Jan. 17, 1961 J. H. SELBY 2,968,446

BALLER HEAD

Filed Nov. 19, 1956 5 Sheets-Sheet 1

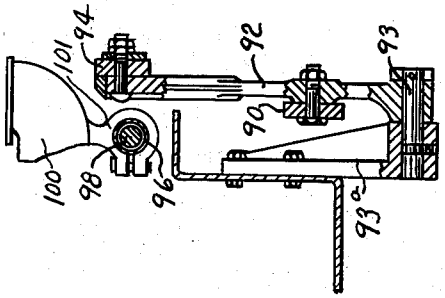


FIG. 8

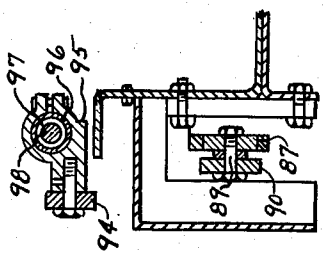


FIG. 9

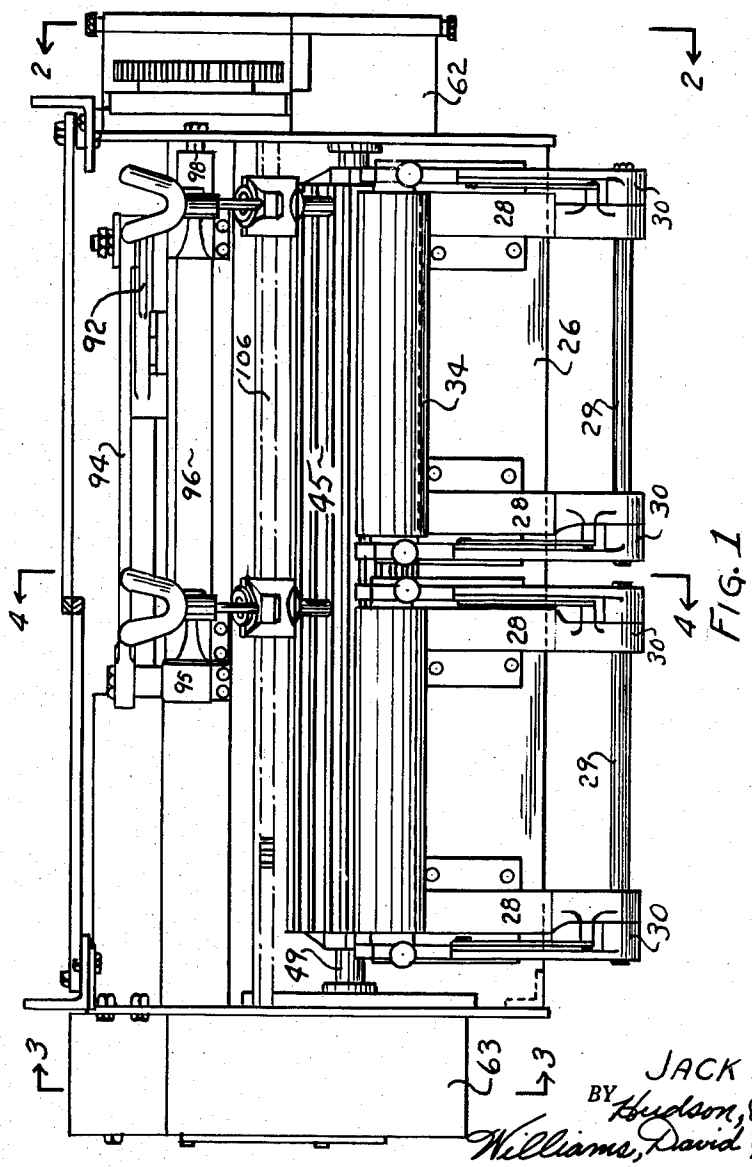


FIG. 1

INVENTOR.
JACK H. SELBY
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

