

# ***OPERATOR'S MANUAL***

***VH-25***

***CE***

2180-7713-102

edition : A04

2022.01.05

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# MODIFICATION RECORDS

DATE	PAGE	ORIGINAL	MODIFIED	ED	MEMO
2010.6.7 2022.1.5	44		FIG 54 整理規格 排版	A02 A04	

# **1.FORWORD**

VH-25 OF MILLING MACHINES are designed and manufactured to meet the demands by most of our customers.

All parts and materials have been placed under strict quality control to ensure the machine quality superiority and permanent service life.

This manual shall give a detailed account of the structure, mechanism, methods of operation, maintenance, etc. of VH-25 Millers. For permanent hi-precision and maximum efficiency of each and every machine, the operators, maintenance and repair personnel are requested to study this manual thoroughly and follow the specific instructions in operations and maintenance exactly.

## **2.Safety Rules and Regulations**

- (1) Wearing of loose clothes by operators is not allowed.
- (2) Operators shall wear the goggles and safety boots.
- (3) Do not allow the body to get too close to the machine while it is in revolution.
- (4) Cautions must be exercised in machine handling in reference to the specific details in this manual.

## **3.Capacity:**

- (1) Vertical units :
  - 1、 Drilling : Front and oblique, drillings.
  - 2、 Boring : Front and oblique borings by cutters installed.
  - 3、 Molding : Processing of irregular curves and mold removing angles.
  - 4、 Polishing : Surface polish on metallic parts.
  - 5、 Milling : Face, oblique, end, side millings, etc.
- (2) Vertical- Horizontal Units :
  - 1、 Same as vertical units from ( 1 ) to ( 5 ).
  - 2、 Cross Milling : Plain milling, slab milling, side milling, gaug milling, cutting off, etc.

## ***4. Specifications of VH-25 of Milling Machine:***

**STANDARD SPECIFICATIONS :**

MODEL		
Work table		
Working Surface		1300x260mm
Longitudinal travel		800mm
Cross travel		450mm
Vertical travel ( knee )		435mm
Longitudinal feeds		22-690/min
Longitudinal rapid traverse		2100/min
Vertical fdde ( knee )		800/min
Motor		
Vertical spindle		3HP 4P
Horizontal spindle		5HP 4P
Longitudinal feed		1/,1/2HP 4/8P
Vertical feed		1.5HP 6P
Collant pump		1/8HP
Weight		1760kg
Vertical main spindle		
Spindle speeds Variable	50HZ	50-3750rpm
	60HZ	60-4500rpm
Spindle taper		NST #40
Quill travel		127mm
Vertical feeds (per revolution of spindle)		0.04 0.08 0.14
Head swivel	(R&L) 90°, (F&B) 45°	(R&L) 90°
Overarm travel		470mm
Overarm swivel		360°
Spindle nose to table		115-565mm
Spindle centerline to column surface		
Horizontal main spindle		
Spindle speeds	50HZ	45,80,165,260,500,980
	60HZ	55,100,200,315,600,1180
Spindle taper		NST #40
Spindle centerline to table surface		0-440mm
Spindle centerline to overarm underside		146mm
Spindle nose to column surface		24mm

# 5. Machine Body

## A. Names Of Machine Parts :

- a. Machine Body, Turret, Ram And Bracket :

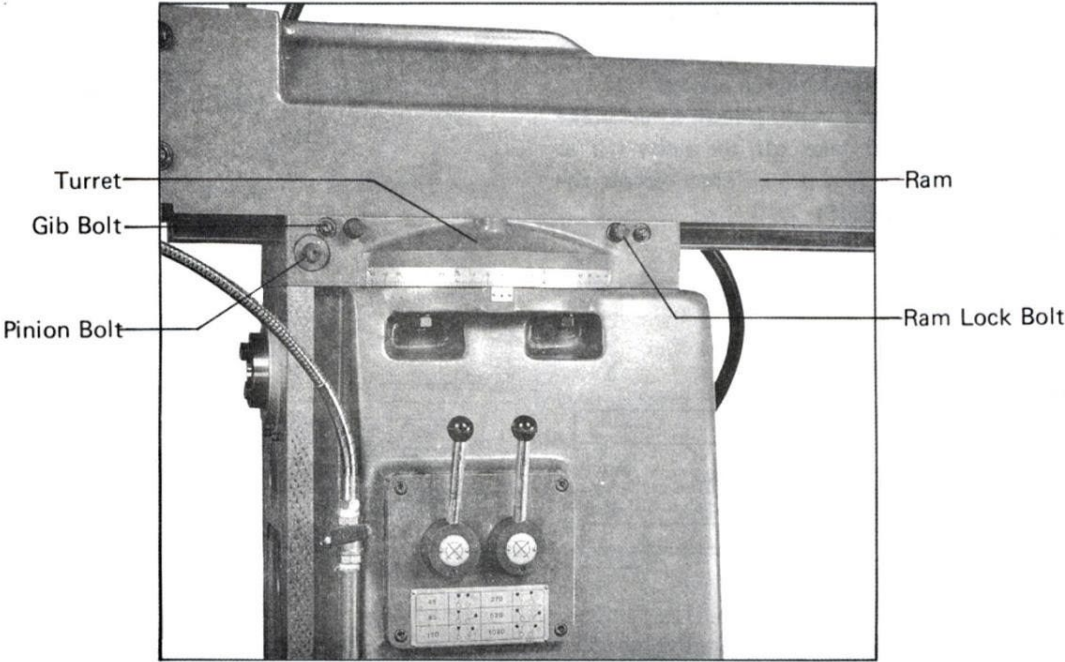


Fig.1

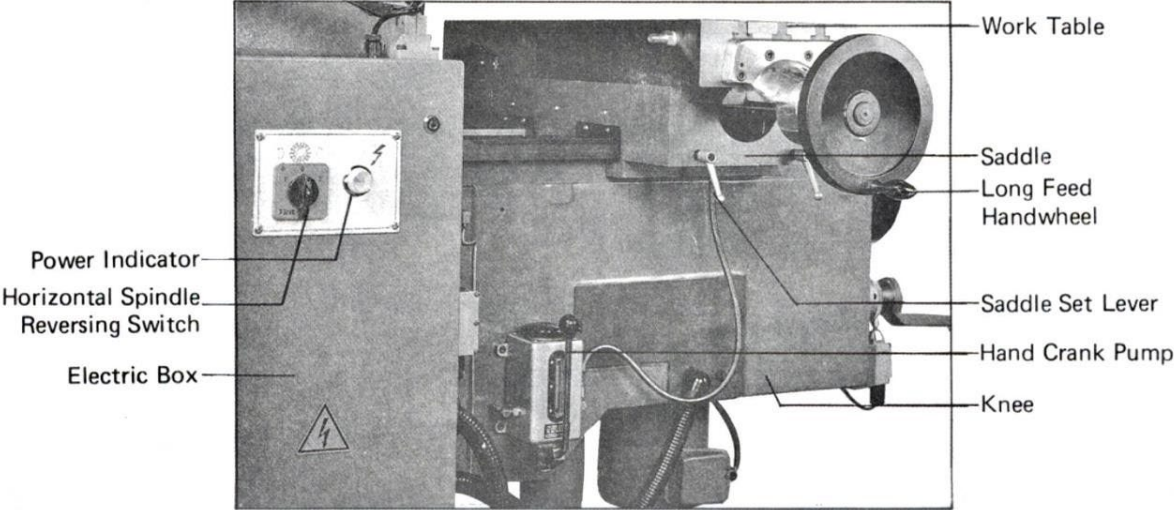


Fig.2

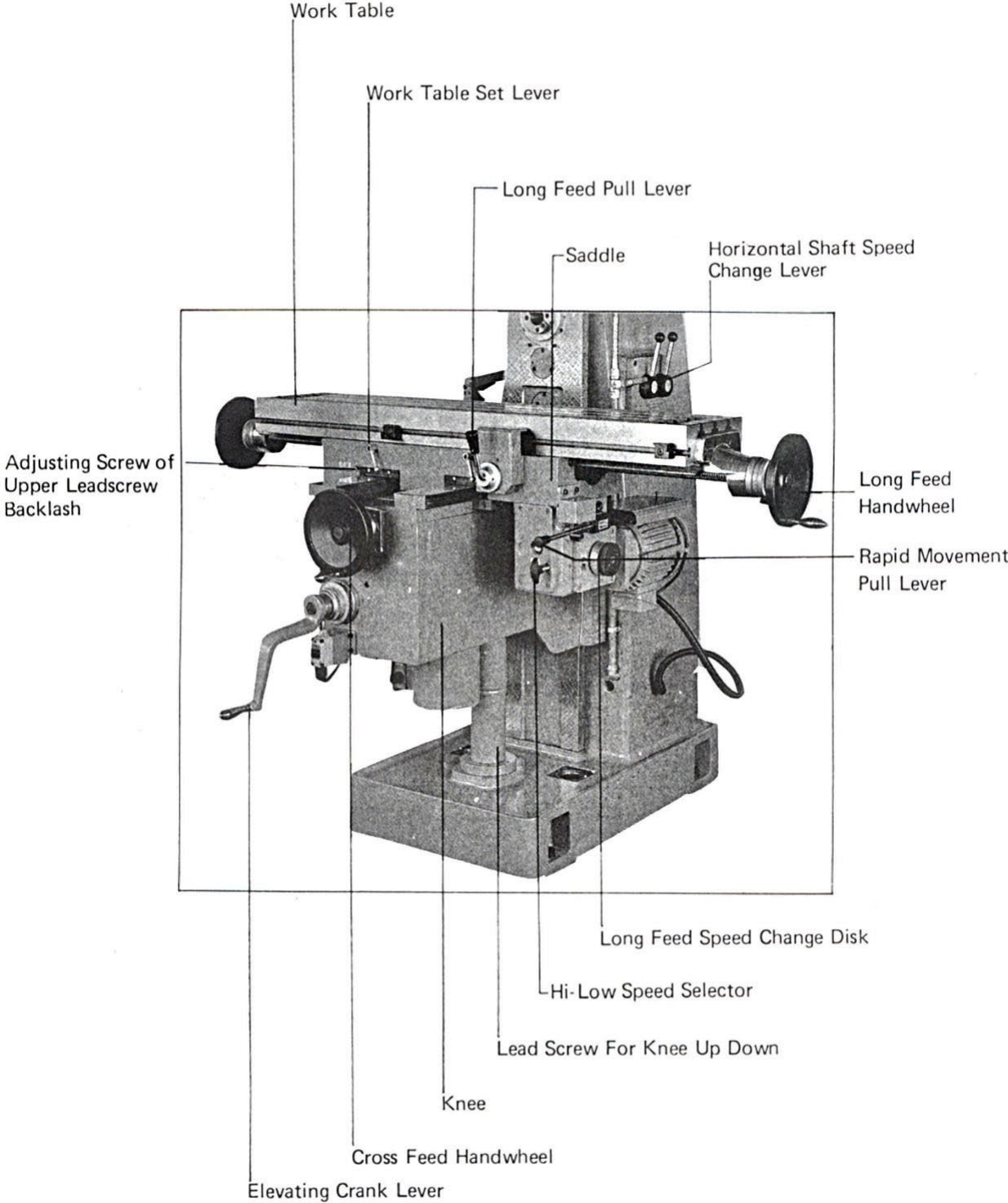


Fig.3



**B、 Machine Lubrication :**

- a. Horizontal spindle, spindle bearing, and horizontal milling cutter arbor sleeve :  
 Lubrication of horizontal spindle drive gear and gear housing is of dipping and aplashing.  
 The horizontal spindle bearing lubrication adopts the forced automatic one.  
 The milling cutter arbor sleeve is lubricated by oil dripping.  
 Table gib surface and feed leadscrew are lubricated by the central forced type.

