

**MMD 154 SERIES
TWIN SHAFT SIZER**

BODDINGTON

SERIAL NUMBER 1540377

**MMD 154 SERIES TWIN SHAFT SIZER
TRIPLE LENGTH , STANDARD CASE ,
6 TOOTH RING , 14 RINGS PER SHAFT.**

SERIAL NUMBERS - 1540377/X451603

**MMD R22 GEARBOX,
150 H.P., 22:1 RATIO.**

SERIAL NUMBER - 7070079

STC 500 FLUID COUPLING.

ELECTRIC MOTOR POPE 150KW D315MD.

THE MMD TWIN SHAFT SIZER

PRINCIPLES OF OPERATION

The MMD Twin Shaft Sizer accepts the product in through the top of the Sizer, delivery being from any angle. The two inward rotating shafts have attached the appropriate sizing teeth which pass the total product, i.e. undersize and oversize inwards and down through the Sizer.

The undersized product is passed through the rotating teeth without further degradation, whilst the oversized product is sized by means of a shearing action, not a crushing action, on the rotating teeth and is then passed to the underside of the Sizer.

Any fines which are attached to the rotating shafts are cleaned off by means of cleaning combs on the side of the Sizer which prevent recirculation of the product.

The flange mounted electric motor lends itself to easy installation on the Sizing unit and requires no alignment as such. The electric motor in turn drives the gearbox via a fluid coupling.

The sizing shafts are supported by heavy duty double spherical roller bearings which are lubricated by grease at both ends of the Sizer. These bearings are protected by heavy duty lip seals and are further protected by a grease filled double labyrinth to prevent the ingress of water, dirt, etc.

The sizing shafts are geared together. This ensures uniform rotation of the shafts relative to one another and maintains the timing of the teeth for gripping and sizing the material.

The actual sizing elements comprise of cast steel teeth which fit on the shafts. The teeth have replaceable caps for maintenance purposes, which are manufactured from manganese steel and thus work harden during operation.

Due to the robust manufacture of the MMD Sizer, there is little or no vibration apparent when the machine is sizing. Maintenance has been kept to a minimum due to the fact that there are only two oil levels on the machine for gear lubrication and only nine greasing points, one greasing point per bearing labyrinth, one point per wheel assembly, and one point on the gear coupling.

MMD TWIN SHAFT SIZER

SAFE OPERATING PROCEDURE

- 1) BEFORE ANY WORK IS CARRIED OUT ON THIS MACHINE, ISOATE THE POWER SUPPLY AND REMOVE THE CABLE FROM THE MOTOR.
- 2) Unless the above operation is carried out, no person or persons shall stand on the machine.
- 3) Installation of safety guards and fences shall be the responsibility of the customer at the time of commissioning.
- 4) During operation of the machine, no person or persons should violate the safety guards and fences in its vicinity.
- 5) Unless otherwise stated, MMD will not be responsible for the safe siting of the machine, and/or any requirements pertaining to operating codes of practice.
- 6) MMD will not be responsible for the use or operation of the machine for any purpose other than the specified/accepted operation requirement in the official order.
- 7) It is understood any maintenance carried out in accordance with this manual shall be by a person or persons qualified to carry out such practice in compliance with the safety requirements of the operating company.

PRE-START CHECK LIST

- 1) Ensure visually that the machine is fully engaged in the working position.
- 2) Check thoroughly to ensure that no person or persons can be injured when the machine starts.
- 3) Check drive components for signs of wear or obvious damage, leaks, etc.
- 4) Check for excess spillage in and around the sizer operating area.

SIZER START-UP PROCEDURE

- 1) Carry out specified pre-start checks.
- 2) Select desired function on control switch, either forward or reverse.
- 3) Machine should now start and the shafts should rotate in the direction desired. If the motor starts but the shafts do not rotate, then the machine is either stalled or the fluid has blown from the fluid coupling.
Refer to Stall Procedure.

COMMISSIONING PROCEDURE

(If the Sizer is removed from the normal position for an extended period to allow for major overhauls or modifications, it will be necessary to re-commission the installation prior to starting up again.)

Mechanical

- 1) Carry out full check of all items against part list and drawings to ensure that everything is installed as per the contract. Visual check only.
- 2) Turn machine shafts by hand using levers through the machine aperture. Check for any obstructions or fouling on the cleaning combs and rotating teeth. Trim as required to achieve free running fit.
- 3) Run machine under no-load conditions for four(4) hours. Check for excessive noise, heat or vibration. Refer to trouble shooting guide if any adverse effects are noted. Rectify as necessary.
- 4) Carry out stall test to re-set fluid coupling.
- 5) Re-site machine and run under full load conditions for eight (8) hours. Check for excessive noise, heat or vibration. Refer to trouble shooting guide if any adverse effects are noted. Rectify as necessary.

UNDERSPEED PROTECTION.

Underspeed protection is provided by an 'Electromatic Brand' inductive proximity switch and relay. (Type DJ10G Sensor and SM105 Relay and Base.) This speed sensing device can be set from 0 - 200 rpm and monitors the sizing shaft speed at the non-driven end of the sizer. The speed sensing device is normally set at zero rpm. In the event of the Sizer going into a stall situation and the shafts stopping, the underspeed sensing device will trip the electric motor driving the Sizer.

If there is an obstruction in the Sizer, this can be removed by reversing the Sizer shafts. Once the obstruction has been cleared or removed, the Sizer can be restarted.

REPLACING UNDERSPEED SENSOR.

Should the underspeed sensor become inoperative, it will be necessary to replace it. To do this, the machine must be in the maintenance position. The machine must be isolated electrically so that the machine cannot be started accidentally whilst work is being carried out.

- 1) Disconnect electric leads
- 2) Loosen locknut and unscrew the detector head..
- 3) Refitting is a reversal of the above procedure. However, care must be taken to ensure that the sensor head is within 7mm of the stud in the end of the breaker shaft, which provides the pulse every revolution.

SETTING UNDERSPEED RELAYS.

The time delay relay should be set in accordance with the local electrical supply to allow the motor to run up to full speed before energising the tachometer relay. This relay can be checked by turning the dial to zero, and trying to start the machine. The motor will start and stop again almost immediately.

The tachometer relay should be set to five (5) seconds on the front dial. This means that if the relay does not count a pulse for five (5) seconds, it will stop the motor. This relay can be checked by setting it to zero and trying to start the machiner whilst it is in a stalled condition (Stall test). The motor should start and stop again almost immediately.

OVERLOAD SAFETY SYSTEMS

1) MECHANICAL

Mechanical overload is taken up by use of a fluid coupling mounted to the input shaft of the gearbox and the output shaft of the motor.

A fusible plug is screwed into the fluid coupling. The purpose of this fusible plug is to provide an additional safeguard to the motor and prevent overheating in the event of a prolonged stall or failure of the motor overload trip.

The plug contains a fusible alloy which melts at a set figure and allows the fluid in the fluid coupling to escape thus removing the load from the motor and allowing it to run free.

After a fusible plug failure, the fault must be corrected, a new fusible plug fitted and the fluid coupling refilled with clean fluid in accordance with the fluid coupling manual.

2) ELECTRICAL

Fitted to the blind end of the sizer is an underspeed sensing device. The purpose of the underspeed sensing device is to notify the operator that the breaker shafts have stopped rotating (i.e. stalled). This is achieved by the pick up on the breaker shafts passing through the magnetic field of the close proximity sensor, therefore inducing an electrical impulse to the monitoring system.

Should the breaker shafts stop rotating, the monitoring system will instantly trip the electric motor.

The power supply to the electric motor must be isolated and a manual inspection can be carried out to identify the fault.

SIZER STALL TEST

After every operating stall and after any major overhaul, the fluid coupling must be re-set to give maximum torque. This is achieved by carrying out the following steps:

- 1) Isolate the machine electrically.
- 2) Position fluid coupling in the housing so that the filling plug is accessible in the access flap.
- 3) Remove filler plug.
- 4) Position the filling hole as indicated in the fluid coupling manual and fill until the coupling will accept no more fluid in this position.
- 5) Replace the filler plug .
- 6) Place a large metallic object (piece of heavy column or beam) between the sizer shafts.
- 7) Re-connect the power to the machine.
- 8) The next operation requires two men and a tachometer and is carried out as follows:
 - (a) Select the start position on the control switch, and run the motor until a steady reading is obtained on the tachometer.
 - (b) Stop the motor.
 - (c) See fluid coupling manual with regard to typical torque/output speed characteristics
- 9) If the tachometer reading is below the specified motor rpm, allowing for voltage drop, release fluid from the coupling. If it is more than the specified motor rpm, add fluid to the coupling. Repeat this process until a steady reading is achieved for the motor manufacturers recommended rpm for maximum torque
- 10) Remove obstruction from between sizer shafts.

TROUBLE SHOOTING GUIDE

It is recommended that a daily check be made for any excessive noise, vibration, lubricant leaks or obvious damage. The following hints should help in determining the source of any unusual feature:

- 1) Noise -When an unusual noise is heard, it is important to determine quickly what is causing the noise so that action can be taken. There are basically two speeds to consider:

(a)High speed end (Motor)

(b)Low speed end (Shafts)

First step is to determine the speed of the noise. It will be a regular noise in either the machine aperture or the drive train. If it is a slow rhythmic noise, it is likely to come from the shafts. This could indicate that there is a broken or loose bolt. Fully check the machine, the machine aperture with no material passing through to determine the cause.

If the noise is high pitched, rapid knock or whine, it is coming from the drive train. Starting from the motor, work along the transmission to determine the cause of the noise. The obvious causes would be faulty bearings in the motor, fluid coupling or gearbox: damaged gears; lack of lubricant or ingress of dust into rotating parts.

- 2) Vibration - A similar check list is used as when tracking down an unusual noise.

However, most excessive vibration is caused by either faulty main shaft bearings or faulty gearbox bearings. These items should be checked first by checking the temperature on the frame of the machine adjacent to the shaft bearings and on the casing of the gearbox.

- 3) Lubricant Leaks - It is essential that all lubricants be fully checked and replenished in accordance with the service manual recommendations. If any leak is found, action must be taken immediately to correct it, i.e. find source of leak, determine cause of leak by reference to manual and identify parts required to rectify leak. When this has been done, the machine must be stopped at the first opportunity so that the work may be carried out.
- 4) Obvious Damage - 99% of the obvious damage occurring in MMD machines is inside the machine aperture caused by tramp iron. Broken or cracked teeth and bolts are the most common. A visual inspection will determine the cause.

In all the above cases, advice may be obtained direct from MMD if there is any doubt whatsoever.

WEAR PLATES

The 154 Series Sizer has wearplates on the inside of the machine aperture as follows:

Drive end	Top & bottom end plates.
Non-drive end	Top & bottom end plates.
Sides-	4 x Top & bottom plates

To remove wearplates, the following procedures must be followed:

- a) To remove the Side Wear Plates, it is necessary to remove the countersunk retaining bolts and then prise the plates away from the side of the machine.
- b) Drive and Non-Drive End Wear Plates
 - 1) Remove fixing bolts from each wear plate.
 - 2) Break the grip with steel wedges and prise away from the machine.
 - 3) Top plates can be lifted out of the machine.
 - 4) Bottom plates must be tapped downwards and tilted in towards the centre of the aperture. This will allow them to be freed.
 - 5) Re-fitting is a reversal of the above.
- c) Things to check
 - 1) Depth of wear - any wear plate with a hole worn through or 15 mm of wear should be replaced.
 - 2) Clearance of rotating teeth on side of machine when wear plates are re-installed. A minimum of 2 mm gap is required.

SHAFTS

In the event that a breaker shaft becomes damaged, it will be necessary to remove it from the machine and replace it with a new one. The procedure used to accomplish this is as follows:

- a) Remove top and bottom wearplates from both ends of the machine.
- b) Remove top and bottom cover plates from both ends of the machine.
- c) Remove the end cover plate, at the spur gear end of the machine.
- d) Remove the clamping rings from the gear coupling and slide the sleeve back towards the gearbox. This action disconnects the drive train from the breaker shafts.
- e) The transfer gear on the damaged shaft should now be removed. This is achieved by using 2 x 20 mm eye bolts in the holes provided. The gear simply slides off the spline.

N.B. This is a two (2) man operation and care should be taken not to damage the gear as it disengages from the spline.

- f) Remove the bolts from the top half of the top bearing shell on each end of the machine.
- g) Using two 20mm eye bolts, lift out the top bearing shells. The shaft assemblies are now exposed.
- h) The damaged shaft can now be lifted out by means of nylon webs slung at either end.
- i) Once the shaft is removed, the bearing assemblies, labyrinth seals, tooth rings must be removed by using a 70 tonne hydraulic press.
(see section on Replacing Main Shaft Bearings.)

Replacement is a reversal of the above procedure.

MAIN SHAFT BEARINGS

These bearings are rated to last for five (5) years under specified conditions. However, there could be bearing failures for such reasons as worn or damaged seals, insufficient lubrication etc. MMD recommend the use of a shock pulse meter or bearing analyser to determine the condition of each bearing on a regular basis. A typical device is the SKF SPM 43A. The bearing must always give a reading in the green or yellow range. Any reading in the red must be dealt with immediately. To replace a worn or damaged bearing, the following procedure must be followed:

- a) Follow the procedure for removing the shafts until the shafts are fully exposed.
- b) Use a wire sling on the overhead crane to raise the shaft at the end with the damaged bearing such that the bearing capsule is clear of the bottom bearing shell.
- c) Using an MMD bearing pulley or similar device plus a 70 tonne hydraulic jack, the complete bearing assembly must be pulled from the end of the shaft, after first removing the end plate.
- d) This will leave the old labyrinth still attached to the shaft. It must be checked visually and dimensionally against the drawing to check for excess wear.
(See heading Things to Check)
- e) The damaged bearing assembly may now be dismantled:
 - i) Remove retaining plate
 - ii) This automatically removes the two outer seals and the seal spacer.
 - iii) Place 4 M12x120 hexagon head bolts in the end of bearing capsule.
Stand assembly on floor using bolts as feet.
Pick up and drop.
The damaged bearing should fall out of the capsule.

THINGS TO CHECK

- 1) Labyrinth check for scoring on seal surface. Also check for any wear on labyrinth shoulders. If any dimension has been reduced by 30% or there is any scoring on the seal surface, then the labyrinth must be replaced.
- 2) Seals check condition of all lips and all springs. If there is any sign of damage at all, the seals must be replaced. As a company policy, MMD recommend that all seals be replaced when they are removed for any reason.
- 3) Seal spacer if there is any scoring on the face of this spacer, it must be replaced. MMD always recommend that the O'ring be replaced whenever this spacer is removed for any reason.
- 4) Bearing capsule - if there is any obvious damage or any sign that the bearing has been turning in the capsule, then it must be replaced. The tolerance between the bearing and capsule is very fine (0.3 mm tap in fit) and any damage inside this capsule is not acceptable.
- 5) Dowel - check for any signs of damage on the vertical sides of the dowel. If the capsule has been trying to turn, there will be indentations approximately half way up its length. If these are evident, then the dowel must be replaced.