Jan. 17, 1961 J. H. SELBY 2,968,446

BALLER HEAD

Filed Nov. 19, 1956 5 Sheets-Sheet 2

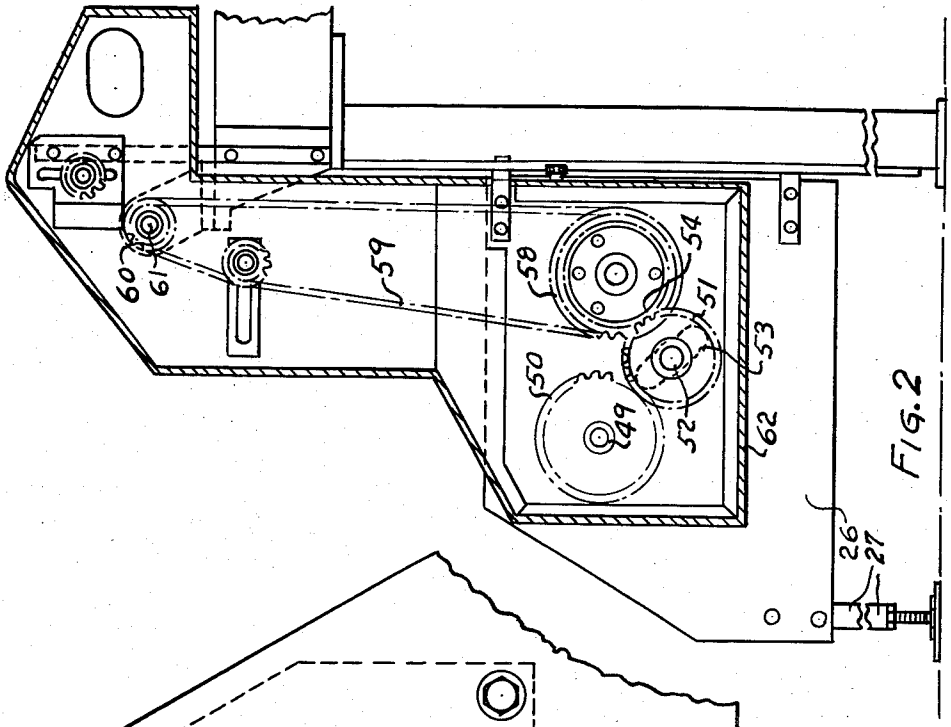


FIG. 2

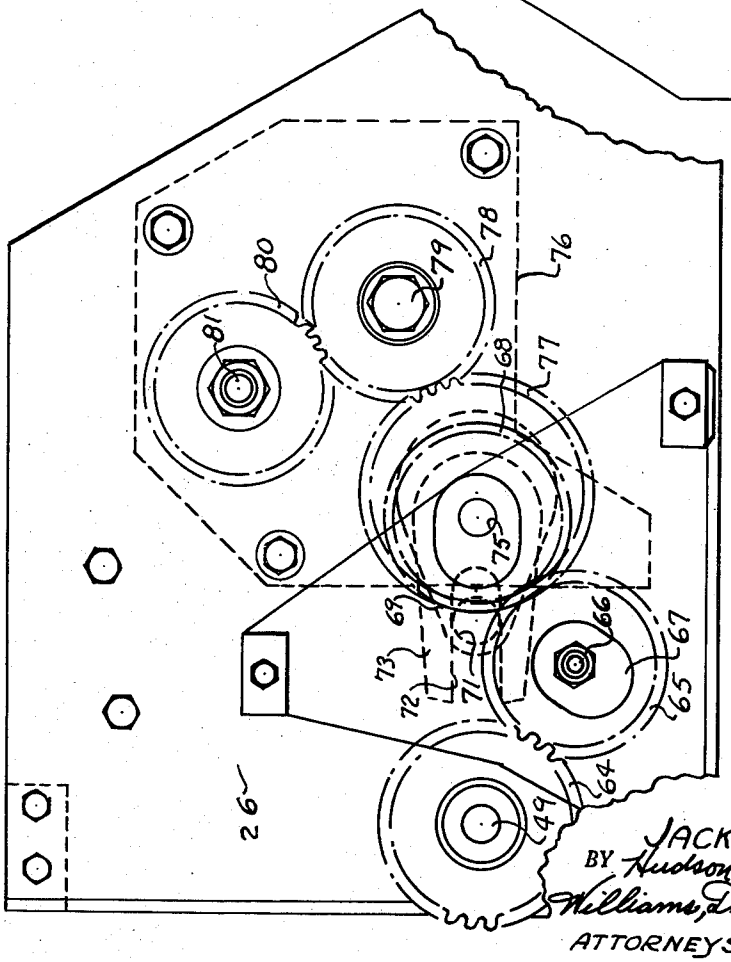


FIG. 3

INVENTOR.
JACK H. SELBY
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

Jan. 17, 1961 J. H. SELBY 2,968,446

BALLER HEAD

Filed Nov. 19, 1956 5 Sheets-Sheet 3

