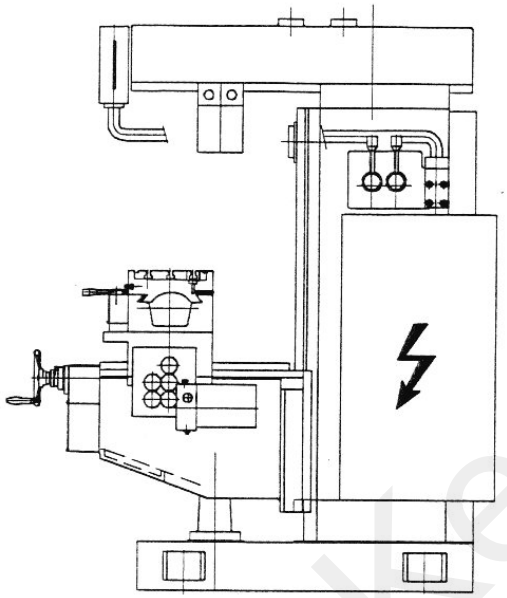
OPERATOR MANUAL

MODEL: KUM-HU300

UPDATE: 1010621

1. OUTLINE OF MACHINE

1-1 APPEARANCE



Fig－1

1-2 FEATURES

(1). This machine is a vertical and horizontal combination milling machine. It is also able to do angular milling, drilling, boring, ect….
(2). The power and rapid feed movements in X axis are operated by one motor through a feed gear unit.
(3). The hardened and ground slide way assures that table will stay where it belongs. These symmetrical ways keep the table balanced as well as providing additional contact surface for superior accuracy and rigidity.
(4). The feed selection levers are positioned in front of the knee to facilitate quick and simple operation.
(5). Push button lubrication is provided for all three slide ways and can be checked by the narrow slot in front of the table.
(6). All gears and shafts in the main spindle drive are hardened and ground.
(7). High quality castings are used throughout ensuring excellent accuracy and finish on the slide way.
(8). It is easy to change the vertical spindle speed infinitely to suit good machining conditions.
(9). Quill will automatic feed can do boring.

1-3 SPECIFICATION

KUM-HU300		UNIT: mm 50HZ
Table		
Size (L x W)	mm	1270 x 300
T- Slot (W x no. x Pitch)	mm	16 x 3 x 80
Swivel	º degree	45°
Distance from vertical spindle nose to table	mm	0 ~ 390
Travel		
X- axis x Y- axis x Z- axis(Manual)	mm	930 x 400 x 450
X- axis x Y- axis x Z- axis(Automatic)	mm	920 x 380 x 450
Feed		
Longitudinal feed rate	mm / min	18 ~ 320 (6 steps)
Longitudinal rapid traverse	mm / min	1040
Cross feed rate	mm / min	50~1800 VARI.
Cross rapid rate	mm/min	1800
Vertical feed traverse (OPTI.)	mm/min	30~600 VARI.
Vertical rapid traverse	mm / min	600
Vertical Spindle		
Spindle nose	Type	NT4
Spindle speed	min^{-1}	45 ~ 1100
Steps	No.	9
Horizontal Spindle		
Spindle nose	Type	NT4
Steps	No.	9
Spindle speed	min^{-1}	60 ~ 1440
Distance from center to bottom of ram	mm	175
Distance from center to table	mm	0 ~ 450
Motor		
Horizontal Spindle	HP / kW	5 / 3,7
Table longitudinal feed	HP / kW	3/4 / 0,55kW
Table cross feed	HP / kW	1/2 / 0,37kW
Table vertical rapid	HP / kW	1 / 0,746kW
Coolant pump	HP / kW	1/8 / 0,1kW
Size		
Machine (L x W x H)	mm	2150 x 1750 x 1890
NET weight	kg	2550
GROSS weight	kg	2700

STANDARD ACCESSORIES:

COOLANT SYSTEM	1 UNIT
CUTTER ARBOR AND SIEEVE	1 SET
ADJUSTING TOOLS	1 SET
TOOL BOX	1 PIECE
CHIP TRAY	1 PIECE
DRAW BARS (VERTICAL & HORIZONTAL)	2 PIECES
LEVELING BLOCKS	4 SETS
LEVELING BOLTS	4 SETS

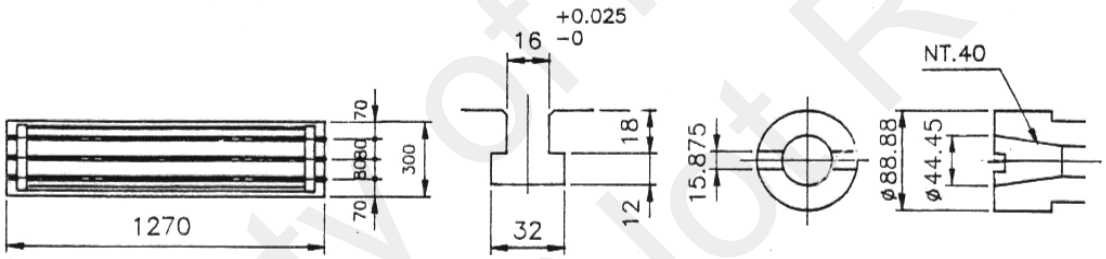
OPTIONAL ACCESSORIES:

SWIVEL-TYPE MILLING VISE

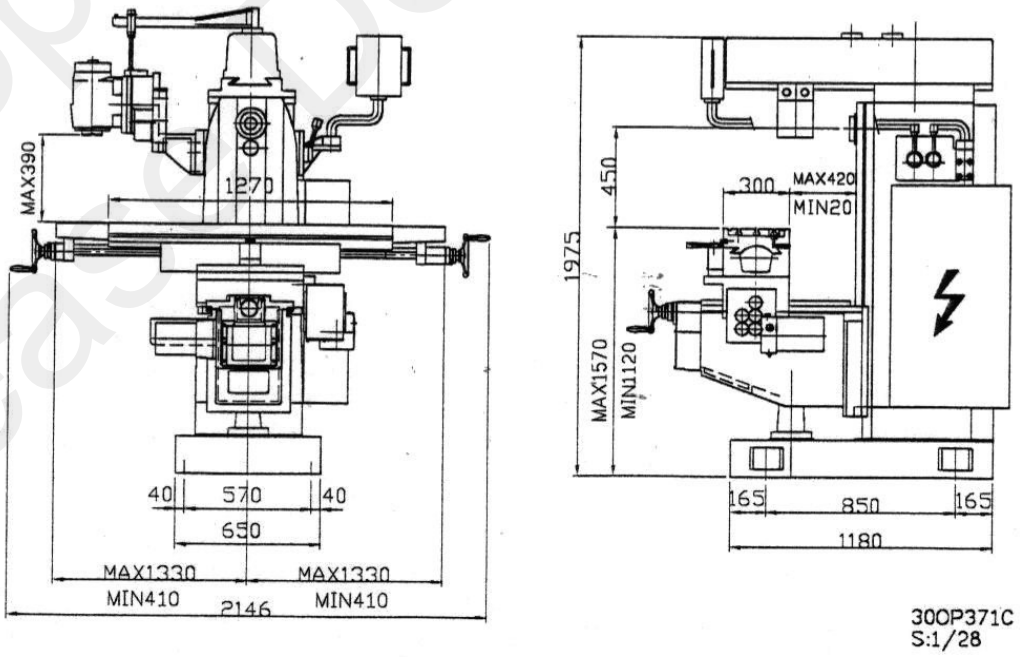
CLAMPING KIT

1-4 EXTERNAL VIEW

TABLE AND SPINDLE DIMENSION



DIMENSION DRAWING



2. INSTALLATION

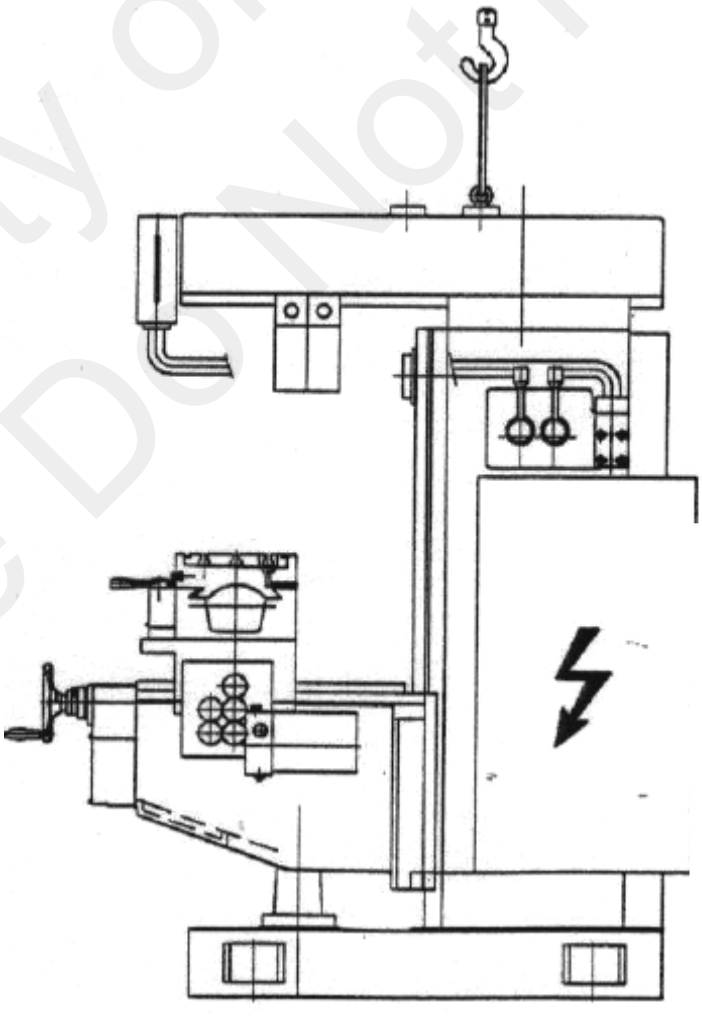
2-1 TRANSPORTATION OF THE MACHINE

This machine weight approximate 2550 kgs (5610 lbs) unpack wooden case. Loosen the 4 bolt from the skid. Move the vertical head in vertical position; remove the ram forward to proper position (Fig 2) then lifting machine.

NOTE: Before lifting machine, check machine in steady and safety condition. Also insert clothes or pieces of wood where wires touched. The machine to absorb impacts which may influence of machine.

2-2 INSPECTION AND CLEANING

When the machine is delivered, check for damage or shortages in the number of attachments. Then wipe off dirt and protective coating.



2-3 FOUNDATION

Before installation, construct a foundation of sufficient thickness (normally 600mm) and pressure-supporting area (depending on the nature of the ground at the installation site) according to the floor plan introduced in (Fig 3). However, if the installation site has a concrete floor of sufficient strength, the construction of a foundation is unnecessary. When installing, achieve leveling by using anchor bolts and wedges or by using a precision level in combination with wedges or leveling blocks.

2-4 INSTALLATION

On the bottom of the machine base, dollies are provided at four corners as shown in (Fig 3). The machine should be balanced on the four points.

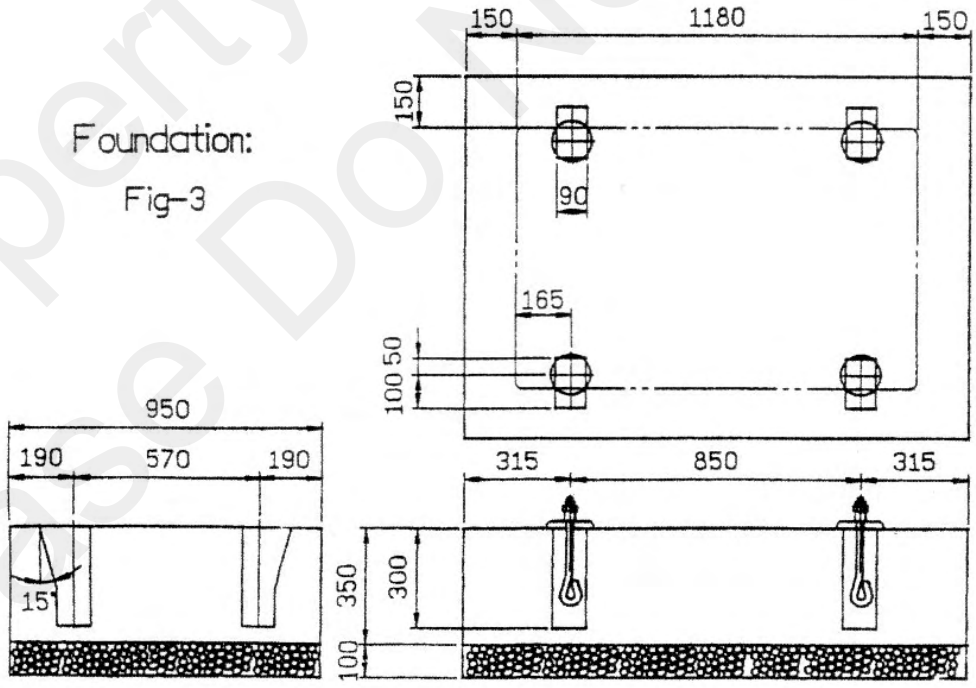
2-5 MAINTENANCE AND INSPECTION

(1). PRECAUTIONS FOR OPERATION

(A) Always supply lubrication oil to designated oiling points before starting. (Table 1) for your reference.

(B) Confirm that the work and setting jigs do not strike anything before actuating table feed.

(C) The power table longitudinal feed should not exceed the range limitations of the machine. Always set the automatic reversing dog on both sides within the moving range.



2-6 CUTTING OIL

There are two general types of cutting oil, i.e., water-soluble cutting oil and water-insoluble cutting oil, and these are further divided into many groups. As selection of the cutting oil depends on each cutting condition, particular trade names or groups cannot be specified here but it is necessary to observe the following:

(1)Use of water-insoluble cutting oil

Examples: (A) General purpose cutting oil

(B) Semi Synthetic soluble cutting fluid

(it needs to add water, and the proportion is 1: 20 (oil : water))

(C) Synthetic soluble cutting fluid

(it needs to add water, and the proportion is 1: 20 (oil : water))

(2)Capacity of the cutting oil tank is about 8 gallon.

(3)Cutting oil should be supplied through an oil strainer into the cutting oil intake provided on the lower part of the column.

2-7 Wiring

The power cord should be connected to the terminals L11, L12, L13 . On completion of the connection, turn on the power switch (Fig 4-1) located on the side of the power box.

After finishing the above preparations, start the main spindle. (See section for spindle starting, spindle stopping and spindle brake). If the rotation direction of the main spindle is clockwise, connections are correct. If rotation is counter-clockwise, exchange connections of two of the three wires L1, L2, L3 of the power cord.

