

THIS book was written for operators of CINCINNATI® Cinpak 45 Milling Machines.

At the time of writing, the book was completely up to date. However, due to continual improvements in design, it is possible that descriptions contained herein may vary to a slight extent from the machine delivered to you. This merely implies that the machine has been improved to better fulfill your requirements.



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**MILLING MACHINE DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI, OHIO 45209**

ILLUSTRATION REFERENCE NUMBERS

For your convenience in quickly finding illustrations referred to in the text, we have given all illustrations the same number as the page on which they appear. For example, Figures 16A, 16B, and 16C are all on page 16.



P A T E N T N O T I C E

The machines and attachments illustrated and described in this book are manufactured under and protected by issued and pending United States and Foreign Patents.

* * *

The design and specifications of these machines are subject to change without notice



S E R I A L N U M B E R

The serial number is stamped on the face of the column and also on the right-hand end of the table.

CONTENTS

	Page
Dimensional Drawing	6
General Specifications	7
Standard Equipment	8
Installation Instructions	9-11
Foundation.....	9
Lifting the Machine.....	9
Bolting Machine to Floor.....	10
Leveling.....	10
Assembling Table to Machines.....	10-11
Backlash Eliminator.....	11
Lubrication Instructions and Specifications	12-13
Functional Diagram	14
Operating Instructions	15-26
Starting the Machine.....	15
Starting the Spindle.....	15
Changing Spindle Speed.....	15
Micrometer Dials.....	16
Table Traverse Handwheel.....	16
Saddle Traverse Handwheel.....	16
Vertical Traverse Handcrank.....	17
Selecting Feed Rate.....	17
Power Feed Levers.....	18-19, 23-26
Logitudinal Feed Levers.....	18
Cross Feed Lever.....	19
Vertical Feed Lever.....	19
Rapid Traverse.....	19
Table Dogs.....	20
Cross Feed Trip Dogs.....	20
Vertical Feed Trip Dogs.....	21
Changing Work Material.....	21
Backlash Eliminator.....	22
Automatic Table Cycles.....	23-26
Setting Up the Machine	27-29
Clamping Devices.....	27
Fixture.....	28
Arbor-Loc Spindle Nose.....	29
Cutting Fluid System	30-31
Care and Maintenance.....	30
Cutting Fluid Valve.....	30
Recommended Cutting Fluids	31
Adjustments	32-36
Lead Screw Bearings.....	32
Cross Screw Bearings.....	33-34
Spindle Bearings.....	34-35
Backlash Eliminator.....	35
Gibs.....	36
Accessories and Attachments	37-38
Safety Precautions	39
Ordering Repair Parts	39

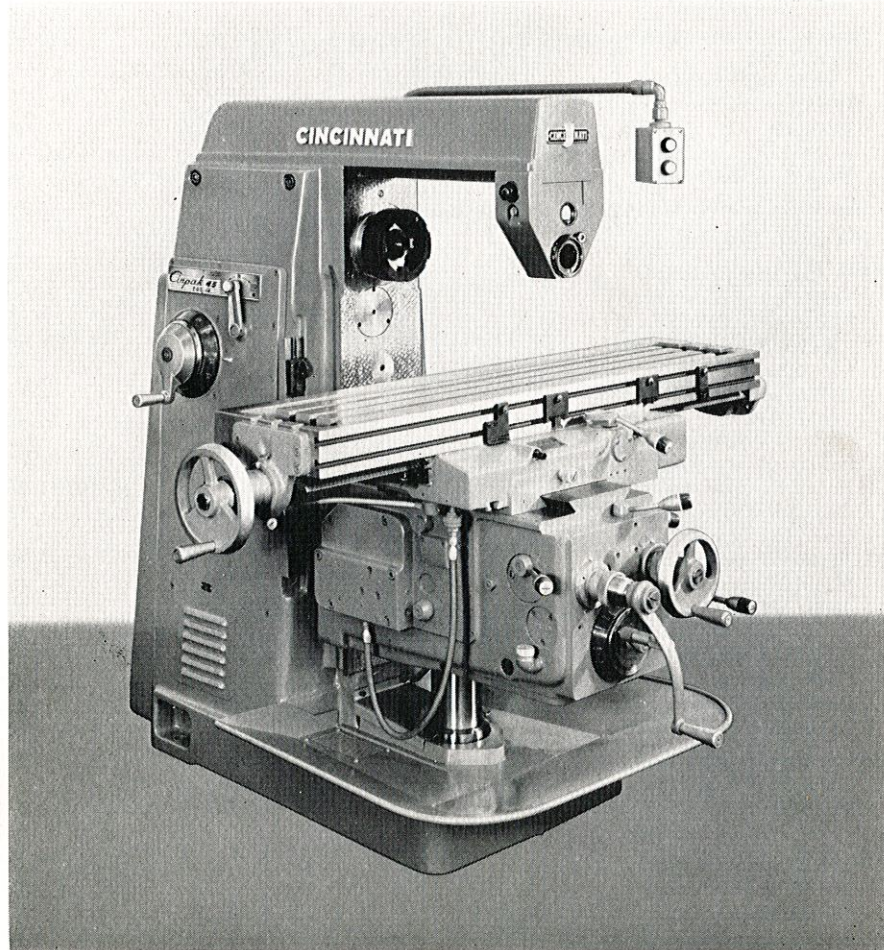


Figure 4
CINCINNATI Cinpak 45 Plain Milling Machine

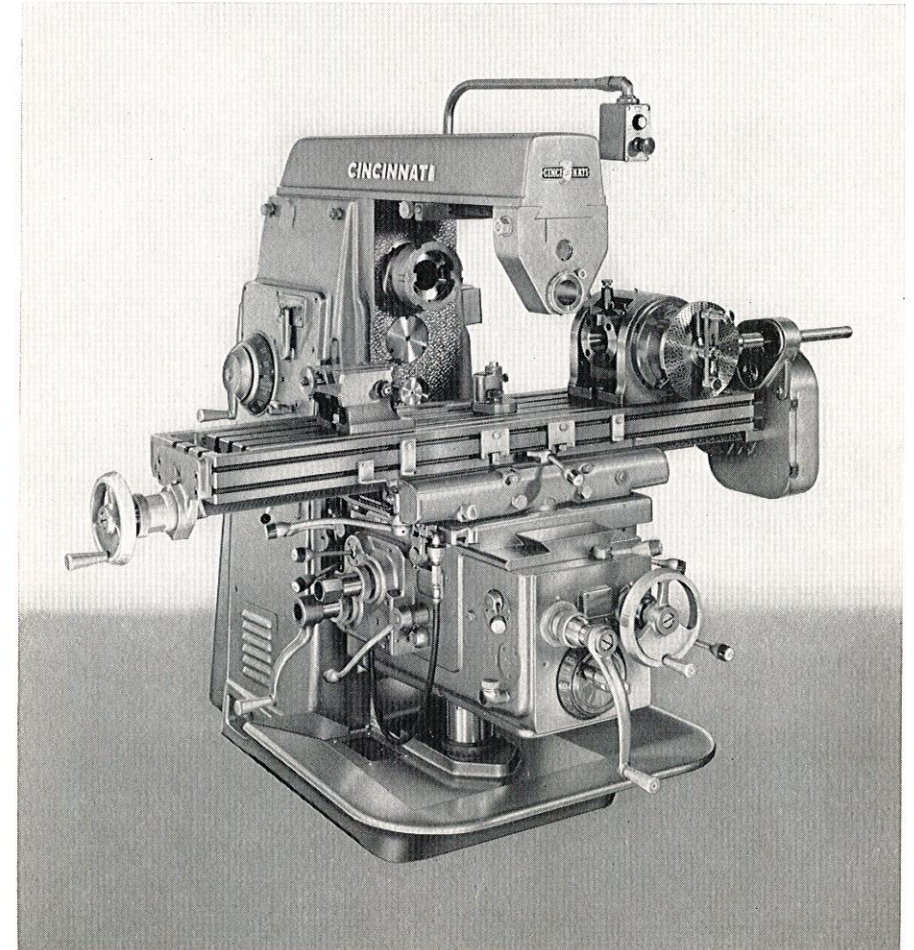


Figure 5
CINCINNATI Cinpak 45 Universal Milling Machine
(Rear Hand and Power Feed Controls for Cross and Vertical Movements are Available at Extra Cost.)

DIMENSIONAL DRAWING

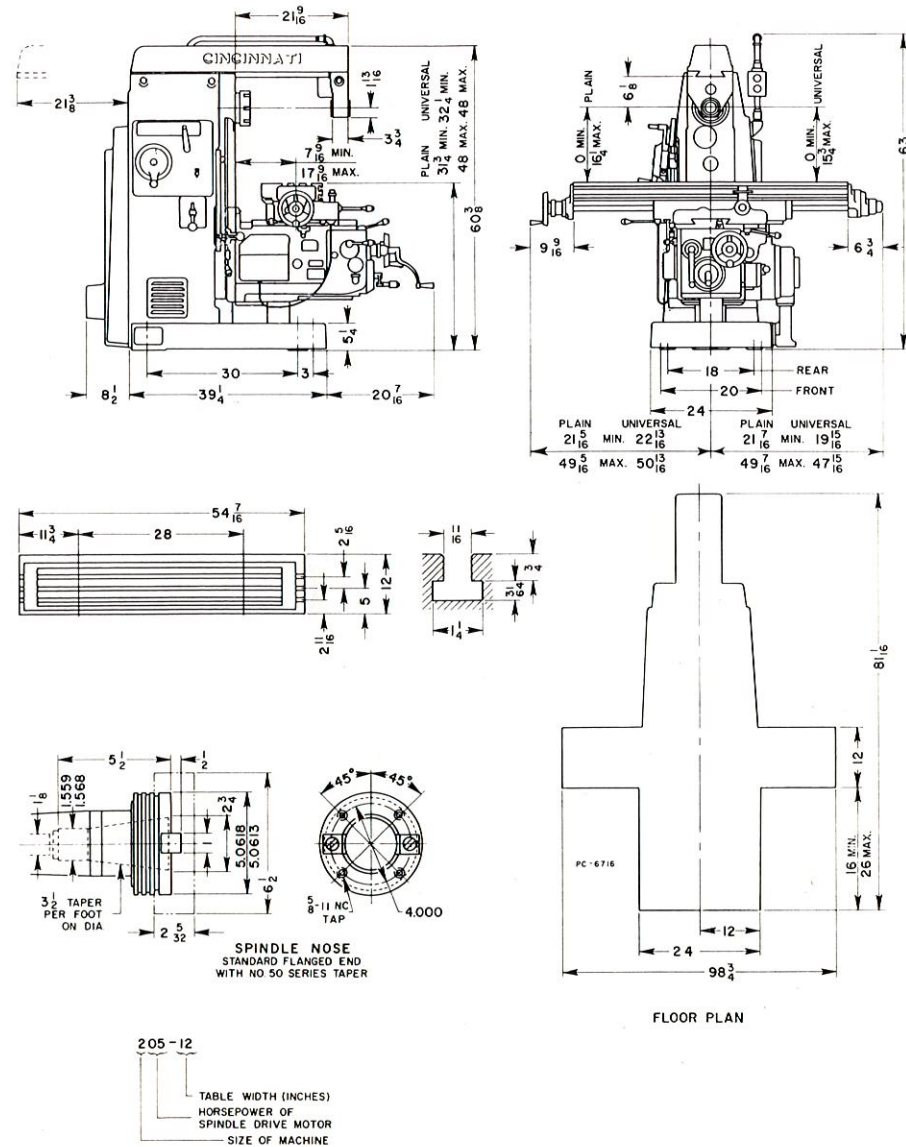


Figure 6
Dimensional Drawing

GENERAL SPECIFICATIONS

General specifications for Plain Machines with and without Automatic Table Cycles. Automatic Table Cycles are not available on Universal Machines. Shipping weights are approximate.

