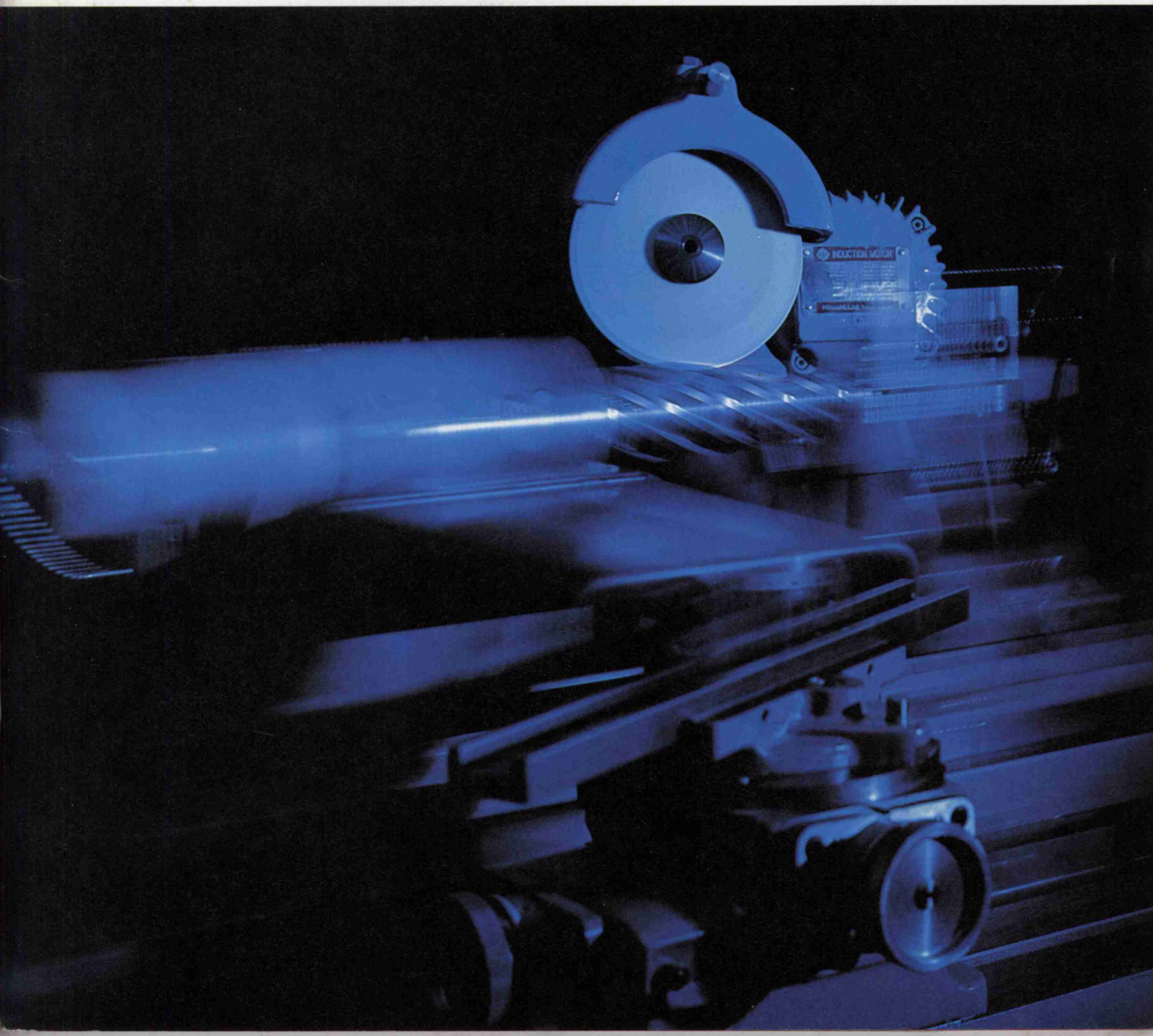


MAKINO
UNIVERSAL CUTTER
& TOOL GRINDER
MODEL C-40
MODEL **CF SERIES** & MODEL **C-25**





IN ANY LANGUAGE, MAKINO C-40 MEANS PRECISION AND VERSATILITY

Makino has specialized in the manufacture of high quality, high precision milling machines for over thirty years, providing the metalworking industry with models to meet all machining requirements.

In order to preserve the tradition of precision and accuracy, Makino's trade mark, accurately ground and optimally sharp cutting tools are a constant requirement. This is why Makino undertook development of the C-40 twenty years ago. The improvements made since then have centered around making the C-40 more versatile, accurate and easier to operate. The result today is the more than 5,000 units of C-40 are utilized in metalworking industry all over the world.

The C-40 is not a big machine—it is only about the size of an office desk. It is however a truly universal cutter and tool grinder capable of grinding all kinds of cutters and tools including milling cutters, taps, and reamers; it also performs cylindrical, inter-

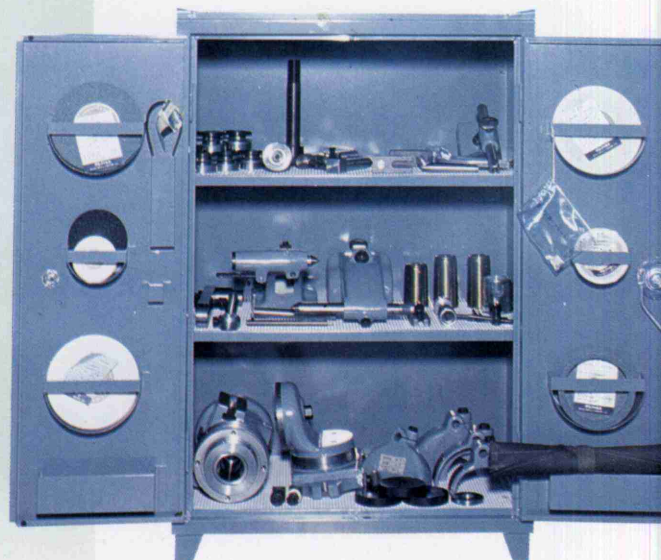
nal and surface grinding operations very easily through use of various attachments.

With more and more metalworking industry turning to automated machine tools, especially those numerically controlled, improvement in maintenance of tools and cutters has become important. At the same time, cutters and tools in general are being made of harder materials, such as sintered carbide tools, to meet the demands of faster machining speeds and higher machining accuracy. As a result, the capability of cutter and tool grinders is now drawing full attention.

The high accuracy and extreme versatility of the Makino C-40 has been acknowledged by men in metalworking industry throughout the world. It has become their first and final choice.



SATISFIES ALL CUTTER AND TOOL GRINDING REQUIREMENTS



THE C-40 GETS MORE PRECISION WORK DONE IN LESS TIME AND WITH LESS EFFORT

Features:	page
* Tilting wheelhead for easy clearance setting	5
* High precision cartridge type wheel spindle	6
* Dual control system for easier control	7
* 180 degree swivelling wheelhead, widened working range	8
* Finger control of table	9
* Spring action table dog	10
* Centralized lubrication system	10
* Universal workhead and tailstock	11
* Convenient tooth-rest	12
* Wide selection of attachments	17

Cylindrical Grinding Attachment
 3-Speed Workhead
 Workhead Indexing Attachment
 Surface Grinding Attachment
 No.2 Radius Grinding Attachment
 Formed Cutter Grinding Attachment
 Small End Mill Grinding Attachment
 Long Reamer Grinding Attachment
 Drill Pointing Attachment
 Automatic Table Feed Attachment
 (Hydraulic)
 Dust Collector
 Riser Block

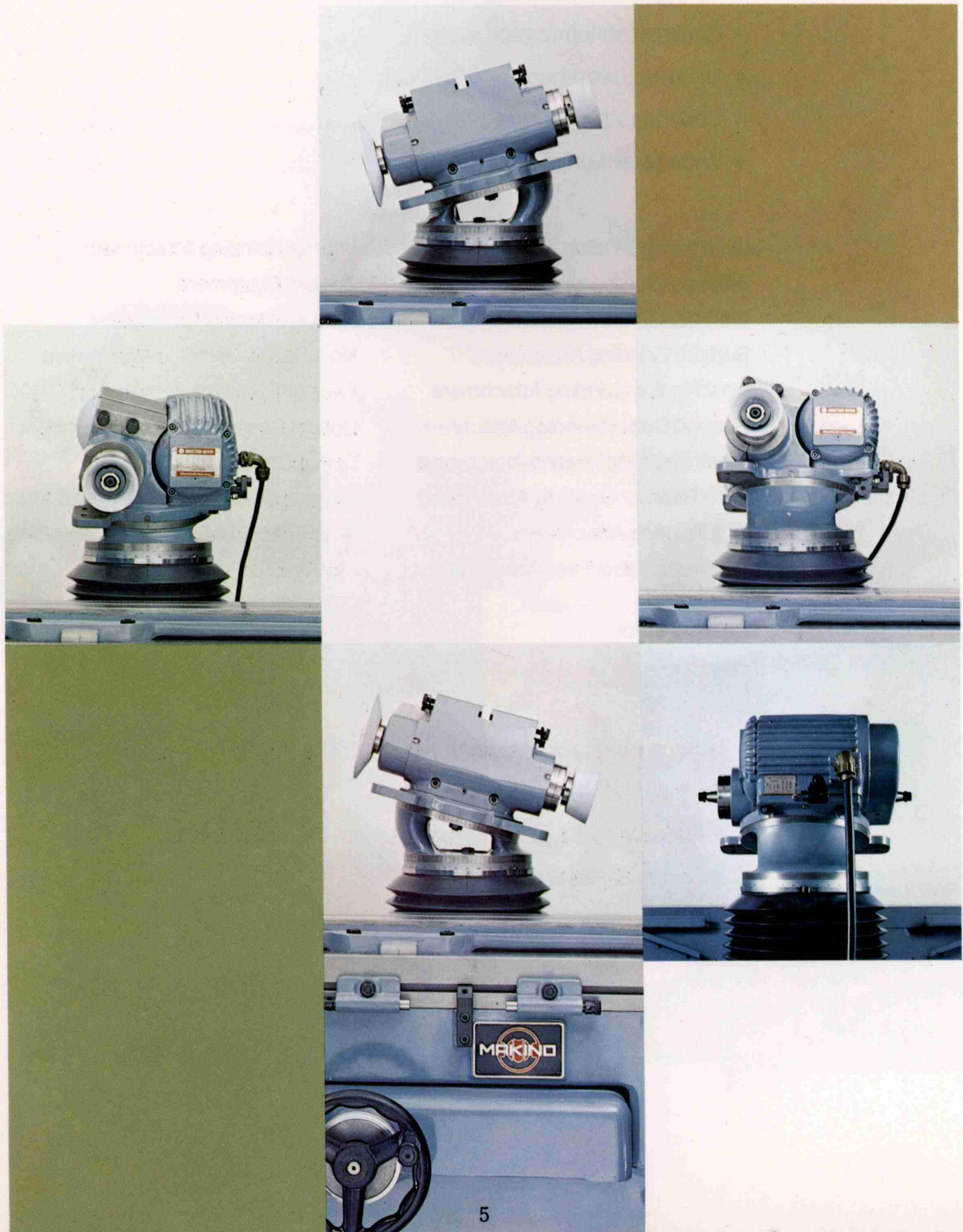
Internal Grinding Attachment
 Coolant Equipment
 Helical Grinding Attachment
 No.1 Radius Grinding Attachment
 Face Mill Grinding Attachment
 Optical Radius Grinding Attachment
 Spring Collet Chuck
 Lathe and Planer Tool Grinding Attachment
 Automatic Table Reciprocating Attachment
 Mist Type Coolant System
 Extended Grinding Wheel Spindle

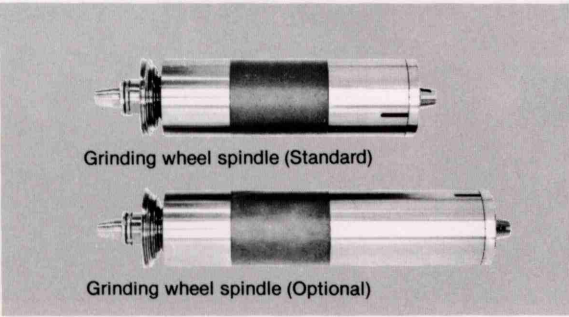
* Unique compact design for minimizing required floor space	32
* Wide range of models	
• For automatic grinding requirement CF-40 Series	33
• For small job application C-25	36

THE C-10 GETS MORE PRECISION WORK
DONE IN LESS TIME AND WITH LESS EFFORT

TILTING WHEELHEAD FOR EASY CLEARANCE SETTING

The wheel head is designed so that it can be tilted easily to ± 15 degrees. It can also be swiveled 360 degrees on the horizontal plane. Both of these features make it very easy to set rake and relief angles, and make for a very wide angle of grinding.

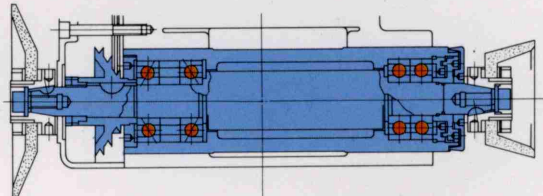




HIGH PRECISION CARTRIDGE TYPE GRINDING WHEEL SPINDLE

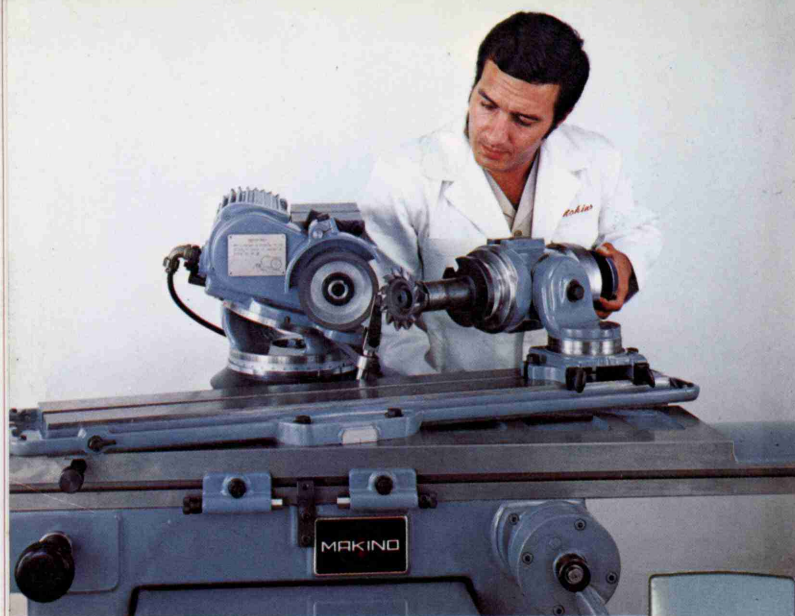
The grinding wheel spindle is the key to precision grinding. Sturdiness and sufficient stability at high speeds and during heavy duty grinding operations must all be thoroughly considered in designing spindle.

The grinding wheel spindle of Makino C-40 is designed to nullify vibration to maintain high accuracy. The spindle runs at three speeds (2600, 3700 and 6200 rpm) and is instantly reversible by pushing the switches, permitting selection of the best suitable speed and direction for a particular grinding operation. A cartridge type unit spindle design facilitates easy maintenance and optimum spindle change flexibility (from the standard to optional extended spindle and vice versa).

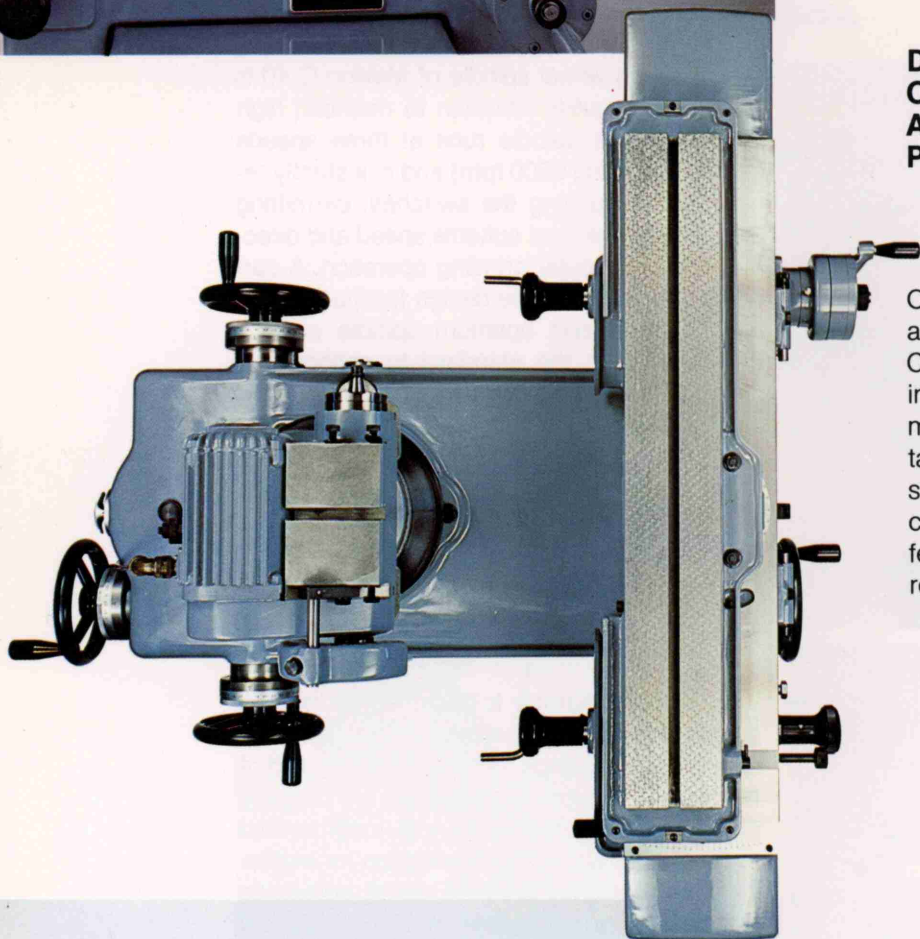


Cross section of grinding wheel spindle

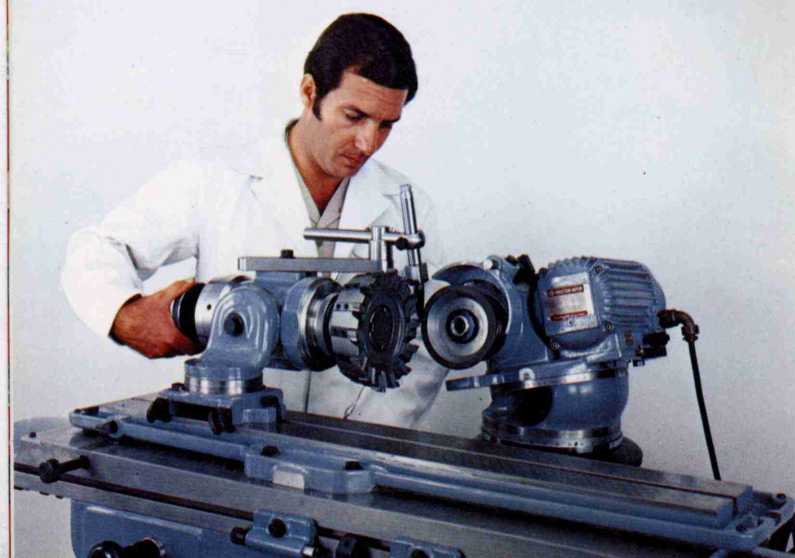
The spindle assembly is designed so that the spindle shaft is supported by two pairs of angular ball bearings, one pair at each end of the spindle support. The bearings are properly pre-loaded by tightening the nuts. Incorporated in the design also is compensation for expansion by heat. The grinding wheel spindle is grease lubricated for life and no additional lubrication is required.



