PANTHER

ALL GEARED LATHE MACHINE

INSTRUCTION & SPARE PARTS MANUAL

MODEL : 4310/	MACHINE No. :

GUJARAT LATHE MFG. CO. PVT. LTD.

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ISO 9001 QM011

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MODEL – 4310

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MANUFACTURED BY:

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P R E F AC E

This machine have been manufactured with a view to obtain the highest degree of working accuracy and it has been thoroughly tested for the performance to confirm IS 11118-1984, IS 1878 (part-1) -1971 and Dr. Schlesinger's code for "Testing Machine Tools."

The accuracy of the machine can be achieved and maintained only if the instructions contained in this manual are starkly followed. The users of the machine are therefore, requested to get themselves acquainted with contents of the manual, before Installation, operation and maintenance of the machine. It is suggested that a copy of this manual be made available to the operation and maintenance staff on the shop floor, who will be directly handling this machine.

As the machine and accessories are constantly being improved this manual may differ in detail with the machine supplied.

At the time of ordering the spares, please mention the component number as indicated in this manual and serial number of the machine, which is stamped on Right hand corner of the lathe machine bed.

Please Read Instruction Manual before Starting the Machine.

For easy reference and under standing, this manual is divided in to followings five different sections.

Section 1 Introduction
Section 2 Installation
Section 3 Operation
Section 4 Settings, Maintenance and Trouble Shootings.
Section 5 Assembly drawings and spare part list.

I N D E X

I N D E X

SECTION - 1
INTORDUCTION

1.1 Machine specifications: -

Type of bed	Gap bed
Width of bed	555 mm
Height of center	430 mm
Swing over bed	840 mm
Swing over saddle	600 mm
Swing over cross slide	510 mm
Swing in gap	1250 mm
Length of gap in front of face plate	330 mm
No. of spindle speed	8
Spindle speed range	20 to 275 RPM
Taper in spindle sleeve	MT - 5
Spindle hollow	104 mm
Spindle nose detail	Bayonet size 11
No. of British threads	28
Range of British threads	1.5 to 22 TPI
No. of Metric threads	22
Range of Metric threads	0.75 to 16 mm Pitch
No. of feeds	28
Range of Longitudinal feeds	0.2 to 3.0 mm / rev.
Range of Transverse feeds	0.033 to 0.50 mm / rev.
Lead screw	50.8 mm X 2 TPI
Tail stock spindle diameter	95 mm
Taper in Tail stock spindle	MT - 5
Cross slide travel	430 mm
Compound slide travel	230 mm
Tail stock sleeve travel	220 mm
Tool shank size	38 X 38 mm

	4310/1	4310/2	4310/3	4310/4	4310/5
Length of bed	3750 mm	4750 mm	5750 mm	6750 mm	7750 mm
Admit between centerP	2000 mm	3000 mm	4000 mm	5000 mm	6000 mm
Net weight	6250 Kgs	7300 Kgs	9500 Kgs	11200 Kgs	12800 Kgs
Motor H.P.	15 H.P.	15 H.P.	15 H.P.	20 H.P.	20 H.P.

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Machine Model :- 4310/_ **Machine Specification :-_____**

Machine Sr. no. :- Z -____ **Date :- _____**

STANDARD ACCESSORIES			EXTRA ACCESSORIES		
1	Hardened guide ways	1 no.	1	Face plate	no.
2	Center adopter	1 no.	2	Steady rest	no.
3	Dead Center MT - 5	2 no.	3	Follow rest	no.
4	Carrier plate	1 no.	4	Coolant equipmentswith tank & fitting Make:-_____ H.P._____ Sr._____	no.
5	Instruction manual	1 no.	5	Machine lamp with CT.	no.
6	Tool post key	1 no.	6	3 jaw self centering chuck with flange Ø _____	no.
7	Dual speed gear box in tailstock quill movement	1 no.	7	4 jaw dog chuck with flange Ø _____	no.
8	Change gears fitted with machine: - 60, 80, 80, 127	4 no.	8	Extra chuck flange	no.
9	Change gears packed in tool box: - 64, 65, 76, 90, 90, 100,100,110	8 no.	9	Taper turning attachments	no.
10	Oil can	1 no.	10	Rear tool post	no.
11	Screw driver	1 no.	11	Rear splash guard	no.
12	Allen keys	9 no.	12	Revolving center MT - 5	no.
13	Fixed spanner	9 no.	13	Quick change tool post with 5 tool holders	no.
14	Long cross slide	1 no.	14	Rapid traverse of main saddle Motor Sr. no. _____ Make _____ H.P. ___ R.P.M. _____	no.
15	Electric motor H.P. _____ Make _____ Sr. no. _____	1 no.	15	Int./Ext./Combine tool post grinder with/without electric motor	no.
16	'V' Belts no. _____	5 nos.			
17	Electrical control panel	1 no.			
18	Norton gear box	1 no.			

Any other accessories: -

Mode of packing :- _____

Name & Address: - _____

_____

Checked by :- _____

It any discrepancy is found with regard to the above accessories. It should be Immediately notified to us along with machine serial no.

1.3 List of Accessories.

1.3.1 Standard Accessories: - (to be supplied with machine).

(01) Harden guide ways of lathe bed.
(02) Electric Motor with V-Belts.
(03) Forward – off – Reverse shaft.
(04) Norton gearbox.
(05) Long cross slide.
(06) Carrier plate.
(07) Center adapter.
(08) Dead center – MT-5. 2nos.
(09) Instruction manual with test chart.
(10) Tool post bolt key.
(11) Change gears for inch /mm threading. (For 2 TPI lead screw).
(12) Oilcan.
(13) Screw driver.
(14) Allen keys - 11 no.
(15) Fixed spanner - 6 no.
(16) Drop worm type feed engage / disengage lever
(17) Gear oil pump with splash lubrication for head stock
(18) Planner type rigid lathe bed
(19) Control panel box

1.3.2 Optional Accessories (To be order along with machine).

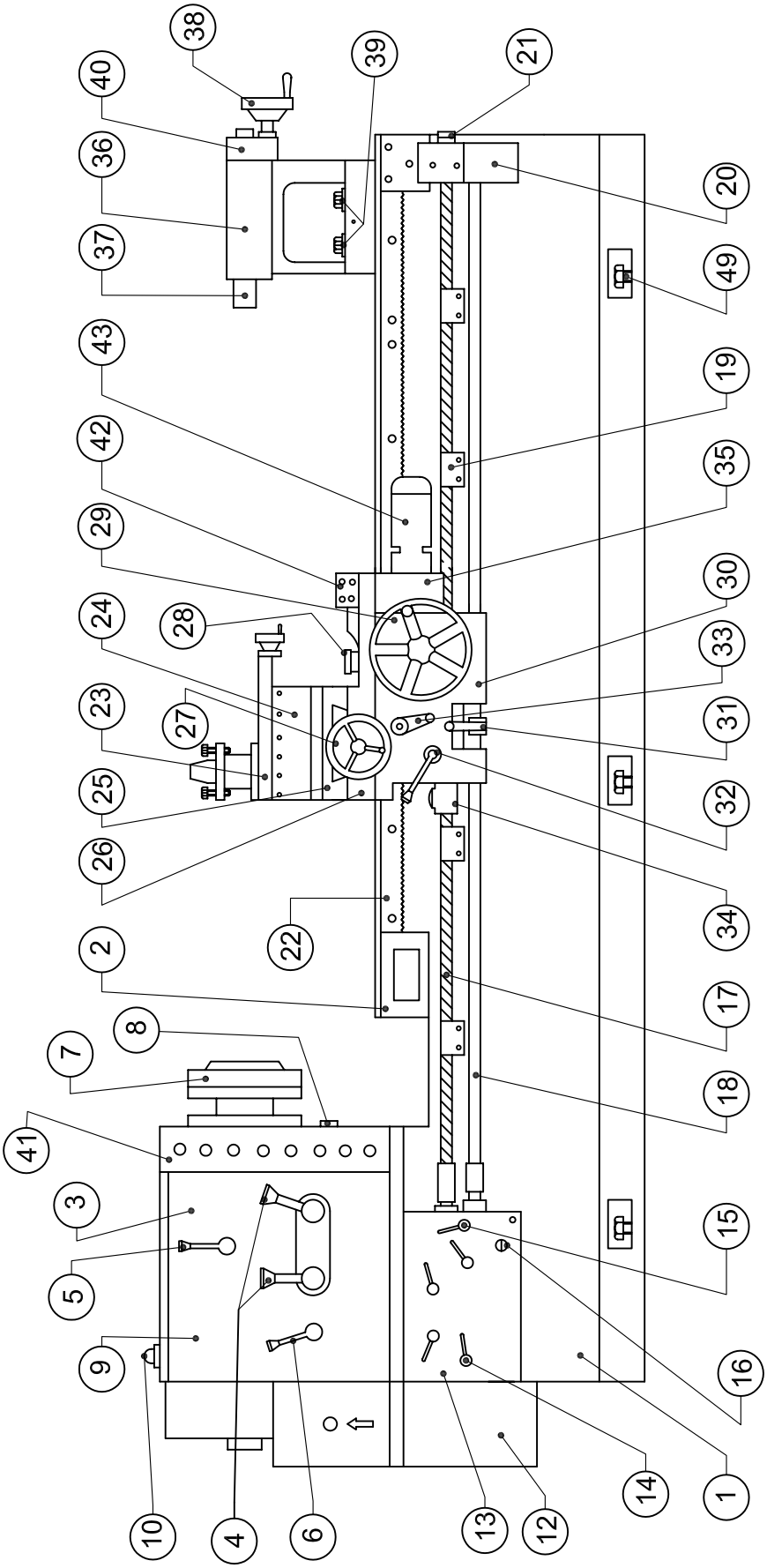
(01) Electric coolant pump with tank and fittings.
(02) Rear tool post with tool holders.
(03) Taper turning attachment.
(04) Rear splashguard.
(05) Drift type tail stock spindle.
(06) Rake operated center.
(07) Rapid movement of saddle
(08) Dual speed gear box in tail stock quill

1.3.3 Optional Accessories :- (Retro fitting possible)

(01) Face plate.
(02) Steady rest pad type.
(03) Follow rest pad type.
(04) Chuck flange.
(05) Machine lamp.
(06) Quick-change tool post with 5 tool holders.
(07) Internal or external or combine tool post grinder with or with out elect. Motor – 2800 RPM & on – Off switch.
(08) Keyway cutting attachment.
(09) Revolving center.
(10) 3 – Jaw self-centering or 4 – Jaw Dog chuck.

1.3.4 List of change gears :- (Machine having 2 TPI lead screw. 7 DP)

(A) 60-64-65-76-80-80-90-90-100-100- 110-127 = 12 no.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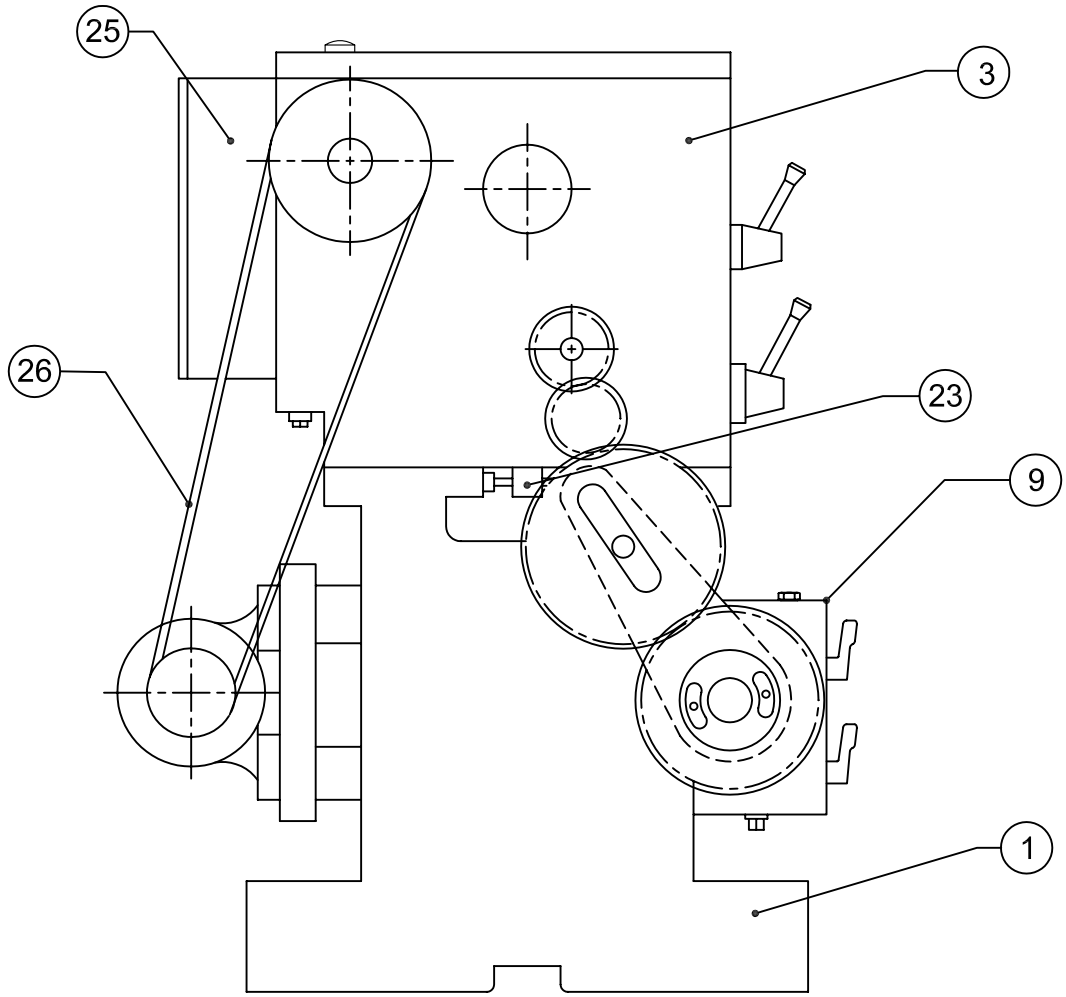
LEGEND



LEGEND

1.4 LEGEND :-

(1) Bed.
(2) Bed Gap.
(3) Head Stock.
(4) Speed Changing Levers.
(5) High – Low Speed Lever.
(6) Feed Direction Change Lever.
(7) Spindle (Bayonet 11 Type).
(8) Oil Sight Glass.
(9) Head Stock Top Cover.
(10) Oil Filling Plug.
(11) Oil Drain Plug.
(12) Change Gear Cover.
(13) Universal Norton Gear Box.
(14-A) Feed Selecting Levers position A-B.
(14-B) Feed Selecting Levers position R-S-T.
(14-C) Feed Selecting Levers position C-D.
(14-D) Feed Selecting Levers position X-Y-Z.
(15) Thread – Feed Selecting Lever.
(16-A) Oil Sight Glass.
(16-B) Oil Filling Glass.
(16-C) Oil Drain Glass.
(17) Lead Screw.
(18) Feed Shaft.
(19) Lead Screw Support Brackets.
(20) Off End Bracket.
(21) Lead Screw Check Nuts.
(22) Rake.
(23) Tool Post Assembly.
(24) Compound Assembly.
(25) Long Cross Slide.
(26) Carriage.
(27) Transverse Hand Feed Wheel.
(28) Carriage Oil Cups.
(29) Longitudinal Hand Feed Wheel.
(30) Apron Assembly.

(31) Worm Box Assembly.
(32-A) Feed Engaging Lever.
(32-B) Feed Selective Lever.
(33) Thread Engaging lever.
(34) Thread Dial Indicator.
(35) Rapid. Feed Gear Box.
(36) Tail Stock.
(37) Tail Stock Spindle.
(38) Tail Stock Hand Wheel.
(39) Tail Stock Lock Bolts.
(40) Tail Stock Dual Speed Gear Box.
(41) Push Button Box.
(42) Rapid Push Button Box
(43) Rapid Electric Motor.
(44) V – Belts.
(45) Control Panel Box.
(46) Head Stock Setting Bolts.
(47) Electric Motor.
(48) Motor Rails.
(49) Leveling Bolts.
(50) Change Gear.
(51) Arm Plate.

SECTION – 2

INSTALATION

2.1 Lifting the machine :-

While lifting the machine by crane, proper care should be taken to prevent damage of machine paints, components and levers. Use suitable wooden block or felt packing, whenever chances of damage to machine part due to contact of Rope or chain are possible. Suitable capacity ropes / chains should be used, while lifting the machine and it should be lift in balance position. For proper balancing of the machine, move tail stock and carriage at appropriate position and clamp on bed.

2.2 Unpacking and cleaning :-

Once machine is brought in shop Floor, for unpacking of the machine, proper care should be taken. In case of machine with case packing, top direction is marked on wooden case. It is suggested that the packing case is opened soon after its receipt and verification is made for the standard and extra accessories mention in packing slip.

Prior to dispatch, all Slides all unpainted parts, handles etc are coated with anti corrosive / rust – preventive. This should be carefully removed and wiped dry and then all bright machine parts should be oiled Immediately.

2.3 Foundation :-

The lathe machine can give satisfactory performance only, if it is put on proper foundation and proper leveling is done. Foundation should be prepared as per foundation drawing and sufficient time should be allowed for concrete slab to be fully cured and dried. The depth of the foundation slab given in foundation drawing is only recommendary and it should be directly decided by the users, depending upon the soil condition and surrounding atmosphere. The load bearing capacity of the soil should be taken in account for preparing foundation.

2.4 Leveling of The Machine :-

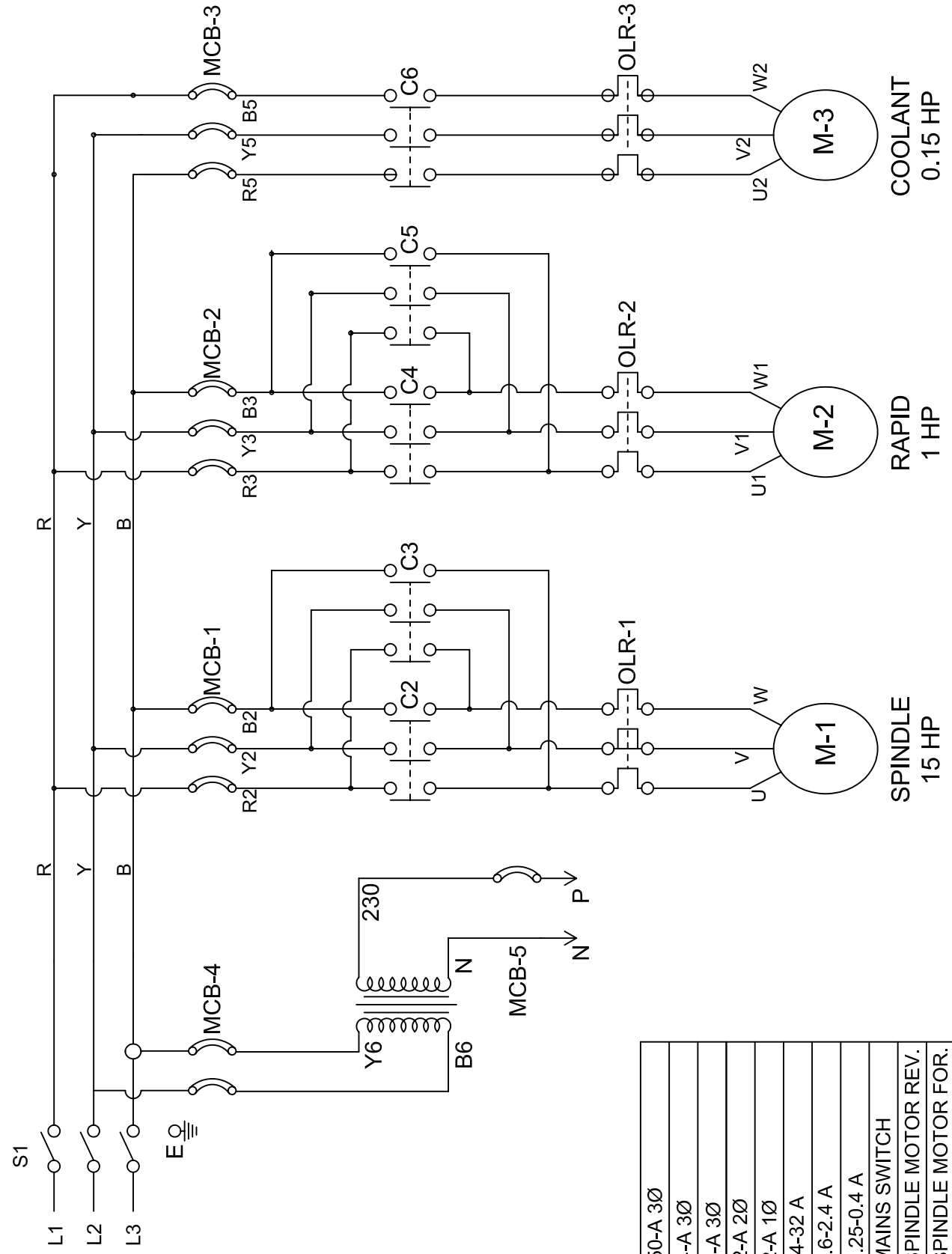
Leveling is very important and should be carried out with proper care. The accuracy of sprit level which recommended is 0.020 mm/mtr. For leveling follow the procedure given below.

- Keep the precision level on surface slide top face at centre in transverse position.
- Adjust the leveling bolt to make the position of level bubble in centre.
- Move carriage slide without disturbing level towards head stock side and adjust the bubble in level at centre position by adjusting level bolt.
- Move carriage slide toward tail stock side and repeat the procedure.
- Make both the readings at head stock side and tail stock side to be identical.
- After setting transverse level, move the carriage to the centre of bed.
- Keep precision level on surface slide top near V guide ways of bed in longitudinal position.
- Ensure the bubble position at centre of level by using thin paper if required.
- Move carriage towards head stock side and than tail stock side and ensure the variation and adjust level if required.
- Recheck the transverse level.

After proper leveling of machine, run machine for about 2 hours at various speeds and feed and re cheek levels and re set the level if required.

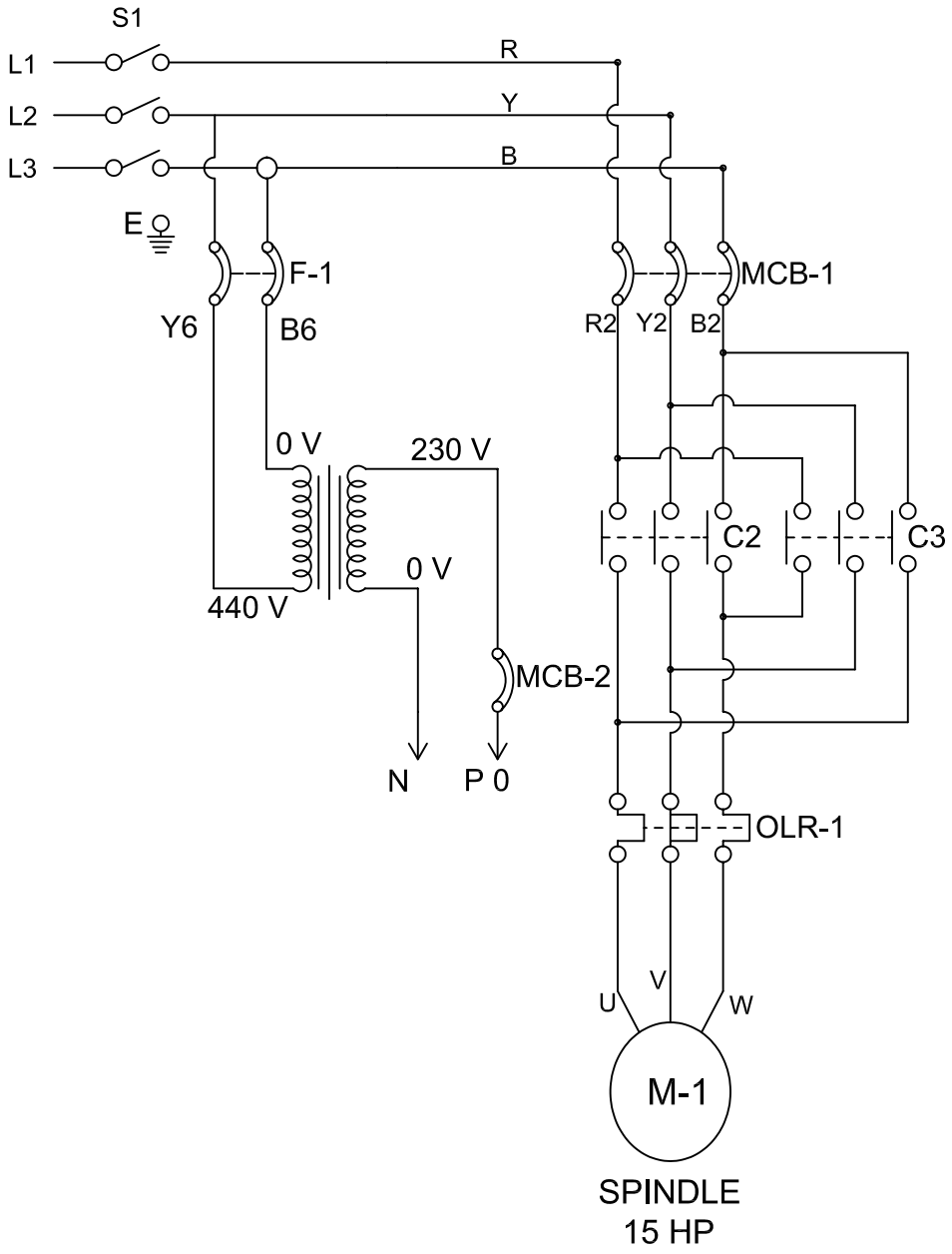
Then the foundation bolts are grouted in larger holes with 1:3 cement and sand mixture. Sufficient time should be allowed for concrete to cure. The foundation bolts are then tightened without undue force. Periodically cheek up bed level to ensure continued level accuracy.

