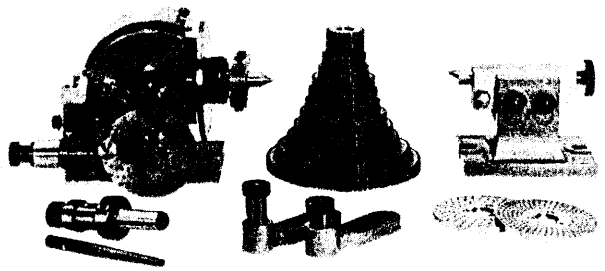
550-032 -033 DIVIDING HEAD

The dividing head of this type is called a universal index center. It has the advantage of allowing differential indexing and spiral machining in combination with change gears, bracket and spindle arbor.

This divice can be used for many dividual numbers. e. g. 2 to 50 by indirect indexing and 51 to 380 by indirect or differential indexing.

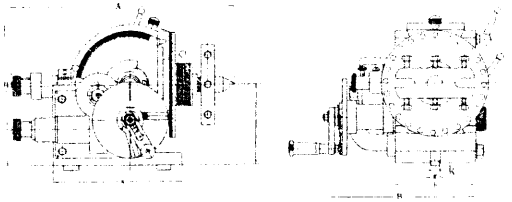


Standard Accessories

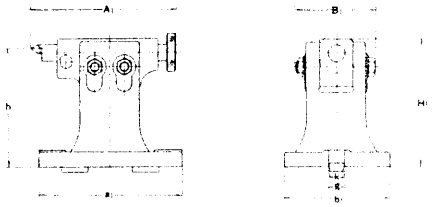
Change gear 12
(Number of teeth 24, 24, 28, 32, 40, 44, 48, 56, 64, 72, 86, 100)
Spindle Arbor 1
Arbor handle 1
Arbor collar 1
Arm Ⓛ (long shaft) 1
Arm collar Ⓛ (for long shaft) 1
Arm Ⓢ (short shaft) 1
Arm collar Ⓢ (for short shaft) 1
Change gear look nut 4
Index plate A, B, C ..... 1 each
Center (B & S taper) 1
Driving dog 1
Flange(milling chuck adaptor) 1

Dimentional Drawing

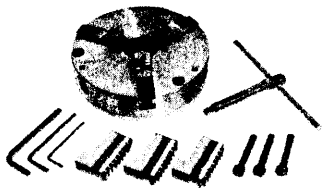
Dividing Head



Tail Stock



Special Accessories Three-jaw milling chuck



Unit : mm/in

Stock No.	Maximum clamping Capability		Outer diameter	Barrel thickness	Applicable Dividing head
	Inner jaw	Outer jaw			
milling chuck for type 550-032	3~74 0.12~2.91	72~144 2.83~5.66	190 7.48	54 2.12	550-032
〃 550-033	3~95 0.12~3.74	93~185 3.66~7.28	230 9.05	60 2.36	550-033

Stock No. & Dimensions (Type 550-032, -033)

Unit : mm/in.

Stock No.	Height	Machine body			Base dimensions		Bolt slots	Center taper	Spindle screws	Weight
		Overall length	Overall width	Center height						
	H	A	B	h	a	b	g			Kg/Lb
550-032	236 9.29	365 14.37	272 10.71	133 5.23	213 8.39	134 5.28	17 0.67	BS-10	M55×P3	65 144.3
550-033	301 11.85	459 18.07	350 13.78	170 6.69	272 10.71	170 6.69	21 0.83	BS-11	M70×P4	113 249

Stock No.	Machine body				Base dimensions		Bolt slots	Guide block width
	Overall length	Overall width	Height	Center height				
	A_1	B_1	H_1	h	a_1	b_1	g_1	K
Tailstock for type 550-032	255 10.04	88 3.47	139 5.47	133 5.23	175 6.89	124 4.88	17 0.67	16 0.63
〃 550-033	296 11.65	114 4.49	179 7.05	170 6.69	225 8.86	164 6.46	21 0.83	20 0.79

Operation and Maintenance

If an dividing head with a high degree of accuracy is improperly handled, it may be damaged (especially damage to worm gear) or lead to more rejects.

In order to obtain highest performance from this device, it is advisable to thoroughly understand the mechanism for proper operation and maintenance.

When keeping the dividing head after detaching from the milling machine, clean thoroughly, removing all dirt, metal chips, cutting oil and other matters causing rust or flaws. Be sure to store this device on a shelf or stand or in a box free from moisture, while paying attemtion to the location.

In this case, care must be taken not to damage the guide block etc.

Apply protective oil to the major parts such as spindle, index plate, etc.

Hints on mounting to milling machines

(1) Clean the table top of the milling machine and the bottom of the head-stock & tail-stock.

(2) Fit the head-stock and the tail-stock to the T-slot on the table of the milling machine and put a test bar between the both centers. Fix a dial indicator to the milling machine as shown in Fig. 1.

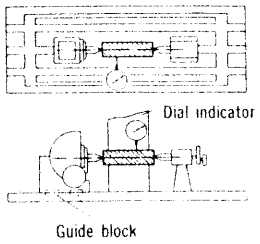


Fig. 1

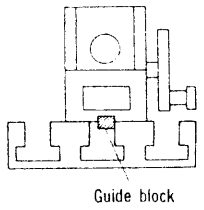


Fig. 2

Then check that the parallelism of the dividing head and the height of the both centers are held within the guaranteed tolerance, while moving the dial indicator right-to-left by feeding the table.

