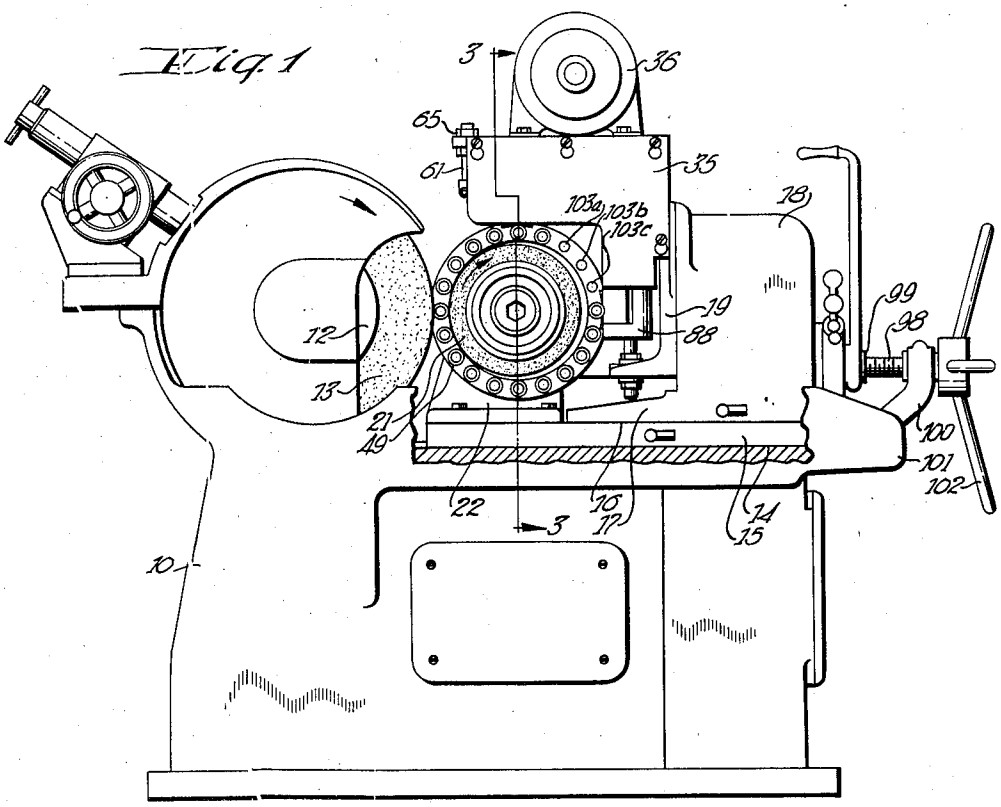
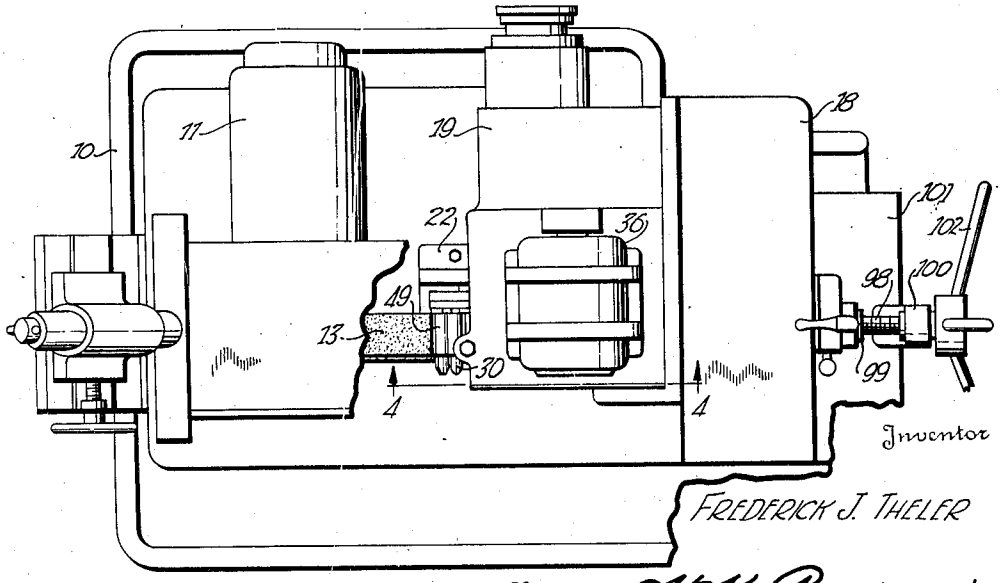
Feb. 19, 1935. F. J. THELER 1,991,712