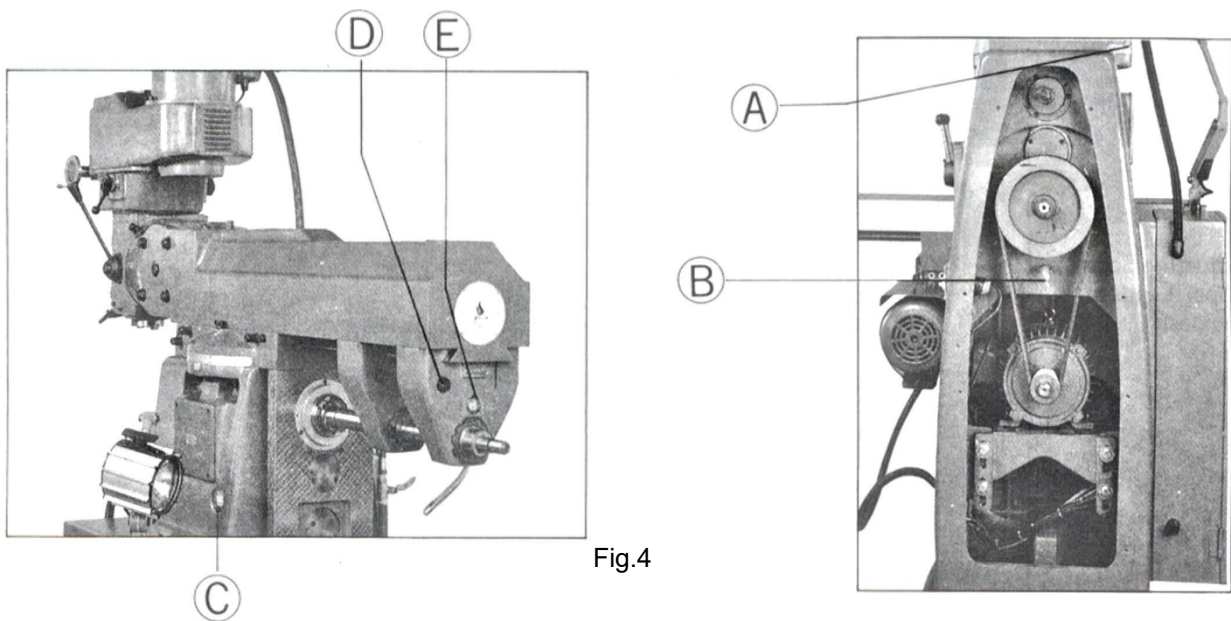
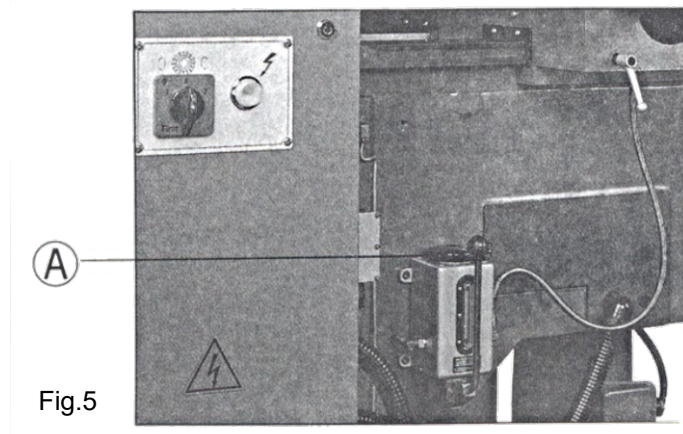


Fig.4

Position	Lubricated Parts	Lubricant	Frequency	Q'ty
( A ) Inlet ( B ) Outlet	Horizontal Spindle, Drive Gear & Taper Roller Bearings	KUO KUANG R-68 ESSO FBIS K53 DTE 26 GULF WAY HARMONY	First oil change at 3 months after installation. Than, every other 6 months	Filled up to between H-L in oil window (C)
( D ) Inlet	Horizontal Milling cutter Arbor sleeve	KUO KUANG R-68 GULF WAY GREASE NO.2 SHELL TONNA 33 ESSO FBIS K-53	Check oil lever through ( E ) ewwklly	

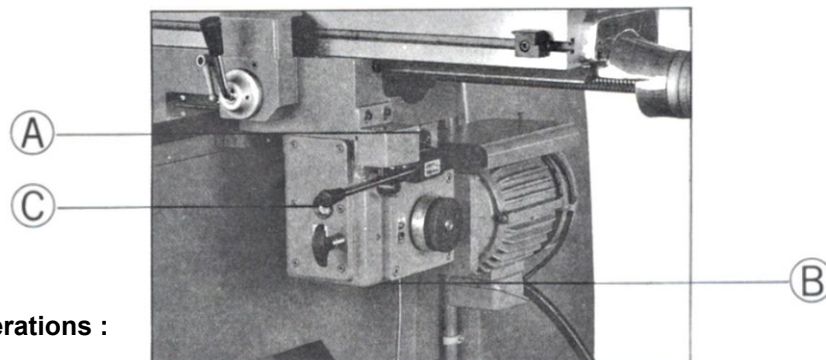
b. Lubrication of sliding surfaces of work table, saddle, base and gib :

Position	Lubricated Parts	Lubricant	Frequency	Q'ty
( A ) Inlet	Sliding surface of work table, saddle, Base Gib and feed leadscrews	KUO KUANG R-68 ESSO FBIS K53 VACTRA 2 GULF WAY 52 SHELL TONNA 33	3-5 times daily by pulling 3 times each	Filled up to upper level



c. Gear Housing Lubrication

Position	Lubricated Parts	Lubricant	Frequency	Q'ty
( A ) Inlet ( B ) Outlet	Gears Inside Gear Housing	KUO KUANG R-68 GULF WAY 52 VACTRA 2 ESSO FBIS K53 SHELL TONNA 33 HEAVY MEDIUM	First oil change at 3 months after installation Then, every other 6 months	Filled up to between H-L in oil window (C) (1/2 height)



**C、 Operations :**

1. Cautions prior to operations :

- a. Check and see if the motor voltage is conformed to that of the power source.
- b. Check and see if the power indicator lamp ( B ) is light the electric box is connected with the power source.
- c. Check and see if the motor turning direction of vertical spindle, horizontal spindle and gear housing is correct. If the gear housing motor is not turning correctly, then the longitudinal rapid feed will become impossible.

2. Electric Switches :

- a. Horizontal Reversing Switch ( A ) :

Turning of horizontal spindle shall be in the direction as symbol.

- b. Control Switches :

As shown in the figure, from left to right the switches are for vertical milling, horizontal milling, automatic cross table feed cooling system, and for ON, for OFF.when ( M ) is pushed down, its indicator lamp will beam. ( N ) button is the main control switch OFF.

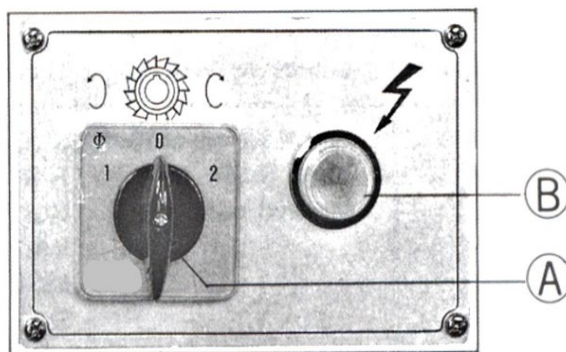


Fig.7

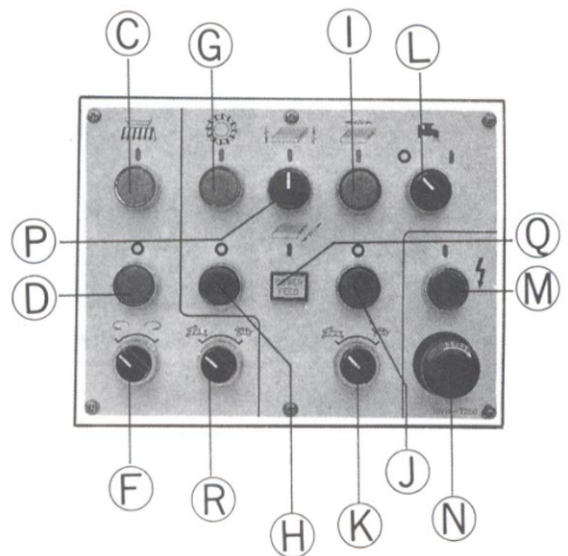


Fig.8

- ( C ) Vertical spindle power ON switch
- ( D ) Vertical spindle power OFF switch
- ( F ) Vertical Spindle Cw. Ccw Select Switch
- ( G ) Horizontal Spindle Power On Switch
- ( H ) Horizontal spindle power off switch
- ( I ) Table power feed power ON switch
- ( J ) Table power feed power OFF switch
- ( K ) Table power feed Hi/Low select switch
- ( L ) Cooling select switch
- ( M ) Electric source ON / OFF switch
- ( N ) Emergency stop switch
- ( O ) Jog Switch ( Figure 9 )

When change the speed gear of horizontal, push the jog button ( O ) for instant turning to engage the gear smoothly.