The parallelism and height of the dividing head have been fully adjusted before leaving our factory and the head-stock and tail-stock have the same number.

However, they may be out of order due to shocks during transit. So, be sure to check them in case of precise machining.

(3) When the width of the T-slot is larger than that of the guide block of the dividing head, shift it to one side as shown in Fig. 2.

Hints on setting workpiece

Note that misalignment of the center of a workpiece will adversely affect the dividing accuracy.

When supporting a workpiece with the both centers, use the driving dog. Firmly clamp the driving dog to the center, and when clamping the work to the driving dog, tighten each push screw evenly.

In this case, be careful not to twist the work.

Operating Instructions and Functions of Each Unit

Indexing Method

● Direct indexing

This is the simple indexing method using the direct indexing plate (05) and the index pin (16).

First, loosen the metal clamp screw (26) by turning it in the direction "U", and then turn the worm stopper (25) in the direction "D," thus disengaging the worm shaft (20) from the worm wheel (10).

The direct indering plate has 24 holes, and therefore dividing into the following numbers can be puickly made by turning the spindle manually :2, 3, 4, 6, 8, 12 and 24.

A direct indexing plate having a specific number of holes (36 or less) is manufactured upon request.

In this case, turning the worm stopper (25) in the direction "D" will transmit the driving force from (25) to (21) and then (20).

As a result, the worm shaft (20) disengages from the worm wheel (10) by means of the eccentric metal and thus it comes down.

The direct indexing plate is graduated in 1°—360° per revolution, which can be read by the plate rotating indicater.

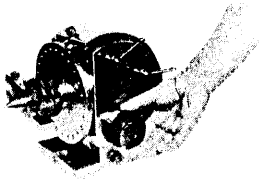


Fig. 3 Engagement and disengagement of worm metal

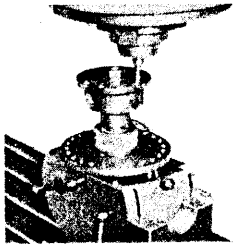


Fig. 4 Direct indexing

● Indirect indexing

This indexing method makes possible the dividing into all numbers from 2 to 50 plus even numbers up to 100 (except 96) and multiples of 5. In case of indirect indexing, dividual numbers more than the above become less.

Three index plates (28) for indirect indexing are provided and the number of holes of each plate is shown below :

Table 1. Index Plate (3 pcs.)

Number of holes	A	15	16	17	18	19	20
	B	21	23	27	29	31	33
	C	37	39	41	43	47	49

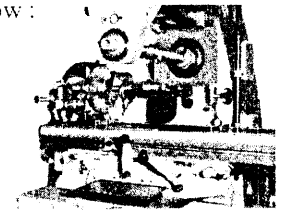


Fig. 5 Indirect Indexing

In this dividing head the rotational ratio of the worm and the worm wheel is 40 :1.

Therefore, one revolution of the crank handle (31) will turn the spindle by 1/40 revolution.

The relationship between the number of handle revolution " N " and the dividual number " T " to be sought may be expressed with the following equation :

$$N=\frac{40}{T}\ldots(1)$$

(Example) Division into 18 equal parts

$T=18$

Therefore $N=\frac{40}{18}\rightarrow\frac{40}{18}=2\frac{4}{18}$

In this case, 2 means two revolutions of the crank handle and the denominator 18 means the hole row of the index plate.

Also, 4 indicates that the handle should be rotated at intervals of 4 holes using a row of 18 holes.

(Refer to Table 1.)

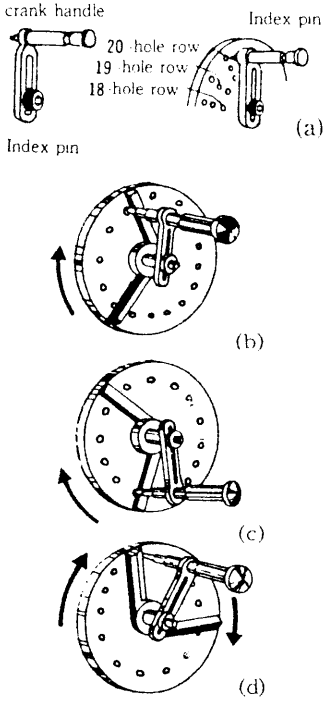
But in this method, the operator has to count 4 holes intervals one by one.

It is therefore necessary to use a device called ' sector ' (29) to avoid such troublesome procedures.

Operations of Crank Handle and Sector

In case of the Example 'DIVISION into 18 equal parts' aforesaid, it is natural that indexing operation should proceed with the intervals of 4 holes after setting the index plate A on which a row of 18 holes are provided. But in this method, the operator has to count 4 holes' intervals one by one. He must feel inefficient.

In this viewpoint, it is necessary to use a device called 'sector' to avoid such troublesome procedures. The following will describe some necessary procedures for operation of the sector.



(a) Loosen the crank handle locknut, adjust its length so as to cause the index pin to fall in the train of 18 holes, and retighten it.
Loosen the set screws of the sector, open two arms in accordance with the interval of 4 holes (total number of holes is five), and retighten with set screws.

(b) First, bring the left arm of the sector near to the index pin's left side.
Next, rotate the crank handle twice clockwise to apply it to the right arm of the sector so that the index pin will fall in the hole located at the right arm's left side surface.