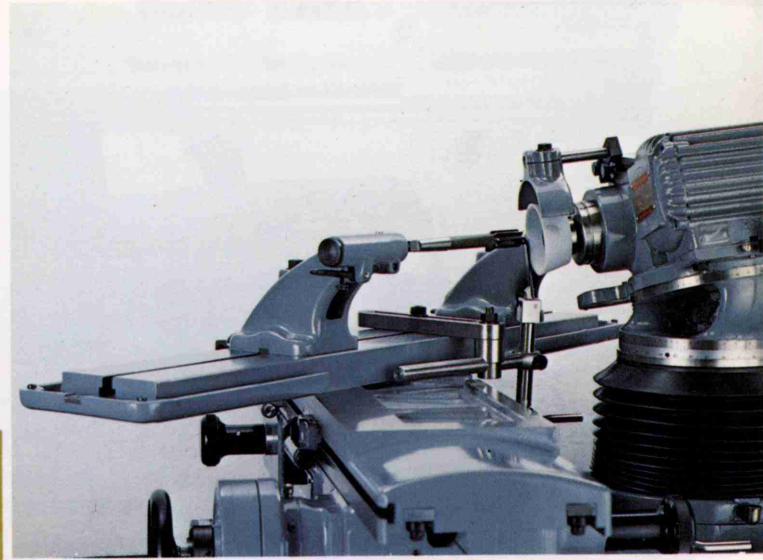
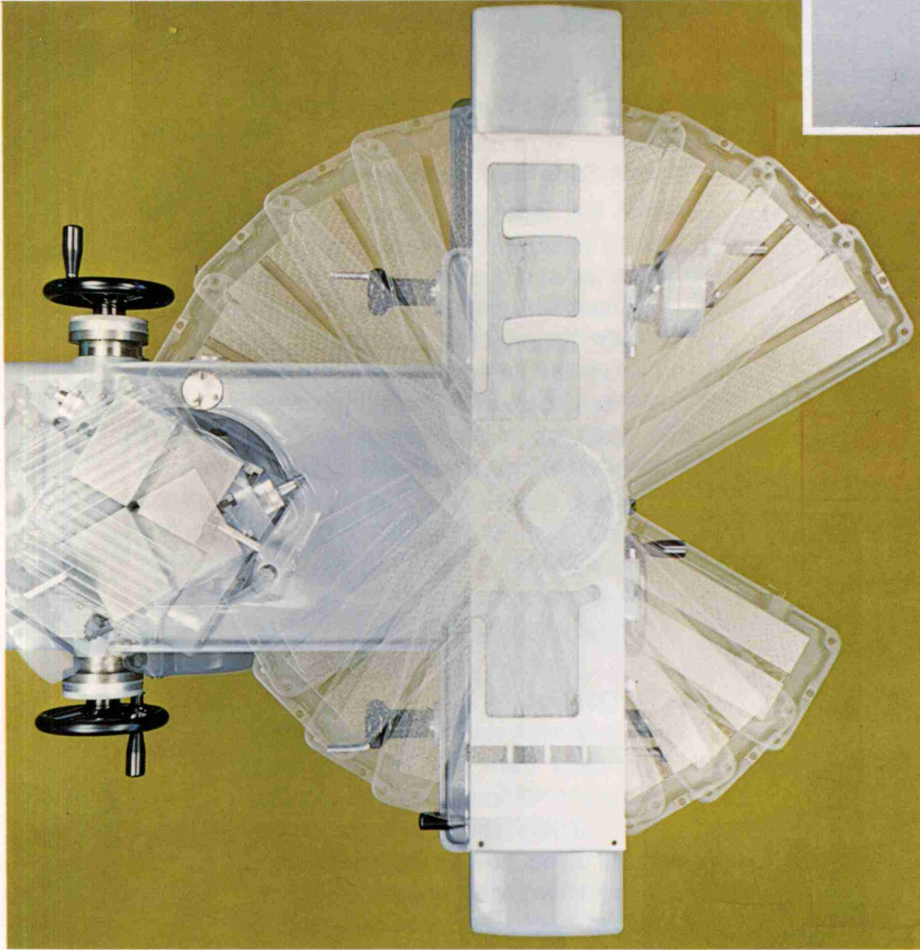
**DUPLICATE CONTROLS PERMIT
OPERATOR TO GRIND FROM
A CHOICE OF FOUR MACHINE
POSITIONS**



One of the decisive factors in selecting a cutter and tool grinder is the ease of operation. The C-40 is operator engineered throughout including the height of the work table and control mechanisms, in respect to the wheelhead and table. The Makino C-40 can be operated in a standing or sitting manner. For further operator convenience operation is possible from 4 different machine points, both sides and front and rear.



Swivelling of grinding wheelhead and work table



Tilting wheelhead and swivelling table extend the cross range to grind the chamfer of long cutter.

ACCURATE, VERSATILE TABLE

* Table Swivels 120 Degrees

The table is equipped with a graduated scale and swivels ± 60 degrees.

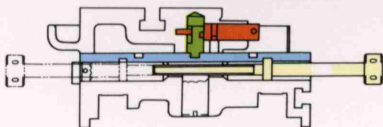
The ± 60 degrees swivelling combined with the 360 degree swivelling of the wheel head extends C-40 versatility when grinding large (long) cutters and tools.

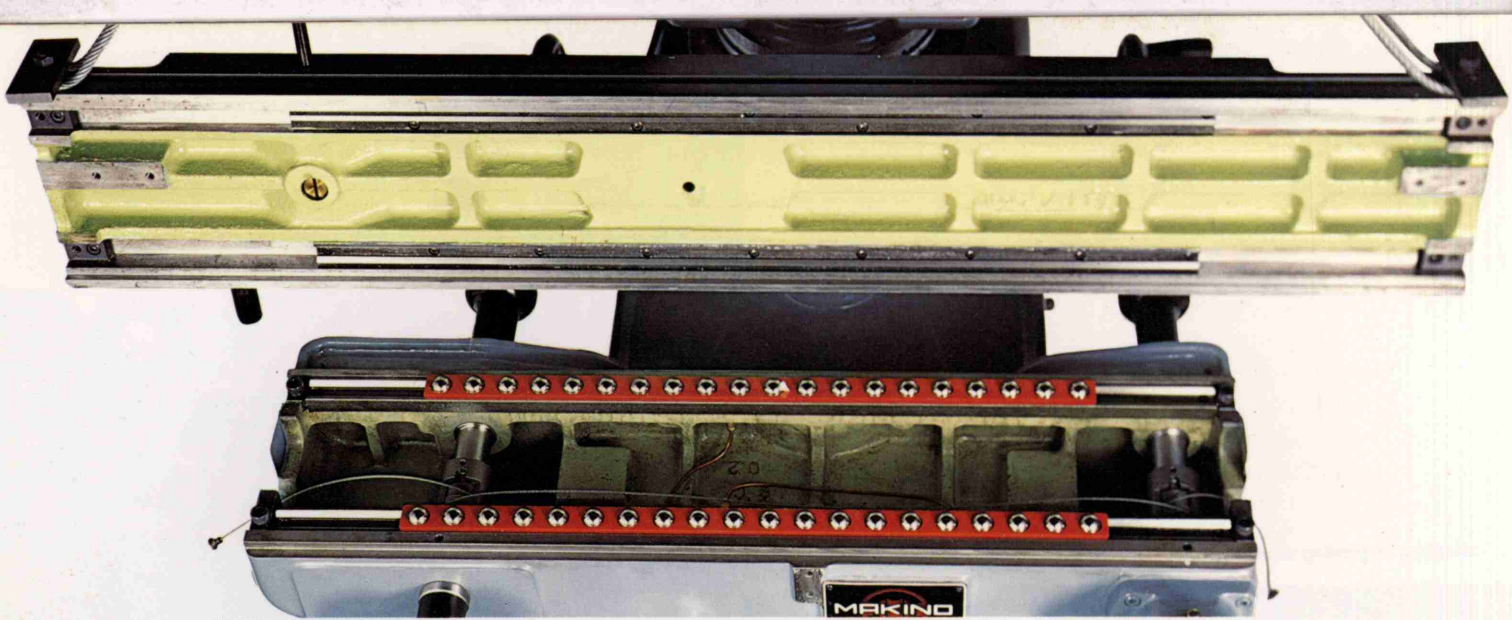


Taper adjustment screw

* THE FINE ADJUSTMENT OF TABLE Swivel is Made by the Taper Adjustment Screw.

Taper adjustment screw provides fine adjustment on the table taper angle to the grinding wheel within the range of ± 10 degrees. It can therefore be set for precise taper.



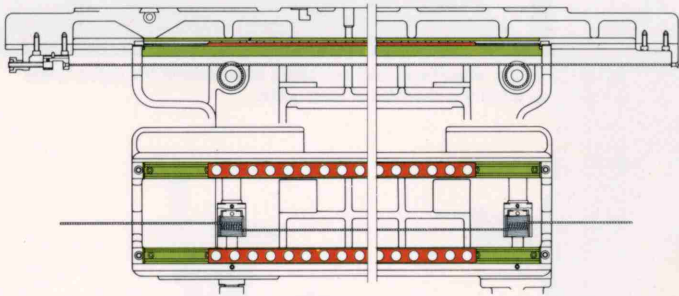


Anti-friction slide way

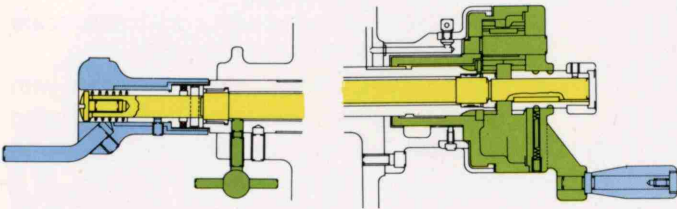
MANY FEATURES INCORPORATED IN TABLE

* Anti-Friction Slide Way Bearings Used.

As seen in the photograph above, for precise smooth table slide, the table ways have been hardened and ground and anti-friction slide way bearings are used. The table is controlled by the winding motion of cable onto a take up reel, which insures back-lash free operation. Because of this construction of table, operation is light and smooth so that it does not fatigue the operator.



Cable for table feed



* Finger Tip Control.

It is absolutely necessary that the table be easily controlled from fine to rapid feed range to handle various grinding requirements. The C-40 has table feed knobs on the right and left hand side of the table. Also, there is a crank handle for fine table control. The table feed mechanism is so designed to be controllable by finger tip action that it permits integral response of grinding conditions to operator hand.

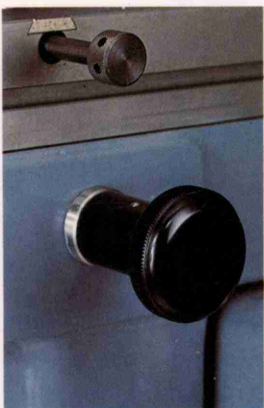


Table feed knob



Crank handle for table fine feed

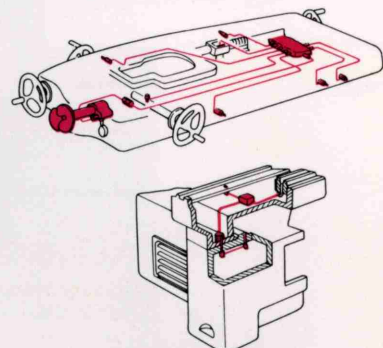
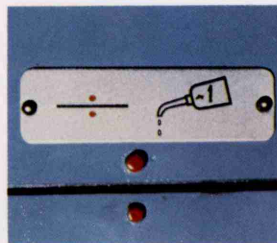
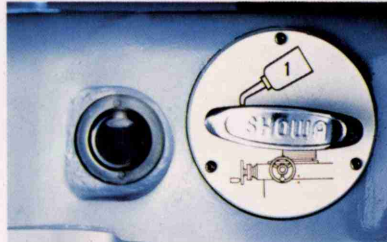
*** Spring-Cushioned Table Dogs.**

Table dogs are not only used for positioning the table, but springs incorporated also absorb the shock when the table is returned. This permits a smoother control of the table. By setting reversely, they can be used for clamping the table movement.



Spring cushioned table dogs

One shot lubrication system and oil level check window



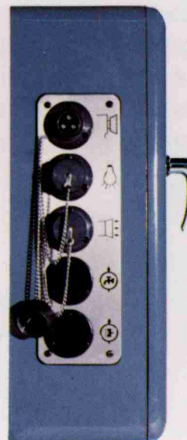
Centralized lubrication system

*** Centralized Lubrication.**

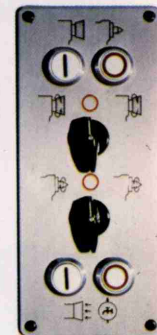
For cutter grinding operation, precise tool grinder's movement is of primary importance, and it must be at all times maintained. This means a complete lubrication system is necessary. The C-40 is equipped with the centralized system which lubricates all the required points, shown at the right. This system saves time for daily lubrication and, at the same time, help keep the machine in its best condition for an extended period of time.

*** Electrical Controls.**

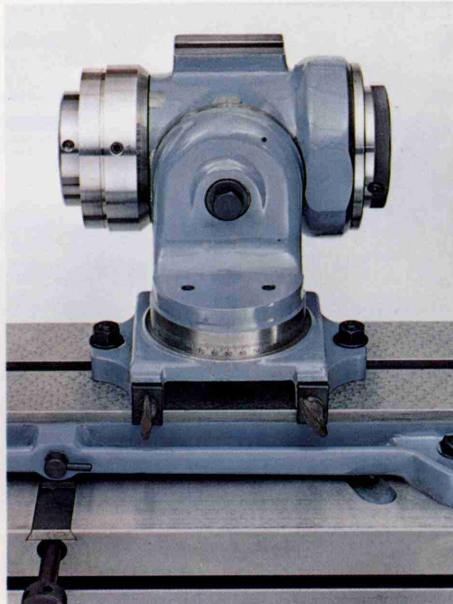
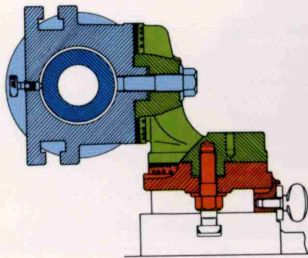
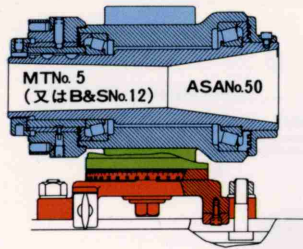
All of the electrical control circuitry are concentrated in the control box located at the back of the machine body. This insures easy maintenance and operator safety. Switches required for machine operation are located on the panel on the lower left side of the column and are easily accessible.



Side view of electrical control box



Operation panel

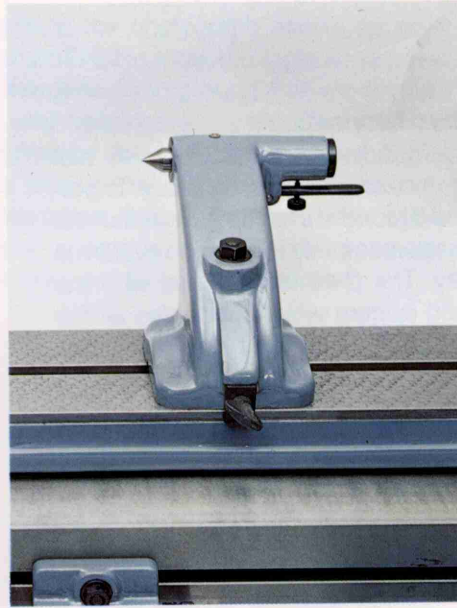
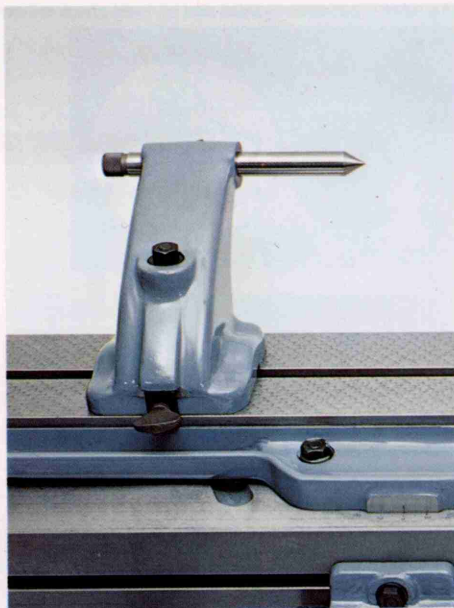


STANDARD EQUIPMENT—ALL HIGH PRECISION AND VERSATILE FOR ALL GRINDING REQUIREMENTS

*** Universal Workhead**

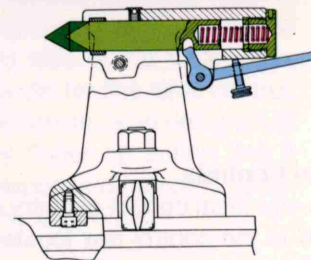
The workhead is positioned on the table as desired by the operator and can swiveled accurately at any angle both horizontally and vertically. It means it can be optionally set to obtain the most suitable angle for a specific grinding job. It has a taper hole in each end of the spindle, one B & S No.12 taper (or M. T. No.5), the other ASA No.50.

Tailstocks



*** Tailstock**

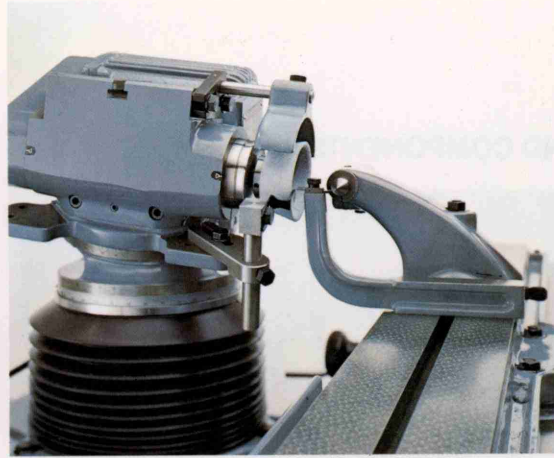
The tailstock can be easily positioned at any place on the table. It is combined with the workhead or other tailstock to hold the workpiece. Design is such that the tailstock can be aligned easily and positively by pushing both to one side of the table slot by thumb screws. The left tailstock has a retractable center for easy workpiece mounting and dismounting.



Retractable tailstock center

*** Center Gauge**

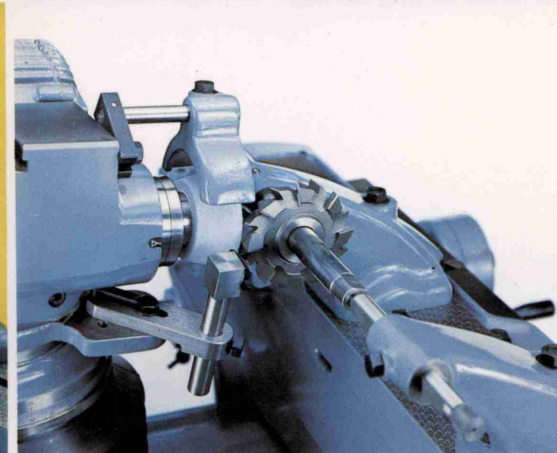
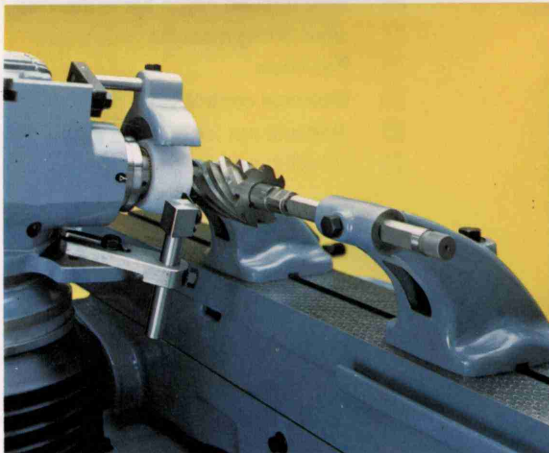
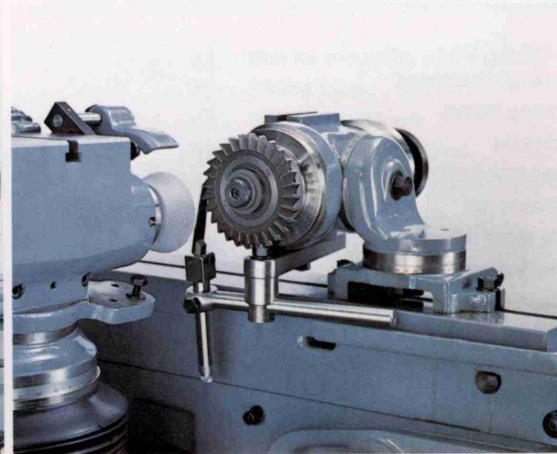
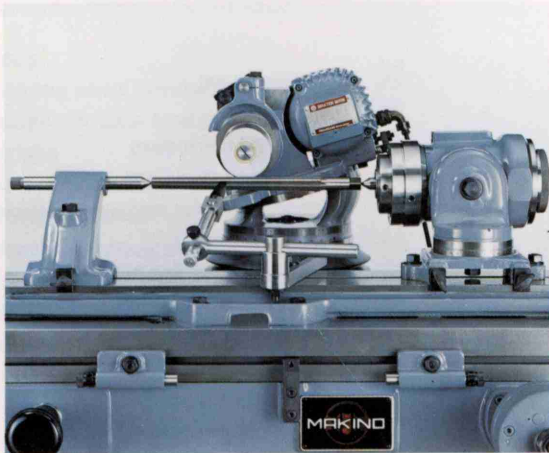
To grind the relief angles, the tooth to be ground should first be brought to the same heights as the center of the cutter. To do this a center gauge is used. With this center gauge, the height of the center of cutter is levelled to match the height of center of tail-stock. This center gauge can also be utilized for aligning the center line of the grinding wheel spindle.