2-8 Lubrication

Prior to starting, each moving part must be lubricated with suitable lubricating oil. Refer to table. I for instructions to lubricate the spindle head gears, quill and slide ways.

The lubrication oil to be used for each part is also listed in (Tables 2, and 3), it can be used for selecting the correct lubricant to keep the machine in its best condition.

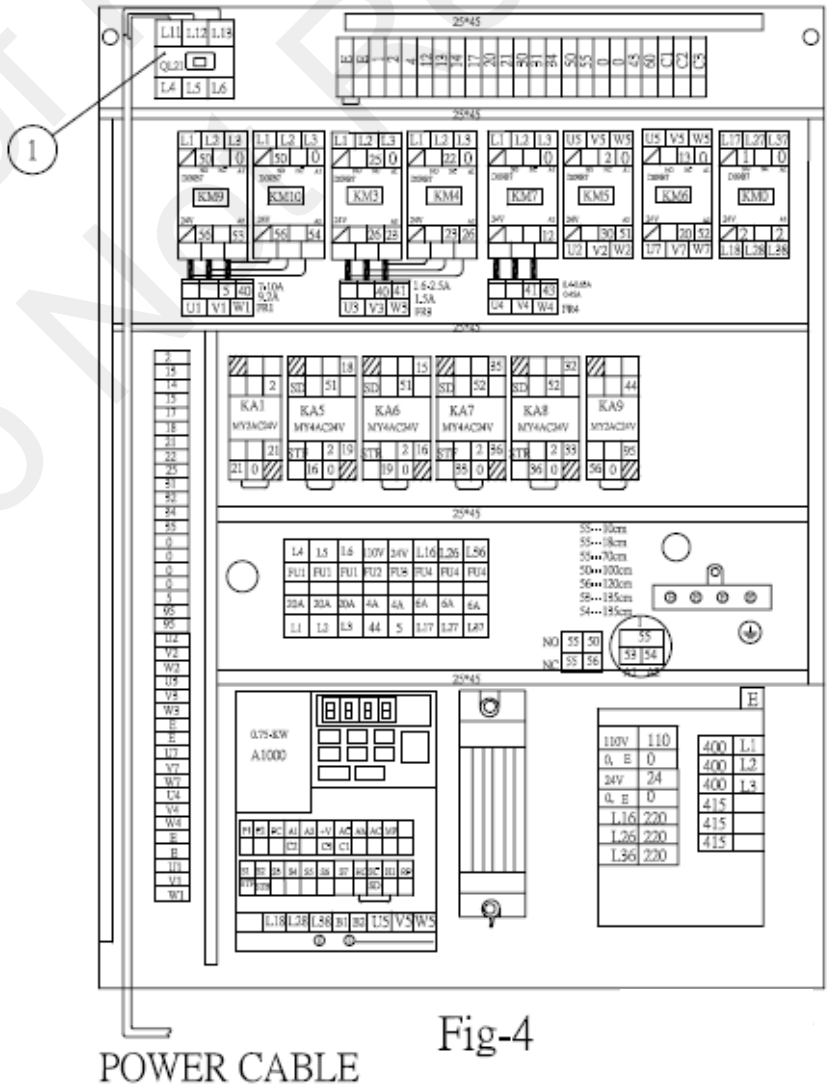
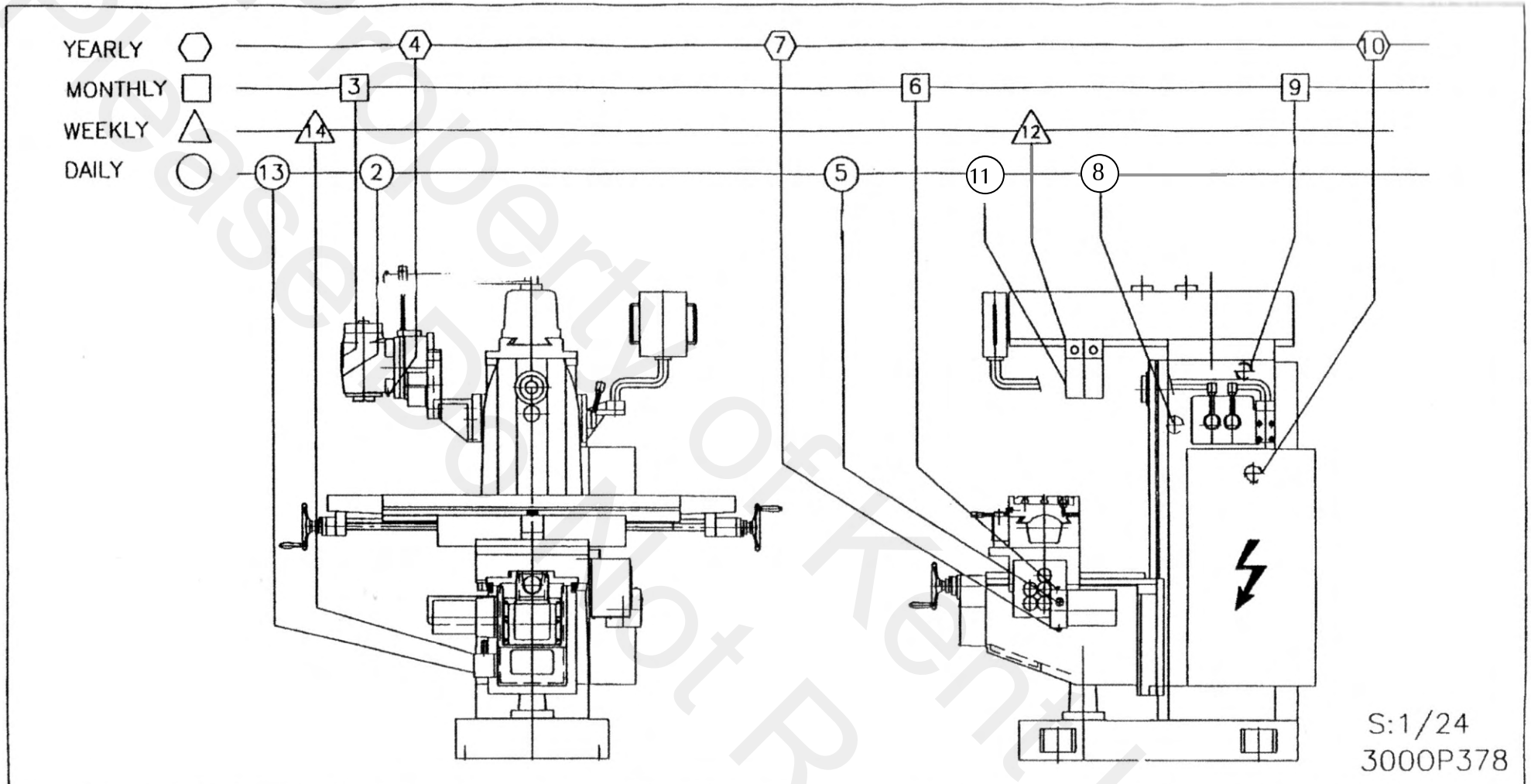


Fig-4

TABLE -1 **LUBRICATION INSTRUCTIONS**



	Spindle gears (V)			Table feed gears			Spindle gears(H)			Arbor support		Slide ways	
Machine components	2	3	4	5	6	7	8	9	10	11	12	13	14
Check	Daily			Daily			Daily			Daily		Daily	
Fill		Monthly			Monthly			Monthly			Weekly		Weekly
Clean & Replace			Yearly			Yearly			Yearly				
Lubricant	CB68			CB68			CB68			G68		G68	
Capacity		4L			40L			40L			0.5L		2L
Remarks													

INSTRUCTION FOR CORRECT LUBRICANT

TABLE -2

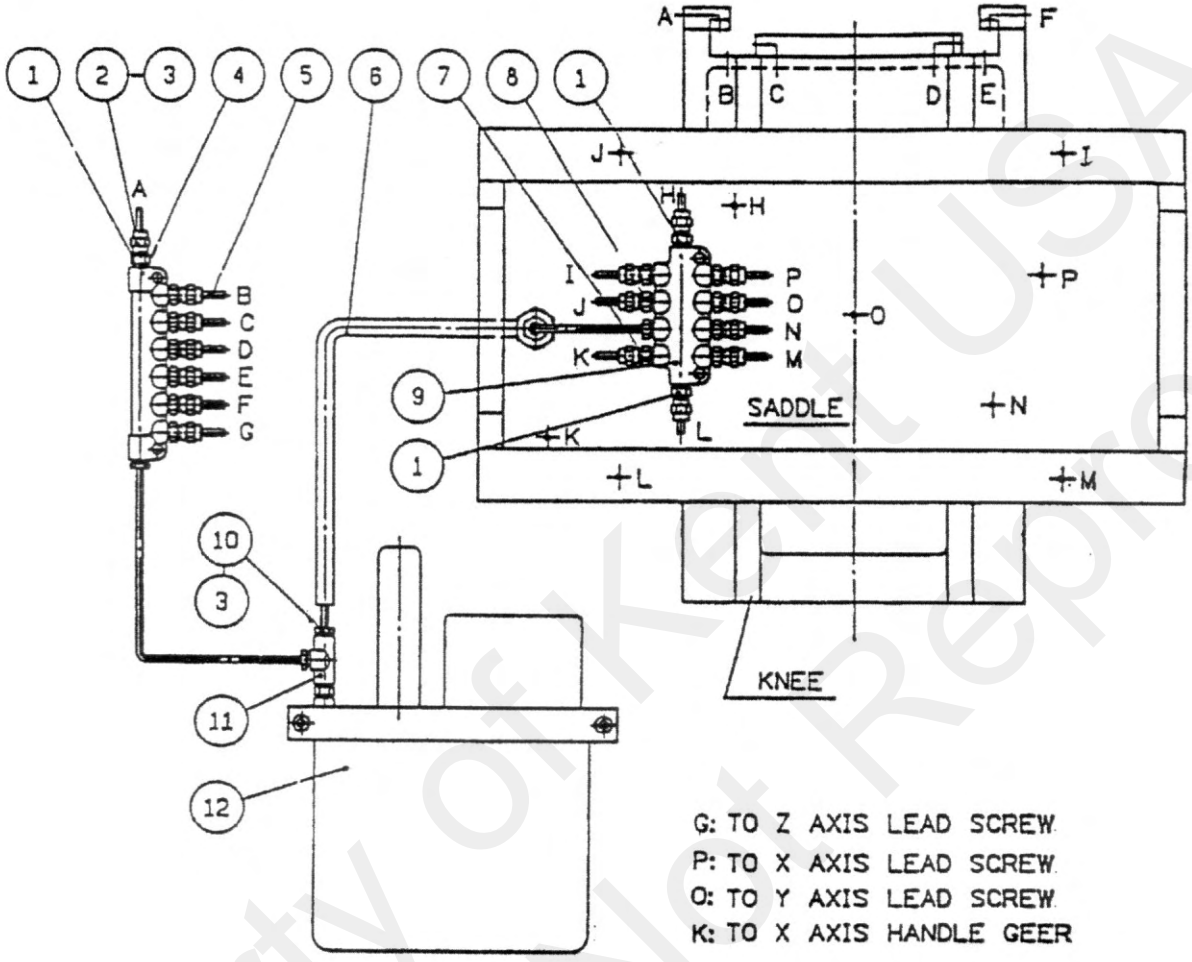
	Application Fields	Properties	Symbol and Viscosity Grade	Kinematic Viscosity CST (130°F) Mean.	min.	max.	REMARKS
GEARS	Enclosed moderately loaded gear (spur gear, bevel gear)	Refined mineral oils with good oxidation stability	CB 32 CB 68 CB 150	32 68 150	28.8 61.2 135	35.2 74.8 165	Pinion speeds (motor output) 2,000 – 5,000 rpm (within 5HP) 1,000 – 2,000 rpm (within 10HP) – 1,000 rpm (within 20HP)
	Enclosed heavily loaded gears (worm and wheel)	Refined oils with good oxidation stability and with improved load-carrying ability	CC 150 CC 320 CC 460	150 320 460	135 288 414	165 352 506	Worm speeds 2,000 – rpm 1,000 – 2,000 rpm – 1,000 rpm
BEARINGS	Spindles bearings and associated clutches	Refined mineral oils with superior anticorrosion and anti-oxidation performances.	FC 2 FC 10 FC 22	2.2 10 22	1.98 9.00 19.8	2.42 11.0 24.2	Shaft speeds (shaft dia.) 10,000 – rpm (1/8 in) 2,000 – 10,000 rpm (1/8 – 5-7/8in) – 2,000 rpm (5-7/8in)
SLIDE WAYS	Slide ways	Refined mineral oils with improved lubricity and tackiness performance preventing stick-slip	G 68 G 220	68 220	61.2 198	74.8 242	Slide way (surface pressure) Horizontal (under 57lb/in^2) Vertical (under 57lb/in^2)
HYDRAULIC SYSTEMS	Hydraulic systems	Refined mineral oils with superior anti-corrosion and anti-oxidation performance	HL 32 HL 68	32 68	28.8 61.2	35.2 74.8	Oil temperature (Rated pressure) 0 – 148°F (under 500lb/in^2) 85 – 175°F (under 500lb/in^2)
		Refined mineral oils with superior anti-corrosion, anti-oxidation and anti-wear performances.	HM 32 HM 68	32 68	28.8 61.2	35.2 74.8	Oil temperature (Rated pressure) 0 – 148°F (under 2000lb/in^2) 85°F – 175°F (under 2000lb/in^2)
	Hydraulic and Slide ways	Refined mineral oils of HM type with anti-stick-slip properties	HG 32 HG 68	32 68	28.8 61.2	32.2 74.8	Oil temperature (Rated pressure) 0 – 148°F (under 1000lb/in^2) 85°F – 175°F (under 1000lb/in^2)
GREASE		Premium quality greases with superior anti-oxidation and anti-corrosion properties		Viscosity (102°F) SSU			
			XM 1 XM 2	310 – 340 285 – 295			Centralized systems Cup or hand gun