	Plain	Universal
Table		
Working surface.....	54 ⁷ / ₁₆ " x 12"	54 ⁷ / ₁₆ " x 12"
Size over-all.....	54 ⁷ / ₁₆ " x 12"	54 ⁷ / ₁₆ " x 12"
T-slots, number and size.....	Three-1 ¹ / ₁₆ "	Three-1 ¹ / ₁₆ "
Distance between T-slots.....	2 ³ / ₁₆ "	2 ³ / ₁₆ "
Swivels.....	—	40° R and L
Range		
Longitudinal.....	28"	28"
Cross.....	10"	10"
Vertical.....	16 ¹ / ₂ "	16"
Centerline spindle to top of table {		
Max.....	16 ¹ / ₄ "	15 ³ / ₄ "
Min.....	0"	0"
Spindle		
Spindle nose.....	No. 50 Std.	No. 50 Std.
Hole for draw-in bolt.....	1 ¹ / ₈ "	1 ¹ / ₈ "
Speeds—infinitely variable		
Low range.....	40-245 rpm	40-245 rpm
High range.....	280-1800 rpm	280-1800 rpm
Feed		
Number.....	16	16
Range		
Longitudinal and cross.....	1/4-30"/min.	1/4-30"/min.
Vertical.....	1/8-15"/min.	1/8-15"/min.
Power Rapid Traverse (spindle running or stopped)		
Longitudinal and cross.....	150"/min.	150"/min.
Vertical.....	75"/min.	75"/min.
Dividing Head		
Size (nominal swing).....	—	10"
Take-in length.....	—	30"
Overarm		
Underside to centerline of spindle.....	6 ¹ / ₈ "	6 ¹ / ₈ "
Drive		
Spindle drive motor.....	5 hp	5 hp
Feed drive motor.....	1 ¹ / ₂ hp	1 ¹ / ₂ hp
Cutting Fluid Pump		
Motor driven-gallons per minute.....	Included 5	Included 5
Floor Space		
Maximum size.....	99 ¹ / ₄ "x81 ¹³ / ₁₆ "	99 ¹ / ₄ "x81 ¹³ / ₁₆ "
Area.....	59 sq. ft.	59 sq. ft.
Shipping Data		
Net weight.....	4340 lbs.	4720 lbs.
Gross weight, domestic.....	4750 lbs.	5110 lbs.
Gross weight, export.....	5250 lbs.	5610 lbs.
Shipping case size (LxWxH).....	81"x66 ³ / ₈ "x62 ¹ / ₂ "	81"x66 ³ / ₈ "x62 ¹ / ₂ "
Volume.....	194 cu. ft.	194 cu. ft.
Code Names		
Standard Table Cycle Machines.....	YUXYE	YUXYF

STANDARD EQUIPMENT SUPPLIED WITH PLAIN AND UNIVERSAL MACHINES

Complete Electrical Equipment for 50 or 60 cycle, 3 phase, 220 to 550 volts A.C. and wired in accordance with the "Machine Tool Electrical Standards".

Spindle Drive Motor: 5 hp, open, normal torque, normal starting current, special brake type.

Feed Drive Motor: 1½ hp, flange type frame.

Control: Full voltage magnetic starter with overload and under-voltage protection including transformer and push buttons operated at 110 volts.

Disconnect Switch: A non-fusible type is supplied.

Arbor Support: One Style "B" provided without lugs for brace. Includes one 2½" adjustable arbor bushing.

Dynapoise Vibration Damper Overarm.

Automatic Backlash Eliminator.

Arbor-Loc Spindle Nose.

Motor Driven Cutting Fluid Pump.

Arbor Draw-in Bolt, Wrenches.

Rear Power Feed Control—longitudinal only.

Adjustable Table Control Dogs: Machines without Automatic Cycles, 2 feed trip and 2 flipper type dogs. Machines with Automatic Cycles, 2 feed, 2 rapid traverse, 2 reverse, 1 end stop, 1 center safety stop.

STANDARD EQUIPMENT SUPPLIED WITH UNIVERSAL MACHINES ONLY

Standard 10" Universal Dividing Head with No. 50 Series standard taper hole in spindle. Equipment includes tailstock with 2-point adjustable center; steady rest; one plate for indexing through 40 to 1 ratio—all numbers up to and including 60, all even numbers and those divisible by 5 up to 120, and many beyond; direct indexing from spindle nose; one center for dividing head; work driver; and provision for connecting head to Enclosed Standard Lead Driving Mechanism.

Enclosed Standard Lead Driving Mechanism, including change gears for milling leads, range 2½" to 100" (only) for Standard Universal Dividing Heads.

INSTALLATION INSTRUCTIONS

To obtain accurate results from a milling machine over a long period of time, three external requirements must be met. First, the foundation upon which the machine rests must be heavy enough to maintain stability and flatness under the weight of the machine. Second, the machine must be firmly anchored in place to the foundation. Third, the machine must be carefully leveled and then checked occasionally to be sure that level is maintained.

Foundation. If the floor upon which the machine will be located is made of substantial wood or concrete, fairly flat, and sufficiently heavy to withstand the weight of the machine, no special foundation will be required. For floors of lesser stability and strength, a foundation should be built up equal to or better than this floor specification. (Check machine specifications for weights).

Lifting the Machine. The machine may be lifted by a crane with a rope or cable sling around the overarm (Figure 9). Tighten the overarm clamping bolts before lifting.

If wire cables are used to lift the machine, protect the machined surfaces with leather padding or wood blocks.

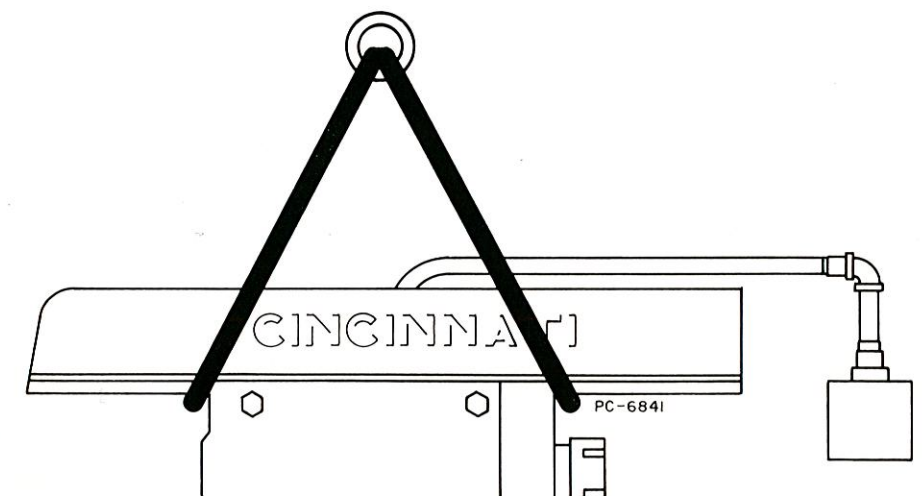


Figure 9
Lifting the Machine

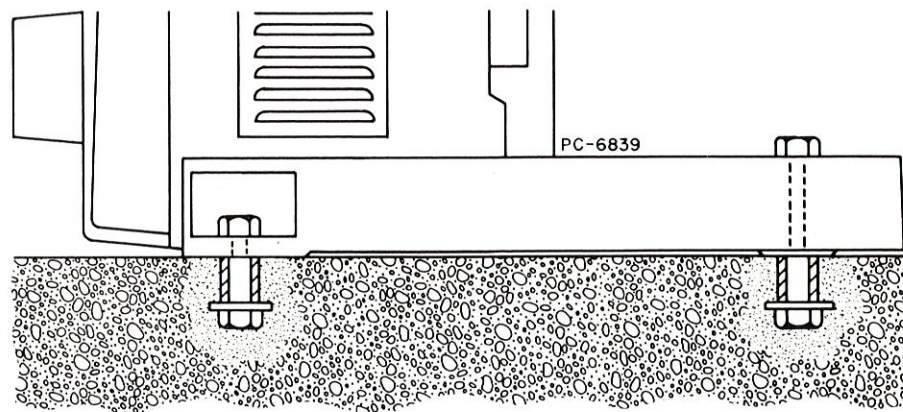


Figure 10
Bolting the Machine to a Concrete Floor

Bolting the Machine to the Floor. When preparing for this operation, notice that center distances of bolt holes given on the "floor plans" are approximated. If the floor is concrete, drill the bolt holes about 6" in diameter. Insert the hold-down bolt through a 1½" pipe, as illustrated in Figure 10, and fill the pipe with dry sand. Lower the machine on two 1" thick boards, and engage the nuts on two or three threads of the bolts. Fill the holes around the pipe with quick drying cement, thin enough to flow easily. When cement is dry, remove boards, level machine, and tighten hold-down nuts.

Leveling. After the machine has been moved to its proper location, it must be carefully leveled. Use an accurate micrometer level for the operation. A carpenter's level or the bulb in a machinist's combination square are not good enough. Place laminated shims under the bearing pads of the base, alternating metal and felt shims, until the table is level in both directions. Shims should be large enough so entire bearing pad, under the base, is resting on the shims, so as to evenly distribute the weight of the machine. It is necessary, of course, that the machine table and leveling instrument be absolutely clean and free of burrs to obtain the most accurate results.

Assembling the Table to the Machine. If the machine table has been removed for convenience in shipping, it may be replaced in the following manner:

1. Wash the bearing surfaces on the saddle and table perfectly clean. Apply a liberal coat of oil to the saddle bearings.

2. Place the table feed engaging lever in its neutral position (clutch disengaged).
3. Insert the two table locking shoes and follow up with the table clamping screws (see Figure 27A).
4. Insert the table feed screw through the sleeves in the saddle, from the right hand side of the machine, and thread the screw through the nut in the left hand end of the saddle until the end of it projects about 15".
5. Slide the table into position, from left to right.
6. Insert the table gib in the left hand end of the saddle at the front.
7. Adjust the gib so that the table cannot be pulled by two men, then back off the gib screw until the table can be pulled. There must be no evidence of "side-play".
8. Connect the aprons to the ends of the table, the right end first and then the left end, pulling them up tightly. Be sure that the dowel pins are in place.
9. Assemble the clutch, dial, and handwheel at the left hand end.

Backlash Eliminator. For convenience of shipping and/or installation, it is sometimes necessary to remove the table and lead screw. When this is done, the backlash eliminator must be properly reassembled and adjusted.

Reassembling Backlash Eliminator.