(c) Rotate the sector clockwise this time, and put the right side surface of the left arm to the left side of the index pin.
In this case, the relationship between the index pin and the sector's left arm in their positions are the same as in Par. (b). The index pin hole that actually accommodates the index pin is located at the point where goes across five holes to the right away from the hole as in Par. (d).

(d) Repeat the same procedures.

Precision angular dividing

The principle of the method is the same as the indirect dividing explained already.

The spindle turns 1/40 for a full rotation of the crank handle, so 1/40 rotation of the spindle corresponds to the angle 360°/40 i. e. 9°.

Formula 2: $N=\frac{\alpha}{90^\circ}$ ·····(2)

where N : number of the rotation of the crank
α : dividing angle
Example : Divide the angle into 43° 20′.
Formula 2 tells

$$N=\frac{\alpha}{9^\circ}=\frac{43^\circ 20'}{9^\circ}$$

Change 43° 20′ and 9° in unit of minute

$$\frac{43^\circ 20'}{9^\circ}=\frac{2600'}{540'}=4\frac{22}{27}$$

Thus by using the 27-hole position of the dividing plate, turn the crank handle 4 full rotations and further advance 22 holes on the dividing plate.

Defferential Indexing

This method is used for a dividual number that cannot be divided by the direct indexing or indirect indexing. Change gears are used in this method.

Rotate the spindle by turning the crank handle, thereby rotating the index plate by a desired angle in the same direction as of the crank handle or in the opposite direction via a change gear fixed to the rear of the spindle.

This acts as an additional rotation to the spindle rotation, and thus the spindle rotation is controlled. Namely, addition of the number of revolutions that can be obtained by the indirect indexing to that of the additional revolutions by the change gear will make the number of revolutions of the spindle.

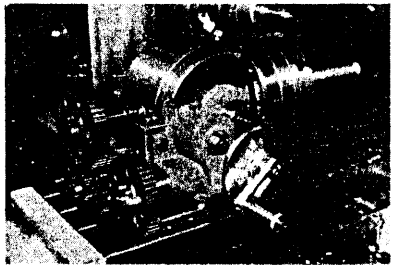
In this case, therefore, remove the indexing plate stopper from the index plate, and in place of it fit the spindle arbor, arm, change gear, etc. (accessories) to it.

Then, set the spindle in such a manner that it rotates on the same axis as of the crank handle. (Fig. 6)

T : dividing number

T′ : the assumed number close to T

N : the number of revolutions of crank handle



Defferential Indexing Fig. 6

$$N=\frac{40}{T'}\cdots\cdots\cdots(3)$$

$$\text{Gear ratio } i=40\times\frac{T'-T}{T'}\cdots\cdots\cdots(4)$$

Where dividing can be made with two change gears

$$i=\frac{A}{B}\cdots\cdots\cdots(5)$$

(Note) In case of the double-geared drive, the gear to be engaged with the spindle arbor is designated A and the gear to be engaged with the gear case arbor B in this manual.
However, in other manuals up to now A is named P and B is named Q.

When four gears are used

$$i=\frac{A}{B}\times\frac{C}{D}\cdots\cdots\cdots(5)'$$

(Note) In case of the quadri-geared drive, the gear to be engaged with the spindle arbor is designated A, and the gear to be engaged with gear A is called B.
The gear to be engaged with gear D on the same axis is designated C, and the gear to be engaged with the gear case arbor is named D.
However, in other manuals up to now, A is called P and gears B and C are called L and M respectively. Also, gear D to be engaged with the gear case arbor is named Q.
When reading symbols A, B, C, D, E and F as P, Q, L, M, O_1 and O_2 shown in other manuals, note that P is always A but Q is B or D.
When the gear ratio i is a positive number, that is, the assumed number is greater than the dividual number, select such number of idle gears that the spindle rotates in the same direction as of the gear case arbor, and then set the gears as sown in Fig. 11 and Fig. 13.
When the gear ratio i is a negative number, namely, the assumed number is smaller than the dividual number, select such number of idle gears that the spindle rotates in the direction opposite to the gear case arbor, and then set the gears as shown in Fig. 12 and Fig. 14.

(Example 1) Divide into 107

Where the assumed dividual number is 110, the number N of revolutions of crank handle is as follows :

$$N=\frac{40}{T'}=\frac{40}{110}=\frac{4}{11}=\frac{4\times3}{11\times3}=\frac{12}{33}$$

$$\text{Gear ratio } i=40\times\frac{T'-T}{T'}=40\times\frac{110-107}{110}=\frac{12}{11}=\frac{12\times4}{11\times4}=\frac{48}{44}$$

The tooth numbers of change gears are given below :

A=48, B=44

Since the gear ratio is a positive number, one idle gear is required

and its proper tooth number is 32.

(Example 2) Divide into 331

Where the assumed dividual number is 320, the number N of revolutions of crank handle is as follows:

$$N=\frac{40}{T'}=\frac{40}{320}=\frac{1}{16}$$

$$\text{Gear ratio } i=40\times\frac{T'-T}{T'}=40\times\frac{320-331}{320}=-\frac{11}{8}=-\frac{11}{16}\times\frac{2}{1}=-\frac{44}{64}\times\frac{48}{24}$$

The tooth numbers of change gears are given below:

A=44, B=64, C=48, D=24

Since the gear ratio is a negative number, one idle gear is required and its proper tooth number is 40.

✳Spiral working

When cutting a spiral flute, the workpiece is fed by the table of the milling machine, while it is rotated by an dividing head.

