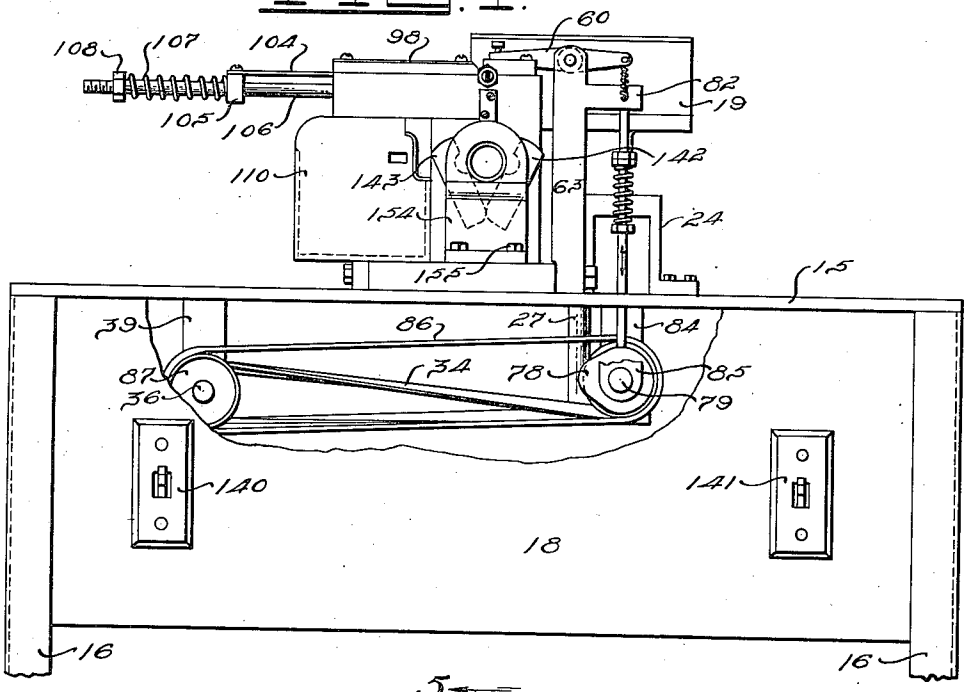
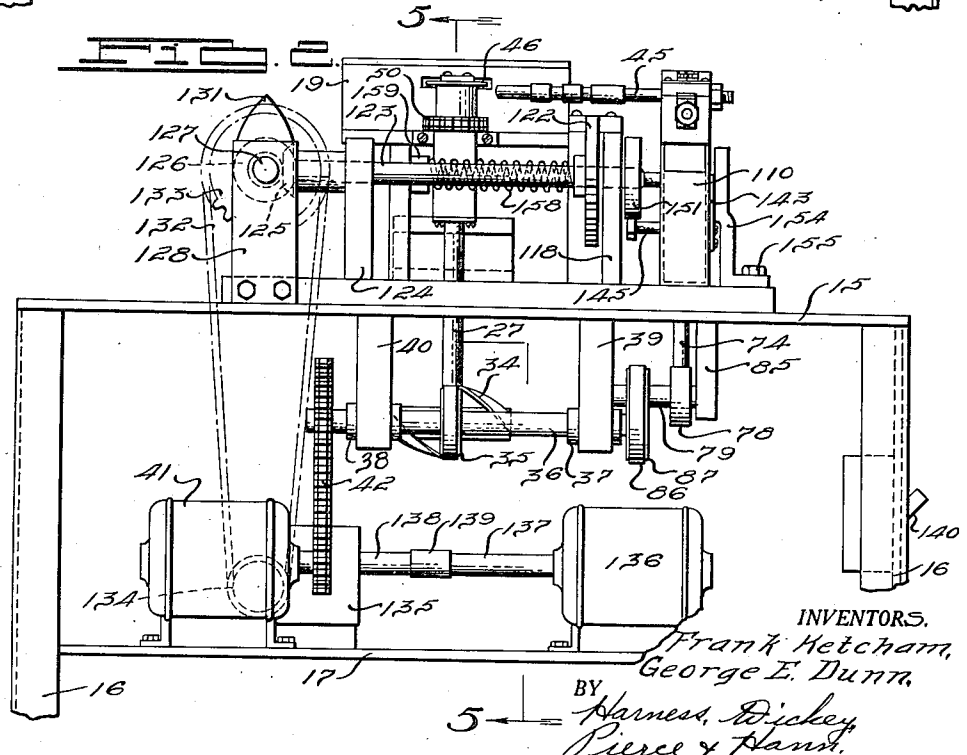
Jan. 26, 1937. F. KETCHAM ET AL 2,068,683