1. Remove wire. Remove one nut at a time for cleaning and replace in same position.
2. With nuts replaced, turn each until scribed line on nut matches scribed line on cap. Hold nuts firmly in position and run lead screw into both nuts. This holds correct radial position of threads relative to faces. With lead screw in position, be sure lines on caps and nuts are still in line.
3. Fit table to saddle and adjust bearings in apron for not more than .005" backlash in lead screw dial.
4. Turn knob on front of saddle all the way in and try lead screw by hand. If backlash is evident, adjust as outlined on page 35.

Note.—Table gib should be relatively loose when making test. Adjust gib to proper depth after checking eliminator.

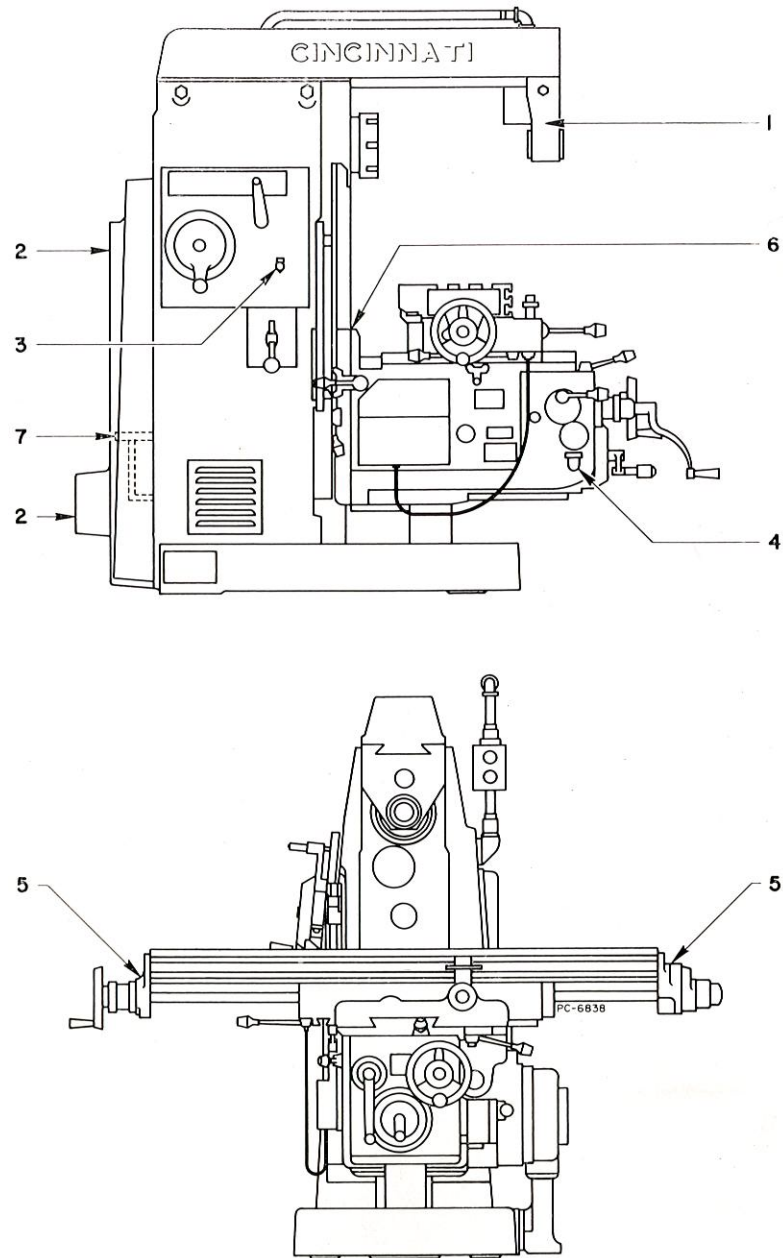


Figure 12
Lubrication Diagram

LUBRICATING INSTRUCTIONS AND SPECIFICATIONS

See Lubrication Diagram, opposite page

After the machine has been installed in accordance with the information given in the "Installation Instructions" and the data sheet which accompany the machine, it must be thoroughly lubricated before being placed in operation.

Thoroughly oil all moving parts as they are installed. Then lubricate all principal points as listed below before starting machine. Periodic and thorough lubrication with correct lubricant, as specified, will help maintain the long life and accuracy built into machine. The intervals listed are based on a normal eight-hour day.

PURCHASE LUBRICANTS FROM RELIABLE DEALERS!

When to Oil	Station Number	Instructions	Parts Lubricated	Specifications
Check Daily	1	Keep filled above low limit on gage.	Arbor support bearing.	TEXACO REGAL Oil "B" (R & O)
	3	Keep filled above low limit on gage.	Spindle drive gears and bearings.	P-55. Good quality paraffinic base rust and oxidation inhibited oil. Viscosity range 200-220 S.U.S. @100°F.
	4	Keep filled above low limit on gage at left of filler.	Gears and bearings in knee. Table-saddle and saddle-knee ways.	
	5	Spring cap oil cups. Keep filled.	Table leadscrew bearings and auxiliary drive shaft bushings.	
	6	Spring cap oil cups. Keep filled.	Knee-column ways.	
Check Weekly	7	Maintain oil level to threads in filler pipe. Fill with knee at bottom of screw.	Vertical screw.	P-63. Lead Naphthenate type oil. Viscosity range 300 to 360 S.U.S. @100°F. LUBRI-CANT 1
Weekly	2	Two or three shots of grease with hand gun. Do not over-grease.	Motor and pulley sheaves.	P-64. Premium quality No. 2 Lithium base grease. TEXACO MULTIFAK 2

P-55, P-63 and P-64 are specification numbers of The Cincinnati Milling Machine Company.

A list of approved products corresponding to the above specifications may be obtained from our Field Service Department.

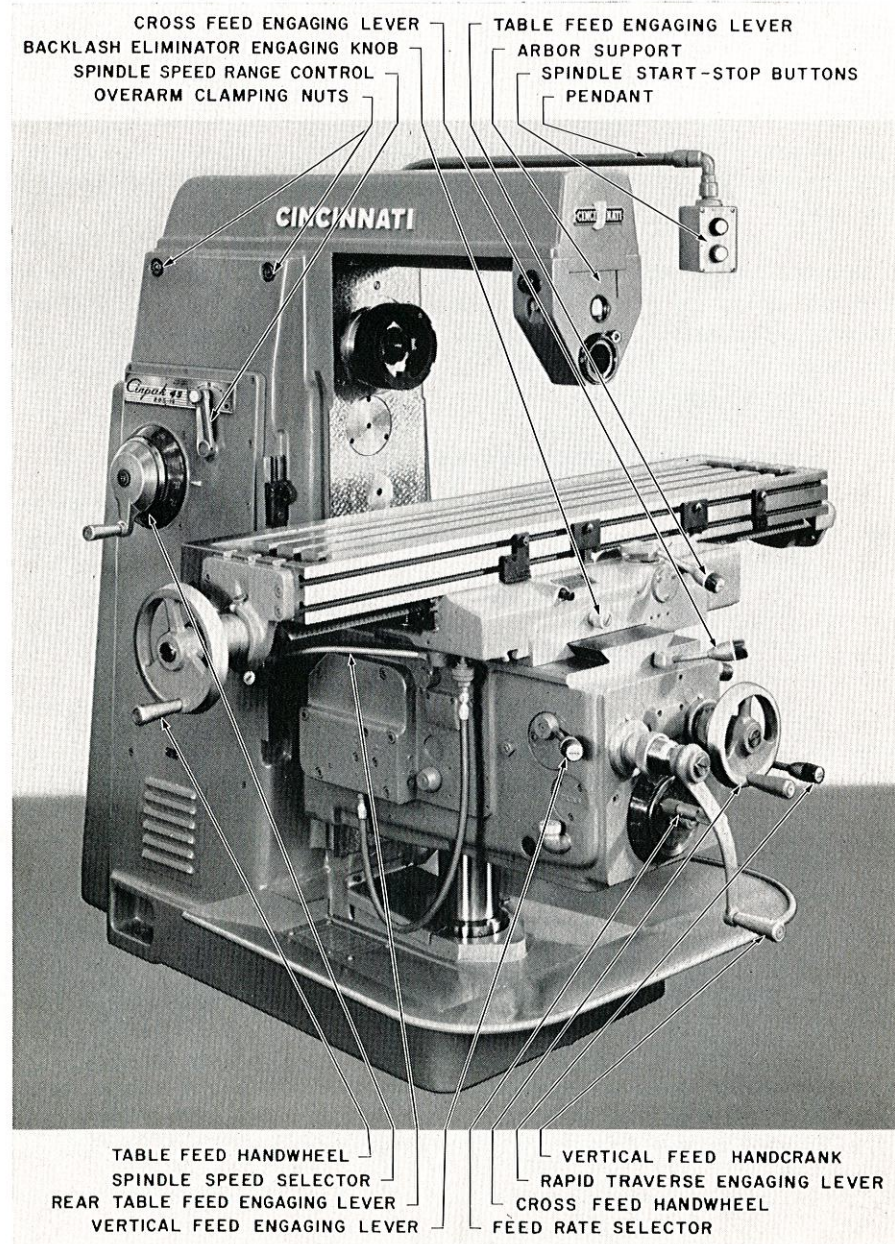


Figure 14
Functional Diagram

OPERATING INSTRUCTIONS

The following general operating instructions apply to both plain and universal Cinpak 45 milling machines. If the machine is being started for the first time be certain that the procedures outlined under "Installation Instructions," pages 9-11, and "Lubrication," pages 12-13, have been followed before you proceed with a machining operation.

Starting the Machine. Place the longitudinal, cross and vertical power feed levers in the neutral position (see Figures 18A and 19). Turn the disconnect switch to the "on" position, as shown in Figure 15A. Place the spindle directional control lever (Figure 15B) in the "forward" or "reverse" position. The spindle drive motor in the column, and the feed drive motor in the knee are now energized.

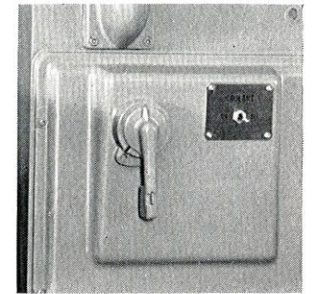


Figure 15A
Disconnect Switch

Starting the Spindle. Start the machine. Set the spindle speed range selector lever (Figure 15B) to the "high" or "low" position, depending upon spindle speed desired. Start the spindle by pressing the "start" button on the pendant. "Forward" position of the spindle directional control lever should cause the spindle to rotate in a counter-clockwise direction, when viewed from the front of the machine. *Be certain* that you have pressed the "stop" button on the pendant, and that the spindle has stopped, *before* you attempt to change the direction of spindle rotation or range of spindle speed.

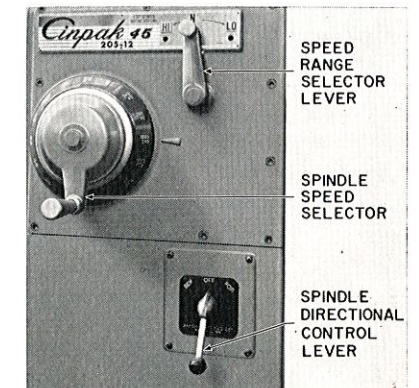


Figure 15B
Controls for Spindle Speed
and Direction of Spindle Rotation

Changing Spindle Speed. Each increment of the spindle speed selector dial (Figure 15B) consists of two numbers. The higher number represents the rpm at which the spindle will rotate if the speed range lever is at the "high" position. The lower number represents the rpm at which the spindle will rotate if the speed range lever is at the "low" position. To change spindle speed *within* either the high or low range, first start the spindle, then rotate the crank on the speed selector dial in either direction, until the desired speed is aligned with the indicator button. If it becomes necessary to change spindle speed range to reach the desired rpm, stop the spindle before shifting the speed range selector lever.