RE-ASSEMBLY

Assuming the worst condition that every item must be replaced, the following procedure must be followed:

- 1) Remove old labyrinth from shaft, using oxy-acetylene cutting equipment to heat the labyrinth, and then knock off. Care must be taken to ensure that no damage is done to the shaft.
- 2) Assemble all parts required in the following order:
 - a) Labyrinth
 - b) Capsule
 - c) Seals
 - d) Bearing
 - e) Dowel and bonded seal
 - f) Seal retaining plates
 - g) Spacer and O-ring.
- 3) Warm the labyrinth in an oil bath up to 100C.
Remove from bath and push onto shaft immediately.
Labyrinth will stop at the raised shoulder and will not travel any further.
- 4) Fit the inner seals into the bearing capsule.
These are a tap in fit and the lips must be both faced towards the labyrinth.
- 5) Coat the inside of the capsule sparingly with a suitable anti-seizing agent.
- 6) Fit the bearing into the capsule.
This is a gentle tap in fit and a soft wooden drift must be used.
The bearing must seat fully home in the capsule.
- 7) Fit the new dowel into the hole in the bottom well of the bearing shell, with the bonded seals.

- 8) Warm the bearing and capsule in an oil bath to 100C.
Remove from bath and immediately push on to shaft.
Care must be taken as the seals engage the labyrinth spacer and the assembly must be 'felt' into position. The assembly will seat fully home once engaged onto the seal surface of the labyrinth spacer as the furthest extremity of the labyrinth locates firmly against the inner race of the bearing.
Ensure that the dowel hole is at six o'clock on the shaft.
- 9) Fit the two outer seals into the seal retaining plate ensuring that the lips face towards the bearing.
- 10) Push the seal retaining plate onto the shaft upto the capsule and bolt together.
- 11) Fit the spacer and O'ring together.
Push the assembled spacer onto the shaft ensuring that the O'ring is nearest to the bearing and not the spline on the shaft.
- 12) Test grease the bearing from the side of the machine to check for a free flow of grease through the casting.
- 13) Lower the shaft into position and ensure that the capsule locates with the dowel and grease comes through the bearing.
- 14) Re-assemble the machine in reverse sequence
(see Shaft Removal Section).

FLUID COUPLING

The coupling has a splined female bore which mounts directly on to the input shaft of the MMD gearbox with no alignment necessary. The input side has a driving hub which is driven by a separate boss mounted directly onto the keyed motor shaft. The boss drives the coupling via pins shrouded with a heavy duty neoprene bush.

The fluid coupling is a failsafe device which ensures that no mechanical damage can occur to the machine. The working chamber of the coupling houses a runner and an impellor with no mechanical connection other than the viscosity of the driving medium which can be mineral oil or water depending on the type of fluid coupling required.

In the event of an operating stall, the shafts would stop turning. This stopped motion would be transferred through the gearbox to the driven side of the fluid coupling. However, the driving side of the coupling would continued to rotate. This action generates heat inside the coupling up to a point where the fusible plug safety device will blow and release the fluid.

MMD TWIN SHAFT SIZER

MAINTENANCE SCHEDULE

N.B.

BEFORE ANY WORK IS CARRIED OUT ON THIS MACHINE, ISOLATE THE POWER SUPPLY AND REMOVE THE CABLE FROM THE MOTOR.

DAILY:

Visual and audible examination for excessive vibration or noise.

Grease four main breaker shaft bearings until grease is visible from labyrinth seals on ends of breaker shafts.

Recommended Lubrication: Silkolene G62 Lithium Grease

Recommended Equivalent Century Lupus Regular A2 Lubricating Grease

Due to the harsh working conditions it is necessary to apply regular amounts of grease to the seals, so MMD recommend 5cc of grease to each bearing per day, that is 5 strokes of a grease gun to each bearing per day.

Check Gearbox and blind end spur gear oil levels and top up as required.

Recommended Lubrication: Croda Gear LT 98 to ISO 320

Recommended Equivalent: Shell Omala 220.

Check teeth caps and fixings for damage and replace as required.

MONTHLY:

As daily plus the following.

Grease gear coupling and wheel carriages at 1/4" BSP grease nipples

Recommended Lubrication: Silkolene G55T Lithium Grease

Recommended Equivalent: Century Lupus A2 Lubricating Grease

Stall test fluid coupling, adjust level as required.

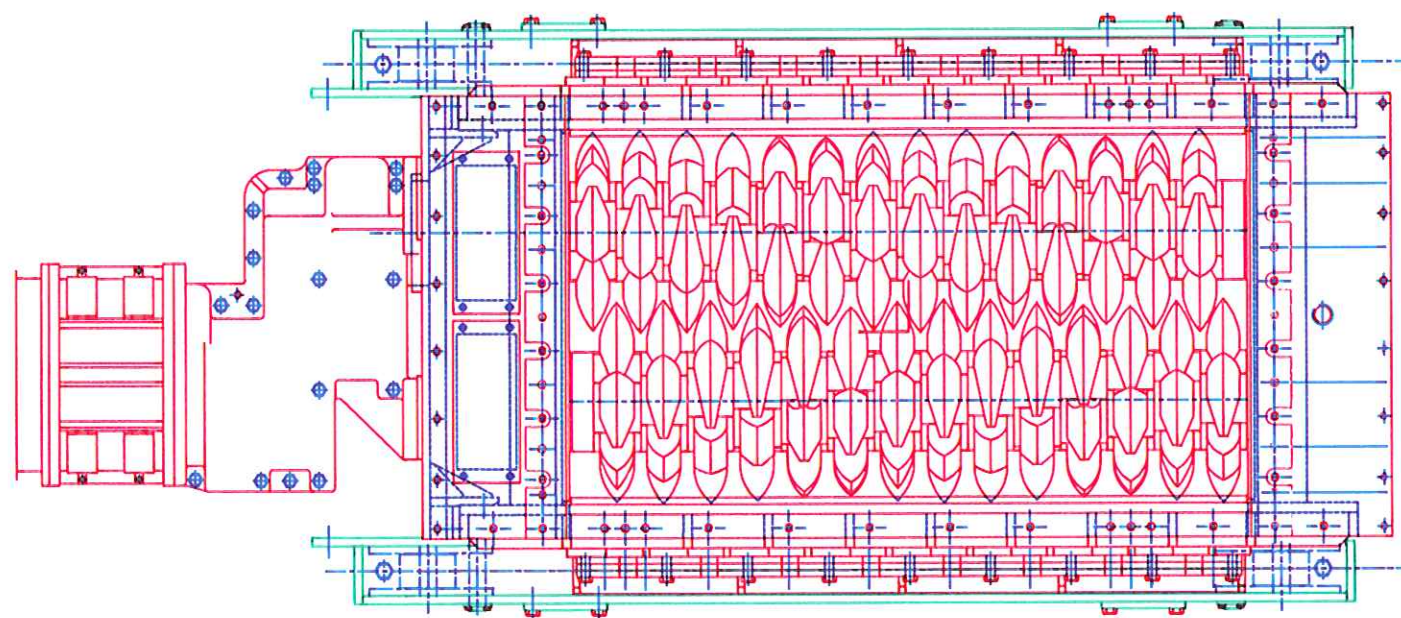
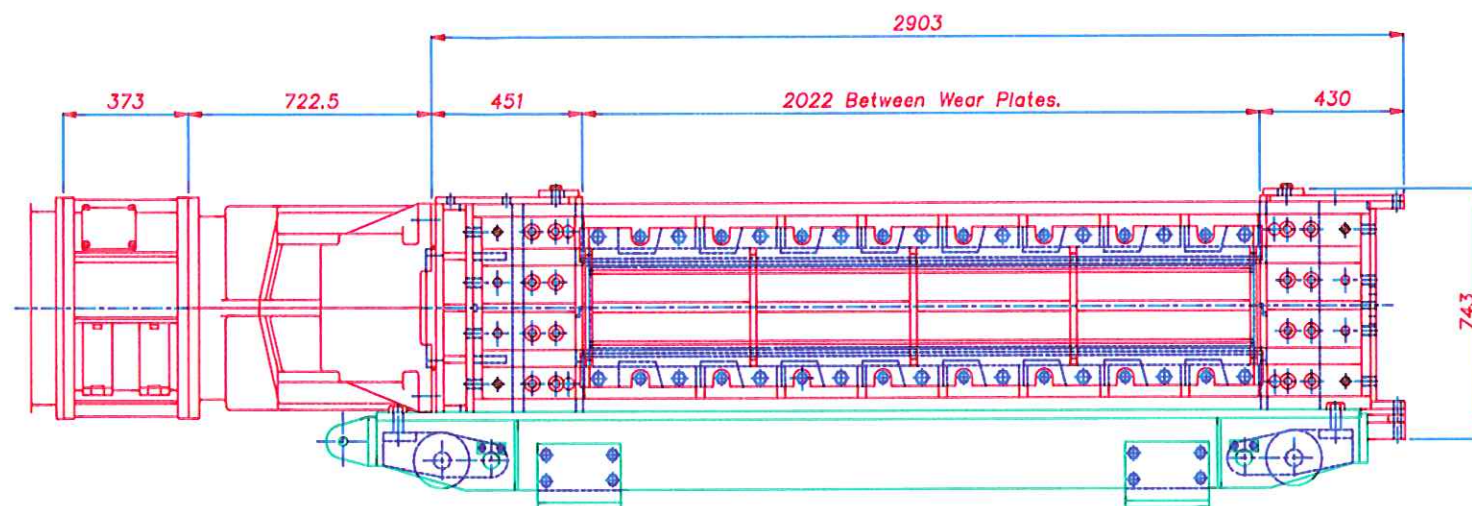
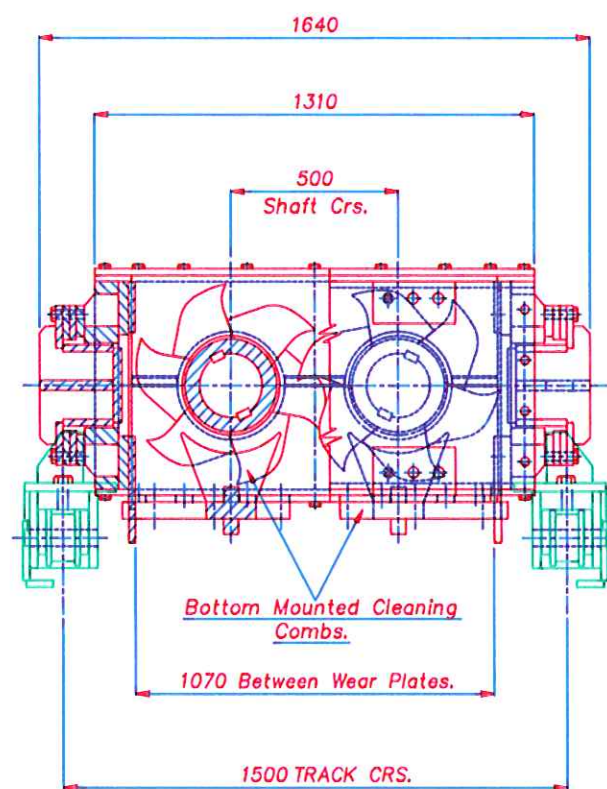
This should also be done on installation and after every fusible plug failure, see Fluid Coupling manual

Recommended Lubrication: Derwent 46 Hydraulic Oil.

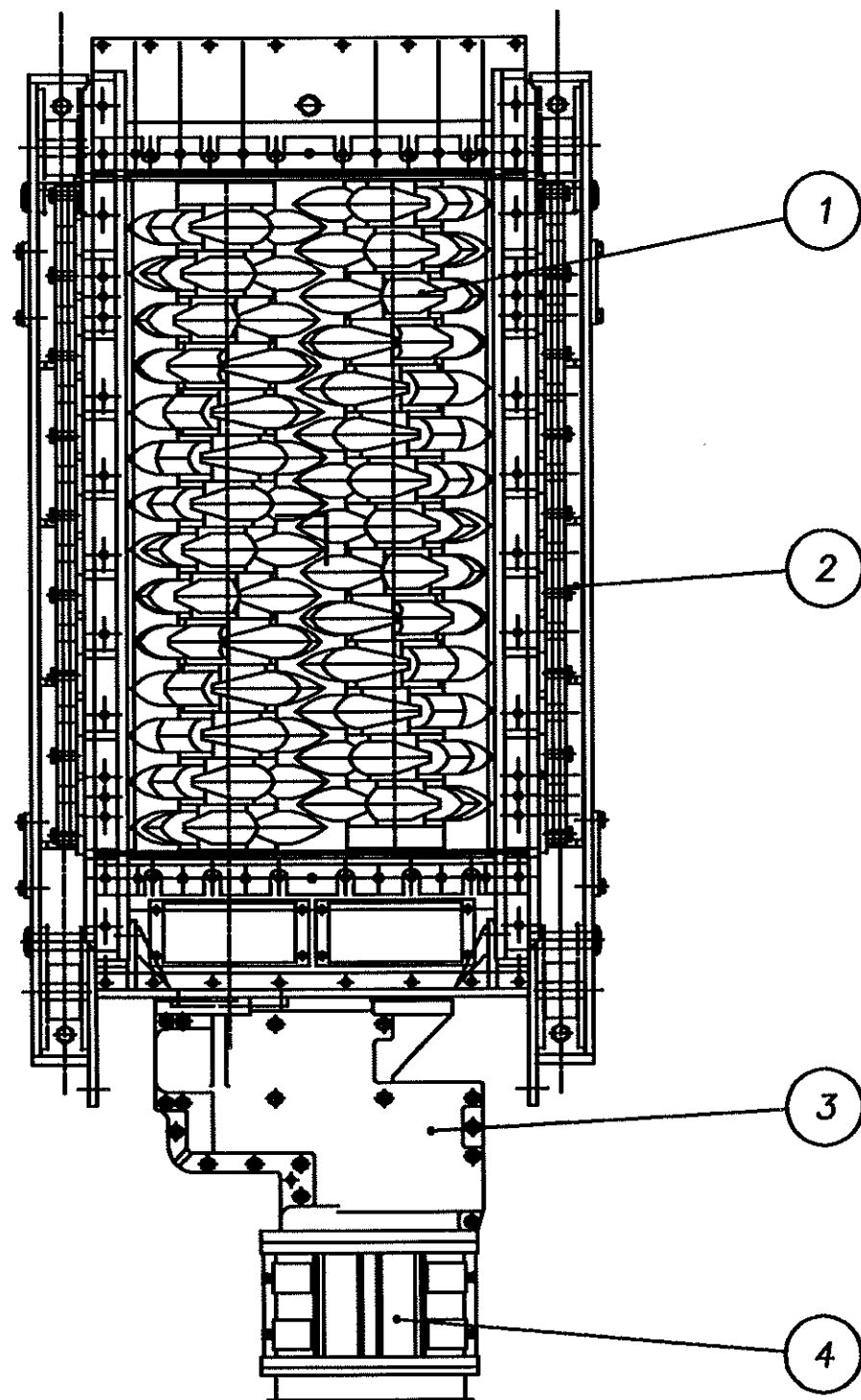
Recommended Equivalent: Shell Tellus 46.