TABLE -3

THE GENERAL LUBRICANTS FOR MACHINE TOOL

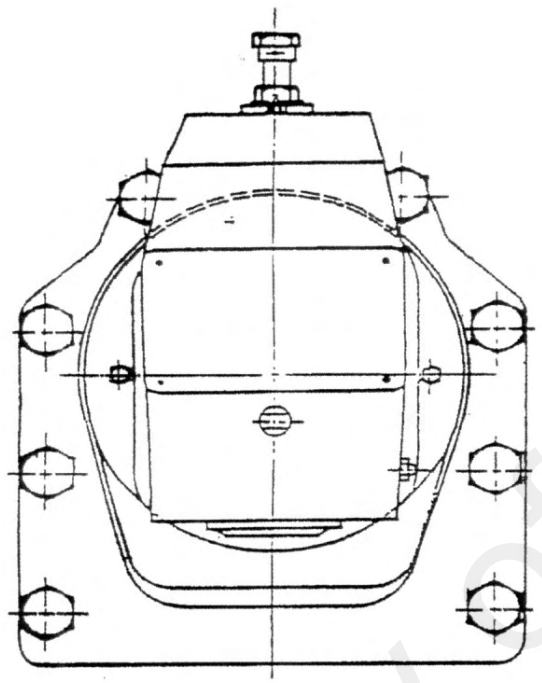
	SYMBOL	CPC	ESSO/EXXON	SHELL	MOBIL	DAPHNE
Gears	CB 32 CB 68 CB 150	R 32 R 68 R 150	Teresso 32 Teresso 68 Teresso 150	Tellus Oil C 32 Tellus Oil C 68 Tellus Oil C 150	DTE Oil Light DTE Oil Heavy Medium DTE Oil Extra Heavy	Mechanic Oil 32 Mechanic Oil 68 Mechanic Oil 150
	CC 150 CC 320 CC 460	R 150 R 320 R 460	Spartan EP 150 Spartan EP 320 Spartan EP 460	Omala Oil 150 Omala Oil 320 Omala Oil 460	Gear 629 Gear 632 Gear 634	CE Compound 150S CE Compound 320S CE Compound 460S
Bearings	FC 2 FC 10 FC 22	R 12 R 22	Spinesso 10 Spinesso 22	High spin oil C2 Tellus Oil C 10 Tellus Oil C 22	Velocite Oil No. 3 Velocite Oil No. 6 Velocite Oil No. 10	Mechanic Oil 2 Mechanic Oil 10 Mechanic Oil 22
Slide Ways	G 68 G 220	Slide way oil Slide way oil	Febis K 68 Febis K 220	Tonna T 68 Tonna T 220	Vactra Oil No. 2 Vactra Oil No. 4	Multiway 68C Multiway 220C
Hydraulic System	HL 32 HL 68 HM 32 HM 68 HG 32 HG 68	R 32 R 68 32 AW 68 AW – –	Teresso 32 Teresso 68 Nuto HP 32 Nuto HP 68 Powerex DP 32 Powerex DP 68	Tellus Oil C 32 Tellus Oil C 68 Tellus Oil 32 Tellus Oil 68 Tonna Oil T 32 Tonna Oil T 68	DTE Oil Light DTE Oil Heavy Medium DTE 24 DTE 26 Vacuoline Oil 1405 Vacuoline Oil 1408	Hydraulic Fluid 32 Hydraulic Fluid 68 Super Hydraulic Fluid 32 Super Hydraulic Fluid 68 Multiway 32 Multiway 68
Grease	XM 1 XM 2	Gulfcrown Grease E.P. No.1 Gulfcrown Grease E.P. No.2	Listan 1 Listan 2	Alvania Grease 1 Alvania Grease 2	Mobilux EP 1 Mobilux 2	Cornex Grease No. 1 Cornex Grease No. 2

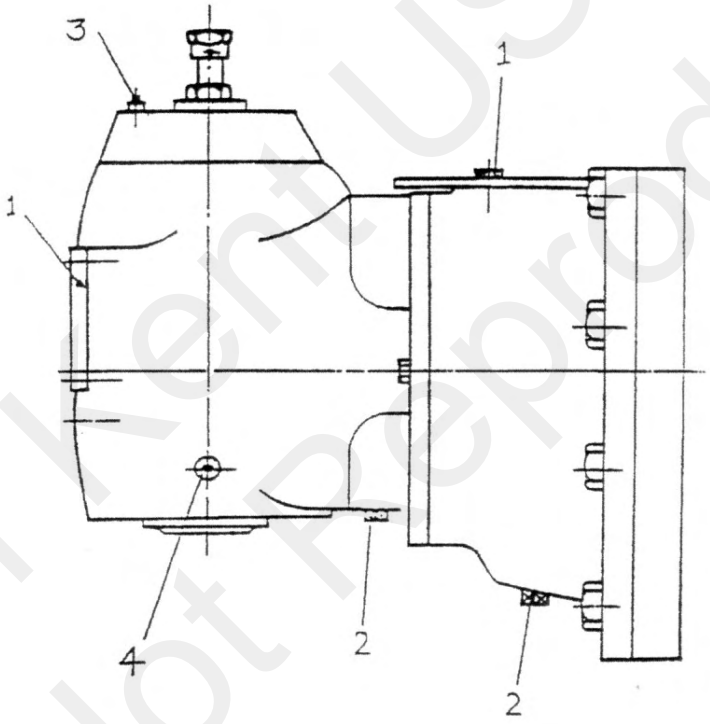
LUBRICATION SYSTEM



NO	PART NAME	SPECIFICATION	QTY
1	JOINT OF RATIO DISTRIBUTION CONTROLLER	PSB4	9
2	NUT	PAN4	16
3	SLEEVE	PB4	24
4	DISTRIBUTOR	DB-8	1
5	ALUMINUN PIPE	ø4	
6	OUTSIDE STEEL WIRE SOFT TUBE	ø4x500L	1
7	JOINT OF RATIO DISTRIBUTION CONTROLLER	PSB3	1
8	JOINT OF RATIO DISTRIBUTION CONTROLLER	PSB5	6
9	DISTRIBUTOR	DA-10	1
10	SET PLUG	PA4	8
11	T-JOINT	PKD4	1
12	LUBRICATION PUMP	SMA-601-15	1

LUBRICATION FOR VERTICAL ATTACHMENT





FREQUENCY	LUBRICATE	LUBRICANT	QUANTITY	LUB. AT
3 months from installation. 6 months regular	Spur gears, Spiral bevel gears, Ball bearings	Gulf Harmany 53 Shell turbo oil 33. Esso Telesstic 52	Top-up to oil sight level	1. Drain the dirty lubricant from 2.
3 months	Spindle taper roller bearings	Esso Andok C.	Practical quantity	3 and 4

3. Operation

3-1 OPERATION PANEL

(A) Electric operation panel for standard Z axis table up-down rapid movement (Fig 6-A)

1: Power on & lamp

2: Y axis rapid button

3: Speed adjuster for Y axis feed

4: Y axis feed direction lever

5: X axis standby button

6: Horizontal start button

7: Coolant Pump

8: Horizontal spindle stop button

9: Z axis rapid down button

10. Z axis rapid down button

11: Emergency stop button

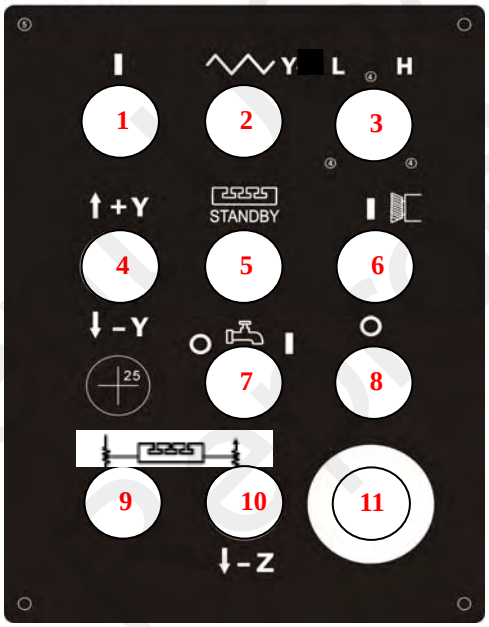


Fig 6-A

(B) Electric operation panel for option Z axis inverter motor and share one inverter controller with Y axis (Fig-6-B)

1: Power on & lamp

2: Y & Z axes rapid button

3: Speed adjuster for Y & Z axes feed

4: Y axis feed direction lever

5: X axis standby button

6: Horizontal start button

7: Coolant Pump

8: Horizontal spindle stop button

9: Z axis up down feed direction lever

10: Emergency stop button

Fig 6-B

3-2 OVERARM TRANSVERSE MOVEMENT

The overarm may be moved transversely within a range of about 500 mm.

This cross movement should be carried out in the following manners:

(1)Loosen the 2 bolts. (Fig7-5)

(2)Move the overarm, transversely by turning the pinion rotation shaft (Fig 7-6) with a wrench.

(3)Retighten the 2 bolts after obtaining the necessary movement to fix the overarm.

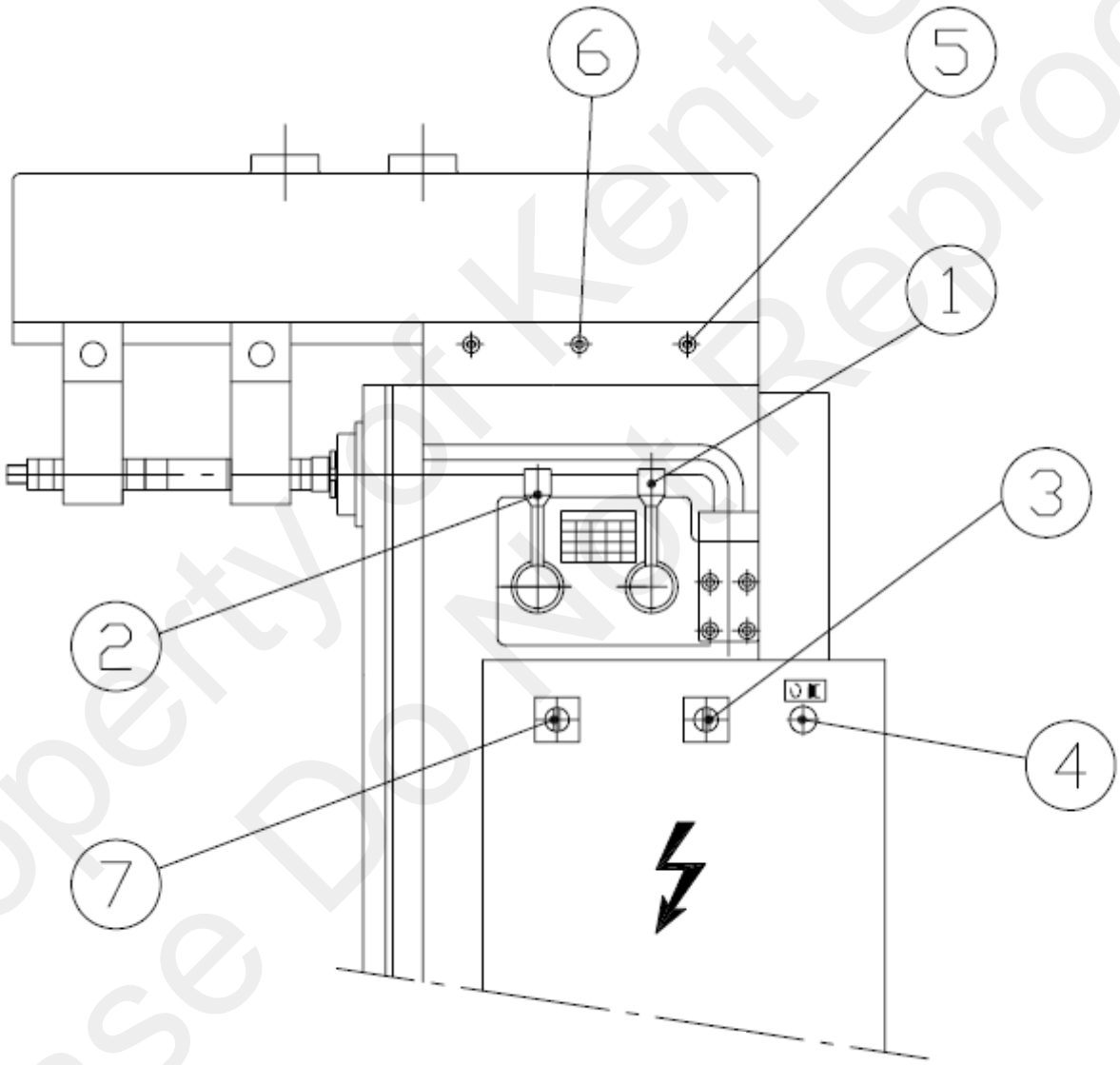


Fig 7

3-3 CHANGE OF HORIZONTAL SPINDLE SPEED

Move lever (Fig 7-1) to position L.M. OR H depending upon the spindle speed range required, and move lever (Fig 7-2) the position A.B OR C particular speed required.

Main switch (Fig 7-7) can power on/off. Speed changes must not be made while the main motor is running. To facilitate changing spindle speed, stop both main and feed motors by depressing “RED” emergency stop button (Fig 6-10) turn spindle direction switch(Fig 7-3) to position forward or reverse and then intermittently press the green inching button (Fig 7-4) on side of box, at the same time moving lever (Fig 7-1, 7-2)until the required gears are engaged. It should be noted that as a safety measure the feed motor will automatically stop when the inching button is operated.

3-4 PARTS NAME OF MACHINE

1. Vertical attachment
2. X axis feed direction selector
3. X axis clamp lever
4. Y axis hand wheel
5. Y axis clamp lever
6. Y axis hand wheel
7. Knee handle
8. Feed box
9. Feed selection lever A feed selection rod
10. Feed selection lever B hi-low feed selection
11. Longitudinal power and rapid traverse engagement lever
12. Control panel
13. Horizontal spindle speed selection lever

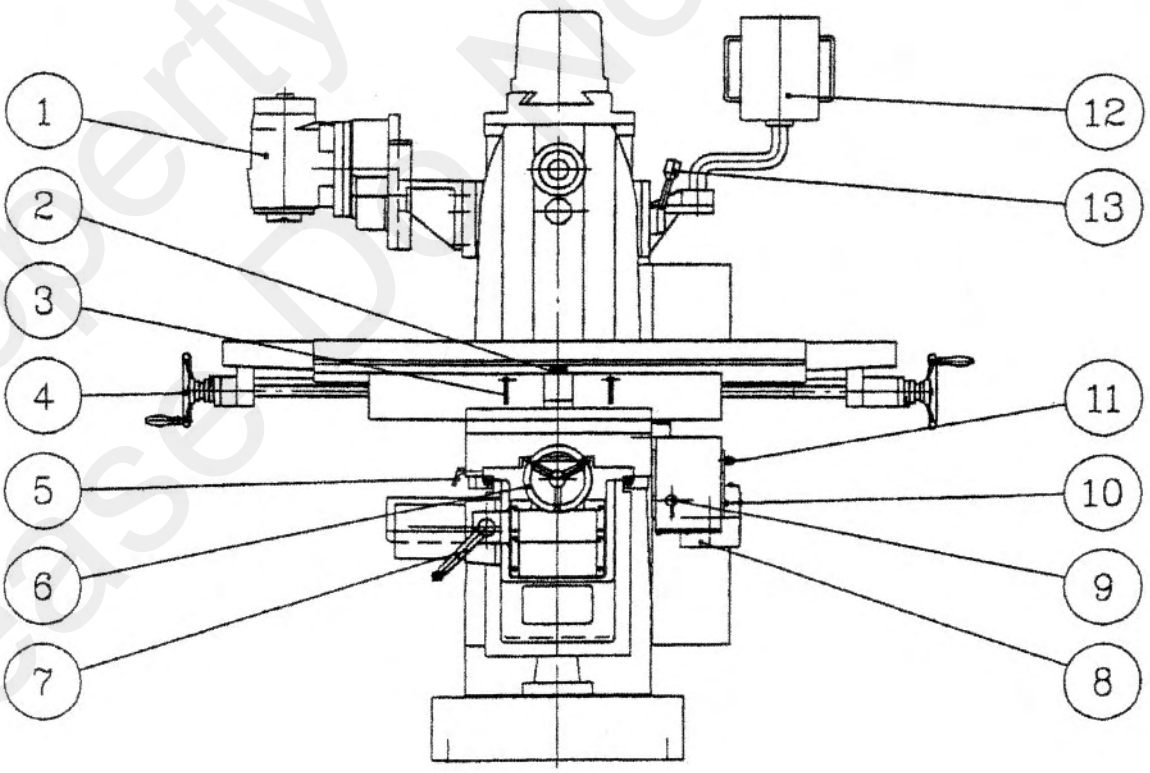


Fig 8

3-5 OPERATION

3-5-1 Operation of manual feeding

Operate longitudinal feed by hand wheel (Fig8-4), cross feed by hand wheel (Fig8-6), and vertical feed by hand lever (Fig 8-7).