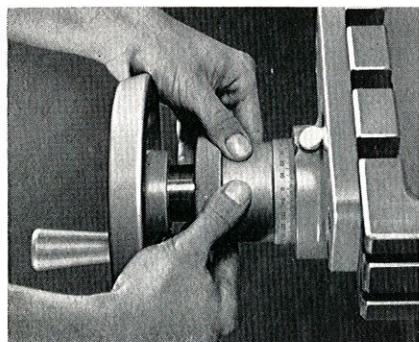


Figure 16A
Micrometer Dial

Micrometer Dials. Longitudinal, cross, and vertical hand controls are equipped with adjustable micrometer type dials (Figure 16A) for accurately positioning the moving units. To change position or setting of the dial without moving the handwheel, pull out on the dial, rotate it to the desired position, and release. Spring tension will re-seat the dial.

Table Traverse Handwheel. To move the table by hand when power feed is disengaged, push in on the handwheel (Figure 16B) until you feel the clutch teeth mesh, then turn the handwheel in either direction. Each complete revolution of the table traverse handwheel in a clockwise direction will move the table .250" away from the operator. The dial is graduated in 250 spaces, each space equalling .001". A built-in safety feature prevents use of the table traverse handwheel when the table power feed lever is engaged.

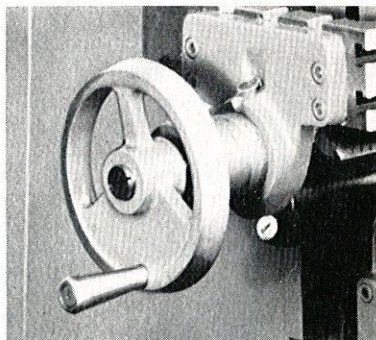


Figure 16B
Table Traverse Handwheel

Saddle Traverse Handwheel. To move the saddle by hand when power feed is disengaged, push in on the handwheel (Figure 16C) until you feel the clutch teeth mesh, then turn the handwheel in either direction. Each complete revolution of the saddle traverse handwheel in a clockwise direction will move the saddle .250" away from the operator. The dial is graduated in 250 spaces, each space equalling .001". A built-in safety feature prevents use of the saddle traverse handwheel when the saddle power feed lever is engaged.

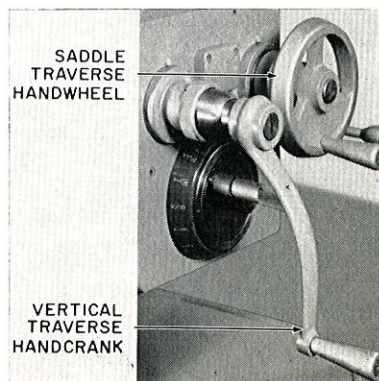


Figure 16C
Cross and Vertical
Hand Feed Controls

Vertical Traverse Handcrank. To move the knee by hand when power feed is disengaged, push in on the handcrank (Figure 16C) until you feel the clutch teeth mesh, and turn the handcrank in either direction. Each complete revolution of the handcrank in a clockwise direction will raise the knee .125". The dial is graduated in 125 spaces, each space equalling .001". A built-in safety feature prevents use of the vertical traverse handcrank when the vertical power feed lever is engaged.

Selecting the Feed Rate. Each increment of the feed selector dial represents a rate of power feed in inches per minute for the table and saddle. Vertical, or knee feed rates are *half* of the amount shown on the dial. Figure 17B shows the feed selector dial set for feed rates of $\frac{5}{16}$ and $\frac{1}{4}$ inches per minute. To select a different feed rate, pull out the handle on the feed change lever (Figure 17A) and rotate it in either direction until the desired rate is aligned with the indicator button, then release the handle, allowing the pin to engage the hole in the face of the dial. Each half revolution of the crank will advance the feed selector dial (in the same direction) to the next feed rate.

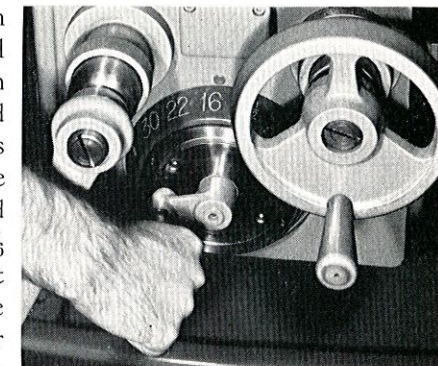


Figure 17A
Changing the Feed Rate

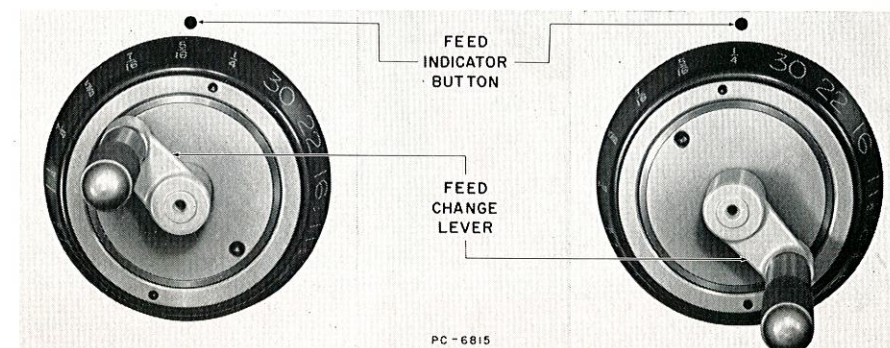


Figure 17B
Left: Feed Dial Set for Feed Rate of $\frac{5}{16}$ " per Minute
Right: Feed Dial Set for Feed Rate of $\frac{1}{4}$ " per Minute

Power Feed Levers. Power feed is engaged to the table, saddle, or knee by moving the power feed lever for the particular unit in the direction you want it to feed. If you want the table to feed right for example, push the table feed engaging lever to the right. Before engaging power feed to a sliding unit, be certain that it is not secured by a clamping device (see page 27). The spindle drive motor must be energized by pressing the "start" button on the pendant before any of the sliding units will feed under power. There are occasions, such as during a set-up, when you will want to engage power feed with the spindle stopped. This can be done by first placing the spindle speed range selector lever in the neutral position, and then pressing the "start" button on the pendant. Power feed can then be engaged to table, saddle, or knee with the spindle stopped. **CAUTION:** Be certain to press the spindle "stop" button on the pendant before moving the spindle speed range selector lever to "high" or "low" position.

Longitudinal Feed Levers. Power feed to the table can be engaged from either of two working positions. If the front table feed lever shown in Figure 18A is moved from the neutral position to the right, the table will feed right; if moved from the neutral position to the left, the table will feed left. The rear table feed lever shown in Figure 18B is provided for longitudinal feed control from a behind the table operating position. When the lever is moved toward the front of the machine, the table will feed right. Moving the lever toward the rear of the machine will cause the table to feed left.

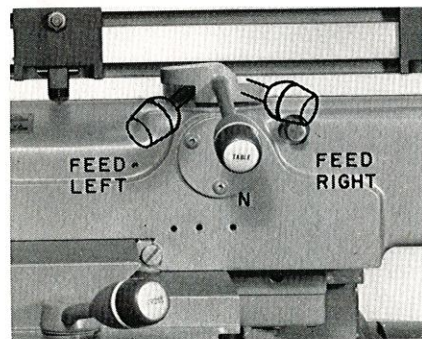


Figure 18A
Front Table Feed Lever

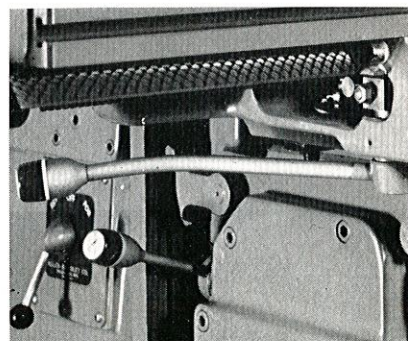


Figure 18B
Rear Table Feed Lever

Before engaging either of the longitudinal power feed levers, be certain that the table clamping screws are loose. For maximum rigidity, tighten the knee and saddle clamping devices when using longitudinal feed only.

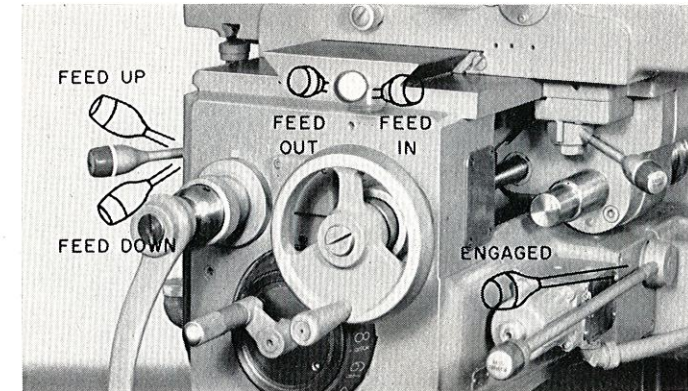


Figure 19
Cross and Vertical Power Feed Levers and Rapid Traverse Engaging Lever

Cross Feed Lever. The power cross feed engaging lever is shown in Figure 19. When this lever is moved from the neutral position toward the saddle, or "in", the saddle will feed toward the column. When the lever is moved from the neutral position away from the saddle, or "out", the saddle will feed away from the column. Before engaging power feed to the saddle, be certain that the saddle clamping lever is loose. For maximum rigidity during the machining operation, tighten the knee clamping lever and table clamping screws when using power cross feed alone.

Vertical Feed Lever. The power vertical feed engaging lever is shown in Figure 19. When this lever is moved upward from the neutral position, the knee will feed up. When the lever is moved downward from the neutral position, the knee will feed down. Before engaging power feed to the knee, be certain that the knee clamping lever is loose. For maximum rigidity during the machining operation, tighten the saddle clamping lever and table clamping screws when using power vertical feed alone.

Power Rapid Traverse. To engage power rapid traverse to the table, saddle, or knee, first engage the feed lever for the unit and then lift the rapid traverse lever (Figure 19). Rapid traverse may be engaged with the spindle running or stopped. **WARNING:** If you hear a clicking or snapping noise when rapid traverse is engaged, stop the machine. This noise is caused by the safety gear slipping due to interference between feeding and stationary members of the machine. The safety gear will also slip if the feed rate is too high. Rapid traverse for longitudinal and cross movements is 150 inches per minute, and 75 inches per minute for vertical movement.