Application of center gauge

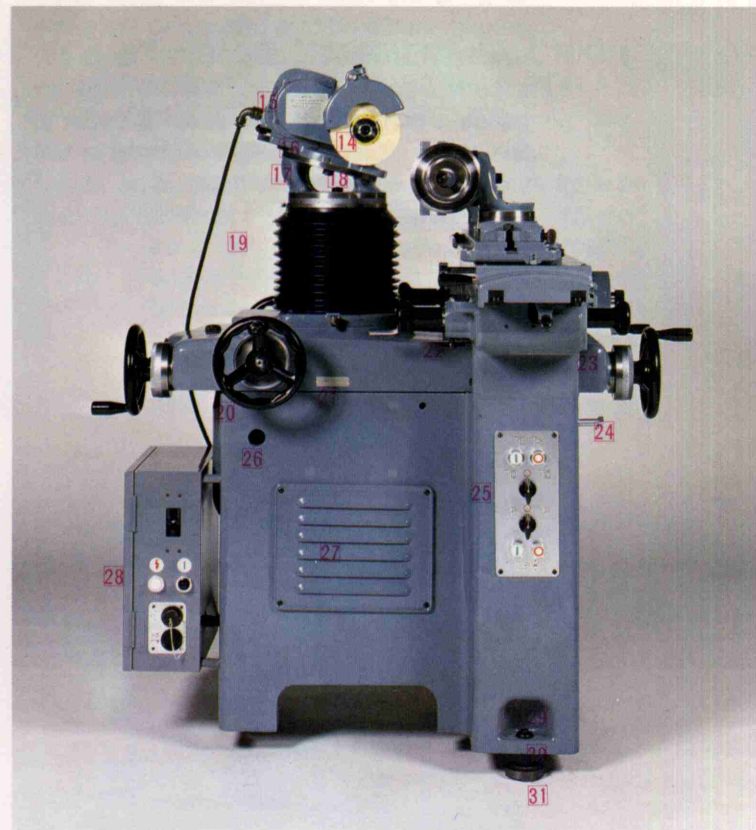
*** Tooth Rest**

Another must for precision and efficient cutter grinding is the tooth rest. Two types of tooth rest come with the C-40, a fixed type and an adjustable type to best suit the type of cutter being ground.



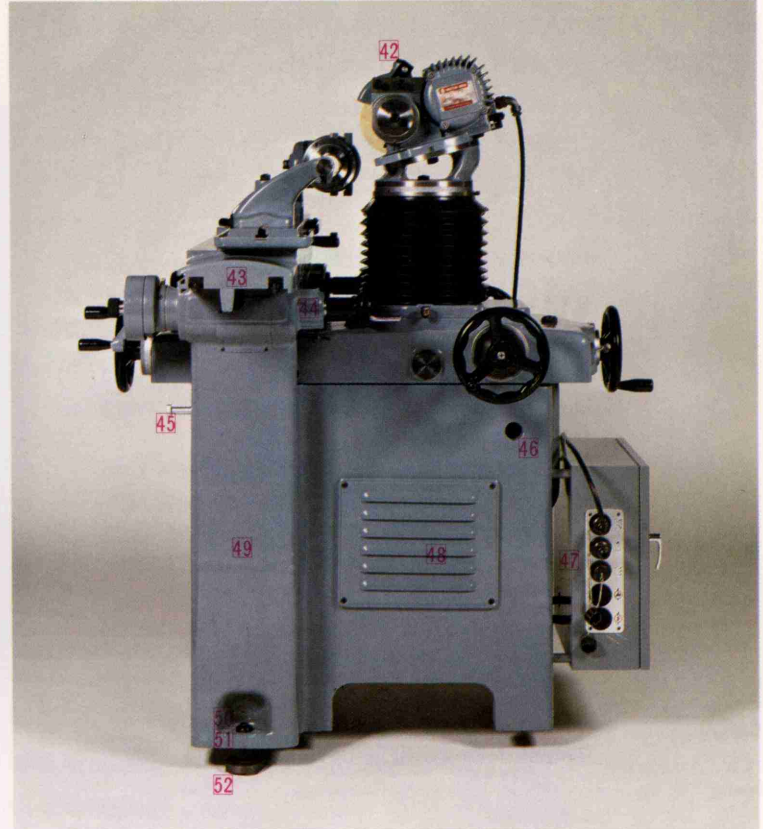
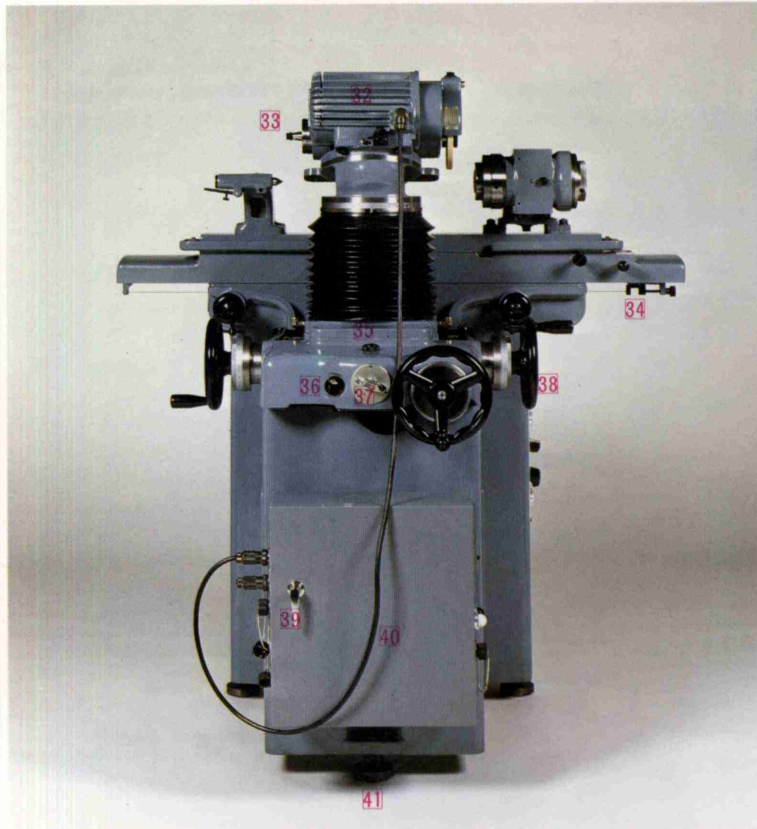
Applications of tooth rest

C-40 PARTS AND COMPONENTS



- 1 Grinding Wheelhead
- 2 Grinding Wheel
- 3 Workhead
- 4 Hexagonal nut for setting swivel table
- 5 Eccentric pin
- 6 Table taper adjusting screw
- 7 Table dog
- 8 Table manual control knob
- 9 Stopper
- 10 Handwheel for cross movement of wheel head
- 11 Right tailstock
- 12 Swivel table
- 13 Crank handle for table fine feed

- 14 Grinding Wheel
- 15 Belt cover
- 16 Wheelhead angle base
- 17 Wheelhead swivel base
- 18 Hexagonal nut for setting wheelhead swivel base
- 19 Dust guard bellow
- 20 Wheelhead elevating handwheel
- 21 Lubrication point
- 22 Screw for clamping table
- 23 Saddle
- 24 Bolt for lifting machine
- 25 Electrical control panel
- 26 Hole through which bar is inserted when lifting machine
- 27 when lifting machine
- 28 Bed cover
- 29 Electrical control box
- 30 Bolt and nut for levelling pad
- 31 Levelling pad



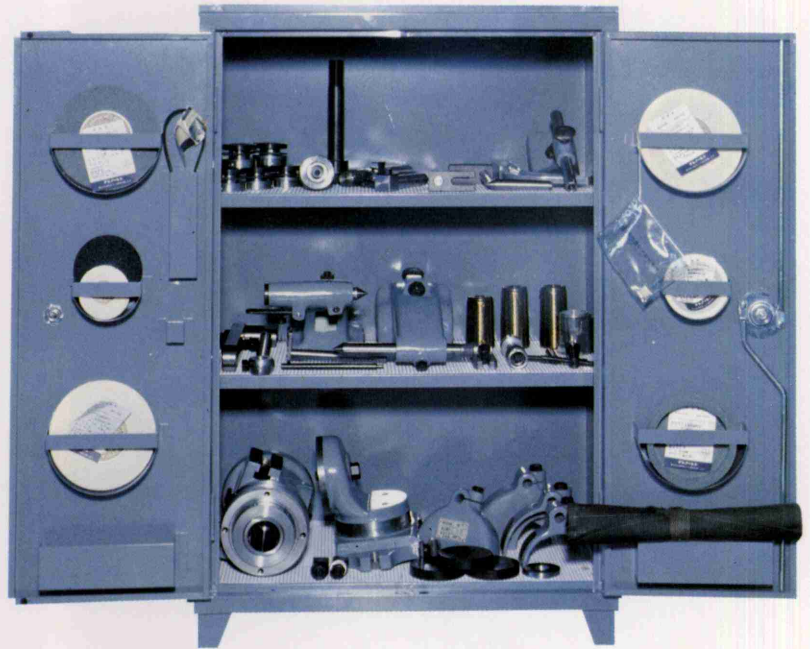
- 32 Motor
- 33 Grinding wheel spindle
- 34 Bracket for table feed cable
- 35 Oil inlet
- 36 Oil level check window
- 37 Lubrication knob
- 38 Wheel head elevating handwheel
- 39 Door handle for electrical control box
- 40 Electrical control box
- 41 Levelling pad (Standard Accessory)

- 42 Bolt for mounting wheel guard
- 43 Sliding table
- 44 Table control knob
- 45 Bolt for lifting machine
- 46 Hole through which bar is inserted when lifting machine
- 47 Electrical connector
- 48 Bed cover
- 49 Column
- 50 Bolt and nut for levelling pad
- 51 Levelling pad
- 52 Levelling pad

STANDARD EQUIPMENT AND TOOL CABINET

With the standard equipment alone, Makino C-40 is capable of grinding the following cutters.

Plain Milling Cutters, End Mills, Sheel End Mills, Groove Milling Cutters, Key Way Milling Cutters, Dovetail Milling Cutters, Side Milling Cutters, Angular Milling Cutters, Face Mills (Max. 8" dia.) (200mm), Circular Saws (Max. 48" dia.) (1200mm), Metal Hacksaws, Taps and Reamers.

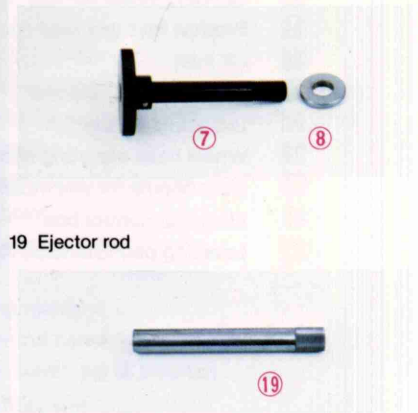
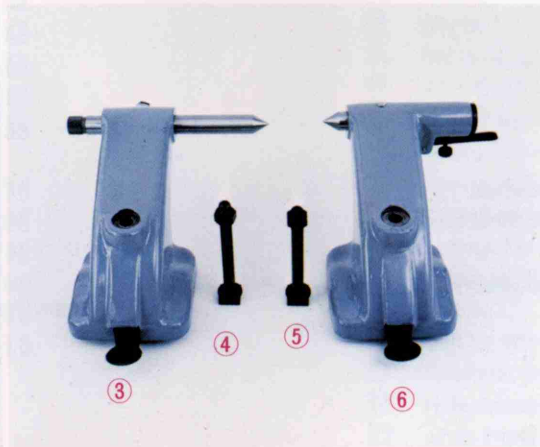
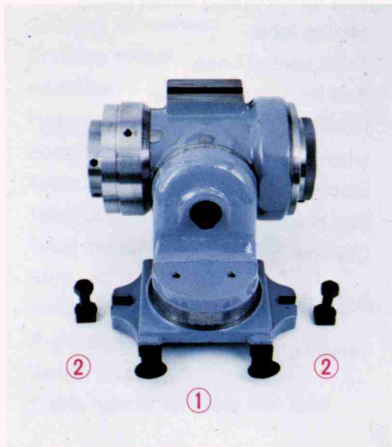


STANDARD EQUIPMENT

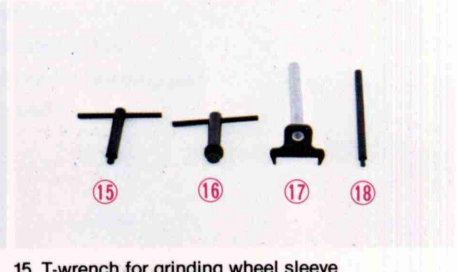
- 1 Workhead
- 2 T-bolt for workhead

- 3 Left hand tailstock
- 4 T-bolts for tailstock
- 5 Righthand tailstock
- 6 Right hand tailstock

- 7 Draw-in bolt for workhead
- 8 Washer



- 9 Double end wrench
- 10 Wrench 36
- 11 Nut wrench
- 12 Driver
- 13 Allen type wrench

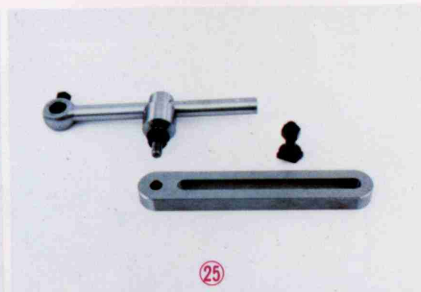
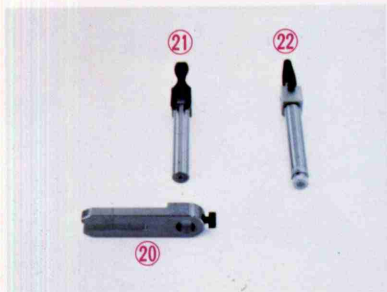


14 Center gauge

15 T-wrench for grinding wheel sleeve
16 Sleeve extracting bar
17 Collet wrench
18 Pin wrench

- 20 Plain tooth rest plate
- 21 Plain tooth rest holder (with offset blade)
- 22 Micrometer adjustable toothrest (with round top blade)

- 25 Universal tooth rest plate and blade holder extension

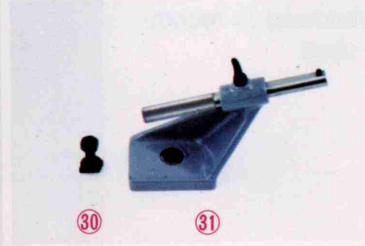
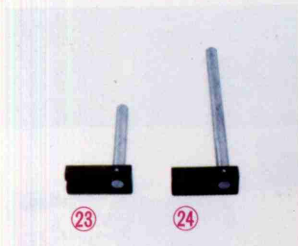


- 23 Wheel guard holder (Short)
- 24 Wheel guard holder (Long)

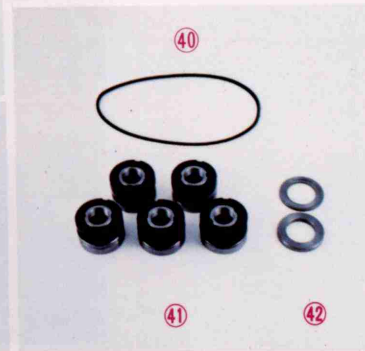
- 26~29 Wheel guard

- 30 T-bolt for diamond dresser holder
- 31 Diamond dresser holder

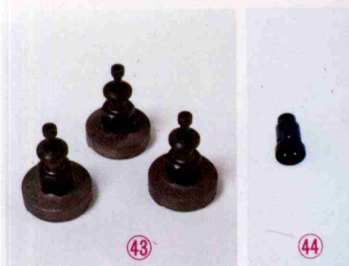
- 32 Center for workhead spindle B & S No.7 (or MT No.2)
- 33 Reducing collet B & S No.12 x No.7 (or MT No.5 x No.2)
- 34 Reducing collet B & S No.12 x No.9 (or MT No.5 x No.3)
- 35 Reducing collet B & S No.12 x No.10 (or MT No.5 x No.4)



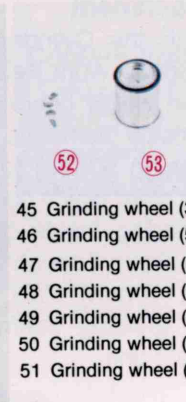
- 36 4" spindle extension
- 37 Washer
- 38 4" extension wheel sleeve and collar
- 39 Perforated bolt for extension wheel sleeve



- 40 Belt for spindle drive (Poly-flex belt)
- 41 Grinding wheel sleeves (5 sets)
- 42 Washer for 1/8" dia. grinding wheel (2 pcs)



- 43 Levelling pads (3 pcs)
- 44 Plug for lighting



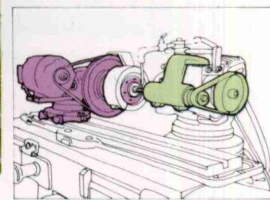
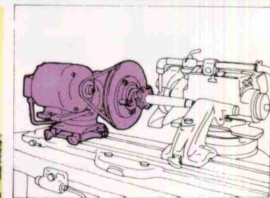
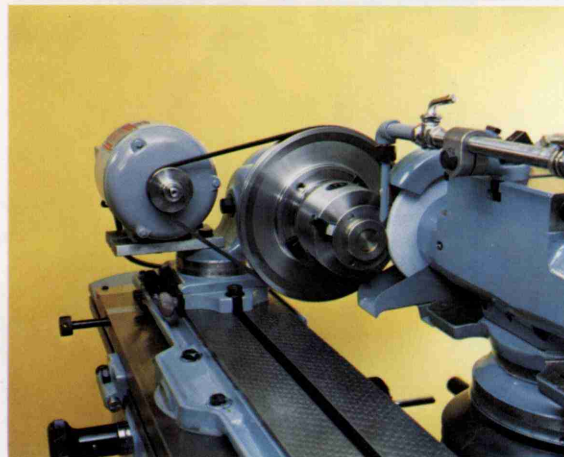
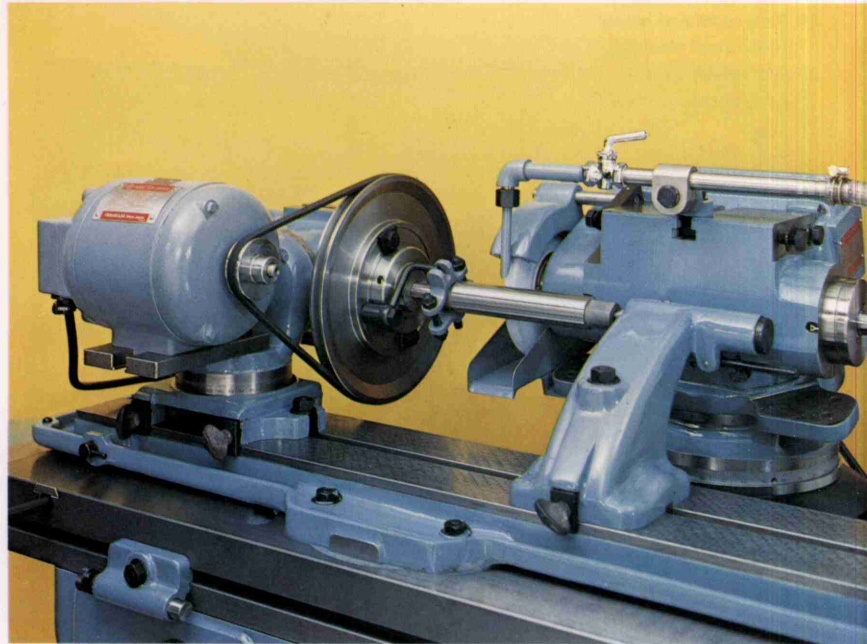
- 52 Keys for spindle
- 53 Touch-up paint...
- 45 Grinding wheel (3 1/2" x 1 1/2" x 1 1/4" hole), flaring cup
- 46 Grinding wheel (5" x 1 1/2" x 1 1/4" hole), straight cup
- 47 Grinding wheel (6" x 1 1/2" x 1 1/4" hole), disk
- 48 Grinding wheel (6" x 1/2" x 1 1/4" hole), disk
- 49 Grinding wheel (4" x 1/16" x 1/2" hole), disk
- 50 Grinding wheel (6" x 3/4" x 1 1/4" hole), dished
- 51 Grinding wheel (3" x 1/2" x 1/2" hole), dished

Note: 1. Centers and collets of workhead with Morse Taper are available. Please specify when ordering.
 Note: 2. In case of CF, workhead ① and bolt ② for workhead are accessories.