POWER WIRING DIAGRAM

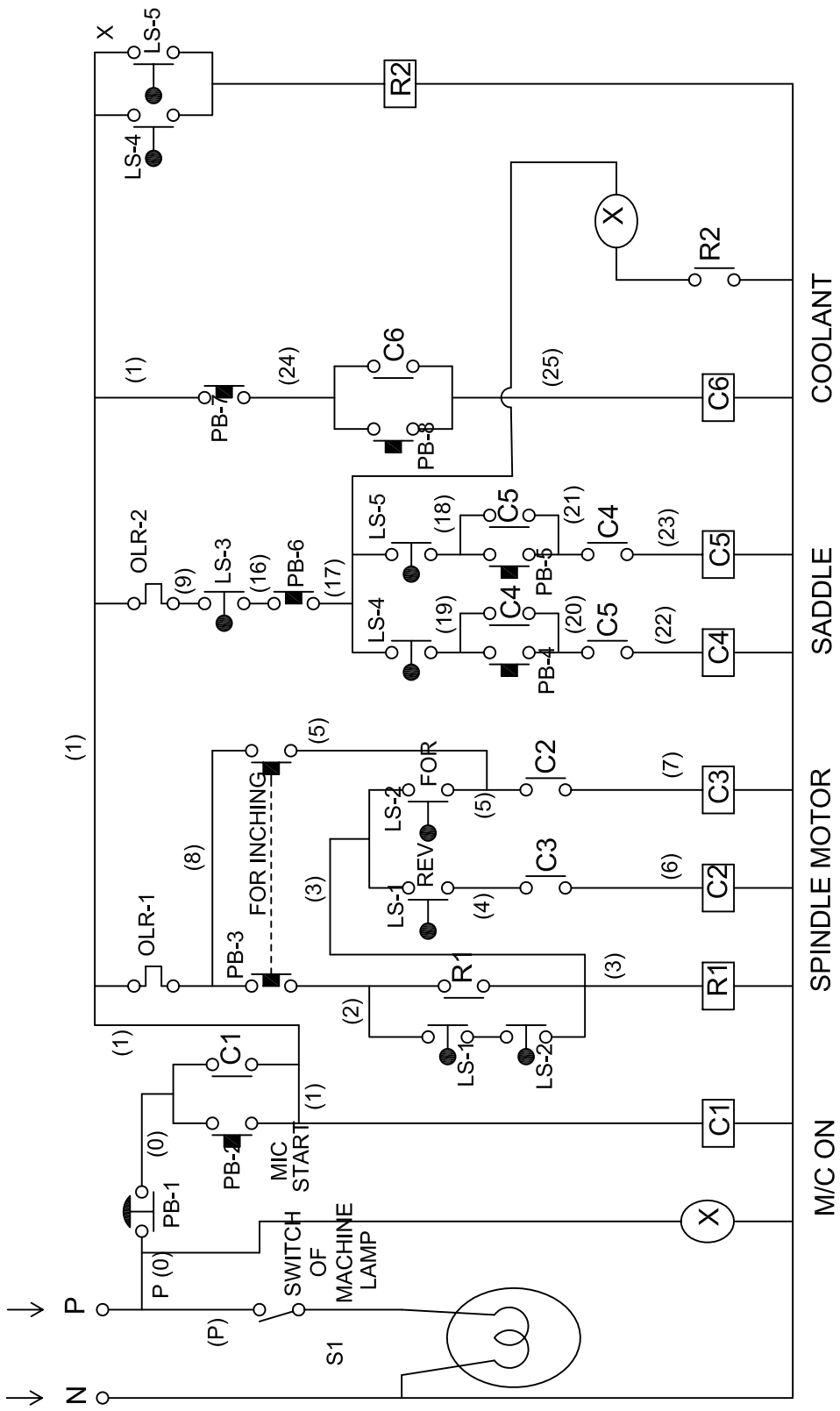


MCB-1	50-A 3Ø
MCB-2	4-A 3Ø
MCB-3	2-A 3Ø
MCB-4	2-A 2Ø
MCB-5	2-A 1Ø
OLR-1	24-32 A
OLR-2	1.6-2.4 A
OLR-3	0.25-0.4 A
S1	MAINS SWITCH
C2	SPINDLE MOTOR REV.
C3	SPINDLE MOTOR FOR.
C4	RAPID MOTOR REV.
C5	RAPID MOTOR FOR.
C6	COOLANT MOTOR

POWER WIRING DIAGRAM

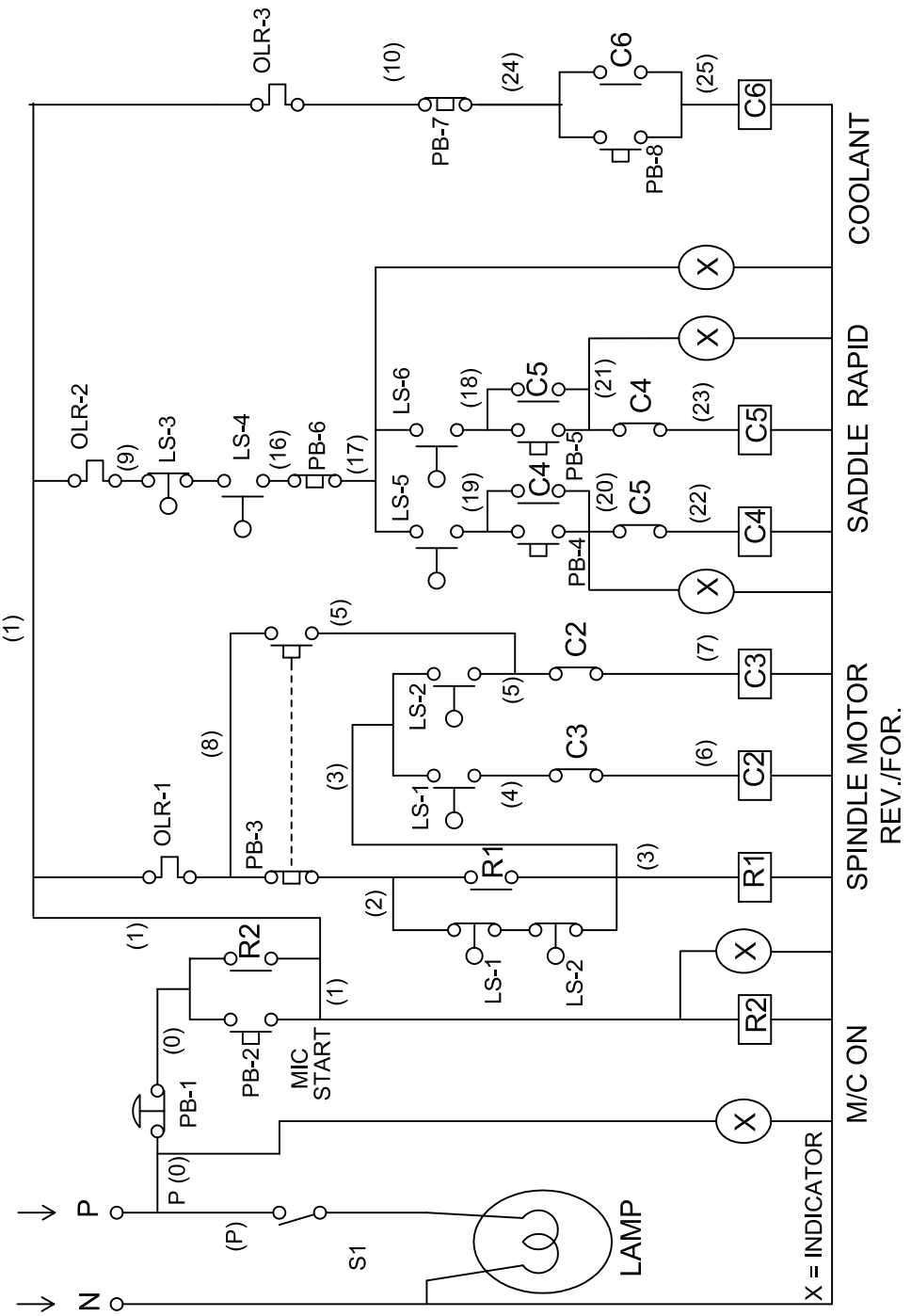


MCB-1	50-A 3Ø
MCB-2	2-A 1Ø
F-1	0.5 -A
OLR-1	24-32 A
S1	MAINS SWITCH
C2	SPINDLE MOTOR REV.
C3	SPINDLE MOTOR FOR.



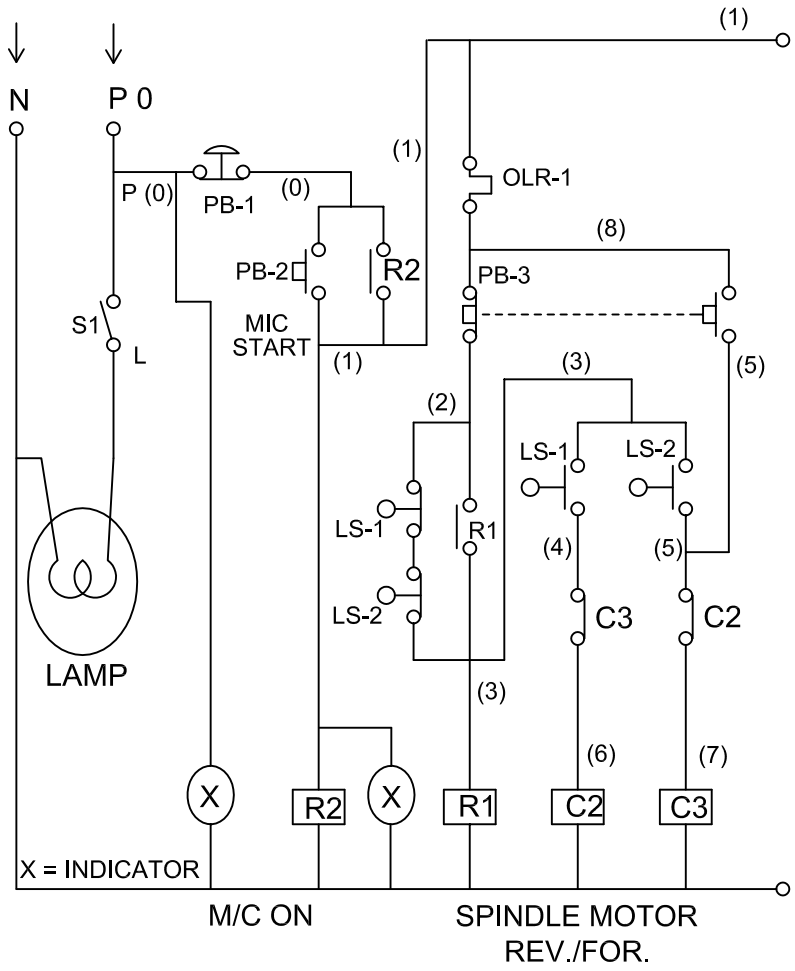
PB-1	EMERGENCY STOP	PB-8	COOLANT ON
PB-2	MATCHINE START (ON)	LS-1	SPINDLE REV.
PB-3	FORWARD INCHIUR	LS-2	SPINDLE FOR.
PB-4	APRON FOR.	LS-3	SADDLE OFF
PB-5	APRON REV.	LS-4	FOR.APRON LIMIT OFF
PB-6	SADDLE MOTOR OFF	LS-5	REV.APRON LIMIT OFF
PB-7	COOLANT OFF	S-1	MATCHINE LAMP ON/OFF SWITCH

CONTROL WIRING DIAGRAM



PB-1	EMERGENCY STOP	PB-8	COOLANT ON	C2	SPINDLE MOTOR REV.
PB-2	MACHINE START (ON)	LS-1	SPINDLE REV.	C3	SPINDLE MOTOR FWD.
PB-3	FORWARD INCHING	LS-2	SPINDLE FOR.	C4	RAPID MOTOR FWD.
PB-4	RAPID FWD.	LS-3	RAPID OFF	C5	RAPID MOTOR REV.
PB-5	RAPID REV.	LS-4	RAPID OFF	C6	COOLANT MOTOR ON
PB-6	RAPID MOTOR OFF	LS-5	FWD.APRON LIMIT OFF	R1-R2	CONTROL RELAY
PB-7	COOLANT OFF	LS-6	REV.APRON LIMIT OFF	S-1	LAMP ON/OFF SWITCH

CONTROL WIRING DIAGRAM



PB-1	EMERGENCY STOP		
PB-2	MACHINE START (ON)	C2	SPINDLE MOTOR REV.
PB-3	FORWARD INCHING	C3	SPINDLE MOTOR FWD.
LS-1	SPINDLE REV.	R1-R2	CONTROL RELAY
LS-2	SPINDLE FOR.	S-1	LAMP ON/OFF SWITCH

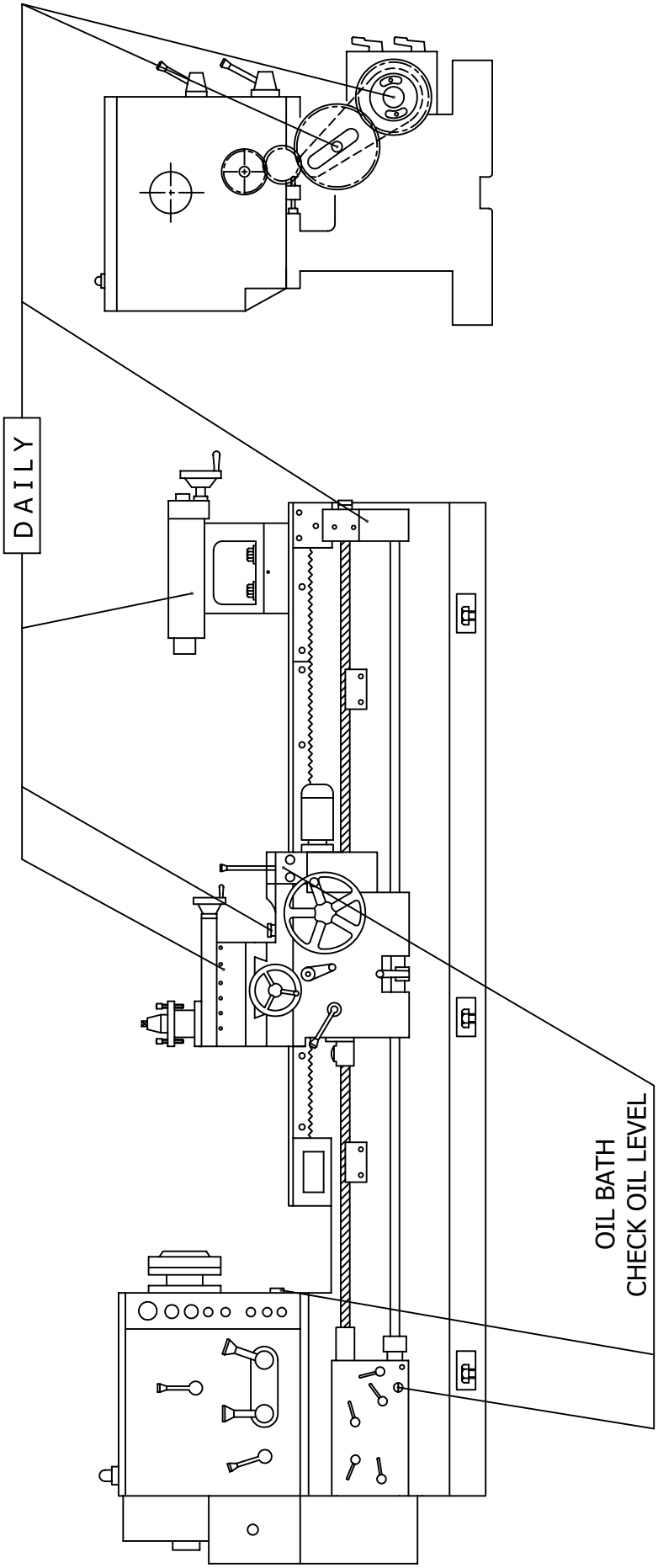
2.5 Electric Connections :-

Machine is supplied with electrical, hence internal wiring of electric motor and reverse/forward switch is done in machine. Give Elect. Power supply of three phase and proper ear thing to machine. Keep rev / for handle in center position for safety. Give power supply to machine and check machine body with tester for leak aging of power supply for safety. Press ON push button to start power supply. Rotate rev / for handle in required position to start machine. Check machine spindle rotation, it should be matched with position of rev / for start handle. If position is not matched than interchange any two pair of leads from main elect. Supply. During connection of power, main power supply should be kept off.

To stop the machine press OFF push button on rotate rev / for handle in center position. If machines stopped by OFF push button, for restart machine ON push button should be used. If machine stopped by rev / for handle, machine can restart by same handle without pressing push buttons. Thus this system provides facility to operate machine from two points (1) from push button at head stock (2) from handle at apron.

Internal electric wiring of electric motor and controls is done with wiring panel kept in electric cabinet. Wiring diagram is also given in this manual. During connection of power, main power supply should be kept off.

LUBRICATION POINTS



2.6 Idle running of the machine :-

At the time of machine dispatch, speed and feed levers are set for the lowest value. You are requested to ensure that these positions are maintained at the time of starting the machine to avoid any accidental switching on at high speed and feed, which may damage the machine.

Machine saddle, tail stock spindle etc are kept locked at the time of machine dispatch. Do not try to move them until they are properly cleaned. Lubricated and unlocked.

2.7 Lubrication :-

Proper lubrication of lathe machine plays vital roll to retain accuracy and gives satisfactory service. If lubrication is neglected the bearing surface may be damage, impairing the accuracy and shortening the life of machine.

Lubrication head stock and Norton gear box are done by splash lubrication. Oil level indicator is provided in head stock and Norton gear box. Check oil level through oil level indicator regularly, if oil level seems down then pour oil through oil filling plug. One gear pump is provided in the head stock for lubrication of head stock gears and bearings. Working of lubrication pump is indicated through oil window given in head stock front side.

In initial period, or first time running oil should be changed after first 300 hours running and than after 500 running hours.

Latter on oil can be used up to 1000 to 1500 running hours. Before filling new oil, the head stock should be washed with kerosene and thoroughly dried Quantity of oil and type of oil to be used in head stock and Norton gear box is show in lubrication chart. Lubrication of apron, surface slide, lead screw and tail stock are done by oil can. Various oil holes are provided for lubrication.

All the oil holes, oil cups, grease nipple of the lathe machine should be inspected and filled at least once in day or more often if machine is operate day and night shifts or high speed and feed value is engaged Dirt chip should be brushed away before oiling or greasing to prevent them to enter in to holes.

2.7.1 Lubrication through various oil holes :-

Oil holes are provided at various places for oiling.
(1) Arm plate stud, (2) Thread dial indicator.
Apply oil daily in these oil holes by oil can.

2.7.2 Lubrication through various oil nipples :-

Various oil nipples are provided for oiling.
(1) Carriage screw, (2) Carriage screw nut, (3) Compound screw,
(4) Compound screw nut, (5) Surface slide, (6) Compound slide,
(7) Tail stock body bore.
Apply oil daily in these oil holes by oil can.

2.7.3 Lubrication through oil cups :-

Small oil cups are provided for lubrications.
(1) Carriage, (2) Lead screw brackets, (3) Tail stock body.
Apply oil daily to oil cups by oil can.

2.7.4 Apron :-

One oil level indicator is given in front face of apron box. Pour oil through oil pouring holes given on top face of carriage slide up to level marked in oil level indicator if required. One oil drain plug is given at the bottom face of apron body to remove oil remove oil from apron box.

2.7.5 List of recommended lubrication :-

Sr. No.	Company	Head stock Feed box	Guide ways Lead screw Tail stock Apron
1	HPCL	PARTHAN EP 220	WAYLUB 220
2	BPCL	MAK AMOCAM	WAYLUB 220
3	ISO GRADE	320	220
4	CASTRO OIL	GEAR OIL 320	MAGNA 220
5	MOBIL OIL	GEAR OIL 632	VACTRA 4
6	SHELL OIL	OMALA 320	TONNA 220

Section - 3 OPERATIONS

3.1 Safety :-

(1) Protect your eyes by wearing safety glasses.
(2) Wear shoes with oil resistance soles.
(3) If you have long hair, tie it back properly.
(4) Do not wear long sleeved clothes or loose clothing.
(5) Make sure that your work area should be free from chips, coolant, Elect. wire, air-hoses, oils or any thing that can be get in your way and cause you to fall.
(6) Make sure that work holding are firm.
(7) Make sure that tool holding are firm.
(8) Ensure proper belt tension.
(9) Refit covers and guards before the machine is put again into operation after opening of any cover or guards.
(10) Do not file work piece, when they are being rotate under power. This is extremely hazardous.
(11) Do not touch machine part immediately after machining, it may have sharp edges ad considerable amount of heat.
(12) Wear rubber sole shoes while working on electrical cabinet.
(13) All maintenance work should be done with power off condition.
(14) Electrical shock can cause serious injury or loss of life. All service and maintenance work within the electrical cabinet should be performed by qualified electrician in power off condition.
(15) When replacing fuse always replace them with the same type and rating. Do not substitute fuses for higher current or different voltage.
(16) While working on the machine parts like brake unit transformer etc it may be extremely hot. Take sufficient care when handling such parts.
(17) Do not shift gear in the running condition in headstock as well as Norton gearbox.

3.2 Do, Do Not And CHECKS :-

DO :

- Check and maintain oil level in head stock and feedbox.
- Amplified pitches. Do follow guide line given for amplified pitches.
- The following table gives guideline for selection of maximum spindle speed while cutting high range pitch threading / amplified pitches.

Metric Pitch	English Thread	Spindle Speed
0.75	22	275
4	15	135
8	10	65
12	5	31
16	1.5	20

DO NOT :

- Do not open head stock covers or end feed gear covers while machine is running.
- Do not shift gears in motion.
- Do not exceed speeds of chuck or face plate beyond the specified limit.
- Do not exceed more than 30 reversals of the motor switches per hour.
- Do not remove chucks from threaded spindle by rotating spindle in reverse direction.

CHECKS :

- Job weight limitation. Do not load jobs weighing more than 200 Kgs. Without steady rest or centre support.
- Do not start the machine at high speed with heavy jobs.
- Sudden reversal of spindle at speed above 145 RPM is not recommended.
- It is recommended that cast iron chucks should not be run at surface speed more than 16 mtr / sec. Accordingly 200 mm diameter chuck should not run at more than 1500 RPM.

3.3 Head stock :-

Head stock pulley is directly driven by electric motor through five V-belts. Power transmission in side the head stock to main spindle is through gear arrangement. Total 8 nos. different spindle speeds are available.

Main spindle RPM is selected by two levers, High / low speed changing lever (05) and Speed changing lever (04). Lever 05 have two different positions one is high speed position second is low speed range. Lever 04 are two different levers each lever have 3 different positions. L.H. Lever have position 1, Neutral & 2, similarly R.H. lever have position 3, Neutral & 4. Both the levers are interlocked with each other. L.H. lever will give selection of position 1 or 2 and R.H. lever will give selection of position 3 or 4.

First of all put both levers (04) in neutral position than rotate any one lever to your required position 1-2 or 3-4. If any one lever is set in engage position than automatically second lever will be locked in neutral position. Feed selecting lever (06) has three different positions Reverse. Neutral and forward feed direction.

Oil sight glass (08) is provided for checking oil level in head stock. Lubrication of main bearings, gears, shifters and shafts are done by splash lubrication system as well as gear oil pump. Gear oil pump will give lubrication oil at various points in head stock with force lubrication. One Indicator glass is provided in head stock which indicates working of gear pump. It is necessary to keep always proper oil level in head stock to give lubrication of head stock parts. Oil filling plug (10) is given on top face of head stock cover and oil drain plug (11) is given at back side of head stock bottom face.

CAUTION : Do not shift gear while M/c is running.

3.3.1 RPM Chart :-

SPINDLE SPEED IN RPM				
LEVER POSITION	4	1	3	2
L	20	31	42	65
H	95	135	180	275

3.4 Norton gear box :-

Norton gear box is provides for selection of various feeds and threads. Total 28 types of British threads and 22 types of metric threads can be cut by selecting different levers positions. Total 4 different knobs are given in Norton gear box. Feed selecting knob (14-A) has two different positions A and B, Knob (14-B) has three different positions R,S and T, and Knob (14-C) has two different positions C and D, Knob (14-D) has three different positions X,Y and Z. By selecting any one position of each four levers different thread pitch can be set.

For selection of threading or feed operation, knob (15) is given. By using knob (15) you can select either threading or feed operation.

Oil filling plug (16-B) and oil drain plug (16-C) is given for adding or removing oil from Norton gear box. Oil sight glass (16-A) is given for checking oil level in Norton gear box. It is necessary to maintain proper oil level in Norton gear box. Lubrication of Norton gear box is done by splash lubrication system.

CAUTION : Do not shift gear while M/c is running.

3.5 End feed gears train :-

At the rear end of the head stock, change gear train is fitted to give longitudinal feed, transverse feed and threading operation. To change the direction of rotation of gear train, feed changing lever (06) is given in head stock.

One arm plate with arm stud and gun metal bush is fitted with Norton gear box. Change gears are connected in this arm plate to give drive from head stock output gear to Norton gear box.