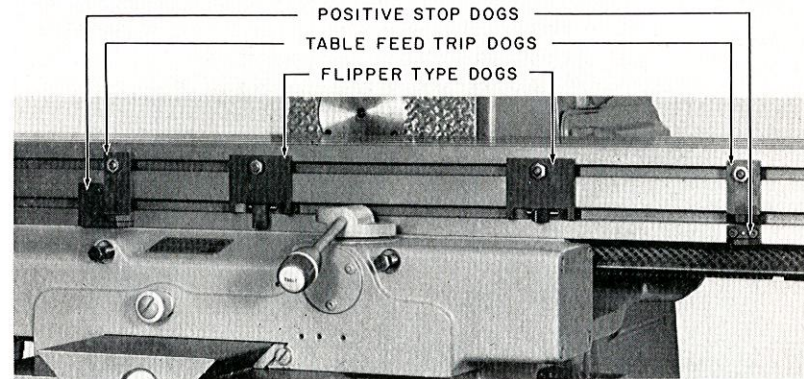


Figure 20
Table Feed Trip Dogs and Stop Dogs

Table Dogs. The table dogs (Figure 20) will disengage the table feed lever at any desired point throughout the range of table travel.

When the table feed lever is disengaged by one of the solid feed trip dogs, table feed can be resumed *only* in the opposite direction. For this reason, the feed trip dogs should be placed at the beginning and end of table travel for a particular machining operation.

If the set-up requires a pause in table travel for a tool change or fixture adjustment, position a flipper type dog to trip the table feed lever at that particular point. The flipper type dog will disengage the table feed lever and, unlike the table feed trip dogs, permit you to resume table feed in either direction.

When positioning the dogs, be certain that the long dogs are to the left of the table feed lever, and the short dogs are to the right.

Positive stop dogs are screwed and pinned to either end of the table. These dogs are installed at the factory to limit table travel to a safe range. *Do not* remove the positive stop dogs to obtain a greater range of table travel.

Cross Feed Trip Dogs. The length of power cross feed is determined by setting the cross feed trip dogs, located under the left hand end of the saddle (Figure 21A). Positive stop dogs are installed to limit cross travel within a safe range. *Do not* remove the positive stop dogs to obtain a greater range of cross travel.

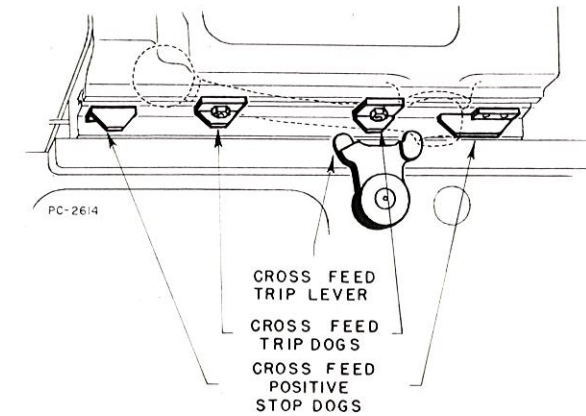


Figure 21A
Cross Feed Trip Dogs and Stop Dogs

Vertical Feed Trip Dogs. The length of power vertical feed is determined by setting the vertical feed trip dogs, located at the left of the knee-column bearing (Figure 21B). Positive stop dogs are installed to limit vertical travel to a safe range. *Do not* remove the positive stop dogs to obtain a greater range of vertical travel.

Changing Work Material. Covers are provided for the cutting fluid drains at either end of the table. When working with materials which do not require a cutting fluid (cast iron in particular), use the covers to keep fine chips and particles out of the cutting fluid system. Remove the covers when machining a material which requires cutting fluid.

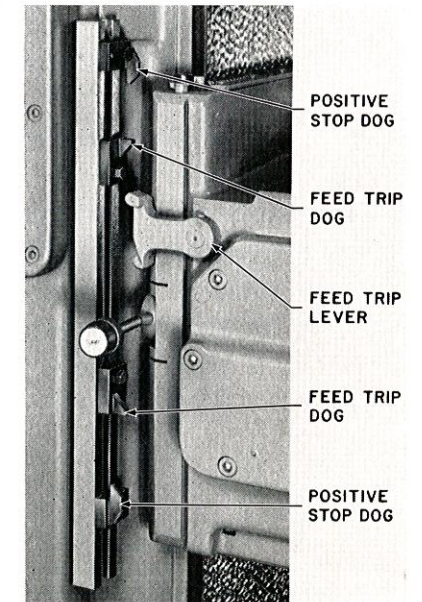


Figure 21B
Vertical Feed Trip Dogs and Stop Dogs

It's a good idea to remove chips as they accumulate on the table and on the knee-saddle bearing. Use a brush or lint free rag to clean these surfaces. Never use compressed air, as this will force chips and particles between the bearing surfaces, resulting in rapid wear.

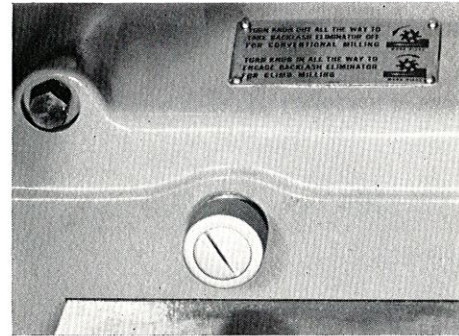


Figure 22A
Backlash Eliminator Engaging Knob

Backlash Eliminator. The backlash eliminator engaging knob (Figure 22A) should be turned all the way in for climb, or down milling operations (see Figure 22B). When this device is engaged, the "play" or backlash which normally exists between the leadscrew and nut is eliminated. The removal of this backlash is necessary to prevent the set-up from being pulled under the cutter by the force of a climb milling cut.

The backlash eliminator engaging knob may remain engaged for conventional, or up milling operations (see Figure 22B). During a conventional milling cut, or when the table rapid traverse is engaged, the backlash eliminator is automatically disengaged. There should be no need to adjust this unit, unless it has been previously mis-adjusted. If adjustment is necessary, follow the instructions on page 35.

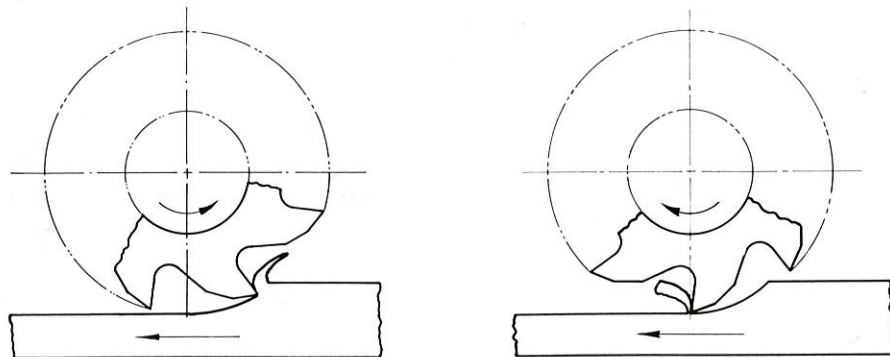


Figure 22B
Left: Conventional, or up milling
Right: Climb, or down milling

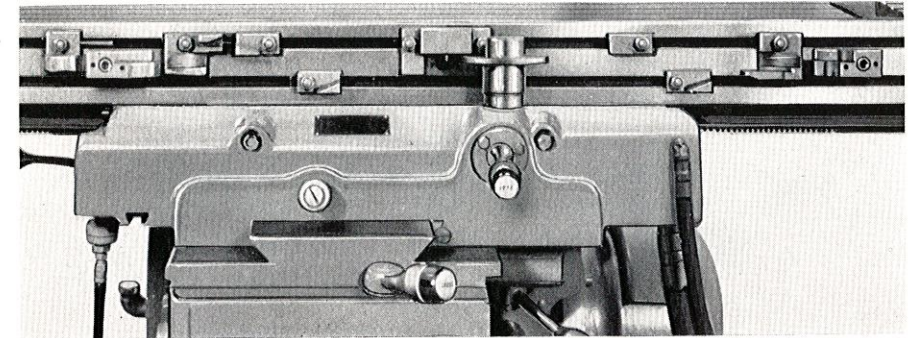


Figure 23A
Automatic Table Cycle Control for
Cincinnati Cinpak 45 Plain Milling Machine

Automatic Table Cycles for Cinpak 45 Milling Machines. Standard Cinpak 45 Milling Machines, without Automatic Cycle, have a three-position table control lever and table dogs which act only to stop the table movement out of feed in either direction. When these machines are provided with Automatic Cycle; a five-position table control lever (Figure 23B) is provided for hand control of table movements and table dogs act to provide completely automatic shifting from feed to rapid traverse, rapid traverse to feed, feed to rapid traverse in opposite direction, and feed to stop. Eight adjustable table control dogs are supplied with the

Automatic Cycle; 2 feed dogs, 2 rapid traverse dogs, 2 reverse dogs, 1 stop dog, and 1 safety stop dog.

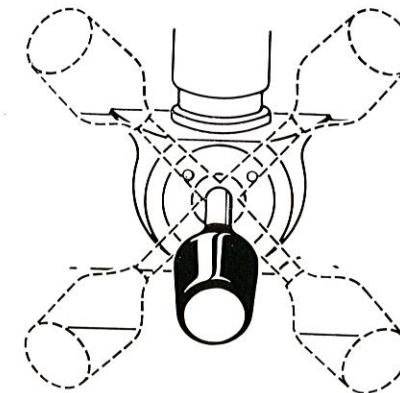


Figure 23B
Table Control Lever

The table control lever in Figure 23B is shown in the five operating positions. The two lower positions will engage table feed to either left or right, depending upon the direction in which the lever is moved. At either of the two upper positions, the table will rapid traverse to the left or right, again depending upon the direction in which the lever is moved. Central position is table stop.

The extreme positions of table movement in either direction are limited by two dogs permanently pinned to the front of the table. These dogs provide a safety measure to prevent power movements of the table beyond its actual operating range.

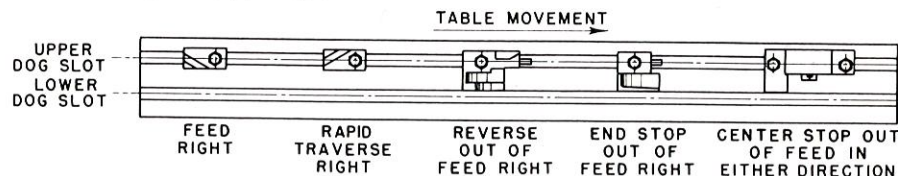


Figure 24A
Dogs Which Act with Table Moving to the Right

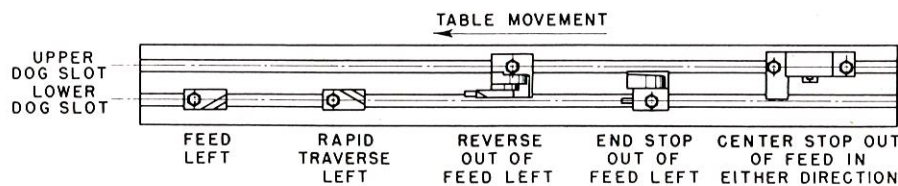


Figure 24B
Dogs Which Act with Table Moving to the Left

The feed dogs and rapid traverse dogs are of the same pattern, their function being merely to raise or lower the dog trip plunger. The upper position of the trip plunger initiates the feed rate, the lower position initiates the rapid traverse rate. Of the four dogs supplied, two are right-hand; two are left-hand. These dogs are used in the upper dog slot to control table movement to the right; in the lower dog slot to control table movements to the left.