MECHANISM FOR ASSEMBLING BEARINGS

Original Filed March 30, 1933 3 Sheets-Sheet 1

FIG. 1.





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MECHANISM FOR ASSEMBLING BEARINGS

Original Filed March 30, 1933 3 Sheets-Sheet 2

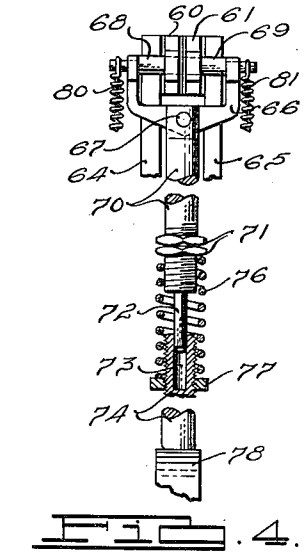


FIG. 4.

FIG. 3.

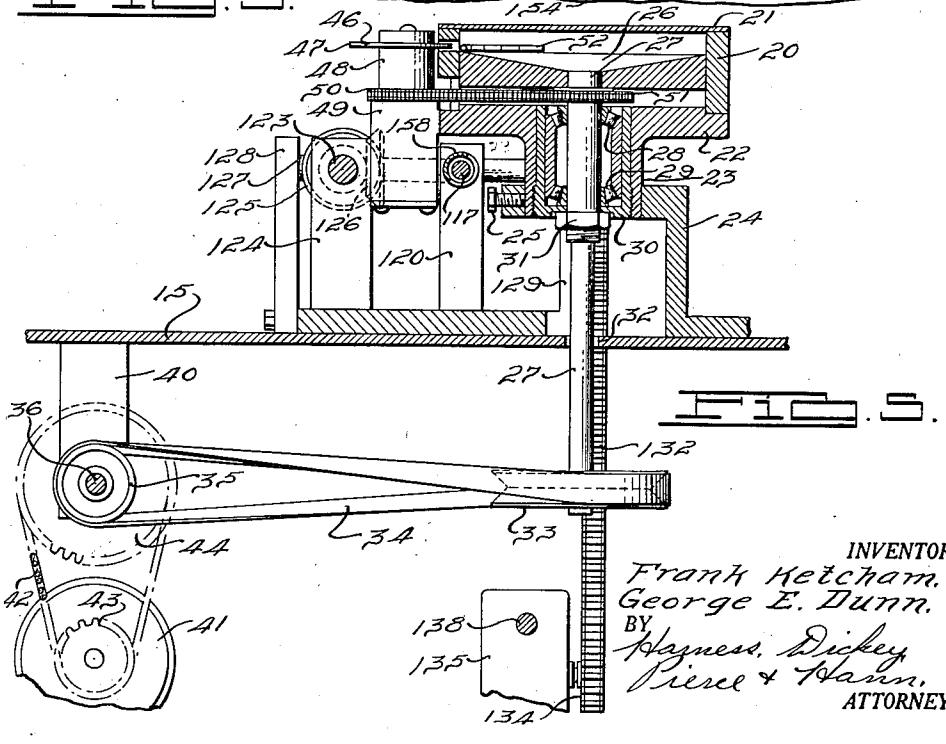


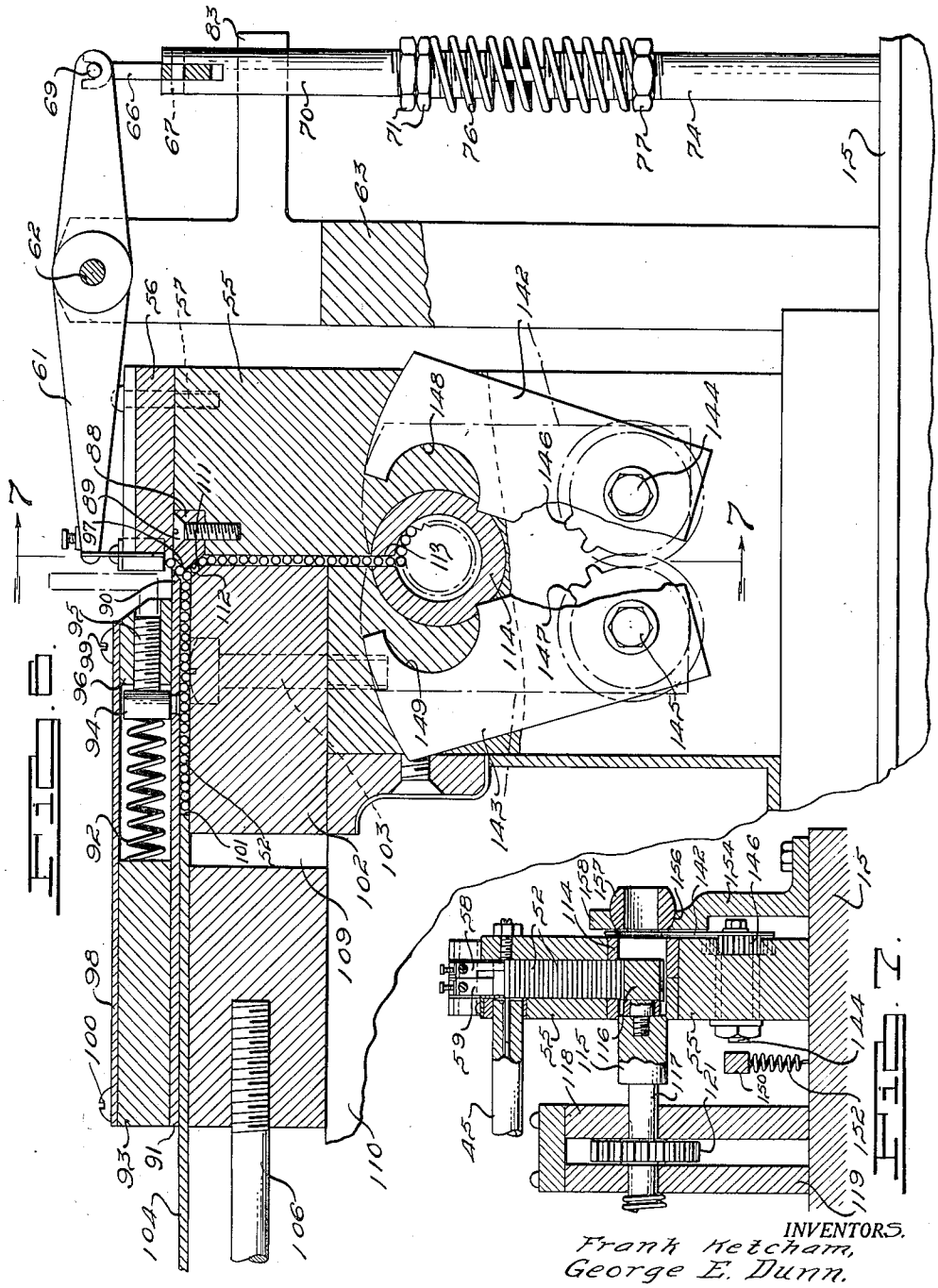
FIG. 5.

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MECHANISM FOR ASSEMBLING BEARINGS

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Original application March 30, 1933, Serial No. 663,444. Divided and this application January 19, 1934, Serial No. 707,289

3 Claims. (Cl. 221—130)

This invention relates to machines for assembling roller bearings or the like and it has particular relation to a machine wherein a hopper feed mechanism is utilized. It constitutes a division of our co-pending application for patent, Serial Number 663,444, filed March 30, 1933.

An object of the present invention is to provide a machine which will assemble a plurality of rollers in predetermined grouped positions.

Another object of the invention is to provide a machine which will separate rollers from a loose quantity and position them in predetermined relation.