- ( P ) Table Power Feed Up-Down Switch
- ( Q ) Table power feed cross way switch ( OPTION )
- ( R ) Verical spindle Hi / Low speed select switch ( OPTION )

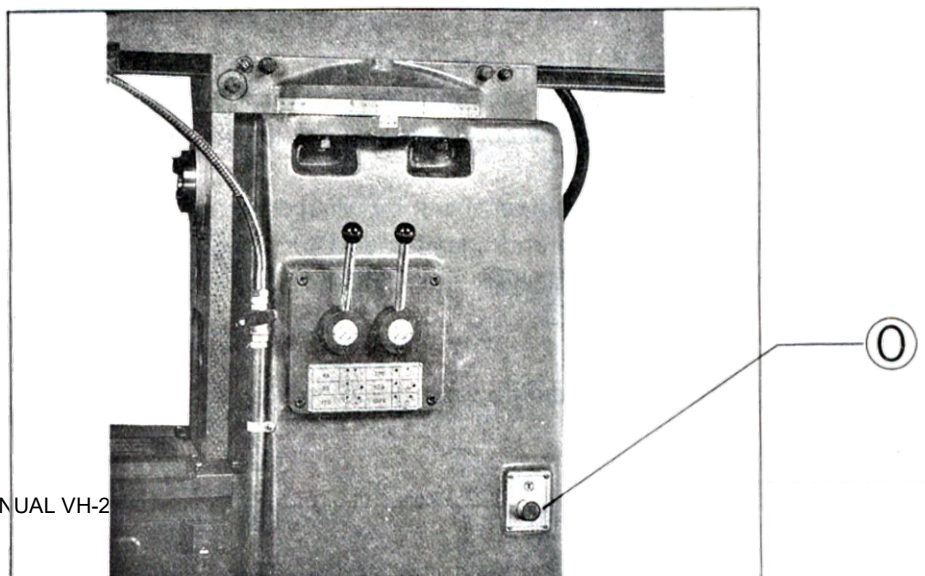


Fig.9

3. Movement and turning of ram:

Ram Movement :

- a. Loosen the two ram set bolts ( A&B )
- b. Turn the crank lever to move the pinion bolt ( C ) for the desired position of ram.
- c. Lock the end set bolt ( B ) at the rear end of ram before setting the lock bolt ( A ) at the front end.

Ram Swivelling :

- a. Use an open mouth spanner to loosen the four bolts ( E ) .
- b. Push the ram manually and turn it to the desired position before locking the nuts again ( E ) .

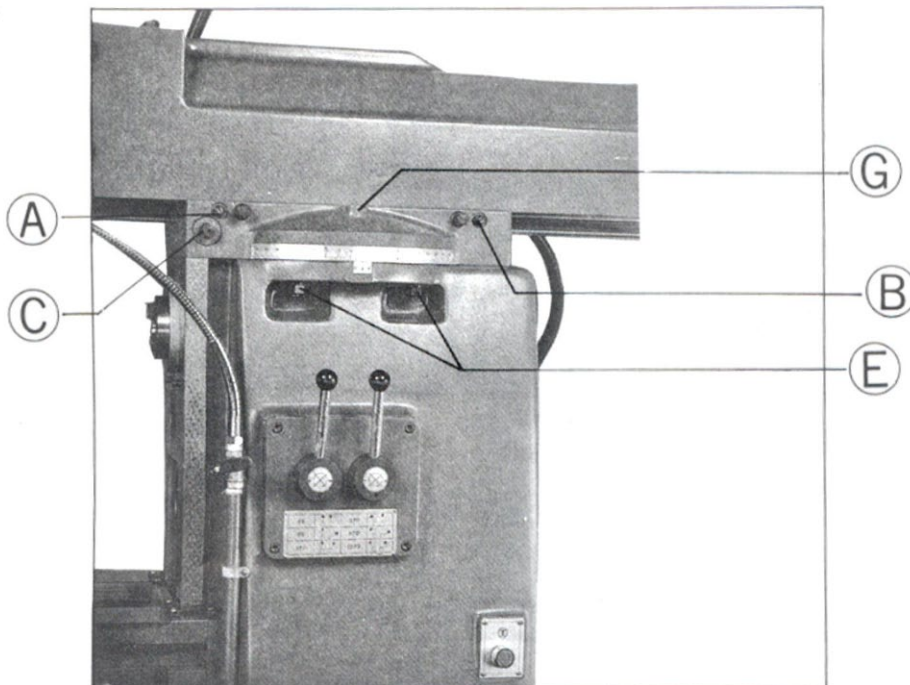


Fig.10

4. Conversion from vertical to horizontal milling :
  - a. Use an open-mouth spanner to loosen the four nuts ( E ) .
  - b. Push the ram manually and the turret by 180 degrees until the zero position aligned at the marking. Then, insert the taper pin ( G ) to secure the positioning. Lock up the four lock nuts ( E ) .
  - c. Install the cutter shank arbor ( F ) and lock the upper taper shank by using draw bar ( H ) .
  - d. Insert the separating sleeve into the proper position and install the cutter shank arbor bracket ( I<sub>1</sub> ) .Then, repeat it for ( I<sub>2</sub> ) .insert the remaining sleeves. Lock the nut ( J ) .
  - e. Lock tightly the upper nut ( K ) .

Note: Reverse the steps in the conversion from horizontal to vertical milling.

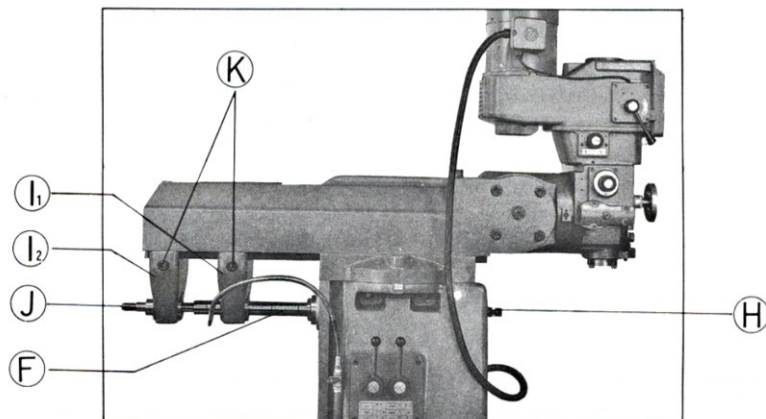


Fig.11

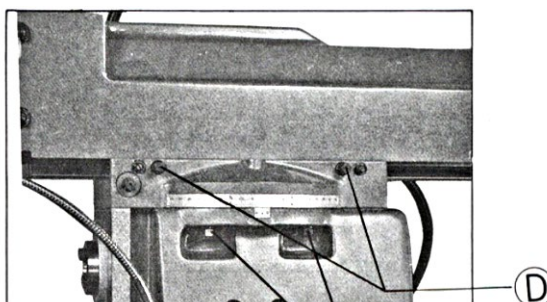


Fig.12

5. Speed change of horizontal spindle

- a. By means of speed selector ( A ) , The six speed horizontal spindle may turn from 45 to 980 rpm ( 50Hz ) or 55 to 1, 180 rpm ( 60Hz ) .
- b. Whenever the gear shifting is handicaped, push the jog button ( O ) for instant turning of horizontal spindle to engage the gears easily.

Note: Speed change is not allowed when the machine is running.

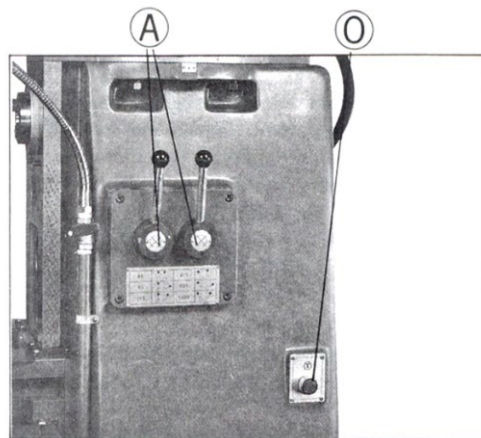


Fig.13

6. Zero position of dial ring of table feed:

- a. Loosen the nut ( bolt ) ( A ) of dial ring.
- b. Turn the dial ring ( B ) to zero position.
- c. Lock the nut ( bolt ) ( A ) of dial ring.

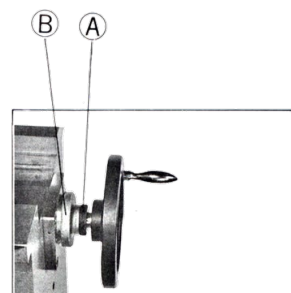
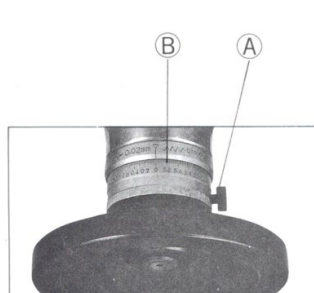


Fig.14

Fig.15

7. Setting of sliding surfaces of work table, saddle, base and gib.
8. All non-feed sliding surfaces shall be secured and set to prevent slipping and increase machine body's rigidity. The sliding surface setting levers are clockwise for setting and counterclockwise for release.
9. Automatic Long Table Feed:
  - a. Loosen the upper base setting lever ( A ) .
  - b. Pull or push the hi-low speed selector ( B ) .
  - c. Turn the speed change disk ( C ) to the position of desirous feed rate.
  - d. Push down the control switch of feed start. Before push ( I ) down, make certain the ( M ) is pushed down to let ( M ) indicator lamp beam.
  - e. Operate the long feed lever ( D ) in the direction as arrowed.
  - f. For rapid table movement pull lever ( E ) upward. However, the operator must know the direction of movement first so as to avoid the impact of cutter tool and workpiece.
  - g. For manual long feed, the pull lever ( D ) must be positioned in the middle.
  - h. In stop motion, push down the button.
  - i. Selection of Hi/Low button can be made in table feed to obtain the speed rate needed.