All operations are powered by the table feed screw of the milling machine.

Therefore, draw out the indexing plate stopper from the index plate before starthing operation.

The number of teeth of change gear and the tilting angle of table of milling machine are determined according to the lead or helix angle of the spiral flute to be cut.

These are obtained from the following method:

(1) Finding the set of change gears

$$R=\frac{L}{Pm\times 40}\cdots\cdots(6)$$

R: Gear ratio

L: Work lead

Pm: Table feed screw pitch of milling machine

Where two change gears are used

$$R=\frac{B}{A}\cdots\cdots(7)$$

A: Change gear to be set to table feed screw of milling machine

B: Change gear to be set to gear case arbor

Where four change gears are used

$$R=\frac{B}{A}\times\frac{D}{C}\cdots\cdots(7)'$$

A: Change gear to be set to table feed screw of milling machine

B: Change gear to be set to arm ① (long shaft) and engaged with gear A

C: Change gear to be set to arm ② (long shaft) and engaged with gear D

D: Change gear to be set to gear case arbor

When work lead is of right-hand spiral, select such number of idle gears that the table feed screw rotates in the same direction as of the gear case arbor.

When work lead is of left-hand spiral, select such number of idle gears that the table feed screw rotates in the direction opposite to the gear case arbor.

(2) Calculation of helix angle

When cutting a spiral flute with a universal milling machine, rotate the table of the milling machine by the helix angle of the spiral flute. The helix angle is calculated by the following formula:

$$\tan\theta=\frac{D\times 3.1416}{L}\cdots\cdots(8)$$

θ: Helix angle

D: Work dia.

L: Lead of spiral flute

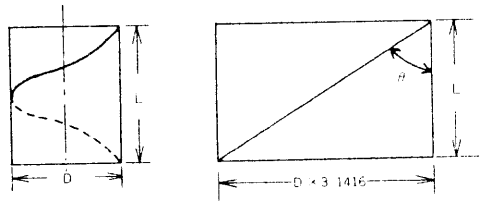


Fig. 7

To calculate the lead of a spiral flute from a given helix angle, the formula (6) is transformed as follows:

$$L=\frac{D\times 3.1416}{\tan\theta}\cdots\cdots(8)'$$

(Example 3)

Cut the 6 threaded right-hand spiral of the lead 5 inch where the diameter is 1 inch ,using a milling machine of table feed screw pitch 1/4 inch.

The Type and number of change gears and the rotating angle of the table are obtained from the following calculation :

By formulas 6 and 7,

$$R=\frac{5}{1/4\times 40}=\frac{1}{2}\rightarrow \frac{B}{A}=\frac{24}{48}\left(\text{or }\frac{28}{56}\text{ or }\frac{32}{64}\right)$$

Set a change gear having 48 teeth to the table feed screw and set a change gear having 24 teeth to the gear case arbor.

Because of the right-hand spiral, one idle gear is used so that both change gears may rotate in the same direction.

By formula (8),

$$\tan\theta=\frac{1\times 3.1416}{5}=0.62832\rightarrow \theta=32^\circ 8'\ 31''$$

As a result, tilt the table, on which the workpiece is placed, by 32° 8′ 31″ from the cutter.

By formula (1), the number of revolutions of the crank handle is calculated as follows :

Since six threads mean division into six equal parts,

$$N=\frac{40}{T}=\frac{40}{6}=6\frac{2}{3}=6\frac{2\times 11}{3\times 11}=6\frac{22}{33}$$

Therefore, set the crank handle at the row of 33 holes of the index plate B.

After cutting the first spiral flute, move the crank handle by 6 revolutions and 22 holes and then start to cut the second spiral flute.

Six spiral flutes can be cut by repeating the above-mentioned procedures 6 times.

(Example 4)

Cut the left-hand spiral of the lead 7.5 inch, using a milling machine of table feed screw pitch 1/4 inch.

The type ahd number of change gears are obtained from the following calculation :

$$R=\frac{B}{A}\times\frac{D}{C}=\frac{L}{Pm\times 40}\rightarrow \frac{7.5}{1/4\times 40}=\frac{7.5}{10}=\frac{3}{4}=\frac{1}{2}\times\frac{3}{2}=\frac{32\times 72}{64\times 48}$$

A=64, B=32, C=48, D=72

Because of the left-hand spiral, one idle gear is set between gears C and D so that A rotates in the direction opposite to D.

(Calculation of helix angle is omitted in Example 4.)

(3) Cutting of short lead

Where gear ratio $R=\frac{L}{Pm\times 40}$ is 1 or more, speed reduction is made by the change gear.

As a result, mechanical advantages may be obtained making cutting easier.

However, if the gear ratio is less than 1, mechanical disadvantages will occur due to increased speed by change gears, making cutting difficult.

If it is less than 0.5, special care should be taken to fully adjust and lubricate the table feed screw of the milling machine as well as change gears.

If it is less than 0.25, do not perform mechanical feed. In this case, cutting should be made by moving the spindle and the table of the milling maching while turning the crank handle. This makes short lead cutting easier.

Special accessory : Driving Unit

In case of spiral flute cutting, the connection of the master screw of a milling machine with the index must be manufactured upon order, because the size of the table end surface and the gear mounting part of the master screw varies according to manufacturers of milling machine. (Refer to Fig. 9)

Method to Adjust the Function

(a) Engagement of worm with worm wheel

Turn the metal clamp screw (26) that fixes the worm metal (21) in the direction of U to loosen the engagement. Turning the worm stopper in the direction of E will tighten the engagement.

