Feb. 23, 1943. A. POPE 2,311,998

CENTERLESS TURNING MACHINE

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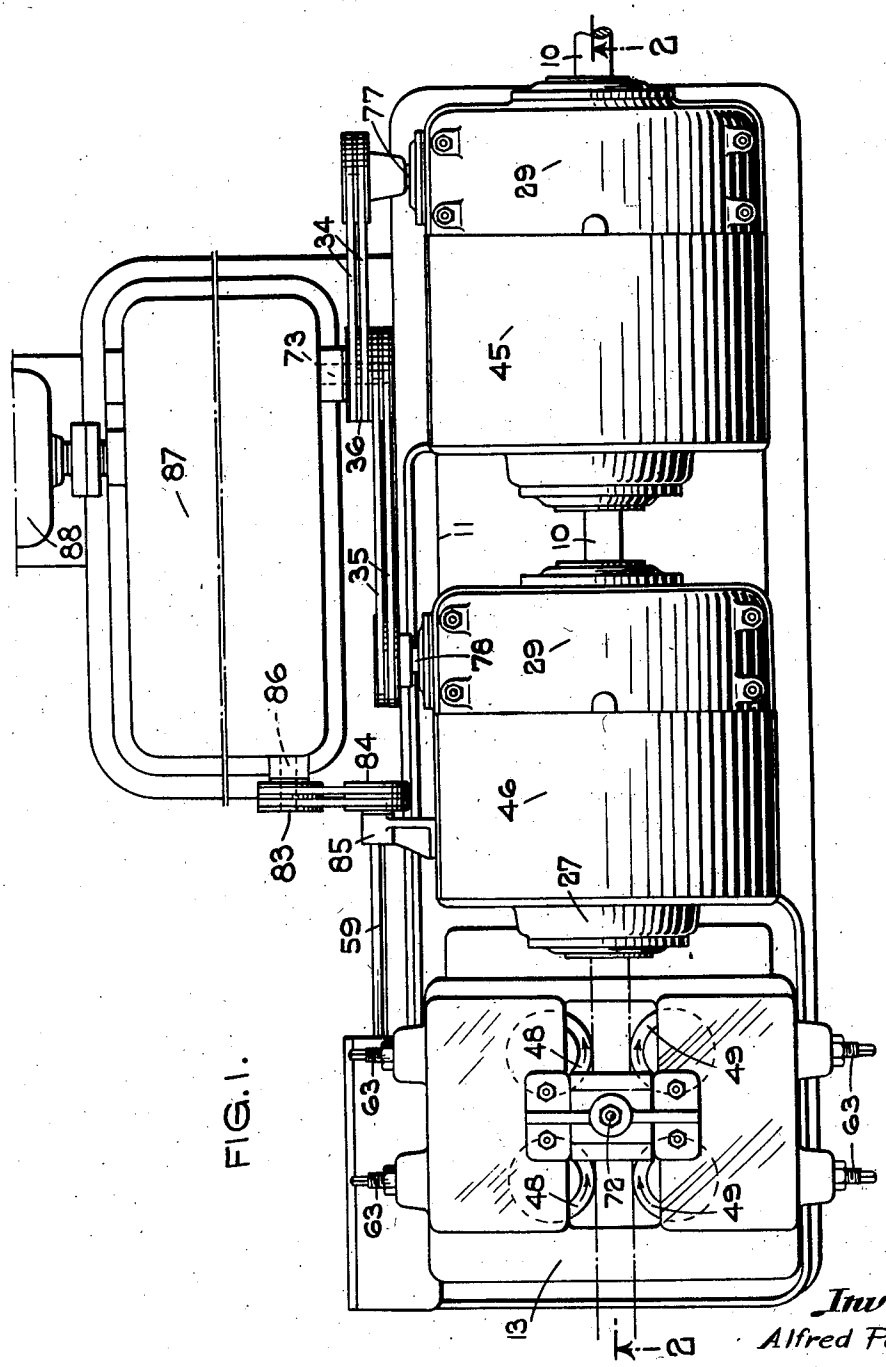


FIG. 1.