Other objects of the invention will become apparent from the following description, the drawings relating thereto and the claims hereinafter set forth.

For an understanding of the invention, reference may be had to the drawings, wherein,

Figure 1 is a view in front elevation of the improved machine, a portion of the front panel thereof being broken away to show the interior construction.

Fig. 2 is a view in side elevation of the same.

Fig. 3 is a fragmentary view in top plan of the same with a part of the hopper and discharge conduit thereof shown in horizontal section.

Fig. 4 is an enlarged fragmentary view, partly in elevation and partly in section, taken on the line 4—4 of Fig. 3, looking in the direction indicated.

Fig. 5 is an enlarged sectional view taken on the line 5—5 of Fig. 2, looking in the direction indicated.

Fig. 6 is an enlarged sectional view taken on the line 6—6 of Fig. 3, looking in the direction indicated.

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6 with the axially movable roller assembling mandrel shown in position for having the rollers assembled therearound.

In the construction shown in the drawings, the improved machine is assembled on a table or frame comprising a horizontally disposed top plate 15 of substantially rectangular shape, supported by depending legs 16 disposed at the four corners thereof. A horizontally disposed shelf 17 is secured to the legs 16 in spaced relation, below the top 15 upon which the motor drive units are mounted, and a vertically disposed front panel 18 closes the space between the top 15 and shelf 17 at the front side of the machine.

The improved roller bearing assembling machine comprises a shallow annular hopper, generally designated as 19 in Fig. 1, which is formed by a vertically disposed stationary annular rim 20, a cover plate 21, and a stationary base member 22. The base 22 is provided with a depending tubular neck 23, the lower end of which is securely held in a mounting bracket 24 by a set screw 25. The hopper is provided with a rotatable bottom 26 mounted at the top end of a vertically disposed shaft 27 which is journaled in opposed taper roller bearings 28 and 29, which are assembled in a cup-shaped member 30. The lower or base end of the cup 30 is exteriorly threaded for engaging complementary threads formed on the interior of the neck 23 at the lower end thereof. A nut 31 is threaded on the shaft 27 immediately below the cup 30 for adjusting and retaining the opposed taper roller bearings 28 and 29 with their respective bearing raceways.

The shaft 27 is of reduced diameter immediately below the threaded portion which receives the nut 31 and extends downwardly through an opening 32 formed in the top 15 and the lower end thereof carries a horizontally disposed belt pulley 33 rigidly affixed thereto for receiving a V-shaped drive belt 34. The drive belt 34 is given a quarter turn to pass over and be driven by a vertically positioned belt pulley 35 which is rigidly affixed to a horizontally disposed countershaft 36. The countershaft 36 is journaled in bearings 37 and 38 carried at the lower end of depending brackets 39 and 40 respectively which are rigidly secured to the underside of the top member 15.

Rotation is imparted to the countershaft 36 by an electric motor 41 mounted on the shelf 17, the drive of which is imparted through a chain 42 and sprocket wheels 43 and 44 mounted on the motor armature shaft and countershaft 36, respectively.

The side wall 20 of the hopper, at a point closely adjacent to the top surface of the revolving bottom 26, is provided with a tangentially disposed opening for receiving one end of a roller discharge conduit 45. Means are provided immediately in front of the opening for controlling the flow of rollers into the discharge conduit 45, which comprises a horizontally rotatable disc 46 having a finger or lug 47 thereon which protrudes into the pathway of the rollers being fed to the discharge conduit, the disc 46 being positioned in a horizontally disposed slot formed in the hopper side wall 20. Means are provided for rotating the disc 46, and comprise a vertically disposed shaft 48, the lower end of which is journaled in a suitable bearing assembly 49. The disc 46 and shaft 48 are driven by a

link belt 50 which passes around the sprocket on the shaft 48 and around a similar sprocket 51 rigidly affixed to the upper end of the shaft 27 immediately beneath the hopper bottom 26.

The conduit 45 which receives rollers 52 as they are discharged from the hopper by centrifugal action, is made in sections with suitable collars 53 and 54 so that it may be readily removed in case of jamming or other trouble which interrupts the flow of rollers therethrough.

