

# Baum Family Maker Space Standard Operating Procedure



## SERIES I MILLING MACHINES



TP5290

## **SAFETY**

To prevent serious bodily injury, you should observe the following basic safety precautions when installing, operating or servicing the milling machine.

- 1. Follow all instructions in the manual.**
- 2. Wear approved industrial safety glasses and safety shoes.**
- 3. Do not wear gloves, long sleeves, long hair, rings, watches, jewelry or other items that could become caught in moving parts.**
- 4. Keep all parts of your body away from moving parts (belts, cutters, gears, etc.)**
- 5. Use proper point of operation safeguarding.**

These and other safety precautions are discussed in the American National Standard Institute standard entitled safety requirements for the construction, care, and use of drilling, milling, and boring machines (ANSI B11-8-1983).

## **WARNINGS, CAUTIONS, AND NOTES**

### **- WARNING -**

Warning notices are used in this publication to emphasize that hazardous mechanical conditions, voltages, currents, or temperatures exist in this equipment which could cause serious personal injury and/or damage to the equipment.

### **- CAUTION -**

Caution notices are used where equipment might be damaged if care is not taken.

In situations where inattention could cause either personal injury or damage to the equipment, a warning notice is used.

### **- NOTE -**

Notes merely call attention to information that is especially significant in understanding and operating the equipment. This document is intended for the use of those who install, operate and maintain the milling machine.

## **SAFETY RECOMMENDATIONS**

**DO NOT OPERATE EQUIPMENT** until you have read and understood the appropriate operator and safety maintenance manuals.

**DO NOT OPERATE EQUIPMENT** until you have read and understood all machine and control key signs.

**DO NOT OPERATE EQUIPMENT** for the first time without a qualified instructor. Consult your supervisor when in doubt as to the correct way to perform an operation.

**DO NOT OPERATE EQUIPMENT** unless proper maintenance has been regularly performed and the equipment is known to be in good working order.

**DO NOT ALLOW** the operation or repair of equipment by untrained personnel.

**WARNING** or **INSTRUCTION TAGS** are mounted on the equipment for your safety and information. Do not remove them.

**DO NOT OPERATE EQUIPMENT** if any unusual or excessive heat, noise, smoke, or vibration occurs. Report any excessive or unusual vibration, sounds, smoke, or heat as well as any damaged parts.

**WEAR SAFETY GLASSES** with side shields and proper shoes at all times. When necessary, wear respirator, helmet, and ear muffs or plugs.

**DO NOT OPERATE ANY MACHINE** while wearing rings, watches, jewelry, loose clothing, neckties, or long hair not contained by a net or shop cap.

**DO NOT WEAR GLOVES** while operating equipment. Gloves are easily caught in moving parts.

**REMOVE ANY LOOSE PARTS OR TOOLS** left on machine or in the work area before operating the machine. Always check the machine and work area for loose tools and parts, especially after work has been completed by maintenance personnel.

**REMOVE CHUCK WRENCHES** before starting the machine.

**NEVER OPERATE A MACHINE** after taking strong medication, using non-prescription drugs or consuming alcoholic beverages.

**SAFEGUARD THE CUTTING ZONE** (“point of operation”). Use standard, general purpose safeguards when possible. Use special safeguards when required.

**PROTECT YOUR HANDS.** Stop the spindle completely before changing tools.

**DO NOT REMOVE CHIPS** with hands. Use a hook or similar device and make certain that all machine movements have ceased.

**DO NOT ADJUST** tooling, workpieces or coolant hoses while the machine is running.

**NEVER REACH** around a safeguard.

**PROTECT YOUR HANDS.** Stop the machine before changing or adjusting belts, pulleys or gears.

**PROTECT YOUR HANDS.** Keep hands and arms clear of spindle start switch when changing tools.

**PROTECT YOUR EYES AND THE MACHINE.** Never use a compressed air hose to remove chips.

**KEEP WORK AREA WELL LIGHTED.** ask for additional light if needed.

**DON'T SLIP.** Keep your work area clean and dry. Remove chips, oil and obstacles.

**NEVER LEAN ON** your machine. Stand away when the machine is running.

**MAKE CERTAIN** that you are clear of any “pinch points” created by moving slides before starting the machine.

**PREVENT OBJECTS** from flying loose. Securely clamp and locate workpiece. Use stop blocks where necessary. Keep clamps clear of cutter path.

**PREVENT CUTTER BREAKAGE.** Use correct table feed and spindle speed for the job. Reduce feed and speed if you notice unusual noise or vibration.

**PREVENT CUTTER BREAKAGE.** Rotate spindle in clockwise direction for right-hand tools, counterclockwise for left-hand tools. Use the correct tool for the job.

**PREVENT WORKPIECE and cutter damage.** Never start the machine when the cutter is in contact with the workpiece.

**DO NOT USE** worn or defective tools. Use the proper size and type of tool for the task at hand.

**KEEP ROTATING CRANKS AND HANDWHEELS** well lubricated and maintained. Do not remove safety springs.

**CERTAIN MATERIALS**, such as magnesium, are highly flammable in dust and chip form. See your supervisor before working with these materials.