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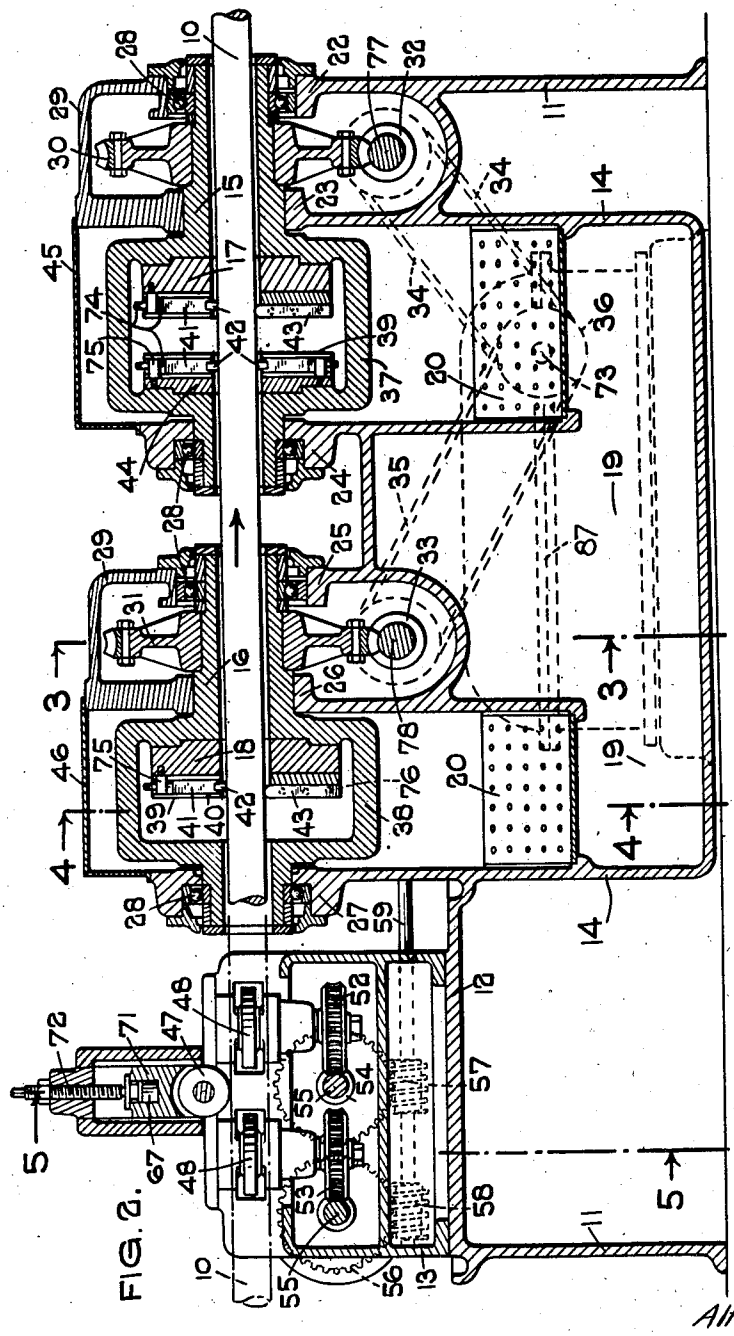


FIG. 2.

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FIG. 3.