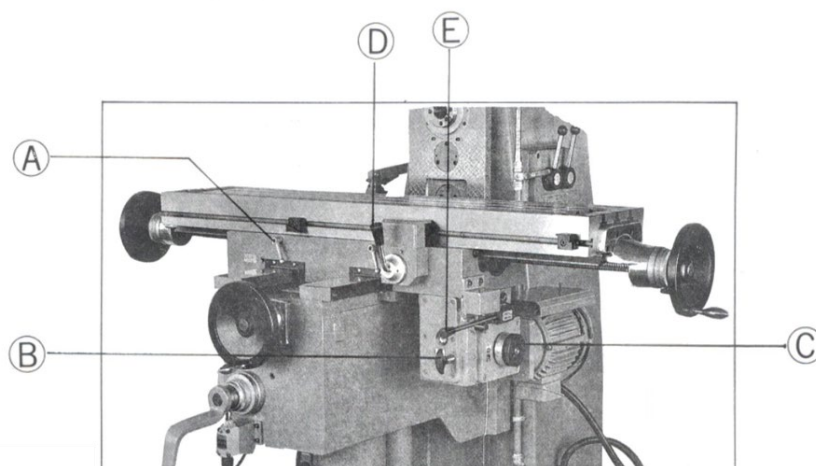




Fig.16

10. Replacement of v-belt of horizontal spindle:

- a. Disconnect the power source.
- b. Take off the two rear cover of machine body.
- c. Loosen the four hexagonal bolts ( A ) on the motor mount.
- d. Take out V-belt ( B ).
- e. Assemble the components in the reverse order once the V-belt is replaced.

Note:

1. Upon installation of V-belts, each one of them shall keep an even and proper tension.
2. Replacements of V-belt shell conform to our company specifications.

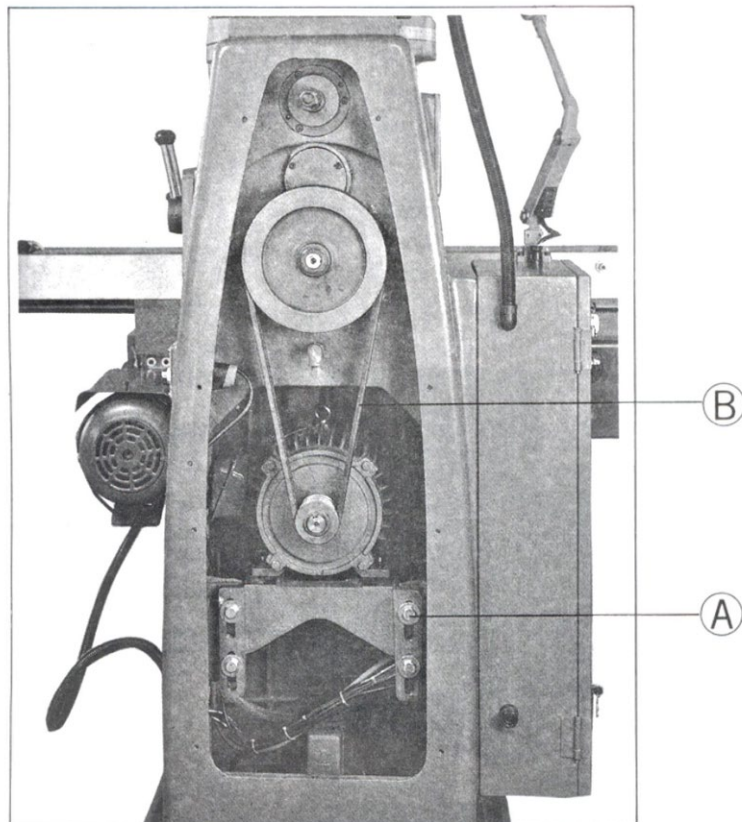


Fig.17

## D、 Adjustment

### 1. Steps in Backlash Adjustment of Upper Leadscrews:

- a. Use an L-shape hexagonal spanner and perform the micro adjustment on adjusting screw ( B ) as arrowed on the plate. Meanwhile, turn the Long feed handwheel slightly until a slight resistance is sensed. There is no backlash now between the headscrew and its nut.
- b. If the adjustment is too tight, both the leadscrew and its nut will be worn out excessively and their service life will be shortened.
- c. Once the adjustments is completed, try the manual feed to see if the sliding is smooth or not.
- d. Each turn of adjusting screw may reduce the backlash by 0.034mm( 0.0013" ).

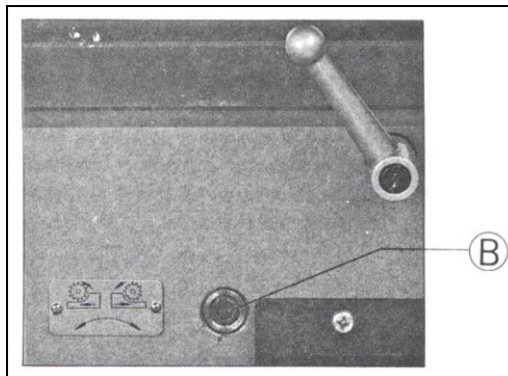


Fig.18

### 2. Adjustment of Play Between Gibs :

As a result of long-term operation between the sliding surface and gibs, the worn-out gibs will create a clearance. Therefore, the gibs must be adjusted to maintain the precision of sliding surfaces.

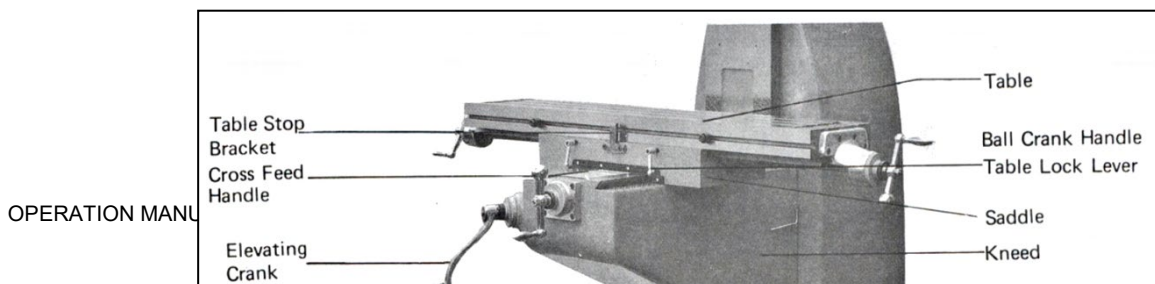


Fig.19

3. Adjustment of work table gib:

Work table gib ( C ) is attached between saddle and work table dovetail.

- a. Loosen the setting lever ( A ).
- b. Clean the slideway and add the lubricant.
- c. Use a screwdriver to adjust the big bolts ( B ) on left and right sides of the saddle.
- d. Method of Adjustment: If the Long feed handwheel is felt too loose by turning, loosen the adjusting bolt on the right side of the saddle a little bit. Then, lock up the adjusting bolt on the left side before turning the handwheel again. If the handwheel is too tight, just reverse the steps repeatedly until the work table sliding is satisfactory smooth.
- e. Replace the excessive worn-out gibs whenever it is necessary.

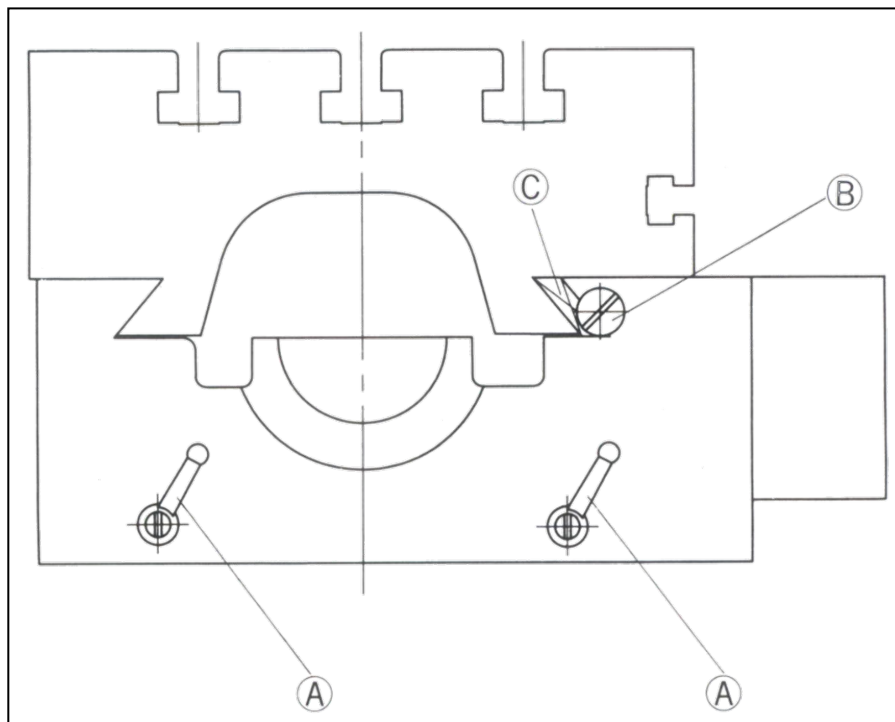


Fig.20

4. Saddle gib is attached to the position between the right side of saddle and the base dovetail.
  - a. Loosen the saddle lock lever .
  - b. Move the saddle to the front part of the knee.
  - c. Take off the front and rear wiper holders ( F ) of saddles.
  - d. Clean the slideway and add the lubricant.
  - e. Use a screw driver to adjust the gib bolts ( E ) in the right front and rear parts of the saddle.
  - f. Employ the same methods to adjust the work table gib.
  - g. Lock up the wiper holders ( F ) on the saddle.