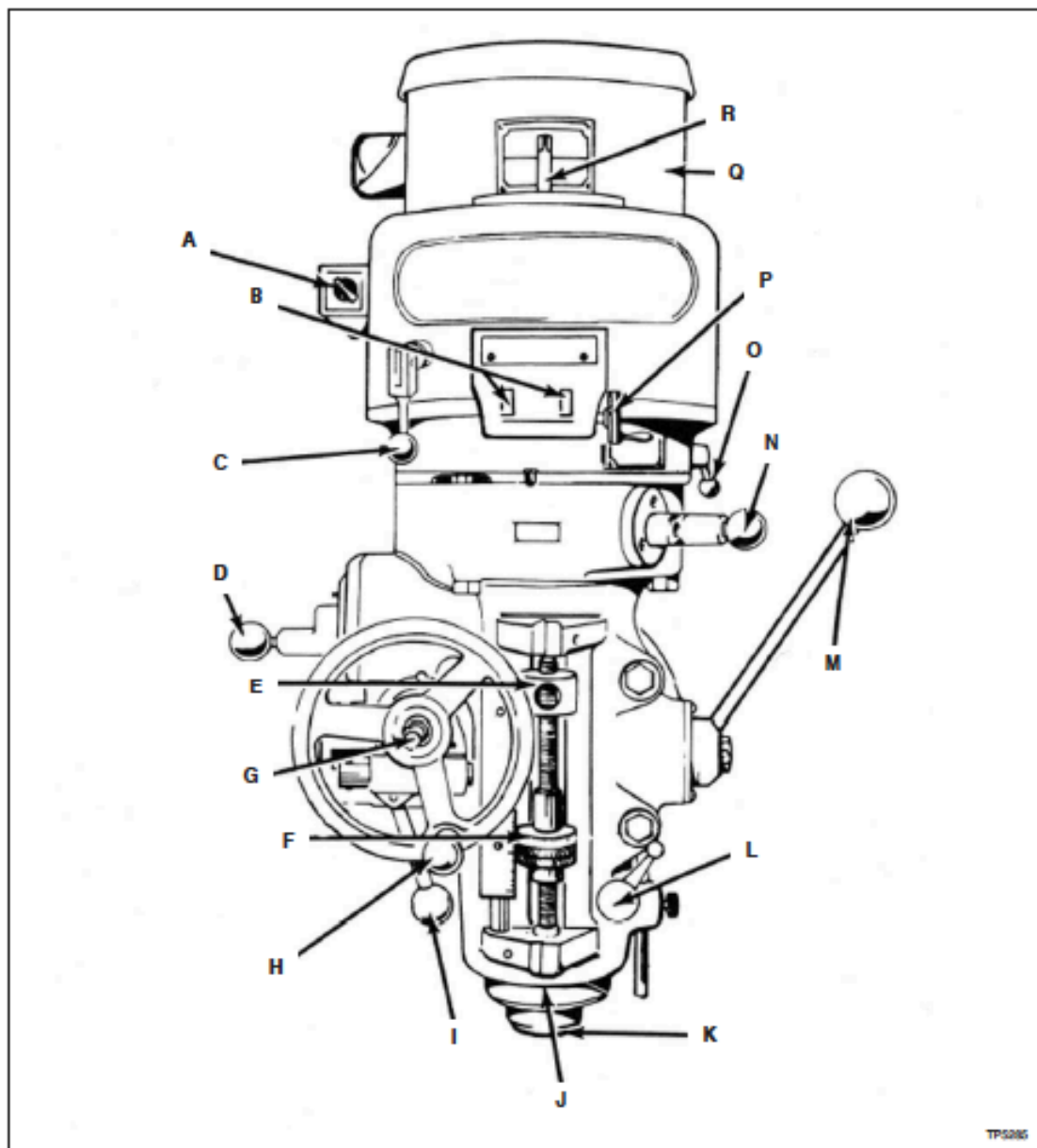
**PREVENT FIRE.** Keep flammable liquids and materials away from work area and hot chips.

**PREVENT MACHINE** from moving unexpectedly. Disengage power feed when not being used (manual machines only).

**PREVENT MACHINE** from moving unexpectedly. Always start machine in manual mode.

**UNLESS OTHERWISE NOTED**, all operating and maintenance procedures are to be performed by one person. To avoid injury to yourself and others, be sure that all personnel are clear of the machine when opening or closing the coolant guard door and any access covers.

## Operation- Head Controls



### Figure 2-1: Head Control Parts Assembly

### HIGH-LOW RANGE SWITCH

High-Low Range Switch "A", Figure 2.2, is a motor reversing switch. When the attachment is in direct drive (HIGH SPEED), the motor and spindle are turning in a clockwise direction as viewed from the top of machine. When the attachment is in "Back Gear" (LOW SPEED), the spindle will run backwards (counter-clockwise) unless the motor direction is reversed by moving switch to "Low".

The back gear lever is marked Hi-Lo. This will indicate the proper switch position. They should be positioned alike or the spindle will run backwards.