Quantity: 475 STC to suit 150hp motor , 3.5 gallons/15.9 litres

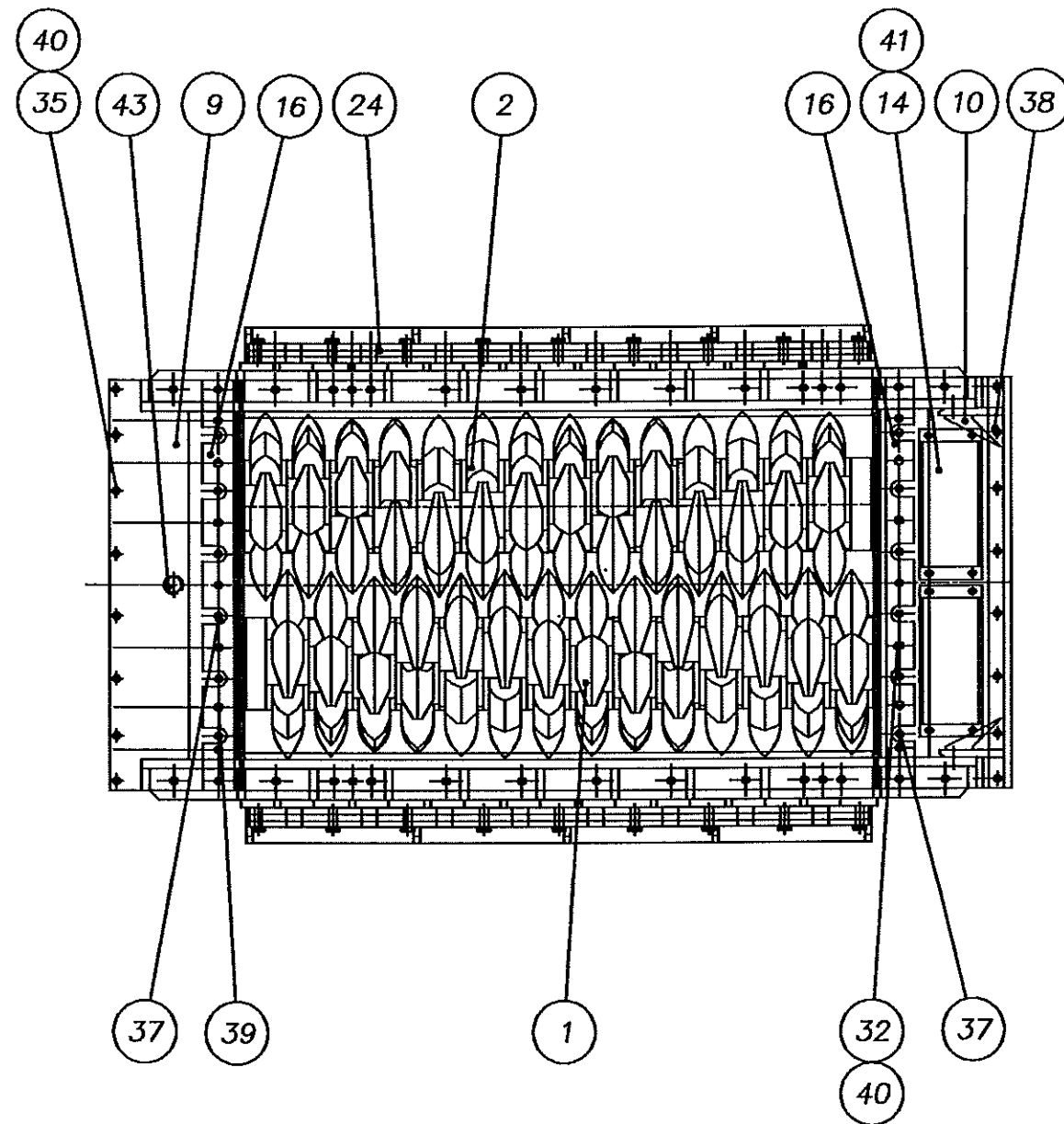
500 STC to suit 200hp motor , 4 gallons/18.2 litres



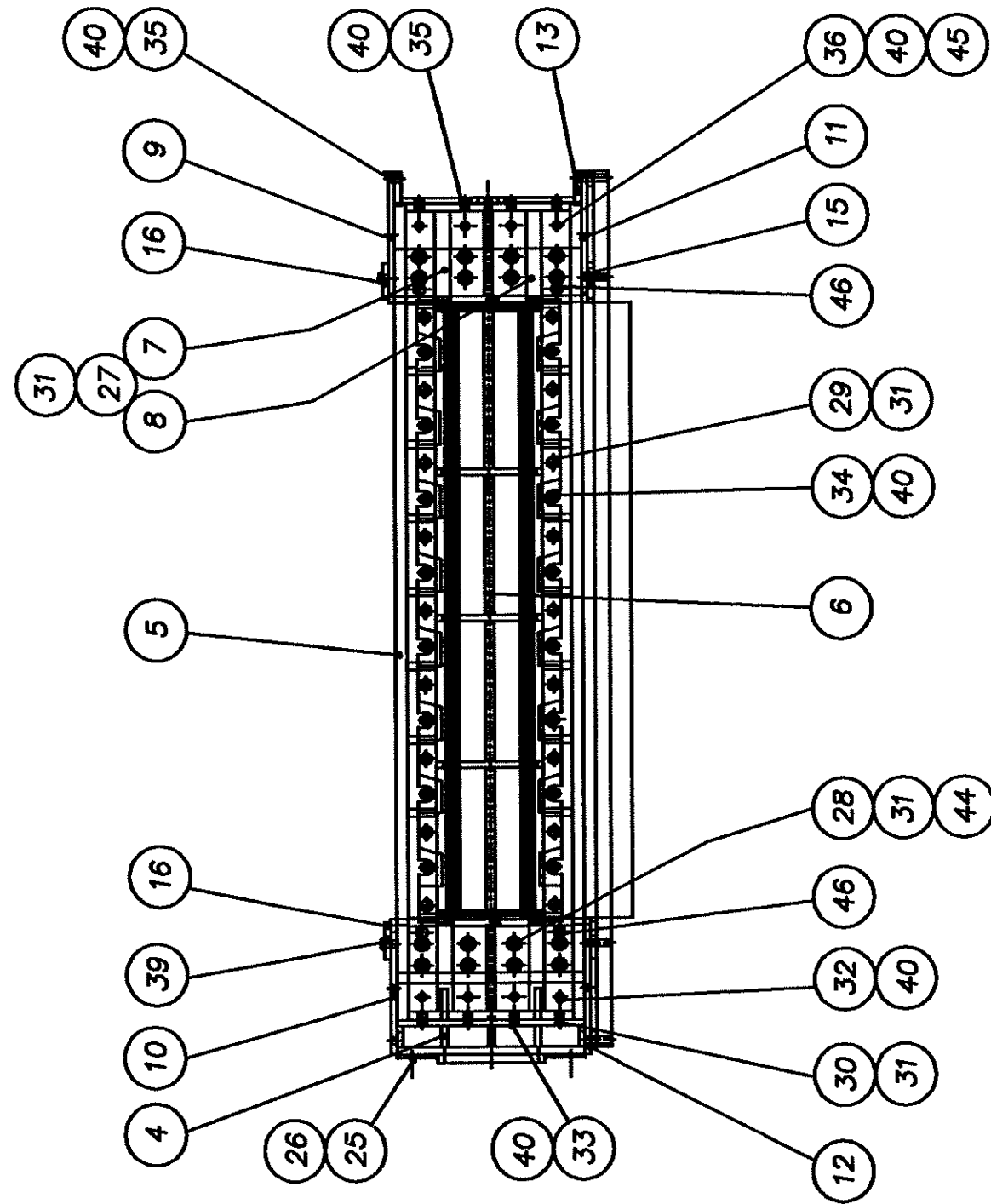
MMD MINING MACHINERY DEVELOPMENTS LTD.
Twin shaft sizer assembly. Part number 991540377



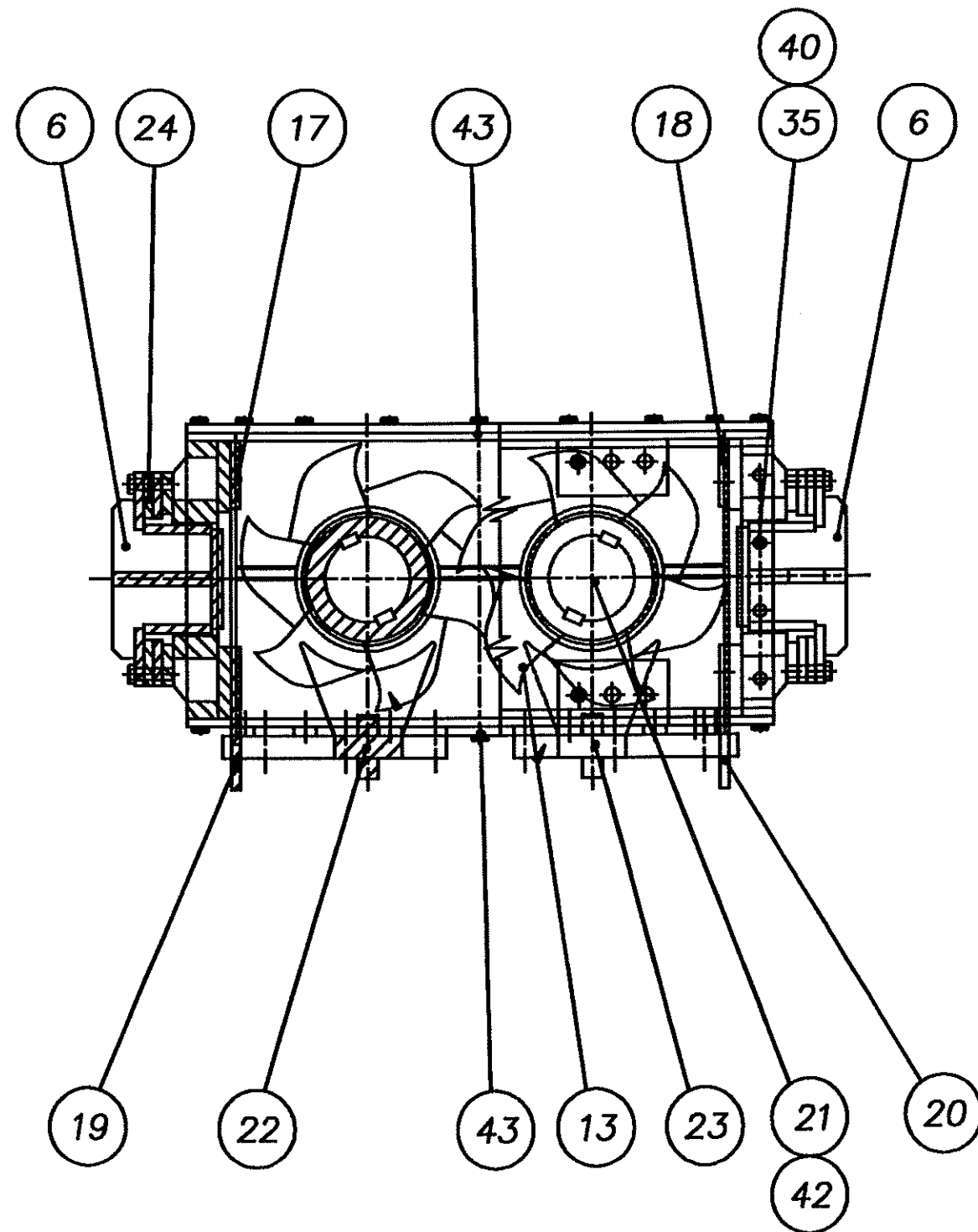
ITEM	PART No.	DESCRIPTION	QTY
1	341540377	Case assembly	1
2	141549064	Wheel carriage assembly	1
3	247070200	MMD R22 22:1 150 hp Gearbox	1
4	141548709	STC 500 Fluid coupling assembly	1

Part Number 341540377

MMD MINING MACHINERY DEVELOPMENTS LTD
Case Assembly Part Number 341540377



MMD MINING MACHINERY DEVELOPMENTS LTD
Case Assembly Part Number 341540377



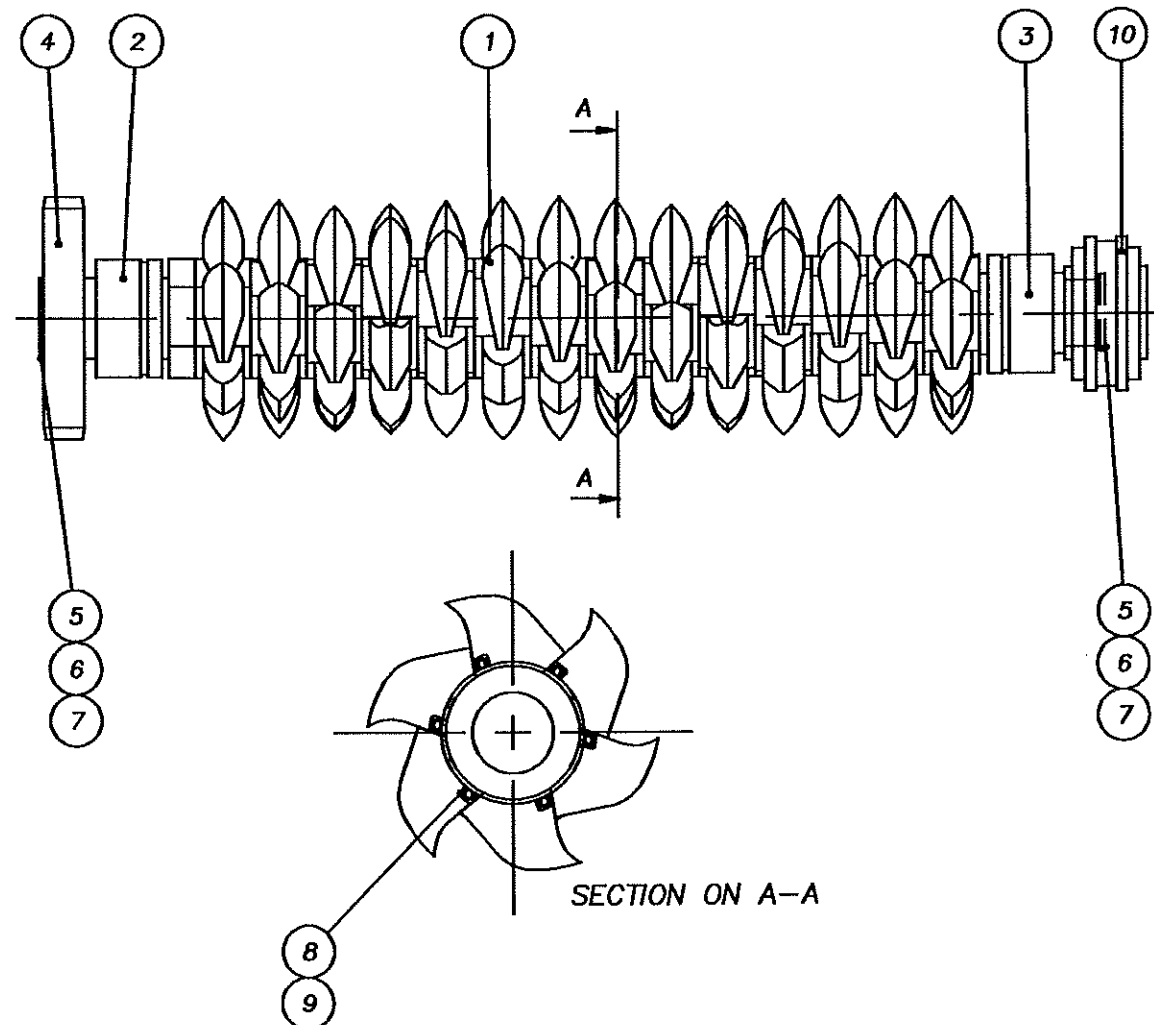
MMD MINING MACHINERY DEVELOPMENTS LTD.