3.5.1 Thread chart 2 TPI British Threads :-

BRITISH THREADS					
GEAR	**LEVER**	**AC**	**AD**	**BC**	**BD**
64/80 x 90/90	TX	1.5	3	6	12
	TY	2	4	8	16
	SX	1.875	3.75	7.5	15
	SY	2.5	5	10	20
64/110 x 90/90	TY	2.75	5.5	11	22
64/76 x 90/90	SY	2.375	4.75	9.5	19
64/100 x 90/65	TY	1.625	3.25	6.5	13
FEED mm/rev : Long. 4.75 / TPI – Trans 0.730 / TPI					

3.5.2 Thread chart 2 TPI Metric Threads :-

METRIC THREADS					
GEAR	**LEVER**	**AC**	**AD**	**BC**	**BD**
$\frac{60}{127} \times \frac{80}{80}$	RX	16	8	4	2
	SZ	14	7	3.5	1.75
	RY	12	6	3	1.5
	TX	10	5	2.5	1.25
	SX	8	4	2	1
	TY	7.5	3.75	1.875	0.937
	SY	6	3	1.5	0.75
FEED mm/rev : Long 0.1870 × mm pitch. Trans 0.0288 × mm pitch.					

3.6 Thread dial indicator :-

Thread dial indicator (34) is used during threading operation. By using thread dial indicator half nut with lead screw can engage at correct position during successive threading cuts, so that tool will follow the original cuts and it will eliminates the necessity of reversing the lathe spindle.

For British Threading :-

For all odd and even threads in each inch, close half nuts at any no. on dial. (For example at no. 4, 5, 6 etc.)

For all threads involving one half threads in each size, close half nuts at any alternative no. on dial. (For example 2, 4, 6 or 1, 3, 5)

For Metric Threading :-

During metric threading thread dial indicator will not be used and spindle has to run in reverse direction with out dish engaging half nuts in second and subsequent cuts till threading operation is completed.

3.6.1 Special threading not indicating in thread chart :-

British Threads :-

Gear train for required TPI = Gear train of selected TPI $\times$ $\frac{\text{Selected TPI}}{\text{Required TPI}}$

For example 19 TPI threads required. Than select nearest 20 TPI threads and set levers position as per 20 TPI of Norton gear box, that will be SY - BD

$$= \frac{64}{80} \times \frac{90}{90} \times \frac{20}{19}$$

$$= \frac{64}{76} \times \frac{90}{90}$$

Metric Threads :-

Gear train of required pitch = Gear train of selected pitch x $\frac{\text{Required pitch}}{\text{Selected pitch}}$

For example pitch required is 1.75 mm, than select nearest pitch of 2.00 mm and set levers as per 2.00 mm pitch that will be SX - BC

$$= \frac{60}{127} \times \frac{80}{80} \times \frac{1.75}{2.00}$$

$$= \frac{60}{127} \times \frac{70}{80}$$

3.6.2 Feed Calculations :-

Longitudinal feed (In mm/rev.) = $\frac{4.75}{TPI}$ OR 0.187 x Pitch

Transverse feed (In mm/rev.) = $\frac{0.730}{TPI}$ OR 0.0288 x Pitch

- For example if machine change gears set as per 10 TPI than
  - Longitudinal feed will be $\frac{4.75}{10}$ = 0.475 mm / rev.
  - Transverse feed will be $\frac{0.730}{10}$ = 0.073 mm / rev.
- For example if machine change gears set as per 2.5 mm pitch than
  - Longitudinal feed will be 0.187 x 2.5 = 0.467 mm / rev.
  - Transverse feed will be 0.0288 x 2.5 = 0.072 mm / rev.

3.7 Carriage :-

Carriage slide (27) is fitted on bed top face with one lock piece and setting wedge at rear side and two lock pieces on front side. On the top face of carriage, surface slide (26) fitted on Dow tail guide ways with setting wedge. On the side edge of carriage two tapped holes are given to clamp follow rest guide. Aluminum chip guards with felt are given at all four corners of carriage to prevent to enter dust and chips inside the sliding surface. Two oil cups (29) with cap are provided on top face of carriage slide for lubrication of sliding surface. One lock bolt is provided on carriage surface to lock carriage movement if required.

Surface slide (26) is fitted on carriage (27) Dow tails. On the front face of carriage one screw boss fitted to guide surface screw and nut. Surface screw and gear is fitted in carriage and surface screw gun metal nut is fitted on bottom face of surface slide (26). One hand wheel with micro ring (28) is fitted on surface screw to give manual hand feed to surface slide. On the top face of surface slide one circular T-slot is given and angular marking of 180 degree (90 degree on either side.) is done to set compound slide at any desire angular position.

Compound slide assembly (25) is located in center of surface slide (26) and clamped with surface through two nos. T-bolts. One 4 way tool post (24) is fitted on top face of compound slide to hold tools.

3.8 Apron box :-

Construction of apron gear box (31) is rigid and box type. Apron gear box is fitted at bottom face of carriage (27). Lead screw is passes through apron gear box worm to give drive to apron box. One thread cutting lever (33) is fitted on left side of apron gear box. This lever operates engage / dis engage of half nut on lead screw during threading operation. Thread dial indicator (34) is fitted on left hand side of apron gear box. Feed mechanism is drop worm type. Feed engage / disengage is done by feed engage lever (32-A). For engaging feed, lift lever (32-A) in upward direction and for disengage feed push lever (32-A) in downward direction. Feed selection for longitudinal or transverse is done by feed selection lever (32-B).

Feed selecting lever (32-B) with spring loaded plunger is provided on apron gear box. This lever has 3 positions Reverse, Neutral & Forward feed. Thread cutting lever and feed engage lever (32-A) are inter locked with each other to prevent operating of both levers simultaneously. During thread cutting operation feed engage lever (32-A) should in neutral position, otherwise thread engage lever (33) will not work. Similarly during turning operation thread engage lever (33) should be in dis engage condition with lead screw, otherwise feed engage lever (32-A) will not work.

One hand wheel (35) is provided to move carriage slide on lathe bed by manual operation. For optional rapid movement of carriage on bed one rapid feed gear box (36) with electric motor (45) is fitted on right side of apron box.

3.9 Tail stock :-

Tail stock body (37) with tail stock base is fitted on lathe bed to provide support during turning operation or to perform drilling, boring, taper turning, and etc. operation. Tail stock assembly (37) is clamped on lathe bed by two tail stock clamping pad and bolt (40). After setting tail stock at desire position on bed. It should be clamped with bed by clamping bolt. Two setting bolts are provided on either side of tail stock base to set alignment of tail stock spindle with lathe spindle.

Tail stock spindle (38) guide in tail stock body and moves axially by hand wheel (39) and screw nut assembly fitted with hand wheel. One clamping handle is given to clamp tail stock spindle movements if required. As optional for dual hand feed of tail stock spindle one dual feed gear box (41) is provided on back face of tail stock.

Section - 4 Settings and Maintenance

Proper care and maintenance of the machine is important factor to increase life and reliability of machine performance. Following are the few important settings, which needed attention.

4.1 Head stock :-

4.1.1 Taper setting :-

Head stock is mounted on bed by six bolts. To set head stock alignment, first loose bolts slightly and than insert test mandrel of 300 mm length in spindle nose and align axis of taper mandrel with longitudinal movements and clamped bolts.

4.1.2 Spindle setting :-

Main spindle runs in two taper roller bearings and one roller bearing. To adjust radial or axial clearance of spindle tightens check nuts so that the spindle can be rotate by hand with light drag.

4.1.3 V-Belts setting :-

Main electric motor is mounted on motor mounting bracket on back side of lathe bed. Five nos. V Belts are fitted between motor pulley and head stock pulley. To adjust belt tension, un clamps four bolts of elect. Motor and re adjust the position of motor on motor on motor mounting bracket and clamp bolts.

4.2 Lead screw :-

Lead screw is coupled with out put shaft of Norton gearbox by key.

4.3 Carriage :-

Carriage is fitted on bed with one V guide and one flat surface. Carriage is set on bed guide ways with two keeper blocks on operator side and one keeper plate with parallel wedge in rear side.

4.4 Surface slide and Compound slide :-

Surface slide and compound slide is scraped and matched in guide ways with one wedge, Setting bolts are given to set slide wedge clearance.

4.5 Tail stock :-

Taper turning of long job can be done by off setting of tail stock with respect to head stock center line. In tail stock base two setting bolts are given on either side. By loosen one setting bolt and tighten other setting bolt tail stock body can be set off set.

4.6 Tool post :-

After long use the tool post clamping handle may extend beyond the convenient zone of clamping. To get back proper angle of tool post clamping handle face the bottom spacer of clamping lever by required amount.

4.7 Half nut :-

Half nuts are guided in guide ways of apron body. Clearance of guide ways can be set by setting bolts given on left hand side of apron body. First loosen slightly two hex bolts given on guide ways and compete settings, after completing settings,, clamping bolts should be tighten.

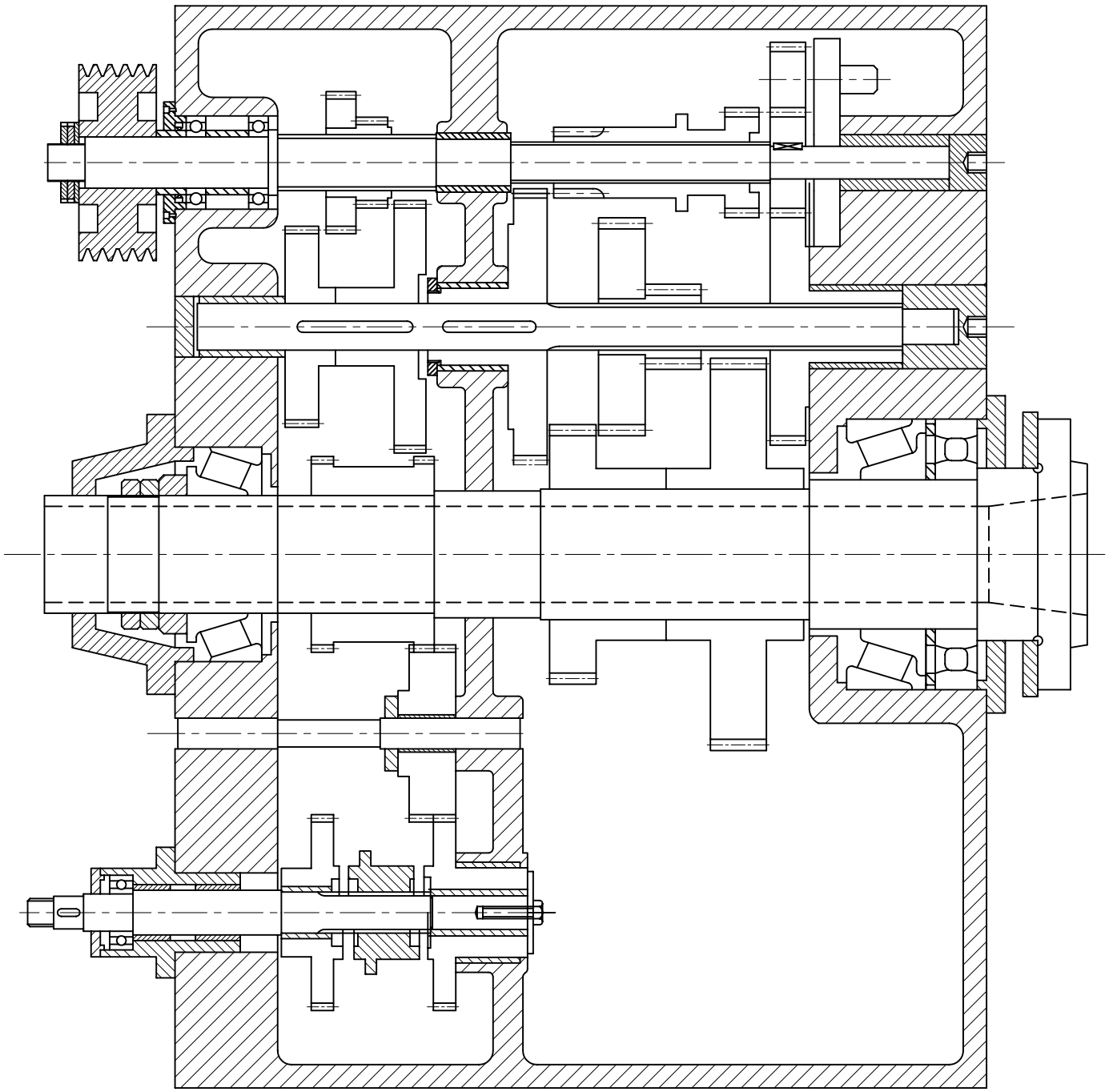
4.8 Trouble shooting and remedy :-

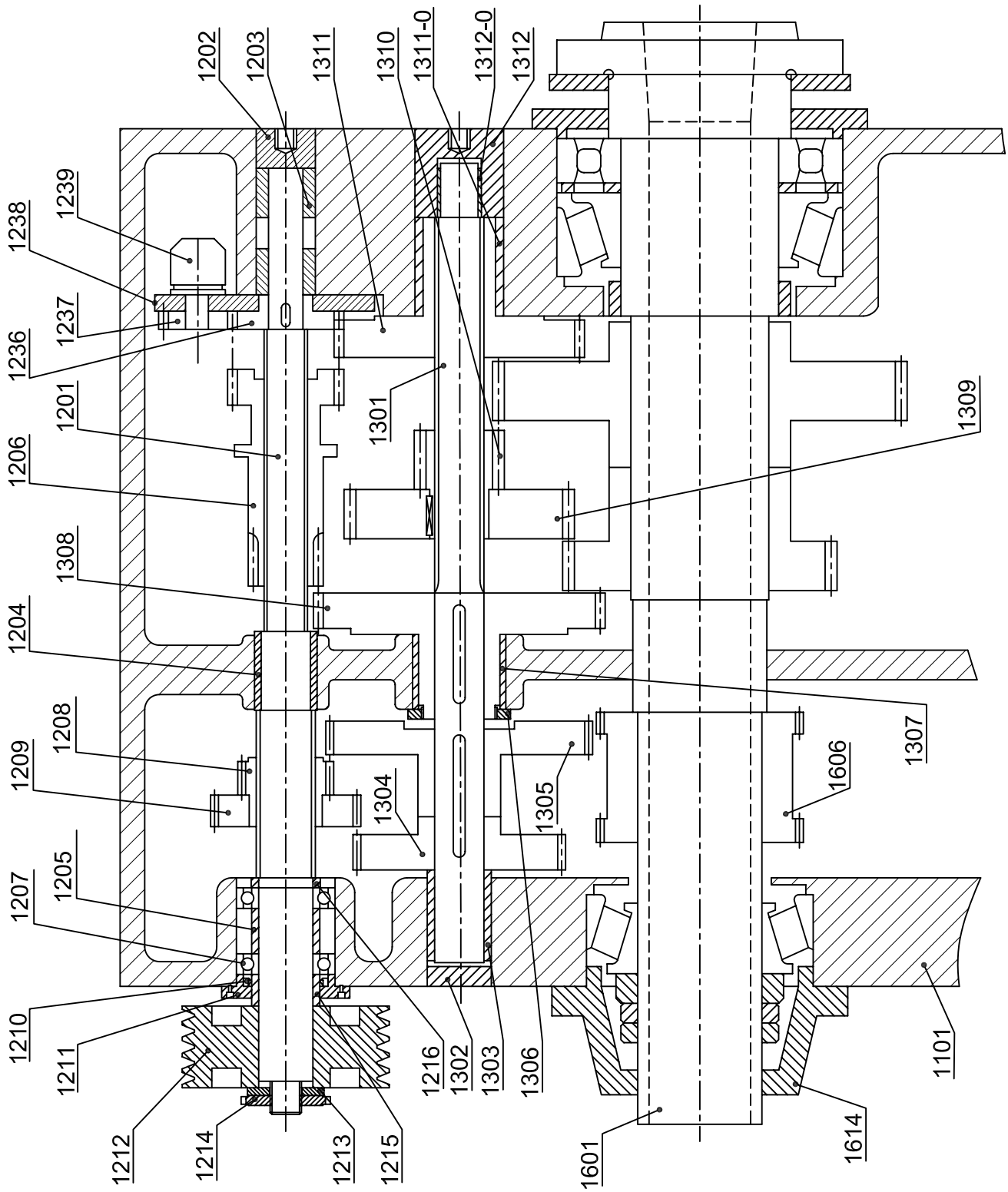
SR.	TROUBLE	CAUSE	REMEDY
1	Machine vibrates while running.	(A) Improper leveling.	Level machine properly and tighten on foundation
		(B) Job not balanced.	Balance job by adding counter weight and reduce spindle speed and feed.
2	Machine vibrates while machining and chatter mark on job.	(A) Improper tension of V belts.	Adjust V belt tension.
		(B) Excessive tool over hang.	Reduce over hang of tool and clamp tool rigidly
		(C) Wrong tool.	Check proper tool material and tool geometry
		(D) Wrong cutting parameters.	Select proper speed, feed and depth of cut consider job material, tool material and job diameter
		(E) Improper tool center.	Adjust correct tool center
		(F) Work holding not rigid.	Check job holding
		(G) Clearances between carriage, surface, or comp. slides are not proper.	Adjust proper clearances between all wedges
		(H) Slender components machine without support.	Put proper support to job
		(I) Back plate of chuck is loose.	Check back plate of chuck
		(J) Pre loading of main spindle is not correct.	Adjust pre loading of spindle

SR.	TROUBLE	CAUSE	REMEDY
3	Spindle runs too tight or loose.	(A) Preloading of spindle is not proper.	Adjust check nuts given at rear end of head stock such that spindle should rotate by hand with light drag
4	Machine cuts taper on job.	(A) Alignment of head stock is not proper.	Align head stock axis with carriage movement
5	Machine cuts taper on job held between centers.	(A) Alignment of tail stock not proper. (B) Improper m/c level. (C) Tool worn out.	Align tail stock axis Level machine properly Re grind or replace tool
6	Gear train in end feed gear train make sound during running.	(A) Alignment of change gear is not proper. (B) Fixing nut bolts not proper tight. (C) Some damage mark on gear teeth. (D) Lubricant is not sufficient.	Adjust backlash of change gears Tighten fixing nut and bolts Inspect and remove damage mark from gear Provide sufficient lubrication
7	Machine is not able to take heavy cuts.	(A) Belt tension is not proper.	Adjust proper belt tension

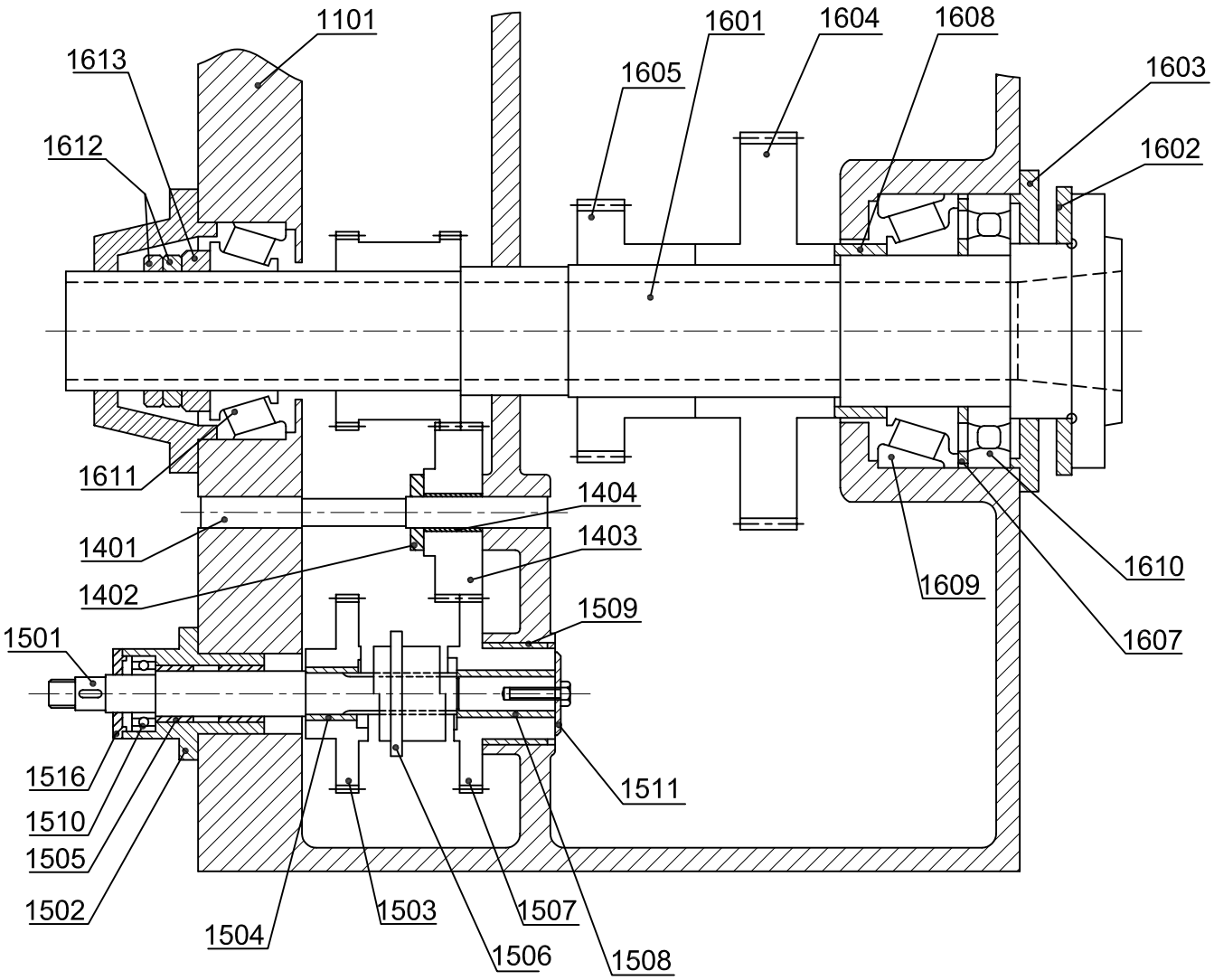
SR.	TROUBLE	CAUSE	REMEDY
8	Threading over lapse.	(A) Excessive axial play of lead screw. (B) Excessive play in half nuts. (C) Gear train or norton lever position is not proper. (D) Engagement of half nut is not proper.	Set axial play of lead screw. Set play of half nuts. Set proper gear train or proper lever position of norton gear box. Engage half nut as per instruction given in thread dial indicator.
9	Noise in head stock.	(A) Lubricant is not sufficient. (B) Gear damage. (C) Bearing damage.	Check oil lever and maintain proper oil level. Replace damage gear. Replace bearing.