- NOTE -

Spindle should run in clockwise position.

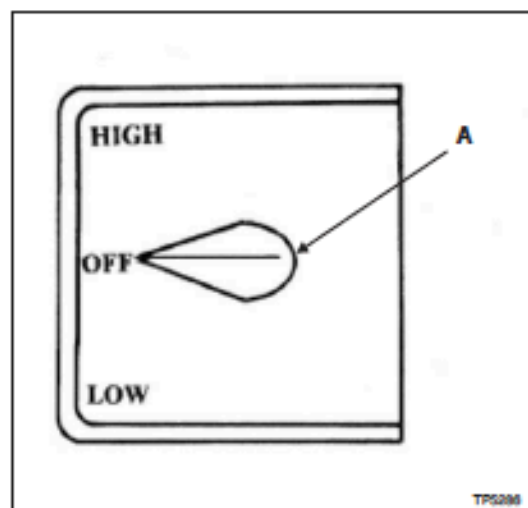


Figure 2.2 - High-Low Range Switch

### VARIABLE SPEED DIAL

Variable Speed Dial "B", Figure 2.3, visibly indicates, in windows, the speed range that the machine is operating in, 60 to 500 low range, 500 to 4200 high range.

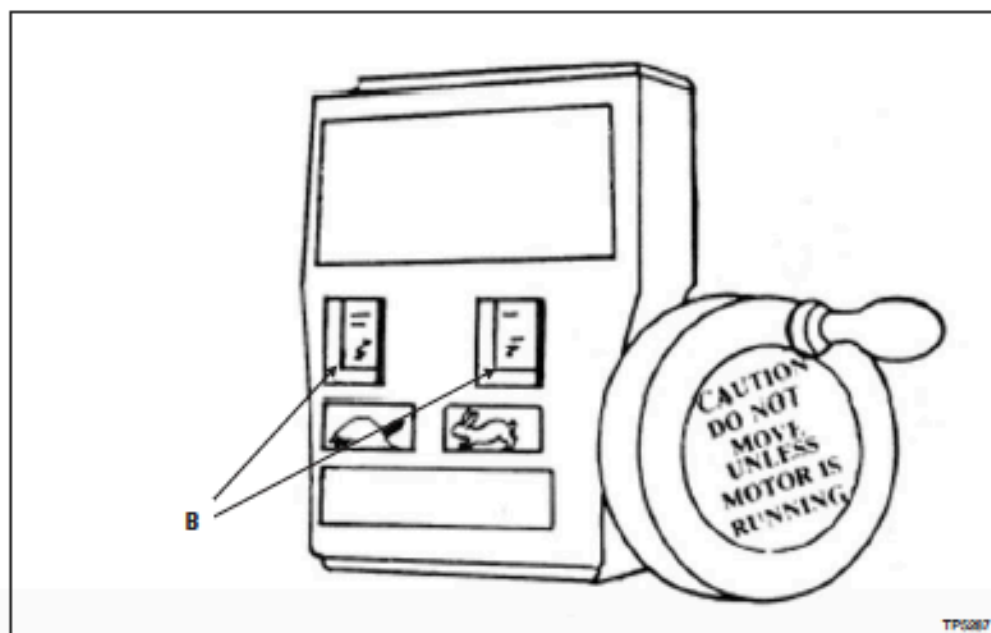


Figure 2.3 - Variable Speed Dial



## SPINDLE BRAKE

Spindle Brake "C", Figure 2.4, can be moved in either direction to stop spindle; however, when locking spindle, brake lever should be moved either by pulling towards the operator or pushing away from the operator, then raised. When brake is worn out it has to be replaced. There are no adjustments to be made.

### - CAUTION -

BE certain that spindle brake is released before starting the motor. This is important as the motor can be damaged if switch is turned on with brake in locked position.

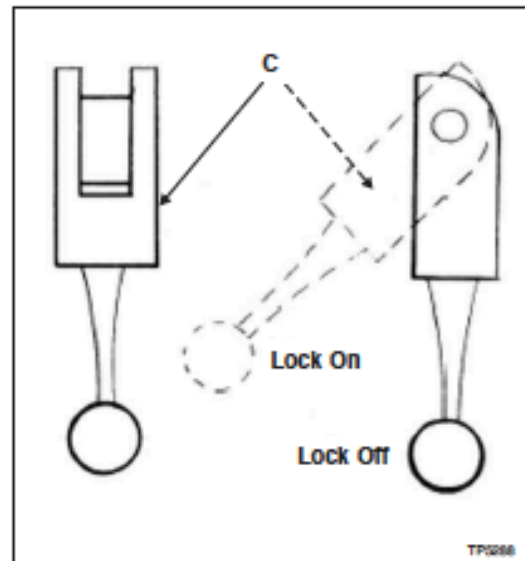


Figure 2.4 - Spindle Brake

## QUILL FEED SELECTOR

The Quill Feed Selector "D", Figure 2.5, is used for selecting the three feeds: .0015", .003" and .006" per revolution. It is shifted by pulling knob out and turning from one position to the other. Feeds are stamped on cover below indentation hole. Feed is more readily engaged when spindle is running.