GRINDING MACHINE

Filed Feb. 29, 1932 4 Sheets-Sheet 1

Fig. 1





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Fig. 2

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GRINDING MACHINE

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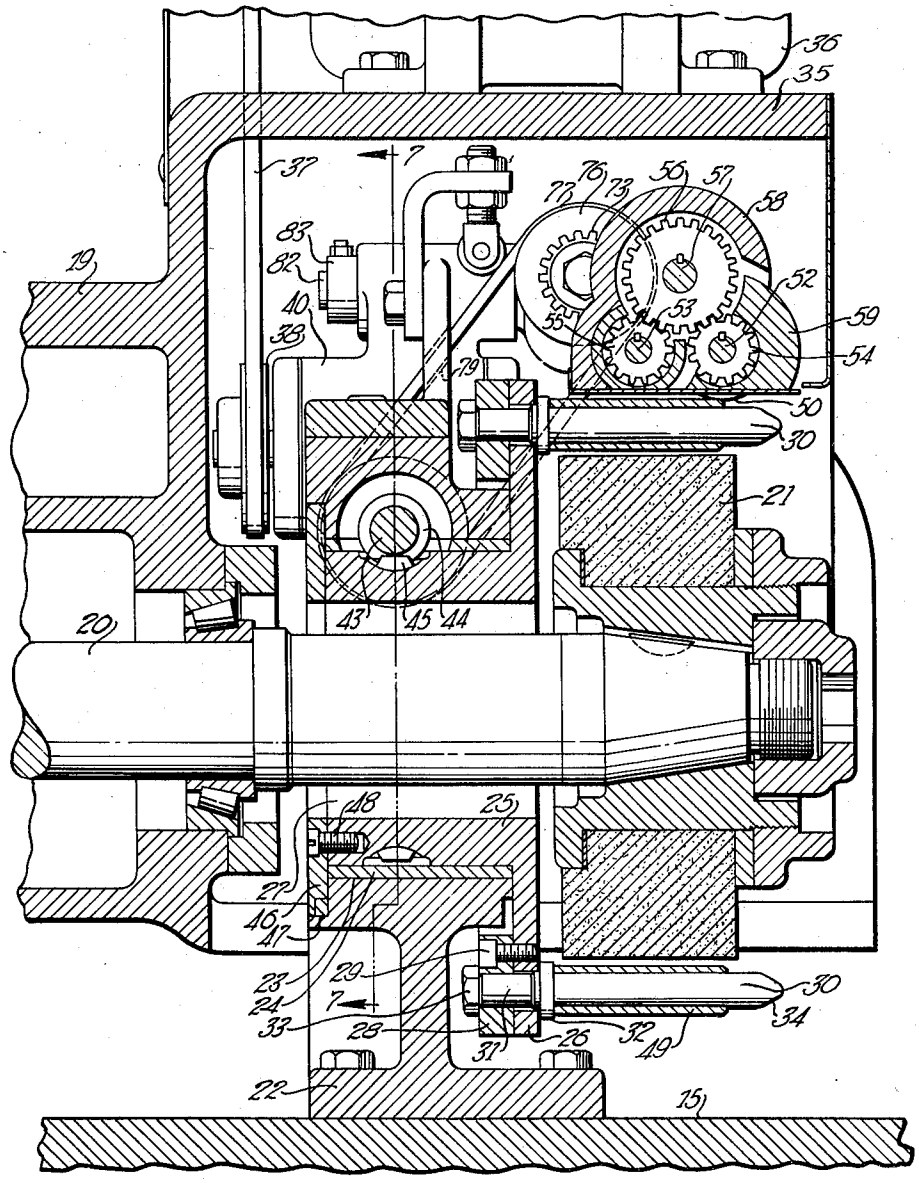