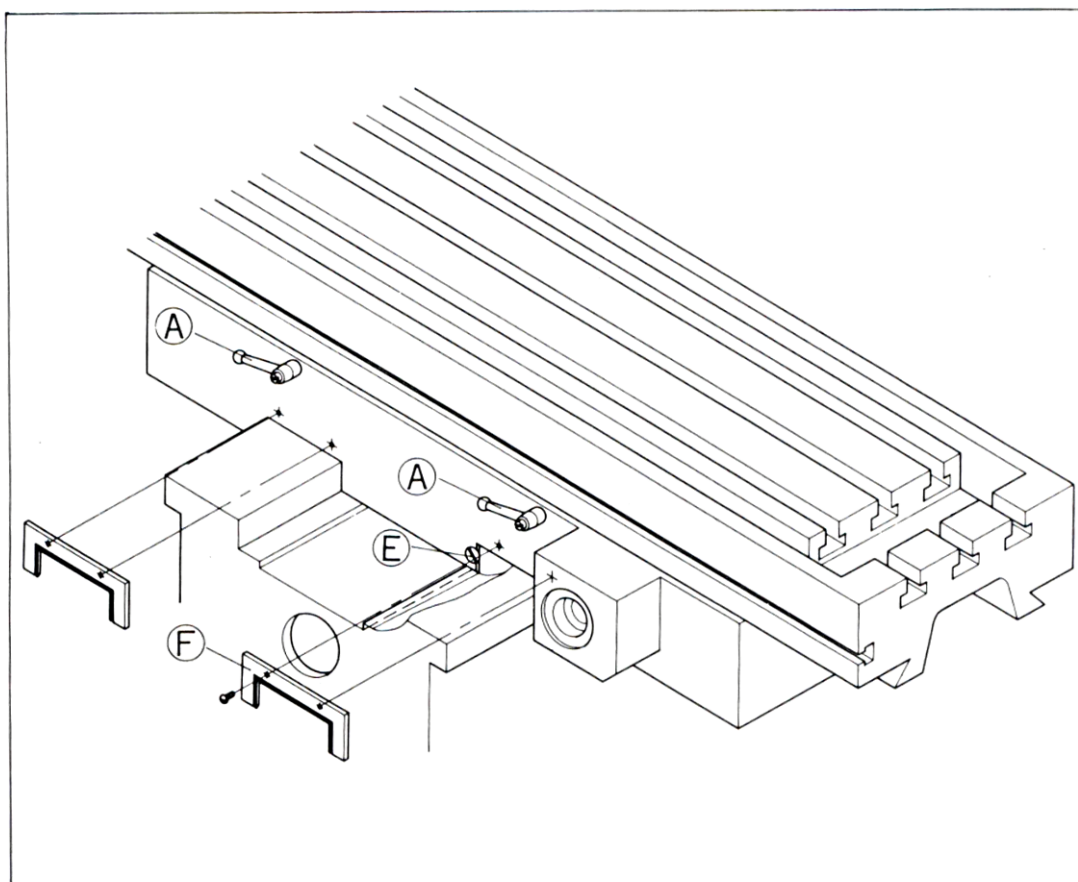


Fig.21

5. Adjustment of knee gib on machine body:

Saddle gib is attached to the position between the side of saddle and the base slide way.

- a. Loosen the lock belt ( A ) by using hexagonal spanner.
- b. Take off the wiper holder ( B ).
- c. Clean the slideway and add the lubricant.
- d. Move the knee to the highest position.
- e. Use a screw driver to adjust the bolts ( C ) in the left upward and bottom parts of the knee.
- f. Employ the same methods to adjust the work table gib.
- g. Restore and lock up the wiper holder ( B ).

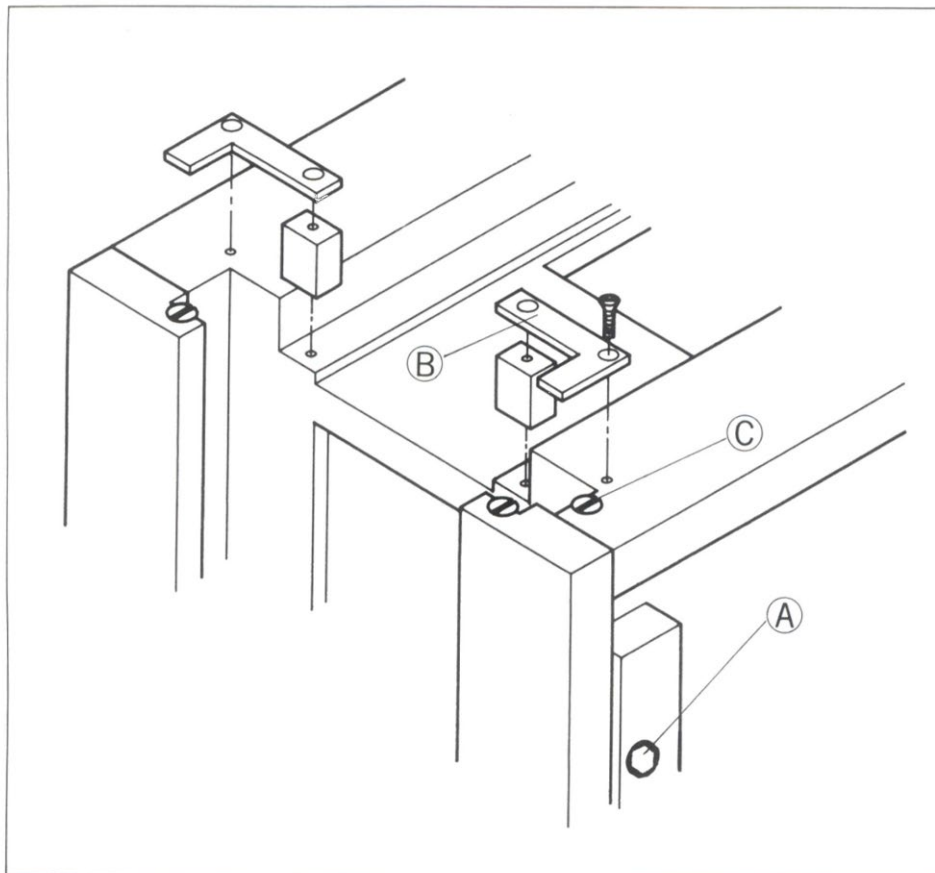


FIG.22

6. Adjustment of Ram Gib:

Ram gib is attached to the position between the ram and the turret dovetail. Tightness of ram can be adjusted properly by gib bolts.

- a. Loosen the ram lock bolts ( A ).
- b. Clean the slideway and add the lubricant.
- c. Loosen the nuts on gib bolts ( B ).
- d. Use a screw dricer to adjust the gib bolts until the ram sides smoothly.
- e. Lock up the nuts.

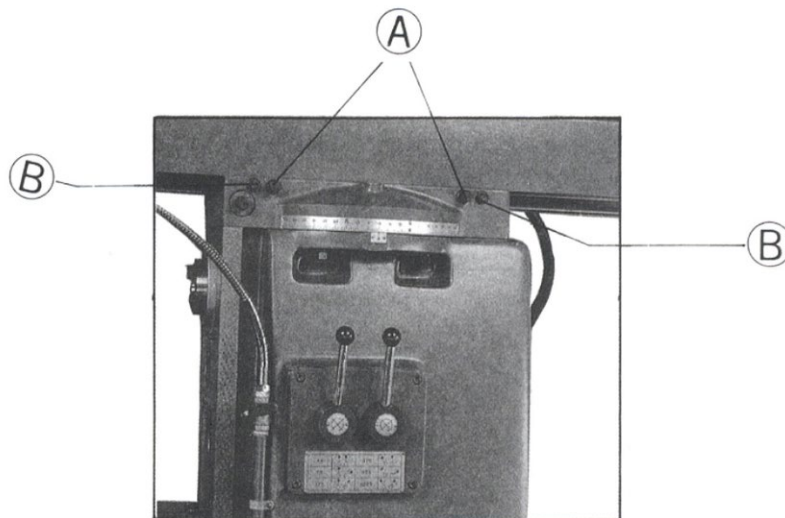


Fig.23

## ***6. Transport, Unpacking and Floor Space***

### **A. Methods of Transport:**

#### 1. Methods of Transport:

- a. Prior of packed transport may be made by using forklift ( Figure 24 ) and a reinforced cable ( Figure 26 ).
- b. After unpacking, transport may be made by hoisting with a reinforced cable ( Figure 25 ) and the forklift eye bolt ( Figure 27 ).

#### **Remarks:**

1. When the machine is being hoisted, keep the personnel afar.
2. Hoisting by eye bolt should be used as less as possible.
3. To hoist the unpacked case by reinforced cable, the motion shall observe strictly the instructions appeared on side of the wooden case.
4. Keep the work table and saddle in the proper positions so as to keep the machine balance.
5. Do not hoist the machine too high. The best position is to keep the machine base approximately 10 cm from the ground.
6. Do not allow the machine to wobble in hoisting.
7. Only an authorized forklift or crane operator is allowed to transport the machine.





Fig.24

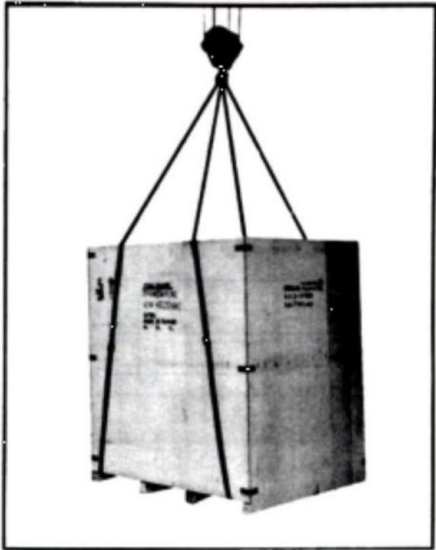


Fig.25

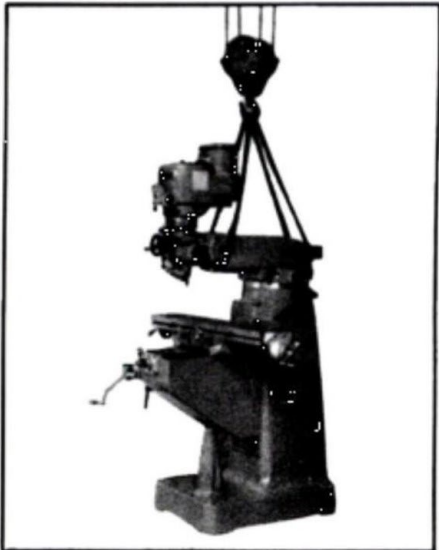


Fig.26



Fig.27

### **B、 Cautions for Unpacking:**

- 1、 To transport the machine, it is necessary to support the machine with the crated case or pallet to avoid the damages. In case of damages, please contact our agent or the transporter.
- 2、 After unpacking, check and see if all tools and accessories are intact without shortage, otherwise, please contact our agent.
- 3、 Restore the headstock to its normal position after unpacking.
- 4、 After unpacking, do not move the guard rail sliding surfaces and work table as long as the rustproof oil on them are not cleaned off and followed with the lubrication.
- 5、 Before the cleaning starts, the sliding protective pieces must be dismantled, and all guard rail sliding surface setting levers, loosened. When the rustproof oil is removed, proper amount of lubricant should be injected onto various sliding surfaces. Hen move the sliding surfaces for final cleansing and lubrication.
- 6、 Do not remove the oil brushes in the process of cleaning.
- 7、 Do not use gasoline or any other inflammable oil cleanser.