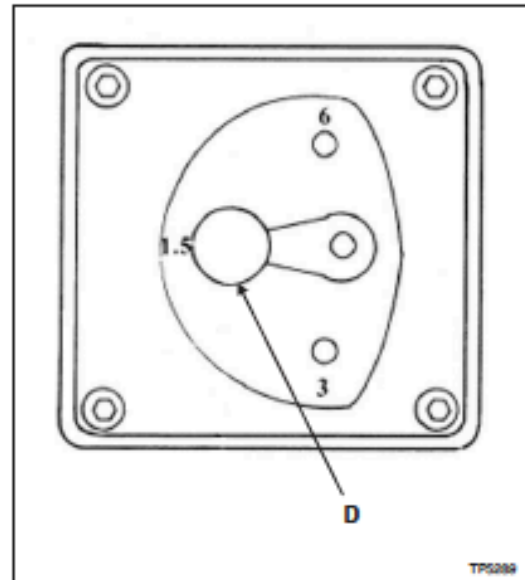


Figure 2.5 - Quill Feed Selector

### QUILL STOP KNOB

Quill Stop Knob "E", Figure 2.6, is used to disengage automatic feed in either direction as well as the stop point setting working depths.

### MICROMETER NUT

Micrometer Nut "F", Figure 2.6, is used for setting depths. Each graduation on nut indicates .001" of depth, it reads directly to scale mounted along the side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

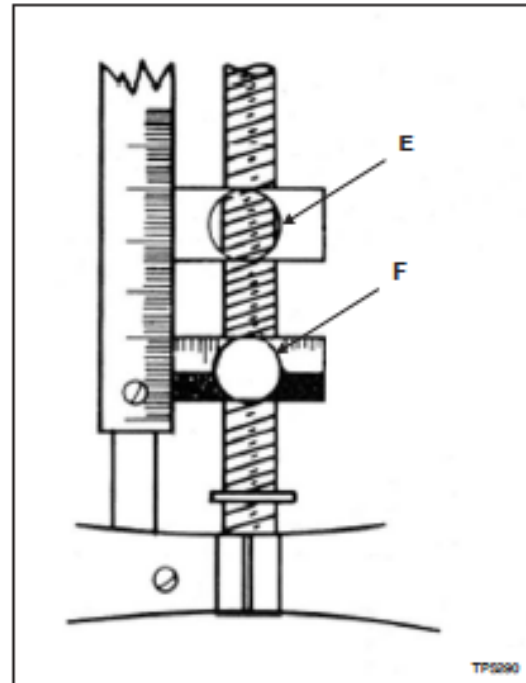


Figure 2.6 - Quill Stop Knob and

### HI-NEUTRAL-LO LEVER

The HI-Neutral-Lo Lever "O", Figure 2.13, is used to put the attachment into either back gear or direct drive. Rotate the spindle by hand to facilitate meshing of clutch or gears.

Neutral is provided to permit free spindle rotation for indicating and setup work.

In the high speed position (direct drive) the spindle is driven by tapered clutch teeth. If the clutch is not meshed tightly, clutch rattle will be heard. This can be corrected by loosening the two securing screws in lever while in high speed position. The clutch spring will automatically adjust the clutch. Tighten the two securing screws in lever.

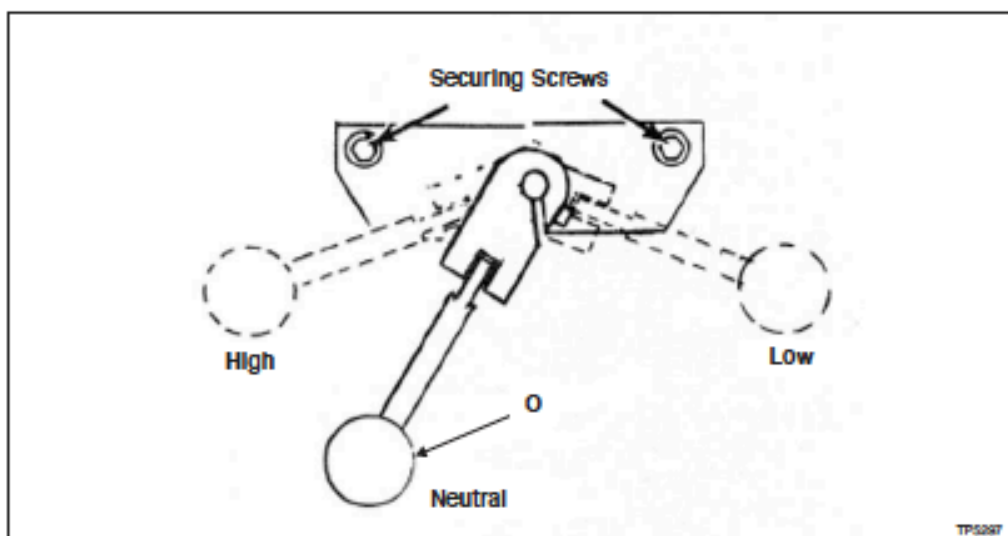


Figure 2.13 - HI-Neutral-Lo Lever

**- CAUTION -**  
**Do not shift hi-lo lever while motor is running.**

## SPEED CHANGE HANDWHEEL

### - CAUTION -

**DO NOT attempt to change spindle RPM unless the motor is running. Dial speeds will only be approximate. Belt wear will cause a slight variation in speeds from what is indicated on the dial.**

Spindle speeds are adjusted by turning Speed Change Handwheel "P", Figure 2.14, on the front of the belt housing. There are two ranges: 60 to 500 and 500 to 4200.