Fig. 3

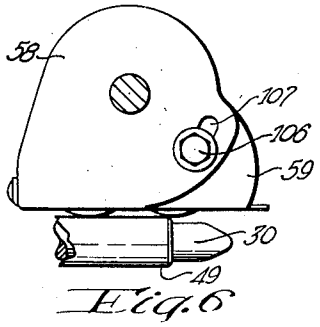


Fig. 6

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GRINDING MACHINE

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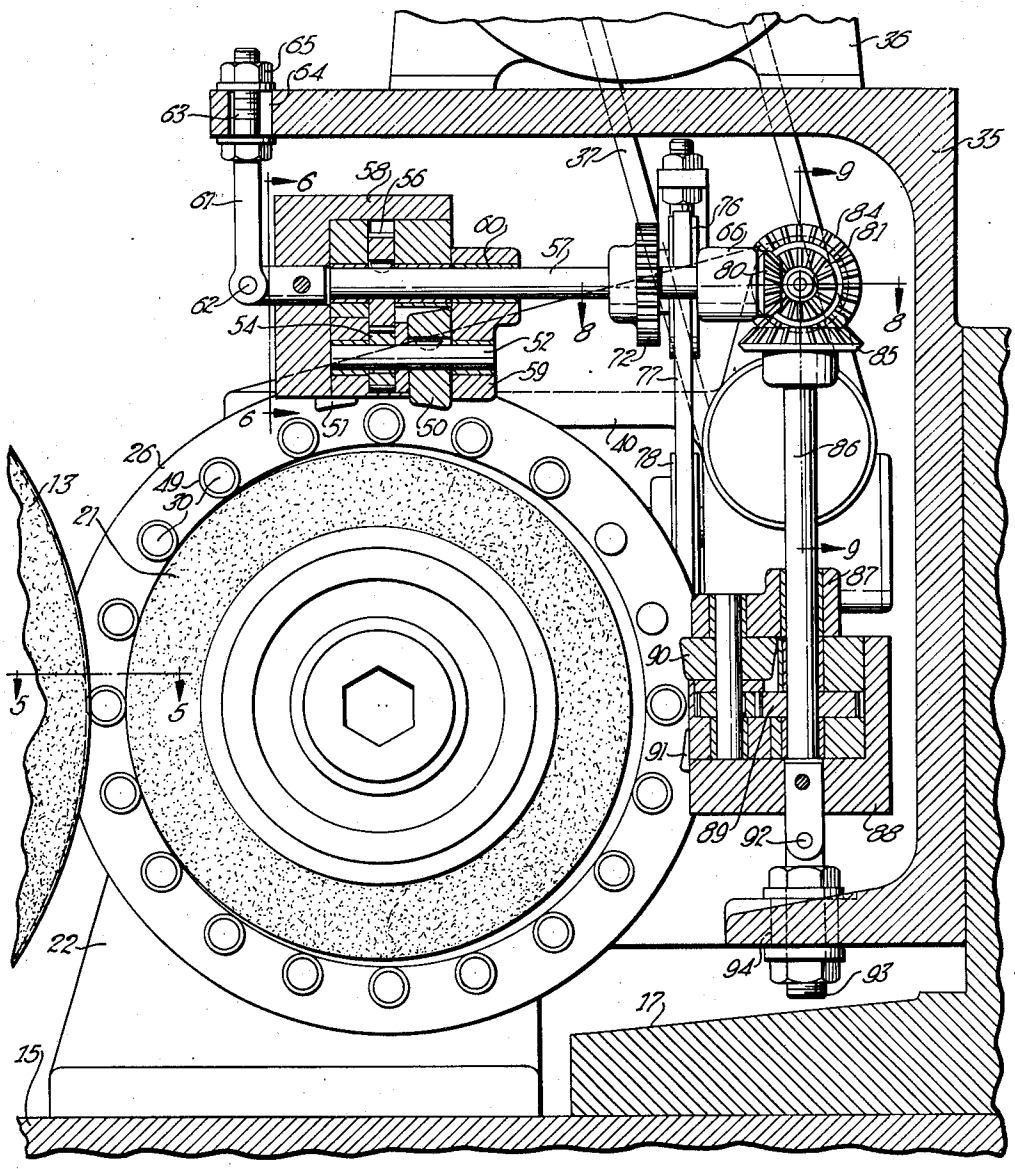


Fig. 4

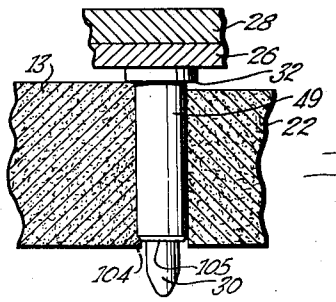


Fig. 5

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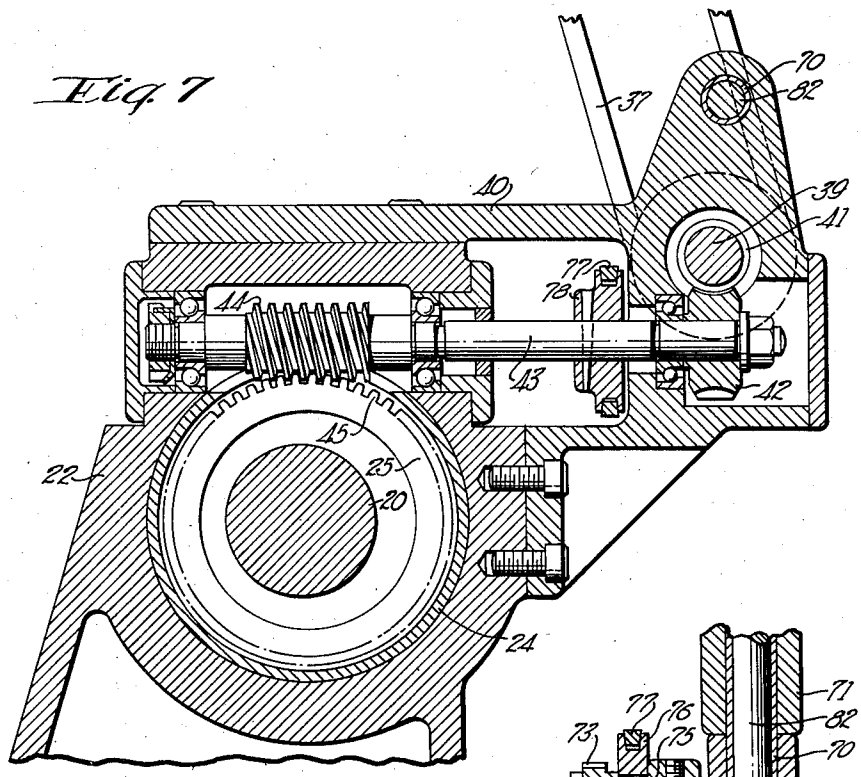
Attorney