WIDE SELECTION OF EXTRA ATTACHMENTS MAKES THE DIFFICULT JOBS EASY

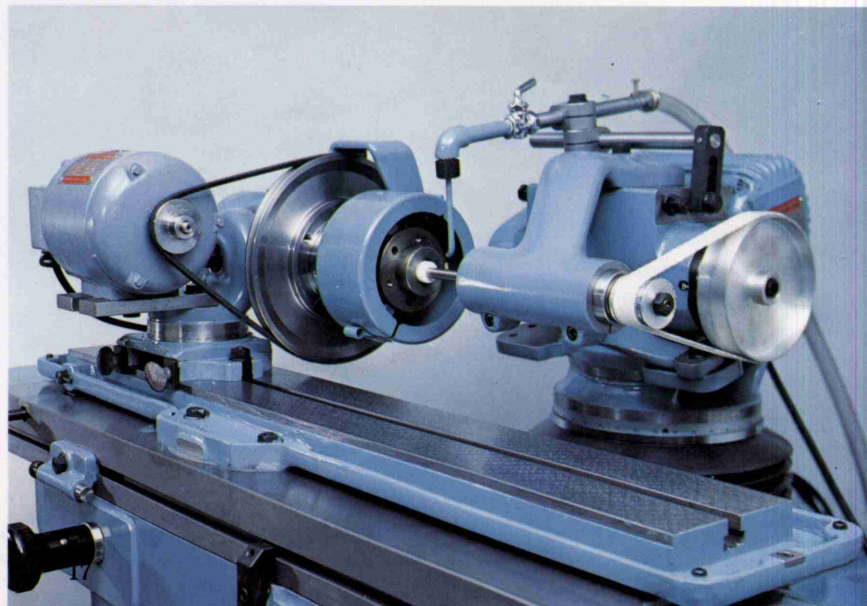
■ Cylindrical Grinding Attachment

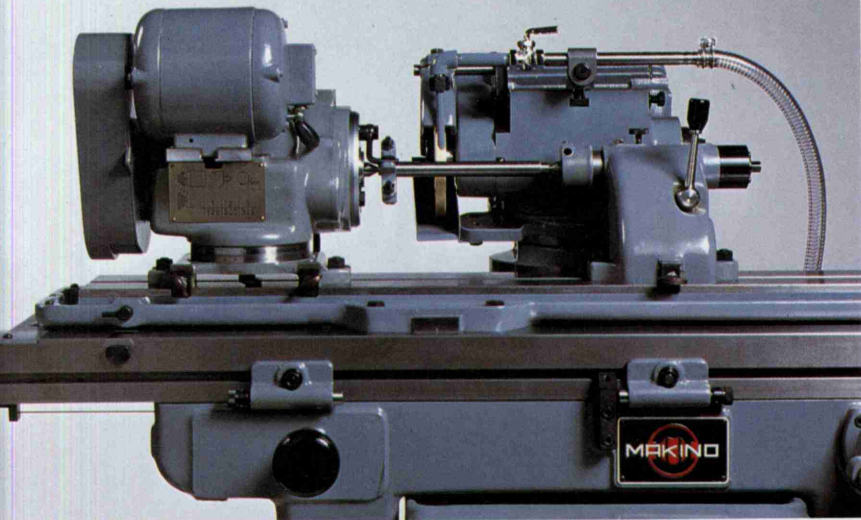
This attachment is most suitable for straight or taper cylindrical grinding and for face grinding of various tools. It will swing a 10" (250mm) diameter work piece in a chuck or between live or dead centers. For the cylindrical grinding of workpieces larger than 2" (50mm) in diameter, the use of the 3-Speed Workhead is recommendable. 0.2kW motor is used. (Attachment No.1)



■ Internal Grinding Attachment

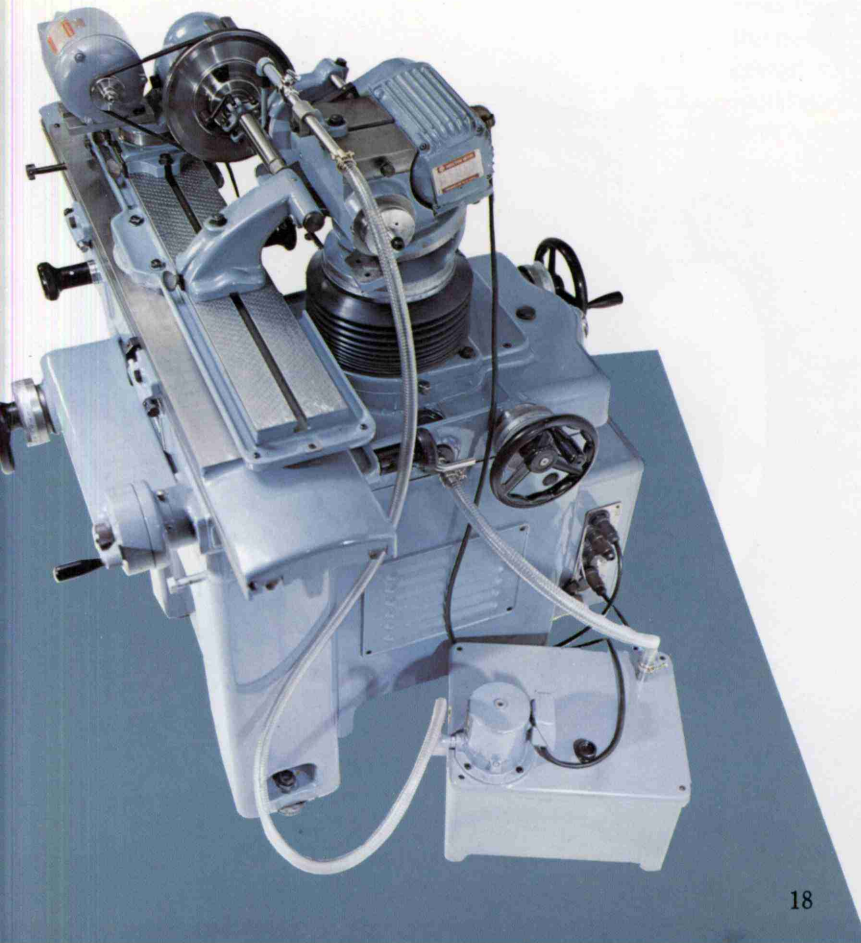
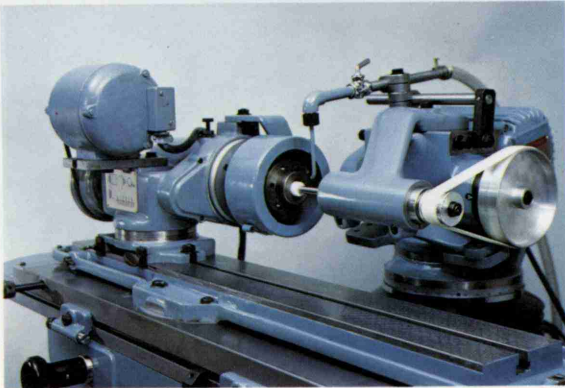
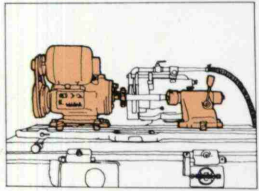
This is generally used with the Cylindrical Grinding Attachment or 3-Speed Work Head. Two type are available, one which operates at 20,000 rpm for grinding inside diameters of 1/2" through 2" (12mm through 50mm) to a depth of 3" (75mm) and the other which operates at 35,000 rpm for grinding inside diameters of 5/16" through 3/4" (8mm through 20 mm) to a depth of 1 9/16" (40mm). This of course can be used for grinding internal tapers. Use it with the coolant unit. (Attachment No.4)





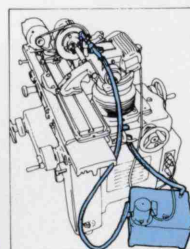
■ 3-Speed Workhead

The 3-Speed Workhead is used for heavy duty cylindrical grinding of reamers, centers, mandrels, taps, and drills. It is supplied with a heavy duty tailstock as a set, and can swing a workpiece in a chuck or between live or dead centers. It is equipped with a 1/4 Hp motor which provides 3 speeds, 120, 200, and 325 rpm. The availability of various speeds improves grinding performance. Swing over bed is 250mm. (Attachment No.23)



■ Coolant Equipment

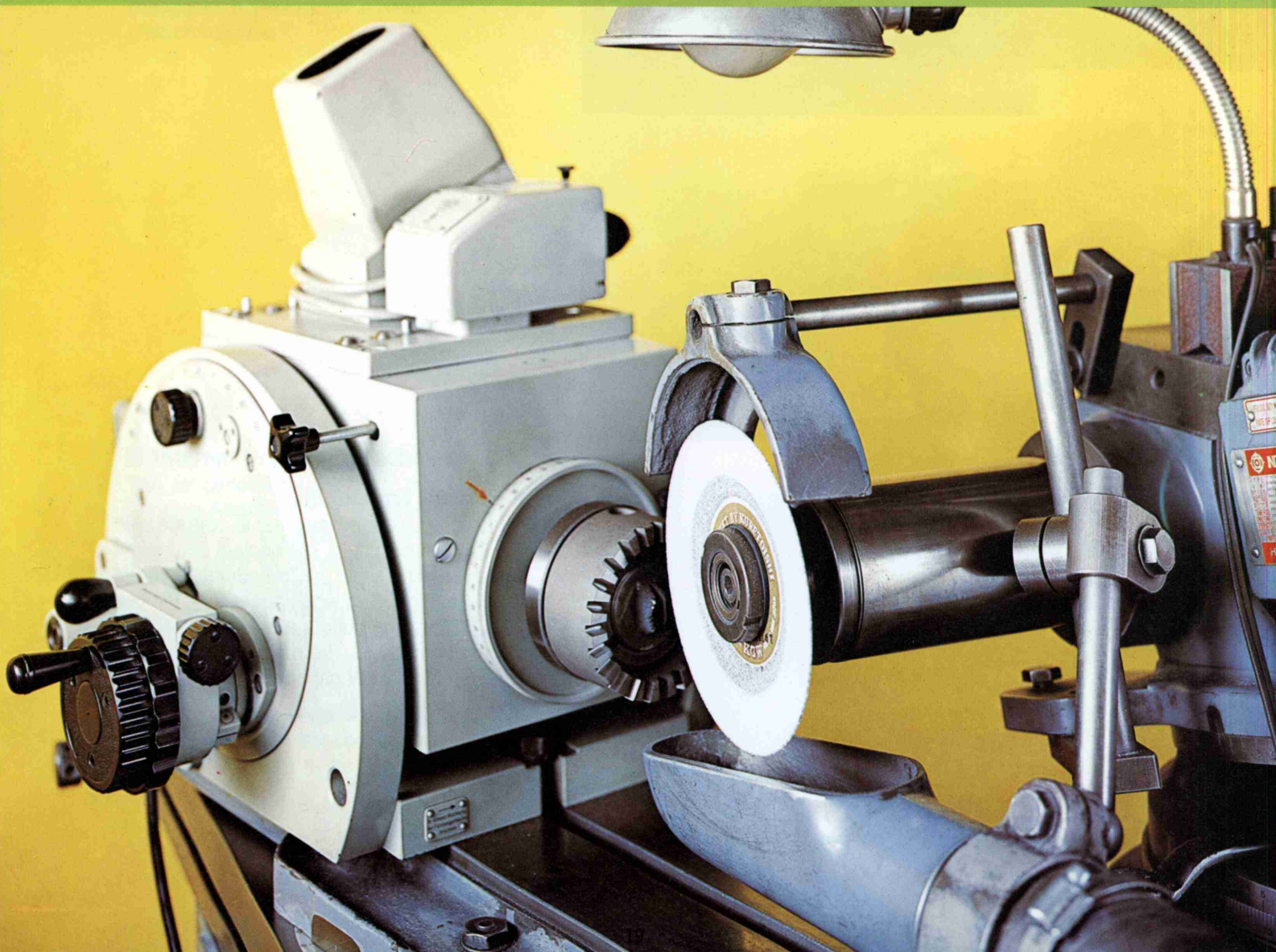
The C-40 is uniquely designed to operate with or without cutting fluid. The coolant equipment is conveniently used for cylindrical, internal and surface grinding when necessary. Various types of spraying outlets are available to suit specific operations. The motor of the coolant pump is of 0.075kW capacity. (Attachment No.21)





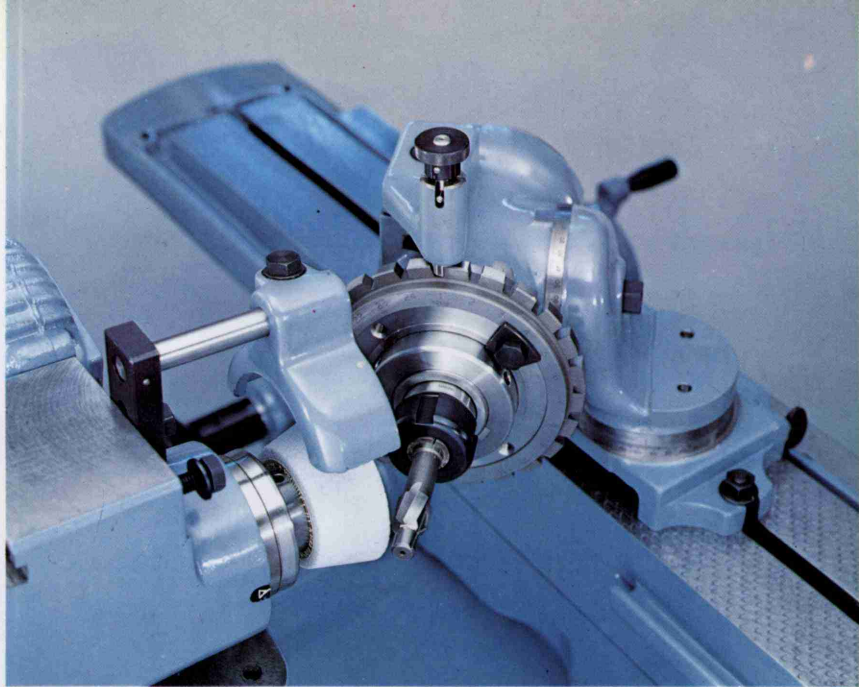
■ Makino's Index Plates

There are two kinds, one for the workhead and the other for Helical Grinding Attachment. In both cases, accuracy is extremely important because all tools ground with an index plate generally require extreme precision; grinding errors, no matter how slight, lead to cutting inaccuracy and tool damage. Makino supplies one of the world's highest levels of accuracy in its indexing attachment. Prior to shipping, each indexing attachment will have been tested thoroughly to insure accuracy.





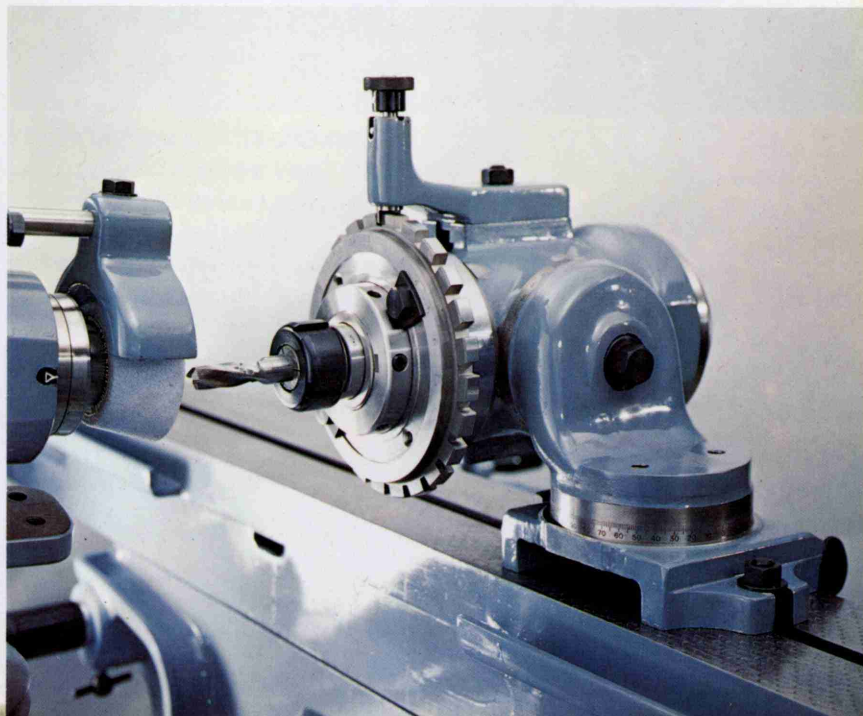
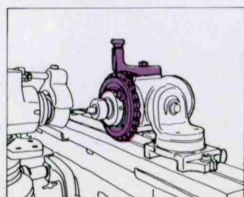
Index plate workhead indexing attachment

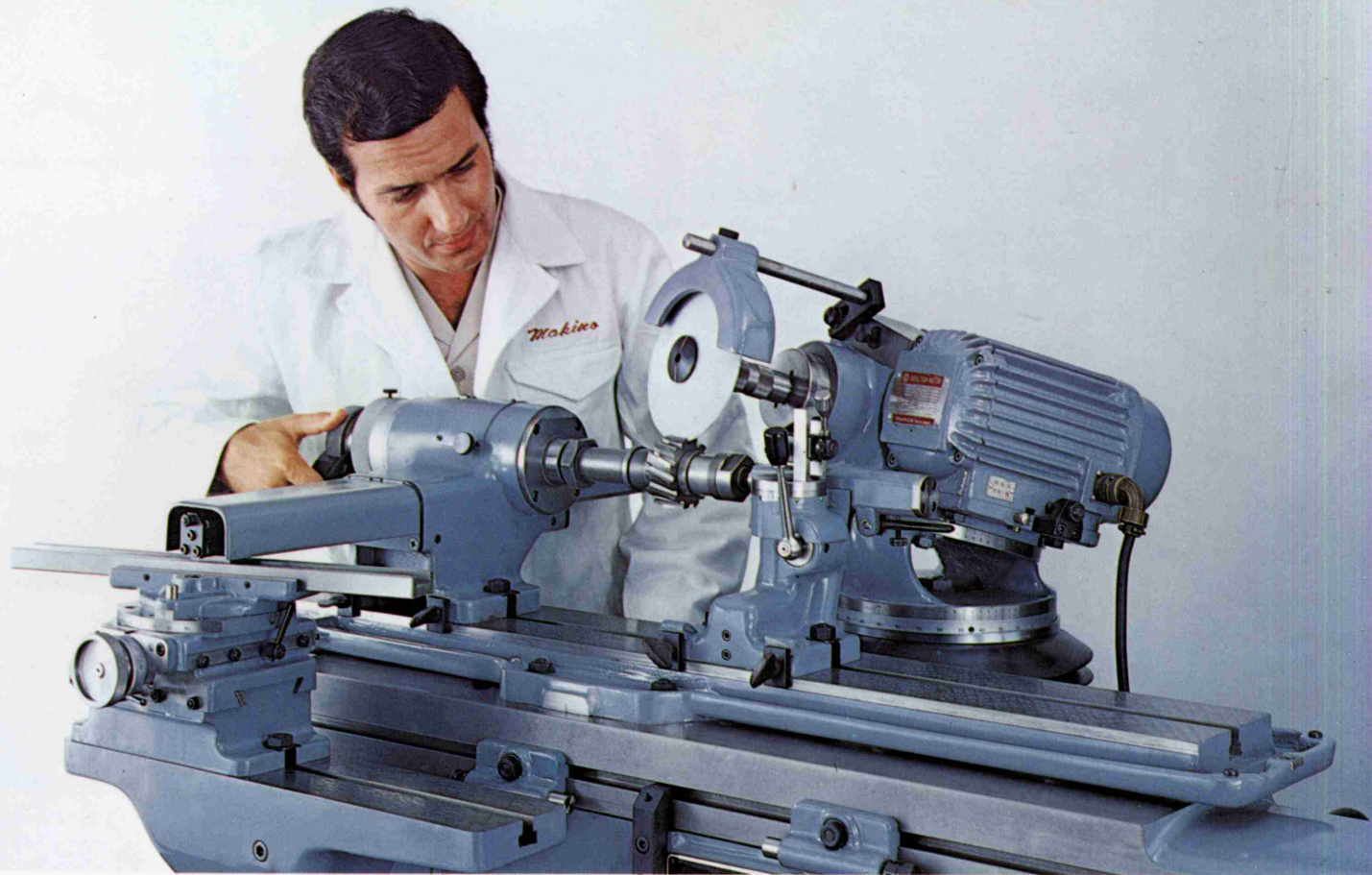


Index plate for helical grinding attachment

■ Workhead Indexing Attachment

Accurate indexing can be made quickly and easily by mounting the Indexing Attachment onto the standard workhead. This eliminates the need for a tooth rest which is normally required for grinding cutters. If not specified, workhead indexing attachment is provided with a plate of 24 equally spaced slots, however, it can be extended up to 48. (Attachment No.12)



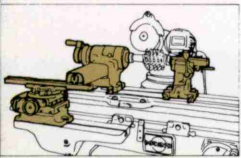


■ Helical Grinding Attachment

This attachment is suitable for grinding the relief and rake angle of spiral cutters or the straight teeth of hobs, end mills and center drills. The work spindle is possible to be turned twice at Max. for the lead of "0" through infinity.