To obtain 60 to 500 (low range):

1. Hold the HI-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the HI-Neutral-Lo lever to the "Lo" position (back gear).
3. Use the low range on the drum switch to engage the back gears.

### - CAUTION -

**If the back gears do not mesh, do not force the lever.**

To obtain 500 to 4200 (high range):

1. Hold the HI-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the HI-Neutral-Lo lever to the "Hi" position.
3. Set the drum switch to high range.

### - CAUTION -

**Try to avoid shifting the hi-lo lever when the feed worm is engaged.**

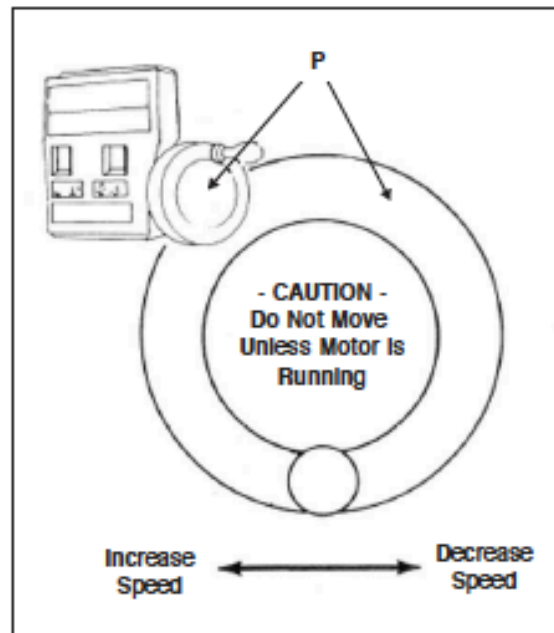


Figure 2.14 - Speed Change Handwheel

## MOTOR

Motor "Q", Figure 2.15, has the following specifications:

- 2 HP variable speed (with 2J head)
- 3 HP 30 minute duty rate

## DRAWBAR

When tightening or loosening the Drawbar "R", Figure 2.15, it is necessary to lock the spindle. To accomplish this, use the spindle brake which is located on the left side of the belt housing, pulling towards the operator or pushing away from the operator until it binds, then raise the quill feed handle.

Drawbar has 7/16"-20 right hand thread and should be tightened by hand with normal amount of pressure using wrench furnished with machine. To loosen collet, back off drawbar and if collet does not open immediately, give knob on top of drawbar a slight tap. Spindle has non-sticking taper and collet should release readily.

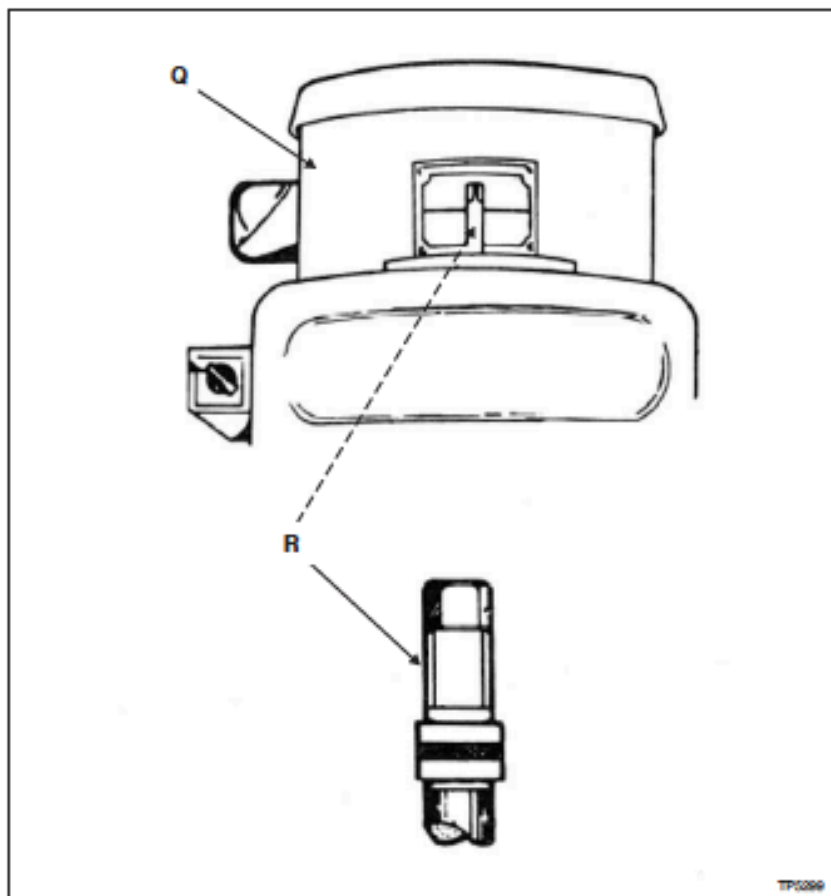


Figure 2.15 - Motor and Drawbar

## OPERATIONAL PROCEDURES

### Spindle Speed

**- CAUTION -**

**DO NOT change speed when spindle is stationary. Change speed only when spindle is running.**

To change speed within range:

1. Start spindle.
2. Turn handwheel "A", Figure 2.16, to select required speed.

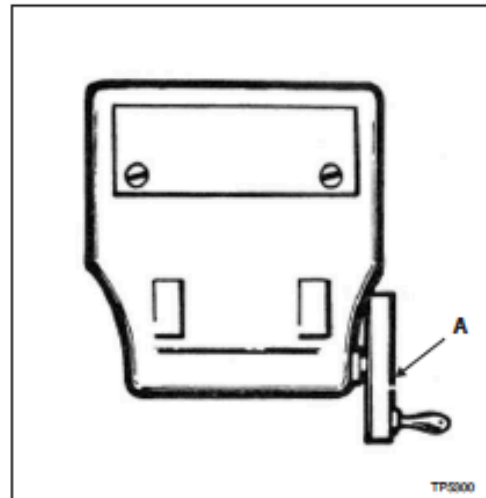


Figure 2.16 - Spindle Speed Change

### Back Gear (Low Speed)

**- CAUTION -**

**DO NOT change range while spindle is running. Change range only when spindle is stationary.**

To change range from direct to back gear drive:

1. Switch "B", Figure 2.17, to OFF (Stop spindle rotation).
2. Move lever "C" through neutral to LOW (This reverses the spindle rotation).
3. Switch "B" to LOW.

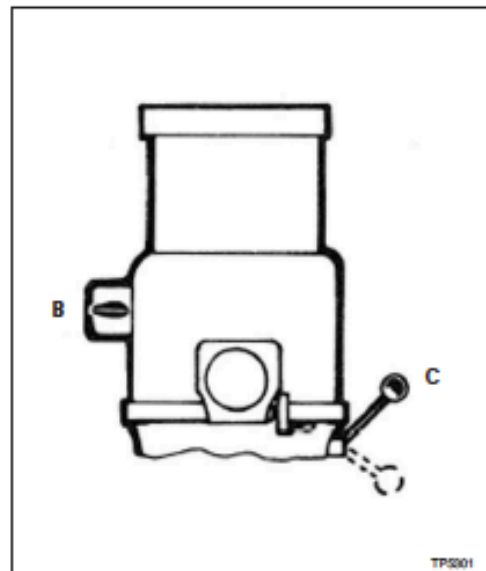


Figure 2.17 - Back Gear Range Change

### Direct Drive (High Speed)

To change range from back gear to direct drive:

1. Switch "B" to OFF (Stop spindle rotation).
2. Move lever "C", Figure 2.18, through neutral to HIGH.
3. Rotate spindle by hand until the clutches are felt to engage.
4. Switch "B" to HIGH.

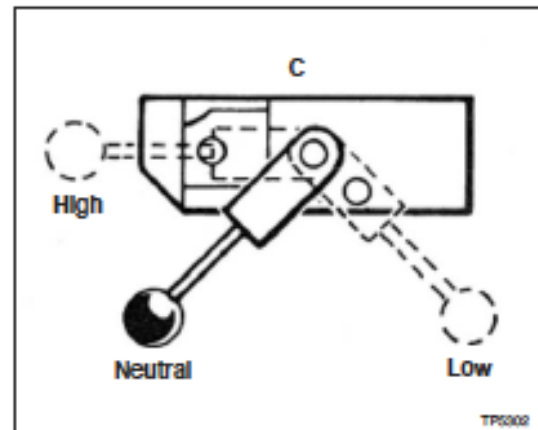


Figure 2.18 - Direct Drive Lever

## OPERATIONAL PROCEDURES

### Spindle Brake

Brake lever has capability to rotate in either direction to brake and lock.

1. CAM upwards to lock and prevent movement of spindle (see Figure 2.21).

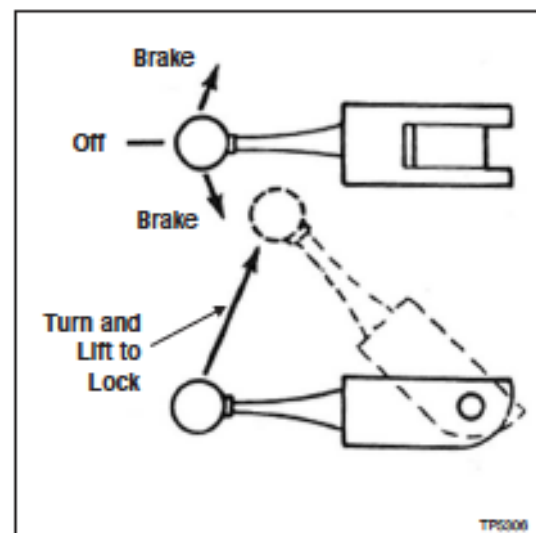


Figure 2.21 - Spindle Brake

### Swivel Belt Housing

**- CAUTION -**

Incorrect spline alignment can be caused by unequal tightening of the locknuts 'J' causing fluctuation of the quill feed which can be felt through the sensitive feed handle. It is advised to call Hardinge service department before attempting this procedure.