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GRINDING MACHINE

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Fig. 7



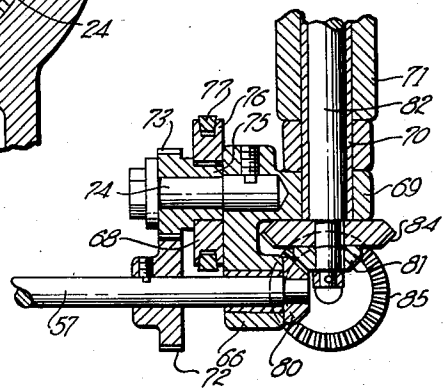


Fig. 8

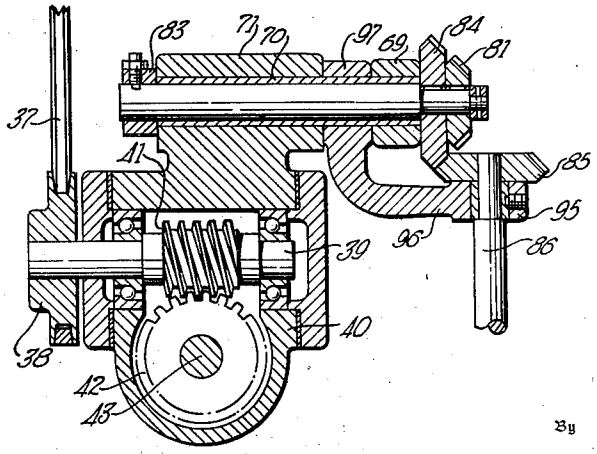


Fig. 9

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Patented Feb. 19, 1935 1,991,712

UNITED STATES PATENT OFFICE

1,991,712

GRINDING MACHINE

Frederick J. Theler, Cincinnati, Ohio, assignor to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application February 29, 1932, Serial No. 595,752

17 Claims. (Cl. 51—108)

This invention relates to improvements in machine tools and especially to improvements in grinding machines.

The device of this invention has particular utility for grinding comparatively thin cylindrical articles such as sleeves made of cork or other soft material as used in the textile industry for guiding thread to the weaving machines. It is to be understood, however, that the invention is not restricted solely to that type of article, but may be employed with equal facility for grinding other sleeves that have a wall thickness which is to be held within comparatively narrow limits. The invention being particularly directed to the means for positioning the work on carrying spindles and for ejecting the work from such spindles.

Therefore, one of the principal objects of the present invention is the provision of improved loading and ejecting mechanism for use with machine tools for positioning the work relative to the carrying spindle or arbor and for ejecting said work from the spindle or arbor.

Another object of the invention is the provision of improved work carrying mechanism for supporting the work and presenting same to a grinding wheel to effect a stock removal therefrom.

A further object of the invention is the provision of improved means for effecting the rotation of sleeve-like work pieces.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawings forming a part thereof and it is to be understood that any modifications may be made in the exact structural details there shown and described within the scope of the appended claims without departing from or exceeding the spirit of the invention.

In the drawings:

Figure 1 is a front elevation of a grinding machine embodying the improvements of this invention.

Figure 2 is a top plan view of the machine shown in Figure 1.

Figure 3 is a fragmentary sectional view as seen substantially from line 3—3 of Figure 1.

Figure 4 is a view partly in section and partly in elevation as seen substantially from line 4—4 of Figure 2.

Figure 5 is a fragmentary sectional view as seen substantially from line 5—5 of Figure 4.

Figure 6 is an elevational view of certain parts shown in Figure 4 and as seen particularly from line 6—6 of Figure 4.

Figure 7 is a fragmentary sectional view as seen substantially from line 7—7 of Figure 3.

Figure 8 is a sectional view taken on line 8—8 of Figure 4.

Figure 9 is a sectional view taken on line 9—9 of Figure 4.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

A machine embodying this invention may comprise a bed 10 having rising therefrom at one end thereof a pedestal bearing 11 in which is journaled a spindle 12 having secured to its one end a grinding wheel 13. The grinding wheel and spindle are adapted to be rotated at a high grinding rate of speed in a clockwise direction as indicated by the arrow associated with the grinding wheel housing. The bed 10 is further provided on its upper surface with a guideway 14 for a lower slide 15 for guiding said slide in its movement toward and from the grinding wheel. The said lower slide 15 is in turn provided with a guideway 16 for the upper slide 17 which has associated therewith a bracket 18. Carried by the bracket 18 is a housing or head 19 in which is journaled a spindle 20 for a friction drive wheel 21. The friction drive wheel 21 and its spindle 20 are adapted to be rotated in a clockwise direction as indicated by the arrow adjacent thereto and at a slow work rotation controlling rate of speed. Any usual or suitable driving means may be employed for rotating both the grinding wheel and the friction drive wheel and the said wheels have their proximate points spaced from one another an amount equal to the desired finished size of the work pieces to be operated upon and form a grinding throat between them.

The lower slide 15 has secured to it at its inner end a bracket or journal bearing 22 having formed therein an enlarged bore or opening 23 carrying a liner or bushing 24. Journaled in the liner or bushing 24 is a bearing portion 25 of a plate 26. The plate 26 is provided centrally thereof with an enlarged opening 27 through which the friction drive wheel spindle 20 projects.

The plate 26 has secured to its rear face a ring 28 by means of cap screws or the like 29. The ring 28 has fastened to it in a circular path concentric with the plate 26 a plurality of spindles or arbors 30. The said arbors each having a reduced end 31 which extends into the ring 28 being secured therein between a shoulder 32 formed on the arbors and a nut 33 threaded on the extreme end thereof. Each of the arbors extend through an aligned bore in the plate 26 against

which the shoulder 30 contacts and is provided at its outer or free end with a substantial point 34 to facilitate insertion of the work thereon.