The reverse dogs reverse the table from feed to rapid traverse in the opposite direction. One left-hand and one right-hand dog are supplied. Both dogs are mounted in the upper dog slot.

The stop dog acts to stop the table from feed. It is non-directional and can be used to trip the table out of feed in either direction. When mounted in upper dog slot it stops table when feeding to the right, when mounted in lower slot it stops table when feeding to the left.

The safety stop dog also acts to stop the table from feed in either direction, but is supplied particularly to provide an automatic safety stop in the center of an automatic reciprocating cycle. It is mounted in the upper dog slot and acts to stop the table from both directions of feed.

On Automatic Cycle machines, the action of the rapid traverse control lever on the side of the knee is independent of the table control lever. When the table control lever is shifted, by hand or by the table dogs, into

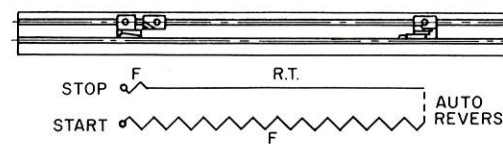
the rapid traverse position, the rapid traverse lever is not affected but remains in the neutral position. Conversely, if the table control lever is in the feed position, engaging the rapid traverse lever will put the table in rapid traverse without changing the position of the table control lever.

The cycle drawings on the following pages illustrate just a few of the many useful automatic cycles which can be obtained. Cycles can progress in either direction or, as in the case of the automatic reciprocating cycle, in both directions.

In reading the cycle drawings, they progress in the opposite direction to the actual table movement, as this illustrates the relative movement between the trip plunger and the trip dogs so that the dog can be shown directly above the cycle function it controls.

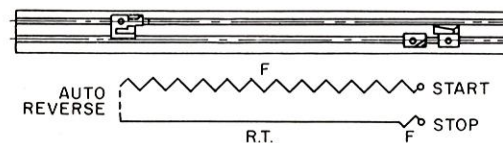
The short feed stroke at the end of some rapid traverse strokes is used to permit the table to be automatically stopped. If you have a cycle requiring more than one automatic stop, the second stop can be accomplished by using the center safety stop dog.

Cycles are started by shifting the table control lever to give the desired movement.



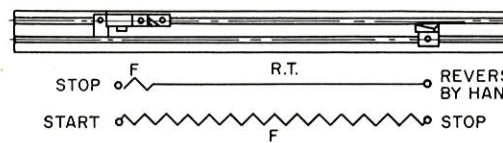
Cycle A

Simple milling cycle, automatic reverse and rapid return feeding left. Feed left, automatic reverse, rapid traverse right, short feed right, stop.



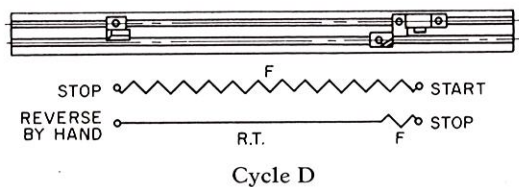
Cycle B

Simple milling cycle, automatic reverse and rapid return, feeding right. Feed right, automatic reverse, rapid traverse left, short feed left, stop.

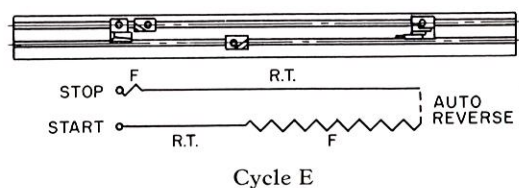


Cycle C

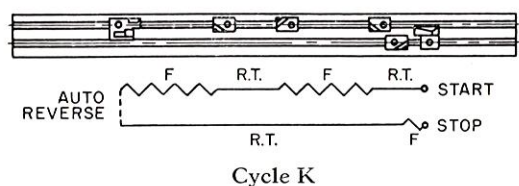
Simple milling cycle, feed to stop, hand controlled reverse and rapid return, feeding left. Feed left, automatic stop, reverse by hand, rapid traverse right, short feed right, stop.



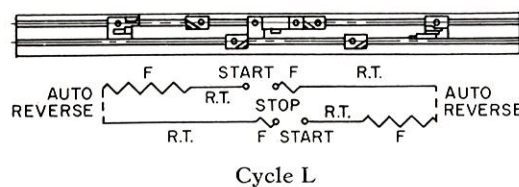
Simple milling cycle, feed to stop, hand controlled reverse and rapid return, feeding right. Feed right, automatic stop, reverse by hand, rapid traverse left, short feed left, stop.



Simple milling cycle, rapid approach, automatic reverse and rapid return, feeding left. Rapid traverse left, feed left, automatic reverse, rapid traverse right, short feed right, stop.



Intermittent feed cycle, rapid approach, automatic reverse and rapid return, feeding right. Rapid traverse right, feed right, rapid traverse right, feed right, automatic reverse, rapid traverse left, short feed left, stop.



Reciprocating cycle, rapid approach, automatic reverse and rapid return, feeding both right and left, with center safety stop. Rapid traverse left, feed left, automatic reverse, rapid traverse right, short feed right, stop. Rapid traverse right, feed right, automatic reverse, rapid traverse left, short feed left, stop.

SETTING UP THE MACHINE

Clamping Devices. In order to obtain the maximum in rigidity during a machining operation, it is advisable to clamp the sliding units which will not be in motion. The clamping devices are intended for this purpose only and are not designed as a means to compensate for wear between the sliding units. Tapered gibs are provided for this purpose and they should be used when it becomes necessary to adjust for wear. (See "Adjusting the Gibs" on page 36 for correct procedure.) Before engaging the power feed lever on the table, saddle, or knee, check the clamping device on the unit to be certain that it is loose.

The table is clamped by tightening two screws on the saddle (Figure 27A). These screws should be tightened only when power feed to the table will not be used in the machining operation. Four clamping screws (Figure 28) are provided to secure the housing on a universal machine. Two are located on the front of the housing, below the table clamping screws, and two are at the rear of the housing. These screws should be loosened only to swivel the table during a set-up.

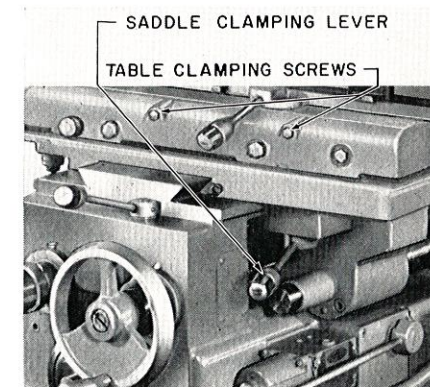


Figure 27A
Table and Saddle Clamping Devices

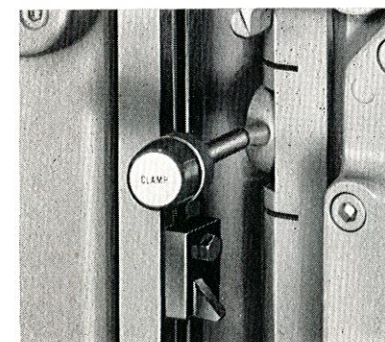
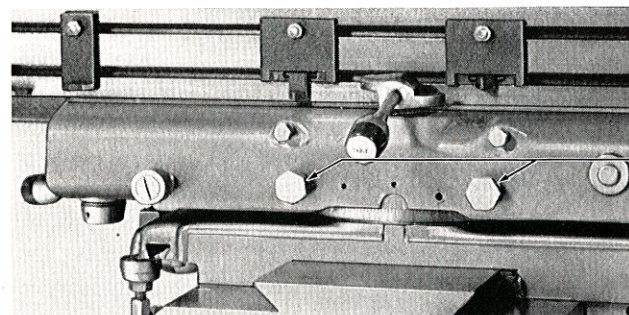


Figure 27B
Vertical Clamping Lever

The saddle clamping lever is located at the right side of the knee (Figure 27A). Tighten the saddle clamping lever when power cross feed will not be used in the machining operation.

The vertical clamping lever is located at the left rear section of the knee (Figure 27B). Tighten the vertical clamping lever when power vertical feed will not be used in the machining operation.



FRONT HOUSING
CLAMPING SCREWS
ALSO TWO AT
REAR OF HOUSING

Figure 28
Housing Clamping Screws

Fixture. The fixture should be positioned as near to the center of the table as operating conditions will permit. This practice prevents undue wear on the table gibs caused by overhang of the table. To insure maximum rigidity, it is also advisable to locate the fixture as close as possible to the face of the column. The table T-slots are accurately machined and should be used to obtain proper alignment of the fixture and cutter. They also provide a means for clamping the fixture to the table. These are the only two purposes for which table T-slots are designed. They should never be used for any purpose which could result in loss of the original accuracy. If the T-slots become marred or otherwise damaged, the work or fixture which is located in them cannot be properly aligned with the cutter. In this case, the T-slots would have to be re-planed or a new table purchased to restore the original accuracy.

Before placing the fixture on the table, be certain that the top of the table and the bottom of the fixture are free of chips and dirt. Dirt particles between the table and fixture will cause misalignment with the cutter as well as scoring of the table surface. If nicks are present on either the fixture or the table, stone them down lightly with a fine oilstone.

After the set-up is completed, make a "trial run" by feeding the sliding units which will be involved on the job. Be certain that there is clearance between moving and stationary members of the machine, such as fixtures and arbor supports, fixture and arbor, fixture and column, etc.

Arbor-Loc Spindle Nose. When placing a cutting tool in the Arbor-Loc spindle nose, proceed as follows: Rotate the adapter nut in a counter-clockwise direction until the set screw in the adapter nut contacts the lugs on the split ring. This assures alignment of the adapter nut lugs and the driving keys. Place the tapered shank of the cutting tool in the spindle (Figure 29A), being certain that the driving keys and the slots on the arbor flange are engaged. Rotate adapter nut clockwise about 15 degrees to snug the tool in position, then tighten securely with the spanner wrench provided.

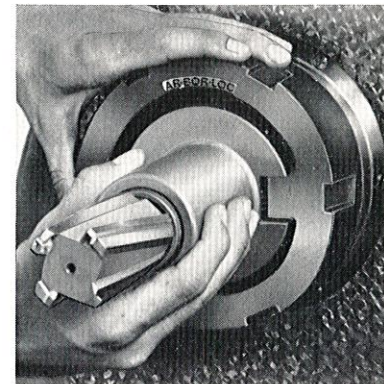


Figure 29A
Placing a Tool in the
Arbor-Loc Spindle Nose

Assembling Arbor-Loc on Spindle Nose. If the Arbor-Loc has been removed from the spindle nose for the use of some attachment or for large face milling cutters, it requires but a few minutes to reassemble. Proceed in the following manner:

1. Center the split ring (Figure 29B) on the machine spindle nose driving keys and at the same time fit them in the groove around the spindle.
2. Stretch the adapter spring (Figure 29C) around the split ring, snapping it in the groove designed in these unit parts.
3. Adapter nut is then screwed on split ring.
4. Stop screw, shown in Figure 29D, is then screwed in adapter nut. This screw has a predetermined length for the purpose of eliminating excessive turning of the nut when mounting or removing arbors and adapters. It should be screwed in until the head is seated against the co-bored hole.