If directional engage lever (Fig 8-11) at engagement position, longitudinal manual feed can not be operated.

Chart of rotation of manual feed hand wheel and moving direction of working table.

Hand Wheel Table	Rotation Direction (clockwise)	Displacement one division	Scale Collar one revolution
Longitudinal Feed	Right hand	0.02 mm	5.00 mm
Cross feed	Forward (go far from operator)	0.02 mm	5.00 mm
Vertical feed	Upward	0.02 mm	2.50 mm

3-5-2 Operation of Cross Feed

Unclamp the 2 clamp lever on right side of saddle, and rotate cross hand wheel clockwise or counter clockwise for moving in-out.

3-5-3 Operation of table vertical rapid and feed traverse

Unclamping the 2 clamping lever at rear side of knee to loose the knee, first please choose switch for Z axis up-down (Fig 6-9), if move to **+Z** by pressing rapid button (Fig 6-2) then it can lift up the knee. If move to **–Z** then it can downward the knee. If want to do cutting feed, then move to **+Z** by feed speed button (Fig 6-3) , then speed will be modified , to clockwise direction speed is fast, to counterclockwise speed is slower.

3-5-4 Operation of table longitudinal power feed

Loosen the 2 clamping lever (Fig 8-3) on the table before engaging the auto longitudinal feed.

Push down the engagement lever (Fig 8-11), toward the feed R&L selector (Fig 8-2). Right for right movement and left for left movement.

Lift the engagement lever (Fig 8-11) upward for auto longitudinal rapid traverse according to the feed direction from feed R&L selector (Fig 8-2).Set the engagement level (Fig 8-11) in the middle position for manual feed by hand wheel in left and right side of saddle (Fig 8-4)

3-5-5 Choice of feed speed

Feeding speed is dependent on the spindle speed material of work piece tips of cutter and diameter of cutters.

With this machine 6 steps of cutting feed and rapid traverse are carried Out from the feed box (Fig 8-8)

Move the feed selection rod (Fig 8-9) to position A.B.C to choose the right feed. Pull the hi-low feed selector (Fig 8-10) out and push it in for to choose the hi-low speed.

3-5-6 Operation of cross feed

1. Select the feed direction lever (Fig 6-4) to needed position. Either or forward or backward.

2. Toward feed engage/disengage lever (Fig 9-1) to auto position for automatic cross feeding.

3. Adjust the correct speed from the speed adjuster (Fig 6-3)

4. Put feed engage/disengage lever (Fig 9-1) in manual position for Cross manual movement.

Fig 9-1

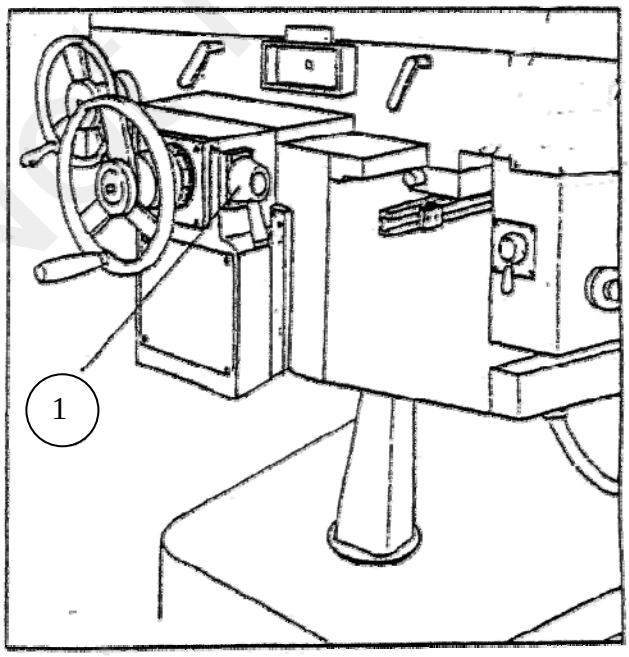


Fig 9

3-5-7 Operation of swivel table

First loosen the four nuts where are front and rear of table (Fig 10-1), and then forced rotation saddle (Fig 10-2) can be processed to the required point, and then tighten the four nuts. (Fig 10-3)Slewing angle parameters, each engraved on the seat surface 45 degrees indicates a return to the original zero should be re-proof T-slot table straightness.

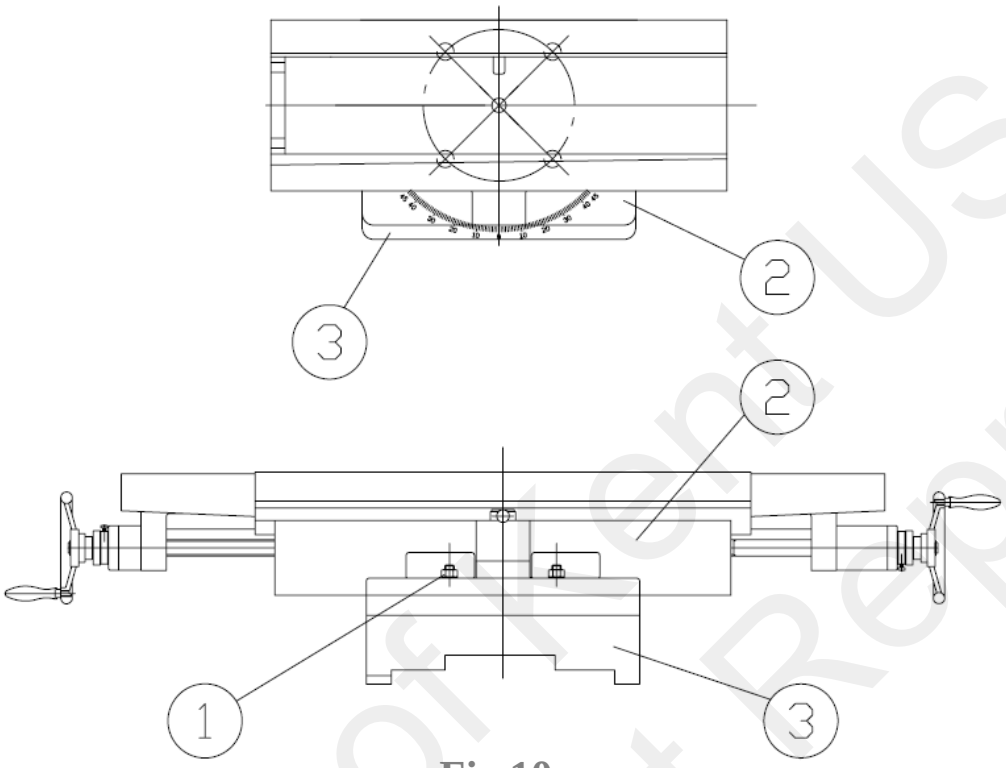


Fig 10

3-5-8 Cover function

1. Before press power on (Fig 6-1), make sure the stretched out arm on both sides of the cover, such as location (Fig11-1), and hanging head cover position (Fig12-1) in order to successfully turn the power on.
2. If the attachment head lifting in the side of the fuselage, attachment head covers shall be shift cam (Fig12-3) need to be adjusted to be pressure logic switch (Fig12-4).
3. If you encounter an emergency situation, such as (Fig11-2 & Fig12-2) will cover the shift, it will automatically cut off power supply.

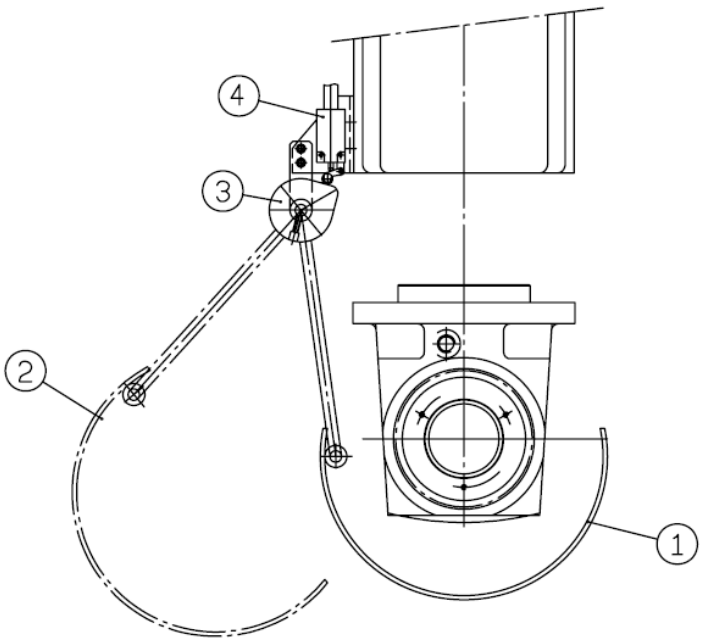


Fig 12

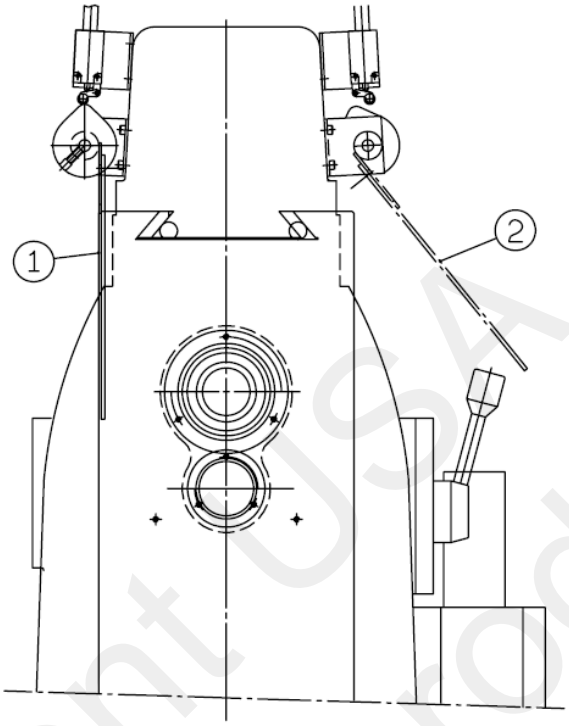


Fig 11

3-5-9 MOUNTING VERTICAL ATTACHMENT

(A) Move overatm to the extreme rear position. Keeps the front machine surface aligning with the column surface.

(B) Remove the vertical attachment from it's bracket and shift to front position.

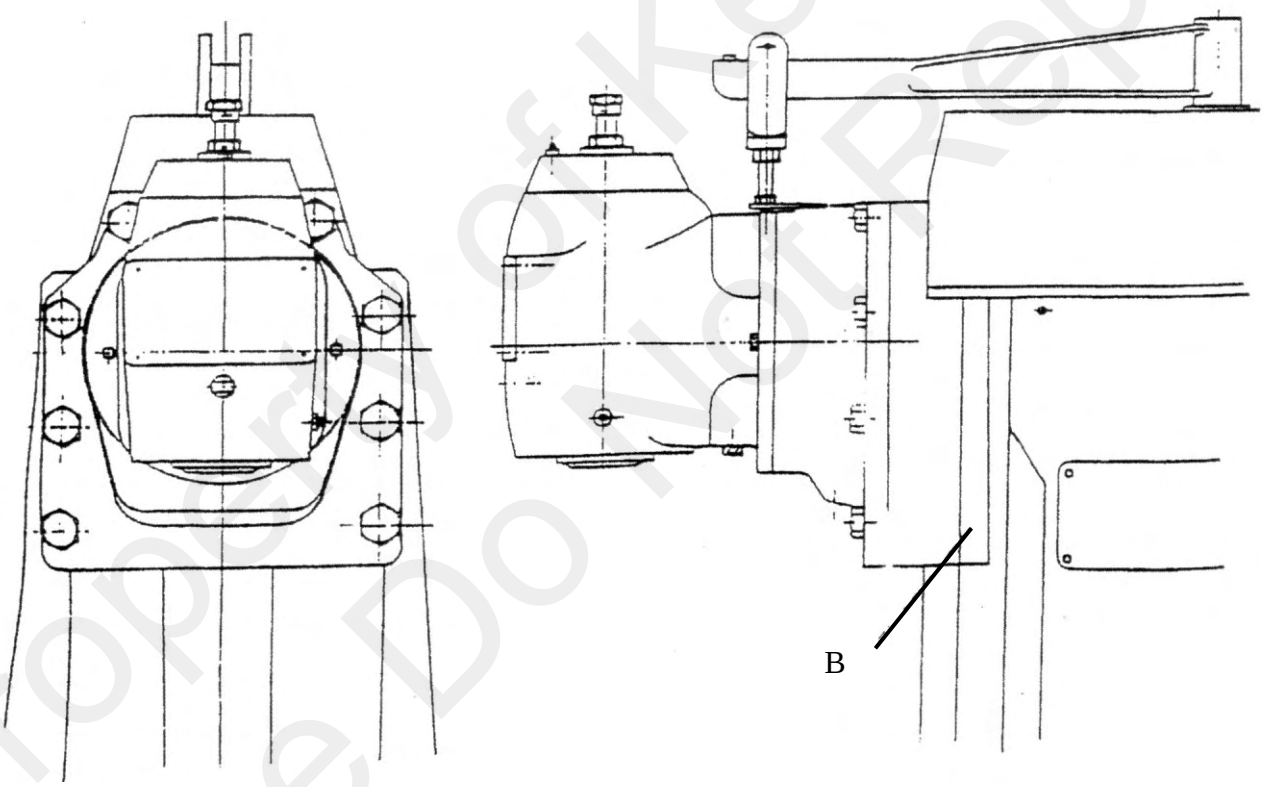
(C) Before mounting. Be sure to release the six w 5/8" hex head bolt from the two back plates (B). Remove the two back plates.