The spindle housing or head 19 has its outer end enlarged to form a hood portion 35 which encloses the plate 26 and mechanism carried thereby and the friction drive wheel 21. Mounted on the upper end of the hood 35 is a prime mover or motor 36 being geared or belted by a flexible transmission member 37 to a pulley 38 on one end of a worm shaft 39. The worm shaft 39 is journaled in a bracket 40 secured to the journal bearing 22. The worm shaft 39 has integral therewith or secured thereto a worm 41 meshing with a worm wheel 42 on one end of a driven shaft 43 journaled in anti-friction bearings carried by the bracket 40 and the journal bearing 22. The shaft 43 has secured to it or formed integral therewith a worm 44 meshing with worm teeth 45 formed around the outer surface of the bearing portion 25 of the plate 26 and whereby the said plate is driven at a very slow rate of speed for actuating the arbors circumferentially of the friction drive wheel 21. The plate 26 is held against inadvertent disassociation with the journal bearing 22 by a clamp plate 46 forming the flange that extends beyond the periphery of the bearing 25 and is seated in a recess 47 formed in the rear face of the journal bearing 22, the clamp plate being secured to the bearing portion 25 of the carrying plate by means of cap screws or the like 48.

As was suggested above, the carrier plate 26 is actuated at a very slow rate of speed circumferentially of the friction drive wheel for passing the work in succession through the grinding throat while presenting said work pieces 49 to the action of the grinding wheel. The diameter of the arbors 30 is substantially equal to the bore within the work pieces so that considerable pressure may be necessary to properly slide the sleeve like work pieces onto the arbors which is somewhat difficult with the said arbors constantly moving. For this reason positively actuated mechanical means are provided for sliding the work onto the arbors and abutting same against the shoulder 32 formed thereon and properly positioning the said work relative to the arbors and wheels. This positive means comprises substantially conically shaped rollers or wheels 50 and 51, see Figure 4, respectively mounted on shafts 52 and 53, see Figure 3. The shafts 52 and 53 each carry a gear 54 and 55 simultaneously meshed with a larger driving gear 56 keyed or otherwise secured to a shaft 57. The shafts 53 and 57 are journaled in a bracket or housing 58 while the shaft 52 is mounted in a supplemental housing 59.

Extending through the housing 58 and supplemental housing 59 is a sleeve 60 whereby the said parts are substantially connected to form a unitary structure enclosing the friction loading rollers or wheels 50 and 51, driven gears 52 and 53 and the common driving gear 56 as well as providing suitable journals for the shafts. The sleeve 60 which connects the housing portions 58 and 59 surrounds the driving shaft 57 and forms a pivotal connection for said housings whereby the position of the rollers or wheels 50 and 51 may be circumferentially adjusted with respect to one another as well as whereby the position of the roller or wheel 50 may be varied as respects the axis of the arbors passing there under so that different sizes of work pieces may be accommodated thereby. In order to adjust the relative position of the roller or wheel 51 the shaft 57 is vertically raised or oscillated about a point later to be described by means of the bolt 61 which has a pivotal connection at 62 with the shaft 57 and a threaded end 63 passing through an enlarged perforation 64 formed in the upper wall of the hood 35. Lock nuts 65 are provided for locking the bolt 61 in its several adjusted positions.

The other end of the shaft 57 is journaled in bearing portion 66 of arm 68, see Figure 8, the arm 68 having at its other end the bearing portion 69 having its axis extending at right angles to the axis of the bearing portion 66 and having passing through it the sleeve 70 which is secured in the sleeve-like portion 71 of bracket member 40. By this construction as noted above the shaft 57 is oscillated about the axis of the sleeve 70 and thereby alters the position of the circumference of friction rollers or wheels 50 and 51 as respects the axis of the arbors 30.

The shaft 57 is provided intermediate its ends with a gear 72, see Figures 4 and 8, meshing with a pinion 73 loosely journaled on a stud 74 carried by the arm 63 so that a driving connection is maintained between gears 72 and 73 regardless of the adjustment of the shaft 57. The gear 73 is further provided with a reduced portion 75 on which is keyed or otherwise secured a pulley or the like 76 for the belt or other transmission member 77. This belt 77 is in turn extended about a pulley or the like 78 mounted in alignment therewith and secured to the driving shaft 43, the belt passing through a cored opening 79 formed in the bracket 40.

Secured to the end of the shaft 57 is a bevel pinion 80 meshing with a complementary bevel pinion 81 keyed or otherwise secured to the end of a shaft 82 which is journaled in the sleeve 70 carried by the bracket 40 above described. The shaft 82 is held against inadvertent disassociation with the sleeve 70 by means of a collar 83 secured to the rear end of the shaft and abutting the end of the sleeve 70 and sleeve-like bearing portion 71. This shaft 82 has further secured to it a bevel gear 84 meshing with a complementary bevel gear 85 secured to the upper end of a vertically disposed shaft 86. This shaft 86 extends vertically of the machine and passes through housing sections 87 and 88 which are similar in construction to the housing sections 58 and 59 above described. The vertical shaft 86 drives a gear 89 within the housing 87—88 which in turn drives a pair of friction rollers or wheels 90 and 91 similar in all respects to the rollers or wheels 50 and 51 above described but rotated in a direction opposite to that in which the wheels 50 and 51 are driven. These rollers 90 and 91 are adapted to eject or strip the work pieces from the spindles or arbors 30 instead of actuating the said work pieces toward the carrier plate 26 as do the rollers or wheels 50 and 51.