As shown in Fig. 7, the other end of the conduit 45 terminates at, and is supported by an upstanding bracket 55 which carries a plate 56 rigidly secured thereto by screws 57, a slot being provided at the end of the plate 56 adjacent to the terminating end of the conduit 45, so that rollers passing endwise through the conduit in end to end abutting relationship are projected across the slot and strike against a closed end wall to stop further axial movement of the roller.

Referring also to Figs. 3, 4 and 6, means are provided for engaging the rollers projected into the slot and forcing them downwardly in a substantially vertically disposed passageway and comprise a pair of depending fingers 58 and 59 which are rigidly secured to the ends of horizontally disposed rocker arms 60 and 61 respectively, which are journaled on a cross shaft 62. The shaft 62 is supported by an upstanding bracket 63, the lower end of which is rigidly mounted to the top plate 15 and the upper end of which is bifurcated to form spaced parallel arms 64 and 65, which receive the rocker arms therebetween, and in the upper ends of which the shaft 62 is supported.

As best shown by Fig. 4, the rocker arms 60 and 61 are adapted to have individual and independent movement from a single or common source of actuation and which is secured by a transversely disposed yoke member 66, which is pivoted medially of its ends on a pin 67, the ends of the yoke arms being bifurcated so as to be of upstanding U-shape to embrace horizontally disposed rigidly mounted pins 68 and 69 mounted in the ends of the rocker arms 60 and 61 respectively which are opposite to the ends having the fingers 58 and 59.

The yoke member 66 is pivoted to the upper end of a push rod 70, the lower end of which is threaded to receive a pair of nuts 71 and axially bored to receive the upper end of an axially disposed, downwardly projecting pin 72. The lower end of the pin 72 is slidably received in an axially disposed bore 73 of a push rod 74. The push rods 70 and 74 are normally held in spaced relation by a helical compression spring 76, the upper end of which surrounds the lower end of the push rod 70 and bears against the adjusting nut 71, and the lower end of which similarly surrounds the upper end of push rod 74 and bears against a nut 77 which is threaded on the top end thereof. Axial movement is imparted to the two part push rod assembly in an upward direction by a cam 78 which is fixed to a horizontally journaled counter-shaft 79 shown by Figs. 1 and 2.

The push rod and rocker arms are normally yieldingly urged downward by helical tension springs 80 and 81, the upper ends of which are attached to the pins 68 and 69, respectively, and the lower ends of which are anchored to horizontally disposed brackets 82 and 83 which are integrally formed on the bifurcated ends 64 and 65 respectively, of the supporting bracket 63.

Again referring to Figs. 1 and 2, the counter-shaft 79 is journaled at opposite ends in the lower ends of depending brackets 84 and 85, the upper ends of which are rigidly secured to the underside of the top plate 15. Rotation is imparted to the counter-shaft 79 by a belt 86 which passes around a pulley 87 fixed on the counter-shaft 36 and a similar pulley wheel fixed to the counter-shaft 79.

Now referring to Fig. 6 particularly, as the rollers are forced downwardly by the fingers 58 and 59 of the rocker arms, they are deflected by the sloping end surface 97 of a block 88 which is rigidly fastened to the bracket 55 by screw 89. The end of the block 88 having the sloping surface 97, is of substantially horizontal V-shape and the sloping surface 97 co-acts with one end 90 of a horizontally disposed slide plate member 91, which is normally urged toward the block 88 by a helical compression spring 92. One end of the spring 92 abuts against a fixed block 93 and the other end thereof bears against an upstanding stud 94 riveted to the top surface of the slide plate 91. A set screw 95 is threaded into a fixed block 96, for adjustably positioning the end 90 with respect to the sloping upper surface 97 of block 88, so as to provide a restricted passageway of slightly smaller size than the diameter of rollers 52, thus causing the slide plate 91 to be moved slightly against the action of spring 92 when the rollers 52 are forced down the passageway by the fingers 58 and 59. The blocks 93 and 96 are joined to each other by top plate 98 and rigidly secured by screws 99 and 100.