ITEM	PART No.	DESCRIPTION	QTY
	341540377	CASE ASSEMBLY	
		Comprising:	
1	241548714	Breaker shaft assembly - Drive	1
2	241548715	Breaker shaft assembly - Driven	1
3	243210006	Speed sensing assembly	1
4	851544304	Gearbox mounting plate	1
5	851544043	Side plate	2
6	851544596	Infill box	2
7	064001960	Bearing housing - top	2
8	061543854	Bearing housing - bottom	2
9	051540870	Top cover plate - blind end	1
10	051544238	Top cover plate - drive end	1
11	051548498	Bottom cover plate - blind end	1
12	051548497	Bottom cover plate - drive end	1
13	851544114	End cover plate	1
14	041544239	Inspection cover	4
15	851548493	Bottom wear plate	2
16	854001360	Top wear plate	2
17	044006590	Side wear plate	1
18	044006589	Side wear plate	1
19	041548657	Side wear plate	1
20	041548658	Side wear plate	1
21	014006441	Cover plate	1
22	061544889	Bottom cleaning comb	1
23	061544890	Bottom cleaning comb	1
24	044008327	20 mm Packer	4
25	030330110	M30 x 110 HT Bolt	8
26	031430000	M30 Nyloc nut	8
27	030324110	M24 x 110 HT Bolt	16
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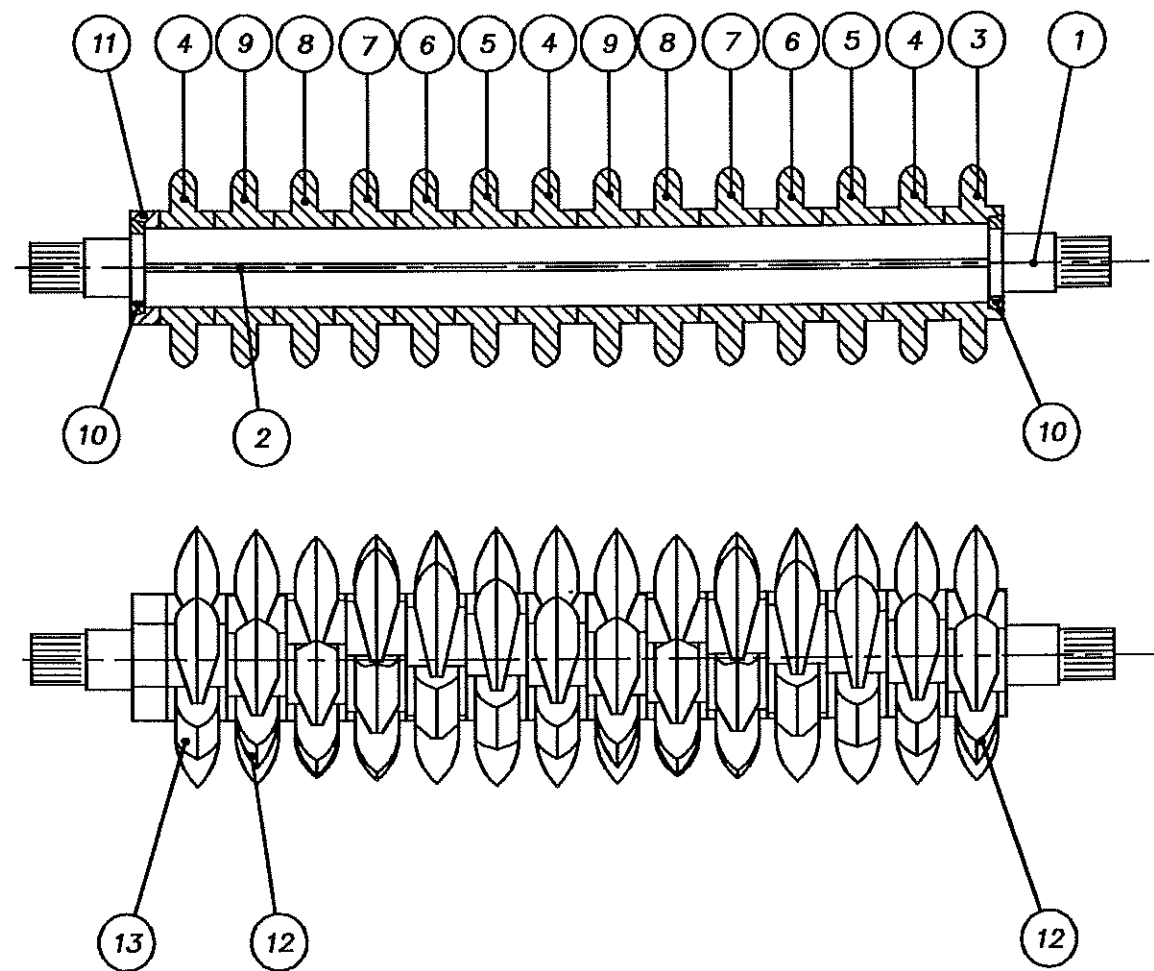
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MMD MINING MACHINERY DEVELOPMENTS LTD.
Breaker shaft assembly-Drive Part number 241548714



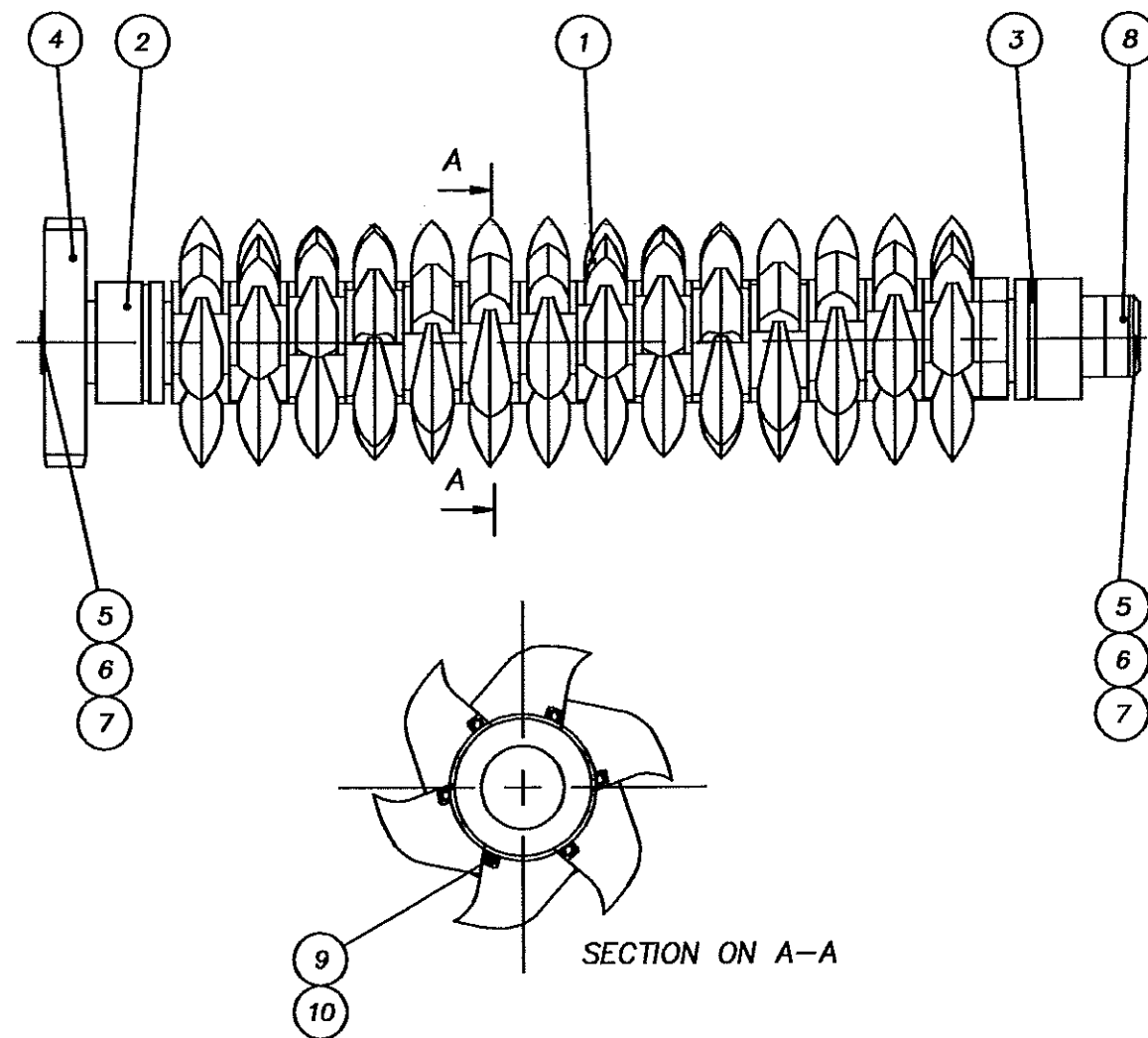
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1	141548714	Breaker shaft assembly	1
2	141540800	Fixed bearing assembly	1
3	141540810	Floating bearing assembly	1
4	011540150	Spur gear	1
5	011080090	End cap	2
6	034120050	M20 x 50 Csk. socket screw	2
7	031706040	6 dia. x 40 long Sel-loc pin	2
8	030520070	M20 x 70 Socket capscREW	84
9	031420000	M20 Nyloc nut	84
10	111090000	Gear coupling assembly	1

MMD MINING MACHINERY DEVELOPMENTS LTD.
Breaker shaft assembly-Drive Part number 141548714



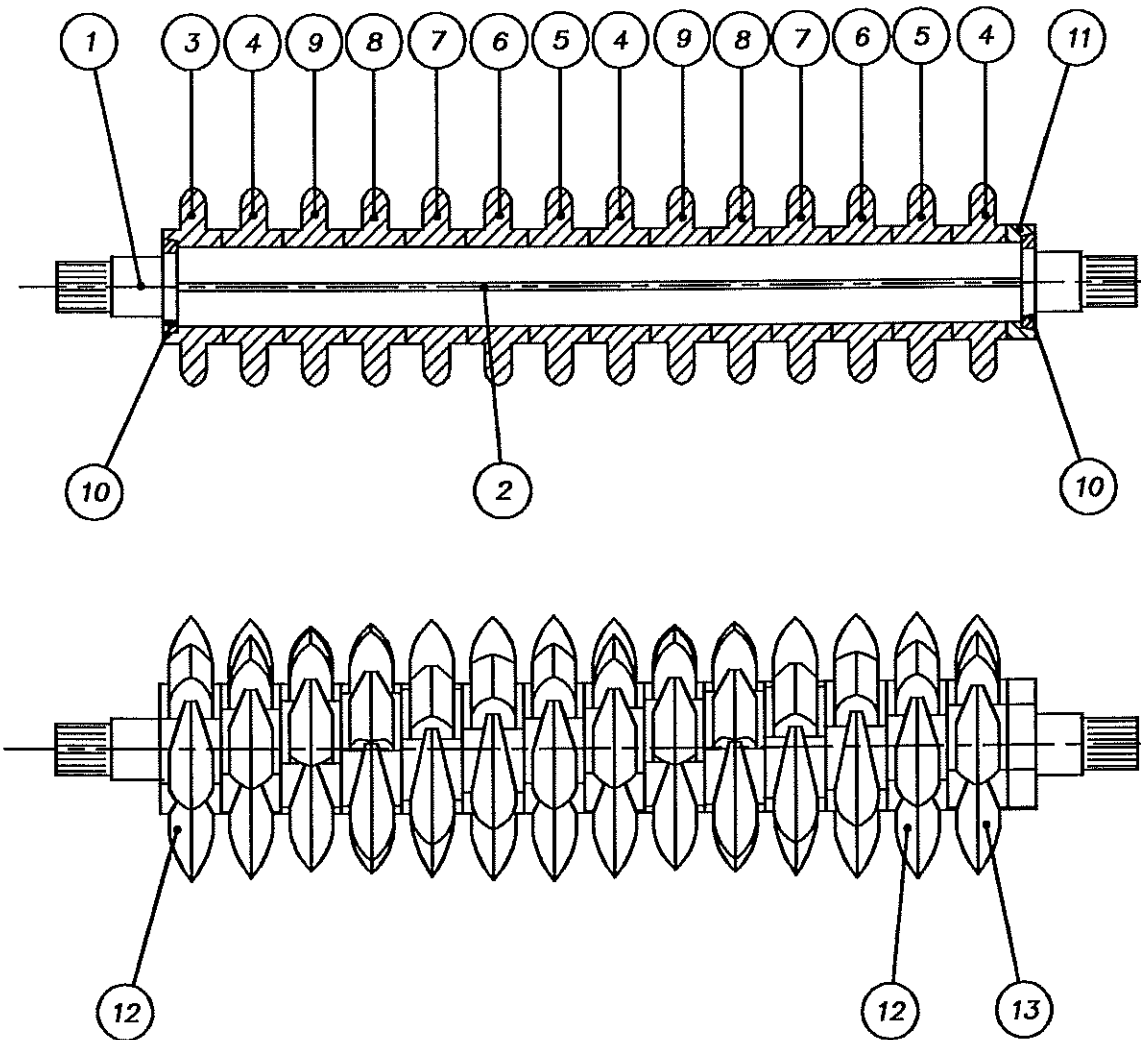
ITEM	PART No.	DESCRIPTION	QTY
1	064008266	Breaker shaft	1
2	014008321	Key	2
3	064008272	Tooth ring	1
4	064008273	Tooth ring	3
5	064008274	Tooth ring	2
6	064008275	Tooth ring	2
7	064008276	Tooth ring	2
8	064008277	Tooth ring	2
9	064008278	Tooth ring	2
10	014008144	Screwed collar	2
11	014008280	Spacer	1
12	014009015	5" Tooth cap	78
13	844009046	5" Extended tooth cap	6

MMD MINING MACHINERY DEVELOPMENTS LTD.
Breaker shaft assembly-Driven Part number 241548715