The shaft 86 is adapted to be adjusted to vary the relative positions between the rollers 90 and 91 and the arbors 30 in the same manner that the shaft 57 is adjusted for which purpose it has pivoted at 92 a bolt 93 extending through an elongated perforation 94 formed in a portion of the hood 35. In order to maintain a proper driving connection between the bevel gears 84 and 85 during the adjustment of the housing 87—88 the upper end of the vertical shaft 86 is journaled in a bearing portion 95 of a right angle arm 96. This arm 96 is provided with a second bearing portion 97 that has its axis disposed at ninety degrees to

the axis of the bearing portion 95. The second bearing portion 97 is journaled on the sleeve 70 so that adjustment of the housing 87—88 toward and from the spindles or arbors 30 will cause the gear 85 to roll around the axis of the sleeve 70 on the pitch circle of the gear 84.

As is well known the grinding wheel 13 is subject to wear which would cause an opening up of the grinding throat thereby destroying the size thereof and resulting in producing work pieces of a larger size than desired and to obviate this, the parts are adapted to be adjusted relative to one another. For this reason there is provided an adjusting screw 98 having its threaded end threadedly received by a nut 99 carried by the rear wall of the bracket 18. The other end of this screw is journaled in a bracket 100 secured to an extending portion 101 of the bed 10. A pilot or hand wheel 102 is secured to the screw 98 beyond the bracket 100 for rotating the said screw.

The operation of the mechanism is as follows: By reference to Figure 1, it will be noted that arbors 103*a*, 103*b*, and 103*c* are without work pieces and it is while the arbors are passing through this zone that one end of a work piece is placed on the arbor. It is only necessary that the end of the work be forced onto the arbor a distance sufficient to pass under the foremost of the rollers 50 and 51. These rollers are rotated in a clockwise direction as seen in Figure 3 and while the plate is moving under the roller the frictional contact between the work and the roller will cause the work to be axially shifted along the arbor toward the seating collar 32. If the work is not fully seated by the foremost roller 50 it will in passing the roller 51 be again acted upon for firmly seating the rearmost end of the work against the seating shoulder 32. The carrier plate is continuously rotating and passing successive work pieces down between the grinding wheel and friction drive wheel. Prior to engagement of the work with the grinding wheel the friction drive wheel engages and rotates the work at the desired speed. This rotation of the work continues until the work passes through the grinding throat and eventually leaves contact with the friction drive wheel. As the finished work reaches the housing 87—88 the friction rollers 91 and 90 respectively rotating in a counterclockwise direction, as seen in Figure 6, engage therewith and shift it relative to the arbors in a direction opposite to that in which the work was shifted by the rollers 50 and 51 or in other words, strip successive work pieces from their respective arbors causing same to fall by gravity into a suitable receptacle placed for their reception.

By reference to Figure 5, it will be noted that the grinding wheel is provided with an overhanging lip portion 104 which chamfers the end 97 of the work for use subsequently in the field. In order to chamfer both ends of the work, the work pieces are passed twice through the grinding throat, the first time having the square end seated against the seating shoulder 32 and the second time being reversed end for end with the chamfered end 105 contacting the shoulder 32.

It should also be noted that the housing sections 58 and 59 are clamped or locked in position, after they have been adjusted for holding the rollers or disks in adjusted positions, by means of a locking screw or bolt 106 extending through the arcuate slot 107, formed in the housing 59, into the housing 58. The housing sections 87 and 88 are similarly secured to one another.

What is claimed is:

1. In a grinding machine of the class described, the combination of a grinding wheel, a friction drive wheel opposed to the grinding wheel and spaced therefrom, a rotatable work carrying member supporting a plurality of work pieces for passing same through the grinding throat formed between the grinding wheel and friction drive wheel, arbors carried by the rotatable member individually receiving the work pieces, means for positioning the work on the arbors, and additional means for ejecting the work from the arbors, said positioning and ejecting means each comprising friction rollers spaced from the arbors a distance equal to the thickness of the work and engaging the work between themselves and the arbors.

2. In a grinding machine for grinding the exterior surface of cylindrical sleeves and the like the combination of a grinding wheel rotatable at a high grinding rate of speed, an opposed friction drive wheel spaced from the grinding wheel a distance equal to the final size of the work and forming a grinding throat thereby, a rotatable work carrying plate adjacent the friction drive wheel, arbors projecting from the work carrying plate in circumscribing relation to the friction drive wheel, the friction drive wheel and arbors being rotatable at slower speeds than the grinding wheel and about axes eccentric to one another whereby work pieces carried by the arbors are brought into simultaneous engagement with the grinding wheel and friction drive wheel when within the grinding throat, means for rotating the work carrying plate at a slower speed than the rotation of the friction drive wheel, means disposed radially of the friction drive wheel and work carrying plate for positive engagement with the work for actuating same relative to the arbors and positioning the work thereon, and means for positively actuating said work positioning means.