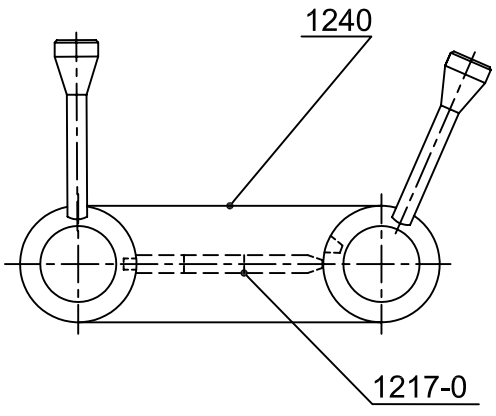
HEAD STOCK SUB ASSEMBLY



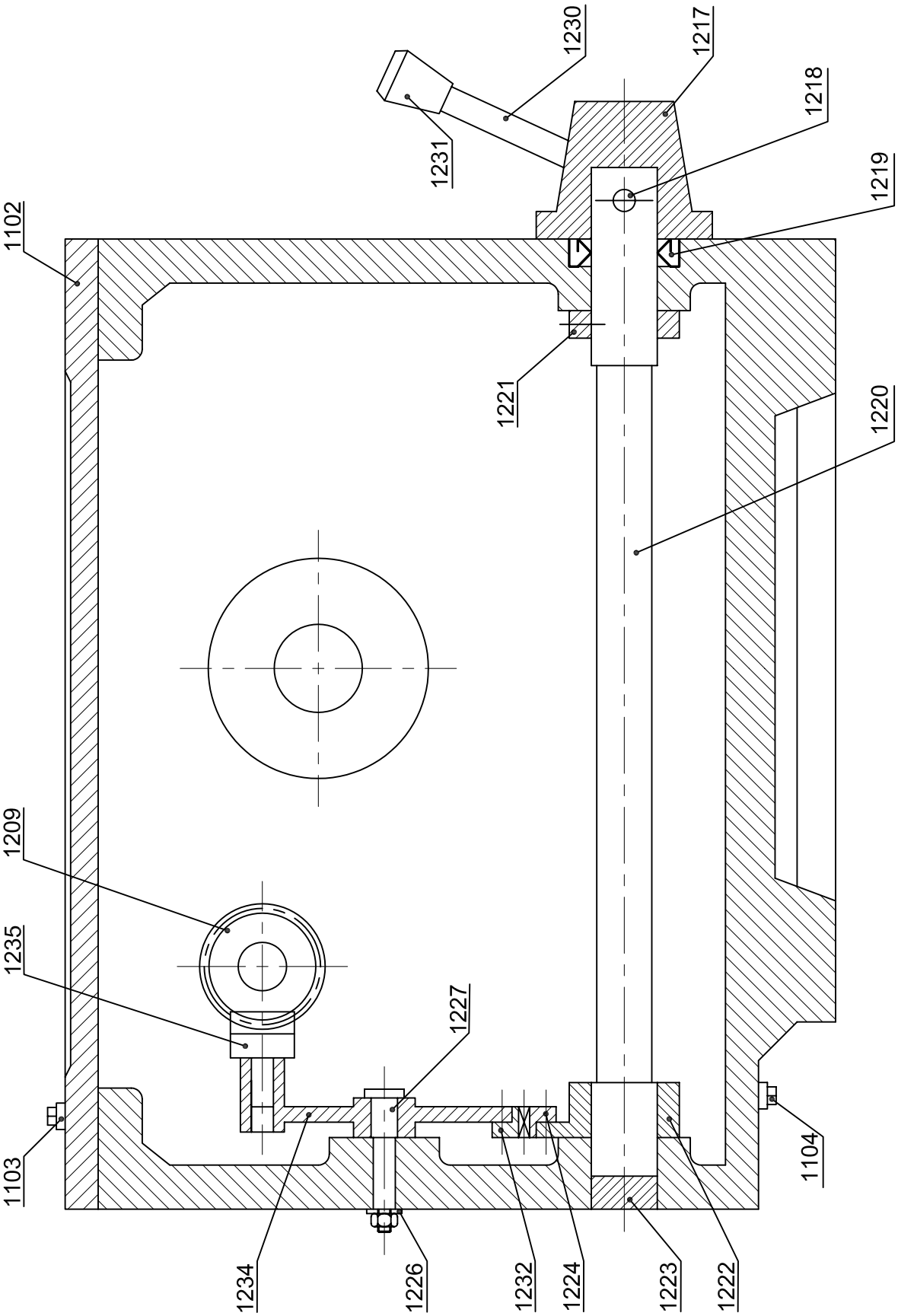


HEAD STOCK SUB ASSEMBLY

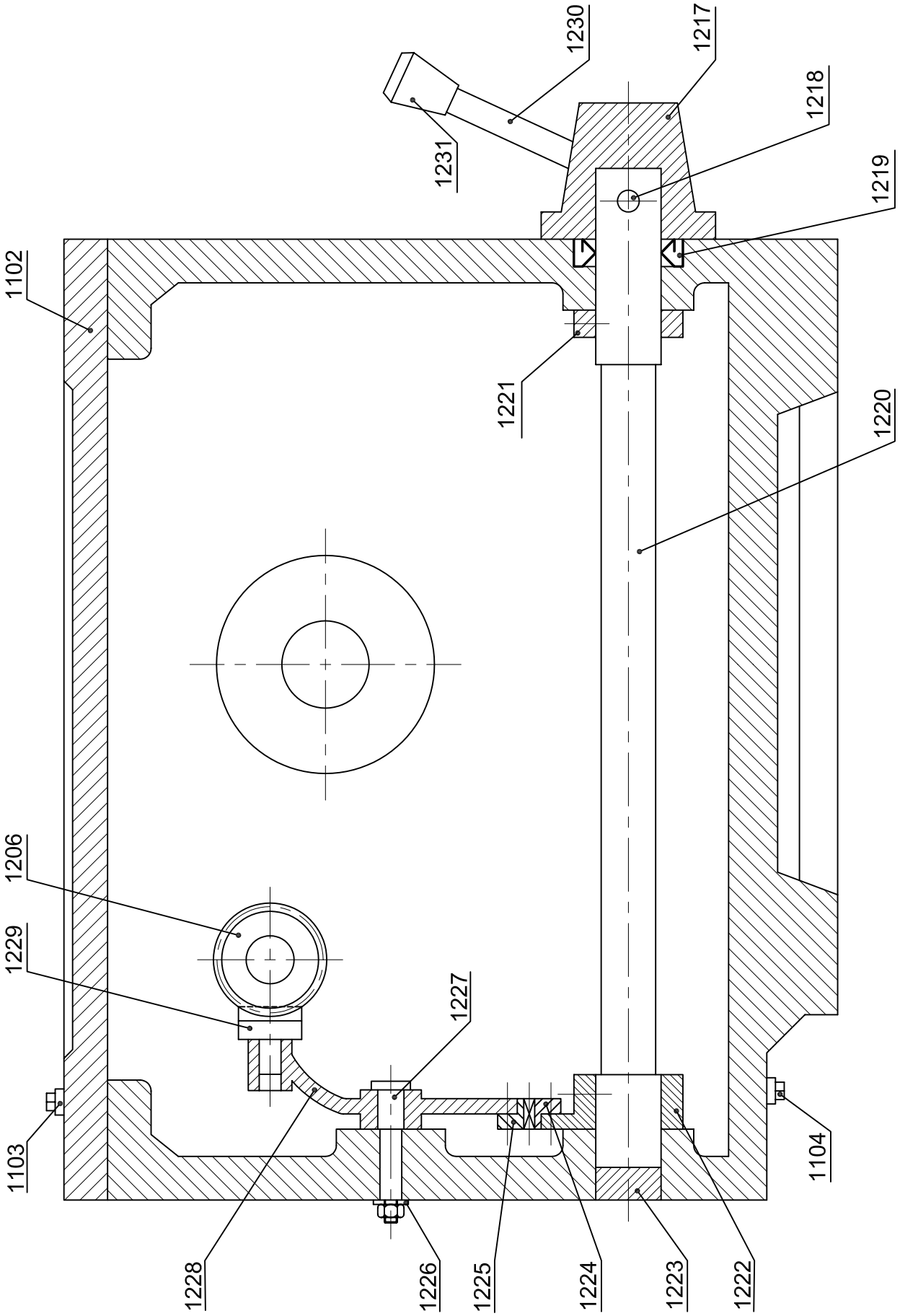




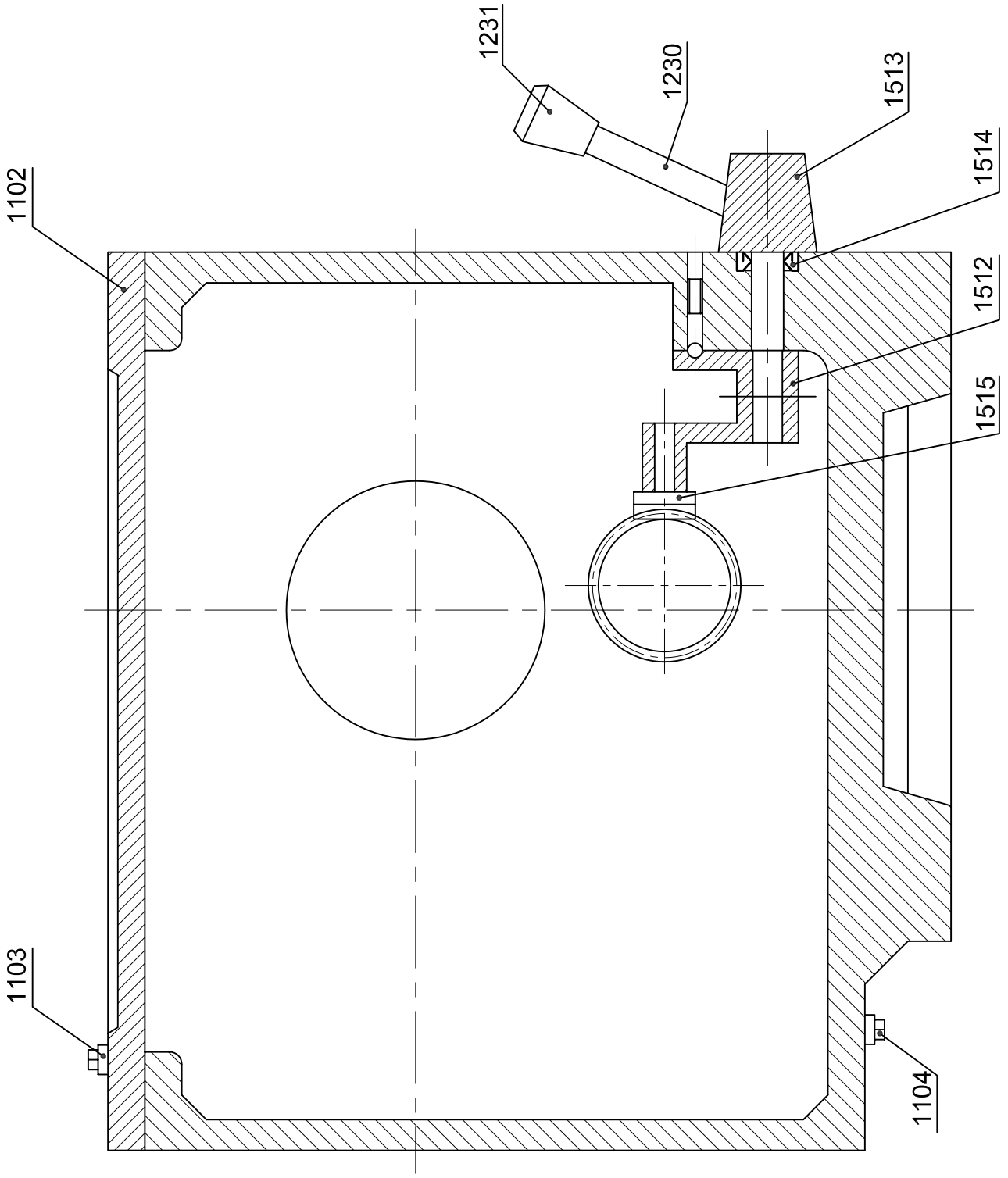
HEAD STOCK SUB ASSEMBLY



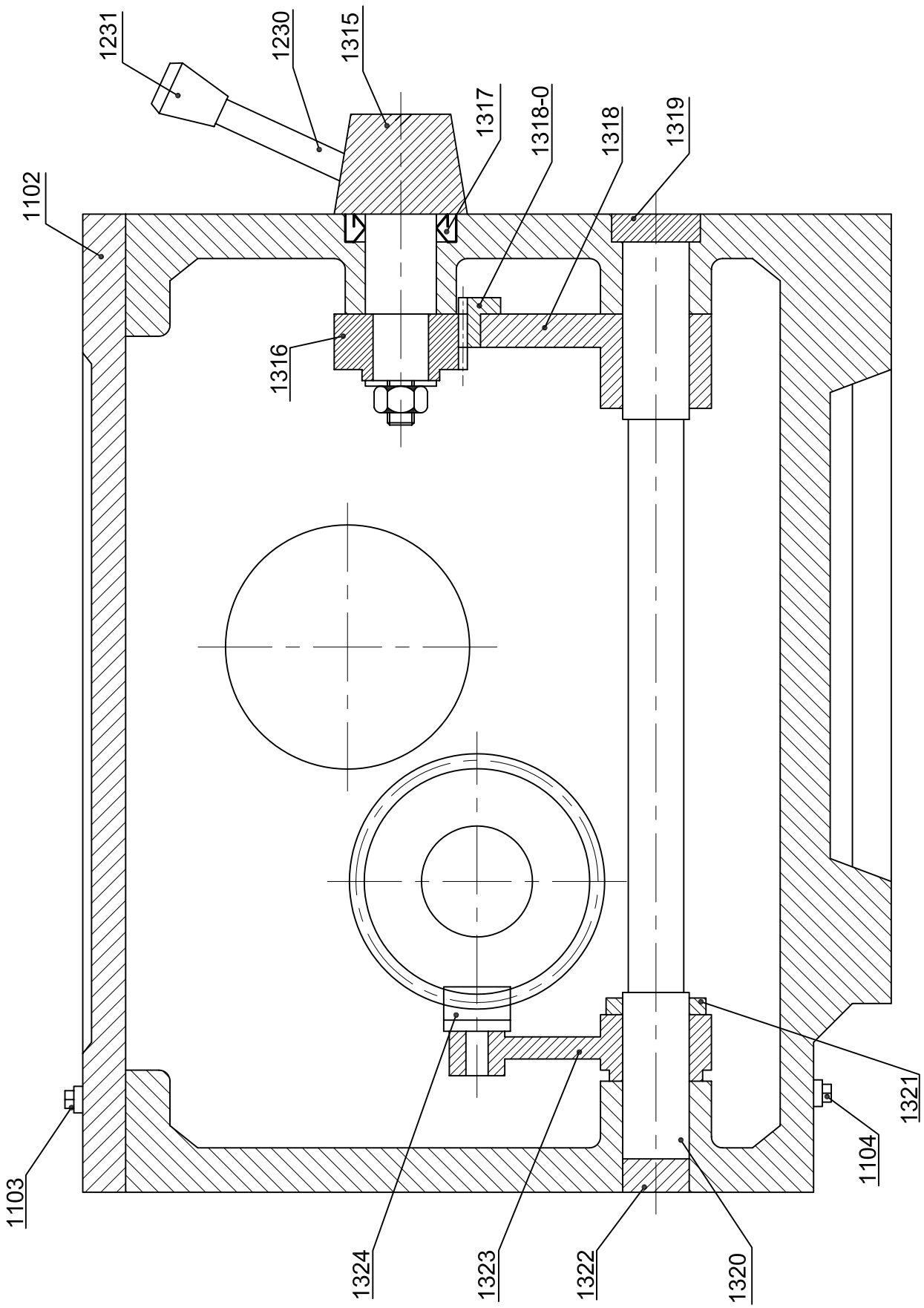
HEAD STOCK SUB ASSEMBLY



HEAD STOCK ASSEMBLY



1500 SERIES SHAFT ASSEMBLY



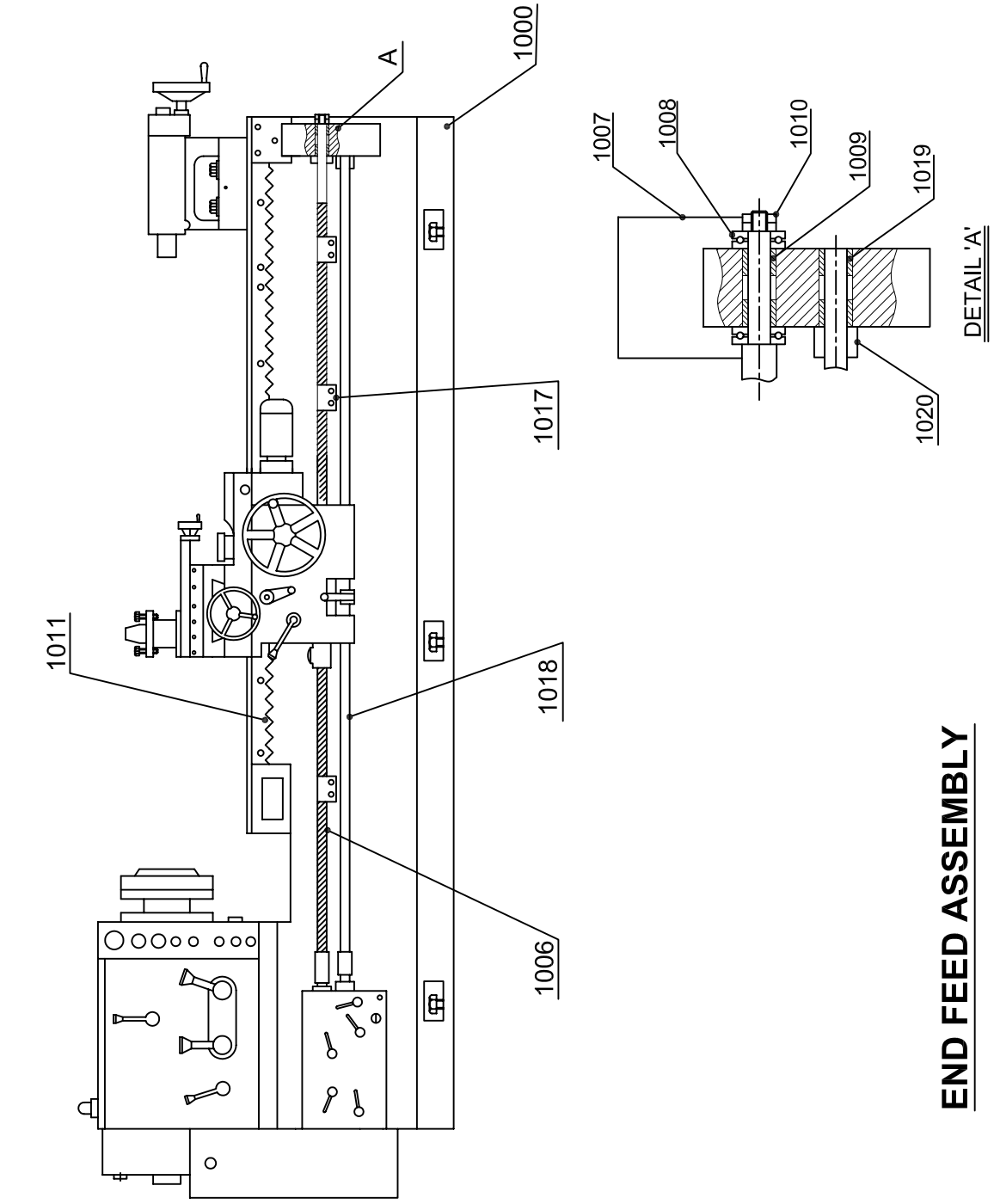
1300 SERIES SHAFT ASSEMBLY

5.1 HEAD STOCK ASSEMBLY

Part No.	Part Name	Quantity
1101	Head stock body	1
1102	Head sock top cover	1
1103	Oil filling plug	1
1104	Oil drain plug	1
1201	Driving shaft	1
1202	Plug	1
1203	G.M. R H Guide bush	1
1204	G.M. Middle guide bush	1
1205	Bearing spacer	1
1206-0	Cluster gear Z = 16	1
1206-1	Cluster gear Z = 26	1
1207	Ball bearing (no. 6211)	2
1208	Gear Z = 21	1
1209	Gear Z = 34	1
1210	Oil seal 70 - 90 - 10	1
1211	Cover	1
1212	Head stock driving pulley	1
1213	Washer	1
1214	Driving pulley lock nut	2
1215	Spacer	1
1216	Spacer	1
1217	Front lever boss	2
1217-0	Inter locking key	1
1218	Taper pin	2
1219	Oil seal 25-42-7	3
1220	Gear shifter shaft for gear (no. 1206)	2
1221	Collar	2
1222	Bottom gear sector type lever	2
1223	Plug	2
1224	Gear sector for bottom lever	2
1225	Gear sector for top lever	1
1226	Washer	2
1227	Top lever locating pin	2
1228	Top lever for gear shifting	1
1229	Fork	1

Part No.	Part Name	Quantity
1230	Handle for front lever boss	4
1231	Knob	4
1232	Gear sector for top lever for gear 1208	1
1234	Top shifter lever for gear 1208	1
1235	Fork	1
1236	Driving gear for pump Z=70	1
1237	Gear Z =56	1
1238	Locating plate	1
1239	Gear pump	1
1240	Inter locking plate	1
1301	Middle shaft	1
1302	End plug	1
1303	G. M. Guide bush L H side	1
1304	Gear Z = 50	1
1305	Gear Z = 63	1
1306	Check nut for gear 1308	1
1307	G. M. Middle guide bush	1
1308	Gear Z = 68	1
1309	Gear Z = 44	1
1310	Gear Z = 16	1
1311	Gear Z = 58	1
1311-0	G.M.Bush	1
1312	Middle shaft and guide bush	1
1312-0	G.M.Bush	1
1315	Front lever pin for gear 3010	1
1316	Gear Z = 40	1
1318	Shifter lever for bottom shaft	1
1318-0	Gear sector for bottom lever	1
1319	Plug	1
1320	Gear shifter lever for bottom shaft	1
1321	Collar	1
1322	Plug	1
1323	Rear side gear sifter lever	1
1324	Fork	1
1401	Idler gear shaft	1
1402	Collar	1
1403	Idler shaft gear Z = 48	1

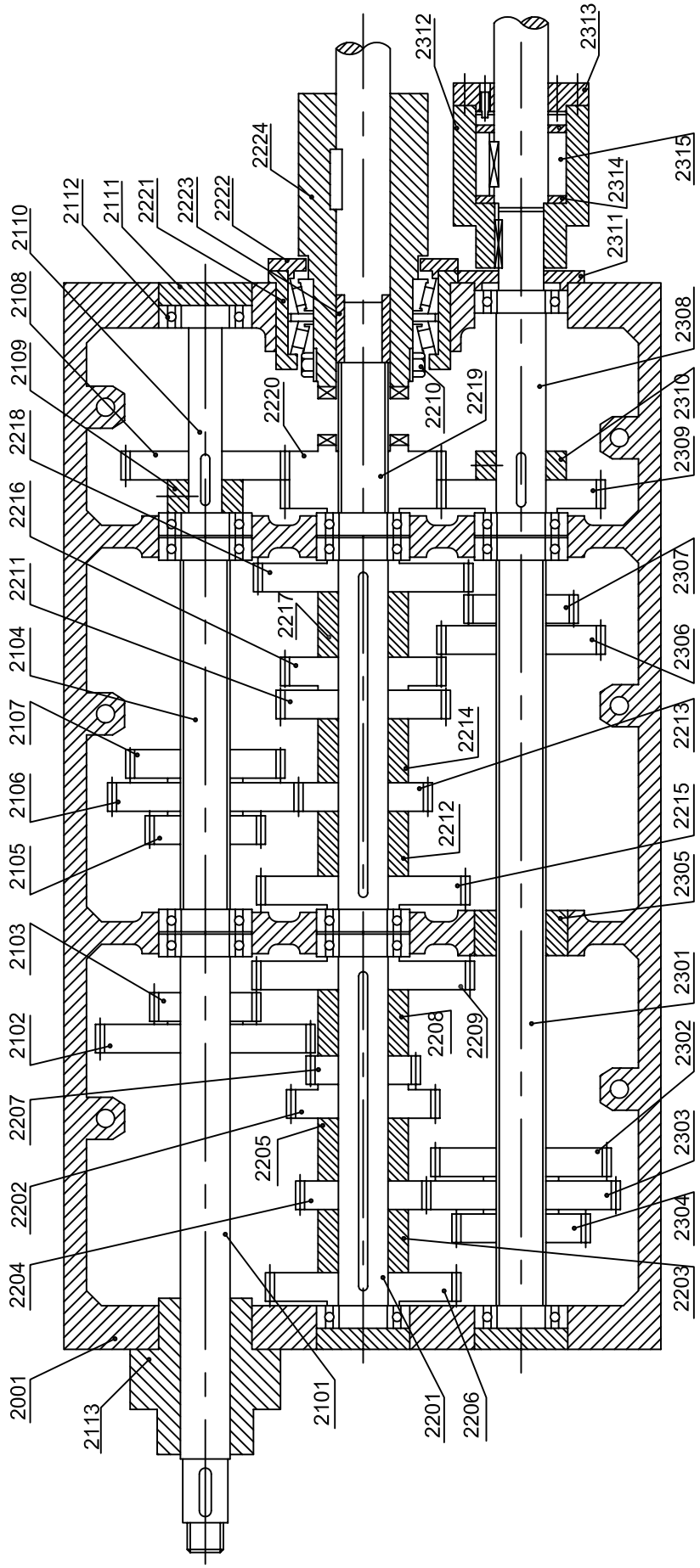
Part No.	Part Name	Quantity
1404	G. M. Bush for idler gear	1
1501	Change gear spline shaft	1
1502	Change gear shaft housing	1
1503	Gear Z = 56	1
1504	G. M. Bush for 1503 gear	2
1505	Housing G. M. bush	1
1506	Claw bush for Rev./ For. Feed	1
1507	Gear Z = 56	1
1508	Guide bush for 1507 gear	1
1509	G. M. Bush for 1507 gear	1
1510	Ball bearing 6208	1
1511	Washer	1
1512	Shifter lever for claw bush shifting	1
1513	Boss for feed reversing lever	1
1514	Oil seal 25-	1
1515	Fork for bottom gear	1
1516	Change gear shaft housing cover	1
1601	Spindle bayonet size 11 type	1
1602	Lock ring	1
1603	Front bearing cover	1
1604	Gear Z = 79	1
1605	Gear Z = 51	1
1606	Gear Z = 56	1
1607	Bearing spacer	1
1608	Inner spacer	1
1609	Taper roller bearing 32232	1
1610	Ball bearing 6232	1
1611	Taper roller bearing 32226	1
1612	Spindle check nuts	2
1613	Rear bearing spacer	1
1614	Rear bearing cover	1
1615	Thrust socket	2
1616	Driving button	1
1617	Bayonet stud	1