A horizontally disposed passageway which forms a magazine 101 is provided between the bottom surface of the slide plate 91 and the top surface of a block 102 which is rigidly secured to the upstanding bracket 55 by cap screws 103. The magazine 101 is substantially of the same depth as the maximum diameter of the rollers 52 so that the rollers are received therein in side by side relationship.

A yielding follower in the form of a pusher plate 104 has one end slidably received in the magazine 101, and the other end thereof secured to a cross-head 105 which is slidably journaled on a fixed rod 106. A helical compression spring 107 surrounds the outer end of the fixed rod 106 and bears between the cross head 105 and an adjustable nut 108 which is threaded on the end of the rod for varying the tension on the spring 107.

A vertically disposed slot 109 is provided in the block 102, the upper end of which communicates with the magazine 101 and the lower end of which discharges into a box or container 110 so as to take care of the overflow of rollers from the magazine when a certain predetermined number have been forced therein and thus caused the follower 104 to be pushed back against the action of the spring 107 until the top end of the slot 109 is uncovered.

Rollers are fed out of the magazine 101 by the follower 104 which pushes the rollers toward the block 88. The V-shaped end of the block 88 has its lower sloping surface 111 in spaced relation to a complementary surface 112 formed on the block 102 and the apex of the V-shaped end of the block 88 is positioned above the horizontal centerline of the magazine 101 so that when rollers in the magazine are pushed toward the block 88, they will have a tendency to feed downwardly into the slot formed between the surfaces 111 and 112. The vertical edge of the block 102 adjacent the surface 112 is in spaced parallel relation to a complementary surface of the bracket

55 to form a vertically disposed slot 113, the lower end of which is in registry with a similar slot formed in a cylindrical bushing 114 which is rigidly mounted in the supporting bracket 55.

As shown best by Fig. 7, the bushing 114 is adapted to receive the enlarged shank 115 having a horizontally disposed mandrel 116 threaded thereinto, the outer surface of which is serrated and in concentrically spaced relation to the interior of the bushing, a distance substantially equal to the diameter of the rollers 52. The shank or head 115 to which the mandrel 116 is attached in axial relationship, has a sliding bearing fit within the bushing 114 so as to hold the mandrel 116 centrally located within the bushing and permit rotative as well as axial movement therein.

The shank or head 115 is integrally formed on one end of a horizontally disposed shaft 117 which is slidably and rotatably journaled in upstanding spaced brackets 118 and 119 and in a similar bearing 120 located adjacent the opposite end thereof and which is shown by Fig. 3. Means are provided for rotating the shaft 117 and comprise a gear wheel 121 splined to the shaft 117 between the brackets 118 and 119 so as to be rotatably fixed thereto but permit axial sliding movement of the shaft through the gear wheel.

The gear 121 meshes with a mutilated gear 122 which is of larger size and has sufficient number of teeth thereon to impart one complete rotation to the gear 121 and then permit a time period before again rotating it. The mutilated gear 122 is fixed on a horizontally disposed counter-shaft 123, which is journaled adjacent one end in the bracket 118 and at a point adjacent its other end in a bearing bracket 124. The countershaft 123, at the end thereof adjacent the bearing 124, is provided with a bevel gear 125 which meshes with and is driven by a similar bevel gear 126 rigidly fixed to a cross countershaft 127, which is journaled in bearings 128 and 129 located adjacent the opposite ends thereof. The shaft 127 is in the same horizontal plane as the shaft 117 and, as shown in Fig. 3 of the drawings, the end of the shaft 117 opposite to the shank head 115, is bifurcated and provided with a roller 130 journaled between the arms of the bifurcation and which is engaged by a cam 131 fixed on the shaft 127 for imparting axial movement to the shaft 117 at a time when the mutilated gear 122 is not in engagement with and rotating the gear 121.

Rotation is imparted to the shaft 127 by a link belt 132 which engages a pulley wheel 133 fixed on one end of the shaft 127 outward from the bearing 129. The belt 132 is driven by a pulley wheel 134 of a speed reduction unit 135. Power is imparted to the speed reduction unit 135 by an electric motor 136 which is connected thereto by shafts 137 and 138 and a flexible coupling 139 which interconnects adjacent ends of said shafts. The motor 136 is rigidly bolted to the shelf 17.