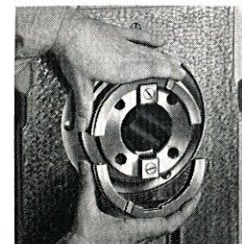


Figure 29B



Figure 29C

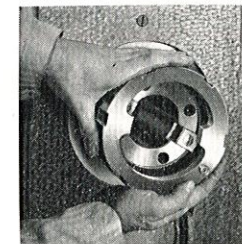


Figure 29D

CUTTING FLUID SYSTEM

Care and Maintenance. Clean the cutting fluid reservoir at the base of the machine periodically. This will insure a full capacity for cutting fluids and prevent conditions which lead to rancidity.

To clean the reservoir, first remove the chip pan at the base of the machine. Pump out the cutting fluid and remove any sludge or sediment which may have settled to the bottom of the reservoir. Wipe chip pan and reservoir clean with a rag, and blow out the strainers in the chip pan with compressed air. To insure cleanliness of the reservoir and cutting fluid lines, use CIMCOOL machine cleaner. It will remove grit and dirt and cut any slime or oil which clings to the walls of the reservoir or inside the coolant lines. Use one gallon of CIMCOOL machine cleaner to 25 gallons of hot water. Circulate the mixture through the cutting fluid system for a half hour, and rinse with clean hot water for three minutes. After the system has been cleaned, recharge with a fresh CIMCOOL mixture (See page 31 for correct dilutions). Replace chip pan before starting a machining operation.

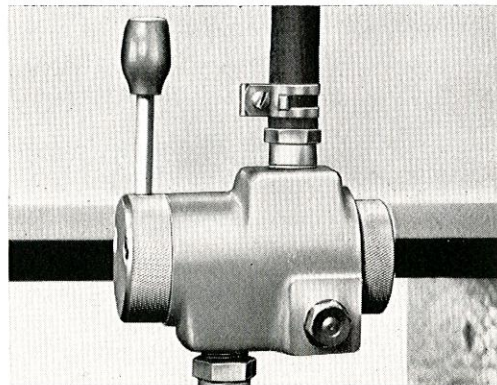


Figure 30
Cutting Fluid Valve

Cutting Fluid Valve. With the shut-off lever in the "on" position, as shown in Figure 30, adjust the rate of flow to the cutter by turning the knurled knob at the rear of the valve. Once the desired rate of flow has been established, there will be no need to make an adjustment each time the shut-off lever is turned off and on.

The valve is mounted on a movable bracket which can be clamped at the most convenient operating position.

RECOMMENDED CUTTING FLUIDS

CIMCOOL[®], made by the Products Division of The Cincinnati Milling Machine Company is a cutting fluid resulting from a mixture of FIVE-STAR CIMCOOL concentrate and water. FIVE-STAR CIMCOOL is recommended because of outstanding advantages, particularly in reducing heat at the tool point, freedom from rancidity, cleanliness, freedom from rust, and absence of vapors, hot chips and slippery film.

The amount of FIVE-STAR CIMCOOL concentrate varies with the nature of the job requirements. The table below lists the starting dilutions of CIMCOOL to use when milling various materials.

RECOMMENDED CIMCOOL MIXES

Material	Average Milling Cutters	Form and Low Clearance Cutters
Mild Steel Malleable Iron Wrought Iron Bronze	FIVE-STAR CIMCOOL 1:40	FIVE-STAR CIMCOOL 1:25
Cast Iron	FIVE-STAR CIMCOOL 1:40	FIVE-STAR CIMCOOL 1:40
Brass Soft Bronze	CIMCOOL S-2 1:40	CIMCOOL S-2 1:25
Aluminum	FIVE-STAR CIMCOOL 1:40	FIVE-STAR CIMCOOL 1:25
Cast Steel Tool Steel and other high tensile strength steels	FIVE-STAR CIMCOOL 1:25	FIVE-STAR CIMCOOL 1:20

FIVE-STAR CIMCOOL may also be used with carbide tipped cutters; however, a large quantity of fluid should be supplied to insure uniform cooling and to avoid cracking the carbide tips.

General Instructions. Never mix FIVE-STAR CIMCOOL with other cutting fluids. Clean cutting fluid system and tank thoroughly with CIMCOOL machine cleaner before using.

Always add a pre-mixture of FIVE-STAR CIMCOOL concentrate and water when replenishing the cutting fluid supply.

ADJUSTMENTS

Adjusting the Lead Screw Bearings. If the amount of "play" in the table handwheel becomes greater than .005", the lead screw bearings should be adjusted in the following manner:

1. Back out the table gib by turning the gib adjusting screw two or three turns in a counter-clockwise direction. Table gib is located at left front of saddle-table dovetail.
2. Remove the cap (Figure 32) at the right-hand end of the table.
3. Loosen the lock screw and tap it lightly to free the lock shoe.
4. Tighten the adjusting nut with a face spanner wrench and then back the nut away no more than $\frac{1}{16}$ turn.
5. Tighten the lock screw and replace the cover.
6. Place the table power feed lever in the neutral position. The table handwheel should turn without undue force, and "play" in the lead screw should be no greater than .005".
7. Re-adjust the gib (See Page 36).

If the bearings have been adjusted properly, and "play" is in excess of .005", the leadscrew or nut is worn and will have to be replaced to obtain accurate work.

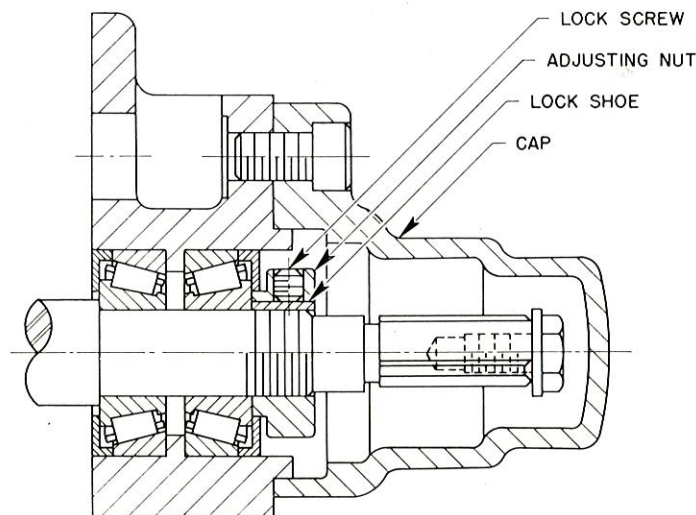


Figure 32
Section Through Table Lead Screw Bearings

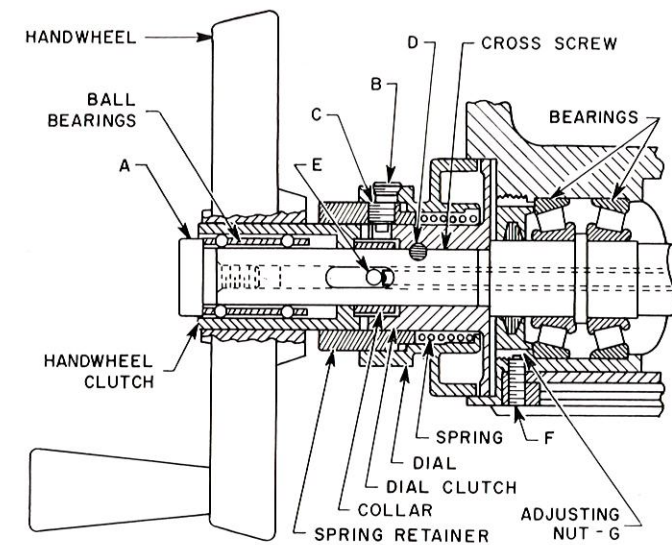


Figure 33
Section Through Handwheel and Front Bearing of Cross Screw

Adjusting the Cross Screw Bearings. The cross screw bearings should be adjusted when "play" at the cross feed dial is in excess of .005". The bearings are located in the knee, just behind the cross feed handwheel and dial assembly. Follow the procedure outlined below when adjusting these bearings (See Figure 33).

1. Loosen the gib located at the right side of the knee saddle bearings by backing out the adjusting screw two or three turns.
2. Remove screw "A" from the center of the handwheel and pull off the handwheel, ball bearings, and clutch.
3. Remove screw plug "B" and rotate the dial until set-screw "C" is visible through the hole. Remove set-screw "C".
4. Slide the dial, spring retainer and spring off the dial clutch.
5. Pin "D" and screw "E" are now visible. Tap out pin "D" and remove screw "E". Slide collar and dial clutch off the cross screw.
6. Remove set screw "F", located in the knee casting near the dial.
7. Adjust the bearings by turning adjusting nut "G" until tight, then back off one slot.
8. Clean all parts in naphtha and allow to dry. Lubricate the ball bearings with a few drops of light oil. Do not blow air into cross screw bearings. Replace parts in the reverse order in which they were removed.
9. Re-adjust knee-saddle gib. (See page 36).

Turn the cross feed handwheel with the power cross feed disengaged and try to determine by "feel" if the bearings have been adjusted correctly. Adjustment should not be so tight as to make hand movement of the saddle difficult, nor should there be a noticeable amount of play in the handwheel.

Adjusting the Spindle Bearings. If the machine is used for general purpose work, there should be .001" end play in the spindle bearings. Machines which operate continuously at high spindle speeds should have .002" end play in the spindle bearings.

Check spindle end play periodically by placing a 1/10,000 indicator on the face of the spindle nose, and tapping the spindle from front to rear. This check must be made with the spindle bearings cold.

If bearings are properly adjusted, spindle temperature should not exceed 115° during operation at highest speed. Spindle temperature is checked with a thermometer, inserted into one of the screw holes in the spindle cap.

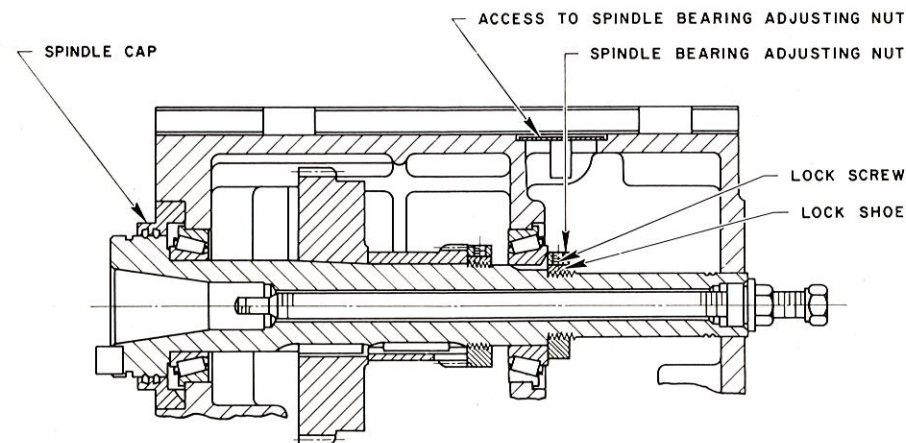


Figure 34
Section Through Spindle Bearings

Follow the procedure outlined below when spindle adjustment becomes necessary (See Figure 34).