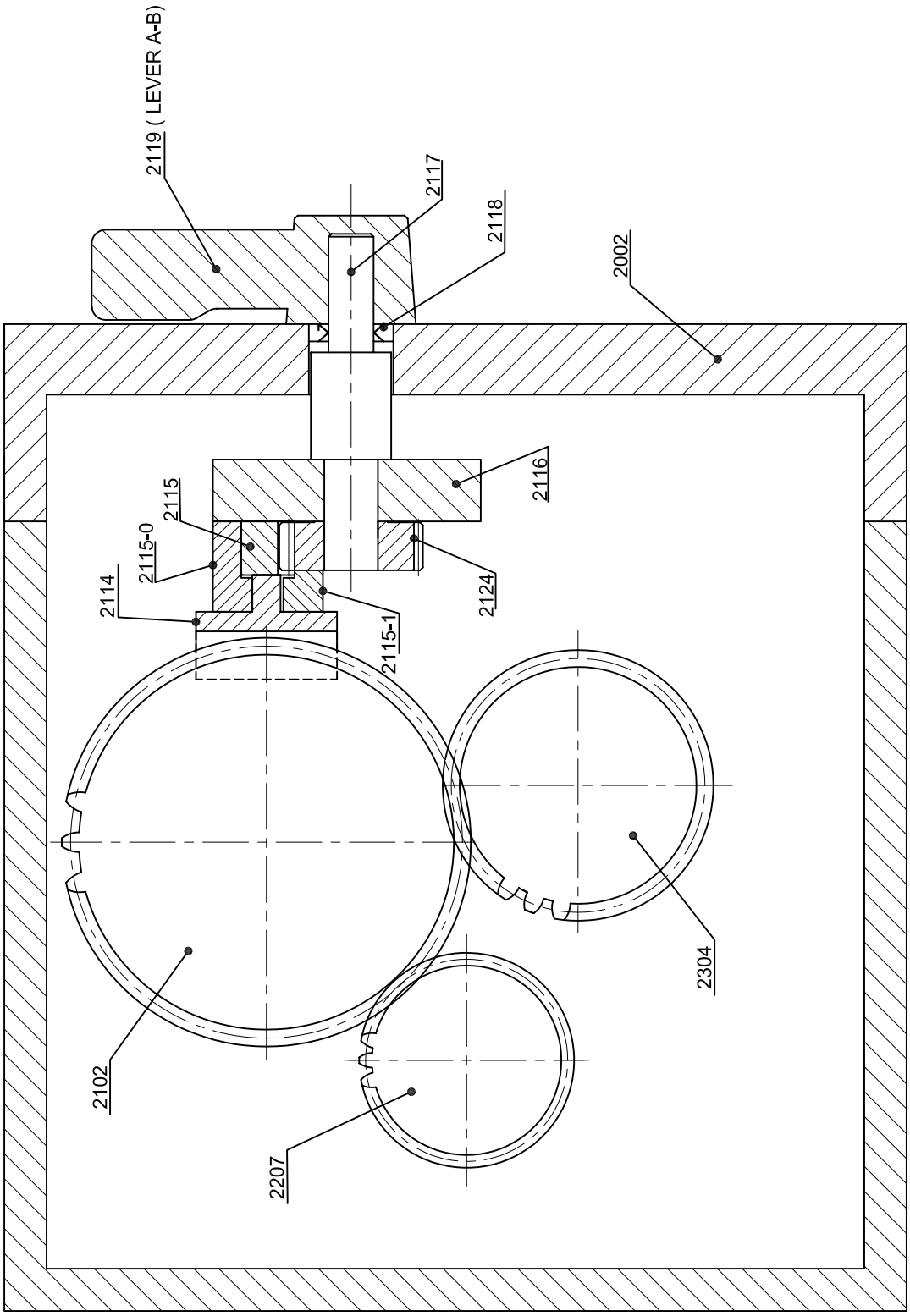
END FEED ASSEMBLY

5.2 END FEED TRAIN ASSEMBLY

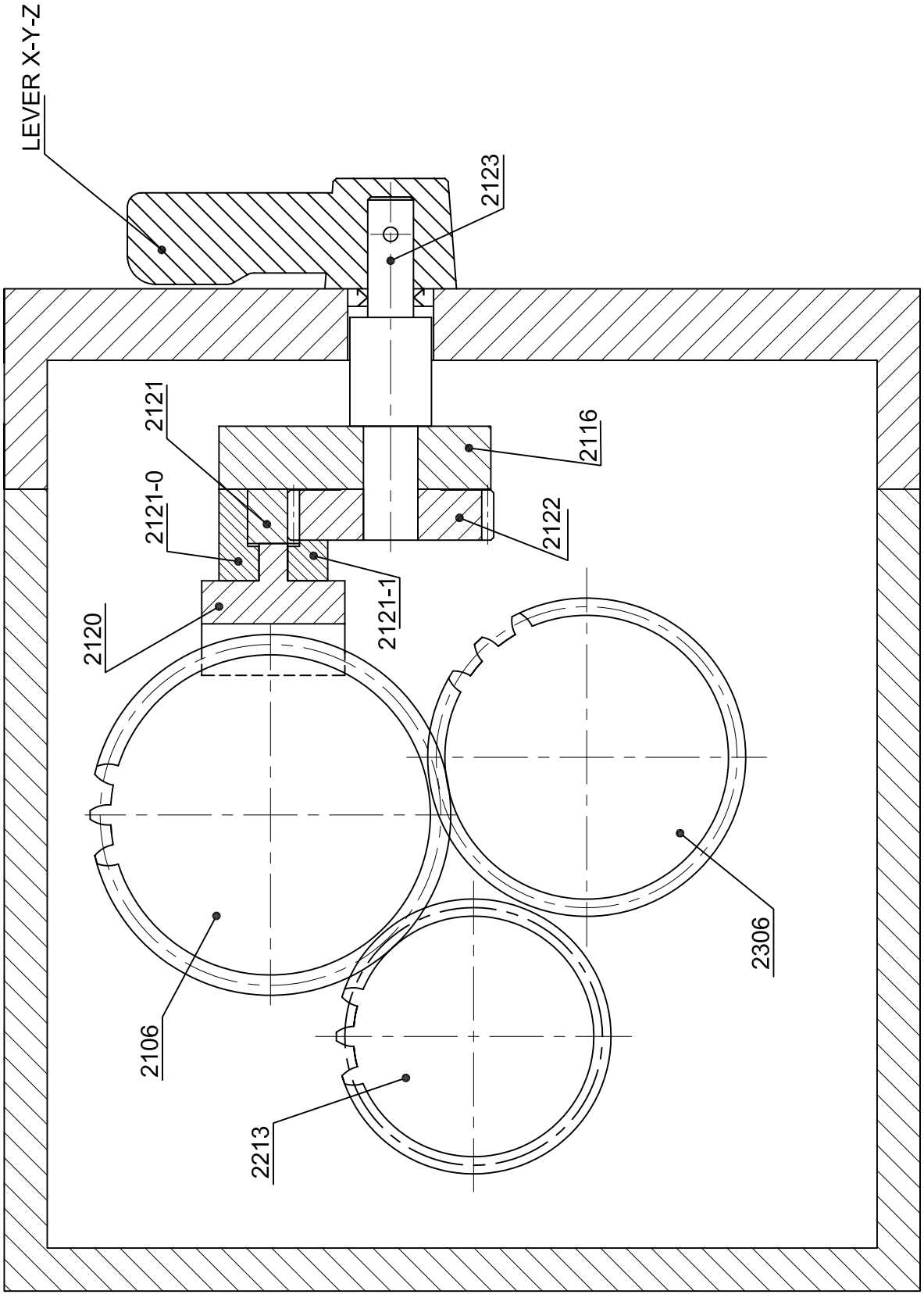
Part No.	Part Name	Quantity
1000	Lathe bed with gap	1
1001	Change gear set (As per packing slip)	--
1002	Arm plate	1
1003	Arm plate stud	1
1004	Gun metal bush of arm plate stud	1
1005	Clamping stud of arm plate	2
1006	Lead screw	1
1007	Lead screw bracket (RH)	1
1008	Thrust bearing	2
1009	Gun metal bush for lead screw	1
1010	Check nut	2
1011	Rake	--
1012	Motor Rail Patta	2
1013	Motor Rail	2
1014	Motor Pulley	1
1015	Electric Motor	1
1016	Side Cover Stud	4
1017	Lead Screw Support	--
1018	Feed Rod	1
1019	Feed Rod G.M.Bush	2
1020	Feed Rod Collar	1
1021	Change gear spacer.	1



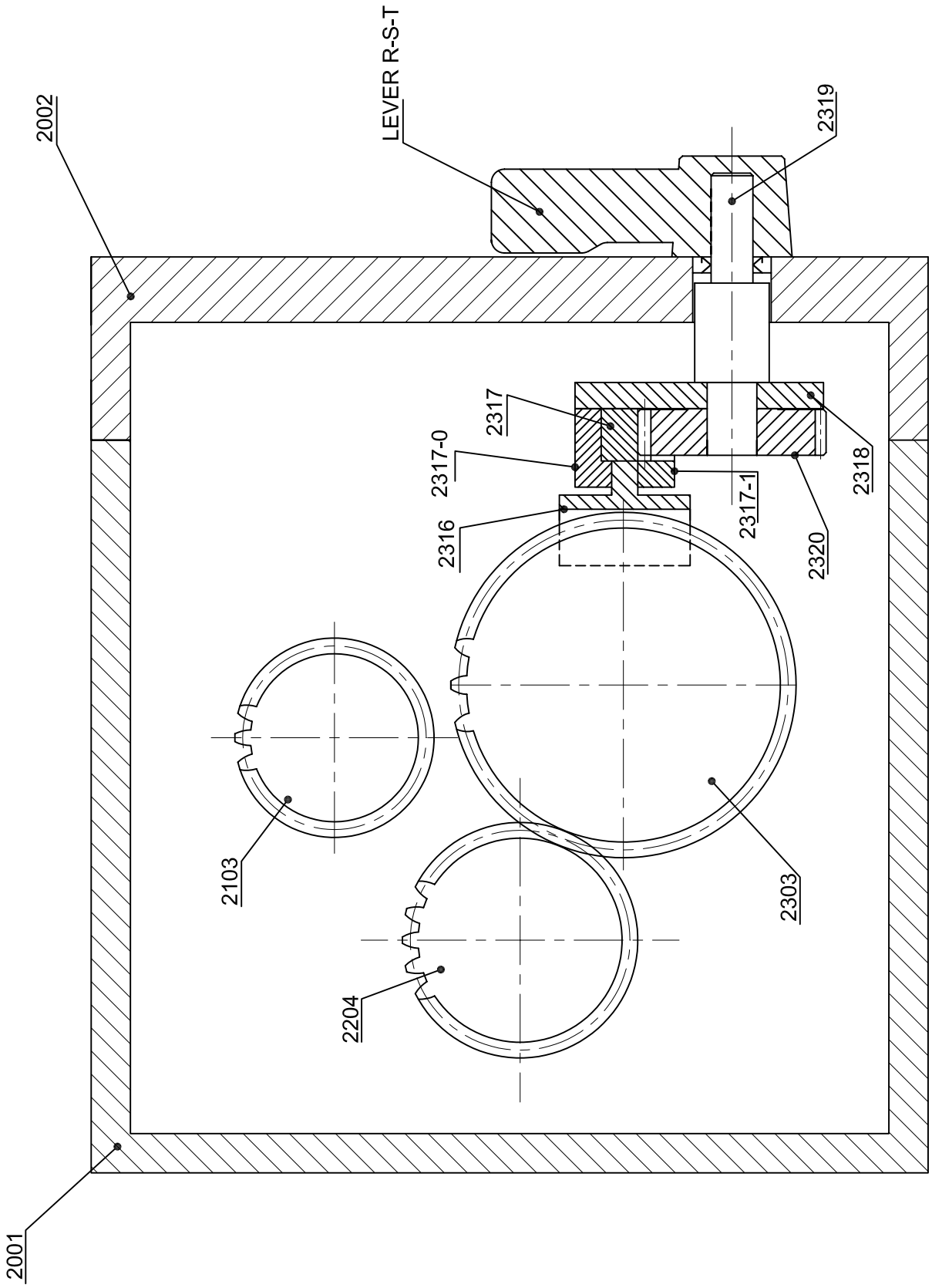
NORTON GEAR BOX


2119 (LEVER A-B)
2117
2118
2002
2116
2115
2115-0
2114
2124
2115-1
2304
2102
2207

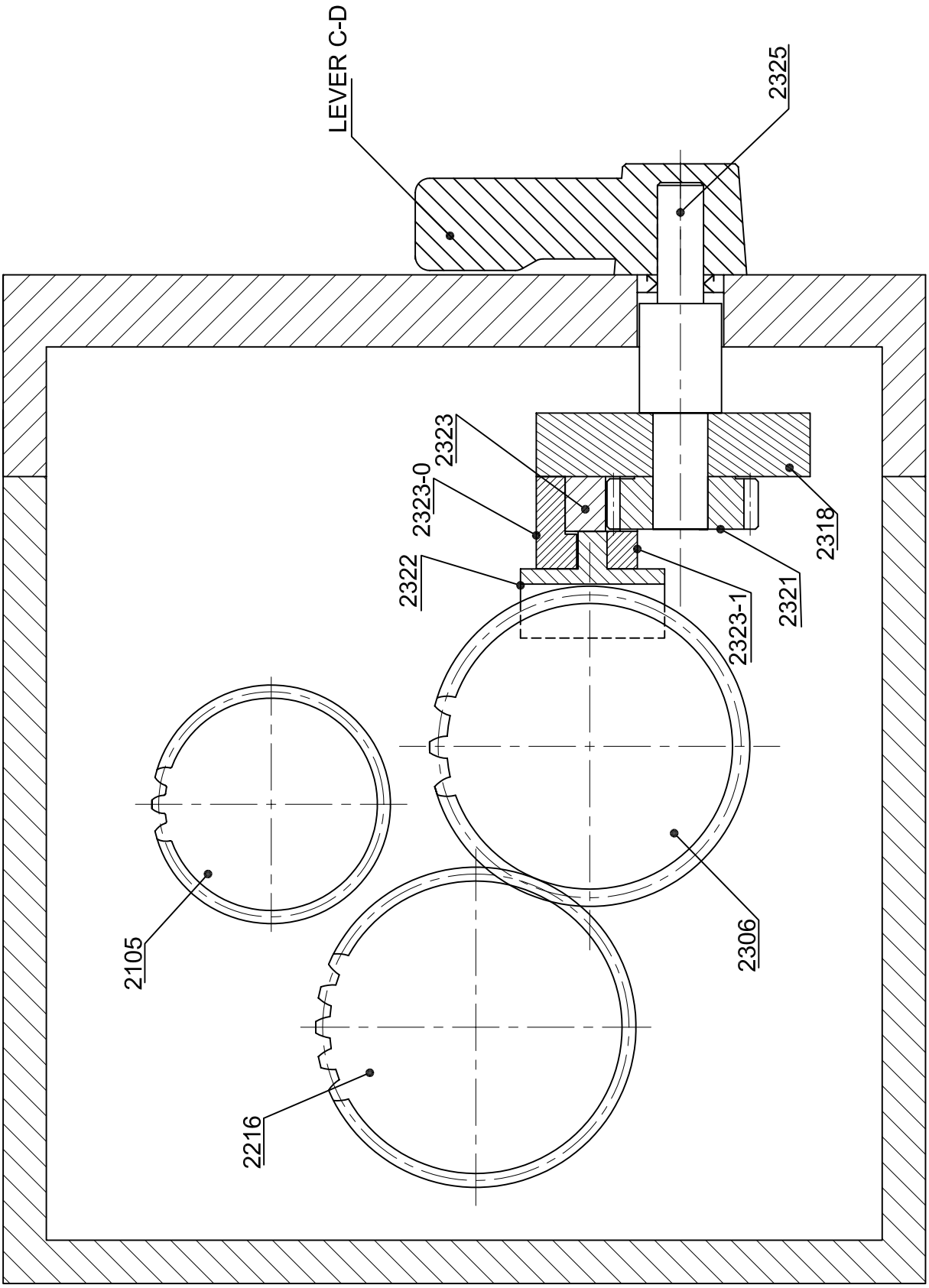
SECTION - "A A"


LEVER X-Y-Z
2123
2121
2116
2121-0
2122
2121-1
2120
2306
2106
2213

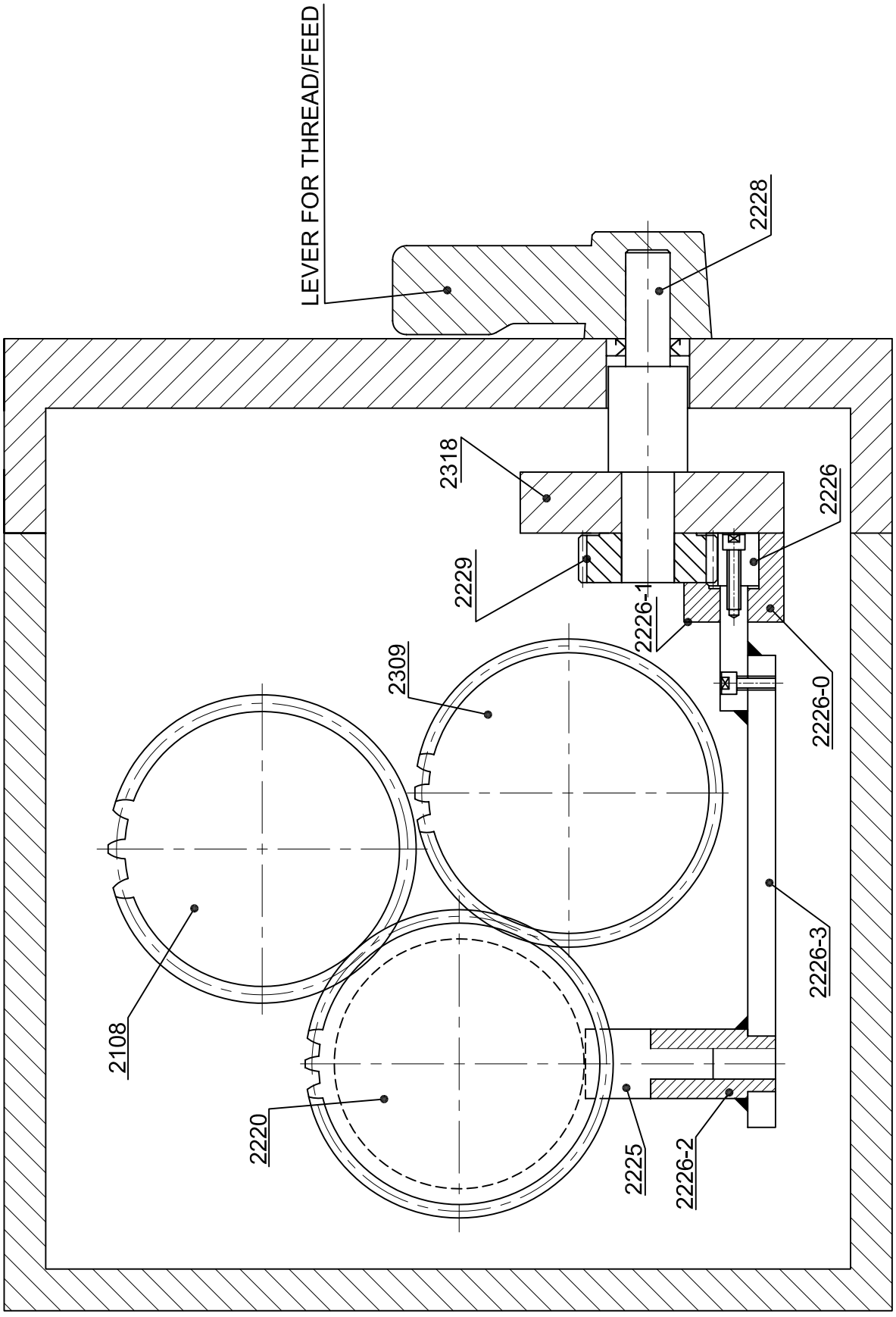
SECTION "B-B"


LEVER R-S-T
2002
2319
2317
2317-0
2318
2317-1
2316
2320
2103
2303
2204
2001

SECTION "C-C"



SECTION "D-D"


LEVER FOR THREAD/FEED
2228
2318
2226
2229
2226-1
2309
2226-0
2226-3
2108
2220
2225
2226-2

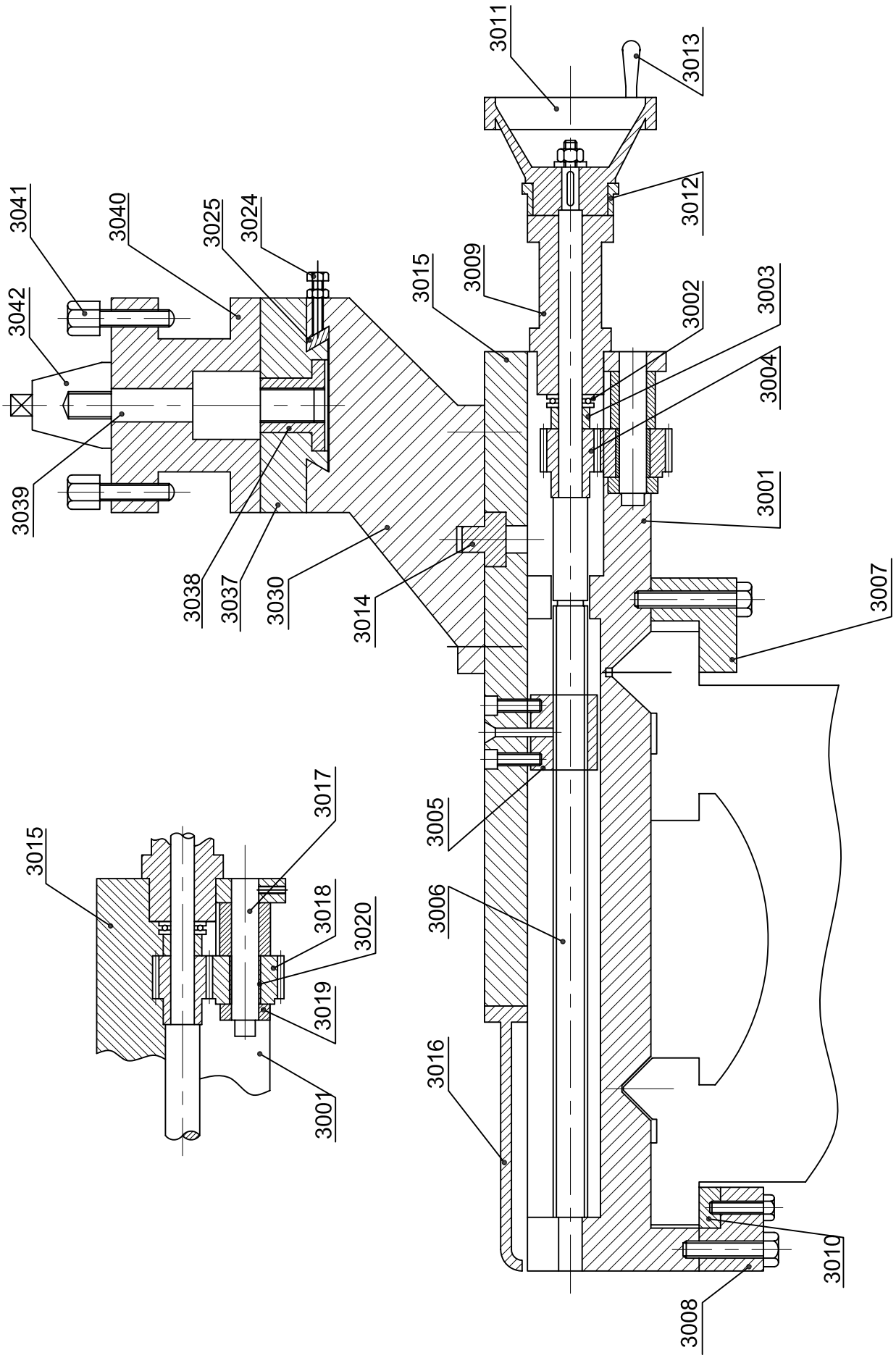
SECTION "E-E"

5.3 NORTON GEAR BOX ASSEMBLY

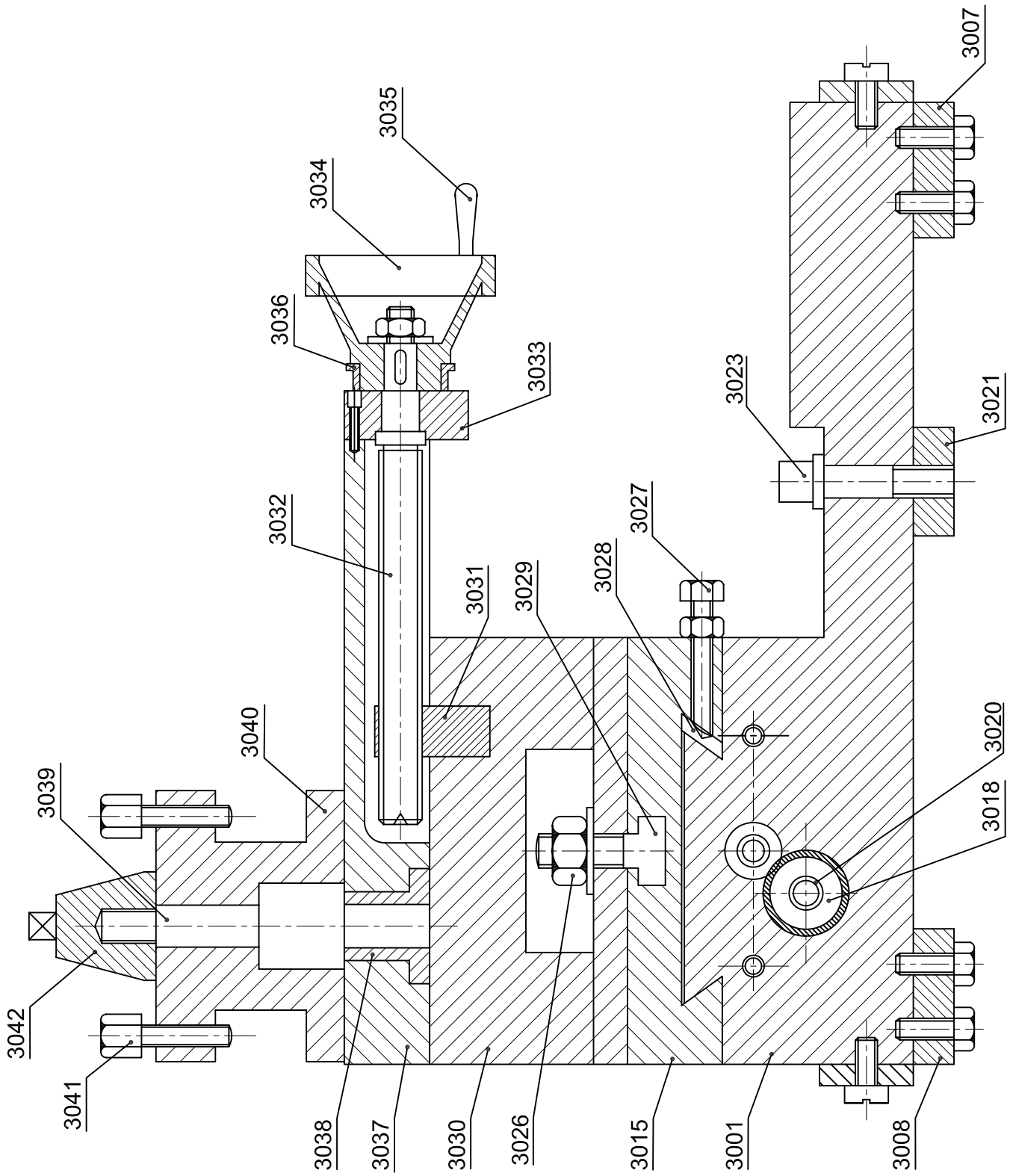
Part No.	Part Name	Quantity
2001	Norton gear box body	1
2002	Norton gear box body cover	1
2101	Top shaft L. H.	1
2102	Gear Z = 44 (DP-8)	1
2103	Gear Z = 22 (DP-8)	1
2104	Top shaft R.H.	1
2105	Gear Z = 24 (DP-8)	1
2106	Gear Z = 40 (Mod. – 3)	1
2107	Gear Z = 35 (Mod. – 3)	1
2108	Gear Z = 35 (Mod. – 3)	1
2109	Bearing – 6204	1
2110	Bearing - 6208	1
2111	Plug	1
2112	Bearing – 6205	13
2113	Input boss	1
2114	Shifter (A-B)	1
2115	Rake (A-B) (DP-12)	1
2115-0	Rake Support (A-B)	1
2115-1	Rake Support (A-B)	1
2116	Guide Plate (A-B, X-Y-Z)	1
2117	Pin for lever A-B	1
2118	Oil seal: 16-30-7	5
2119	Operating Lever	5
2120	Shifter (X-Y-Z)	1
2121	Rake (X-Y-Z) (DP-12)	1
2121-0	Rake Support (X-Y-Z)	1
2121-1	Rake Support (X-Y-Z)	1
2122	Gear for shifting Z-32 (X-Y-Z) (DP-12)	1
2123	Pin for lever X-Y-Z	1
2124	Gear for shifting Z-32 (A-B) (DP – 12)	1
2201	Middle shaft L.H.	1
2202	Gear Z-30 (DP – 8)	1