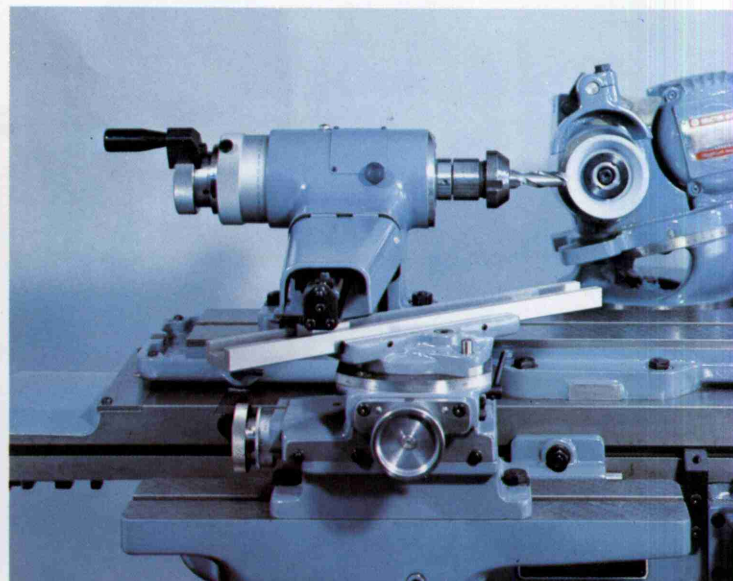
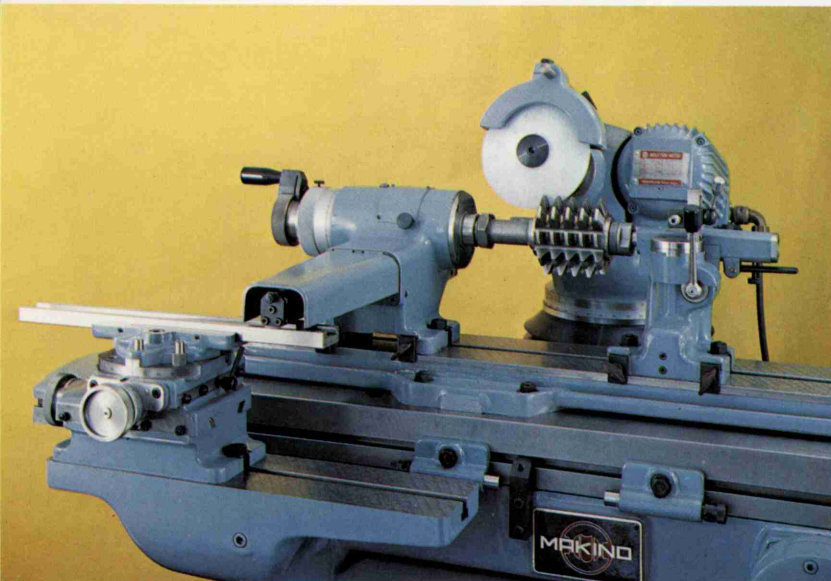
The maximum workpiece diameter that can be ground is 5" (125mm), and the maximum length approximately 13" (320mm). In the case of hobs, the maximum module that can be ground is "8" and the maximum helical angle ± 8 degrees. The standard index plate

are the 24 slot type, however, 40 slot types are also available. Another advantage of this attachment is external relief angle grinding, and rake angle grinding of helical teeth can be made with extreme ease. (Attachment No.18)

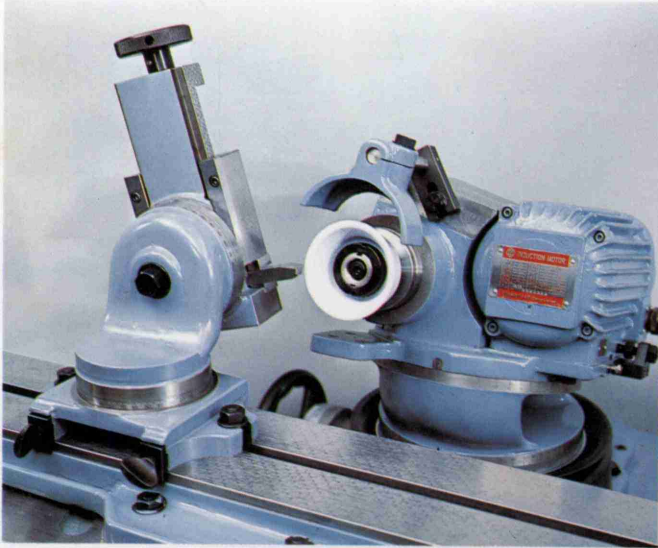


Hob grinding

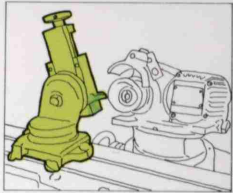
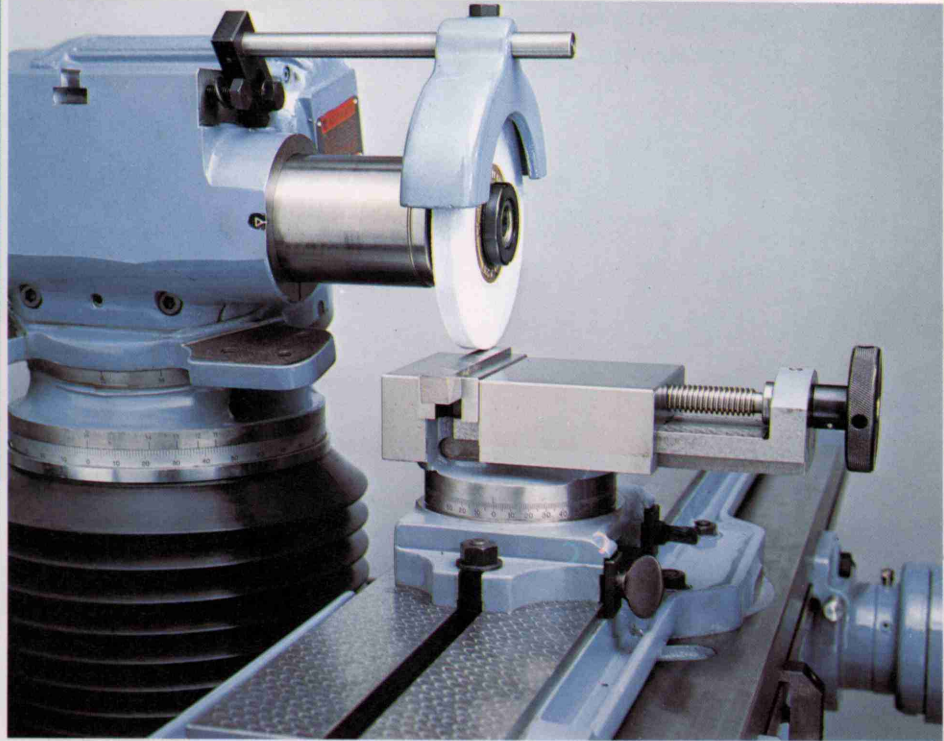
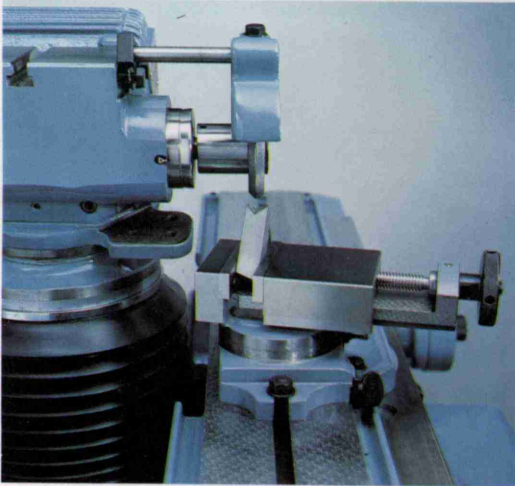
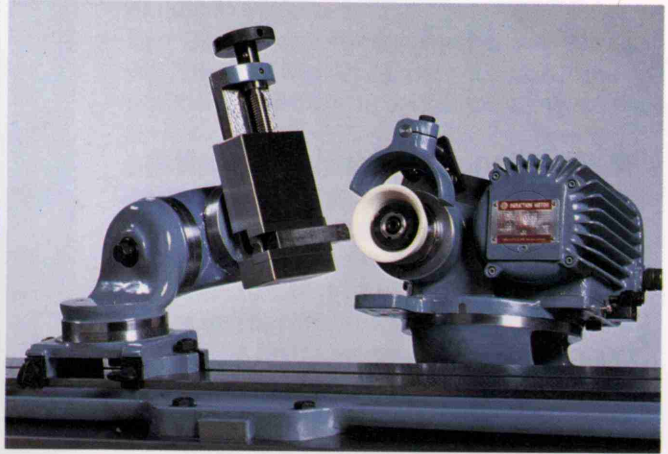
Spiral endmill grinding



Tool bit grinding



Extended grinding wheel spindle combined with surface grinding attachment.



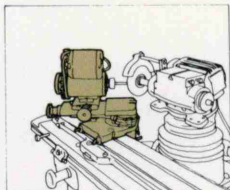
■ Surface Grinding Attachment

This is a so called "Universal Vise" and ideally suited to grinding bits as well as surface grinding. It consists of a swivel vise and independent support provided between the vise and base. The intermediate support permits the vise to swivel 360 degrees horizontally and vertically, so the work-piece can be set easily.

Width of vise: 4" (100mm),

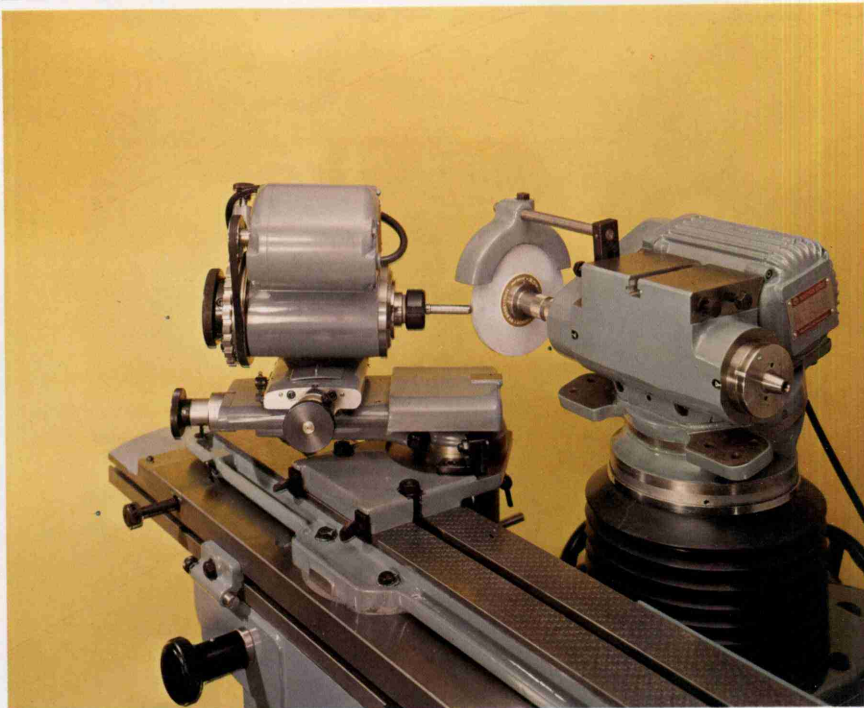
Opening: 2 3/4" (70mm).

(Attachment No.3)



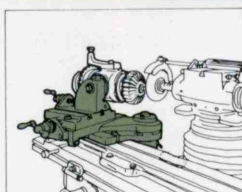
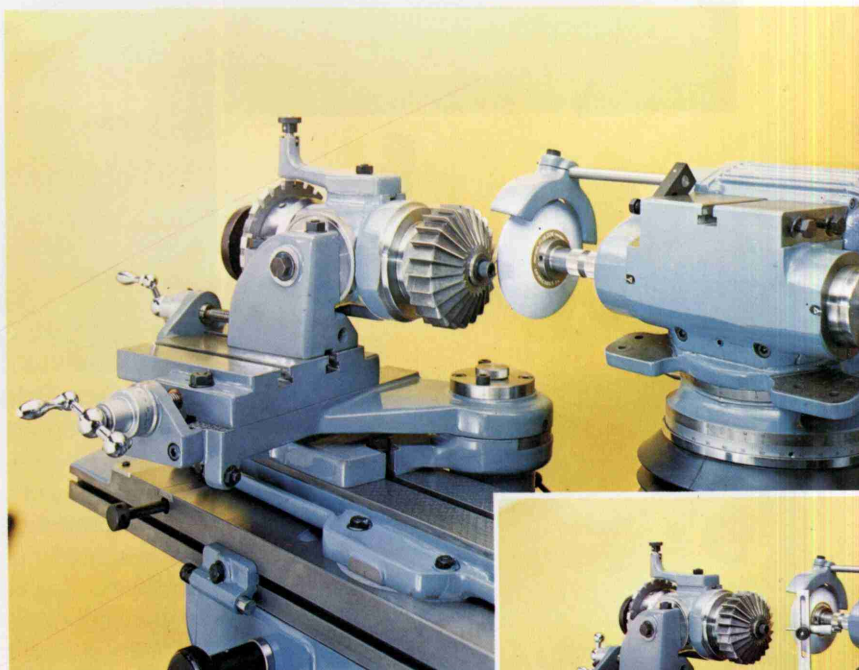
■ No.1 Radius Grinding Attachment

This is ideal for sharpening the radii of ball end mills and styli. It consists of two slide bases, each with micrometer adjustment, and a workhead having a B & S No.12 or Morse Taper No.5 taper hole spindle. It can grind radii up to 7 1/2" (190mm); and for cutter less than 4" (100mm) in diameter, it can grind up to 2" (50mm). Indexing of straight flute cutters is possible by using an index plate mounted on the back of workhead. 0.065kW motor is used. (Attachment No.6)

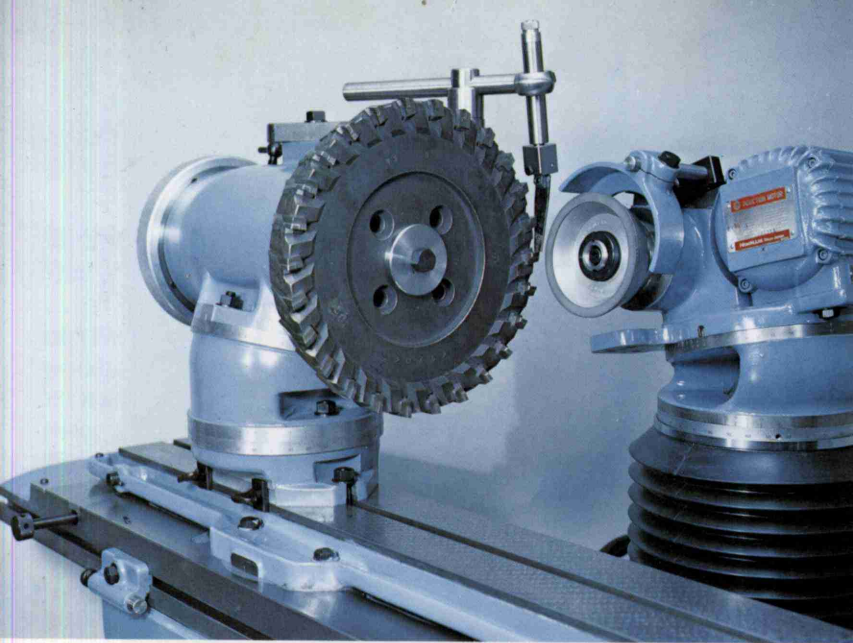


■ No.2 Radius Grinding Attachment

This is suitable for corner radius grinding of face mills and shell end mills. The position for grinding start is set by the micrometer to eliminate grinding error. The grinding capacity of this attachment is 0 through 1" radii (0 through 25mm) and 0 to 12" cutter diameter (0 through 300mm). (Attachment No.7)



Corner radius grinding of milling cutter

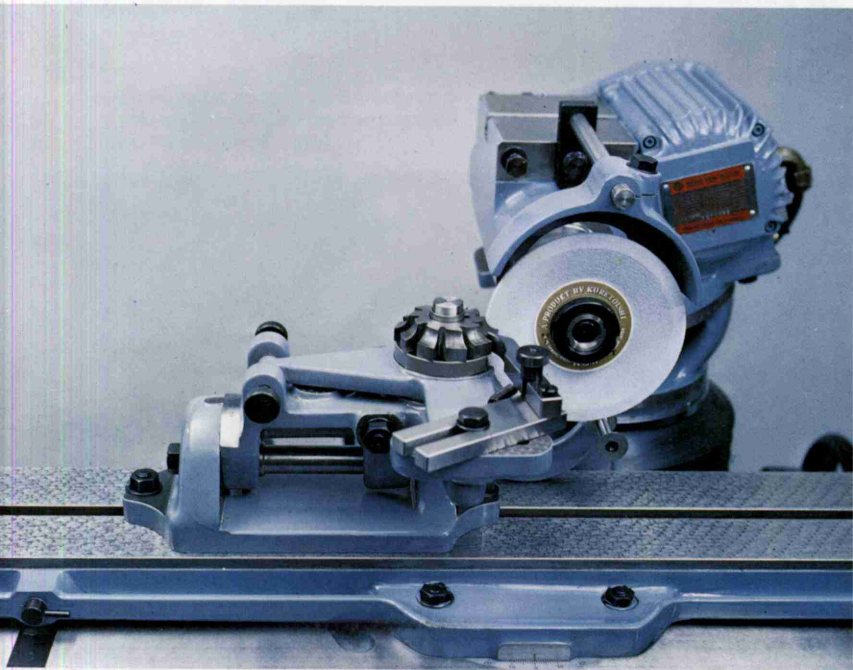
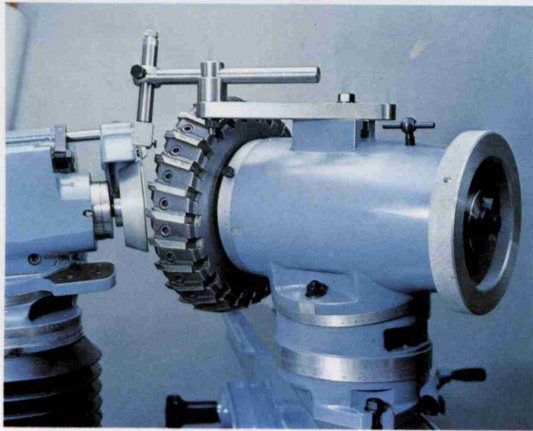
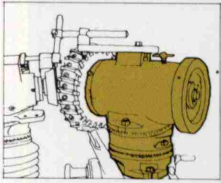


■ Face Mill Grinding Attachment

With this attachment, face mills of large diameter up to 18 inches (457 mm) can be ground efficiently and accurately; however face mills smaller than 8 inches (200mm) in diameter can be mounted and ground with the standard workhead alone.