1. Move the spindle speed range selector lever to the neutral position.
2. Remove the driving keys from the spindle nose and clamp a rod 10" or 12" long in the key slot.
3. Move the overarm forward until it is clear of a small rectangular plate in the top of the column. Be sure that the extended section of the overarm is supported.

4. Remove the plate and rotate the spindle until the lock screw in the spindle bearing adjusting nut is visible.
5. Using a long hex-head wrench, loosen the socket head screw. Tap the end of the wrench to loosen the locking shoe beneath.
6. With the wrench in position, turn the spindle counter-clockwise one revolution with the rod in the spindle nose, and then clockwise until the bearings are drawn up tight.
7. Re-tighten the socket head screw and remove the wrench.
8. Rotate the spindle several times by hand to properly seat the bearings and to be certain that they are adjusted correctly.
9. Replace the rectangular plate, move the overarm to its former position and remove the rod from the face of the spindle.

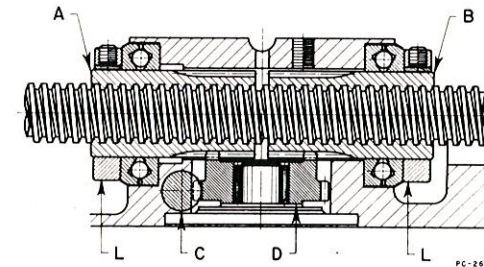


Figure 35
Section Through Backlash Eliminator

Adjusting the Backlash Eliminator. Normally, this unit is self compensating for wear and should not require adjustment for many months. Any need for adjustment will be indicated by (1) lugging table movements while climb milling or (2) if the knurled engaging knob becomes difficult to turn over most of its entire range or (3) if the table handwheel becomes difficult to turn, the adjustment may be too tight. Follow the procedure outlined below when adjustment becomes necessary:

1. Remove the table as follows: Remove cap (Figure 32) from right end of table, and remove screw from end of leadscrew. Loosen lock screw, tap to free the lock shoe under it and remove bearing adjusting nut (Figure 32). Remove screws which hold apron to table, tap apron to free sealed joint, and remove the apron with its two double diameter pins.

Remove the table handwheel assembly by following steps 2 through 5 under "Adjusting the Cross Screw Bearings (page 33)". Remove screws which hold apron to the table and tap apron to break sealed joint. Slide apron with its two double diameter pins and leadscrew bushing off leadscrew.

Remove the table gib at table-saddle bearing on left side of saddle. Fasten a U-clamp to center slot of table, relieve weight of table, and slide it out of saddle V-ways. Pencil mark gib at edge of table to

facilitate re-setting when assembling. Turn backlash eliminator knob at front of saddle to disengaged position.

- Loosen the set screws in adjusting nuts "L" and tap to free lock-shoes under screws. Tighten adjusting nuts until they are snug against their thrust bearings. Normally, only a fractional turn of the nuts is sufficient. With a rag around the leadscrew, it should be possible to rotate the leadscrew by hand. When knurled knob is turned in 2 to 2½ turns, hand rotation of the leadscrew should be impossible. However, you should be able to turn the knurled knob in another 2 to 2½ turns before backlash eliminator becomes fully effective.

It may be necessary to further tighten or slightly loosen nuts "L" to obtain the correct setting. Tighten set screws in adjusting nuts when proper setting is made.

- Slide the table back into position, clean and apply sealer to face of table aprons, then mount them and adjust table leadscrew bearings (page 32). Reset table gib (Figure 36).

Adjusting the Gibs. Headless type taper gibs are provided to compensate for wear of the bearing surfaces between the sliding elements. Keep the bearing surfaces clean to avoid undue wear caused by dirt and grit.

- See that the power feed engaging lever of the unit containing the gib to be adjusted is in the neutral position.
- Turn the adjusting screw (Fig. 36) to tighten the gib. Try movement of the unit by hand. Alternately tighten the screw and try by hand until unit is fairly tight, back screw away two turns, and then advance one turn.

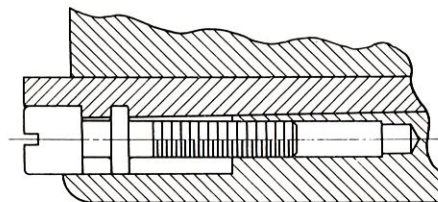


Figure 36
Section Through Headless Type Gib

When adjustment of the gibs is necessary, they should never be drawn up so tightly as to prohibit free movement of the particular unit by means of the hand crank. Tight adjustment squeezes out the oil film, resulting in rapid wear.

ACCESSORIES AND ATTACHMENTS

ARBORS—"50" Spindle Series

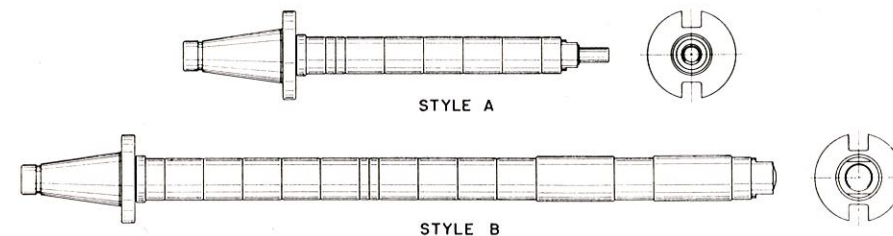


Figure 37—Conventional Milling Machine Arbors

Catalog Number	Diameter	Style	Usable Length of Cutter Space	Diameter of Bearing Collar	Keyway		Code Name
					Width	Depth	
50- 7/8A10	7/8	A	10	None			TENAR
50-1 A12	1	A	12	None	1/4	5/32	ARTWA
50-1 A15	1	A	15	None	1/4	5/32	ARBAA
50-1 A18-4	1	A	18	2 1/8	1/4	5/32	ATARB
50-1 B18-4	1	B	18	2 1/8	1/4	5/32	ARBFF
50-1 B24-4	1	B	24	2 1/8	1/4	5/32	ARBFA
50-1 1/4A12	1 1/4	A	12	None	5/16	3/16	ARBCO
50-1 1/4A15	1 1/4	A	15	None	5/16	3/16	AROGU
50-1 1/4A18-4	1 1/4	A	18	2 1/8	5/16	3/16	ARBRU
50-1 1/4B18-4	1 1/4	B	18	2 1/8	5/16	11/64	BETAR
50-1 1/4B24-4	1 1/4	B	24	2 1/8	5/16	3/16	ONARB
50-1 1/2B18-4	1 1/2	B	18	2 1/8	3/8	13/64	HAFAR
50-1 1/2B24-4	1 1/2	B	24	2 1/8	3/8	7/32	FORAR
50-1 1/2B30-4	1 1/2	B	30	2 1/8	3/8	7/32	ARBTY
50-1 1/2B36-4	1 1/2	B	36	2 1/8	3/8	7/32	ARGOB

ARBOR-LOC
SHELL END MILL ARBORS

Catalog No.	Diameter Range of End Mills	Stud Diam.	Code Name
50- 1/2FCFS	1 1/4—1 1/2	1/2	YUWCS
50- 3/4FCFS	1 3/4—2	3/4	YUWCT
50-1 FCFS	2 1/4—2 1/2—2 3/4	1	YUWCU
50-1 1/4FCFS	3—3 1/2	1 1/4	YUWCV
50-1 1/2FCFS	4—4 1/2—5	1 1/2	YUWCW
50-2 FCFS	5 1/2—6	2	YUWCX

ARBOR-LOC COLLETS
(Includes Draw-in Bolt)

Catalog No.	Inside Taper	Code Name
50NS—FEB 7FS	No. 7 B. & S.	YUWEA
50NS—FEB 9FS	No. 9 B. & S.	YUWEB
50NS—FEB 10FS	No. 10 B. & S.	YUWEC
50NS—FEB 11FS	No. 11 B. & S.	YUWED
50NS—FEM 2FS	No. 2 Morse	YUWEE
50NS—FEM 3FS	No. 3 Morse	YUWEF
50NS—FEM 4FS	No. 4 Morse	YUWEG

Always Order Arbors by the Code Name and Catalog Number

Dividing Head and Enclosed Standard Lead Drive Mechanism.

A Cincinnati Universal Dividing Head and Tailstock, and the Enclosed Standard Lead Drive Mechanism are supplied as standard equipment on Cinpak 45 Universal Milling Machines.

This equipment is also available at extra cost for plain machines, permitting machining operations which require accurately spaced divisions about the periphery of the workpiece. Helical milling can be performed on plain machines which are equipped with the Dividing Head and Enclosed Standard Lead Drive Mechanism and the Universal Milling Attachment.

Complete instructions on operation and care of the Dividing Head and Enclosed Standard Lead Driving Mechanism, including lead tables, are contained in an Operator's Instruction Book which accompanies this equipment.

Circular Milling Table. Available with hand or power table drive. 12" or 16" table diameter.

Universal Milling Attachment. Permits milling of helix angles which exceed swivel range of universal table. This attachment will add helical milling operations to plain machines which are equipped with a dividing head and lead drive mechanism.

High Number Index Plates. Set of three index plates which are interchangeable with the standard dividing head index plate. Indexes all numbers up to 200; all even numbers and those divisible by 5 up to and including 400, except 225, 275, 325, 375.

Vertical Milling Attachment. Adds vertical milling operations to plain or universal machines. Driven by machine spindle at a 1:1 speed ratio.

Independent Overhead Spindle. Spindle head is mounted on a special overarm which contains 3 hp drive motor and gearing. Speed change levers are used to select any of eight available spindle speeds.

Raising Blocks and Angle Plates. Raising Blocks are supplied in matched pairs. Useful when increased "swing" is necessary in dividing head work. Angle Plates permit the work to be located at an angle to or offset from the table T-slots.

Chuck. A three-jaw universal chuck is available for the dividing head in 6" or 9" sizes.

Vises. Plain, Swivel, Toolmakers Universal, All-Steel. Available for a wide variety of work holding applications.

SAFETY PRECAUTIONS

Safety stop dogs are provided for all sliding units. Do not remove these dogs in an effort to obtain more travel, as serious damage to the machine may result. If the job requires a greater range than the safety dogs allow, it must be milled on a machine with greater table travel.

Do not start the machine until all of the oiling stations have been filled with the proper amount of correct lubricants, as shown in the specifications, Page 13.

The electrical compartment door should never be opened except by an experienced maintenance man for electrical control repair work.

Do not try to reverse the direction of rotation of the spindle while it is in motion.

ORDERING REPAIR PARTS

You will receive quicker service when ordering repair parts if you will adhere to the following procedure:

1. **State amount wanted.**
2. **Give part number and name or description of part, and where obtained.**
 - (a) Parts catalog.
 - (b) Parts number stamped on part.
 - (c) Prior invoice.
3. **Give complete serial number of machine.** The serial number will be found stamped in two places: on the face of the column near the spindle, and front of the table near the right hand end.
4. **Specify each individual piece required.** If only certain parts of a unit are required, never use the word "complete"; it always raises the question as to how much of the unit to supply. In some cases, due to the nature of the parts, it will be less costly to you for us to supply additional related pieces, especially if part wanted is obsolete.
5. **Specify how and where to ship.** Do not say "Ship quickest way". Be definite and state the agency desired, that is: Air Mail, Parcel Post, Special Delivery, Express, Motor Freight, Rail Freight, etc.

MEMORANDUM