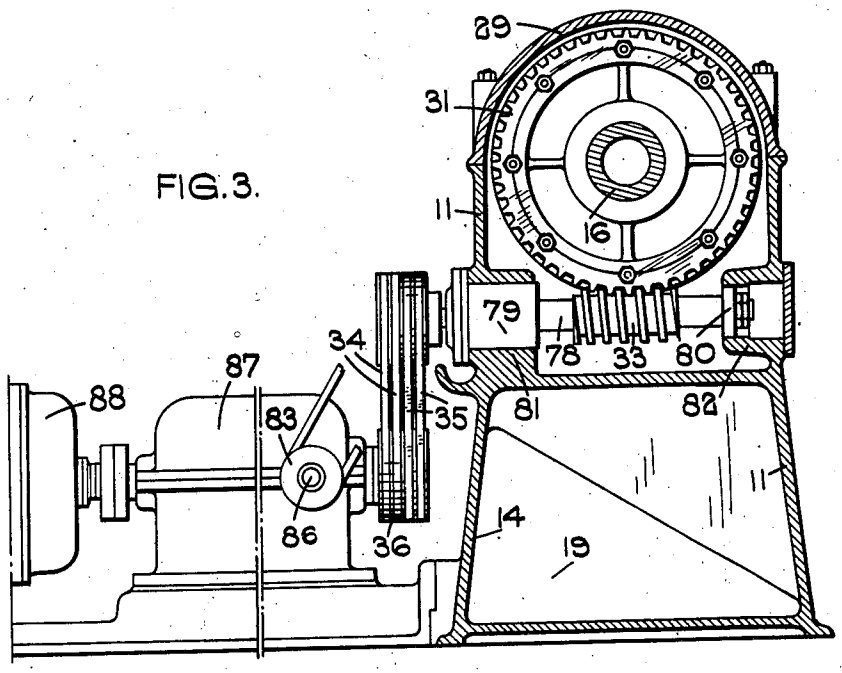
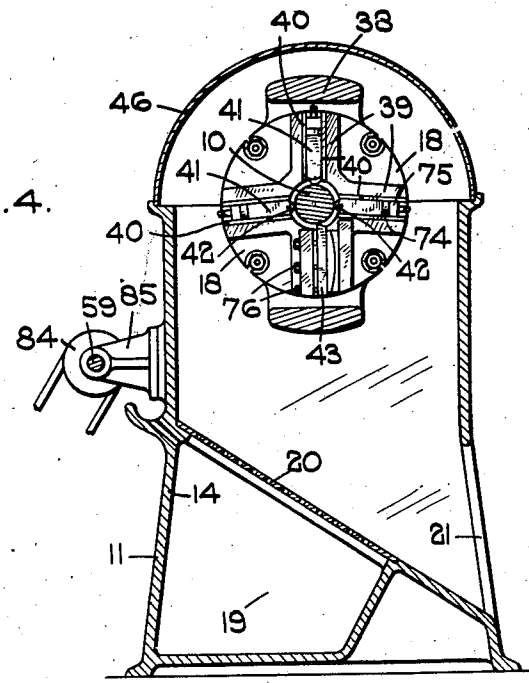


FIG. 4.



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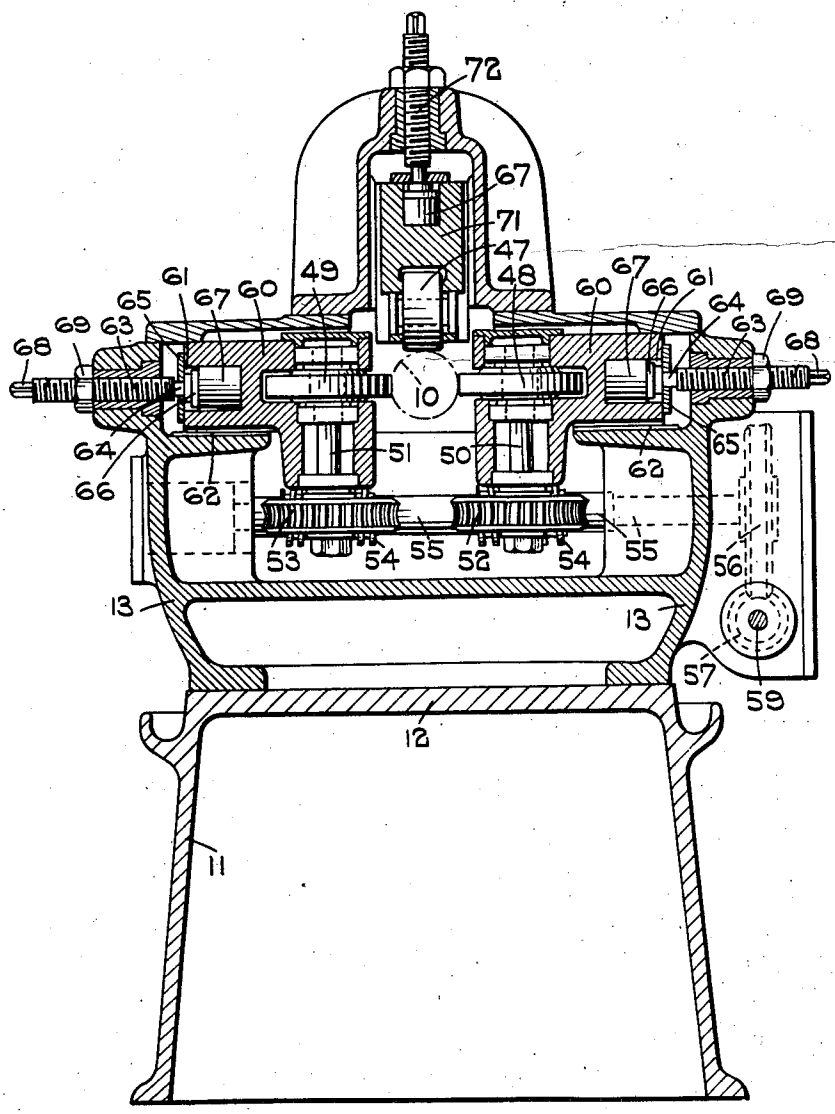
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CENTERLESS TURNING MACHINE