This attachment comprises a base, swivelling horizontally with respect to table, and a workhead swivelling at a 15 degree angle. This construction simplifies greatly the setting of elevation and depression angle. Furthermore, rugged design gives the C-40 the capacity for grinding large size cutters and tools.

(Attachment No.9)

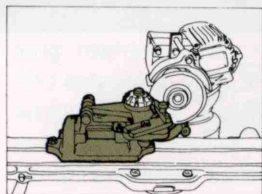


■ Formed Cutter Grinding Attachment

This is designed and manufactured for grinding the rake face of formed cutters. It supports the cutter with the pawl attached to its rake face to facilitate positioning and there elevates the efficiency of rake angle grinding.

Maximum cutter diameter for this attachment is 8³/₄" (215mm) with adapter bushing diameter from 7/8 to 2 inches (22 to 55mm). Grinding can also be carried out by the helical grinding attachment.

(Attachment No.2)

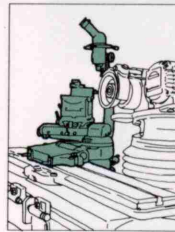
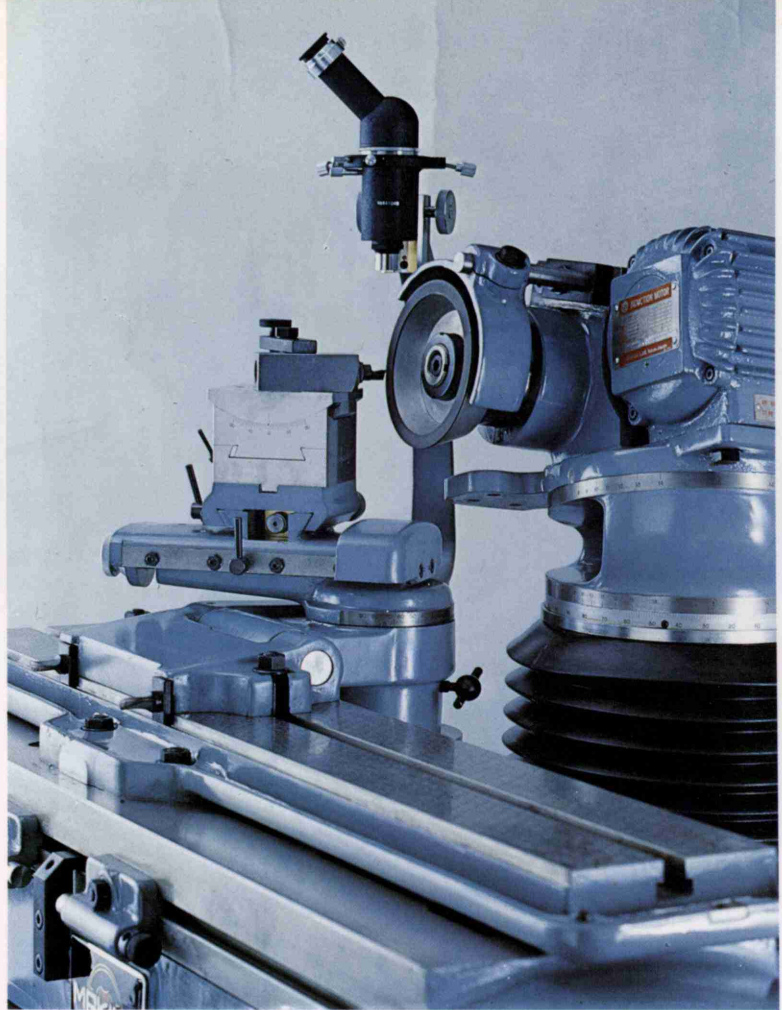
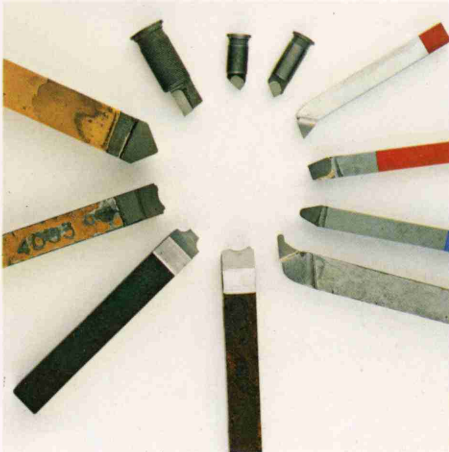


■ Optical Radius Grinding Attachment

This is used for grinding the radius of bits, throwaway chips and the tip of micro-bores. The microscope used is 20X unit and it is capable of reading the radii on the template to the order of 0.005~0.15" (0.1 to 4mm). The entire attachment can be tilted in the range of -5 to 0 to +15 degrees, and the vise, in which work is clamped, can also tilt ± 20 degrees horizontally and vertically. This attachment is ideally suited to the small tool bit radius grinding requirements.

(Attachment No.20)

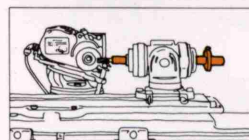
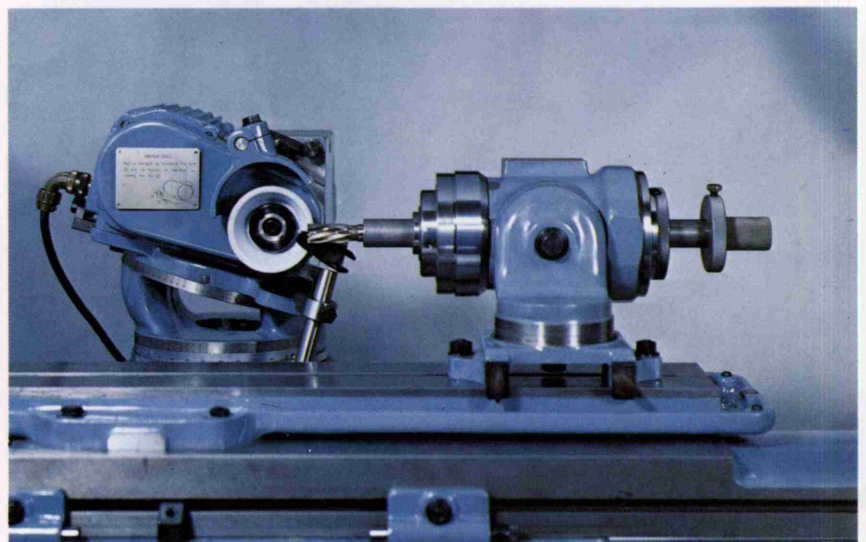
Various bits and microbores ideally ground with Optical Radius Grinding Attachment.



■ Small End Mill Grinding Attachment

This attachment permits the efficient and accurate grinding of small end mills of 3 1/2 inches or shorter with a B & S No.7 or M.T. No.2 taper shank. It consists of a sleeve and bar which slip in the B & S No.12 (or M.T. No.5) taper hole of the workhead. Grinding is made as the bar slides through the inside of the sleeve.

(Attachment No.8)



■ Spring Collet Chuck

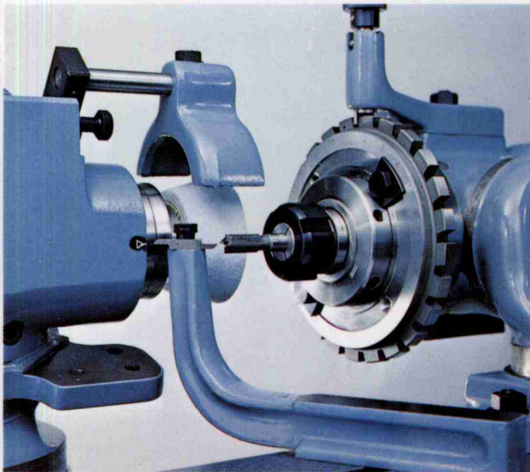
This chuck is used for chucking straight shank cutter of 1/8 inch to 3/4 inch (3 to 20mm). It can be mounted directly in the taper hole of the workhead, a ASA No.50 or B&S No.12 (or Morse No.5). This is an indispensable attachment for small cutter grinding. Spring Collet Chuck for larger size cutters or adapter for 5C collects is also available.

For your note, we also offer the collet chuck set with B&S No.10 (or MT No.4) Taper for Helical Grinding Attachment.

(Attachment No.5)



Collet Chuck Set with ASA No.50 Taper



Spring collet chuck is combinedly used with workhead indexing attachment for more accurate grinding.



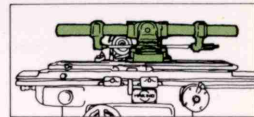
Collet Chuck Set with B&S No.10 Taper



■ Long Reamer Grinding Attachment

This attachment greatly facilitates grinding long reamer, taper reamers, boring cutters, and extension taps. Tools with 6" dia. and 36" length at Max. can be mounted and ground quite efficiently.

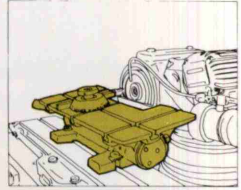
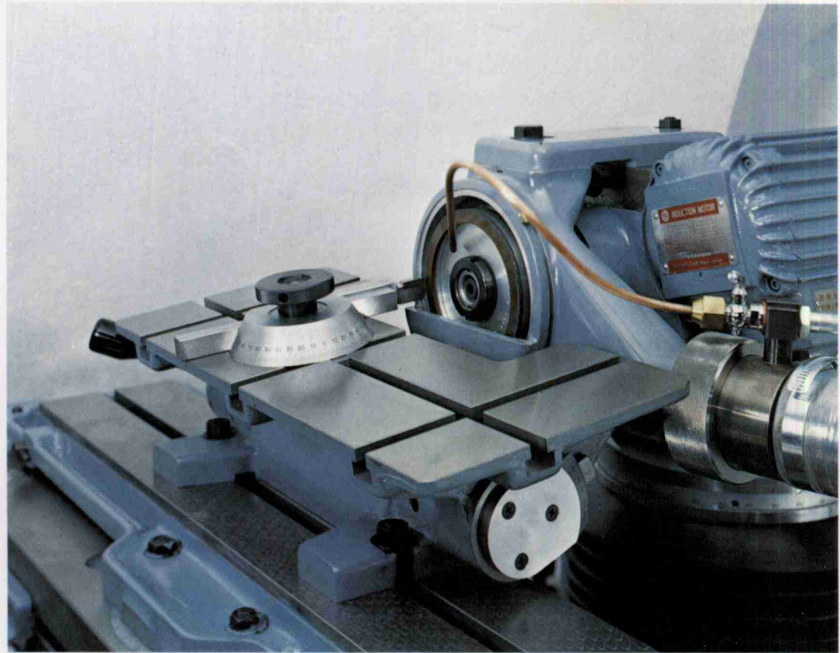
(Attachment No.10)



■ Lathe and Planer Tool Grinding Attachment

This attachment facilitates setting cutters for grinding rake face and relief angles. The large work support provides an outstanding grinding capability. This attachment is ideally suited to grinding cutters for lathes and planers. In case of small lot, usual surface grinder is more suitable.

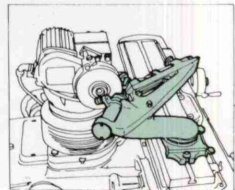
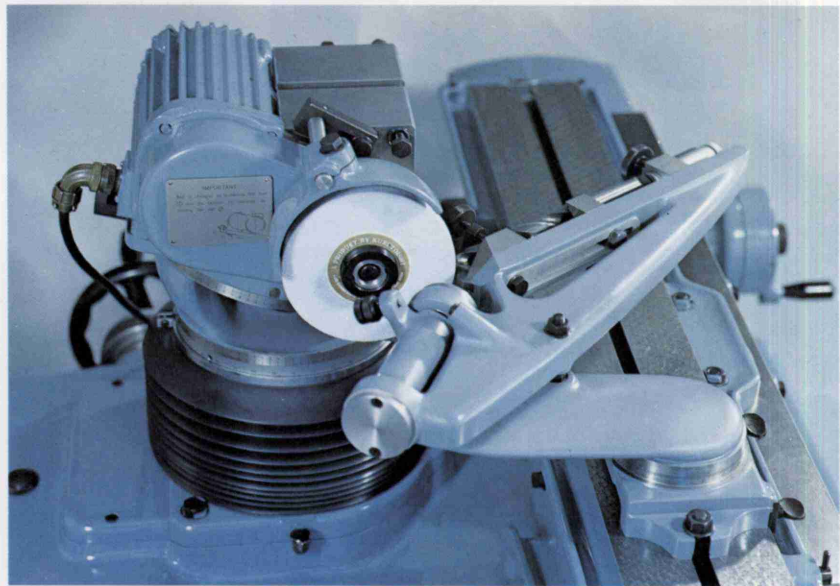
(Attachment No.15)

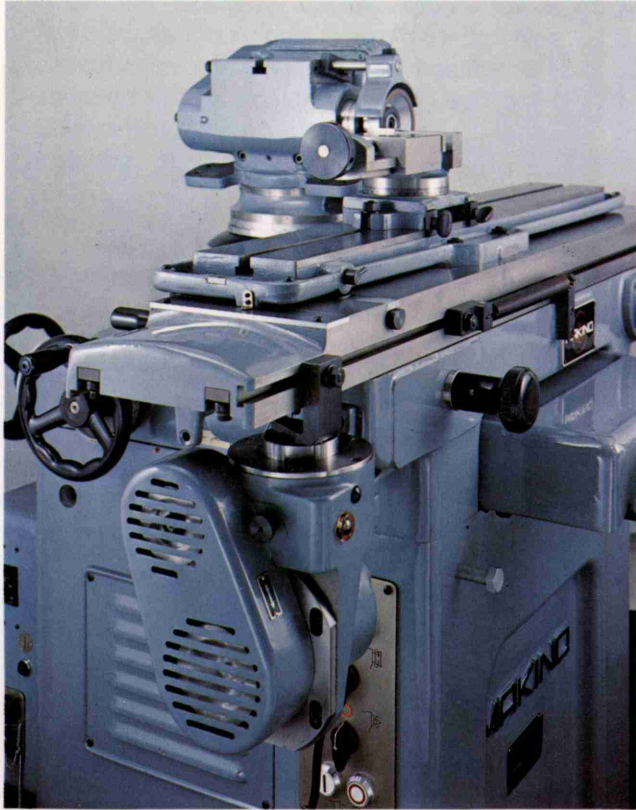


■ Drill Pointing Attachment

This attachment is used for precision grinding of drill tip relief angles. It can handle drills of 1/8 to 1" (3 to 25mm).

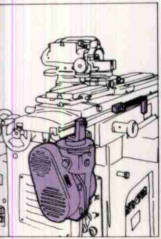
(Attachment No.16)





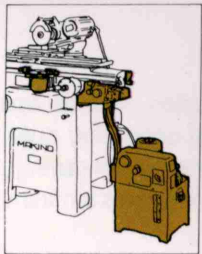
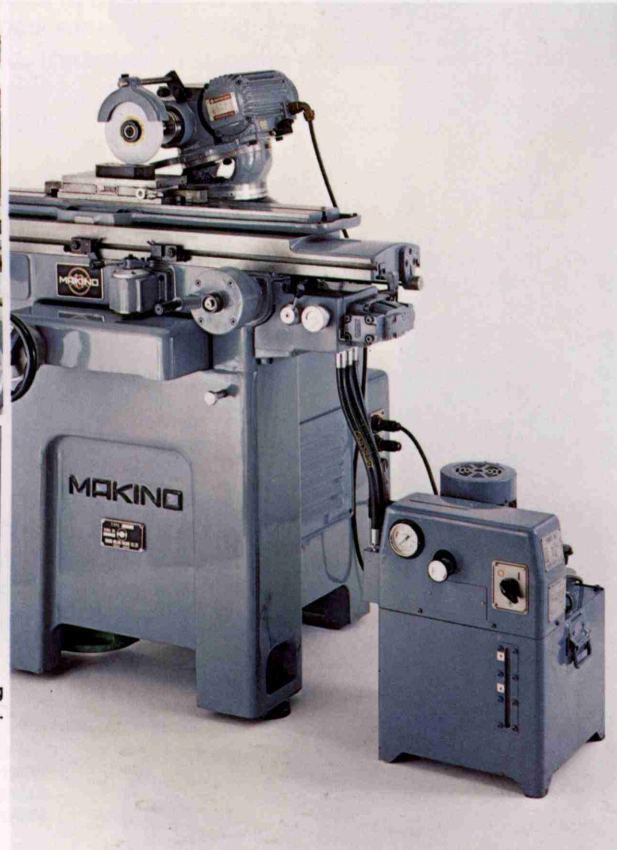
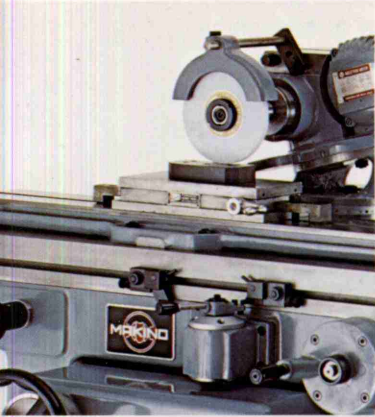
■ **Automatic Table Reciprocating Attachment**

This is ideal for grinding cutters which require table travel over a small distance at certain intervals. The stroke can be adjusted within the range of 0 to 1 1/4" (0 to 30mm). Its reciprocating motion is smooth and precise. 0.065kW motor is used. (Attachment No.17)



■ **Automatic Table Feed Attachment (Hydraulic)**

With this attachment, the table feed can be automatically controlled over a full stroke of 16" (400mm), and the hydraulic motor (1/2 Hp) permits variable table feed speed within the range of 4 to 240 in./min. (100 to 6,000mm/min.) This attachment therefore is extremely effective when combined with the Surface Grinding Attachment or Cylindrical Grinding Attachment or internal grinding attachment. These attachments can not be attached later, so take care while ordering. (Attachment No.22)

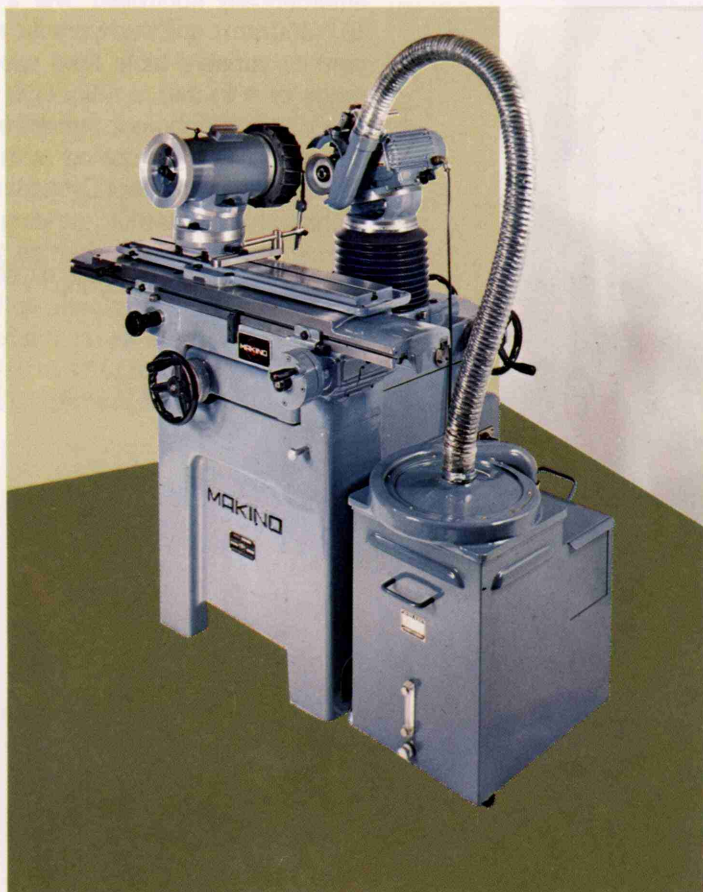
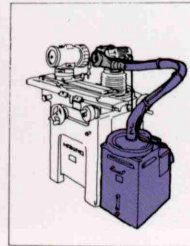


Surface grinding with table automatic feed.