The tightness or looseness of engagement depends on the projection of the stopper screw.

To make engagement tight pull it in, and to make loose push it out.

On the other hand, to disengage the worm from the worm wheel turn the worm stopper in the direction of D.

In this adjustment, take care to turn the crank handle slowly, because the worm wheel which is the important part to keep accuracy shall be damaged if spiral cutting is carried out with the screw thread of the worm touched by the tooth surface of the worm wheel or half-engaged.

After adjustment the metal clamp screw shall be turned in the direction of C as before.

However, the adjustment shall be made expecting a slight backlash.

(b) To move the spindle to the thrust shaft

The spindle is held with two taper roller bearings.

If the spindle becomes loose in the thrust direction, remove the rear cover (12) and then tighten the internal locknut for adjustment.

Be sure to disengage the worm from the worm wheel before adjustment.

(c) To move the worm shaft to the thrust

Disengagement of the worm from the worm wheel must be done before adjustment.

Return the crown washer and turn the lock nut. Set the crank handle (31) to the worm shaft to soch a degree that it can be smoothly revolved.

After adjustment, one of the projections of the washer must be fixed in the notch of the nut and engage the worm with the worm wheel.

If the worm shaft does not move backward or forward the adjustment is perfect.

Other precautions for Operation

- **Spindle Clamp**

Be sure to tighten the clamp handle (15) before starting operation. If the spindle is loose, a backlash between the worm and the worm wheel will slightly rotate the spindle, causing errors.

- **Removal of Backlash**

If the crank handle is excessively turned or stopped in the middle of the dividual number, be sure to return the crank handle by more than half revolution and turn it again in the normal direction to let fall the pin into the prescribed hole of the index plate. Proceed the operation while taking into account the backlash of gears.

- **Protection of Spindle Screw**

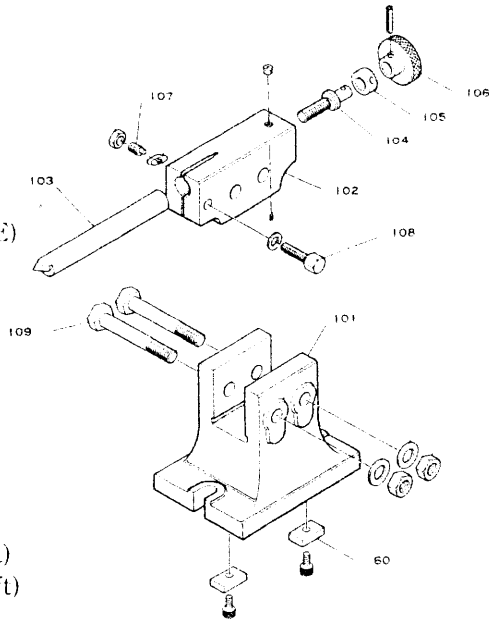
Be sure to fit the spindle dust cover (06) except where the flange is screwed for setting a milling chuck.

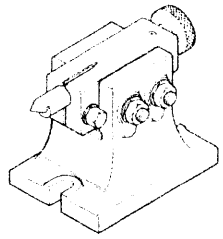
Parts No. and Parts Names

Dividing-head

Parts No.	Name
01	Head stock body
02	Head stock frame
03	Front cover
04	Spindle
05	Direct indexing plate
06	Spindle dust cover
07	Flange
08	Center
09	Driving dog
10	Worm wheel
12	Rear cover
13	Clamp collar
14	Clamp shoe
15	Clamp handle
16	Index pin
17	Pinion handle
18	Plate rotating indicator
19	Indicator screw
20	Worm shaft
21	Worm metal
22	Metal adapter
23	Metal thrust plate
24	Stopper pin
25	Worm stopper
26	Metal clamp screw
27	Gear (A)
28	Index plate
29	Sector
30	Sector spring
31	Crank handle
35	Set screw (plate stopper)
40	Shaft (gear B)
41	Gear (B)
42	Shaft collar (gear B)
43	Indexing plate stopper
44	Gear(C)
45	Gear (D)
46	Gear (E)
47	Gear case arbor (shaft-gear E)
48	Shaft (gear D)
49	Gear case
50	Body tilting indicator
51	Spindle arbor
52	Arbor collar
53	Arbor nut
54	Arbor handle
55-1	Arm Ⓛ (long shaft)
55-2	Arm Ⓢ (short shaft)
56	Arm collar Ⓛ (for long shaft)
57	Arm collar Ⓢ (for short shaft)
58	Change gear lock nut
59	Body lock bolt
60	Guide block
81-1	Change gear 24T
81-2	Change gear 28T
81-3	Change gear 32T
82	Change gear 40T
83	Change gear 44T
84	Change gear 48T
85	Change gear 56T
86	Change gear 64T
87	Change gear 72T
88	Change gear 86T
89	Change gear 100T

Exploded view (Tail-stock)

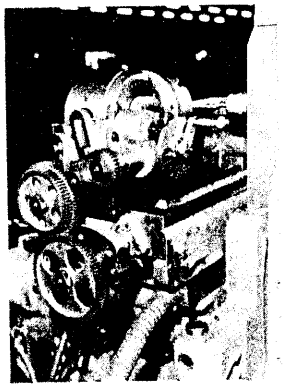




Tail-stock

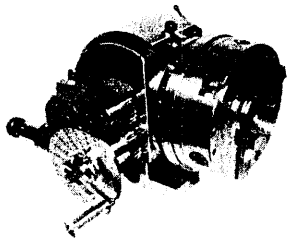
101	Tail stock frame
102	Tail stock block
103	Tail stock center
104	Adjusting screw
105	Thrust collar
106	Knob
107	Center rotating screw
108	Center locking bolt
109	Block locking bolt
60	Guide block

Spiral Working Fig. 9



Exploded view (Dividing Head)

With milling chuck Fig. 8



With differential gear Fig. 10

Symbols on Index Table

Symbols on the index table (page 12 to 15) explain the method of engaging change gears as shown below.