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FIG.5.



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UNITED STATES PATENT OFFICE

2,311,998

CENTERLESS TURNING MACHINE

Alfred Pope, Penn Fields, Wolverhampton, England, assignor to Joshua Bigwood & Son, Limited, Wolverhampton, England

Application February 12, 1940, Serial No. 318,636
In Great Britain February 25, 1939

6 Claims. (Cl. 82—20)

This invention relates to centerless turning machines of the kind employed for turning lengths of shafting or the like, mandrel bars and peeled tube billets, and for turning high grade tubes made from special steel, such machines usually comprising a plurality of rotating heads carrying cutting tools, one head being used for roughing, and the other or another being used for finishing, the work usually being fed through the machine by means of feed rollers and being supported and guided by clamping heads which can travel with the work, there usually being a clamping head at the feed end and another at the delivery end. In these machines the work travels axially, but does not rotate.

The drive to the rotating heads is usually imparted to a continuous driving sleeve in which both or all the heads are mounted. Further, this sleeve is usually mounted in two or three bearings provided in the body of the machine, there being a bearing on each side of a worm wheel or gear wheel on the sleeve by which motion is transmitted to the sleeve, and in some cases one further bearing on the delivery side of the finishing head.

The object of the present invention is to provide an improved construction.

According to the present invention, separate driving sleeves are provided, one for the roughing head and another for the finishing head, each sleeve having its own driving member such as a worm wheel or gear wheel.

With this arrangement, the vibration and shocks produced by the action of the roughing head are not directly transmitted to the finishing head.

Further, the arrangement allows of the finishing head being driven at a different speed from the roughing head. It can be driven either faster or slower. Further, the arrangement allows of the finishing head being driven in the opposite direction from that taken by the roughing head. Such an arrangement is advantageous in some cases where the roughed work is not truly cylindrical, and consequently with the heads rotating in opposite directions, the shocks or reactions produced are to some extent balanced.

According to a further part of the present invention, the rotating heads are each rigidly supported in bearings at both sides, i. e. four bearings are provided in place of three, the bearings being placed in the body of the machine and supporting each driving sleeve at each side of the rotating head carried by the sleeve.

Referring to the drawings:

Figure 1 is a plan view showing one construction.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line 4—4 of Figure 2.

Figure 5 is a section on line 5—5 of Figure 2.

In the construction illustrated, the supporting and guiding means for the member 10 which is to be turned, are not shown. Such supporting and guiding means are well known in the art, and include at each end of the machine one or more guide bars placed horizontally and parallel to the shaft 10, and clamping devices slidably mounted on such guide bars and having means whereby they may grip a shaft such as 10, such clamping means serving to support the shaft and to guide it so that it moves with an endwise movement, the clamping means moving with the shaft.

The drawings do, however, illustrate the means for imparting the endwise movement to the shaft, such means being shown at the left hand end of Figures 1 and 2 and also in Figure 5.

The machine comprises a bed 11 of deep box section, this bed having a table 12, to the upper side of which is secured a body 13 carrying the feed mechanism.

The bed 11 also comprises a box-like portion 14 carrying the driving sleeves 15 and 16 for the turning heads 17, 18. The part 14 of the bed forms a container and receives the turning fluid in the compartments 19. Above each of the compartments 19 is a perforated plate 20 which deflects the turnings towards the front of the machine and out through openings 21, while the turning fluid which passes through the perforations in the plates 20 and collects in the compartments 19, can be returned to circulation by suitable means.