### **C、 Floor Space**

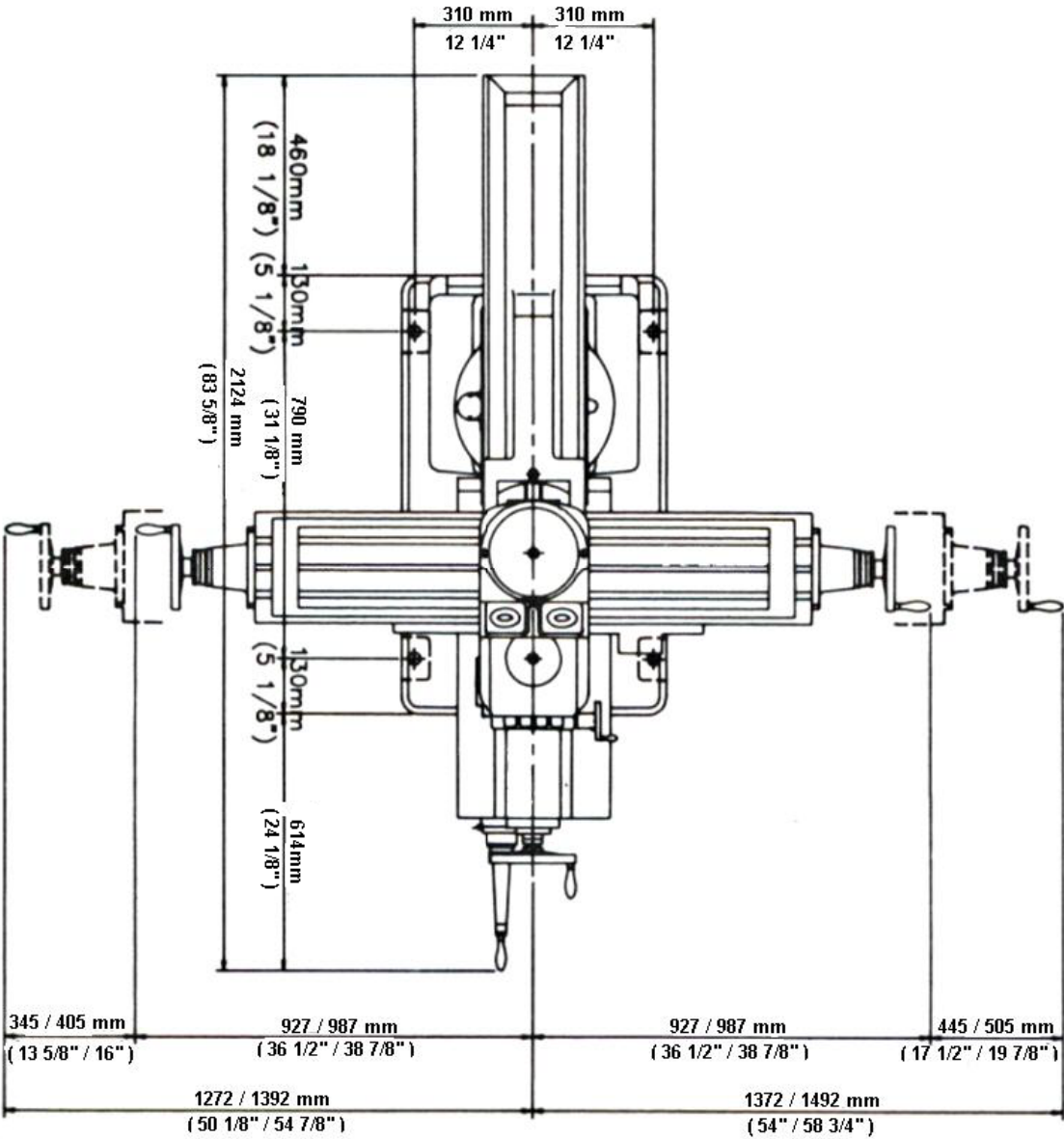


Fig.28

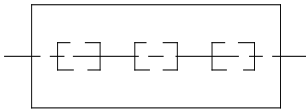
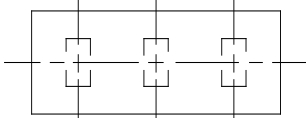
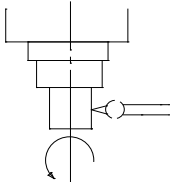
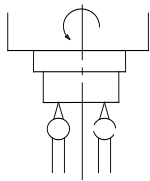

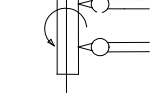
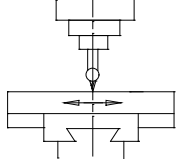
## 7. Precision Alignment:

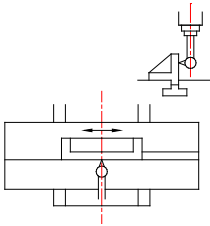
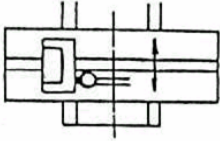
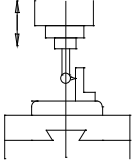
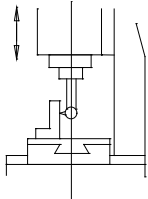
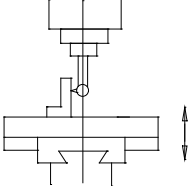
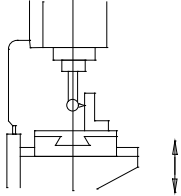
Precision of a machine dominates the processing quality. To produce the quality workpiece, Precision of each and every components is a matter of vital importance. In order to maintain the primary machine precision following a long term operation, regular precision alignment is indispensable to the upgrading

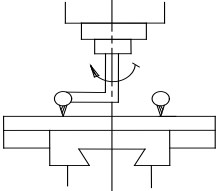
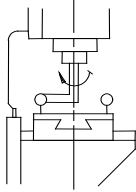
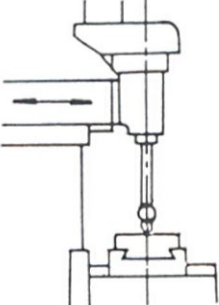
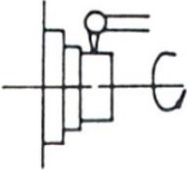
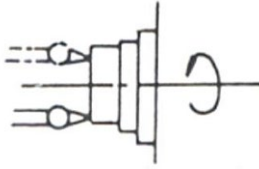
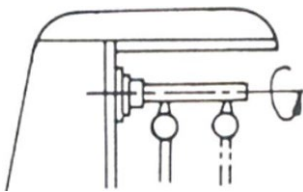
of work quality. Beside, it may extend the machine service life. For details of components to be aligned and precision requirements, please refer to the table of precision Inspection.

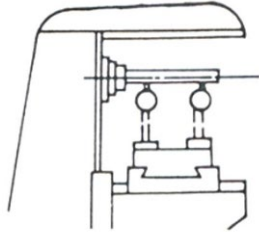
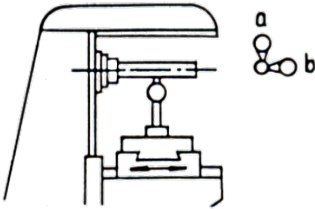
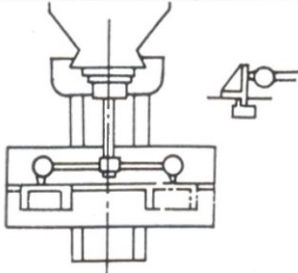
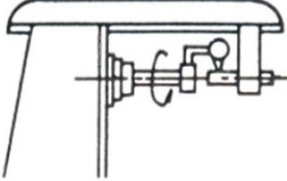
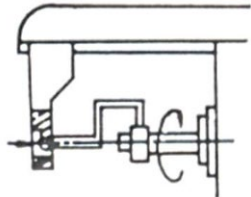
**ACCURACY INSPECTION**

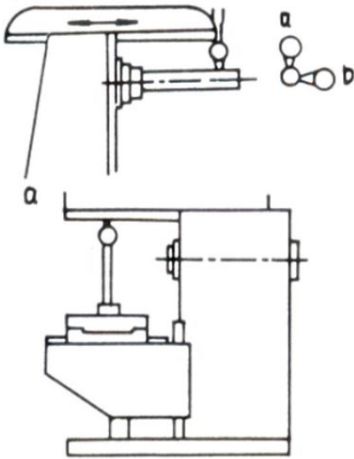
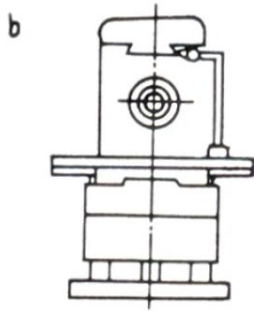
**Ut<sub>im</sub>:mm**

NO.	INSPECTION ITEMS	ILLUSTRATUION	TOLERANCE mm	Measured mm
1	PLANT OF SURFACE EVEN LEVEL		0.06/m	
	LONGITUDINAL DIRECTION CROSS DIRECTION		0.06/m	
2	VERTICAL SPINDLE NOSE RUN OUT		0.01	
3	VERTICAL SPINDLE FACE TURE		0.015	
4	VERTICAL SPINDLE HOLE RUN OUT		0.01	
	AT FACE OF SPINDLE AT END OF 300mm TEST BAR		0.02	
5	PARALLELISM OF LONGITUDINAL MOVE MENT OF TABLE WITH IT'S TOP		0.03	