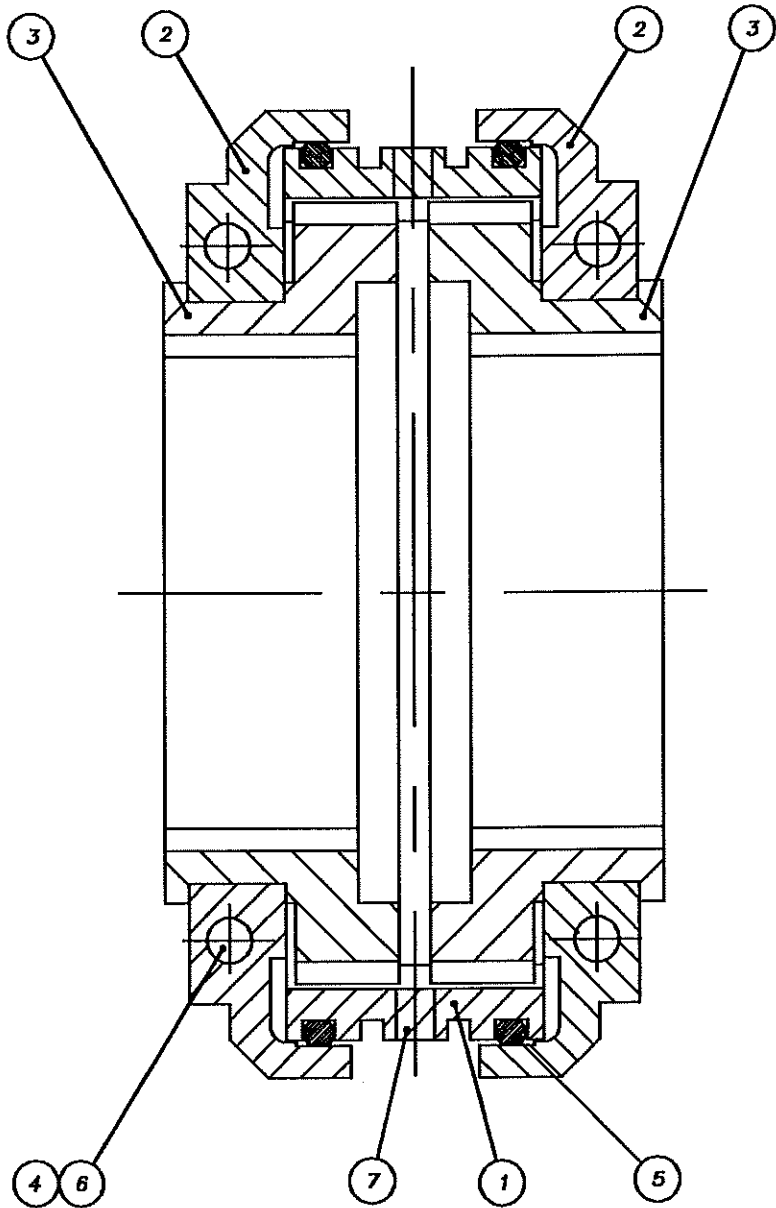
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1	141548715	Breaker shaft assembly	1
2	141540800	Fixed bearing assembly	1
3	141540810	Floating bearing assembly	1
4	011540150	Spur gear	1
5	011080090	End cap	2
6	034120050	M20 x 50 Csk Socket screw	2
7	031706040	6 dia. x 40 long Sel-loc pin	2
8	011544045	Spacer	1
9	030520070	M20 x 70 Socket capscrew	84
10	031420000	M20 Nyloc nut	84

MMD MINING MACHINERY DEVELOPMENTS LTD.
Breaker shaft assembly-Driven Part number 141548715



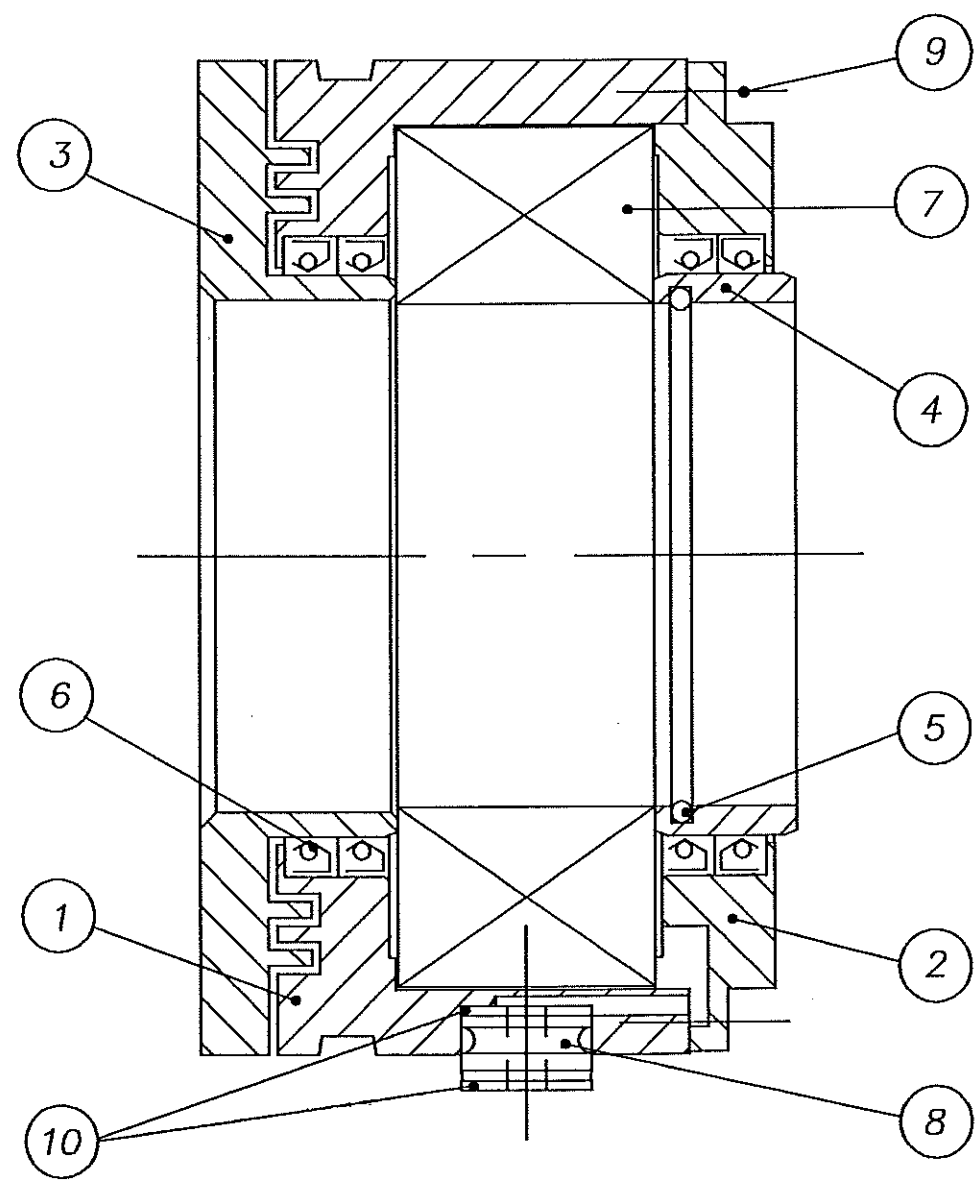
ITEM	PART No.	DESCRIPTION	QTY
1	064008266	Breaker shaft	1
2	014008321	Key	2
3	064008279	Tooth ring	1
4	064008273	Tooth ring	3
5	064008274	Tooth ring	2
6	064008275	Tooth ring	2
7	064008276	Tooth ring	2
8	064008277	Tooth ring	2
9	064008278	Tooth ring	2
10	014008144	Screwed collar	2
11	014008280	Spacer	1
12	014009015	5" Tooth cap	78
13	844009046	5" Extended tooth cap	6

MMD MINING MACHINERY DEVELOPMENTS LTD.
Gear Coupling Assembly 111090000



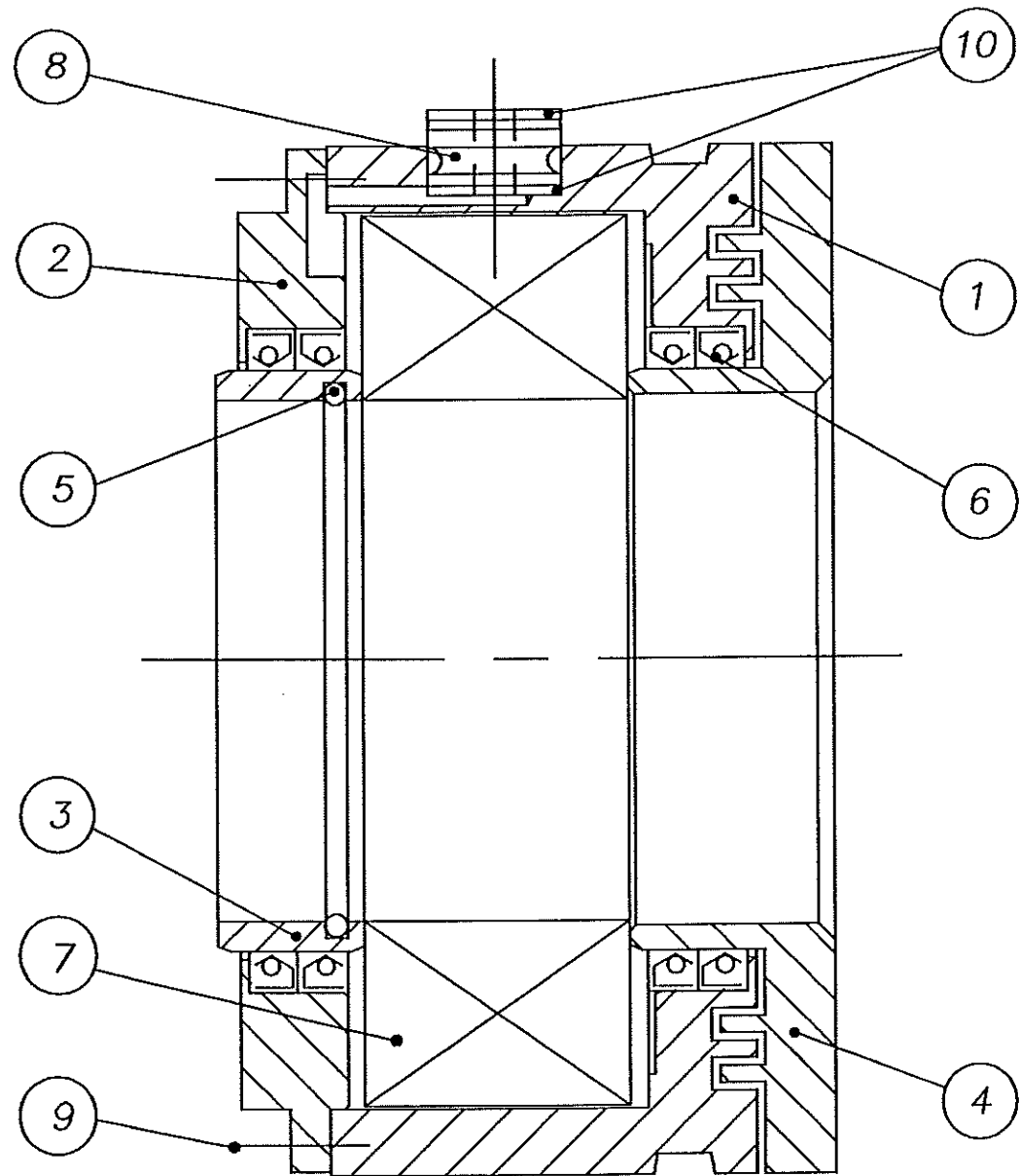
UNITED KINGDOM PATENT No. 2033538			
ITEM	PART No.	DESCRIPTION	QTY
1	011010030	Sleeve	1
2	911010040	Retaining Plate	2
3	011020010	Hub	2
4	031412000	M12 Nyloc nut	2
5	032000360	Gaco o'ring R81000	2
6	031050050	M12x90 Socket capscrew	2
7	031081050	1/4"BSPT plug	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
Fixed Bearing Assembly 141540800



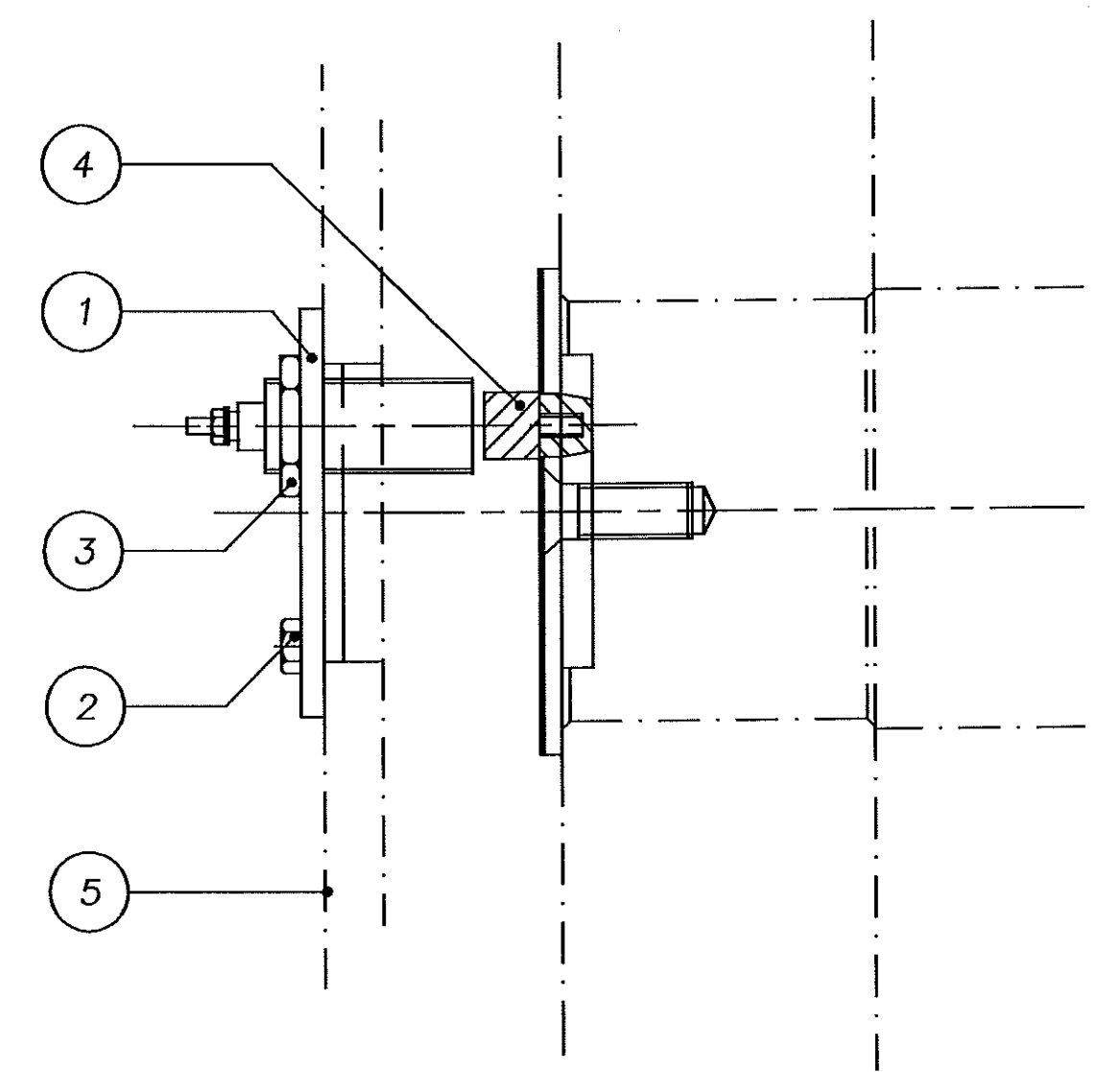
ITEM	PART No.	DESCRIPTION	QTY
1	061540800	Bearing capsule	1
2	061540200	Retaining plate	1
3	061544706	Labyrinth spacer	1
4	011540220	Spacer	1
5	032000100	Gaco o'ring RM1543-57	1
6	032000080	Weston oil seal 175x200x15R4	4
7	035000014	Spherical roller bearing 23132CC/C3-W33	1
8	011545909	Dowel	1
9	030512030	M12x30 Socket capscrew	8
10	032000410	3/4" Bonded seal	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
Floating Bearing Assembly 141540810



ITEM	PART No.	DESCRIPTION	QTY
1	061540820	Bearing capsule	1
2	061540210	Retaining plate	1
3	011540220	Spacer	1
4	061544706	Labyrinth spacer	1
5	032000100	Gaco o'ring RM1543-57	1
6	032000080	Weston oil seal 175x200x15R4	4
7	035000014	Spherical roller bearing 23132CC/C3-W33	1
8	011545909	Dowel	1
9	030512030	M12x30 Socket capcrew	8
10	032000410	3/4" Bonded seal	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
Underspeed sensing assembly Part number 243210006



ITEM	PART No.	DESCRIPTION	QTY
1	014007076	Cover plate	1
2	031310020	M10 x 20 HT Bolt	4
3	143210006	Underspeed sensing device	1
		Comprising:	
	023210001	Loose detector DJ 10G	1
	023210002	Pulse continuity relay S 114156 120V	1
	023210003	Timer relay SM105	1
	023210004	Relay base S 411	3
	023210005	Relay EL 306	1
4	014007077	Stud	1
5	851544114	End cover to case	1

ELECTROMATIC S-SYSTEM PULSE CONTINUITY

CONNECTIONS BC :

For control circuit stop or main coil switch N/O.