The walls of the bed 11 above the part 14 are formed with portions 22, 23, 24, 25, 26 and 27 which serve to support the driving sleeves 15 and 16. The portions 22, 24, 25 and 27 form housings for anti-friction bearings 28.

Above the bearings 22 and 23 and above the bearings 25 and 26 removable castings 29 are provided, these incorporating the upper parts of the bearings 23 and 26 and the upper parts of the housings for two of the anti-friction bearings 28.

Each of the driving sleeves 15 and 16 is provided with a worm wheel, that on the sleeve 15 being shown at 30, and that on the sleeve 16

being shown at 31, these worm wheels being fixed to their respective sleeves.

The worm wheel 30 is driven by a worm 32, and the worm wheel 31 is driven by a worm 33. The two worms 32 and 33 as shown are driven in the same direction by sprocket chains or belts 34, 35, from a sprocket or pulley 36 on a shaft 73.

If it is desired to drive the sleeves 15 and 16 in opposite directions, the worms 32 and 33 are of opposite hand, and this construction is preferred.

The sleeve 15 is provided with a frame-like portion 37, and a similar portion 38 is provided in the sleeve 16.

The portion 37 contains a turning head 17 which is firmly secured to the sleeve and rotates therewith, and similarly the part 38 of the sleeve 16 carries a turning head 18.

Each turning head is formed with four substantially radial arms 39, which arms are slotted and fitted with guide plates 40. In three of the guide plates are adjustably mounted stems 41 carrying at their inner ends rollers 42. In the other guide plate a turning tool 43 is adjustably fixed.

The three stems 41 and the turning tool can be adjusted towards and away from the axial centre of the sleeve. The outer end of each stem 41 is hollow and contains a nut which is prevented from endwise movement in relation to the stem, and this nut is engaged by the inner screw threaded end of an adjusting pin 74 passing through a block 75 attached to the turning head. The pin 74 is prevented from endwise movement in the block 75 and when the pin is turned, the engagement between its threaded part and the nut within the hollow stem 41 produces endwise movement of the stem. The turning tool 43 can be adjusted in an endwise direction by loosening the nuts 76, and after endwise adjustment has been effected, the nuts can be retightened.

The turning head 17 is a finishing head, while the turning head 18 is a roughing head. Both are of substantially the same construction.

A steady head may be provided as shown at 44 in Figure 2, this head being of similar construction to the heads 17 and 18, but in this case all four guide plates carry stems similar to 41 having rollers 42 at their inner ends engaging the shaft 10.

The frame-like part 37 carrying the turning head 17 and the steady head 44 is enclosed by a cap 45, and the frame-like part 38 carrying the turning head 18 is enclosed by a cap 46.

As will be seen, the opening through each of the driving sleeves 15 and 16 is larger than the particular shaft 10 which is shown in the drawings. A machine as illustrated will of course operate upon any shaft provided its external diameter before machining is somewhat less than the diameter of the openings through the driving sleeves 15 and 16. If the shaft is of less diameter than is shown in the drawings, then the stems 41 are adjusted inwardly as also are the turning tools 43.

Both in the roughing head and the finishing head the turning tool operates on the shaft in advance of the points of engagement between the rollers 42 and the shaft, the latter moving from left to right.

The feed gear for the shaft comprises an upper roller 47 bearing on top of the shaft and two pairs of directly opposed rollers 48, 49, operating on the sides of the shaft. Each of the rollers 48 is mounted on a separate shaft 50 provided with a worm wheel 52, and each of the feed rollers 49 is mounted on a separate shaft 51 provided with a worm wheel 53. The two rollers 48 are driven in the opposite direction from the direction taken by the rollers 49.

Thus, there are two worm wheels 52 and two worm wheels 53.

Each pair of worm wheels consisting of one worm wheel 52 and one worm wheel 53 is driven by means of worms 54 on a shaft 55. The two worms 54 on the shaft 55 are of opposite hand in order to produce opposite rotation of the feed rollers 48, 49. Each of the shafts 55 carries a worm wheel 56, and these are driven by worms 57, 58 on a shaft 59. The two worms 57 and 58 are of the same hand so that the two shafts 55 are driven in the same direction.