Part No.	Part Name	Quantity
2203	Spacer	1
2204	Gear Z-28 (Mod. – 3)	1
2205	Spacer	1
2206	Gear Z – 40 (Mod. – 3)	1
2207	Gear Z-22 (DP – 8)	1
2208	Spacer	1
2209	Gear Z-44 (DP-8)	1
2210	Middle Shaft	1
2211	Gear Z-35 (Mod. – 30)	1
2212	Spacer	1
2213	Gear Z-30 (Mod. – 30)	1
2214	Spacer	1
2215	Gear Z-42 (DP – 8)	1
2216	Gear Z-33 (DP – 8)	1
2217	Spacer	1
2218	Gear Z-44 (DP – 8)	1
2219	Middle Shaft R.H.	1
2220	Gear Z-35 (Mod. – 3)	1
2221	Bearing Housing	1
2221-0	Bearing No. 32013	2
2221-1	Bearing spacer	1
2222	End Cover	1
2222-0	Oil seal: 75-90-10	1
2223	G.M. Bush	1
2224	Housing For L.S.Clow Type Bush	1
2225	Shifter (Thread/Feed)	1
2226	Rake (Thread/Feed) (DP – 12)	1
2226-0	Rake Guide (Thread/Feed)	1
2226-1	Rake Guide (Thread/ Feed)	1
2226-2	Bush	1
2226-3	Rake palate	1
2227	Spacer	1
2228	Pin For Lever Thread/Feed	1
2229	Shifting Gear Z- 22 (Thread/ Feed) (DP – 12)	1
2230	Check Nut	2

Part No.	Part Name	Quantity
2231	Plug	2
2301	Bottom Shaft L.H.	1
2302	Gear Z-36 (DP – 8)	1
2303	Gear Z- 42 (Mod. – 3)	1
2304	Gear Z-30 (Mod. – 3)	1
2305	G.M.Bush	1
2306	Gear Z-33 (DP – 8)	1
2307	Gear Z-22 (DP – 8)	1
2308	Bottom Shaft R.H.	1
2309	Gear Z-35 (Mod. – 3)	1
2310	Spacer	1
2311	R.H.End Cover Bottom Shaft	1
2311-0	Oil seal: 25-40-7	1
2312	Feed Housing	1
2313	End Cover	1
2314	Fiber Plate	2
2315	Housing Bush	1
2316	Shifter (R-S-T)	1
2317	Rake (R-S-T) (DP – 12)	1
2317-0	Rake Guide (R-S-T)	1
2317-1	Rake Guide (R-S-T)	1
2318	Guide Plate (R-S-T, C-D, Thread/Feed)	1
2319	Pin For Lever R-S-T	1
2320	Shifting Gear Z-32 (R-S-T) (DP – 12)	1
2321	Shifting Gear Z-32 (C-D) (DP – 12)	1
2322	Shifter (C-D)	1
2323	Rake (C-D) (DP – 12)	1
2323-0	Rake Guide (C-D)	1
2323-1	Rake Guide (C-D)	1
2324	Spacer	1
2325	Pin for Lever	1



CARRIAGE AND TOOL POST ASSEMBLY

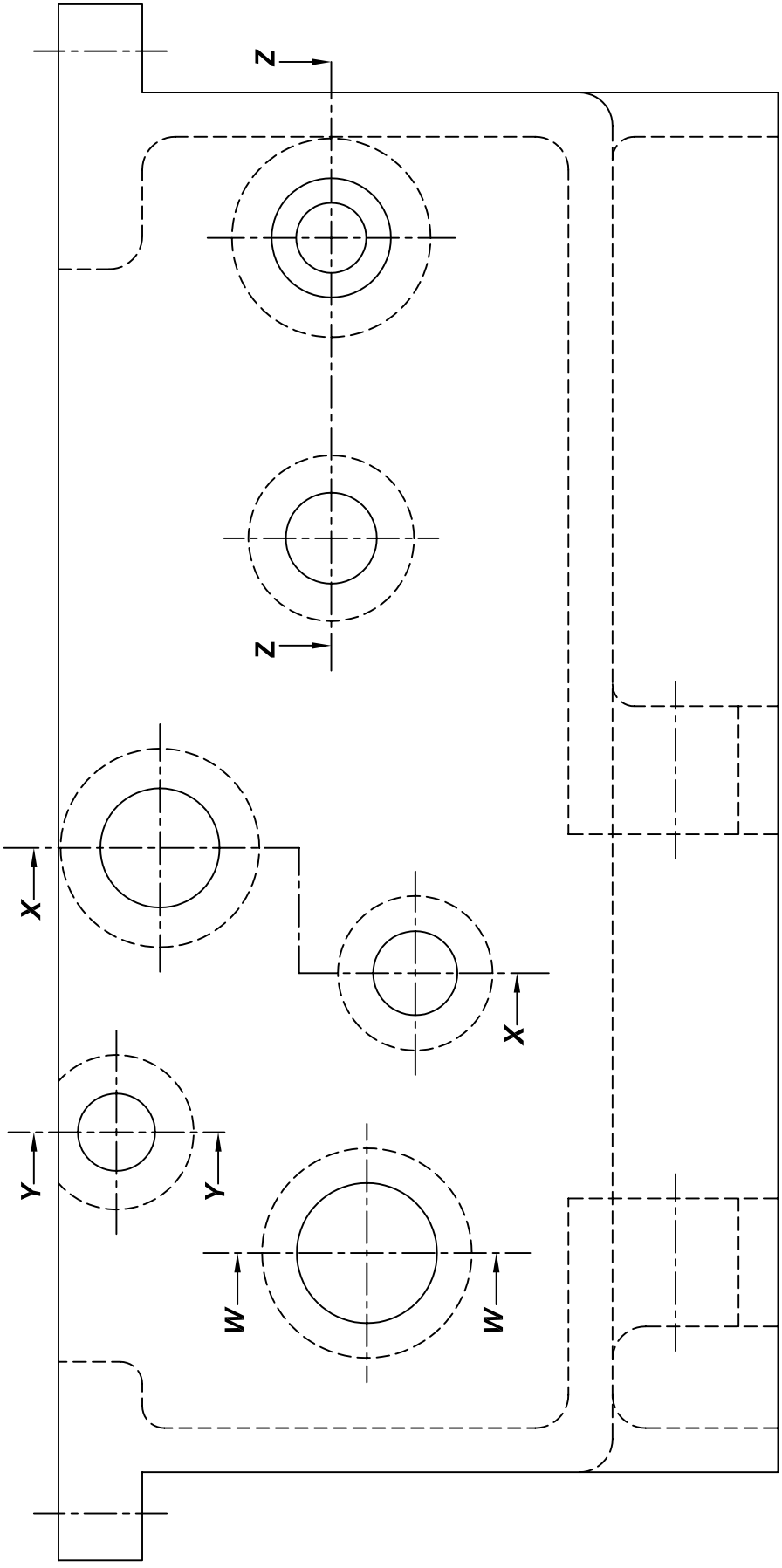


CARRIAGE AND TOOL POST ASSEMBLY

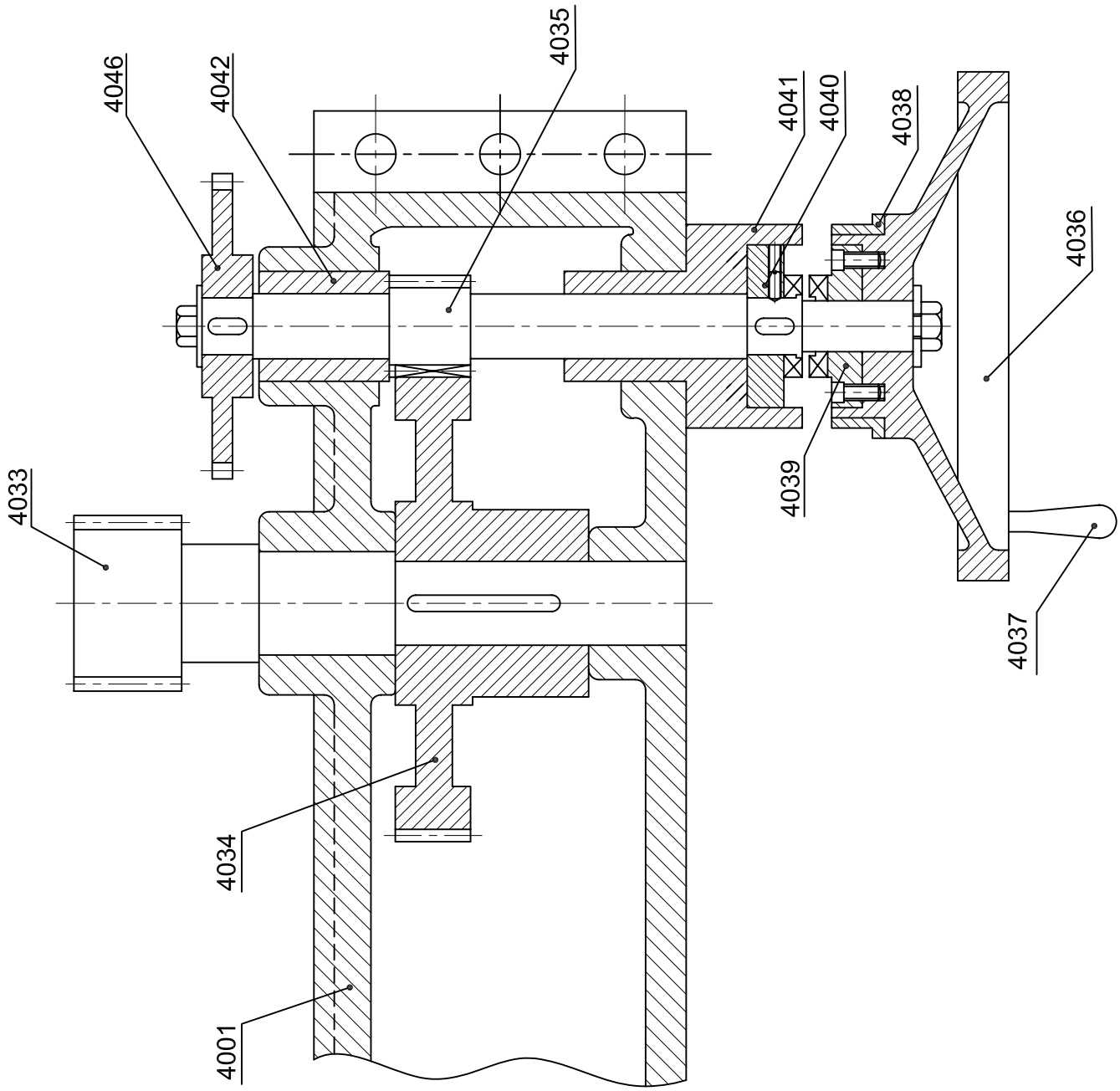
5.4 CARRIAGE AND TOOL POST ASSEMBLY

Part No.	Part Name	Quantity
3001	Saddle	1
3002	Thrust bearing	1
3003	Collar	1
3004	Gear for cross slide screw Z = 13	1
3005	Cross slide screw nut	1
3006	Cross slide screw	1
3007	Saddle front lock piece	1
3008	Saddle rear keeper plate	1
3009	Surface boss	1
3010	Parallel wedge	1
3011	Cross slide hand wheel	1
3012	Micro ring	1
3013	Plastic handle grip with stud	1
3014	Compound slide locating plug	1
3015	Cross slide	1
3016	Cross slide cover	1
3017	Idler gear pin	2
3018	Idler gear Z = 18	1
3019	Collar for idler gear pin	2
3020	Idler gear G.M. bush	1
3021	Saddle lock piece	1
3022	Oil pump	2
3023	Saddle lock bolt	1
3024	Compound slide setting bolts	5
3025	Compound slide wedge	1
3026	Compound lock nut	2
3027	Cross slide setting bolts	6
3028	Cross slide wedge	1
3029	T – bolt	2
3030	Compound slide base	1

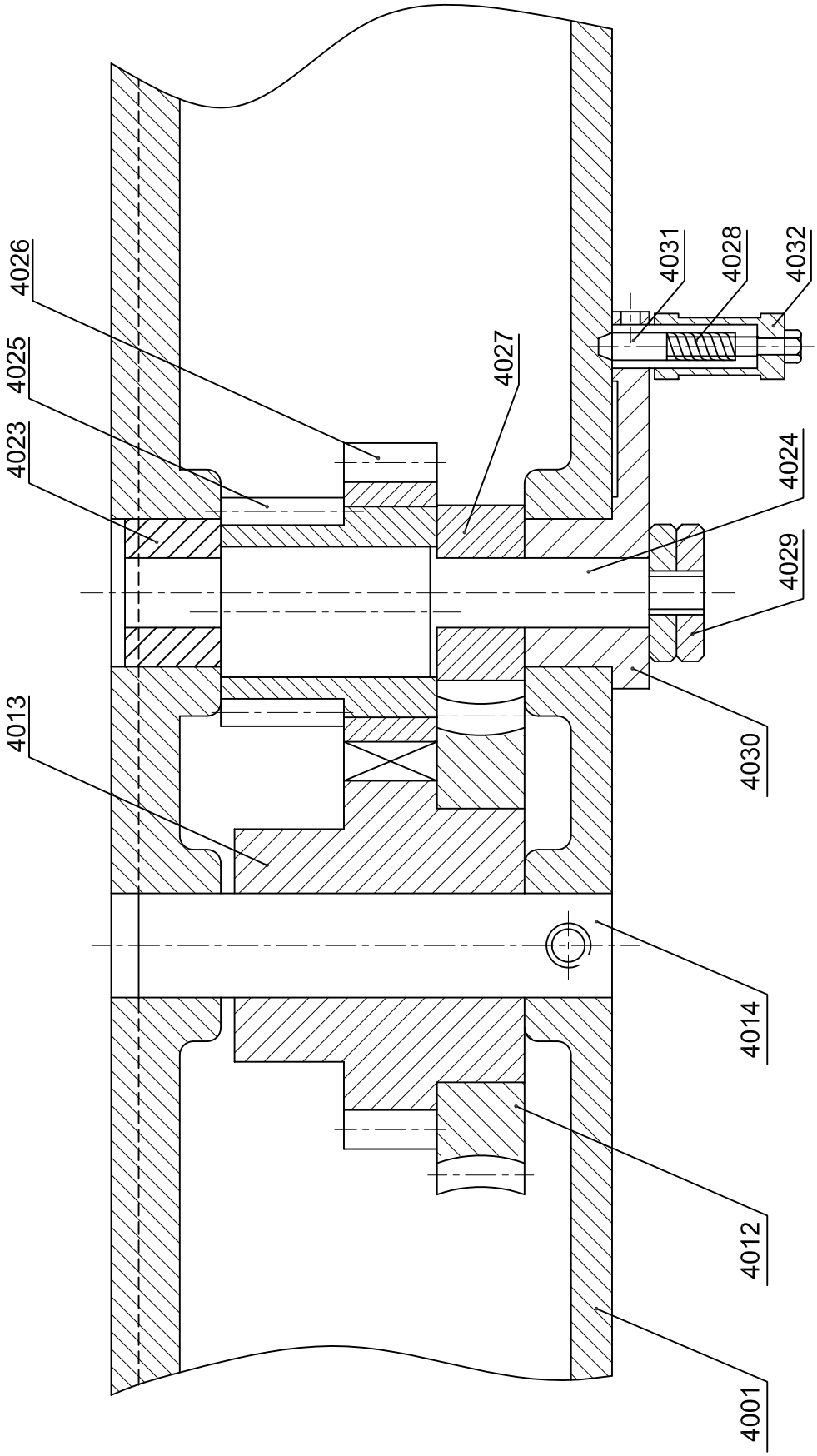
Part No.	Part Name	Quantity
3031	Compound slide screw nut	1
3032	Compound slide screw	1
3033	Compound slide boss	1
3034	Compound slide hand wheel	1
3035	Plastic handle grip with stud	1
3036	Micro ring	1
3037	Compound slide	1
3038	Compound slide threaded bush	1
3039	Tool post stud	1
3040	Tool post	1
3041	Tool clamping bolt	12
3042	Tool post clamping boss	1



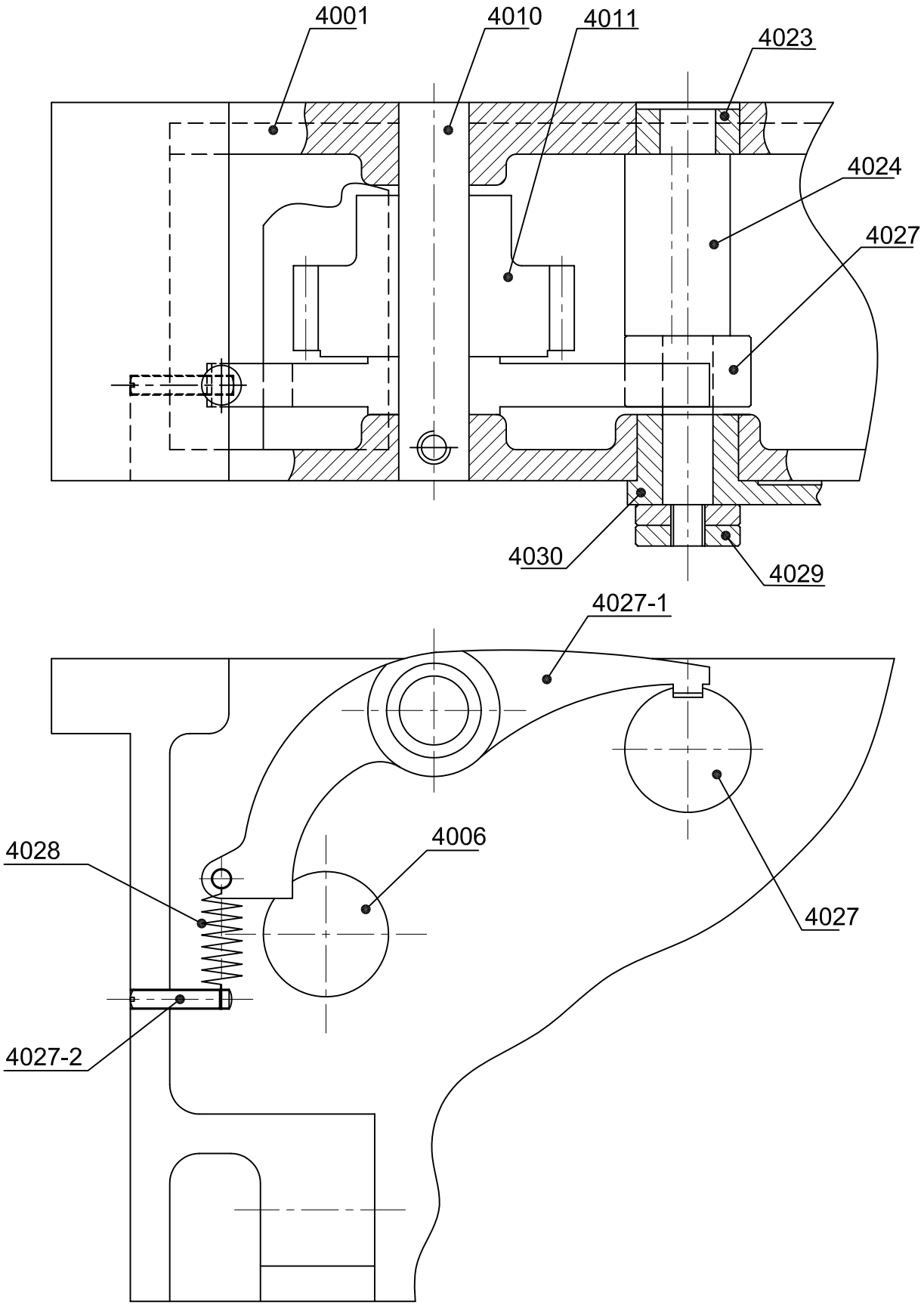
APRON BODY



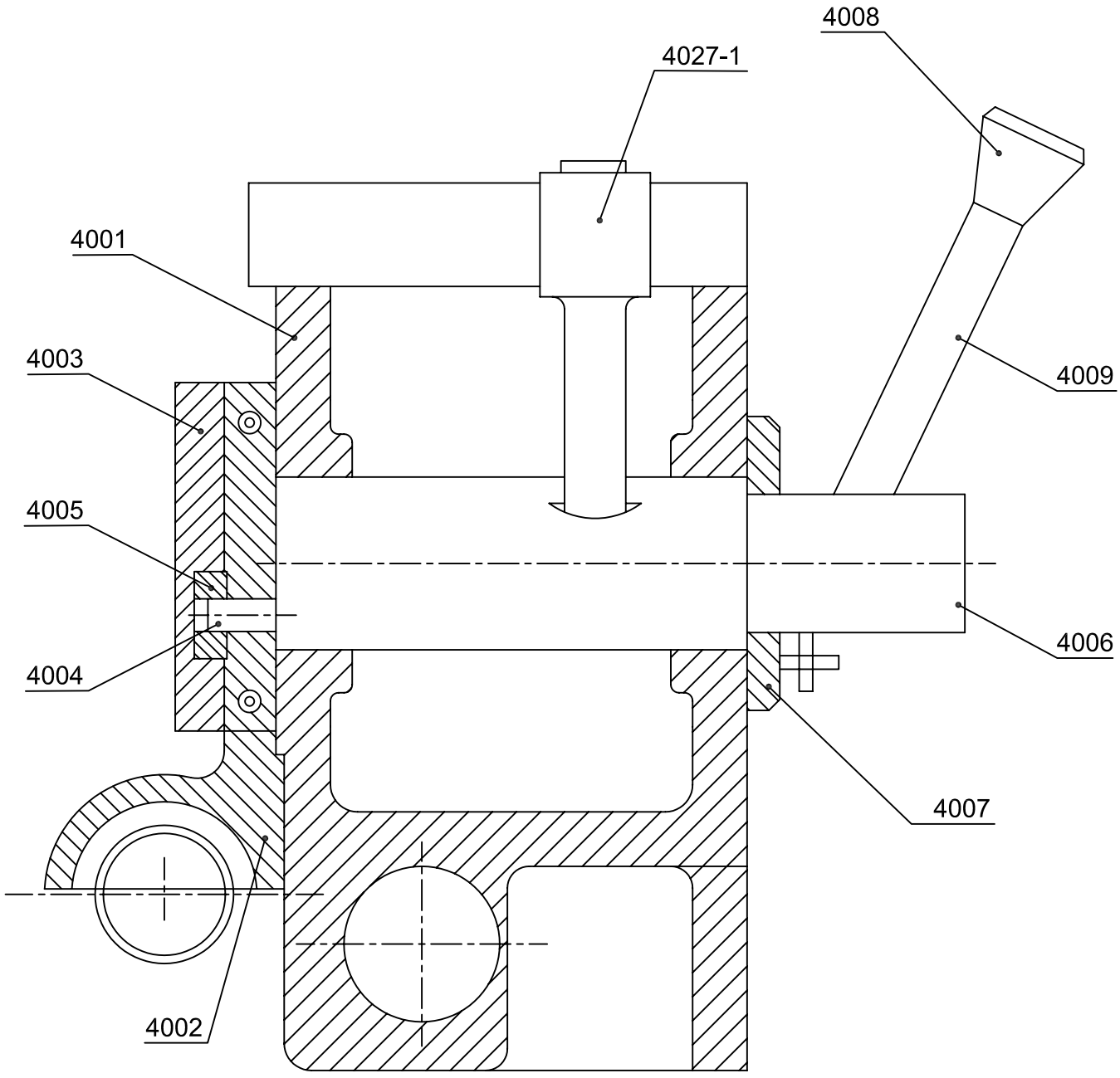
SECTION "ZZ"