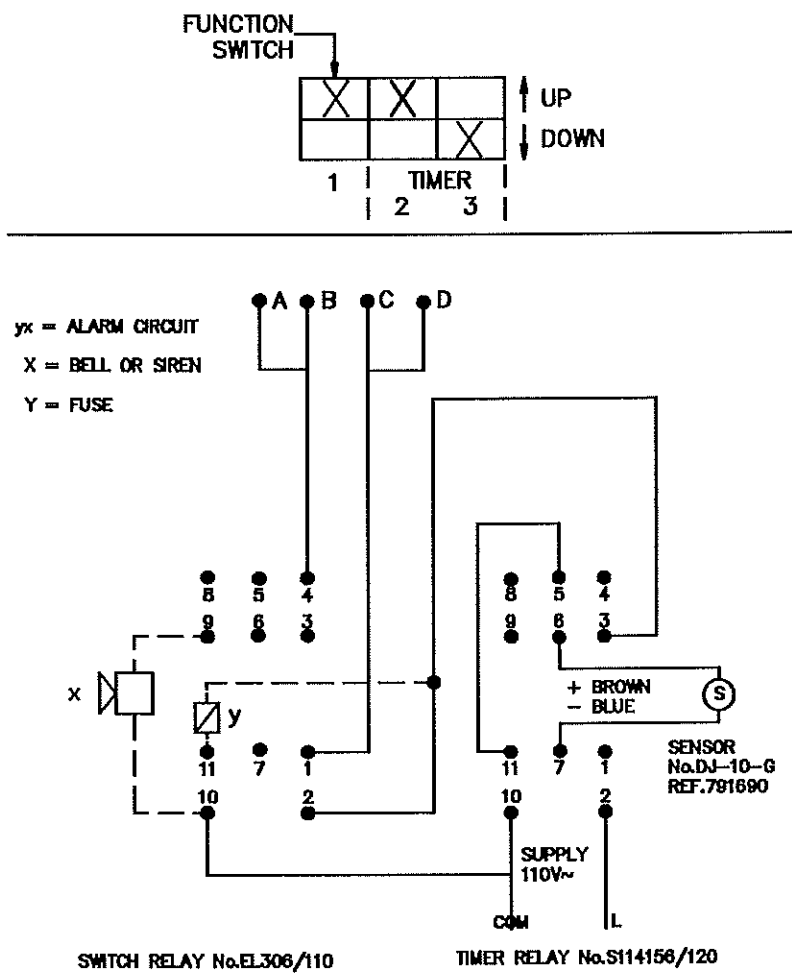
CONNECTIONS AD :

Short circuit for giving motor time to start and gain full speed, wire across auxiliary N/C contactor or timer.

TIMER SETTINGS % RELAY S114156/110

- 30 RPM SET @ 60%
- 50 RPM SET @ 40%
- 70 RPM SET @ 20%
- 100 RPM SET @ 10%
- 150 RPM SET @ 8%
- 250 RPM SET @ 5%

FUNCTION SWITCH ON RELAY No. S114156/120



INDUCTIVE SENSORS

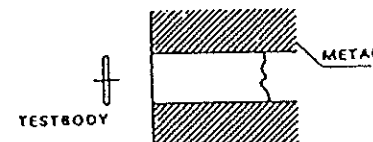
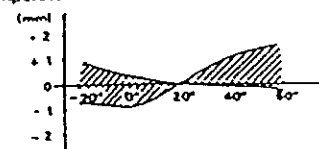
DJ 10/10 G

Activating distance with Fe	10 mm
Activating distance with Al	Approx. 5 mm
Testbody:	30 x 30 x 1 mm
Tolerance on activating distance:	+ 20 %
Hysteresis by activating towards front surface:	< 0.6 mm
Activating frequency:	Max. 400 Hz
Mechanical dimensions:	See fig. 1 and 3 next page.
Cable length:	1 metre, 2 x 0.75 mm ² , Ø max. 6.4 mm
Thread at DJ 10 G	1 3/8" UNF
Weight:	DJ 10: 100 grams. DJ 10 G: 250 grams.

This sensor can be embedded in metal as it is activated only at the front surface.
See drawing.



Temperature influence on activating dist.



S 411

11-pole base with front screw connections

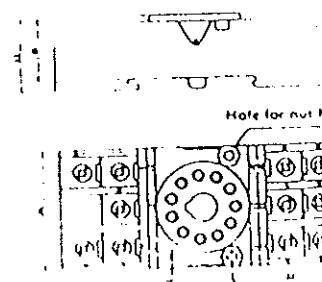
Both types are intended for mounting by 2 screws or for snap-mounting on DIN rail (DIN 46277), and have captive cable clamps and cross cut terminal screws.

Material: brass (Al 1)

Colour: light grey

Material of spring: stainless steel

Material of retaining pins: stainless steel (A2-70) or stainless steel wire





SA 105/205
Knob-adjustable

SA 105/205

- * Delay on operate to 600 secs.
- * Automatic start.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data
and ordering key
Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 1\%$.

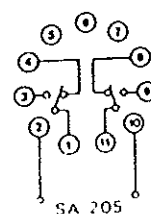
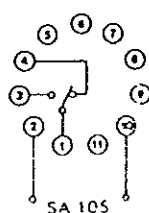
Max. time variation
Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 2\%$.

Reset of time
and/or relay
Occurs by disconnecting
the supply voltage for
min. 300 ms.

Time adjustment
SA 105/205
Knob-adjustable with scale in
seconds.
Scale accuracy: $\pm 10\%$

Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



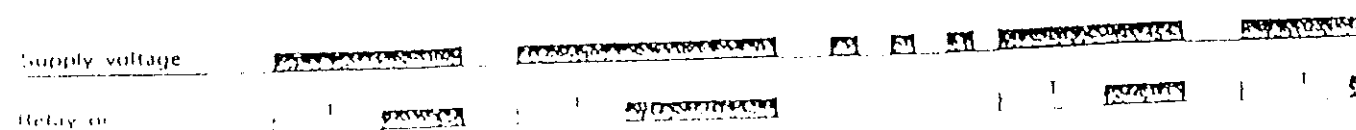
MODE OF OPERATION

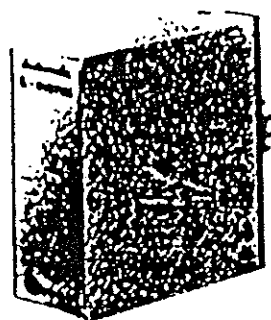
The delay period begins when the supply voltage is applied. At the end of the set delay the relay will operate and will not release until the supply voltage is disconnected.

After removal of the supply voltage a recovery time of 300 ms should be allowed before the system is activated again.

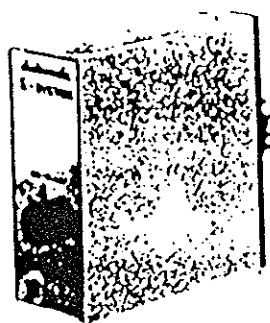
If the supply voltage is removed for more than 300 ms before the relay operates, the time circuit resets and the system is ready for a new timing period.

OPERATION DIAGRAM





SM 100
External resistor
adjustable



SM 105
Knob-adjustable

SM 100/105

- * Pulse-continuity relay.
- * Start at first pulse.
- * Controlled by inductive sensor, capacitive sensor, metallic contact or NPN-transistor.
- * Time range up to 600 s.
- * Adjustment of time either by knob or external time resistor.
- * Repeatability: $\pm 1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data
and ordering key
Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s

Range accuracy
+ 5% on max.
- 10% on min.

Repeatability
 $\pm 1\%$

Max. time variation
Within the limits of rated supply voltage and ambient temperature: $\pm 2\%$

Reset of time

MECHANICAL TRIGGERING

Pins 5 and 11 interconnected with metallic contact.
2 to 5 VDC - 3 mA.
Pin 5 positive.

Pulse duration: Min. 25 ms

TRANSISTOR TRIGGERING

Pins 5 and 11 connected with a pulse generator with NPN-transistor (open collector).
Emitter is connected to pin 11.
2 to 5 VDC - 3 mA.

Pin 5 positive.

Pulse duration: Min. 25 ms.

ELECTRONIC TRIGGERING

When an inductive sensor type DU, DJ, DO, or a capacitive

sensor type DR connected between pins 6 and 7, is actuated.

8 VDC - 15 mA.

Pin 6 positive.

Pulse duration: Min. 20 ms.

Adjustment of SM 100

External resistor or remote potentiometer R_T .

0 - 1 M Ω , 0.25 W.

The external resistor must be mounted before the S-system will work.

Adjustment of SM 105

Knob-adjustable with scale in seconds.

Setting accuracy: $\pm 10\%$.

Accessories

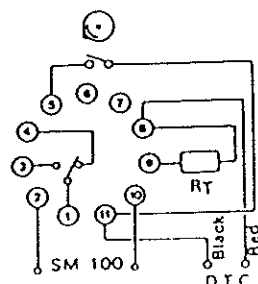
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Remote potentiometer kit.
Inductive sensors type DU, DJ or DO.
Capacitive sensors type DR.
Mounting bracket type DB 1.

Digital Timer Control

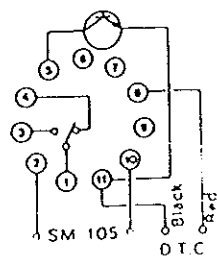
Connection for Digital Timer Control (D.T.C.) between pins 8 and 11.
Pin 8 positive.

See catalogue on accessories.

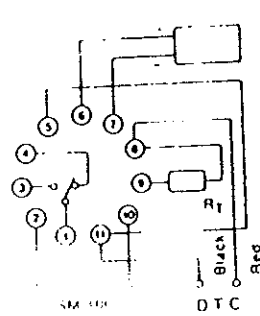
WIRING DIAGRAMS



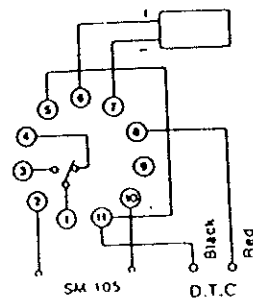
Mechanical triggering
with metallic make contact



Pulse generator triggering
with transistor output



Electronic triggering
with inductive or capacitive sensor



MODE OF OPERATION

This pulse-continuity relay can be used as a speed indicator.

It can be triggered both by inductive sensors, capacitive sensors, ordinary metallic contacts and NPN-transistors and operates from the front edge of the first pulse ¹⁾ and releases after expiration of the set time whether the control pulse has expired or not.

Triggering pulses arriving before the expiration of the set time causes the relay to remain operated for a new full time period.

If the time interval between 2 pulses exceeds the set time, the relay releases, and e.g. thus causing an alarm to start. Typical applications: Controlling that a piston actually is moving, that objects on an assembly line are conveyed properly and without heaping up, or that a periodic control is accomplished with the prescribed intervals.

When the supply voltage is interrupted the relay releases, and the time is reset to zero.

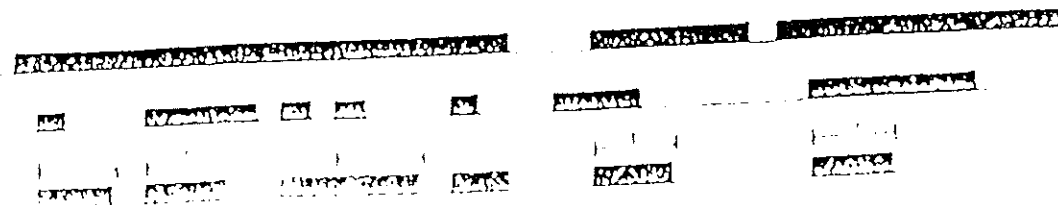
¹⁾ Another pulse-continuity relay, the SP 100/105, operates as soon as the supply voltage is applied.

OPERATION DIAGRAM

Supply voltage

Input pulse

Relay



MMD R22 GEARBOX

22:1 RATIO

PART No. 247070200

ASSEMBLY SCHEDULE

1) Split Gearcase and clean all inside surfaces.

2) Check for any transportation damage on machined faces and clean up as necessary.

NOTE: Check that plate has been welded over breather holes. Ensure inside unmachined surfaces have been painted.

3) Collect pre-selected gears, pinions, bearings and bolts etc from Stores.

NOTE: All wheels and pinions to be cleaned with a paraffin spray or likewise prior to starting to assemble.

4) Using available GA's and Parts Lists proceed to assemble gear train assemblies.

NOTE: All items where practicable to be lifted with eye bolts in holes provided especially wheels and final assemblies.

First item is the 2nd Reduction assembly.

- (a) Put bearings on Induction heater after setting up for bearing setting of 110C.
- (b) Put Gear wheel in oven or similar and heat to 100C.
- (c) Fit bearing 23218 CC/C3 W33 when up to temperature.
- (d) Fit end plate 400192. Loctite 262 to be used on stud.
- (e) Fit bearing 22218 CC/C3 W33 to pinion.
- (f) Fit spacer 400191.
- (g) Fit keys to pinion.
- (h) Fit wheel to pinion using press or similar method when necessary.
- (i) Fit end plate 400193 using Loctite 262 on stud.

5) 3rd Reduction Assembly

Assemble in same method and order as previous for 2nd Reduction assembly.

6) Output Shaft Assembly

- (a) Put bearings on Induction heater to warm up.
- (b) Fit bearing item (a) on sub assembly sheet.
- (c) Fit spacer collar 7070214.
- (d) Take chill out of wheel with hot air blower and fit to shaft ensuring that is is hard down to spacer collar.
- (e) Fit spacer collar 7070215.
- (f) Fit second bearing.
- (g) Fit end plate using Loctite 262 on stud.

7) Input Shaft

- (a) Put bearings on Induction heater.
- (b) When upto temperature, fit blind end bearings.
- (c) Then fit other bearing.