NO.	INSPECTION ITEMS	ILLUSTRATUION	TOLERANCE mm	Measured mm
6	PARALLELISM OF CROSS MOVEMENT OF TABLE WITH IT'S SURFACE		0.02/300	
7	PARALLELISM OF LONGITUDINAL MOVEMENT OF TABLE WITH MIDDLE T-SLOT		0.03	
8	SQUARENESS OF CROSS MOVE MENT OF TABLE WITH MIDDLE T-SLOT		0.02/300	
9	SQUARENESS OF VERTICAL MOVEMENT OF SPINDLE HEAD WITH TABLE SURFACE		0.025/300	
	LONGITUDINAL DIRECTION  CROSS DIRECTION (HIGH AT FRONT OF TABLE)		0.025/300	
10	SQUARENESS OF TABLE SURFACE WITH VERTICAL MOVEMENT OF KNEE		0.02/300	
	LONGITUDINAL DIRECTION  CROSS DIRECTION (HIGH AT FRONT OF TABLE)		0.02/300	

NO.	INSPECTION ITEMS	ILLUSTRATION	TOLERANCE mm	Measured mm
11	SQUARENESS OF TABLE TOP WITH VERTICAL SPINDLE LONGITUDINAL DIRECTION		0.02/300	
	CROSS DIRECTION (HIGH AT FRONT OF TABLE)		0.02/300	
12	OVERARM SLIDE PARALLELISM OF CROSS MOVEMENT WITH TABLE TOP		0.02	
13	HORIZONTAL SPINDLE FACE RUN OUT		0.01	
14	HORIZONTAL SPINDLE FACE TRUE		0.015	
15	HORIZONTAL SPINDLE HOLE RUN OUT AT FACE OF SPINDLE		0.01	
	AT END OF 300mm TEST BAR		0.02	

NO.	INSPECTION ITEMS	ILLUSTRATION	TOLERANCE mm	Measured mm
16	PARALLELISM OF TABLE TOP WITH HORIZONTAL SPINDLE  (HIGH AT FRONT OF TABLE)		0.01	
			0.02	
17	TABLE TOP PARALLELISM OF CROSS MOVEMENT WITH HORIZONTAL SPINDLE  IN VERTICAL IN HORIZONTAL		0.02/300	
			0.02/300	
18	SQUARENESS OF MIDDLE T-SLOT WITH HORIZONTAL SPINDLE		0.02/300	
19	TOLERANCE BETWEEN HORIZONTAL SPINDLE CENTER AND ARBOR SUPPORT	a 	0.02/300	
		b 	0.03/400	

NO.	INSPECTION ITEMS	ILLUSTRATION	TOLERANCE mm	Measured mm
20	PARALLELISM OF SPINDLE CENTERLINE WITH OVERARM SLIDE MOVEMENT OR OVERARM SLIDE WITH SADDLE MOVEMENT  IN VERTICAL  IN HORIZONTAL		0.02/300	
			0.02/300	

## 8. Maintenance

“Maintenance is more important than repair; and repair is better than purchase”.

Under long-term operations, if the machine has not been properly maintained and operated, its service life shall be greatly reduced. The workpiece quality is therefore affected, and the efficiency, decreased. It is essential for an operator to know how to handle the machine and the concept of its maintenance and keep correctly.

Daily Maintenance:

1. Check and see if the oil level of hand crank pump is on the designed line.
2. The designated positions must be lubricated prior to operations.
3. Keep the machine idling for three to five minutes daily prior to operations.
4. At the close of each day, work table shall be cleaned and the unfinished workpiece must be removed. A little bit of lubricant is recommended.



5. At the close of each day, all setting levers shall be loosened, and all aliding parts shall be moved to the proper position. Then cutter must be dismantled.
6. At the close of each day, the headstock must be restored to its normal position if it tilted.

Monthly Maintenance:

1. Check and see if all clamping rails of various sliding surfaces are normal.
2. Check and see if the backlash between leadscrew and its nut is normal.
3. Check and see if the quill lock and that of each and over sliding surface is normal.

Quarterly Maintenance:

1. Check and see if the brake functions and belt are normal.
2. Inspact the lever of work table and erection status of headstock.
3. Test the machine again by the chart of test specifications.
4. Replace whatever parts worn-out.

TROUBLE	CAUSE	CORRECTION
SPINDLE POWER FEED DISENGAGEMENT NOT WORK WELL	The two M4 set screw on disengage lever loosed.	Tighten set screws
HAND MICRO-FEED NOT WORK	<ol style="list-style-type: none"> <li>1. Power feed rates selecting knob set on one of the three feed.</li> <li>2. Engage lever not operated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rotate this knob to one of the two "DUMMY" positions.</li> <li>2. Pull engage lever.</li> </ol>
V-BELT SLIPS AT CUTTING	<ol style="list-style-type: none"> <li>1. V-belt tool loose</li> <li>2. V-belt worm</li> <li>3. Wrong grooves</li> </ol>	<ol style="list-style-type: none"> <li>1. Tight V-belt</li> <li>2. Replace V-belt</li> <li>3. Check grooves</li> </ol>
RAPID TRAVERSE OF FEEDBOX NOT WORK	<ol style="list-style-type: none"> <li>1. Wrong motor rotating direction.</li> <li>2. Multi-disc clutch worm.</li> <li>3. Rapid traverse shifter worm.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconnect the power supply</li> <li>2. Adjust clutch</li> <li>3. Replace shifter</li> </ol>
FEED STOP SUDDENLY DURING MACHINING	<ol style="list-style-type: none"> <li>1. Overload makes the shear pin shear out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the overload cause and replace shear pin</li> </ol>

TROUBLE	CAUSE	CORRECTION
KNEE CAN'T BE POWER ELEVATED	<ol style="list-style-type: none"> <li>1. Knee is locked on column.</li> <li>2. Over weight of workpiece, fixtures, etc. (max. Load capacity: 300kgs)</li> <li>3. Poor lubricating between knee and column</li> </ol>	<ol style="list-style-type: none"> <li>1. Release lock bolts</li> <li>2. Use hand elevating</li> </ol>
CANNOT HOLD SIZE	<ol style="list-style-type: none"> <li>1. Cutting load too great.</li> <li>2. May be due to chip packing.</li> <li>3. Chips causing misalignment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Decrease number of teeth in contact with workpiece</li> <li>2. Increase oil pressure in redirect flow so as wash chips out of teeth.</li> <li>3. Brush or blow all chips away before mounting new piece of work.</li> </ol>
PREMATURE CUTTER DULLING	Cutting load too great	<ol style="list-style-type: none"> <li>1. Decrease number of teeth in contact with workpiece.</li> <li>2. Add blending oil to lubricant</li> </ol>
CUTTING "HOGSIN"	<ol style="list-style-type: none"> <li>1. Peripheral relief too great.</li> <li>2. Rake, angle too large</li> <li>3. Improper speed</li> </ol>	<ol style="list-style-type: none"> <li>1. Use recommended angle</li> <li>2. Decrease rake angle</li> <li>3. Check and adjust</li> </ol>
VIBRATION	<ol style="list-style-type: none"> <li>1. Insufficient clearance rubbing</li> <li>2. Machine at fault</li> </ol>	<ol style="list-style-type: none"> <li>1. Use recommended clearance angle</li> <li>2. Check machine, be sure arbor is at least 1/3 diameters of cutter</li> </ol>
CUTTER BURNS	<ol style="list-style-type: none"> <li>1. Insufficient lubricant</li> <li>2. Speed too fast</li> </ol>	<ol style="list-style-type: none"> <li>1. Add sulfur base oil</li> <li>2. Decrease speed</li> </ol>
HARD TO CHANGE SPEED OF HORIZONTAL	<ol style="list-style-type: none"> <li>1. Gears not meshed</li> <li>2. Poor lubrication on spindle shaft and gears</li> </ol>	<ol style="list-style-type: none"> <li>1. Use job button</li> <li>2. Check lubrication</li> </ol>
POOR SURFACE FINISH	<ol style="list-style-type: none"> <li>1. Feed too high</li> <li>2. Dull tool</li> <li>3. Speed too low</li> <li>4. Insufficient number of cutter teeth</li> </ol>	<ol style="list-style-type: none"> <li>1. Decrease feed and increase speed</li> <li>2. Resharpen</li> <li>3. Increase surface speed</li> <li>4. Use cutter with more closely spaced teeth</li> </ol>