4026
4025
4023
4013
4027
4031
4028
4032
4024
4029
4030
4014
4012
4001

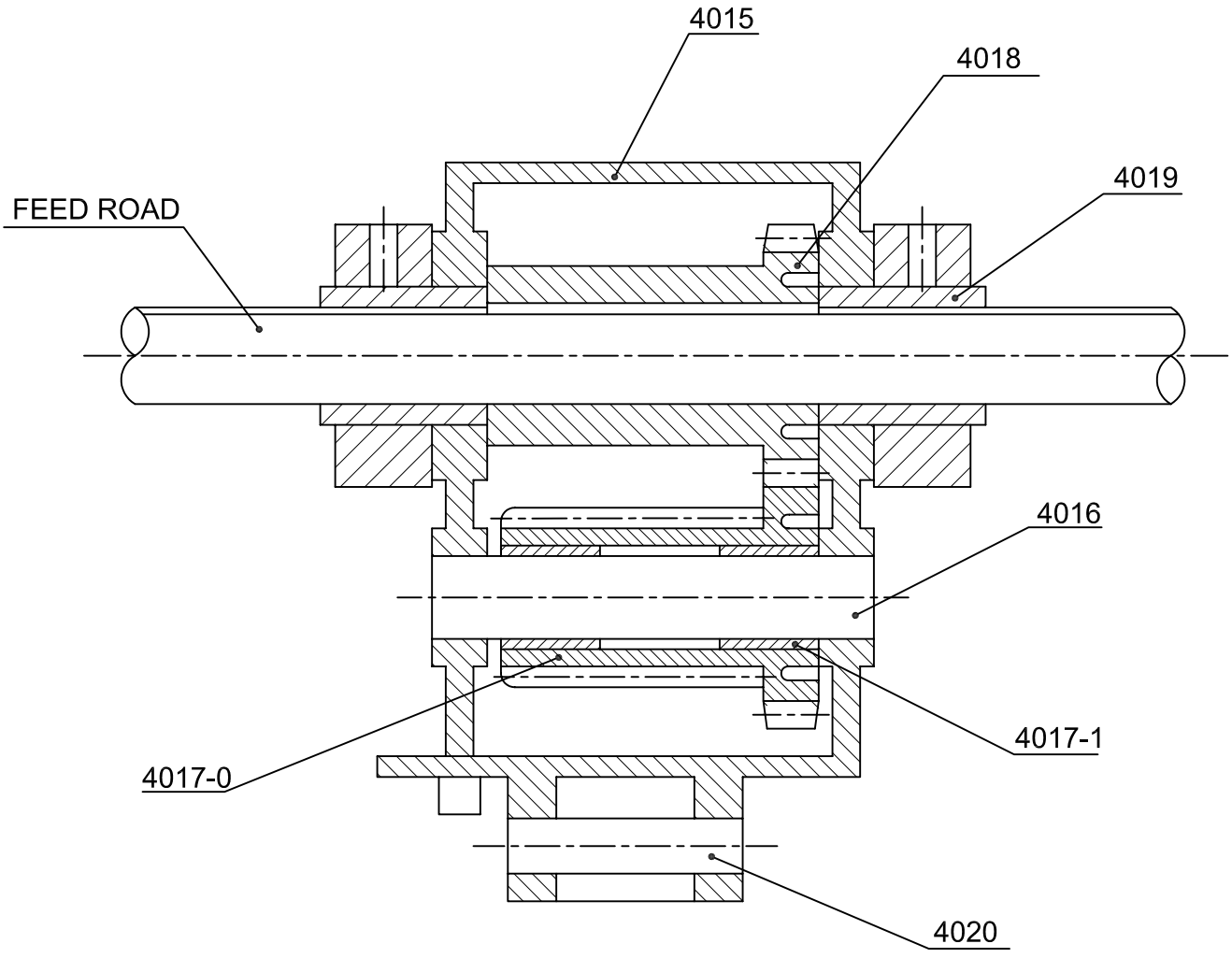
SECTION "XX"


4001
4010
4011
4023
4024
4027
4030
4029
4027-1
4028
4006
4027
4027-2

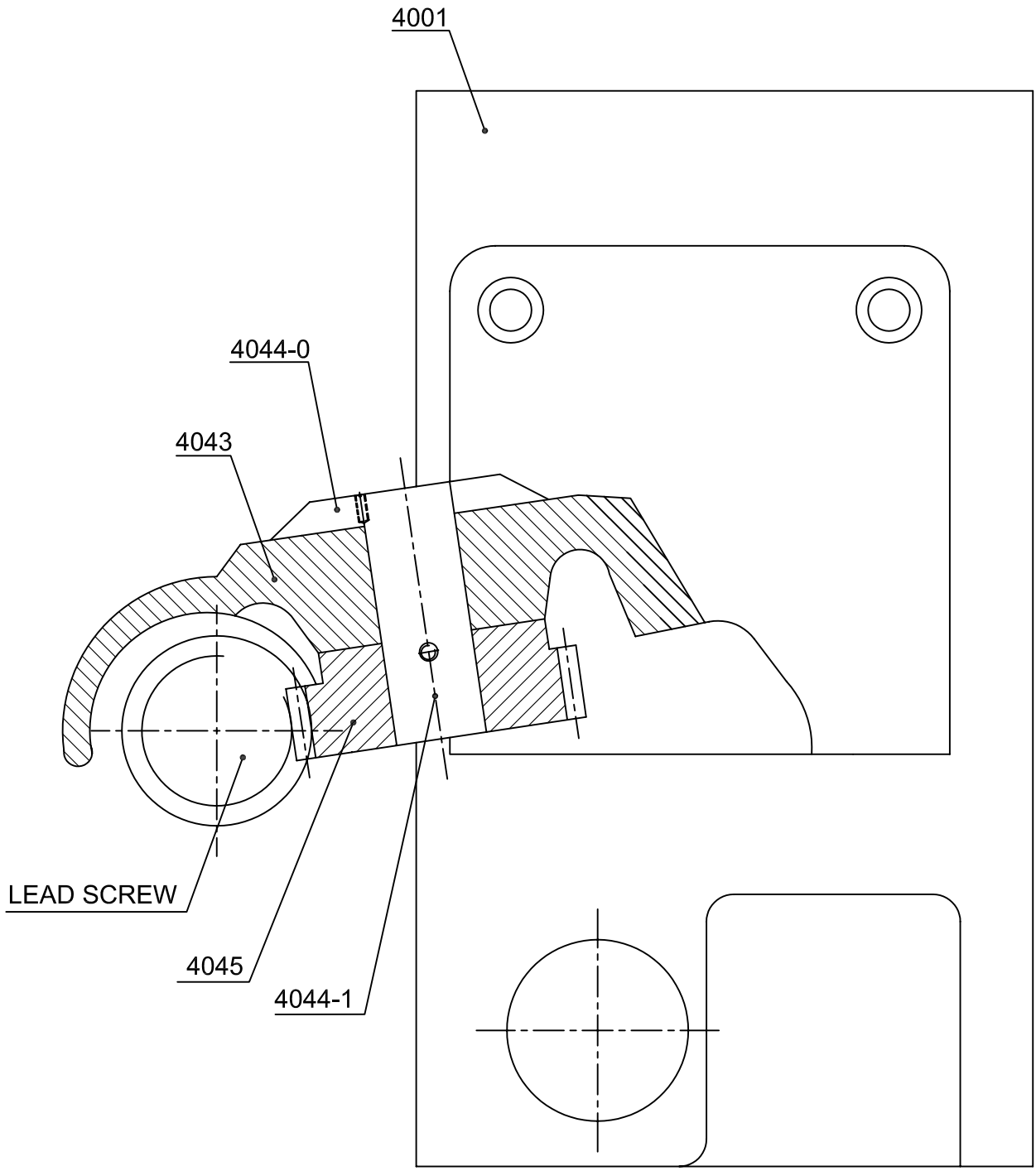
SECTION "YY"



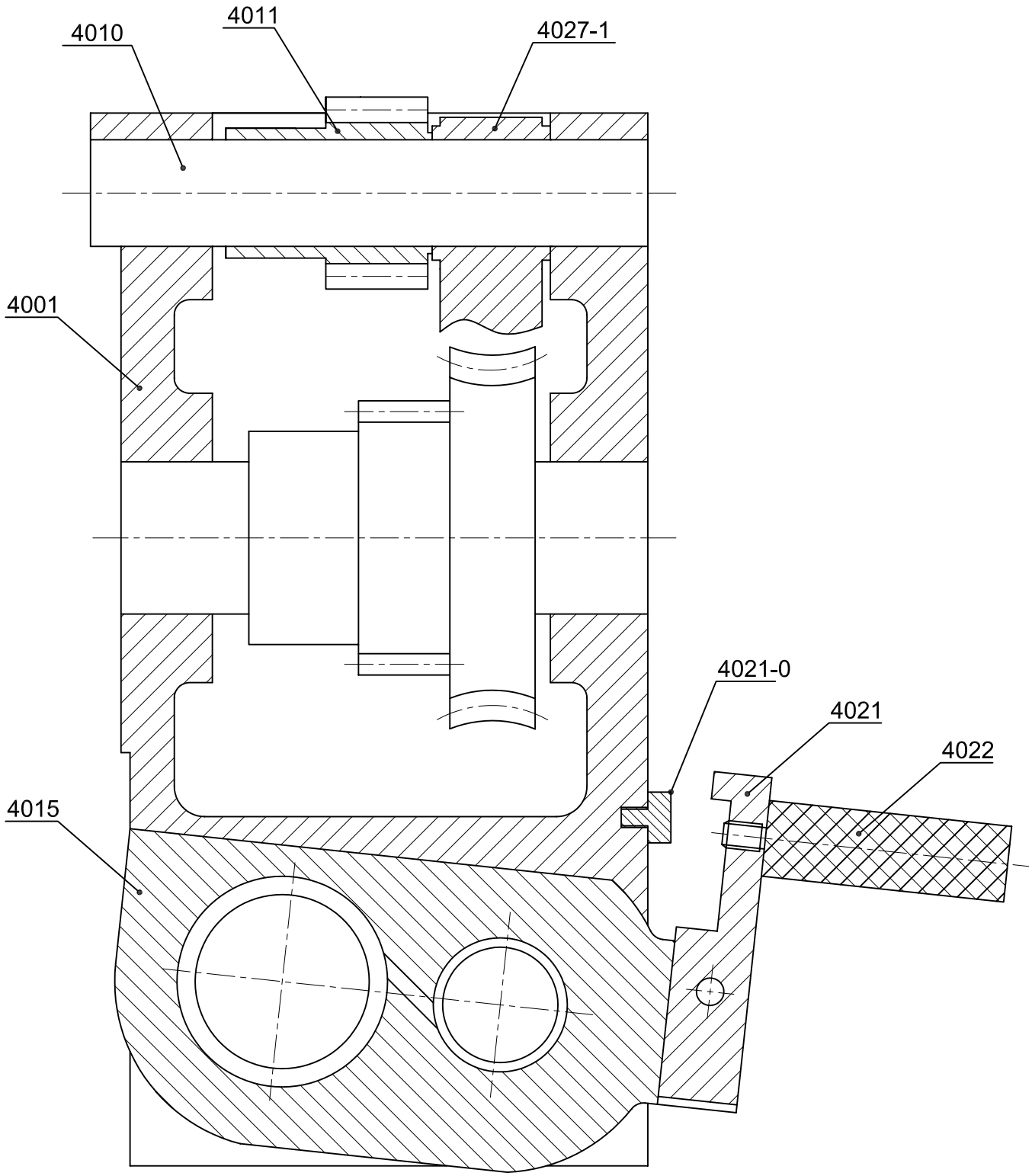
SECTION "W W"



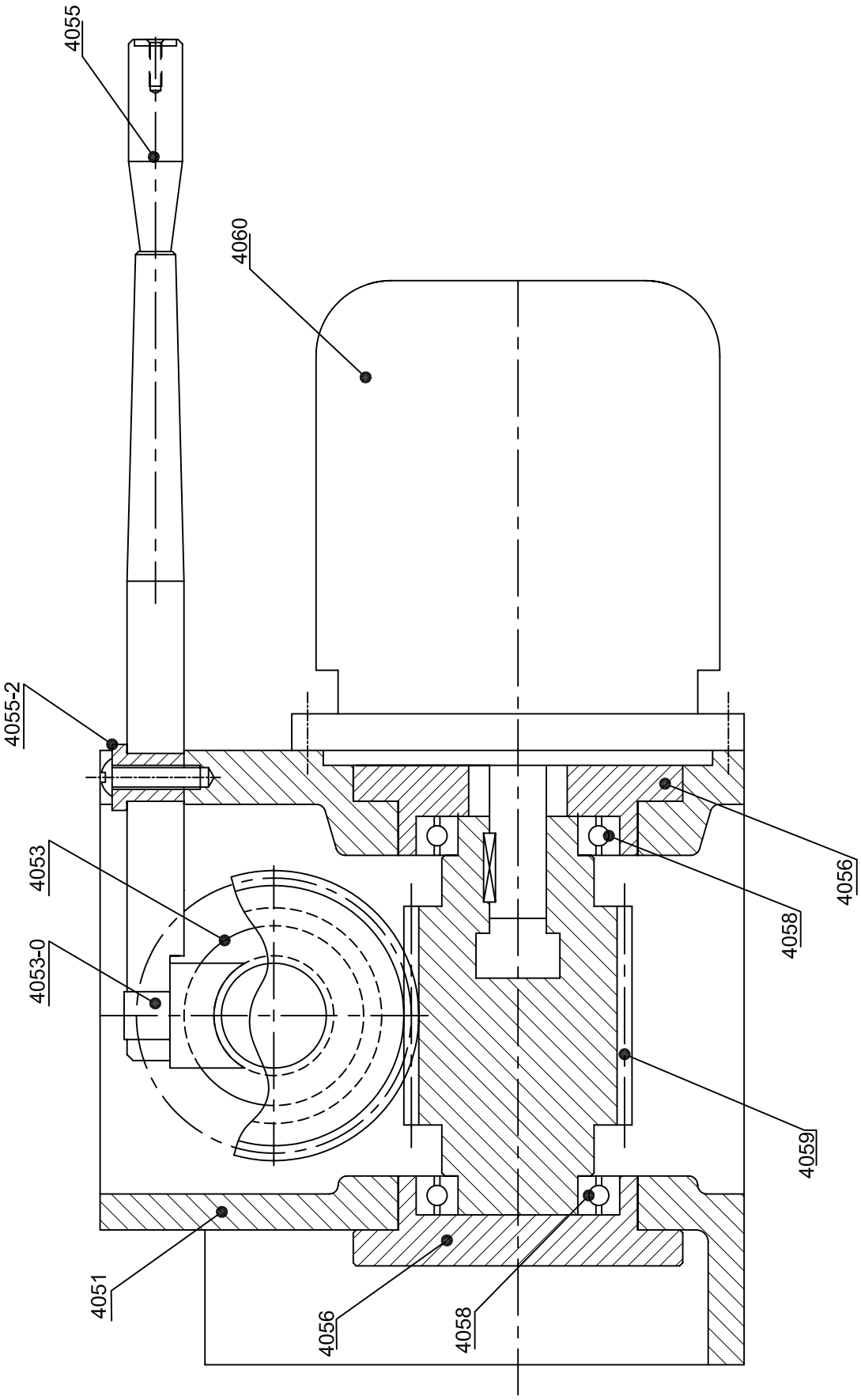
WORM BOX BODY ASSEMBLY



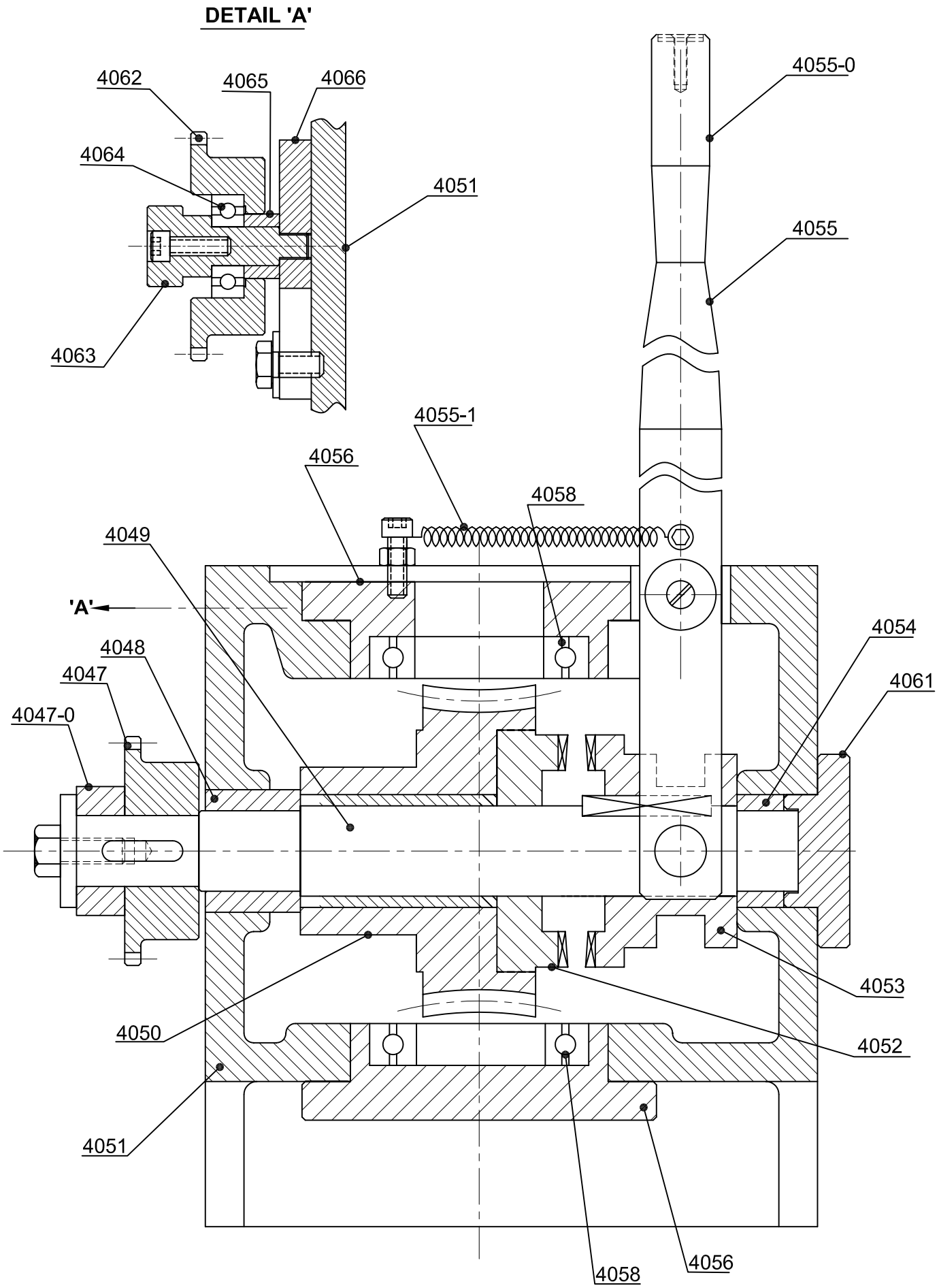
DIAL INDICATOR ASSEMBLY

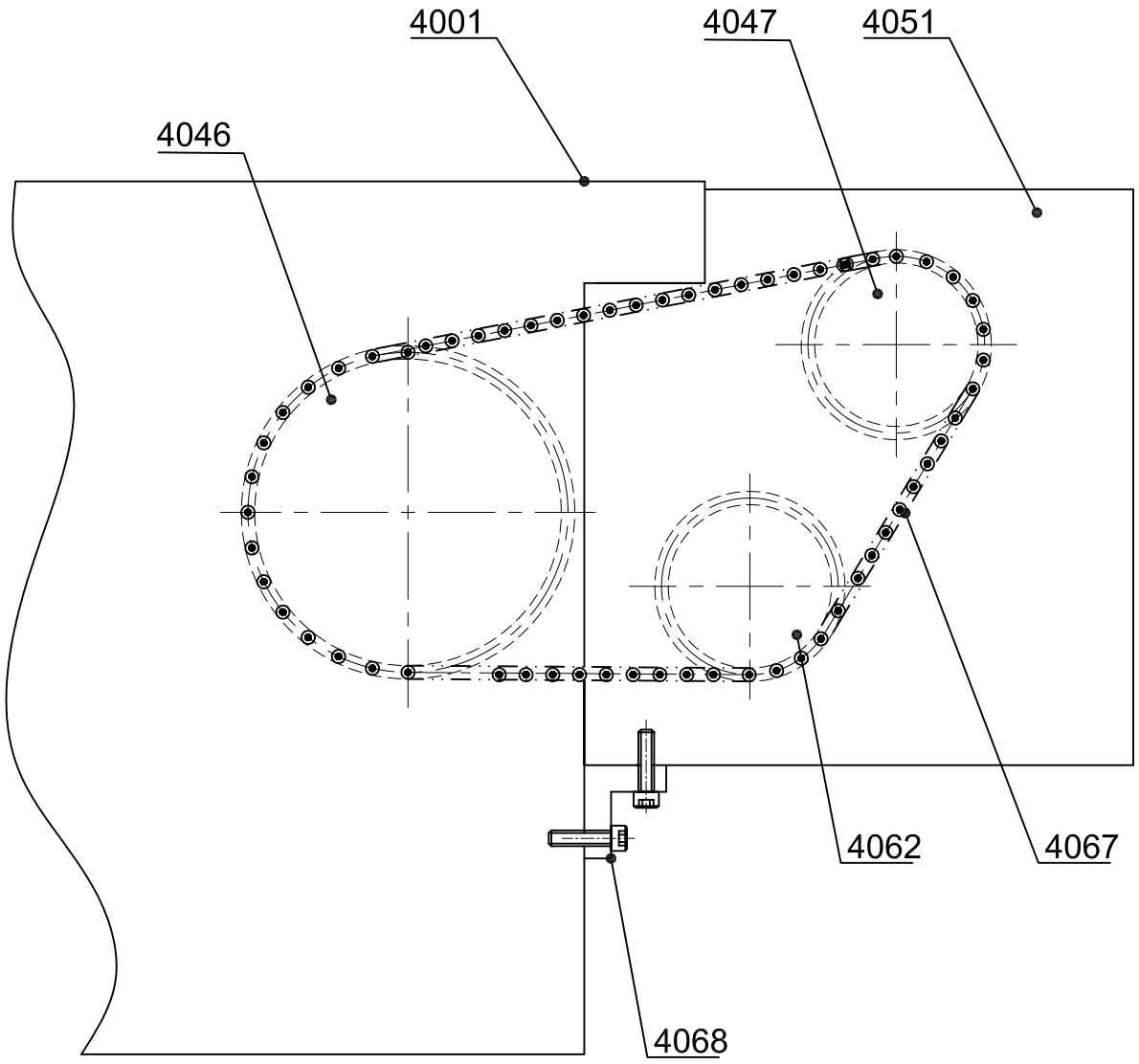


FEED CLUTCH LEVER ASSEMBLY



RAPID GEAR BOX ASSEMBLY


DETAIL 'A'
4062
4065
4066
4064
4051
4063
4055-0
4055
4055-1
4056
4058
4049
'A'
4048
4047
4047-0
4054
4061
4053
4050
4052
4051
4058
4056