1. Loosen three locknuts "J", Figure 2.23.

**- WARNING -**

**DO NOT remove these locking nuts.**

2. Swivel to required angular setting.
3. Tighten three locknuts "J" snugly before final tightening of locknuts. Run spindle to give correct spline alignment, then tighten locknuts securely.

### Swivel Turret

1. Use wrench supplied with machine to loosen the four bolts "K", Figure 2.24.

**- WARNING -**

**DO NOT remove these four bolts.**

2. Index to the required setting.
3. Lock the four bolts "K" to 47 lb-ft.

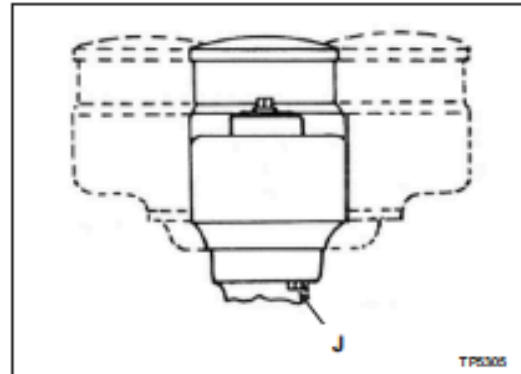


Figure 2.23 - Swivel Belt Housing

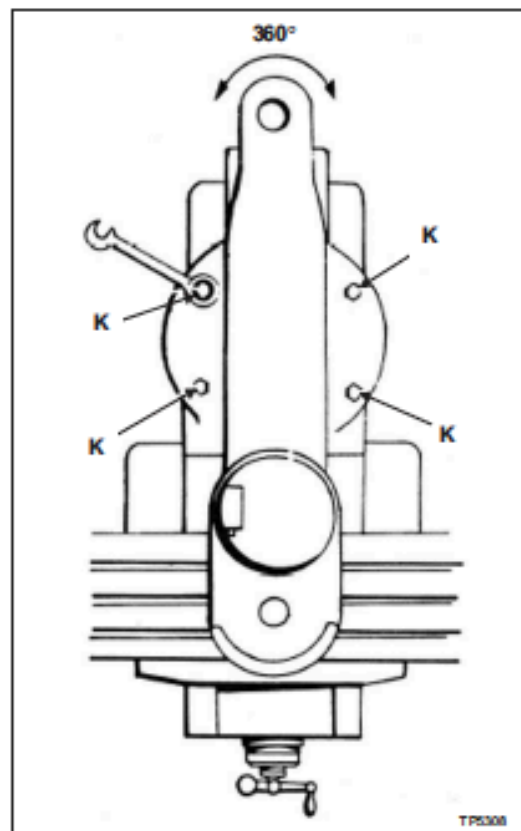


Figure 2.24 - Swivel Turret



### Move Ram Slide

1. Use wrench provided with machine to loosen bolts "L" and "M", Figure 2.25.
2. Use wrench to move the slide to the desired position using bolt "N".
3. Tighten bolts "L" and "M", starting with the rear bolt.

#### - NOTE -

It is recommended that on heavy milling work, head should be kept as close to column as possible, where maximum rigidity is obtained.

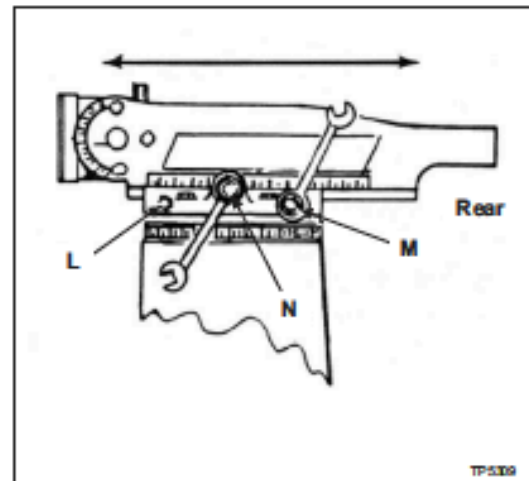


Figure 2.25 - Ram Slide

### Saddle Clamping

When milling with longitudinal table feed only, it is advisable to clamp the knee to the column (see Figure 2.27) and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left hand side of the saddle.

Excessive moisture can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.