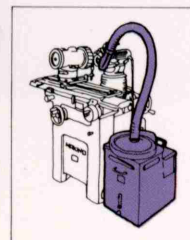
■ Mist Type Coolant System

This system is used for wet grinding extremely hard cutters, such as sintered carbide tools, with a diamond grinding wheel. Cutting fluid is poured continually onto the grinding wheel to form mist and cool the work and grinding wheel. It therefore will prevent grinding dust from spreading and thus protect the operator. This system is added on the Dust Collector, so please note this system should be ordered with the Dust Collector.
(Attachment No.14)



■ Dust Collector

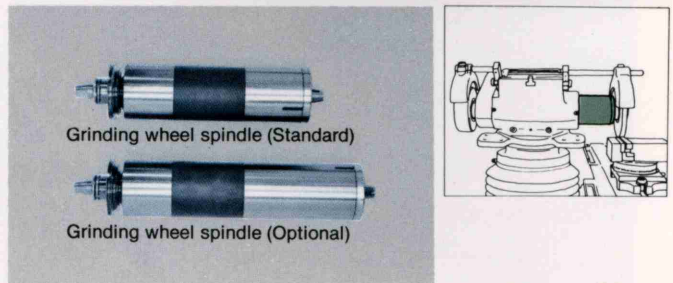
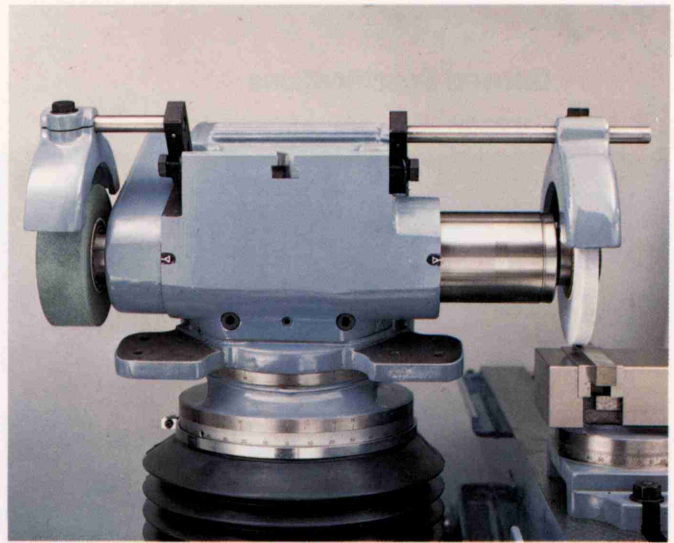
This accessory contributes toward operator safety and his health by collecting dust particles flying off the grinding wheel during grinding. It is compact and consumes a minimum of floor space.
(Attachment No.11)



Dust collector capacity:
Wind approx. 90ℓ (50 Hz)
Static press. approx. 150mm (50Hz)
Motor 0.4kW

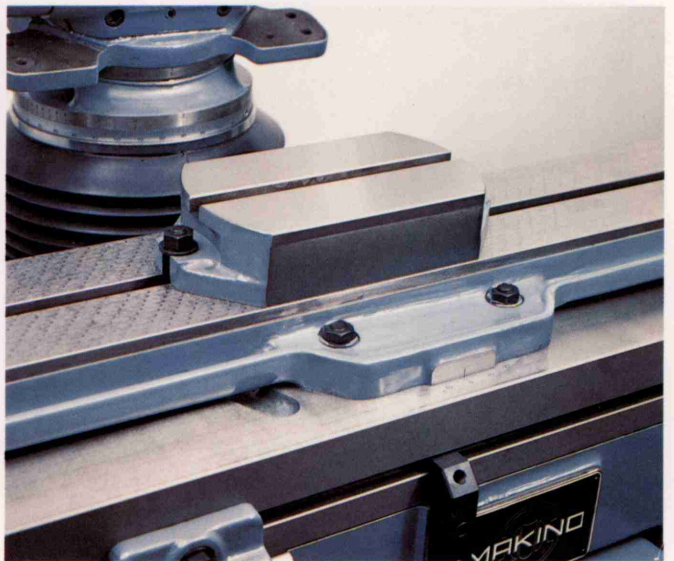
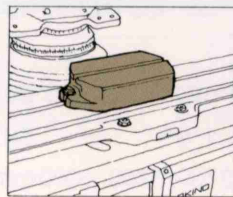
■ Extended Grinding Wheel Spindle

This attachment offers extreme convenience when the extended spindle application is required. As this spindle is also cartridge type construction, it is readily interchangeable with standard spindle. Spindle extension is 3" or 5" (75mm or 125mm). (Attachment No.19)



■ Riser Block

When the additional height of the workhead or workpiece is necessary for grinding, this attachment is used. The height of standard riser block is 2" (50mm) (Attachment No.13)



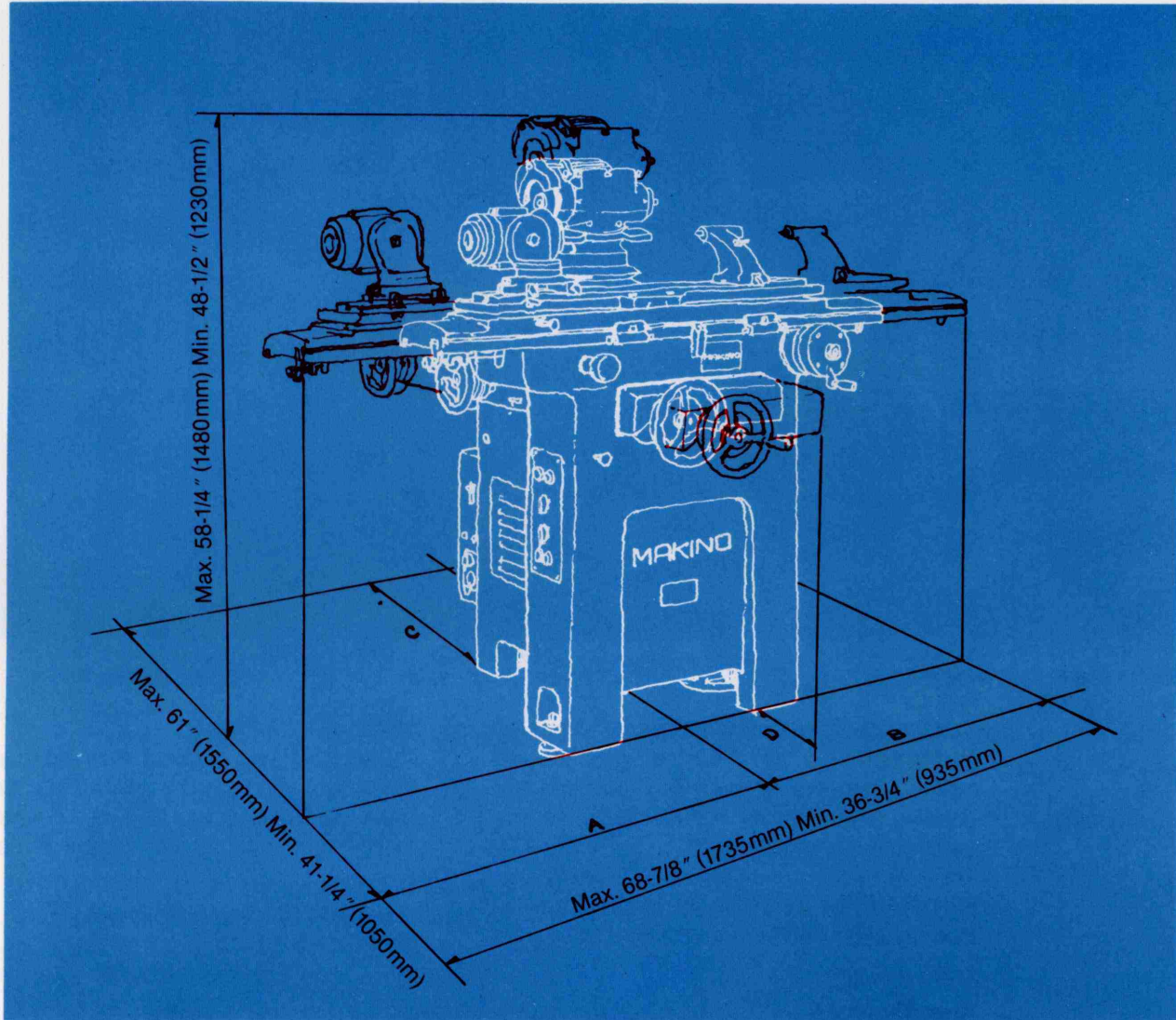
The versatility of the C-40 Universal Cutter and Tool Grinder is as limitless as you choose to make it. With 23 optional attachments, the C-40 becomes more versatile and can be used for almost all cutter & tool grinding jobs. And further development and research is a continuous process at Makino to give the C-40 even greater grinding efficiency and capability.

General Specifications

Capacity:	Inch	Metric
Swing over table	10"	250mm
Distance between centres	27 1/2"	700mm
Distance between tailstock & workhead	22 3/4"	580mm
Taper hole in workhead spindle	one end ASA No.50 other end No.12 B & S, or No.5 MT (Specify by order).	
Table:		
T-Slot (number & size)	one, 0.565" 0.536"	14.30mm + 0.05mm - 0.00mm
Working surface	5 5/16 x 37"	135 x 940mm
Range of movement:		
Longitudinal movement of table	16"	400mm
Cross movement of saddle	10"	250mm
Graduation for table swivel movement	± 60°	
Table graduation on end, for taper of	± 10°	
Vertical movement of wheel head	10"	250mm
Wheel head tilts	± 15°	
Wheel head swivels	360°	
From wheel spindle centre to top of table	max. 12" min. 2"	300mm 50mm
From wheel spindle center to T-slot center	max. 16 1/2" min. 6 1/2"	415mm 165mm
Grinding wheel spindle rpm.	2600, 3700, 6200	
Grinding wheel spindle motor	1HP	0.75kW
Required floor space	61" x 68 1/2"	1550 x 1734mm
Net weight of machine	abt. 2000 lbs.	900kg
Gross weight machine	abt. 2800 lbs.	1350kg
Dimension of packing case	abt. 166-0 CFT.	1840 x 1590 x 1580mm
• When 1.5kW (2HP) (option) is attached		
Wheel diameter	max. 8"	205mm
Flange diameter	1 1/2"	38.1mm
Spindle speed	2700, 3700, 5000 rpm.	

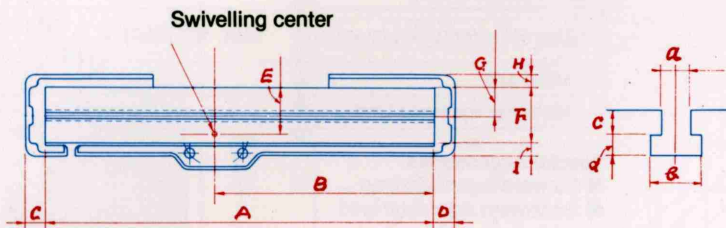
(Above specifications are subject to change without notice.)

FLOOR PLAN



	A	B	C	D	E	F
MAX	37" (925)	31 7/8" (810)	15 7/8" (403)	15 3/8" (392)	61" (1550)	58 1/4" (1480)
MIN	21" (525)	16 1/8" (410)	6" (153)	5 1/2" (142)	41 1/4" (1050)	48 1/2" (1230)

() = mm



A	B	C	D	E	F	G	H	I
37" (940)	21" (532.5)	2" (50)	2" (50)	4 3/8" (110)	5 3/8" (135)	2 3/4" (68.5)	1 3/16" (30)	1 3/16" (30)

() = mm

a	b	c	d
0.565" (14.30 ± 0.05)	1 5/16" (24)	1/2" (12)	3/8" (10)

() = mm

AUTOMATIC CUTTER & TOOL GRINDER

MODEL CF SERIES

FOR COMPLETELY AUTOMATIC
CUTTER AND TOOL GRINDING
ON PRODUCTION BASIS

The CF-40 Series, with the same versatility and precision as the C-40 has, provides you further automatic features on cutter and tool grinding, and naturally it is ideally suited to a batch grinding requirement.

There are three models in the CF-40 Series, the CFIA, CFIB and CFIIIA-40. Each is a special machine designed to meet the special require-

ments of a customer.

These machines, without their special automatic features, can be utilized as the C-40 Universal Cutter & Tool Grinders if necessary, making them a highly economical investment.

Specifications

Item \ Model	CFIA-40	CFIB-40	CFIIIA-40
Indexing (Power)	(with Tooth Rest)	24 (Standard) with index plate	24 (Standard) with index plate
Min. Indexing (Power)	4 (Standard)	3	2 (Standard)
Infeeding Amount (Power)	Infinitely variable 0.0002 ~ 0.0034" (0.005 ~ 0.1)		Infinitely variable 0.0002 ~ 0.0034" (0.005 ~ 0.1) Rotation feed 0.0002 ~ 0.0068" (0.005 ~ 0.2)
Table Power Feeding	Infinitely variable 4 ~ 240"/min. (100 ~ 6000/min.)		
Dia. of Cutter to be ground	Max. 10" (250)	Min. Max. Min. Max. 2 1/4 ~ 10" (60 ~ 250)	Max. Module 8 Max. 5" (125)
Min. Lead			40° By Guide Bar
Motor for Hydraulic Unit		1/2 HP (0.4kW)/4p	

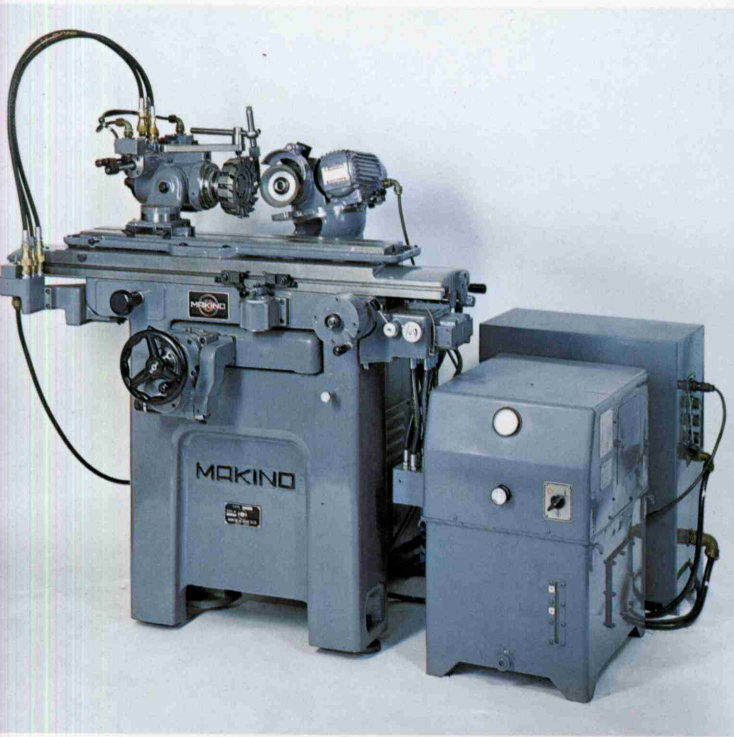
() = mm

Special Accessories

- Forward automatic feed
- Downward automatic feed

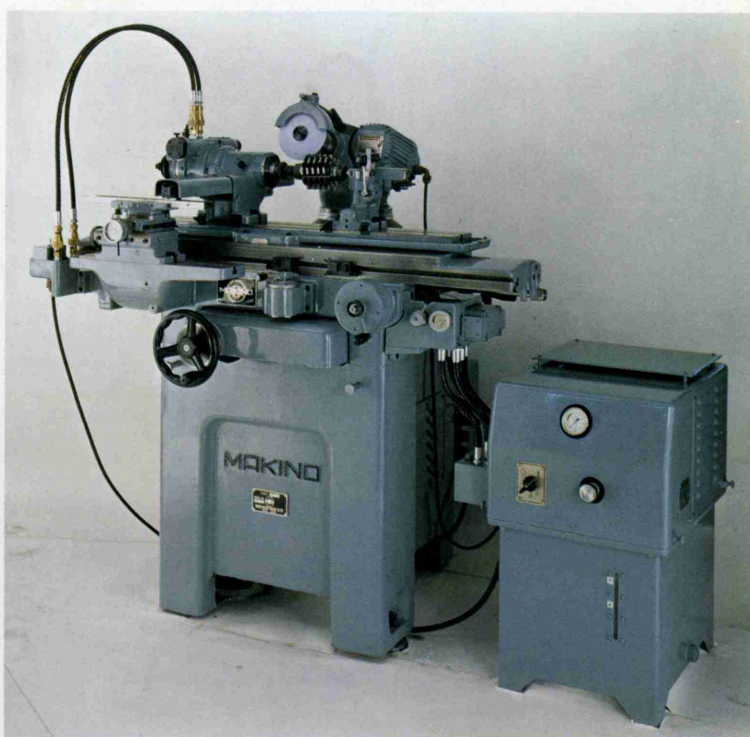
(Above specifications are subject to change without notice.)

MODEL CFI-40

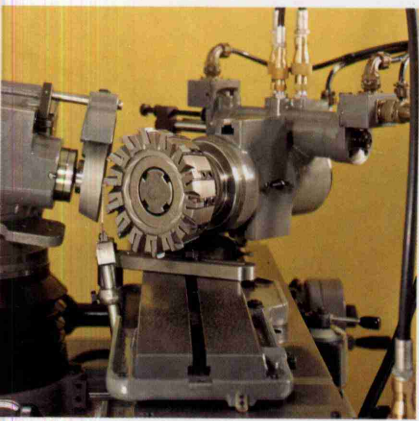


The CFI-40 is most suitable for automatic face mill grinding, requiring indexing of the workhead with the index plate or toothrest. Automatic indexing of the workhead is made by the indexing plate or tooth rest at each table reciprocation and, after one cycle of grinding, automatic infeeding is also made to a preset value ranging from 0.0002 ~ 0.0034" (0.005 ~ 0.1mm). Upon completion of grinding to the preset dimension through repetition of this cycle, the machine shifts the work to the left and comes to a stop.