4001
4047
4051
4046
4062
4067
4068

5.5 APRON ASSEMBLY

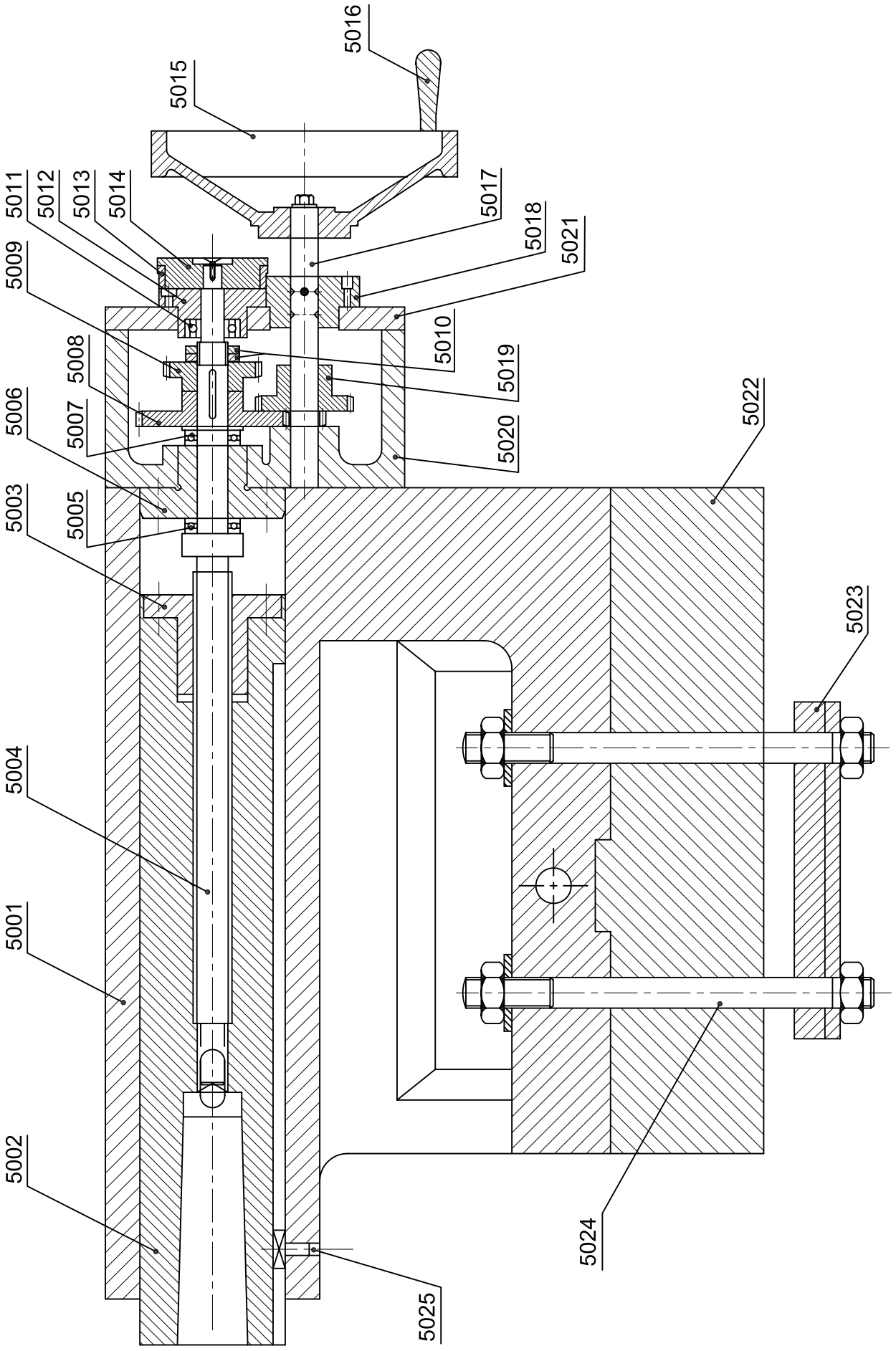
Part No.	Part Name	Quantity
4001	Apron	1
4002	Half nut	1
4003-0	Half nut guide plate	1
4003-1	Gm Wedge	1
4004	Eccentric pin	1
4005	Roller	1
4006	Half nut operating shaft	1
4007	Front plate for H/N shaft	1
4008	Knob	1
4009	Handle	1
4010	Guide pin for surface feed gear	1
4011	Surface feed gear Z=36	1
4012	Worm gear Z=41 D.P.6	1
4013	Gear Z=39	1
4014	Pin for worm gear	1
4015	Worm box body	1
4016	Locating pin for worm	1
4017-0	Worm with Gear	1
4017-1	G M Bush for Worm	2
4018	Driving gear	1
4019	Worm box body guide bush	2
4020	Hinge pin	1
4021	Feed clutch lever	1
4021-0	Resting pad	1
4022	Feed clutch handle	1
4023	Guide bush for eccentric shaft	1
4024	Eccentric shaft	1
4025	Gear Z=21	1
4026	Gear Z=32	1
4027-0	Locating bush for interlock lever	1
4027-1	Interlock Lever	1
4028	Spring	1
4029	Lock nut for feed selection lever	2
4030	Feed selecting lever	1

5.5 APRON ASSEMBLY

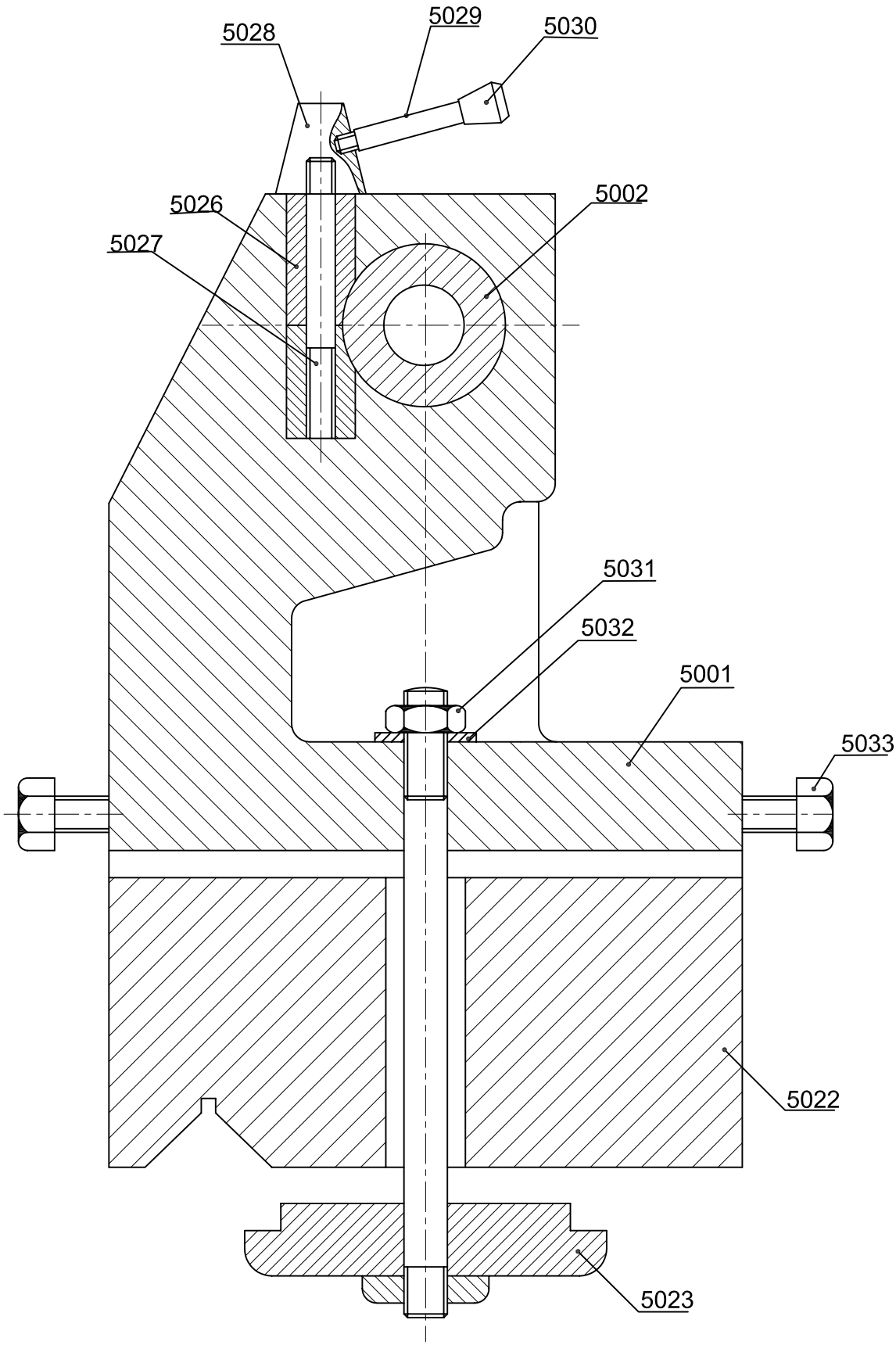
Part No.	Part Name	Quantity
4031	Locating pin	1
4032	Handle for feed selection lever	1
4033	15 Teeth gear shaft for rake	1
4034	Gear Z = 63	1
4035	Hand wheel gear shaft Z = 12	1
4036	Hand wheel	1
4037	Handle	1
4038	Micro ring	1
4039	Claw bush male	1
4040	Claw bush female	1
4041	Boss for hand wheel	1
4042	Bush for hand wheel	1
4043	Dial indicator bracket	1
4044-0	Dial indicator	1
4044-1	Dial Indicator Pin	1
4045	Gear for dial indicator	1
4046	Sprocket wheel	1
4047	Sprocket wheel	1
4047-0	Spacer	1
4048	Guide bush	1
4049	Main shaft	1
4050	Worm gear Z = 29	1
4051	Gear box	1
4052	Claw bush fixed	1
4053	Claw bush sliding	1
4053-0	Shifter	1
4054	G.M. bush	1
4055	Rapid operating lever	1
4055-0	Plastic grip	1
4055-1	Spring	1
4056	End cover	2
4057	Worm guide pin	1
4058	Bearing	2
4059	Worm	1
4060	Flange mounted motor	1

5.5 APRON ASSEMBLY

Part No.	Part Name	Quantity
4061	Cover	1
4062	Idler sprocket wheel Z- 22 X 3/8”	1
4063	Hinge bolt	1
4064	Ball bearing 6201	1
4065	Spacer	1
4066	Setting plate	1
4067	Chain for sprocket wheels	1
4068	Support for rapid gear box	1



TAIL STOCK ASSEMBLY



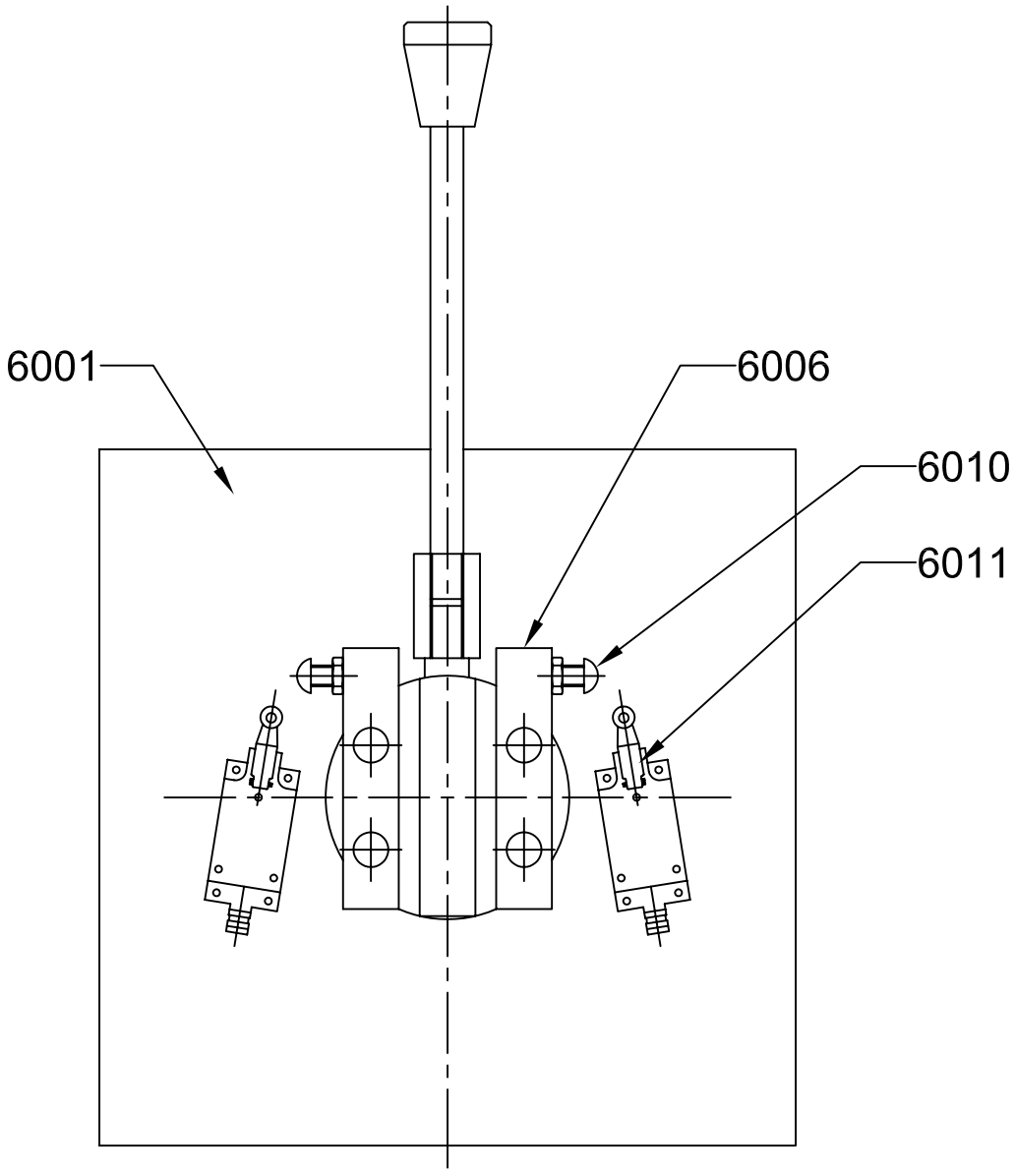
TAIL STOCK ASSEMBLY

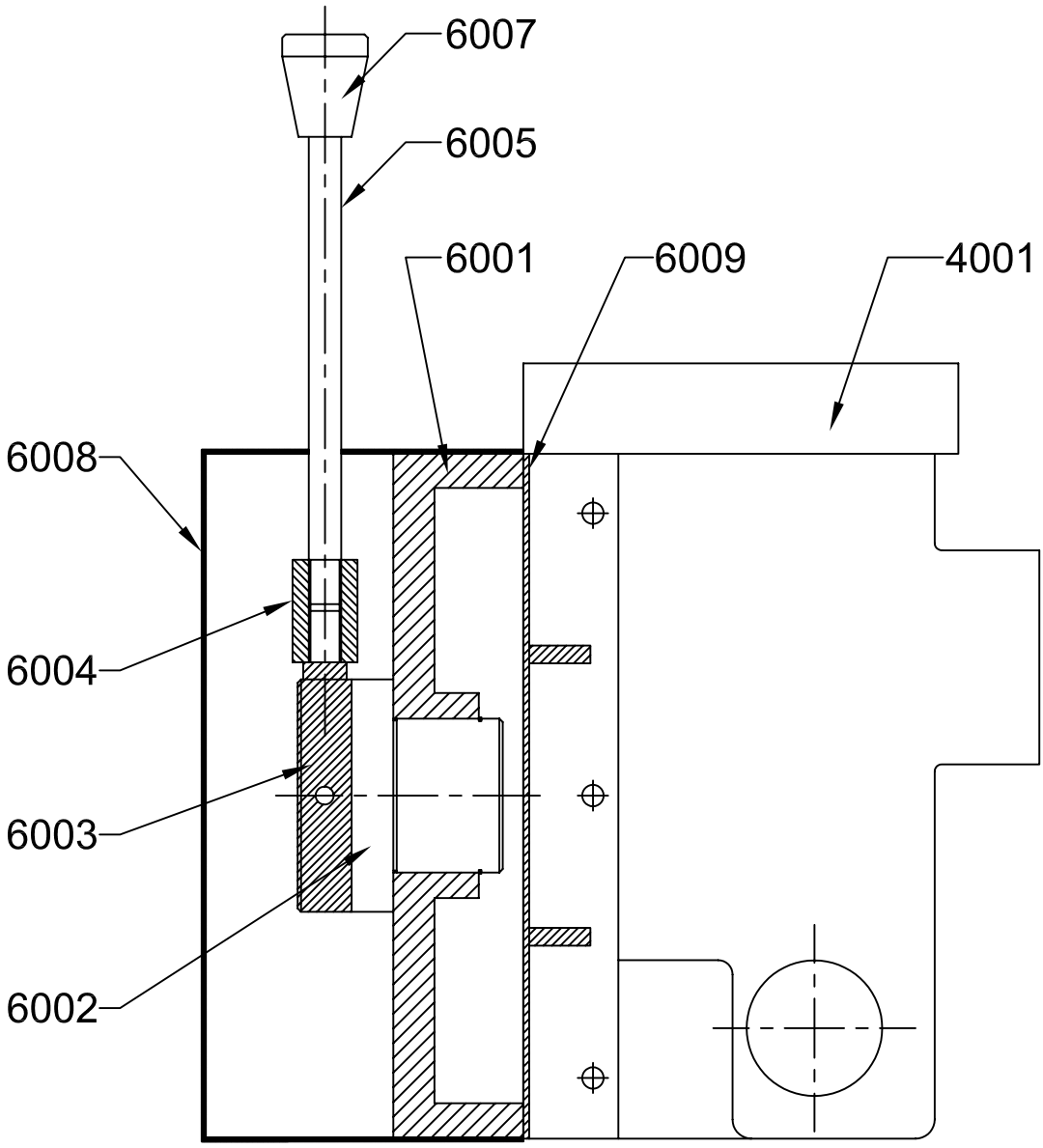
5.6 TAIL STOCK ASSEMBLY

Part No.	Part Name	Quantity
5001	Tail stock body	1
5002	Tail stock spindle	1
5003	Tail stock screw nut	1
5004	Tail stock screw	1
5005	Thrust bearing (no. 51104)	1
5006	Locating plug for gear box	1
5007	Thrust bearing (no. 51104)	1
5008	Gear Z – 48	1
5009	Gear Z – 30	1
5010	Chuck nut	2
5011	Ball bearing (no. 6202)	1
5012	Locating plug for ball bearing	1
5013	Micro ring	1
5014	Micro ring boss	1
5015	Tail stock hand wheel	1
5016	Plastic handle grip with stud	1
5017	Hand wheel shaft gear Z - 12	1
5018	Locating bush for hand wheel shaft	1
5019	Gear Z – 30	1
5020	Dual speed gear box for tail stock	1
5021	Dual speed gear box cover	1
5022	Tail stock base	1
5023	Tail stock clamping plate	1
5024	Tail stock clamping stud	2
5025	Key for tail stock spindle	1
5026	Tail stock spindle locking bush	1
5027	Tail stock spindle locking stud	1
5028	Boss for tail stock spindle locking stud	1
5029	Handle for boss	1
5030	Knob	1
5031	Nut for tail stock clamping stud	1
5032	Washer for tail stock clamping stud	1
5033	Tail stock setting bolts	2

5.7 EXTRA ACCESSORIES

Part No.	Part Name
X001	Face plate
X002	Steady rest base
X003	Steady rest body
X004	Steady rest clamp
X005	Follow rest
X006	Coolant pump with on/off switch
X007	Coolant tank
X008	Spout assembly
X009	Machine lamp
X010	Chuck flange
X011	Self centering chuck
X012	Dog chuck
X013	Rear splash guard
X014	Rear tool post with tool holders
X015	Revolving center
X016	Internal/ external / Combine tool post grinder
X017	Electric motor for tool post grinder
X018	Quick change tool post with 5 tool holders
X019	Key way cutting attachment
X020	Taper turning attachment
X021	Rapid feed attachment for carriage

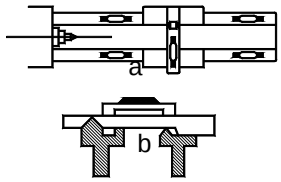
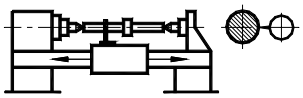
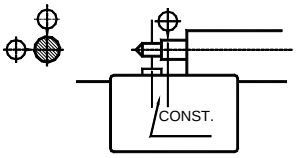
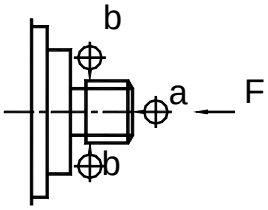
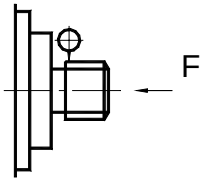
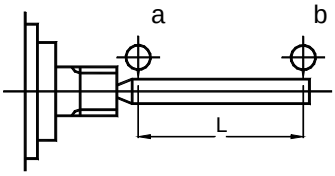
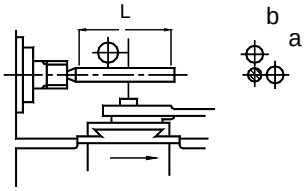

6001
6006
6010
6011


6007
6005
6001
6009
4001
6008
6004
6003
6002

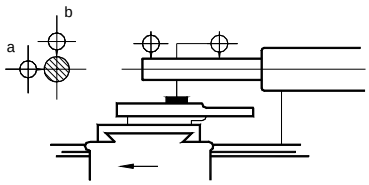
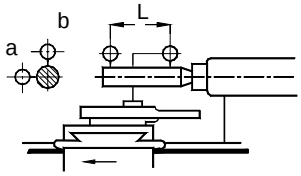
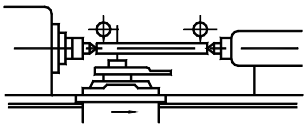
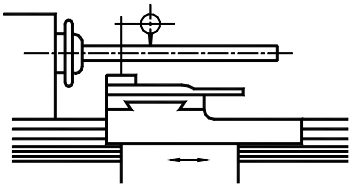
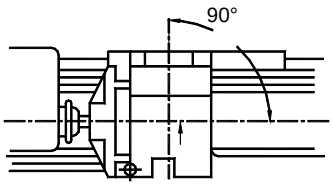
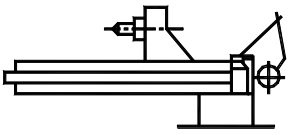
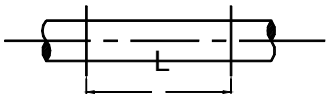
REV. / FOR. SWITCH ASSEMBLY

Part No.	Part Name	Qty.
6001	Rev. / For. Switch guide plate	1
6002	Rev. / For. Switch plug	1
6003	Rev. / For. lever	1
6004	Rev. / For. Switch handle Nut	1
6005	Rev. / For. Switch stud	1
6006	Limit switch lever	2
6007	Knob	1
6008	Rev. / For. Switch cover	1
6009	Rev. / For. Switch bracket	1
6010	Limit switch operating bolt	2
6011	Limit switch	2

MODEL: 4310 / **MACHINE NO.: Z- ____**

SR.	FIGURE	OBJECTS	PERMISSIBLE DEVIATIONS	ACTUAL ERROR
1		Straightness of carriage slide ways (a) In longitudinal direction (b) In transverse direction.	0.05 (Convex) 0.040	
2		Straightness of carriage movement in horizontal plane.	0.025mm	
3		Parallelism of tailstock movement to carriage movement (a) In horizontal plane (b) In vertical plane	0.040 mm 0.040 mm	
4		(a) Periodic axial slip (b) Coming of the face plate mounting surface	(a) 0.015mm (b) 0.020mm (including periodic axial slip)	
5		Run out or spindle nose	0.015 mm	
6		True running of taper bore of spindle (a) Near to the spindle (b) At a list. 300 mm	0.015 mm 0.050mm	
7		Parallelism of spindle axis to the carriage movement (a) In horizontal plane (b) In vertical plane	(a) 0.030 (towards tool only) (b) 0.040 (upwards only)	

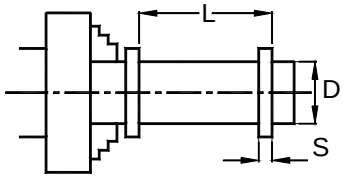
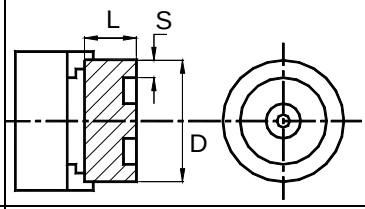
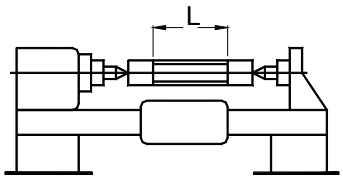
MODEL: **4310 /** **MACHINE NO. : Z -**

SR.	FIGURE	OBJECTS	PERMISSIBLE DEVIATIONS	ACTUAL ERROR
8		Parallelism of external surface of tailstock sleeve to carriage movement (a) In horizontal plane (b) In vertical plane	(a) 0.020 (towards tool only) (b) 0.030 (upwards only)	
9		Parallelism of taper bore of tailstock sleeve to carriage movement (a) In horizontal plane (b) In vertical plane	(a) 0.050 (towards tool only) (b) 0.050 (upwards only)	
10		Difference in height between headstock and tailstock centre	0.060 mm (Tailstock centre higher than head stock centre)	
11		Parallelism of the longitudinal movement of the tool slide to the spindle axis	0.040 upwards only	
12		Squareness of the transverse movement of the cross slide to spindle axis	0.020 mm	
13		Axial slip	0.020 mm	
14		Accuracy of the pitch generated by the lead screw	(a) 0.040 (b) 0.015	

	PANTHER	MODEL	PAGE NO.
		4310	83

PRACTICAL TEST

MODEL: 4310 / **MACHINE NO. : Z-_____**

SR.	FIGURE	OBJECTS	PERMISSIBLE DEVIATIONS	ACTUAL ERROR
1		Turning of cylindrical test piece held in chuck (a) Roundness (b) Cylindricity	(a) 0.020 (b) 0.040	
2		Facing of cylindrical test piece held in chuck (Flat or Concave only.)	0.025	
3		Thread cutting a cylindrical test piece (a) Deviation over length or 300 (b) Deviation over length of 50	(a) 0.04 mm (b) 0.015 mm	
4		Hardness of lathe bed (a) Standard bed (b) Flame harden bed	180 BHN min. 300 BHN min.	-----

- **THE MACHINE CONFIRMS TO GRADE – 1 STANDARD OF ACCURACY AS PRESCRIBED BY D.O. (TOOLS).**
- **THE TEST CHART USED IS TO IS : 1878 (PART – II) – 1992.**

- **TESTED BY : _____.**

- **INSPECTION DEPT : _____.**

For, Gujarat Lathe Mfg. Co. Pvt. Ltd.
Shapar (Dist. Rajkot)