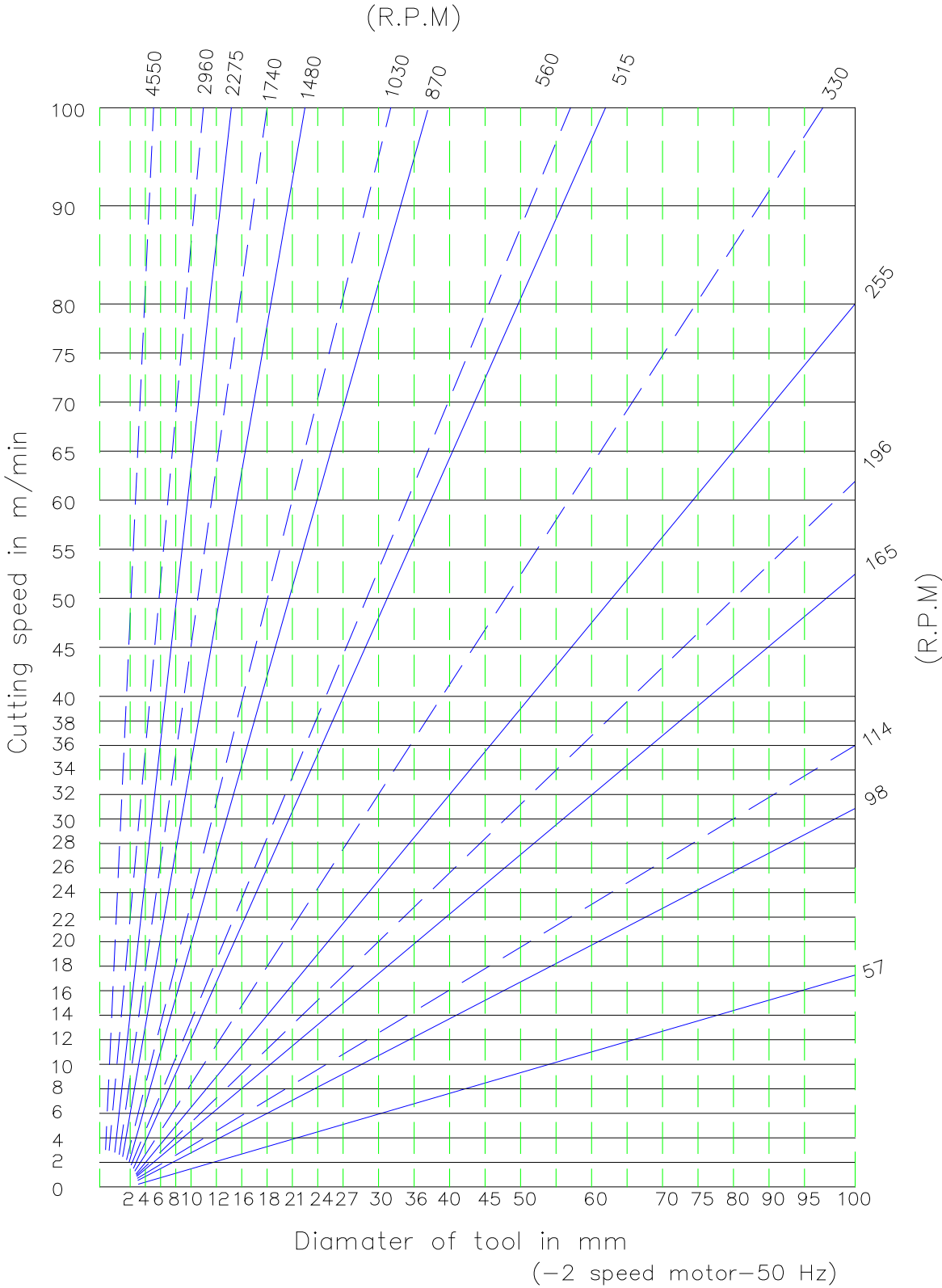
TROUBLE	CAUSE	CORRECTION
WORK BURNISHING	<ol style="list-style-type: none"> <li>1. Cut is too light</li> <li>2. Insufficient peripheral relief</li> <li>3. Land too wide</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase depth of cut</li> <li>2. Increase peripheral relief angle</li> <li>3. Decrease width of land</li> </ol>
TEETH BREAKING	Feed too high	Decrease feed per teeth may be possible to maintain rate by increasing the number of teeth
CHATTER	<ol style="list-style-type: none"> <li>1. Lack of rigidity in the machine, fixtures arbor or workpiece</li> <li>2. Cutting load too great</li> <li>3. Dull cutter</li> <li>4. Poor lubrication</li> <li>5. Straight tooth cutter</li> <li>6. Peripheral relief angle too great</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve rigidity</li> <li>2. Decrease number of teeth in contact with workpiece</li> <li>3. Resharpen</li> <li>4. Improve lubrication</li> <li>5. Use helical tooth cutter</li> <li>6. Decrease relief angle</li> </ol>

# 9. Cutting Condition Chart

FEED-(in mm) PER TOOTH FOR HIGH SPEED STEEL AND HARD METAL CUTTERS. MILLING IN CONVENTIONAL FEED DIRECTIONAL										
WORKPIECE	HANDNESS	ULTIMATE STRENGTH	PLAIN MILLING CUTTERS	FACE MILLING CUTTERS	SLOTTING CUTTERS	END MILLS	FORM RELIEVED PROFILE CUTTERS	SLITTING SAWS	TIPPED CUTTER HEADS	
									HIGH SPEED STEEL	HARD METAL
GG 18 - CAST IRON	170	18	0.2	0.25	0.07	0.05	0.04	40-60	0.3	0.1
GG 26 - CAST IRON	220	23	0.1	0.15	0.05	0.02	0.02	20-30	0.1	0.05
ST 50 - STEEL	140	50	0.2	0.25	0.07	0.05	0.04	40-60	0.3	0.1
ST 60 - STEEL	170	60	0.15	0.2	0.06	0.05	0.04	40-60	0.3	0.1
ST 70 - STEEL	220	75	0.1	0.15	0.06	0.03	0.03	35-50	0.2	0.08
F114 - STEEL	180	65	0.15	0.2	0.07	0.03	0.04	40-60	0.3	0.1
F154 - STEEL	220	75	0.1	0.15	0.06	0.03	0.03	35-50	0.2	0.08
F155 - STEEL	220	75	0.1	0.15	0.06	0.03	0.03	35-50	0.2	0.02
F123 - STEEL	220	75	0.1	0.15	0.06	0.03	0.03	35-50	0.2	0.02
F125 - STEEL	220	75	0.1	0.15	0.06	0.03	0.03	35-50	0.2	0.02
VC Mo 140 - STEEL	290	100	0.08	0.1	0.05	0.02	0.02	25-35	0.15	0.06
VCN 35 - HEAD TREATED STEEL	290	100	0.08	0.1	0.05	0.02	0.02	25-35	0.15	0.06
VCN 45 - HEAD TREATED STEEL	—	110	0.05	0.08	0.03	0.01	0.01	20-30	0.1	0.04
GT 38 - CASE HARDENED STEEL	150	38	0.2	0.25	0.07	0.05	0.04	40-60	0.3	0.1
GS 52 - CAST STEEL	—	52	0.15	0.2	0.06	0.04	0.03	35-50	0.2	0.08
Ms 58 - BRASS	70	15	0.2	0.25	0.07	0.05	0.04	200-300	0.3	0.12
Rg10 - BEARING BRONZE	—	20	0.2	0.25	0.07	0.05	0.04	150-200	0.3	0.12
GBz 14 - CAST BRONZE	—	28	0.15	0.2	0.06	0.04	0.03	80-150	0.2	0.01
COPPER	—	—	0.2	0.25	0.1	0.05	0.05	100-200	0.3	0.12
DIN 1712 - PURE ALUMINUM	35	14	0.15	0.2	0.07	0.05	0.04	200-300	0.2	0.1
AL DIN 1713 - TOUGH LIGHT ALLOYS	60	25	0.1	0.15	0.06	0.03	0.03	150-250	0.15	

CUTTING SPEEDS (in m/min): OF HIGH SPEED STEEL AND METAL CUTTERS, MILLING IN CONVENTIONAL FEED DIRECTION										
WORKPIECE	HANDNESS	ULTIMATE STRENGTH	PLAIN MILLING CUTTERS	FACE MILLING CUTTERS	SLOTING CUTTERS	END MILLS	FORM RELIEVED PROFILE CUTTERS	SLITTING SAWS	TIPPED CUTTER HEADS	
									HIGH SPEED STEEL	HARD METAL
GG 18 - CAST IRON	170	18	14-20	16-22	14-20	16-25	14-20	30-45	17-25	50-100
GG 26 - CAST IRON	220	23	10-16	12-17	10-16	10-16	10-15	15-25	12-18	30-50
ST 50 - STEEL	140	50	16-24	18-28	16-24	18-28	16-24	40-55	18-28	120-200
ST 60 - STEEL	170	60	16-24	18-28	16-24	18-28	16-24	40-55	18-28	100-160
ST 70 - STEEL	220	75	15-20	17-23	15-20	17-25	15-20	30-45	16-24	80-120
F114 - STEEL	180	65	16-22	18-25	16-22	18-26	16-22	40-55	18-28	100-160
F154 - STEEL	220	75	14-20	16-23	14-20	16-24	14-20	30-45	17-25	80-120
F155 - STEEL	220	75	14-20	16-23	14-20	16-24	14-20	30-45	17-25	80-120
F123 - STEEL	220	75	12-18	14-20	12-18	14-22	12-18	30-45	15-22	60-100
F125 - STEEL	220	75	12-18	14-20	12-18	14-22	12-18	30-45	15-22	60-100
VC Mo 140 - STEEL	290	100	11-18	12-20	11-18	12-20	11-18	20-30	14-22	40
VN 35 - HEAD TREATED STEEL	290	100	11-18	12-20	11-18	12-20	11-18	20-30	14-22	40
VN 45 - HEAD TREATED STEEL	—	110	10-15	11-17	10-15	10-16	10-15	10-20	12-18	30-600
GT 38 - CASE HARDENED STEEL	150	38	14-20	16-25	14-20	16-25	14-20	30-45	17-25	60-100
GS 52 - CAST STEEL	—	52	12-18	14-20	12-18	14-22	12-18	30-45	15-22	60-100
Ms 58 - BRASS	70	15	30-50	40-60	30-50	40-60	30-50	100-200	50-70	150-200
Rg10 - BEARING BRONZE	—	20	30-50	40-60	30-50	40-60	30-50	100-200	50-70	150-200
GBz 14 - CAST BRONZE	—	28	25-40	40-50	30-50	30-40	25-40	80-150	40-60	100-150
COPPER	—	—	30-50	40-50	30-50	30-50	25-40	100-200	40-60	100-200
DIN 1712 - PURE ALUMINIUM	35	14	250-300	300-400	300-400	300-400	300-400	200-400	400-500	800-1000
AL DIN 1713 - TOUGH LIGHT ALLOYS	60	25	200-250	250-350	200-250	250-350	200-250	200-400	300-400	600-800

SPEED DIAGRAM (Motor 50 Hz)



## 10. *Cautions*

### A. Machine Operations:

1. Check and ensure if the machine bottom and ground base are properly contacted before the anchor bolts are locked up.
2. The machine must be installed upon a solid base.
3. Check and see if the motor voltage and power source voltage are conformed.
4. Cutters shall be far away from the workpieces when the motor is started or stopped.
5. Switched off the power source before gear change.

### B. Machine Operations:

1. The machine is be started or operated by an authorized operator only.
2. Immediate stop and repair are needed in case of troubles in operations.
3. In installation, the machine shall be connected to earth.
4. In stop motion, the feed lever shall be placed in the neutral position.
5. The machine should be stopped during the inspection on the workpieces.
6. In clamping, check and ensure if the workpieces are firmly vised.
7. The spindle must be kept clean and lubricated all the time.
8. Do not place any tools on the work table to maintain its surface preciseness and smoothness.
9. Prior to cutting, wait until the spindle is running steadily after the motor is started.
10. Use a brush to clean off the iron fragments.

## **11. Remarks**

- 1、 All products, from parts to finished machines, have gone through different flows of process under strict QC systems, with precision degrees in conformity with CNS (please vide charts of ex-factory inspection). TO ensure the preciseness, service life and safety operations, it is highly advisable for the users to study the full details in this manual.
- 2、 Suggestions for improvements of the machine structure and/or inquiries, including plant visitations, are cordially welcome.
- 3、 In case of maintenance, servicing and parts changes, please contact our sales agencies or business department directly.
- 4、 The manufacturer reserves the right to modify the design, operations, structure etc all of the machine without any prior notice.