3. In a grinding machine for grinding the exterior surface of cylindrical sleeves and the like the combination of a grinding wheel rotatable at a high grinding rate of speed, an opposed friction drive wheel spaced from the grinding wheel a distance equal to the final size of the work and forming a grinding throat thereby, a rotatable work carrying plate adjacent the friction drive wheel, arbors projecting from the work carrying plate in circumscribing relation to the friction drive wheel, the friction drive wheel and arbors being rotatable at slower speeds than the grinding wheel and about axes eccentric to one another whereby work pieces carried by the arbors are brought into simultaneous engagement with the grinding wheel and friction drive wheel when within the grinding throat, means for rotating the work carrying plate at a slower speed than the rotation of the friction drive wheel, means disposed radially of the friction drive wheel and work carrying plate for positive engagement with the work for actuating same relative to the arbors and positioning the work thereon, means for positively actuating said work positioning means, and additional means extending radially of the friction drive wheel and work carrying plate for ejecting the work from the arbor at the conclusion of the grinding operation.

4. In a grinding machine for grinding the exterior surface of cylindrical sleeves and the like the combination of a grinding wheel rotatable at a high grinding rate of speed, an opposed friction drive wheel spaced from the grinding wheel a distance equal to the final size of the work and forming a grinding throat thereby, a rotatable

work carrying plate adjacent the friction drive wheel, arbors projecting from the work carrying plate in circumscribing relation to the friction drive wheel, the friction drive wheel and arbors being rotatable at slower speeds than the grinding wheel and about axes eccentric to one another whereby work pieces carried by the arbors are brought into simultaneous engagement with the grinding wheel and friction drive wheel when within the grinding throat, means for rotating the work carrying plate at a slower speed than the rotation of the friction drive wheel, means disposed radially of the friction drive wheel and work carrying plate for positive engagement with the work for actuating same relative to the arbors and positioning the work thereon, means for positively actuating said work positioning means, said positioning means comprising friction rollers disposed at a distance from the arbors substantially equal to the wall thickness of the work and engaging the work between the said rollers and the adjacent surface of the arbors, and means for adjusting the position of the rollers relative to the arbors to enable different sizes of work pieces to be ground.

5. In a grinding machine for grinding the exterior surface of cylindrical sleeves and the like the combination of a grinding wheel rotatable at a high grinding rate of speed, an opposed friction drive wheel spaced from the grinding wheel a distance equal to the final size of the work and forming a grinding throat thereby, a rotatable work carrying plate adjacent the friction drive wheel, arbors projecting from the work carrying plate in circumscribing relation to the friction drive wheel, the friction drive wheel and arbors being rotatable at slower speeds than the grinding wheel and about axes eccentric to one another whereby work pieces carried by the arbors are brought into simultaneous engagement with the grinding wheel and friction drive wheel when within the grinding throat, means for rotating the work carrying plate at a slower speed than the rotation of the friction drive wheel, means disposed radially of the friction drive wheel and work carrying plate for positive engagement with the work for actuating same relative to the arbors and positioning the work thereon, means for positively actuating said work positioning means, additional means extending radially of the friction drive wheel and work carrying plate for ejecting the work from the arbor at the conclusion of the grinding operation, said ejecting means comprising friction rollers disposed at a distance from the arbors substantially equal to the wall thickness of the work and engaging the work between the said rollers and the adjacent surface of the arbors, and means for adjusting the position of the rollers relative to the arbors to enable different sizes of work pieces to be ground.

6. A work presentation mechanism for use with grinding machines comprising a rotatable work carrying plate, a bearing therefor, work supports projecting from the plate and adapted to enter the bore in work pieces, a friction drive wheel disposed beneath the supports and eccentric thereto for engagement with the work and effecting its rotation at a definite point in its cycle of movement, means for engagement with the work for positioning it relative to the support, additional means for ejecting the work from the support at the conclusion of the grinding operation, said positioning and ejecting means each comprising rotatable rollers rotating in opposite directions for reversely actuating the work pieces relative to the supports, and means for adjusting the positions of the rollers relative to the supports for various sizes of work pieces.

7. A work presentation mechanism for use with grinding machines comprising a rotatable work carrying plate, a bearing therefor, work supports projecting from the plate and adapted to enter the bore in work pieces, a friction drive wheel disposed beneath the supports and eccentric thereto for engagement with the work and effecting its rotation at a definite point in its cycle of movement, means for engagement with the work for positioning it relative to the support, additional means for ejecting the work from the support at the conclusion of the grinding operation, said positioning and ejecting means each comprising rotatable rollers rotating in opposite directions for reversely actuating the work pieces relative to the supports, and means for adjusting the positions of the rollers relative to the work supports for various sizes of work pieces, said adjustable means comprising a housing for each roller, and a coupling between the housings of the positioning rollers and ejecting rollers whereby they may be adjusted one with respect to the other to thereby adjust the units individually.

8. In a grinding machine the combination with a bed and a grinding wheel rotatably mounted thereon, of a work presentation and feeding unit comprising a housing mounted on the bed, a spindle rotatably journaled therein, a friction drive wheel secured to the spindle for rotation therewith, a work actuating carrier mounted on the bed adjacent the friction drive wheel for feeding the work past the grinding wheel, arbors projecting from the carrier in overlying relation to the friction drive wheel and circumscribing same, means for rotating the friction drive wheel and carrier at differential rates which are slower than the rate of rotation of the grinding wheel, positive means for positioning the work on the arbors, and additional positive means for ejecting the work from the arbors, said means for rotating the carrier including a prime mover, a worm and worm wheel for rotating the carrier, a transmission between the prime mover and worm and worm wheel, and an additional transmission from the worm wheel drive to the positive work positioning and ejecting means.