8) Assemble the Gear trains in the bottom half of gearcase in the following way:

- (a) Firstly, place 2nd Reduction assembly in case.
- (b) Then fit the input shaft assembly. Check gear alignment with Engineers Blue, to BS 436:Part 1:1967 Grade 8. At least 40% of the working depth for 35% of the length and at least 20% of the working depth for a further 35% of the length.
- (c) Fit 3rd Reduction Assembly.
- (d) Lastly, the output shaft assembly.

NOTE: Now apply oil into all bearings before fitting top case.

9) Put Hermatite sealant on all joint surfaces, also to be used on all end plates.

10)Position side dowel in groove in bottom case and then lower top case down over gears. Locating with second dowel when down, ensuring correct alignment. Fit five bolts, item 10 (M24 x 590 HT) and tighten until they are just nipped.

11)Check now that all the assemblies are seated correctly. Tap input shaft in to make sure that it is up to stop. Same on 2nd and 3rd Reduction shafts. Check from ends with a Vernier Caliper or Depth Micrometer that the bearings are square.

12)Fit all bolts as per list.

13)Tightening of bolts. All bolts are to be nipped up prior to torque setting of bolts.

NOTE: Torque setting for bolts is 797 Nm. Start to tighten bolts from middle working outwards in a balanced manner. All the time of tightening check the free running of the gears.

14)Fit end plate 7070209 ensuring the groove is in line with groove under bearing.

15)Fit end plate 7070210.

16)Fit oil seals into output shaft seal housing, then fit sleeve 7070211 to output shaft ensuring that the grub screw holes are in line with the bottom of the splines. Fit seal housing 7070208.

17)Input Shaft Seal Housing - fit seal to housing, then fit to gearbox over shaft ensuring alignment of groove in housing with groove under bearing.

18)Fit breather stud and all plugs.

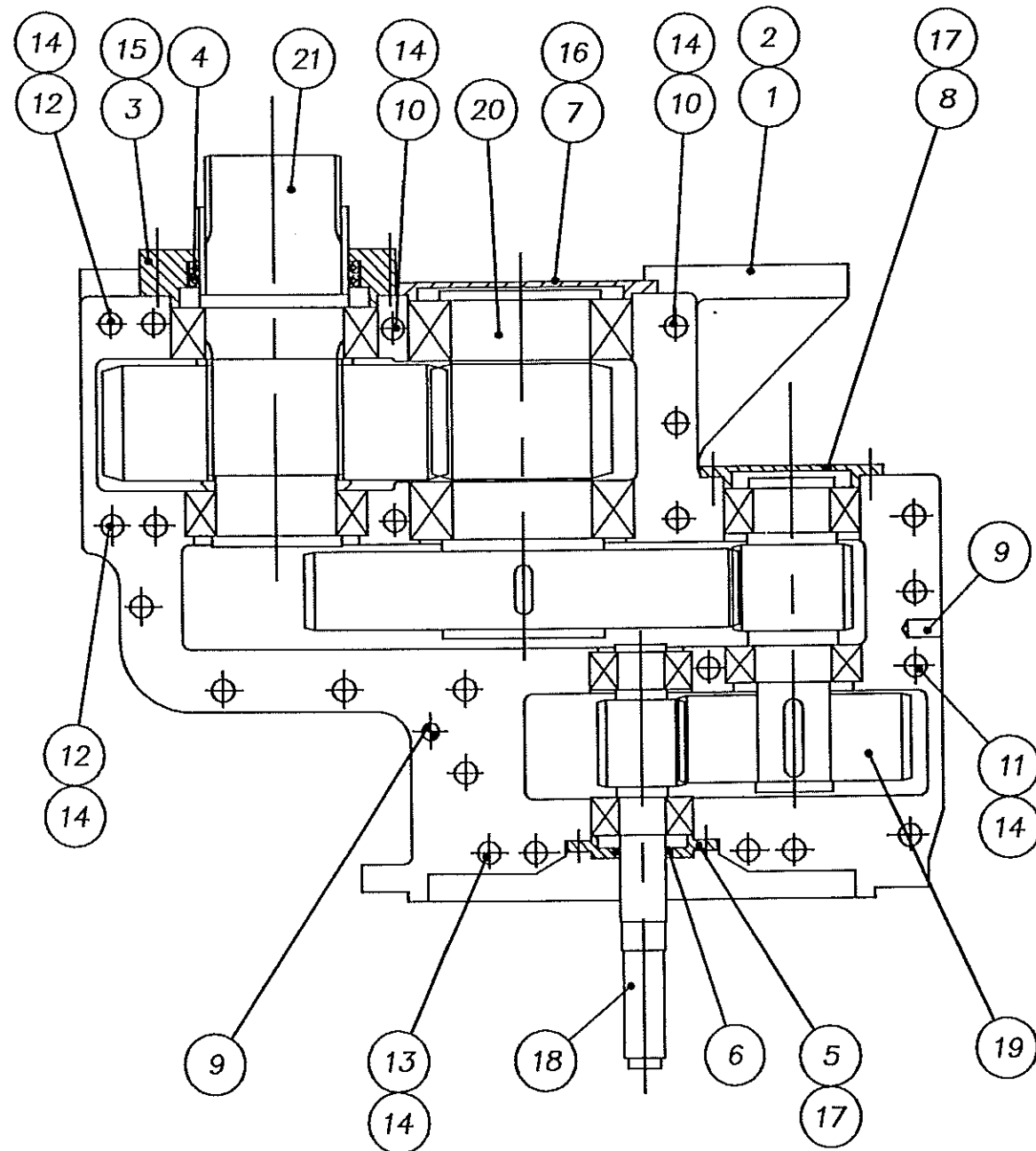
19)Fill with oil (Croda Gear or similar) - 37 litres.

20)Set up and run up for minimum of four hours doing regular temperature checks.

Maximum temperature on Input Shaft bearing of 145F. If this temperature is reached, switch off and let the Gearbox cool down.

Re-start and if the temperature rises again, see the Inspector.

MMD MINING MACHINERY DEVELOPMENTS LTD
R22 Gearbox 22:1 **Part Number 247070200**

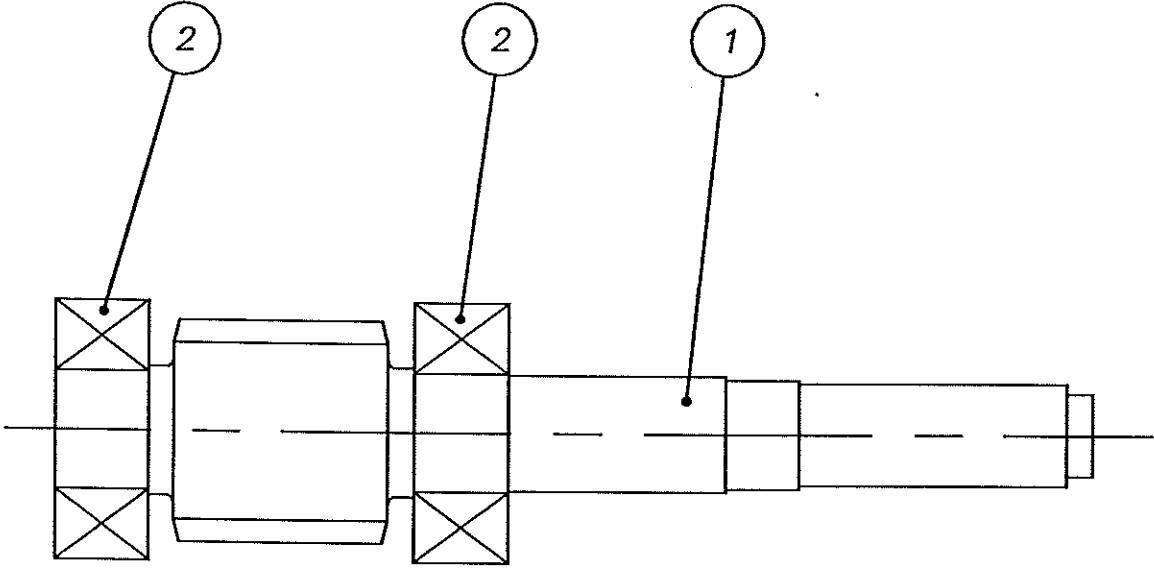


MMD MINING MACHINERY DEVELOPMENTS LTD.

ITEM	PART No.	DESCRIPTION	QTY
	247070200	MMD R22 GEARBOX 22:1 RATIO	
		Comprising:	
1	017070203	Gearbox bottom half	1
2	017070204	Gearbox top half	1
3	017070238	Seal housing	1
4	032000080	Weston oil seal 175x200x15 R4	2
5	012060080	Seal housing	1
6	032000497	Weston oil seal 276x216x31 R4	1
7	017070210	Cover plate	1
8	017070209	Cover plate	1
9	017070217	Dowel	2
10	030324590	M24x590 HT Bolt	5
11	030324430	M24x430 HT Bolt	3
12	030324410	M24x410 HT Bolt	4
13	030324065	M24x65 HT Bolt	11
14	033424000	M24 Philidas nut	23
15	031816060	M16x60 Csk. socket screw	8
16	030512035	M12x35 Socket cap screw	6
17	030512030	M12x30 Socket cap screw	12
18	147070270	Input shaft assembly	1
19	147070271	2nd Reduction shaft assembly	1
20	147070220	3rd Reduction shaft assembly	1
21	147070213	Output shaft assembly	1
*	032000545	Mounting plate O'Ring 310x300x5.7	1
		(This O'Ring is only required if the transfer gears are positioned at the drive end of the machine)	

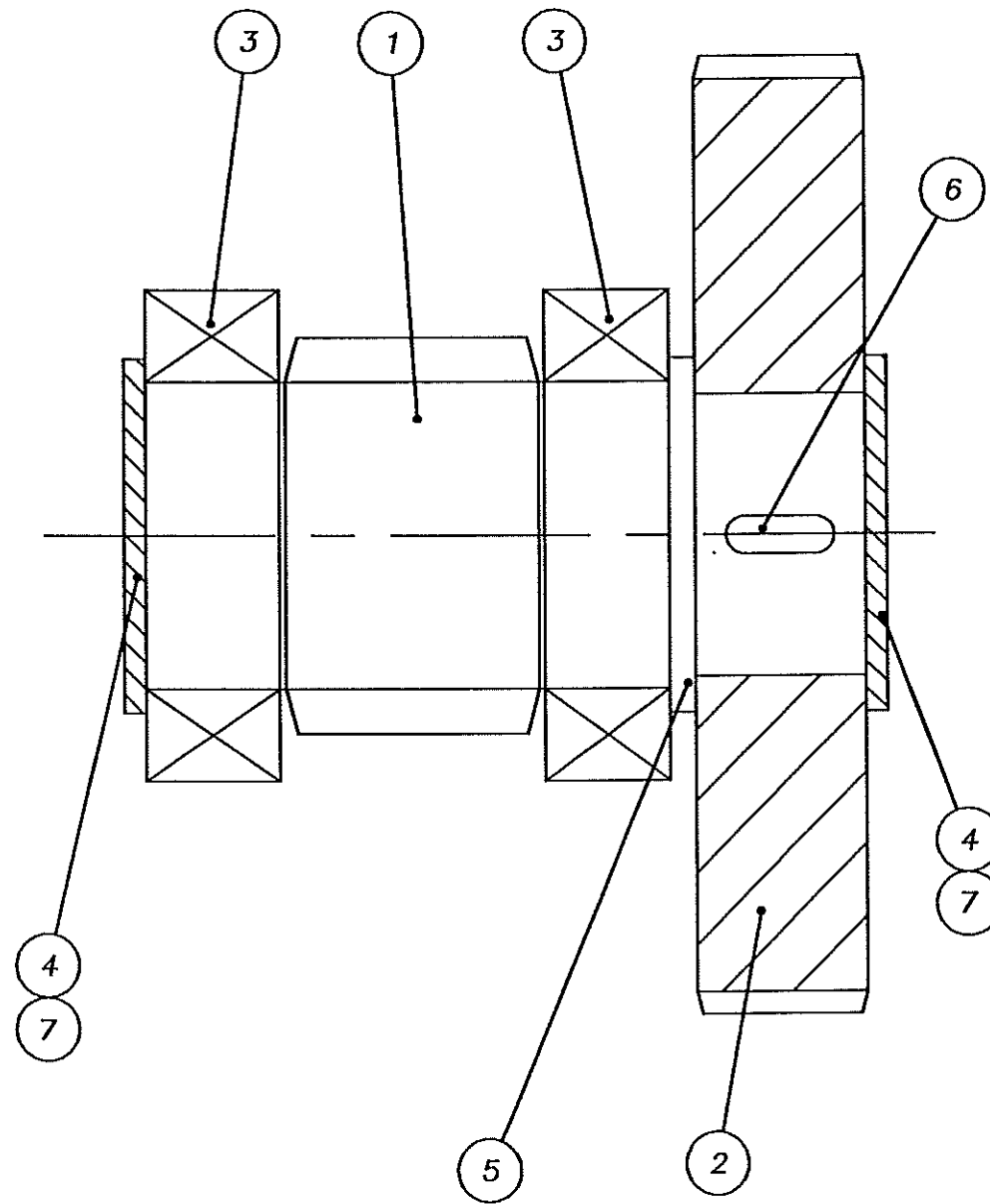
MMD MINING MACHINERY DEVELOPMENTS LTD.