(D) Move in the vertical attachment. Be sure to let the two slots mesh with the two keys on horizontal spindle nose.

(E) Assemble the two back plates and lock the six w5/8" hex head bolts.

(F) Lock the upper two w 5/8" hex head bolts to overarm.

(G) Use M16 L-Key to tight the two M16 set screw. (With brass pad at the front) against the column way to prevent the possible rocking during vertical milling.



4. Safety device

4-1 Thermal relay

When electric current exceeding the rating, the thermal relay (Fig 13) is actuated automatically to stop the driving motor. If the thermal relay is actuated, locate and correct the cause and reset the thermal relay by pressing the thermal relay reset push button.

4-2 Fuse

Fuses (Fig 13) are installed in the control box to protect electric circuits. If the machine does not start operation with the poser source connected and no abnormality is indicated in each safety device, check the fuses. If fuses are blown, remove the cause before replacing the fuse.

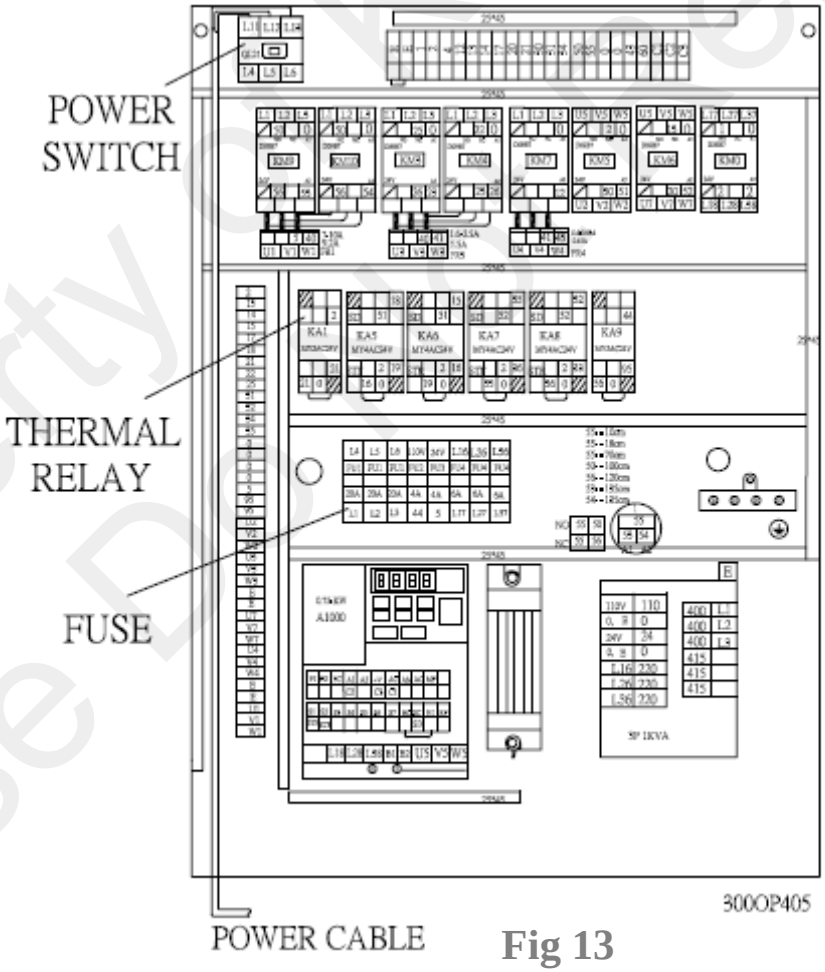
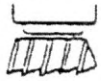
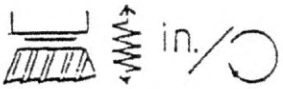
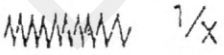


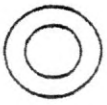
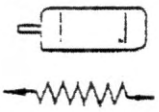
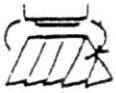
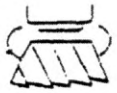
Fig 13

5. SYMBOLS

The various movements and corresponding symbols used on this machine are indicated in (Table 4).

TABLE 4

NO.	DESCRIPTION	SYMBOL
1	Main spindle	
2	Revolution per minute	
3	Feed amount per revolution	
4	Neutral	
5	Main spindle brake	
6	Main spindle without brake	
7	Table	
8	Feed (normal)	
9	Low speed feed	
10	Longitudinal feed	
11	Vertical feed	

NO.	DESCRIPTION	SYMBOL
12	Rapid feed	
13	Power pilot lamp	
14	Start	
15	Stop	
16	Emergency stop	
17	Table feed motor	
18	Cutting oil pump	
19	Vertical spindle clockwise rotation	
20	Vertical spindle counter clockwise rotation	
21	Vertical spindle automatic feed	

6. SUITABLE CUTTERS

6-1 CARBIDE CUTTERS

TABLE 5

MATERIAL		FACE MILLS	SLAB MILLS	END MILLS	FULL & HALF SIDE MILLS	SAWS	FORM MILLS
MALLEABLE SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.005-.015 200-300	.005-.015 200-300	.005-.010 200-350	.005-.010 200-300	.003-.004 200-350	.005-.010 175-275
CAST STEEL SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.008-.015 150-350	.005-.015 150-350	.003-.010 150-350	.005-.010 150-350	.002-.004 150-300	.005-.010 150-300
100-150 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.010-.015 450-800	.008-.015 450-600	.005-.010 450-600	.008-.012 450-800	.003-.006 350-600	.004-.010 350-600
150-250 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.010-.015 300-450	.008-.015 300-450	.005-.010 300-450	.007-.012 300-450	.003-.006 300-450	.004-.010 300-450
250-350 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.008-.015 180-300	.007-.012 150-300	.005-.010 150-300	.005-.012 160-300	.002-.005 150-300	.003-.008 150-300
350-450 BR..STEEL	FEED PER TOOTH FEET PER MIN.	.008-.015 125-180	.007-.012 100-150	.004-.008 100-150	.005-.012 125-180	.001-.004 100-150	.003-.008 100-150
CI HARD 225-350BR.	FEED PER TOOTH FEET PER MIN.	.005-.010 125-200	.005-.010 100-175	.003-.008 125-200	.003-.010 125-200	.002-.003 125-200	.005-.010 100-175
CI MED. 180-225BR.	FEED PER TOOTH FEET PER MIN.	.008-.015 200-275	.008-.015 175-250	.005-.010 200-275	.005-.012 200-275	.003-.004 200-250	.006-.012 175-250
CI SOFT 150-180 BR.	FEED PER TOOTH FEET PER MIN.	.015-.025 275-400	.010-.020 250-350	.005-.012 275-400	.008-.015 275-400	.003-.004 250-350	.008-.015 250-350
BRONZE SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.020 300-1000	.010-.020 300-800	.005-.010 300-1000	.008-.012 300-1000	.003-.004 300-1000	.008-.015 200-800
BRASS SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.020 500-1500	.010-.020 500-1500	.005-.010 500-1500	.008-.012 500-1500	.003-.004 500-1500	.008-.015 500-1500
ALUM. AL. SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.040 2000 UP	.010-.030 2000 UP	.003-.015 2000 UP	.008-.025 2000 UP	.003-.006 2000 UP	.008-.015 2000 UP

Generally lower end of range used for inserted blade cutters, higher end of range for index able insert cutters.

6-2 HIGH SPEED STEELS CUTTERS

TABLE 6

MATERIAL		FACE MILLS	SLAB MILLS	END MILLS	FULL & HALF SIDE MILLS	SAWS	FORM MILLS
MALLEABLE SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.005-.015 60-100	.005-.015 60-90	.003-.010 60-100	.006-.012 60-100	.003-.006 60-100	.005-.010 60-80
CAST STEEL SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.015 40-60	.010-.015 40-60	.005-.010 40-60	.005-.010 40-60	.002-.005 40-60	.008-.012 40-60
100-150 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.015-.030 80-130	.008-.015 80-130	.003-.010 80-140	.010-.020 80-130	.003-.006 70-100	.008-.010 70-100
150-250 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.010-.020 50-70	.008-.015 50-70	.003-.010 60-80	.010-.015 50-70	.003-.006 50-70	.006-.010 50-70
250-350 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.005-.010 35-60	.005-.010 35-50	.003-.010 40-60	.005-.010 35-50	.002-.005 35-50	.005-.010 35-50
350-450 BR. STEEL	FEED PER TOOTH FEET PER MIN.	.003-.008 20-35	.005-.008 20-35	.003-.010 20-40	.003-.008 20-35	.001-.004 20-35	.003-.008 20-35
CI HARD 225-350 BR.	FEED PER TOOTH FEET PER MIN.	.005-.012 40-60	.005-.010 35-50	.003-.008 40-60	.005-.010 40-60	.002-.004 35-60	.005-.010 35-50
CI MED. 180-225 BR.	FEED PER TOOTH FEET PER MIN.	.010-.020 60-80	.008-.015 50-70	.003-.010 60-90	.008-.015 60-80	.003-.005 60-70	.008-.012 50-60
CI SOFT 150-180 BR.	FEED PER TOOTH FEET PER MIN.	.015-.030 80-120	.010-.025 70-110	.004-.010 80-120	.010-.020 80-120	.002-.005 70-110	.010-.015 60-80
BRONZE SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.025 50-225	.008-.020 50-200	.003-.010 50-250	.008-.015 50-225	.003-.005 50-250	.008-.015 50-200
BRASS SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.025 150-300	.008-.020 100-300	.005-.015 150-350	.008-.015 150-350	.003-.005 150-300	.008-.015 100-300
ALUM. AL. SOFT/HARD	FEED PER TOOTH FEET PER MIN.	.010-.040 300-1200	.015-.040 300-1200	.005-.020 300-1200	.010-.030 300-1200	.004-.008 300-1000	.010-.020 300-1200

7. PREVENTIVE MAINTENANCE

For securing the accuracy and life of the machine, we offer the following preventive maintenance charts.

Frequency	Item
Daily	1. It is necessary to oil each lubrication point before operation. 2. Check the level of the oil lubrication and fill if necessary. 3. It is necessary to release the clamps, clean and lubricate the table after operation.
Monthly	1. Check all the gib and adjust if necessary. 2. Check all the backlash between screws and nuts , and adjust if necessary.
Quarterly	1. Check and adjust the machine accuracy.

May we suggest that.

Before attempting any maintenance in the interests of safety you isolate the machine electrically and in the interests of efficiency you read the relevant section of this manual.

When ordering replacement parts please quote:

- The machine model name and the machine serial no.
  (Situated above the door one the left hand side of the column.)
- The head serial no.
  (Found on the front of the belt housing.)
- Item number
- Part number
- Description
- Quantity

8. TROUBLE SHOOTING

Trouble Shooting

TROUBLE	CAUSE	CORRECTION
FEED STOP SUDDENLY DURING MACHINING	1. Overload makes the shear pin shear out.	1. Check the overload cause and replace shear pin.
FEED RATE CHANGE NOT WORK	2. The jaw of the two speeds rocker broken.	1. Replace the two speeds rocker.
KNEE CANT BE POWER ELEVATED	1. Knee is locked on column. 2. Over weight of workpiece, fixtures...etc. (Max load capacity : 350 kgs) 3. Poor lubrication between Knee and column.	1. Release lock bolts. 2. Use hand elevating. 3. Check lubrication.
HARD TO CHANGE SPEED OF HORIZONTAL	1. Gears not meshed. 2. Poor lubrication on spline shaft and gears.	1. Use "Inching" button. 2. Check lubrication.
RAPID TRAVERSE OF FEEDBOX NOT WORK	1. Wrong motor rotating di- 2. Multi-disc clutch worn. 3. Rapid traverse shifter worn.	1. Reconnect the power supply. 2. Adjust clutch. 3. Replace shifter

Trouble Shooting

TROUBLE	CAUSE	CORRECTION
CHATTER	1. Lack of rigidity in the machine, fixtures arbor or workniece.	1. Improve rigidity
	2. Cutting load too great.	2. Decrease number of teeth in contact with workpiece.
	3. Dull cutter	3. Resharpen
	4. Poor lubrication	4. Improve lubrication
	5. Straight tooth cutter.	5. Use helical tooth cutter.
	6. Peripheral relief angle too great.	6. Decrease relief angle
CANNOT HOLD SIZE	1. Cutting load too great	1. Decrease number of teeth in contact with workpiece
	2. May be due to chip packing	2. Increase oil pressure in redirect flow so as to wash chips out of teeth
	3. Chips causing misalignment.	3. Brush or blow all chips away before mounting new piece of work
PREMATURE CUTTER DULLING	1. Cutting load too great	1. Decrease number of teeth in contact with workpiece
		2. Add blending oil to lubricant
POOR SURFACE FINISH	1. Feed too high	1. Decrease feed and increase speed
	2. Dull tool	2. Resharpen
	3. Speed too low	3. Increase surface spee
	4. Insufficient number of cutter teeth	4. Use cutter with more closely spaced teeth

