mm long
05157	Trigger Pivot	Tubular Spacer, $\frac{3}{16}$" diameter x $1\frac{1}{2}$" long

18.4 O-Rings, Seals, Gaskets and other items

03817	Anvil O-Ring	O-Ring, $2\frac{5}{8}$" i.d. x 3" o.d.
05104	Switch Box O-Ring	O-Ring, 4" i.d. x $4\frac{1}{8}$" o.d.
05111	Gear Case Cover Gasket	Klinger Oilit, 0.2 mm thick
05112	Barrel Gasket Top	Klinger Oilit, 0.2 mm thick
05113	Barrel Gasket Bottom	Klinger Oilit, 0.2 mm thick
05116	Pinion Felt Ring	Felt, 21 mm i.d. x 33 mm o.d. x 6 mm thick
05179	Crankshaft Grease Nipple	Nipple to DIN 71412, M8 x 1.25 Taper Thread
05181	Crankshaft Gear Key	Key, 5 mm square x 0.6" long
05221	Gear Case Cover Felt Disc	Felt, 16 mm diameter x 2 mm thick
07211	Gudgeon Pin O-Ring	O-Ring, $\frac{7}{16}$" i.d. x $\frac{5}{8}$" o.d.
07212	Piston Seal	Nu-Lip Ring, $2\frac{1}{8}$" i.d. x $2\frac{1}{2}$" o.d.