Snap switches 140 and 141 are mounted on the front plate 18 for controlling circuits to the electric motors 41 and 136 respectively.

Means are provided for stripping the rollers from around the mandrel 116 and comprise a pair of stripper plates 142 and 143 shown also by Fig. 6 fixedly attached to rock shafts 144 and 145 respectively. The shafts 144 and 145 are interconnected by meshed gears 146 and 147 respectively so that rotation of one of the shafts will cause similar rotation of the other shaft but in the opposite direction. The upper ends of the stripper plates 142 and 143 are cut out in semi-circular shape, as shown in 148 and 149 respectively, so as to snugly surround the mandrel 116 and engage behind the rollers on the mandrel when the mandrel is projected out of bushing 114 so that the rollers are stripped therefrom upon retraction of the mandrel.

As shown best in Fig. 3, rocking movement of the shaft 145 is secured through the medium of a lever 150 which is rigidly affixed to said shaft and one end of which is engaged by a cam 151 fixed to the end of the shaft 123 which protrudes beyond the bearing 118. Contact is maintained between the long end of the lever 150 and cam 151 by a helical tension spring 152, one end of which is anchored to the top plate 15 and the other end of which is attached to the end of the lever.

Means are provided for aiding the operator of the machine to hold a roller bearing member in position to receive the rollers from the mandrel 116, and comprises an upstanding bracket 154 rigidly mounted on the top plate 15 by cap screws 155. The upper end of the bracket 154 is provided with a frusto-spherical socket opening 156 of such contour as to snugly receive a bearing member 157 and hold the same in concentric registry with the mandrel 116.

The interior of the bearing member 157 is preferably provided with a coating of cup grease so as to retain the rollers 52 therein upon withdrawal of the mandrel 116. Such withdrawal of the mandrel is accomplished by a helical compression spring 158 which surrounds the shaft 117 and bears between the fixed bracket 119 and a collar 159 which is secured to the shaft 117, so as to normally maintain the roller 130 of shaft 117 in contact with the cam 131 at all times.

In the operation of this machine, a quantity of rollers 52 are placed in the hopper 19 and the cover plate 21 placed thereon. The motor 41 is then started which, through link belt 42, counter-shaft 36, belt 34 and shaft 27, will rotate the bottom 26 of the hopper and thus by centrifugal force align a series of rollers 52 about the side wall 20 of the hopper in the lower corner thereof at the junction of the side wall and rotating bottom 26. These aligned rollers are projected into the discharge conduit 45 by centrifugal force and the flow of rollers into the conduit is aided by the agitator comprising the cam finger 47 on disc 46, which is rotated through the link belt 50 from the shaft 27.

It is to be noted that the direction of rotation of the hopper bottom 26 and the disc 46 are the same so that the lug 47, as it passes into the hopper, moves in a direction opposite to the direction of movement of the rollers being fed into the discharge conduit so as to strike against the rollers located adjacent the opening to conduit 45 and push them backward and out of line with the opening. It will be observed that by reason of the chain drive of disc 46 from the hopper shaft 27, the lineal feed of the periphery of the hopper will greatly exceed that of the finger 47. Hence the finger will strike and remove from the entrance to the conduit 45 only a few out of a relatively large number of rollers fed to the conduit. This does not materially interfere with the feeding of the rollers but does provide a positive means for occasionally clearing the entrance to the conduit 35 of any rollers

which, due to misalignment, may block the opening.

As the rollers pass through the discharge conduit 45 they enter the passageway at the terminating end thereof and abut against the opposite wall of the passage. Movement of the rollers down the vertical slot and through the restricted opening formed by the sloping surface 97 of block 93 and the adjacent end 99 of the spring pressed plate 91 is accomplished by vertical movement of the fingers 58 and 59 which are attached to the rocker arms 60 and 61.