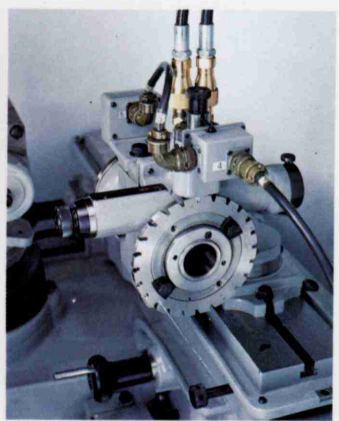
MODEL CFIIIA-40
Helical Grinder



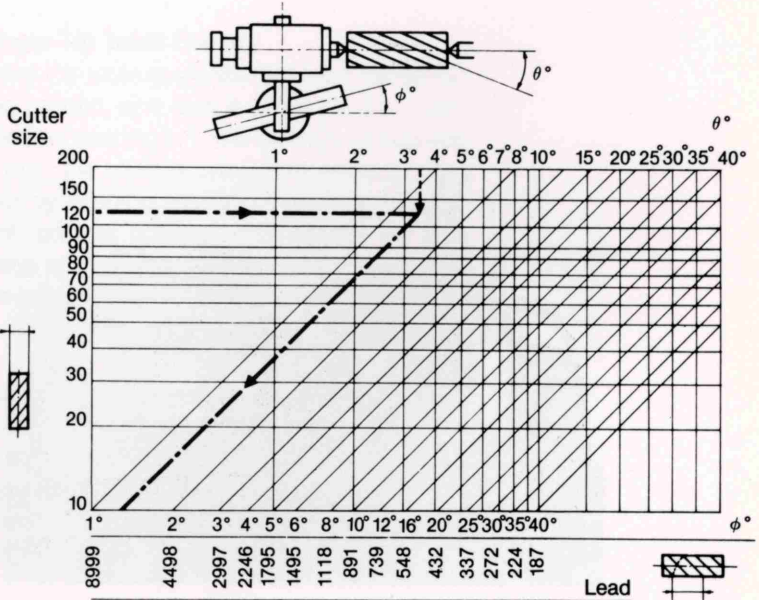
This machines is ideally suited to automatic and economical helical grinding of hobs and spiral cutters etc., to an extremely high degree of accuracy which results from mechanical accuracy itself and full automatic grinding features.



Face mill automatic grinding with tooth rest



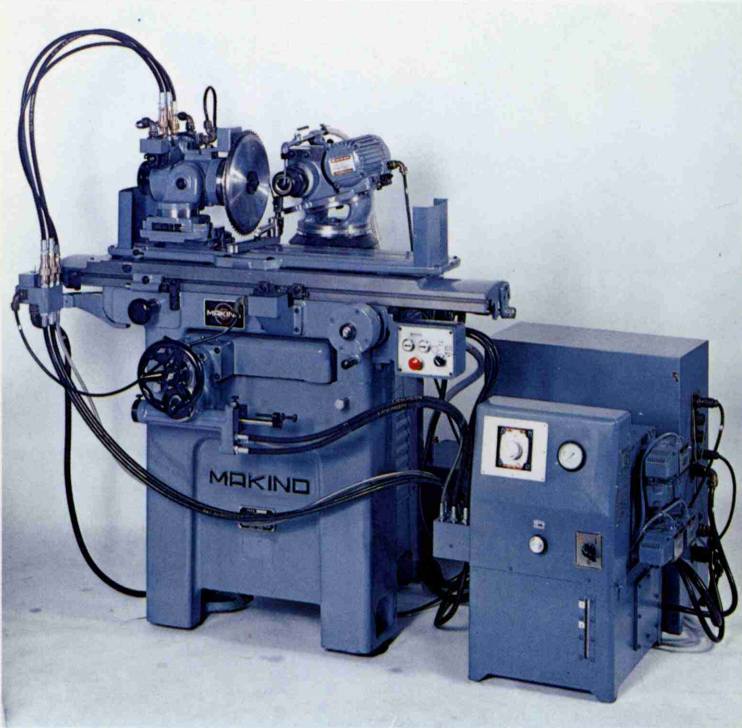
Automatic indexing device (with index plate)



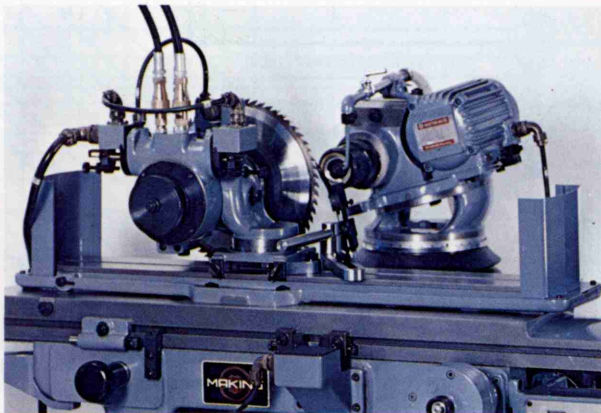
Reference table for helix. angle setting.

MODEL CF-40

Automatic Saw Blade Grinder

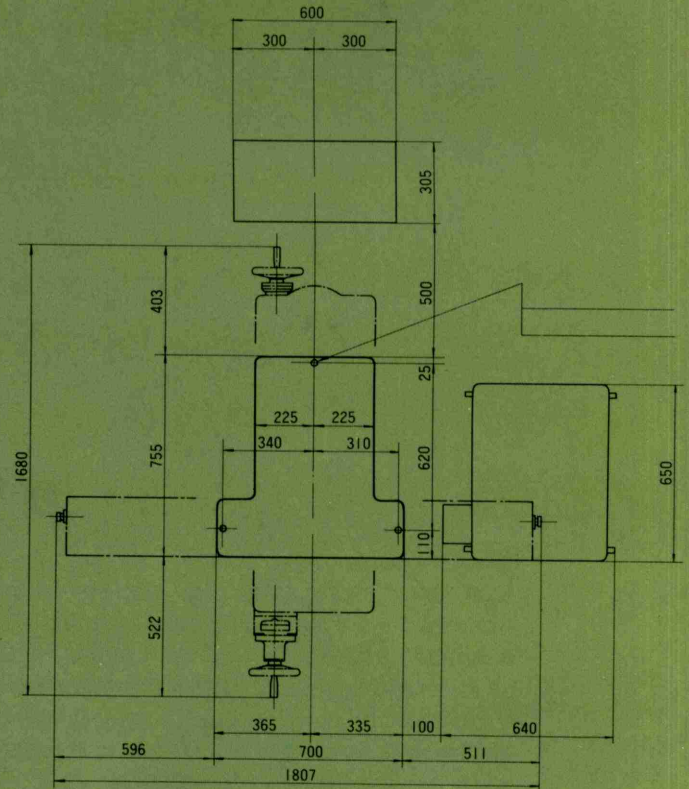


This machine grinds automatically the peripheral teeth of metal saws at the required angle on every reciprocation of table movement with toothrest indexing. Having ground the work to a preset dimension, this machine comes to a complete stop, permitting the next work to be set.



Automatic saw blade grinding

CF-40 SERIES FLOOR PLAN



A	B	C	D
23 ³ / ₈ " (595)	27 ⁵ / ₈ " (700)	20 ³ / ₁₆ " (511)	76" (1930)
E	F	G	H
15 ⁷ / ₈ " (403)	29 ³ / ₄ " (755)	20 ⁵ / ₈ " (522)	74 ³ / ₈ " (1890)
I	J	K	L
23 ⁵ / ₈ " (600)	7 ⁷ / ₈ " (200)	17 ³ / ₄ " (450)	11 ⁵ / ₁₆ " (288)
M	N	O	P
11 ¹³ / ₁₆ " (300)	23 ¹ / ₄ " (588)	7 ⁷ / ₈ " (200)	22 ⁷ / ₈ " (580)

() = mm

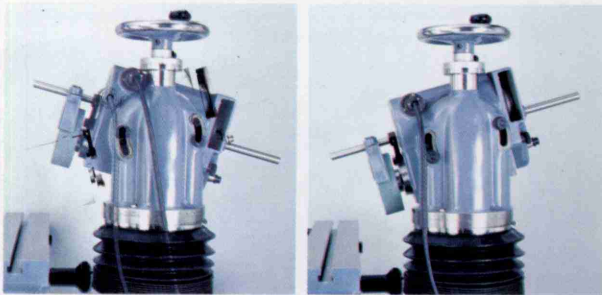


UNIVERSAL CUTTER & TOOL GRINDER

FOR SMALL JOB APPLICATIONS

MODEL C-25

This machine is the "Little Brother" machine of the C-40 for rather small job applications and incorporates the same versatility and accuracy of the C-40. With outstanding operational performance and mechanical rigidity, it is highly effective for use as a special purpose machine on a production basis.



Universal wheelhead tilts ± 15 degrees vertically and swivels 360 degrees horizontally.

MAIN MECHANICAL FEATURES

* Universal Wheelhead

Since the grinding wheel head will tilt ± 15 deg. vertically and swivels 360 deg. horizontally, it facilitates setting clearance angle and increases grinding capacity.

* Permanently Lubricated Grinding Wheel Spindle

The grinding wheel spindle requires no lubrication. Super-accurate angular contact ball bearing and permanent lubrication make for extreme spindle accuracy over prolonged period of time.

* Finger-Tip Table Control

Since the table guide surfaces are hardened and ground, and also it slides on the precision ball bearing in V and flat way. In addition to that, the table is controlled without backlash by winding motion of cable to take-up reel, so that operator can control the machine smoothly without fatigue and can get the good response of cutting condition to his hand, which results in precision grinding.

* Duplicate Controls

Duplicate control construction permits selection of operating position as best suits a particular job. This raises grinding efficiency and results in an added measure of precision.

Specification

Capacity:

	Inch	(Metric)
Swing over table	7"	(180mm)
Distance between centers	16"	(400mm)
Distance between tailstock & workhead	12"	(300mm)

Table:

Working surface	24 ³ / ₈ x 4"	(620 x 105mm)
-----------------	-------------------------------------	---------------

Range of movement:

Longitudinal movement	10"	(250mm)
Cross movement of saddle	8"	(200mm)
Vertical movement of wheel head	7"	(180mm)
From wheel spindle to work center (horiz.)	Max. 8 ⁵ / ₈ " Min. 2 ³ / ₄ "	(220mm) (70mm)
From wheel spindle to work center (vert.)	above 6" below 1 ³ / ₁₆ "	(150mm) (30mm)

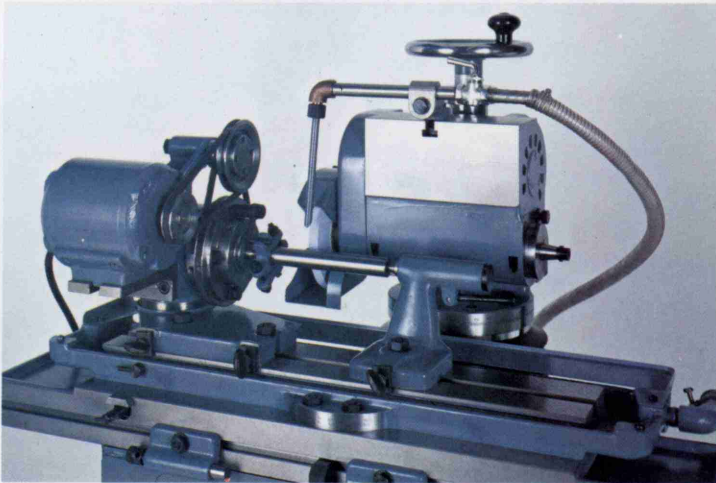
Wheel spindle speed	2 steps 3800 & 6500 rpm
---------------------	-------------------------

Wheel spindle motor	1/2 HP (0.4kW)
Net weight of machine	1200 lbs. (550kgs)
Gross weight	2000 lbs. (900kgs)

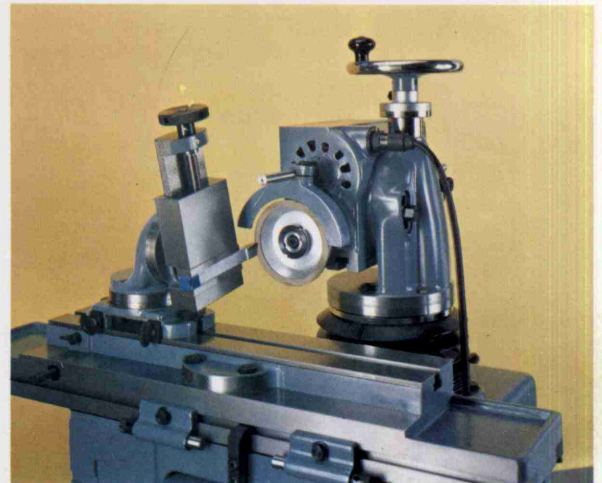
(Above specifications are subject to change without notice.)

MAKINO MODEL C-25 IS AVAILABLE WITH THE EXTRA ATTACHMENTS BELOW

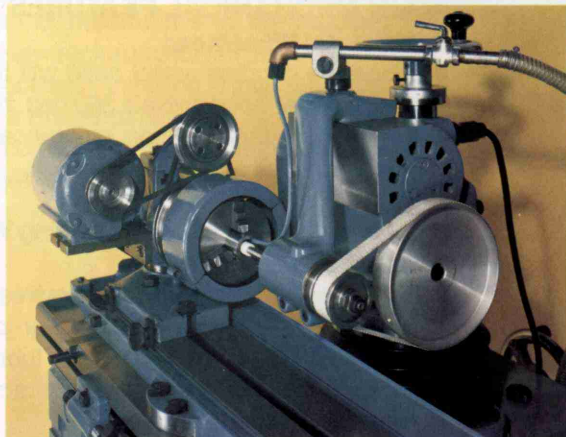
EXTRA ATTACHMENTS



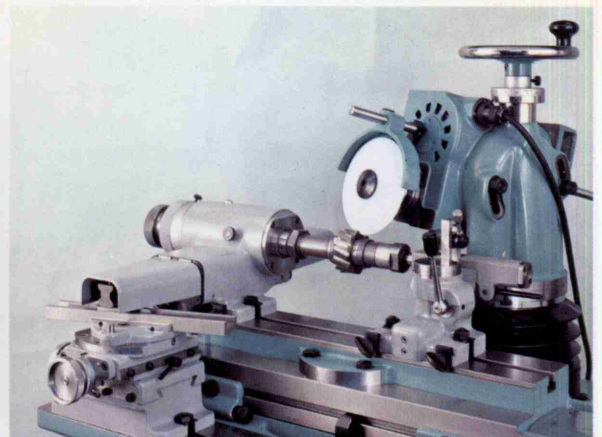
Cylindrical Grinding Attachment



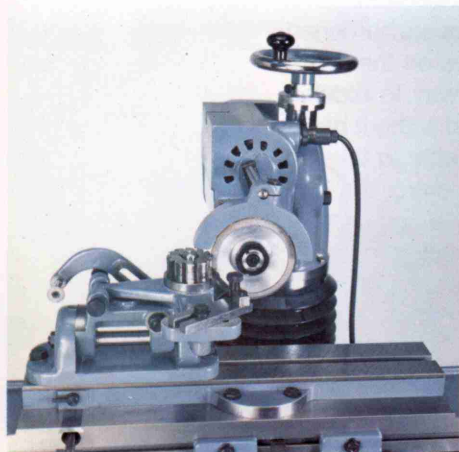
Surface Grinding Attachment



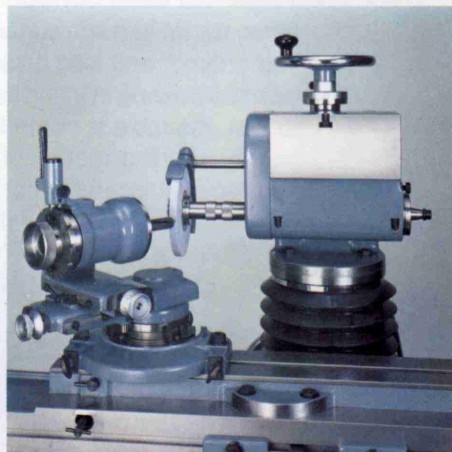
Internal Grinding Attachment



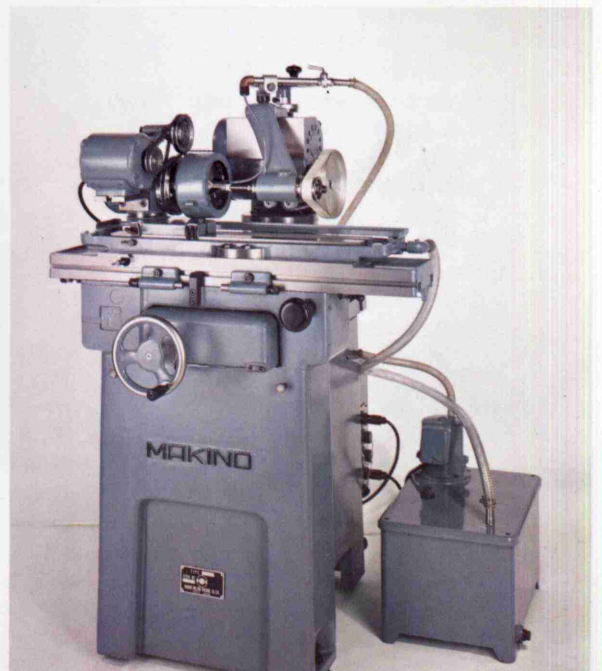
Helical Grinding Attachment (Factory-built)



Formed Cutter Grinding Attachment



No.1 Radius Grinding Attachment



Coolant Equipment

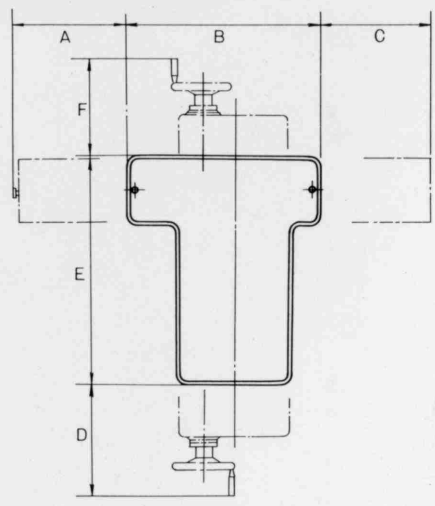


The C-25 comes with the same variety of Standard Equipment as the C-40 (43 items and tool cabinet.)

MAIN STANDARD EQUIPMENT

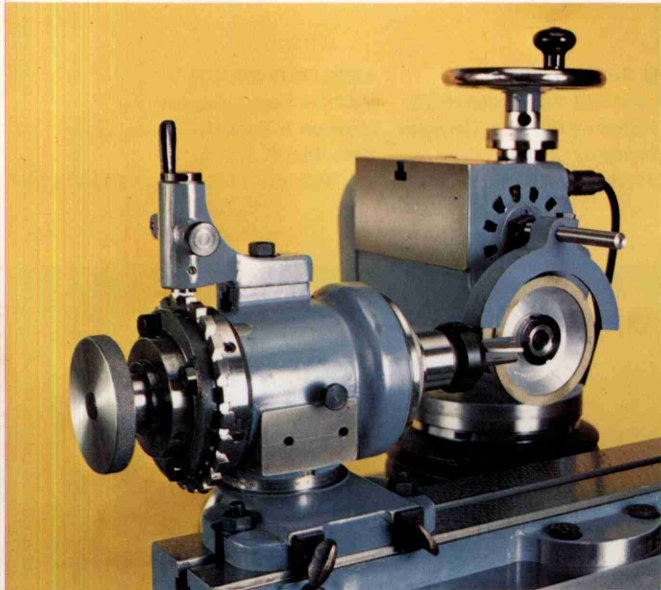
- Workhead
- Right and Left hand tailstock
- Draw-in bolt for workhead
- Spanner and wrenches
- Setting tools for wheel sleeve
- Diamond dresser holder
- Center gauge
- Ejector rod
- Plain tooth rest
- Adjustable tooth rest
- Universal tooth rest plate and extension bar
- Wheel guards
- Center and collets
- Extension wheel sleeve
- Wheel sleeves
- Grinding wheels
- Levelling pads
- and so on.....

C-25 FLOOR PLAN



	A	B	C	D	E	F
MAX	12 3/8" (320)	21 5/16" (540)	12" (305)	11 7/8" (302)	24 1/2" (620)	10 3/4" (272)
MIN	2 3/4" (70)	2 3/16" (55)	2 3/16" (55)	6" (152)	4 13/16" (122)	4 13/16" (122)

() = mm



Workhead Indexing Attachment



Spring Collet Chuck



Dust Collector

Feed your accuracy and productivity ambitions to makino



makino

MAKINO MILLING MACHINE CO.,LTD.

Head Office

3-19, Nakane 2-chome,
Meguro-ku, Tokyo-152, Japan
Tel: Tokyo 717-1151
Telex: 246-6567 (MAKINO J)

MAKINO EUROPE GmbH

Postfach 601780, Wiesendamm 30,
D-2000 Hamburg 60, F.R. Germany
Tel: Hamburg 291246
Telex: 2173698 (MKN D)

LEBLOND MAKINO

Machine Tool Company
Madison & Edwards Roads, Cincinnati,
Ohio 45208, U.S.A.
Tel: 513-351-1700 Telex: 230-214446