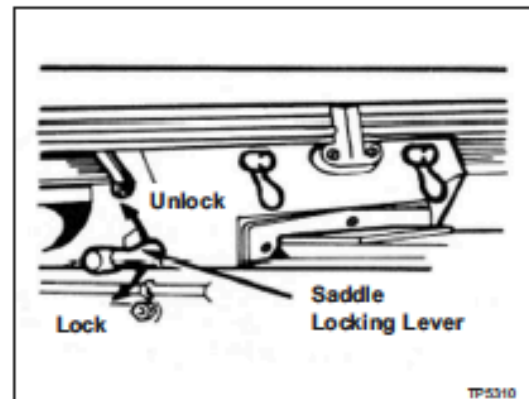


Figure 2.26 - Saddle Clamping



### Table Clamping

The table clamp levers are located on front of saddle and should always be clamped when longitudinal movement is not required (see Figure 2.28).

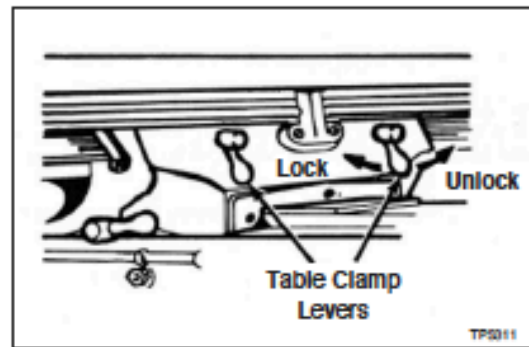


Figure 2.28 - Table Clamping

### Knee Clamping

The knee clamping levers are at the left side of the knee and front of knee. Leave clamped at all times unless using knee in operation (see Figure 2.27).

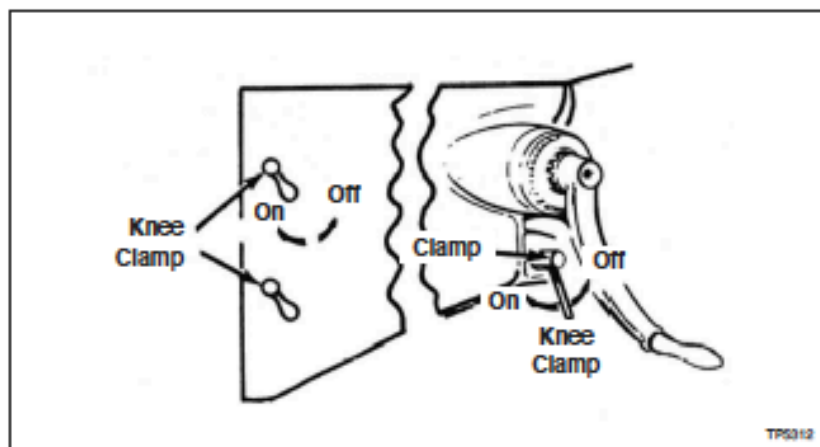


Figure 2.27 - Knee Clamping

### Head Swivel

1. Loosen the four locknuts (see Figure 2.32). Support unit to prevent free fall.
2. Swivel to required angular setting.
3. Tighten the four locknuts first to 25 lb-ft. Then 50 lb-ft

## GENERAL SPEED RECOMMENDATIONS

MATERIAL TO BE CUT	FEET PER MINUTE		
	ROUGH CUT	ROUGH AND FINISH	LIGHT AND FINISH CUT
Cast Iron – Soft (Under 150 Brinnell)	70	80 – 90	120
Cast Iron – Med (150-200 Brinnell)	55	60 – 70	90
Cast Iron – Hard (Over 200 Brinnell)	40	50 – 60	70
Steel (Chrome Nickel 40-45 Shore)	30	40	50
Steel (Stainless)	60	80	90
Steel (Low Carbon)	80	90	140
Steel (High Carbon)	40	50	70
Bronze (Medium)	90	120	150
Bronze (Hard)	65	90	130
Brass (Hard)	100	150	200
Copper	150	200	300
Duraluminum	400		600
Aluminum	600		1000

## TABLE OF CUTTING SPEEDS AND FEEDS

Feet per Minute	15	20	25	30	40	50	60	70	80	90	100
REVOLUTIONS PER MINUTE											
In Inches											
.063"	917	1222	1528	1833	2445	3056	3667	4278			
.125"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056
.187"	306	407	509	611	815	1019	1222	1426	1630	1833	2037
.250"	229	306	382	458	611	764	917	1070	1375	1375	1528
.312"	183	244	306	367	489	611	733	856	978	1100	1222
.375"	153	204	255	306	407	509	611	713	815	917	1019
.438"	131	175	218	262	349	437	524	611	698	786	873
.500"	115	153	191	229	306	382	458	535	611	688	764
.625"	91	122	153	183	244	306	367	428	489	550	611
.750"	76	102	127	153	204	255	306	357	407	458	509
.875"	65	87	109	131	175	218	262	306	349	393	437
1.000"	60	76	95	115	153	191	229	267	306	344	382
1.125"		67	84	102	136	170	204	238	272	306	340
1.250"		61	76	91	122	153	183	214	244	275	306
1.375"			69	83	111	139	167	194	222	250	278
1.500"			63	76	102	127	153	178	204	229	255
1.625"			60	70	94	118	141	165	188	212	235
1.750"				65	87	109	131	153	175	196	218
1.875"				61	81	102	122	143	163	183	204
2.000"					76	95	115	134	153	172	191