This manual describes the sequence of gears driven in such a way as A →B →C →D.

E and F are idle gears, and therefore replacement of F with E or E with F will not change the gear ratio. Other manuals up to now represent P, Q, L and M.

In this case, P is always the same as A, but Q is B for double-geared drive and D for quadri-geared drive.

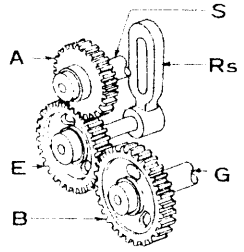


Fig. 11

(1) **Where one idle gear is used for double-geared drive.**

A : Gear to be set to spindle arbor
B : Gear to be set to gear case arbor
E : Idle gear to be set to arm short shaft (RS)
S : Spindle arbor shaft
G : Gear case arbor shaft

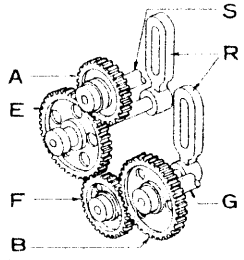


Fig. 12

(3) **Where two idle gears are used for double-geared drive.**

A : Gear to be set to spindle arbor
B : Gear to be set to gear case arbor
E : Gear to be set to either arm (RS) or arm (RL) and engaged with gear A
F : Gear to be set to either arm RS or arm RL in such a manner as to engage with gear B

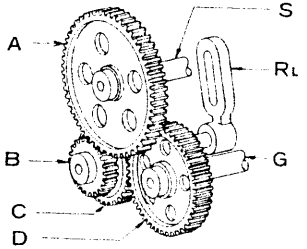


Fig. 13

(2) **Where no idle gear is used for quadri-geared drive.** Two gears B and C should be set to the same shaft as of the arm long shaft (RL).

A : Gear to be set to spindle arbor
B : Gear to be set to arm (RL) and engaged with gear A
C : Gear to be set to arm (RL) and engaged with gear D
D : Gear to be set to gear case arbor

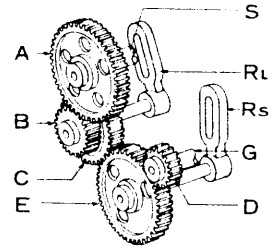


Fig. 14

(4) **Where one idle gear is used for quadri-geared drive.** Two gears B and C should be set to the same shaft as of the arm (RL)

A : Gear to be set to spindle arbor
B : Gear to be set to arm (RL) and engaged with gear A
C : Gear to be set to arm (RL) and engaged with gear E
E : Idle gear to be set to arm (RS) ahd engaged with gears C and D
D : Gear to be set to gear case arbor

Index Table (for worm ratio 1 : 40)

T	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
H		※	33	※	※	33	49	※	18	※	33	33	39	49	33	20	17	18	19	※	21	33	23	33	20
N		20	$13\frac{11}{33}$	10	8	$6\frac{22}{33}$	$5\frac{35}{49}$	5	$4\frac{8}{18}$	4	$3\frac{21}{33}$	$3\frac{11}{33}$	$3\frac{3}{39}$	$2\frac{42}{49}$	$2\frac{22}{33}$	$2\frac{10}{20}$	$2\frac{6}{17}$	$2\frac{4}{18}$	$2\frac{2}{19}$	2	$1\frac{19}{21}$	$1\frac{27}{33}$	$1\frac{17}{23}$	$1\frac{22}{33}$	$1\frac{13}{20}$

T	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
H	39	27	49	29	33	31	20	33	17	49	18	37	19	39	※	41	21	43	33	18	23	47	18	49	20
N	$1\frac{21}{39}$	$1\frac{13}{27}$	$1\frac{21}{49}$	$1\frac{11}{29}$	$1\frac{11}{33}$	$1\frac{9}{31}$	$1\frac{5}{20}$	$1\frac{7}{33}$	$1\frac{3}{17}$	$1\frac{7}{49}$	$1\frac{2}{18}$	$1\frac{3}{37}$	$1\frac{1}{19}$	$1\frac{1}{39}$	1	$\frac{40}{41}$	$\frac{20}{21}$	$\frac{40}{43}$	$\frac{30}{33}$	$\frac{16}{18}$	$\frac{20}{23}$	$\frac{40}{47}$	$\frac{15}{18}$	$\frac{40}{49}$	$\frac{16}{20}$