Trouble Shooting

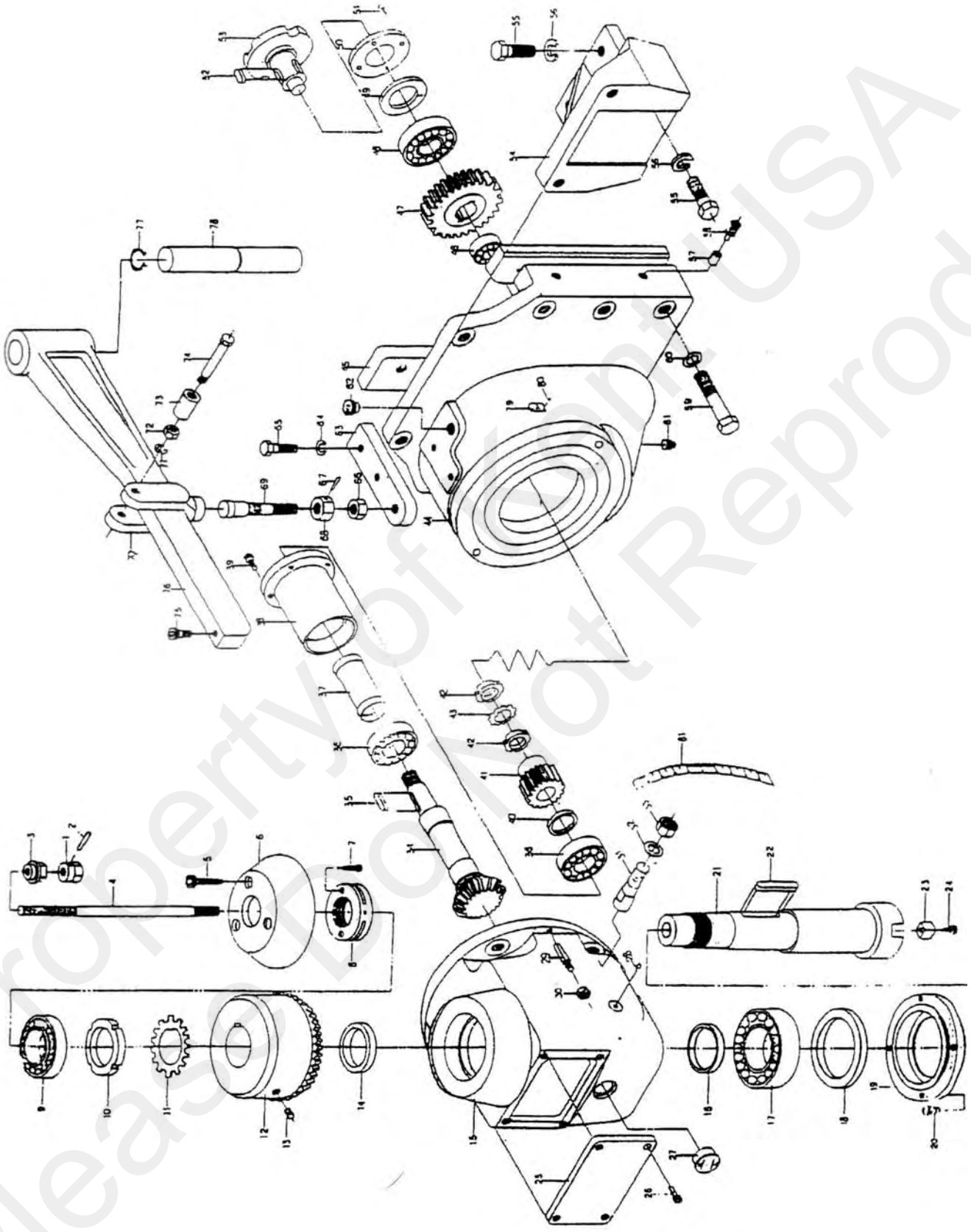
TROUBLE	CAUSE	CORRECTION
CUTTER "HOGS IN"	1. Peripheral relief too great 2. Rake angle too large 3. Improper speed	1. Use recommended angle 2. Decrease rake angle 3. Check and adjust
VIBRATION	1. Insufficient clearance causing rubbing 2. Machine at fault	1. Use recommended clearance angle 2. Check machine, be sure arbor is at least 1/3 diameter of cutter
WORK BURNISHING	1. Cut is too light 2. Insufficient peripheral relief 3. Land too wide	1. Increase depth of cut 2. Increase peripheral relief angle 3. Decrease width of land
CUTTER BURNS	1. Insufficient lubricant 2. Speed too fast	1. Add more sulfur base oil 2. Decrease speed
TEETH BREAKING	1. Feed too high	1. Decrease feed per teeth May be possible to maintain rate by increasing the number of teeth

9. SPARE PARTS

When ordering replacement parts please quote:

- The machine model name and the machine serial no. (Situated above the door on the left hand side of the column.)
- Item number
- Part number
- Description
- Quantity
- PARTS OBTAINBLE IN INCH(I) OR METRIC(M)

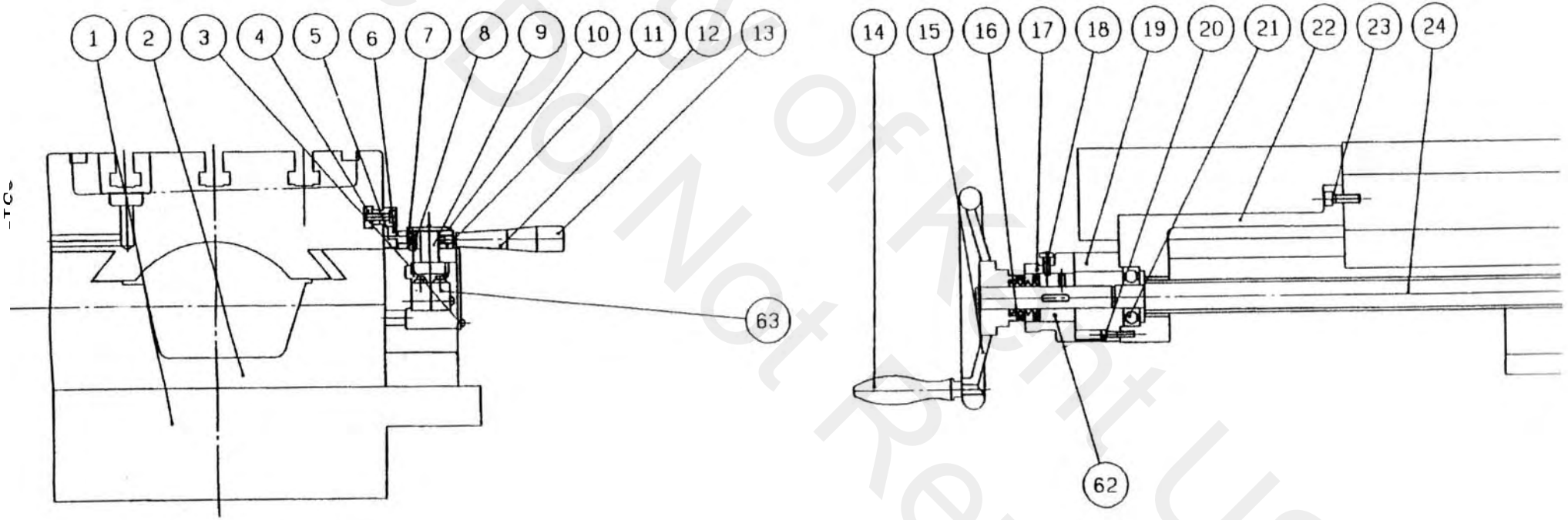
VERTICAL ATTACHMENT



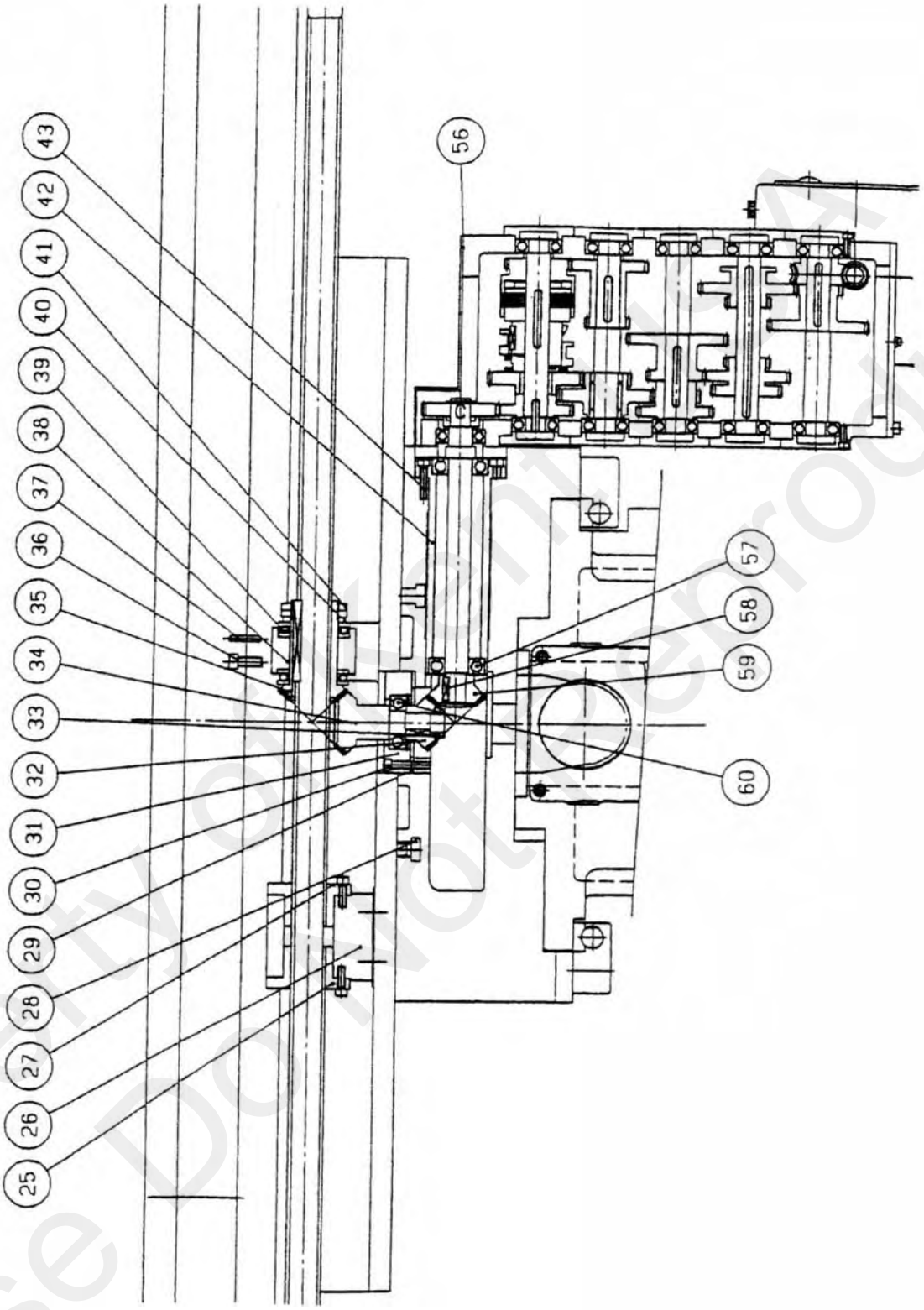
VERTICAL ATTACHMENT

NO	NAME		NO	NAME	
1	NUT		42	LOCK NUT	AN05
2	TAPER PIN		43	SELF LOCK WASHER	AW05
3	NUT		44	HEAD SEAT	
4	PULL STUD		45	PLATE	
5	SOCKET SCREW	M6x40	46	BALL BEARING	6204
6	TOP COVER		47	GEAR	
7	SOCKET SCREW	M6x20	48	BALL BEARING	6207
8	SET SCREW		49	OIL SEAL, V-TYPE	45,65,5
9	TAPPER ROLLER BEARING	#32210	50	COVER	
10	LOCK NUT	AN11	51	FLAT HD SET SCREW	M5x12
11	SELF LOCK WASHER	AW11Ø55	52	KEY	10x10x23
12	SPIRAL BEVEL GEAR		53	JOINT SHAFT	
13	SET SCREW	M8x12	54	BRACKET	
14	COLLAR		55	HEX SCREW	W5/8"x1¾"
15	HEAD		56	SPRING WASHER	5/8"
16	OIL SEAL, V-TYPE	60,75,10	57	COPPER PAD	
17	TAPPER ROLLER BEARING	#32212	58	SET SCREW	M16x25
18	OIL SEAL, V-TYPE	89,115,9	59	HEX SCREW	5/8"x3½
19	SPINDLE NOSE COVER		60	WASHER	
20	SOCKET SCREW	M5x15	61	OIL DRAINER	1/4"
21	SPINDLE		62	OIL CAP	5/8"
22	KEY	12x8x60	63	HANG PLATE	
23	KEY		64	SPRING WASHER	½"
24	LOCKET SCREW	M8x20	65	HEX SCREW	½"x1½"
25	FRONT COVER		66	HEX NUT	5/8"
26	SOCKET SCREW	M6x15	67	TAPPER PIN	
27	OIL GAUGE		68	HEX NUT	¾"
28	OIL NIPPLE	1/8"	69	HANG BOLT	
29	KNOCK BOLT	#6	70	YORK	
30	HEX NUT	5/16"	71	SPRING WASHER	3/8"
31	T-BOLT		72	HEX NUT	3/8"
32	WASHER		73	COLLAR	
33	HEX NUT	5/8"	74	BOLT	
34	SPIRAL BEVEL GEAR SHAFT	7x4x35	75	SOCKET SCREW	M12x20
35	KEY		76	BOOM	
36	BALL BEARING	#7207	77	SNAP RING	
37	COLLAR		78	POST	
38	BEARING HOUSING		79	HEAD SWIVELL INDICATOR	
39	SOCKET SCREW	M8x16	80	RIVET	Ø2x5
40	WASHER		81	HEAD SWIVELL SCALE	
41	PINION				

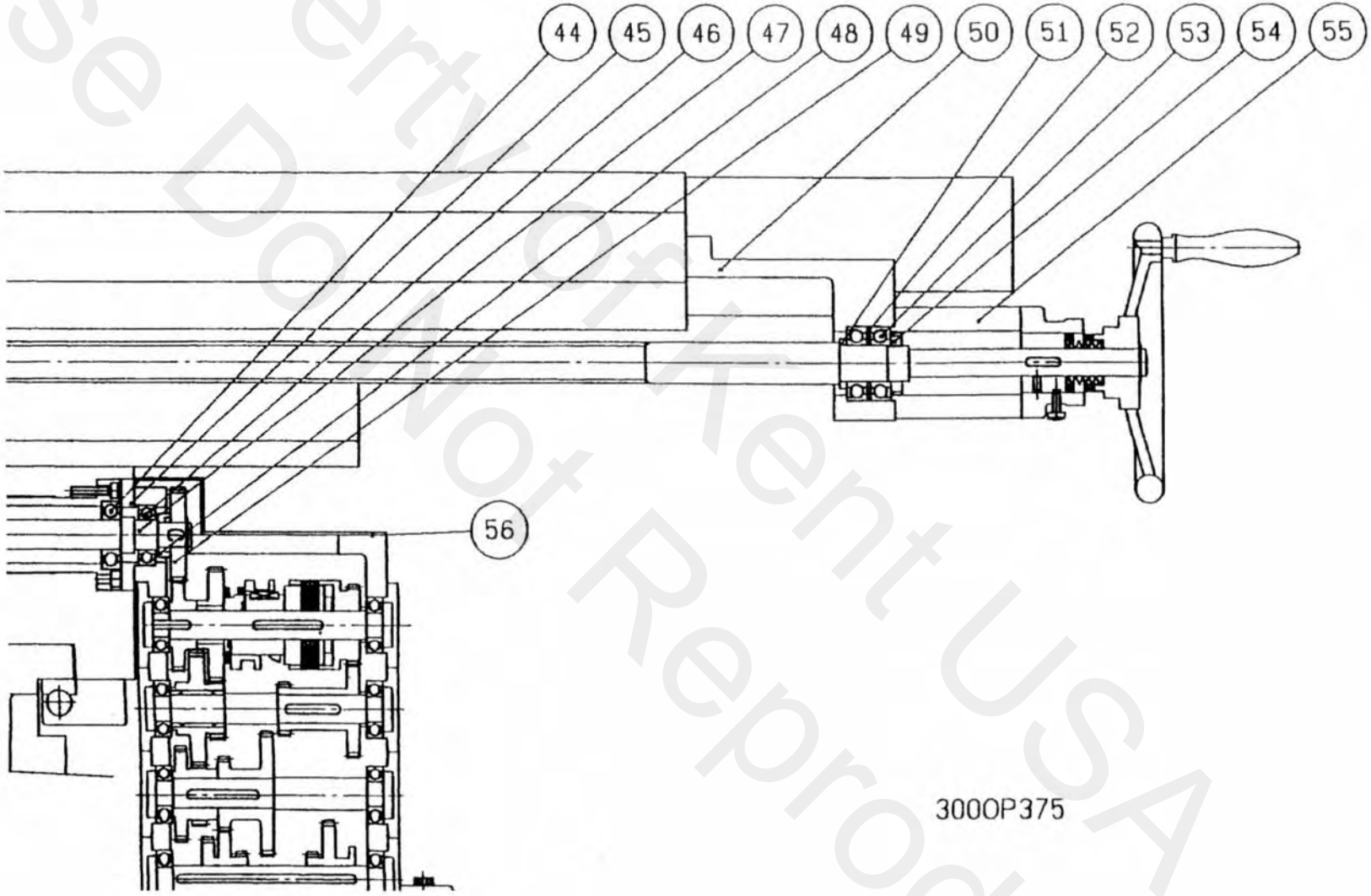
SADDLE ASSEMBLY
(HU-300)