The two shafts 50 and the two shafts 51 are carried in bearing blocks 60, each of which is recessed as shown at 61 at its outer end, and these bearing blocks can slide horizontally upon guides 62 formed in the casting 13. Each bearing block 60 can be adjusted horizontally towards or away from the centre of the shaft 10 by means of a screwed stem 63 having a reduced neck portion 64 passing through a hole in a plate 65 secured to the outer end of the recessed part of the bearing block.

Within the plate 65 the screwed stem is provided with a head 66 which bears upon a rubber or other resilient block 67, and at its outer end the screwed stem 63 is provided with a non-circular part 68 so that it can be turned. After being adjusted, the screwed stem can be secured by a lock nut 69. Thus, all four rollers 48, 49, can be adjusted bodily towards or away from the centre of the shaft 10, and a similar provision is made for the upper roller 47 which is rotatably mounted in a block 71 capable of adjustment by means of a screwed stem 72 of similar construction to the stem 63.

The provision of the rubber or other resilient block 67 enables the feed rollers 47, 48, 49, to follow the contour of the shaft, which may of course be somewhat irregular before machining.

Inward or outward adjustment of the feed rollers 48 and 49 takes place in a direction parallel to the shafts 55, so that such adjustment can take place without releasing the worm wheels 52 and 53 from their co-operating worms.

The machine may be driven by a motor 88 which drives shafts 73 and 86 through gearing contained in a gear box 87.

The shaft 73 carries a pulley or sprocket 36, which in turn drives the worms 32 and 33 mounted respectively on the shafts 77 and 78.

The shafts 77 and 78 are mounted in thrust bearings 79, 80, carried in housings 81, 82, formed in the bed of the machine.

The shaft 86 is provided with a pulley or sprocket 83 driving through belt or chain a pulley or sprocket 84 fixed on the shaft 59. The shaft 59 is supported in a bracket 85 fixed on the side of the machine bed 14, the other end of the shaft 59 being provided with suitable bearings in the casting 13.

What I claim then is:

1. In a centerless turning machine of the kind specified, a machine bed having two groups of three bearings disposed in line, and a separate driving sleeve disposed in each group of bearings, each driving sleeve carrying a machining head and a driving wheel, the machining head in each

case being disposed between the intermediate bearing and one end bearing of a group, and the driving wheel in each case being disposed between the intermediate bearing and the other end bearing of the group.

2. In a centerless turning machine of the kind specified, a driving sleeve for the roughing head, a separate driving sleeve for the finishing head, and a finishing head and a steady head carried by said separate driving sleeve.

3. In a centerless turning machine of the kind specified, a machine bed having two pairs of bearings disposed in line, a separate driving sleeve disposed in each pair of bearings, each driving sleeve carrying a machining head and a worm wheel, a worm shaft for each of said worm wheels, said worm shafts being supported in bearings in the bed, means for driving said worm shafts, a table at one end of the bed, and feed means for the work supported on said table.

4. In a centerless turning machine of the kind specified, a machine bed having two pairs of bearings disposed in line, a separate driving sleeve disposed in each pair of bearings, each driving sleeve carrying a machining head, said bed being formed under said machining heads as a receptacle for machining fluid, and means for deflecting the turnings from said receptacle.

5. In a centerless turning machine of the kind specified having a roughing head carrying cutting tools and a finishing head carrying cutting tools, a machine bed having two pairs of aligned bearings spaced apart axially, a driving sleeve for the roughing head mounted in one pair of bearings and a separate driving sleeve for the finishing head mounted in the other pair of bearings, each of such sleeves having a frame like portion, situated in each case between the bearings of the pair supporting the sleeve, the roughing head being secured to the frame like portion of one sleeve, and the finishing head being secured to the frame like portion of the other sleeve.

6. A centerless turning machine according to claim 5 comprising two pairs of aligned housings on the machine bed, thrust bearings in said housings, shafts mounted in said thrust bearings, said shafts being disposed at right angles to said sleeves, worms on said shafts, said worms being of opposite hand, a worm wheel on each of said sleeves, each of said worm wheels being engaged by one of said worms, and means for driving said shafts in the same direction.

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