9. A work supporting and feeding mechanism for use with a grinding machine comprising a rotatable carrier, a plurality of arbors projecting therefrom each adapted to be received in the bore of a work piece, means for rotating the carrier to cause the arbors to present the work carried thereby to the grinding wheel, and means disposed radially of the carrier for engagement with the work while on the arbors for positioning said work relative to the arbors prior to the engagement thereof with the grinding wheel and for ejecting said work from the arbors after it has passed the grinding wheel, said positioning and ejecting means comprising a plurality of rollers each having their periphery spaced from the arbors a distance slightly less than the thickness of the work, and means for rotating the positioning rollers in one direction and the ejecting rollers in the reverse direction.

10. A work supporting and feeding mechanism for use with a grinding machine comprising a rotatable carrier, a plurality of arbors projecting therefrom each adapted to be received in the bore of a work piece, means for rotating the car-

rier to cause the arbors to present the work carried thereby to the grinding wheel, and means disposed radially of the carrier for engagement with the work while on the arbors for positioning said work relative to the arbors prior to the engagement thereof with the grinding wheel and for ejecting said work from the arbors after it has passed the grinding wheel, said means comprising rollers spaced from the arbors a distance equal to the thickness of the work, a housing for said rollers, means supporting said housing for adjustment toward and from the arbors, and additional means supporting said rollers for adjustment relative to one another independent of the housing adjustment to vary the capacity of the device.

11. In a grinding machine for grinding the exterior surface of cylindrical fragile sleeves and the like the combination of a bed, a pair of opposed grinding and friction drive wheels on the bed and forming between them a grinding throat, a work arbor adapted to enter the bore in the sleeves for passing the same through the grinding throat, and means on one side of the arbor for engaging the wall of the sleeve between itself and the arbor for positioning said sleeve on the arbor.

12. In a grinding machine for grinding the exterior surface of cylindrical fragile sleeves and the like the combination of a bed, a pair of opposed grinding and friction drive wheels on the bed and forming between them a grinding throat, a work arbor adapted to enter the bore in the sleeves for passing the same through the grinding throat, means on one side of the arbor for engaging the wall of the sleeve between itself and the arbor for positioning said sleeve on the arbor, and additional means on one side of the arbor for engaging the wall of the sleeve between itself and the arbor for ejecting the work piece from the arbor.

13. In a grinding machine of the class described for grinding the outer wall of cylindrical fragile sleeves and the like the combination of a bed, a pair of opposed grinding and friction drive wheels forming between them a grinding throat of a size substantially equal to the final size of the work piece, an arbor adapted to enter the bore through the sleeve, means for actuating the arbor through the grinding throat, and means at one end of the throat for engaging the sleeve between itself and the arbor for forcing the sleeve onto the arbor prior to the movement of the arbor and sleeve through the grinding throat.

14. In a grinding machine of the class described for grinding the outer wall of cylindrical fragile sleeves and the like the combination of a bed, a pair of opposed grinding and friction drive wheels forming between them a grinding throat of a size substantially equal to the final size of the work piece, an arbor adapted to enter the bore through the sleeve, means for actuating the arbor through the grinding throat, means at one end of the throat for engaging the sleeve between itself and the arbor for forcing the sleeve onto the arbor prior to the movement of the arbor and sleeve through the grinding throat, and means on the other end of the grinding throat for engaging the sleeve between itself and the arbor and ejecting the sleeve from the arbor.

15. In a grinding machine of the class described for grinding the outer wall of cylindrical fragile sleeves and the like the combination of a bed, a pair of opposed grinding and friction drive wheels forming between them a grinding throat of a size substantially equal to the final size of the work piece, an arbor adapted to enter the bore through the sleeve, means for actuating the arbor through the grinding throat, means at one end of the throat for engaging the sleeve between itself and the arbor for forcing the sleeve onto the arbor prior to the movement of the arbor and sleeve through the grinding throat, and means on the other end of the grinding throat for engaging the sleeve between itself and the arbor and ejecting the sleeve from the arbor, each of said last two named means including a rotatable roller having their axes skewed with respect to the arbor axis.

16. A work presentation mechanism for presenting hollow fragile work pieces to the action of a grinding wheel comprising a rotatable work carrying plate, a bearing therefor, work supports projecting from the plate and adapted each to enter the bore in a work piece, means eccentric to the plate supports for engaging the wall of the work piece between itself and each of the work supports for forcing the said work pieces individually on its support, and additional means eccentric to the work supports for again engaging between itself and the said supports the wall of the work piece for forcing said work pieces from their supports.

17. A work presentation mechanism for presenting hollow fragile work pieces to the action of a grinding wheel comprising a rotatable work carrying plate, a bearing therefor, work supports projecting from the plate and adapted each to enter the bore in a work piece, means eccentric to the plate supports for engaging the wall of the work piece between itself and each of the work supports for forcing the same work pieces individually on its support, additional means eccentric to the work supports for again engaging between itself and the said supports the wall of the work piece for forcing said work pieces from their supports, said last two mentioned means each including a roller having their respective axes angularly related to one another and angularly related in opposite directions to the axis of the supports, and means for rotating said rollers about their respective axes for thereby shifting the work pieces onto and off of the said supports.

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