SADDLE ASSEMBLY
(HU-300)



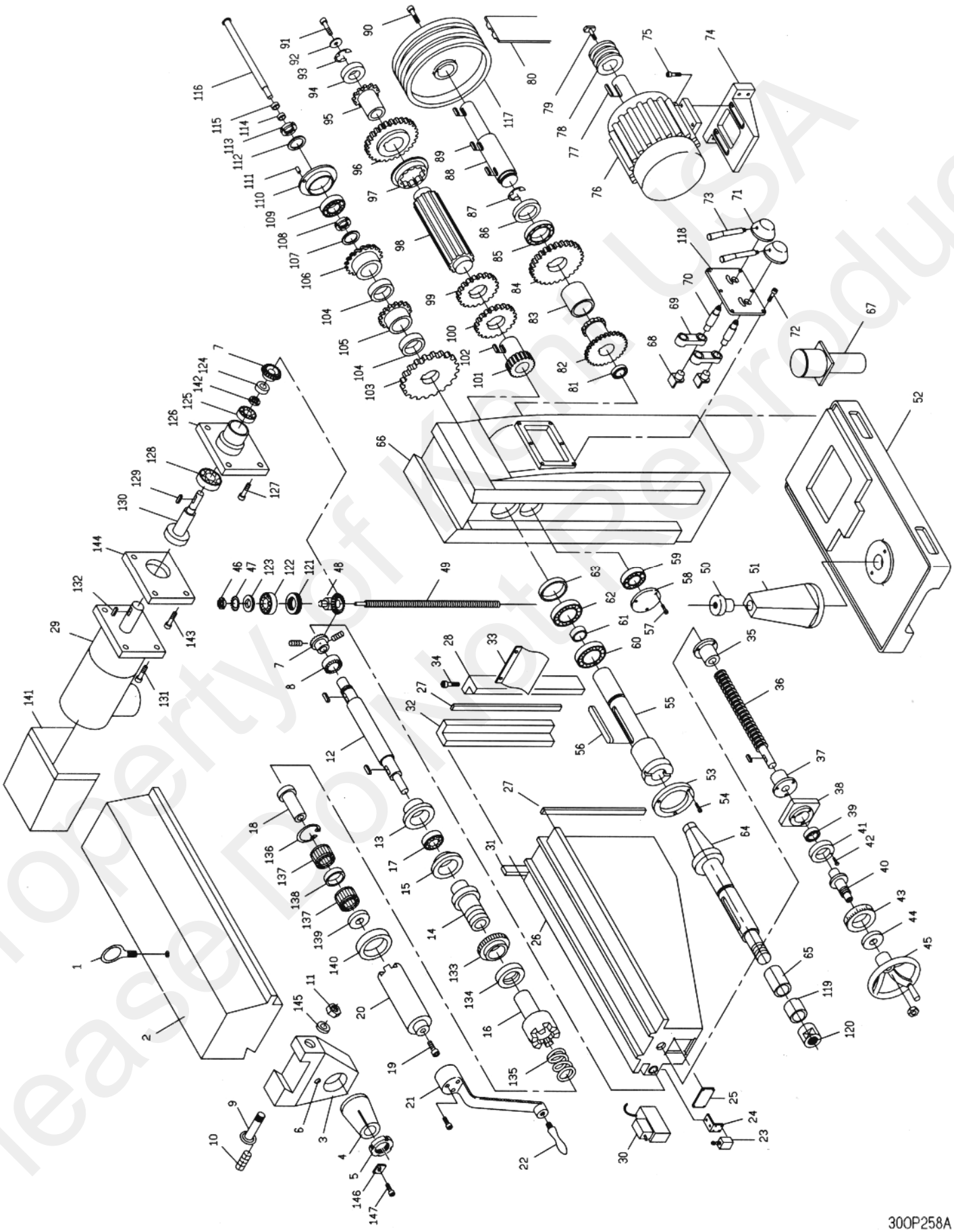
SADDLE ASSEMBLY
(HU-300)



HU-300 SADDLE ASSEMBLY

S/N	P/N	DESCRIPTION	S/N	P/N	DESCRIPTION
1	S-129	Saddle	45	S-144	Bearing Stop
2	S-130	Swivel Base	46	6004ZZ	Ball Bearing
3	S-135	Micro Switch Cover	47	S-133	Shaft
4	SP-070	Nut	48	S-147	Spacer
5	300-S136	Dog	49	S-143	Gear
6	300-S137	Dog	50		Bearing Bracket
7		Spring	51		Spacer
8	1/4	Steel Ball	52		Spacer
9	S-114	Shaft	53	6304ZZ	Ball Bearing
10	S-72	Cover	54		Lock Nut
11	S-112	Lever Bracket	55	300-T102	Bearing Bracket
12	S-113	Lever	56	S-153	Gover
13	H-178	Handle-Knob	57	6204ZZ	Ball Bearing
14		Handle	58	6x6x20L	Key
15	AC-30	Handle Wheel	59	S-97	Gear
16	T-42-1	Spring	60	6204ZZ	Ball Bearing
17	T-58	Dial	61	H-47	Snap Ring
18	T-12	Set Screw	62	T-59	Dial Holder
19	300-T101	Bearing Bracket	63	Z-15GD-B	Micro Switch
20	M6x25L	Hex. Socket Head Bolt			
21	6304ZZ	Ball Bearing			
22		Bearing Bracket			
23	M8x35L	Hex. Socket Head Bolt			
24	300-T122	Lead Screw			
25	T-53	Leadscrew Adjustting Nut			
26	D13-1	Nut Bracket			
27	T-52	Leadscrew Fixed Nut			
28	R-73	Fixed Bolt			
29	S-99	Spacer			
30	M6x30L	Hex. Socket Head Bolt			
31	300-S132	Bearing Bracket			
32	S-96	Gear			
33	H-164	Lock Nut			
34	300-S131	Gear Shaft			
35	S-93	Gear			
36	M8x25L	Hex. Socket Head Bolt			
37	#4x30L	Taper pin			
38	S-94	Gear Bracket			
39	51108	Thrust Bearing			
40	S-121	Spacer			
41	T-39	Lock Nut			
42	S-134	Bearing Bracket			
43	M6x20L	Hex. Socket Head Bolt			
44	6204ZZ	Ball Bearing			

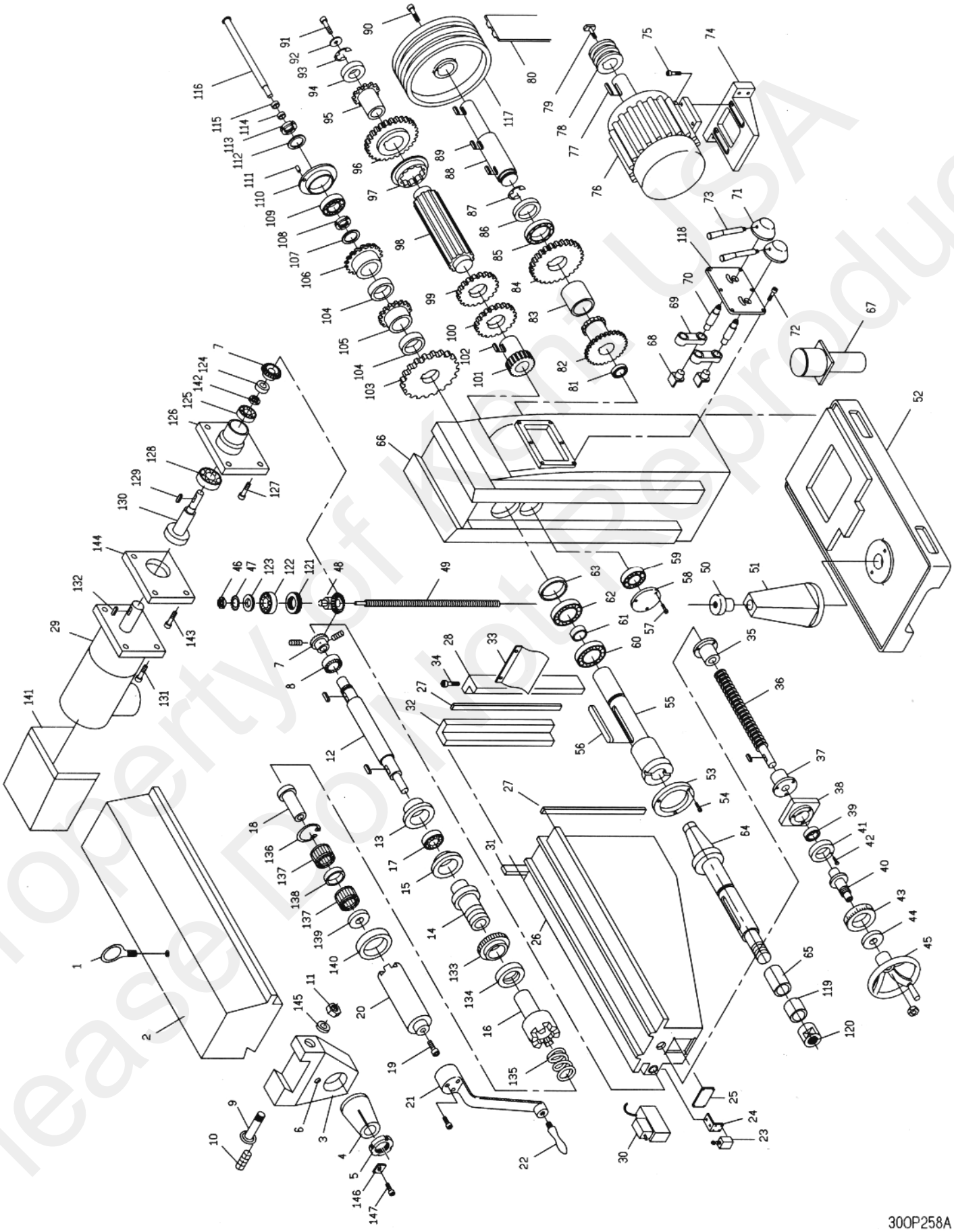
COLUMN KNEE (HU-300)



COLUMN KNEE (HU-300)

S/N	DESCRIPTION	S/N	DESCRIPTION	S/N	DESCRIPTION
1	HOOK	39	SPACER	77	KEY
2	ARM	40	DIAL HOLDER	78	PULLEY
3	ARBOR BRACKET	41	BARING STOP	79	LOCK SCREW
4	BUSH	42	HEX. SOCKET HEAD BOLT	80	BELT
5	SET NUT	43	DIAL RING	81	BALL BEARING
6	OIL LEVEL GAGE	44	DIAL LOCK NUT	82	GEAR
7	BEVEL GEAR	45	HANDLE WHEEL		
8	BALL BEARING	46	NUT		
9	SCREW ROD	47	WASHER		
10	SET SCREW	48	BEVEL GEAR		
11	SET NUT	49	LEED SCREW		
12	SHAFT	50	NUT		
13	BARING SUPPORT	51	LEED SCREW HOUSING		
14	SHAFT	52	BASE		
15	BARING STOP	53	FIXED RING		
16	CLUTCH SHAFT	54	HEX. SOCKET HEAD BOLT		
17	BALL BEARING	55	ORIZONTAL SPINDLE		
18	NEEDLE SHAFT	56	KEY		
19	HEX. SOCKET HEAD BOLT	57	HEX. SOCKET HEAD BOLT		
20	CLUTCH SLEEVE	58	CAP		
21	ELEVATING CRANK	59	BALL BEARING		
22	HANDLE	60	BALL BEARING		
23	LIMITER	61	SPACER		
24	LIMITER SET	62	BALL BEARING		
25	COVER	63	SPACER		
26	KNEE	64	MILLING ARBOR		
27	GIB	65	SPACING COLLARS		
28	GIB HOLDER-R	66	COLUMN		
29	GEAR REDUCER MOTOR	67	COOLANT PUMP		
30	LUBRICATION PUMP	68	SHIFT FORK		
31	GIB	69	ROCKING ARM		
32	GIB HOLDER-L	70	SHAFT		
33	CHIP GUARD	71	HAND BLOCK		
34	ADJUSTING SCREW	72	HEX. SOCKET HEAD BOLT		
35	NUT	73	HANDLE ROD		
36	LEED SCREW	74	MOTOR BRACKET		
37	NUT	75	HEX. SOCKET HEAD BOLT		
38	BARING SUPPORT	76	MOTOR		