T	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
H	33	39	33	27	33	49	33	29	33	33	16	31	16	16	39	33	49	17	49	49	15	18	15	37	15	19	20	39	20	20	21	41	21	21	17	43	33	33	18	18
N	$\frac{24}{33}$	$\frac{30}{39}$	$\frac{24}{33}$	$\frac{20}{27}$	$\frac{24}{33}$	$\frac{35}{49}$	$\frac{22}{33}$	$\frac{20}{29}$	$\frac{22}{33}$	$\frac{22}{33}$	$\frac{10}{16}$	$\frac{20}{31}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{24}{39}$	$\frac{20}{33}$	$\frac{28}{49}$	$\frac{10}{17}$	$\frac{28}{49}$	$\frac{28}{49}$	$\frac{8}{15}$	$\frac{10}{18}$	$\frac{8}{15}$	$\frac{20}{37}$	$\frac{8}{15}$	$\frac{10}{19}$	$\frac{10}{20}$	$\frac{20}{39}$	$\frac{10}{20}$	$\frac{10}{20}$	$\frac{10}{21}$	$\frac{20}{41}$	$\frac{10}{21}$	$\frac{10}{21}$	$\frac{8}{17}$	$\frac{20}{43}$	$\frac{15}{33}$	$\frac{15}{33}$	$\frac{8}{18}$	$\frac{8}{18}$
A	64		64				48		32		72		40				48		32		64		64				48		24		40		32				24		24	
B	44		44				24		48		48		32				28		56		24		40				32		48		28		48				44		72	
C	48										40		24								32		32										40				40		64	
D	24										32		48								40		48										56				48		48	
E			28				40		40								32		40								40		44		44									
F																																								

T	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
H	20	23	20	47	19	20	20	49	20	20	33	33	33	39	21	33	33	27	33	33	33	33	33	33	23	29	33	33	33	33	33	16	33	31	33	16	16	16	33	39
N	$\frac{8}{20}$	$\frac{10}{23}$	$\frac{8}{20}$	$\frac{20}{47}$	$\frac{8}{19}$	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{20}{49}$	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{12}{33}$	$\frac{12}{33}$	$\frac{12}{33}$	$\frac{15}{39}$	$\frac{8}{21}$	$\frac{12}{33}$	$\frac{12}{33}$	$\frac{10}{27}$	$\frac{12}{33}$	$\frac{12}{33}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{8}{23}$	$\frac{10}{29}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{11}{33}$	$\frac{10}{33}$	$\frac{5}{16}$	$\frac{10}{33}$	$\frac{10}{31}$	$\frac{10}{33}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{10}{33}$	$\frac{12}{39}$
A	72		56			64	48		24		72	64	56			64	48		24		72	64	56	48			24	32	28		48	72	72		40	40	24		40	
B	40		40			40	40		40		44	44	44			44	44		44		24	24	24	24			24	48	48		24	48	44		44	32	64		44	
C	48		48						32		48	48	48						32										32		40	40	40		56	24	40			
D	24		24						48		24	24	24						48										56		24	32	24		24	48	48			
E						28	32									28	32				28	32	32	40			48	44											32	
F																																								

Index Table (for worm ratio 1 : 40)

T	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
H	49	33	49	49	27	17	49	49	49	49	18	15	15	18	29	15	15	37	20	15	20	19	20	20	31	39	20	20	20	20	21	21	33	41	33	21	21	21	18	17
N	14/49	10/33	14/49	14/49	8/27	5/17	14/49	14/49	14/49	14/49	5/18	4/15	4/15	5/18	8/29	4/15	4/15	10/37	5/20	4/15	5/20	5/19	5/20	5/20	8/31	10/39	5/20	5/20	5/20	5/20	5/21	5/21	8/33	10/41	8/33	5/21	5/21	5/21	4/18	4/17
A	48		48	48			24	32	24		40	64	56			64	32		48		72		56	48			24	24	28		40	40	32			40	24		64	
B	56		24	28			28	56	48		48	24	24			40	40		32		32		32	32			32	48	64		24	28	72			56	72		48	
C	72								32			32	32			32			44										32				48			32	40		44	
D	24								56			40	40			48			24										56				44			48	56		24	
E			44	44			56	44			32						44				28		40	40			48	44			44	32							
F																																								

T	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
H	18	43	18	18	18	20	18	18	20	18	20	20	21	23	37	20	49	47	20	19	20	20	20	20	39	49	20	20	21	20	21	21	21	21	41	21	21	33	33	21
N	4/18	10/43	4/18	4/18	4/18	4/20	4/18	4/18	4/20	4/18	5/20	4/20	4/21	5/23	8/37	4/20	10/49	10/47	4/20	4/19	4/20	4/20	4/20	4/20	8/39	10/49	4/20	4/20	4/21	4/20	4/21	4/21	4/21	4/21	8/41	4/21	4/21	6/33	6/33	4/21
A	48		32	64	40	72	32	24	72		72	72	72			56	40		48		72	64	56	48			24	24	44		48	64	64	32		32	32	56	48	
B	24		48	48	24	40	48	72	40		24	40	28			40	56		40		40	40	40	40			40	40	28		28	28	48	28		56	56	44	24	
C			56		32	64		64	56		56	48	48			48	72		44									32	32			32			64		48			
D			24		48	24		48	24		32	24	24			24	28		24									48	24			48			48		28			
E	40			32			40				40										32	32	32	44			48				32		32	44			40		40	
F																																								