Movement is imparted to these rocker arms to cause reciprocation of the fingers by the push rods 70 and 74 which are normally held in spaced relation by the compression spring 76. Axial movement of the push rod assembly is caused by the cam 78 which is driven from the counter-shaft 36 through the belt 86. In the event one of the rollers should not be projected completely into the vertical slot or passageway from the discharge conduit 45, such roller will not be broken or bent by reason of the flexible drive through the compression spring 76 or if the roller is only part way across the passageway, the finger 58, which has a shorter contacting end than the finger 59, may move downwardly independently of the finger 59 by reason of the rocking yoke 66 which is pivoted to the top end of the push rod 70 and through which movement is imparted to the rocker arm 60 and 61 against the tension of springs 80 and 81.

As rollers 52 are fed downwardly through the restricted opening and into the magazine 101, they will at first continue their downward movement in the slot 113 until contact is made with the mandrel 116 which at that time is in the position shown in Fig. 7 of the drawings. Continued feeding of the rollers will cause the follower 104 to move to the left, as viewed in Fig. 6, until the follower 104 uncovers the overflow slot 109, at which time any further or additional rollers drop downwardly into the box 110.

At this time the motor 136 is started which, through the shafts 137 and 138, gear reduction unit 135, and belt 132, will cause rotation of the cross counter-shaft 127. Rotation of this shaft will in turn, through the medium of the beveled gears 125 and 126, cause rotation of the counter-shaft 123, which carries the mutilated gear 122. When the teeth on the gear 122 engage with the teeth on the gear 121, which is slidably keyed to the shaft 117, one complete rotation of the shaft 117 takes place, such rotation causing the rollers 52 to be carried around the mandrel 116 so as to completely fill the space between the mandrel and the interior of the cylindrical bushing 114. The mechanism is so timed that at this point the shaft 117 is moved axially to the right to move the mandrel out of the bushing.

As the shaft 117 begins to move axially, the operator places the bearing member 157 in the socket 156 so as to be in position to receive the series of rollers which are grouped around the periphery of the mandrel 116. When the rollers have been projected into the member 157 by the mandrel, the relieved side of the cam 151 is in position to permit rocking movement of lever 150 which is caused by the tension spring 152, such rocking movement causing rotation of the shafts 146 and 145 in opposite directions by reason of the meshed gears 146 and 147 fixed to said shafts. Rotation of the shafts causes the upper ends of the stripper plates 142 and 143 to move inwardly and surround the mandrel immediately back of the rollers thereon and remain in this position until the compression spring 158 returns the shaft 117 to its original position, at which time the cam 151 actuates the lever 150 to restore the stripper plates to their former positions.

The capacity of the vertical slot 113 and of the magazine 101 is such that a sufficient number of rollers are provided to quickly fill the space around the mandrel upon rotation thereof, the feeding of the rollers downwardly and around the mandrel being accelerated by the spring pressed follower 104.

The layer of cup grease around the inner periphery of the bearing member 157 retains the rollers 52 therein while the operator removes the bearing member from the socket 156 and during the time until the bearing is assembled on its trunnion.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

We claim:

1. A mechanism for feeding roller bearings in end-to-end relation comprising a hopper having an annular side wall, a rotatable bottom in the hopper, means for rotating the bottom, said side wall having an opening for the discharge in end-to-end relation of rollers carried by the outer edge of said bottom, and means movable entirely across said opening for intermittently displacing rollers located within the hopper and adjacent said opening from a position in line with said opening.

2. A mechanism for feeding roller bearings in end-to-end relation comprising a hopper having an annular side wall, a rotatable bottom in the hopper, means for rotating the bottom, said side wall having an opening of sufficient size to receive only a single roller at a time in an endwise direction for the discharge in end-to-end relation of rollers carried by the outer edge of said bottom, means for engaging and deflecting rollers located within the hopper and adjacent said opening from a position in line with said opening, and means for operating said last named means to deflect said rollers at intervals spaced in time sufficiently to permit the discharge of a plurality of rollers through said opening between deflecting operations.

3. A mechanism for feeding roller bearings in end-to-end relation comprising a hopper having an annular side wall, a rotatable bottom in the hopper, means for rotating the bottom, said side wall having an opening for the discharge in end-to-end relation of rollers carried by the outer edge of said bottom, and means for intermittently displacing rollers located within the hopper and adjacent said opening from a position in line with said opening, said means comprising a horizontal rotatable disc carrying a projection adapted to move in a path extending entirely across said opening.

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