Input Shaft Assembly Part Number 147070270



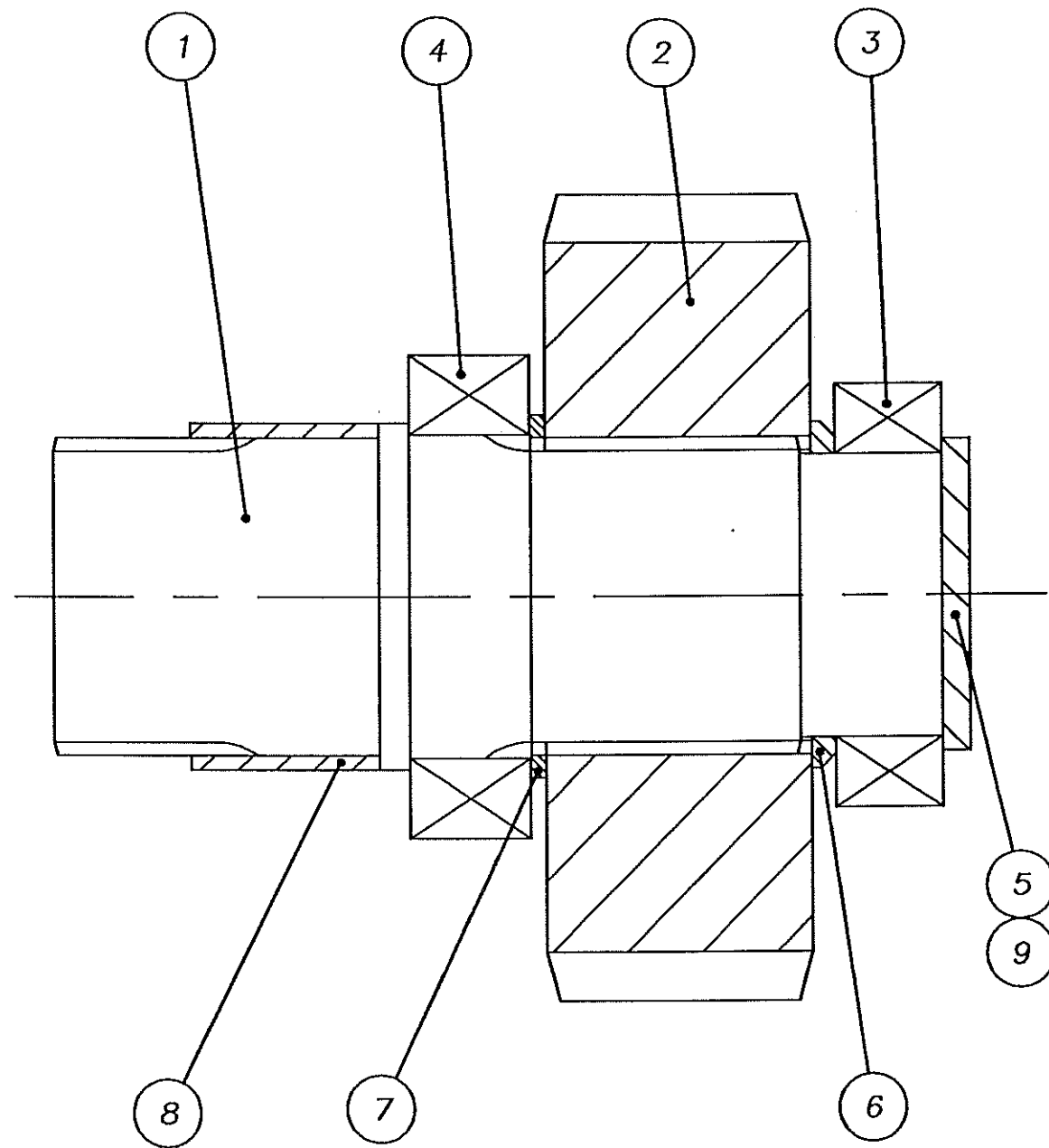
ITEM	PART No.	DESCRIPTION	QTY
1	012060020	Input shaft	1
2	035000009	Spherical roller bearing 22311 CC/C3 W33	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
3rd Red'n Shaft Assembly Part Number 147070220



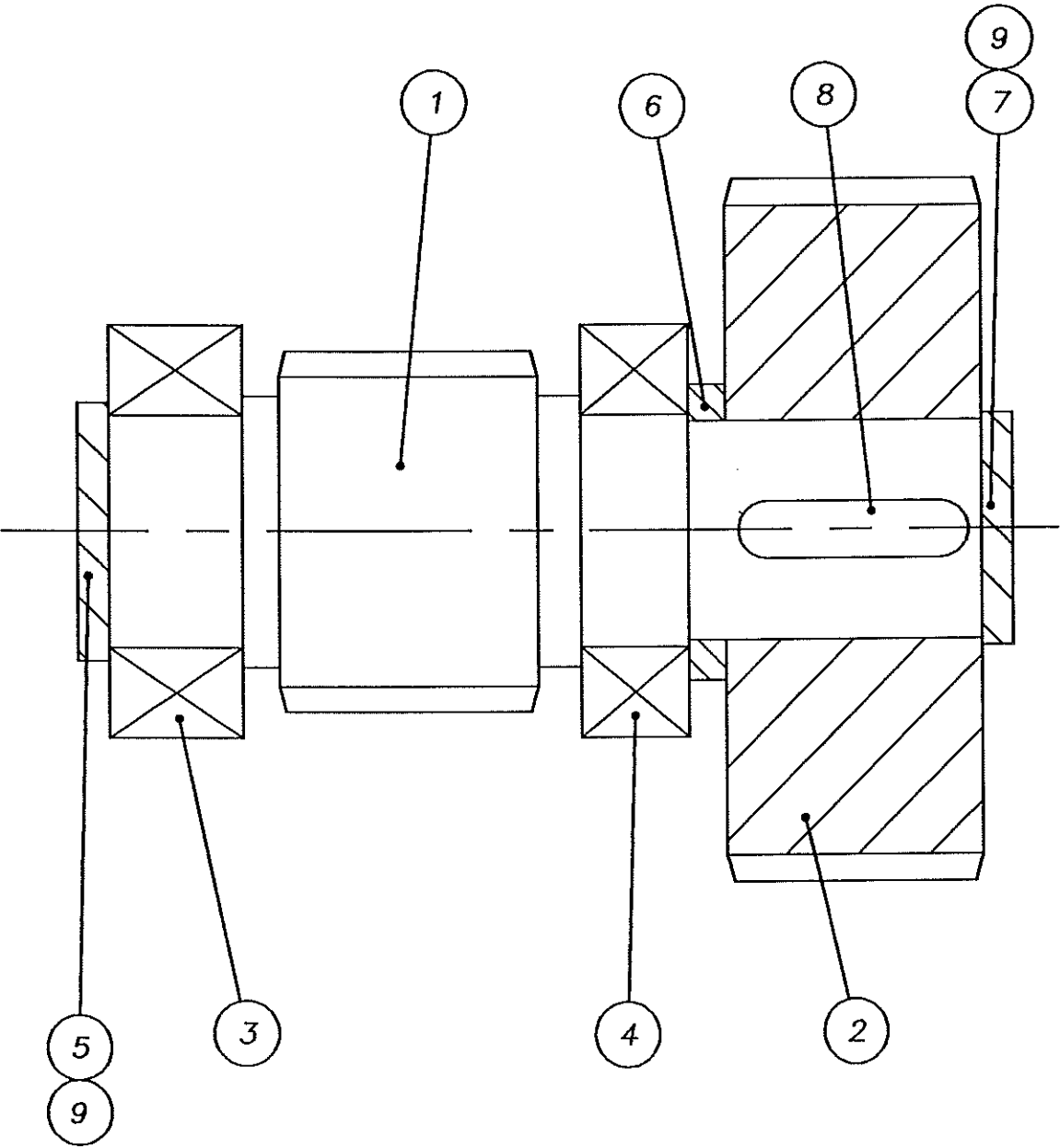
ITEM	PART No.	DESCRIPTION	QTY
1	012060070	Shaft	1
2	012060060	Wheel	1
3	035000012	Spherical roller bearing 23034 CC/C3 W33	2
4	012060090	End plate	2
5	012060110	Spacer	1
6	011773034	Key	2
7	031816050	M16x50Csk. socket screw	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
Output Shaft Assembly Part Number 147070213



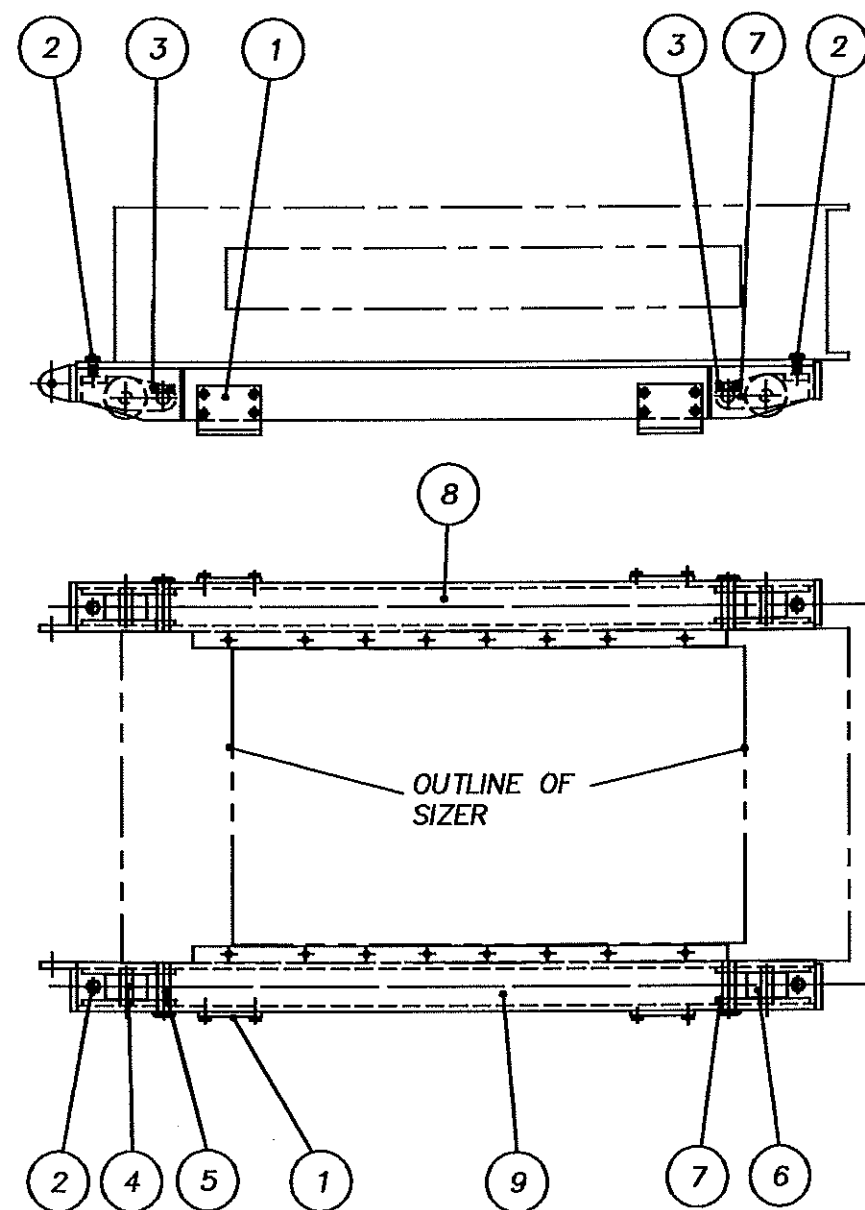
ITEM	PART No.	DESCRIPTION	QTY
1	017070213	Output shaft	1
2	017070212	Wheel	1
3	035000072	Spherical roller bearing 23028 CC/C3 W33	1
4	035000011	Spherical roller bearing 23032 CC/C3 W33	1
5	011773024	End cap	1
6	017070215	Spacer	1
7	017070214	Spacer	1
8	017070211	Sleeve	1
9	031820040	M20x40 Csk. socket screw	1

MMD MINING MACHINERY DEVELOPMENTS LTD.
2nd Red'n Shaft Assembly Part Number 147070271



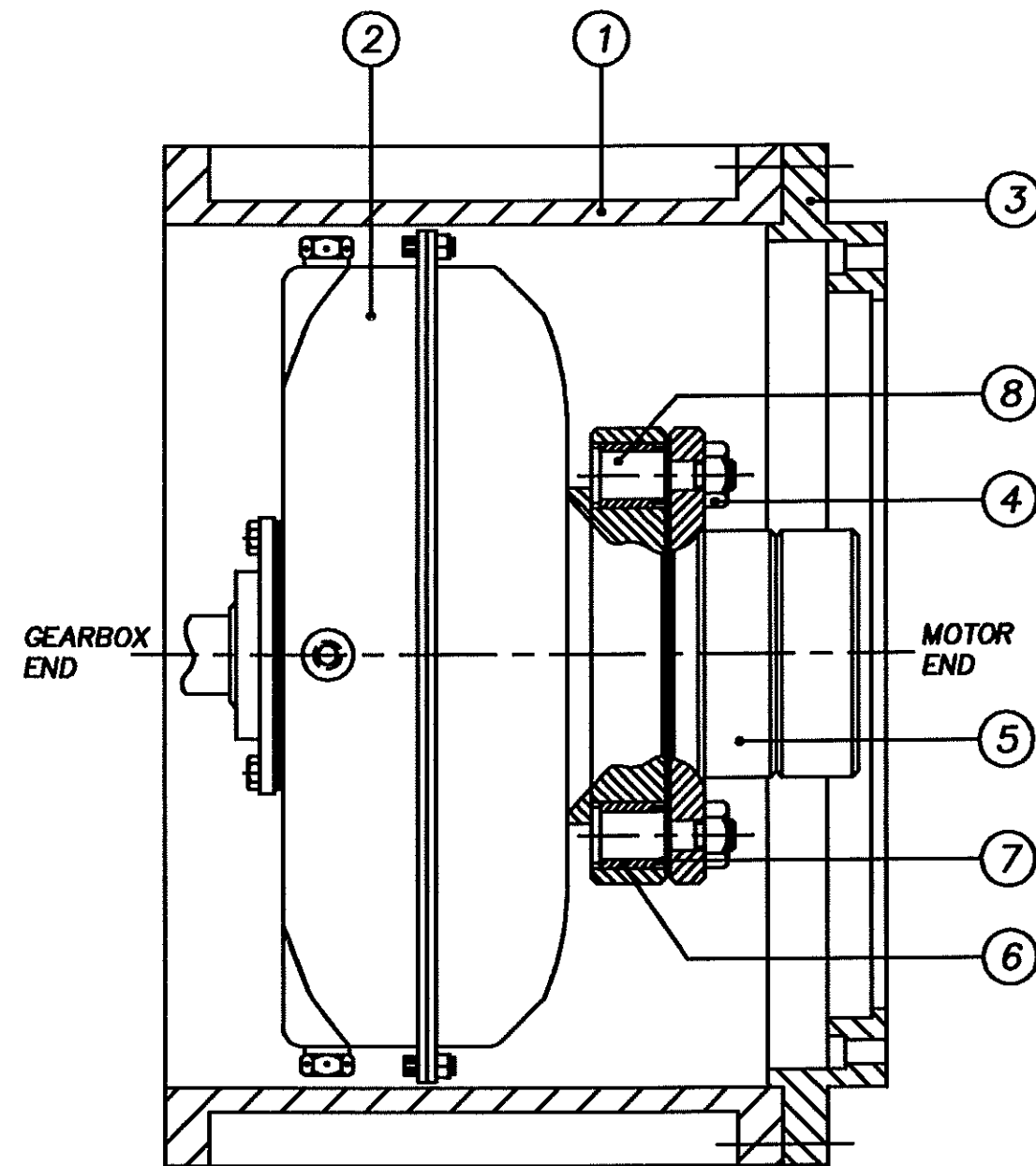
ITEM	PART No.	DESCRIPTION	QTY
1	014001850	Shaft	1
2	014001860	Wheel	1
3	035000017	Spherical roller bearing 23218 CC/C3 W33	1
4	035000007	Spherical roller bearing 22218 CC/C3 W33	1
5	014001920	End plate	1
6	014001910	Spacer	1
7	014001930	End plate	1
8	014001880	Key	2
9	031816040	M16x40 Csk. socket screw	2

MMD MINING MACHINERY DEVELOPMENTS LTD.
Wheel carriage assembly Part number 141549064



ITEM	PART No.	DESCRIPTION	QTY
1	844006683	Trapping bar	4
2	032630060	Jacking screw	4
3	041548936	Keep plate	4
4	011548935	Wheel pin	4
5	011548934	Swivel pin	4
6	011548933	Wheel	4
7	841548932	Wheel carriage	4
8	841548930	Bogey frame	1
9	841548931	Bogey frame	1

MMD MINING MACHINERY DEVELOPMENTS LTD.
Fluid Coupling Assembly 141548709



ITEM	PART No.	DESCRIPTION	QTY
1	061544420	Coupling housing	1
2	023150030	STC 500 Fluid coupling	1
3	014008310	Motor adaptor	1
4	035822000	7/8"BSW Hex nut	8
5	014008311	Driving boss	1
6	012060360	Bush	8
7	012060370	Washer	8
8	012060380	Coupling pin	8