T	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
H	33	33	33	33	43	27	33	33	18	33	39	18	33	18	18	18	49	18	18	23	18	29	18	18	47	18	18	18	49	18	33	49	27	49	49	27	39	31	27	33
N	6/33	6/33	6/33	6/33	8/43	5/27	6/33	6/33	3/18	6/33	6/39	3/18	6/33	3/18	3/18	3/18	8/49	3/18	3/18	4/23	3/18	5/29	3/18	3/18	8/47	3/18	3/18	3/18	8/49	3/18	6/33	8/49	4/27	7/49	8/49	4/27	6/39	5/31	4/27	5/33
A	72	32	56	48			24	24	72		72	72	24	64	48	56	72	56	44		48		56	24		32	24	28	32		56	32	56	72		64	56		56	56
B	24	44	44	44			44	44	24		24	24	44	24	32	24	28	28	24		32		48	24		48	48	48	56		44	28	28	28		24	28		24	44
C	24	48						32	28		48				40		64											32	48		72	24	48	48		32			32	40
D	44	24						48	24		24				24		56											56	28		24	56	24	24		24			24	24
E			32	32			40					32	64	32		40		40	48		40		32	48		44	44				10						40			
F													32																											

Index Table (for worm ratio 1 : 40)

T	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290
H	18	33	33	18	27	49	33	33	49	39	27	49	27	33	49	49	27	49	49	27	49	49	49	49	49	49	49	49	15	49	27	15	49	15	15	15	16	15	15	29
N	3/18	5/33	5/32	3/18	4/27	7/49	5/33	5/33	7/49	6/39	4/27	7/49	4/27	5/13	7/49	7/49	4/27	7/49	7/49	4/27	7/49	7/49	7/49	7/49	7/49	7/49	7/49	7/49	2/15	7/49	4/27	2/15	7/49	2/15	2/15	2/15	2/16	2/15	2/15	4/29
A	44	48	40	56	40	61	56	40	72		64	72	56		40	64	32	48	44		72	64	24	48	40	32	24	32	56		44	56	32	64	56	56	72	64	44	
B	24	44	24	24	48	32	48	44	24		48	28	24		56	32	72	28	28		24	24	24	56	56	56	56	48	40		72	40	64	24	28	24	24	40	24	
C		40			64	48	40						32		72						24	24						24	48		64	48	48	32		32	44		32	
D		24			24	28	44						72		24						56	56						56	24		24	28	56	40		40	32		40	
E	48		44	28				32	32		32	32				40	44	44	40				56	40	44	44	44				40		40		40			44		
F	40			48																																				

T	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
H	15	15	15	15	15	37	33	16	16	15	43	16	33	16	16	16	15	16	16	31	16	39	16	16	16	16	16	16	33	16	33	33	33	33	33	33	33	41	47	33
N	2/15	2/15	2/15	2/15	2/15	5/37	4/33	2/16	2/16	2/15	5/43	2/16	4/33	2/16	2/16	2/16	2/15	2/16	2/16	4/31	2/16	5/39	2/16	2/16	2/16	2/16	2/16	2/16	4/33	2/16	4/33	4/33	4/33	4/33	4/33	4/33	4/33	5/41	5/47	4/33
A	48	64	56	32	32		56	48	56		72	72	72	56	40	56	56	48	44		72		28	24	40	28	24	24	64		48	64	64	32	40	32	24		72	
B	40	40	40	40	48		28	32	64		24	32	44	28	64	32	40	32	32		24		32	32	32	56	32	48	48		44	44	44	44	44	72	44		24	
C		32	32				48	44	72		40		48		72		48				24				24		28	28				32	28		32	48	32		40	
D		48	48				24	24	24		24		24		24		72				64				48		56	56				48	48		48	44	48		24	
E	44			44	44							28		40		40	24	40	40				48	48		40			32		40			40						
F																																								

T	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370
H	16	18	18	16	33	18	43	18	18	17	33	18	49	43	18	18	49	18	18	18	18	18	18	18	18	18	18	20	43	18	19	43	33	49	20	21	20	20	41	37
N	2/16	2/18	3/18	2/16	4/33	2/18	5/43	2/18	2/18	2/17	4/33	2/18	5/49	5/43	2/18	2/18	5/49	2/18	2/18	2/18	2/18	2/18	2/18	2/18	2/18	2/18	2/18	2/20	5/43	2/18	2/19	5/43	3/33	5/49	2/20	2/21	2/20	2/20	4/41	4/37
A	44	56	72	56	48	64	56	64	56		32	56	72		40	32	72	64	32	40	24	64	32	32	40	24	28	72	48		56	72	72	48	56	72	72	64	56	
B	64	24	24	32	44	24	32	48	24		24	28	24		24	48	56	48	48	24	24	24	24	48	72	72	48	40	86		28	86	24	28	32	28	24	40	24	
C	48	32			40		40	44					40			56	100		44	32		24	28			64	32	56	100			100	56	40	48	48	44	56	48	
D	24	24			72		86	24					24			24	28		24	48		72	48			48	56	24	32			40	24	24	24	24	40	28	28	
E	40		32	48	24	40			40		56	32			44			32			48			44	28				28		40	28								
F				40							40																														

Index Table (for worm ratio 1 : 40)

T	371	372	373	374	375	376	377	378	379	380
H	49	20	20	49	20	47	39	20	20	19
N	5/49	2/20	2/20	5/49	2/20	5/47	4/39	2/20	2/20	2/19
A	40	56	72	40	48		64	48	56	
B	56	40	40	56	32		48	40	40	
C	72	48	48	72	40			44	48	
D	24	24	32	28	24			24	32	
E							32			
F										

Remarks : 550-032-R and 033-R (for right-hand operation)

In case of spiral fluting, the master screw of a milling machine should be inter-locked with the gear on the gear case arbor.

The right-hand operated 550-032-R and 033-R have a feature that the gear on the right side of the body is inter-locked with the right side of the milling machine.