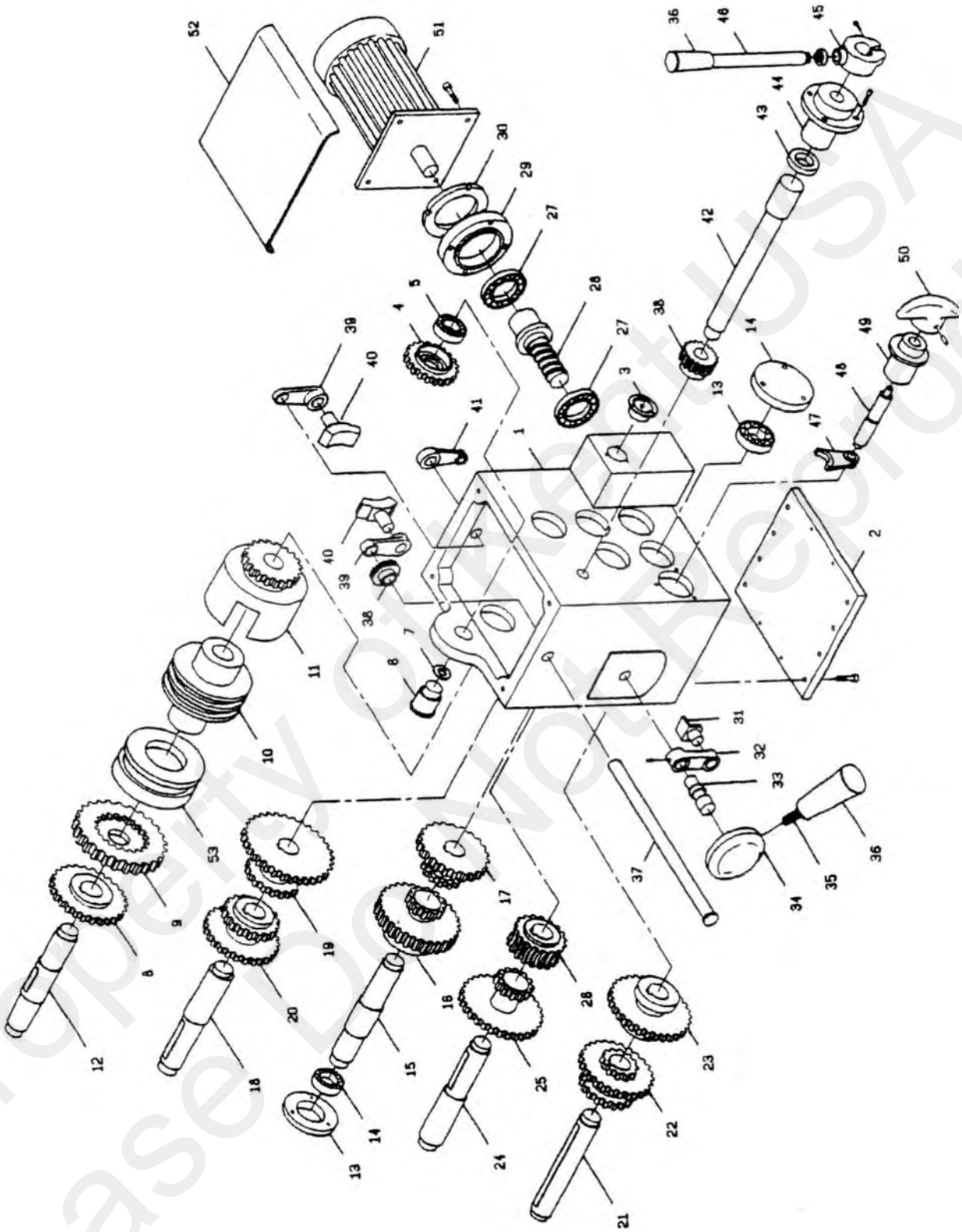
COLUMN KNEE (HU-300)



COLUMN KNEE (HU-300)

S/N	DESCRIPTION	S/N	DESCRIPTION
83	SPACER	120	SET NUT
84	GEAR	121	THRUST BEARING
85	BALL BEARING	122	BALL BEARING
86	SPACER	123	WASHER
87	C-RING	124	WASHER
88	SHAFT	125	BALL BEARING
89	KEY	126	BEARING BRACKET
90	HEX. SOCKET HEAD BOLT	127	HEX. SOCKET HEAD BOLT
91	HEX. SOCKET HEAD BOLT	128	BEARING BRACKET
92	CAP	129	KEY
93	SPACER	130	SHAFT
94	BALL BEARING	131	HEX. SOCKET HEAD BOLT
95	GEAR	132	KEY
96	GEAR	133	DIAL
97	GEAR	134	LOCK NUT
98	GEAR SHAFT	135	SPRING
99	GEAR	136	C-RING
100	GEAR	137	NEEDLE BEARING
101	GEAR	138	SPACER
102	KEY	139	WASHER
103	GEAR	140	COLLAR
104	SPACER	141	COVER
105	GEAR	142	NUT
106	GEAR	143	HEX. SOCKET HEAD BOLT
107	LOCK WASHER	144	SHIM
108	LOCK NUT	145	WASHER
109	BALL BEARING	146	FIX PLATE
110	FLANGE	147	HEX. SOCKET HEAD BOLT
111	HEX. SOCKET HEAD BOLT		
112	LOCK WASHER		
113	LOCK NUT		
114	NUT		
115	WASHER		
116	DRAWBAR		
117	PULLEY		
118	BRACKET		
119	SPACING COLLARS		

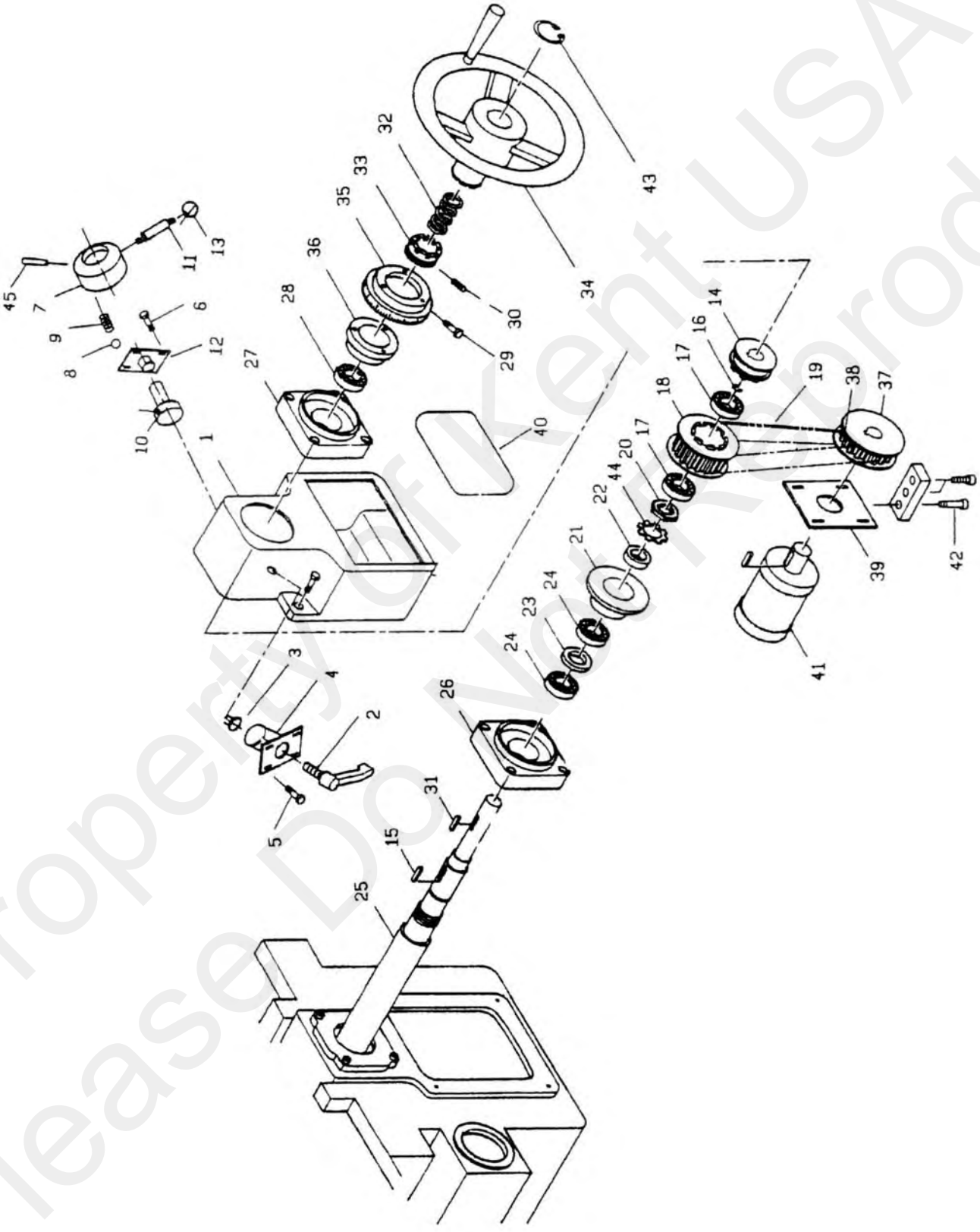
LONGITUDINAL GEAR BOX



LONGITUDINAL GEAR BOX

NO	NEME	NO	NEME
1	Body for Gears	36	Hamdle
2	Cap Plate	37	Axle Lever
3	Cap for Electric	38	Spur Gear
4	Spur Gear	39	Lever Block
5	Bearing	40	Clutch Block
6	Link for Gear	41	Lever Block
7	Washer	42	Nlain Shaft
8	Spur Gear	43	Bushing
9	Gear with Clutch	44	Flange
10	Clutch	45	Hamdle Block
11	Cone with Gear	46	Handle
12	Main Shaft	47	Gears Block
13	Cover Bearing	48	Shaft for Block
14	Bearing	49	Flange
15	Main Shaft	50	Hamdle for Gears
16	Spur Gears	51	Motor
17	Spur Gears	52	Motor Cover
18	Main Shaft	53	Clutch
19	Spur Gears		
20	Spur Gears		
21	Main Shaft		
22	Spur Gears		
23	Spur Gears		
24	Main Shaft		
25	Spur Gears		
26	Worm Gear		
27	Bearing		
28	Motor Axle		
29	Motor Flange		
30	Lock Nut		
31	Black for Gears		
32	Lever Black		
33	Gears Axle		
34	Hamdle Cover		
35	Hamdle Screw		

CROSS FEED (INVERTER MOTOR)



CROSS FEED

NO	NAME	NO	NAME
1	Feed Box	42	Hex.Socket Head Bolt
2	Handle Screw	43	C—Ring
3	Fixed Shaft	44	Lock Washer
4	Fixed Seat	45	Spring Pin
5	Hex.Socket Head Bolt		
6	Hex.Socket Head Bolt		
7	Handle Seat		
8	Stell Ball		
9	Spring		
10	Clutch Shaft		
11	Handle		
12	Fixed Seat		
13	Plastic Ball		
14	Clutch Sleeve		
15	Key		
16	C—Ring		
17	Ball Bearing		
18	Belt Wheel		
19	Belt		
20	Lock Nut		
21	Baring Stop		
22	Spacer		
23	Spacer		
24	Ball Bearing		
25	Ball Screw		
26	Baring Bracket		
27	Baring Bracket		
28	Ball Bearing		
29	Set Screw		
30	Set Screw		
31	Key		
32	Spring		
33	Clutch Sleeve		
34	Handlet Wheel		
35	Dial		
36	Baring Stop		
37	Flange		
38	Belt Wheel		
39	Motor Bracket		
40	Cover		
41	Motor		

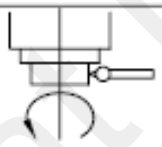
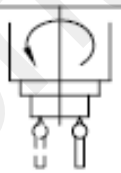
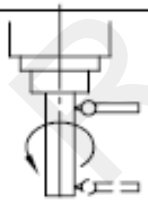
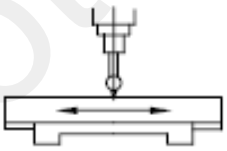
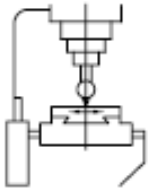
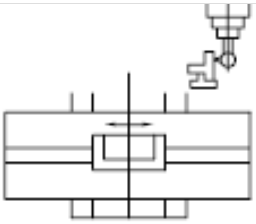
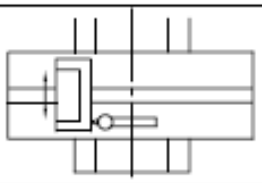
KNEE TYPE VERTICAL HORIZONTAL TURRET MILLING MACHINE

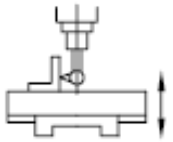
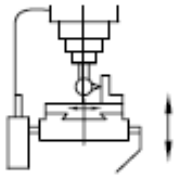
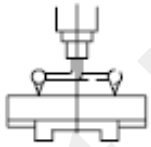
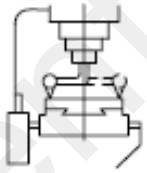
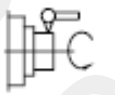
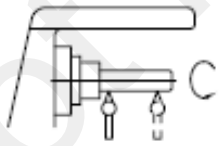
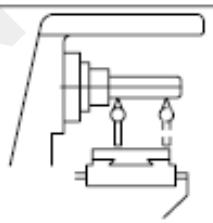
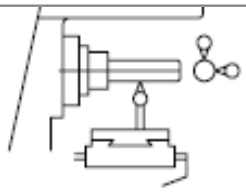
INSPECTION RECORD

Model:_____

Mfg. No:_____

Date:_____

No.	Test to be applied		Fig	Permissible error	Measure value
1	Leveling of work table	In longitudinal direction		0.06/1000	
		In transverse direction		0.06/1000	
2	Runout of spindle	In radial direction		0.01	
3	Longitudinal movement of spindle nose	In axial direction		0.015	
4	Runout of internal taper	Nearest to spindle nose		0.01	
		At a distance of 300mm		0.02	
5	Surface of work table parallel with its jongitudinal movement			0.03	
6	Surface of work table parallel with its transverse movement			0.02/300	
7	Center T-slot parallel with longitudinal table movement			0.03	
8	Center T-slot parallel with longitudinal table movement			0.02/300	

No.	Test to be applied		Fig	Permissible error	Measure value
9	Column ways for knee square with work table	Lateral incline towards front and rear side		0.02/300	
		Incline towardsfrontand rear side. respectively		0.02/300	
10	Work table square with cutter spindle in plane	Through longitudinal axis(table rising towards the front side only)		0.02/300	
		Perpendicular to that through longitudinal axis		0.02/300	
11	Runout of spindle	In radial direction		0.01	
12	Icngitudinal movement of spindle nose	In axial direction		0.015	
13	Cutter spindle: Internal taper runs out of truth (use testing bar)	Nearest to the spindle nose		0.01	
		At distance of 300mm		0.02	
14	Work table parallel with Cutter spindle	Table rising otwards front side		0.02/300	
15	Transverse movement of table parallel with cutter spindle	In vertical plane		0.02/200	
		In horizcntal plane		0.02/300	

DIRECTOR	INSPECTOR	APPROVED BY