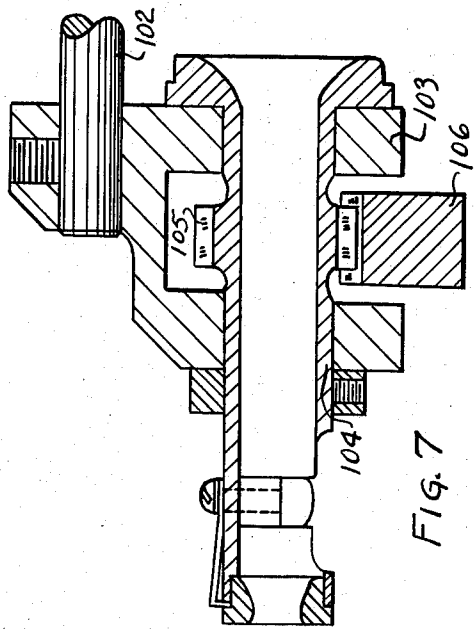


FIG. 7

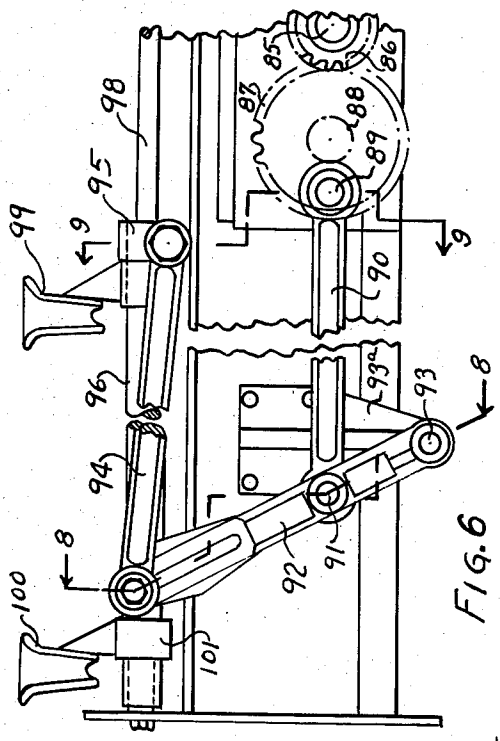


FIG. 6

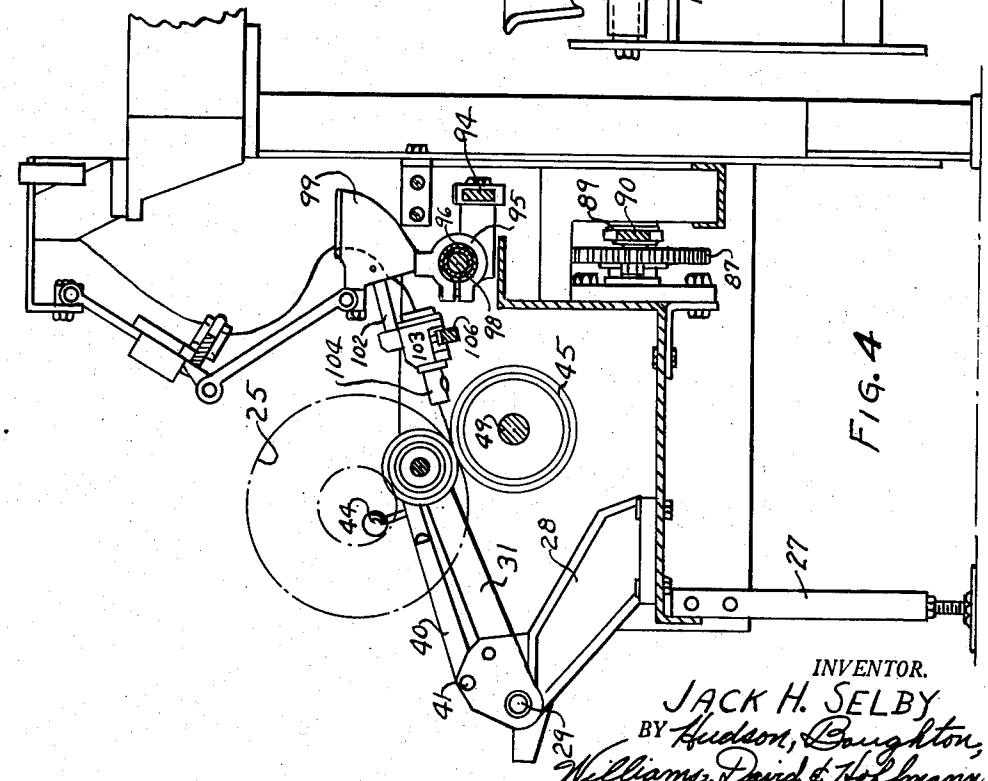


FIG. 4

INVENTOR.
JACK H. SELBY
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

Jan. 17, 1961 J. H. SELBY 2,968,446

BALLER HEAD

Filed Nov. 19, 1956 5 Sheets-Sheet 4

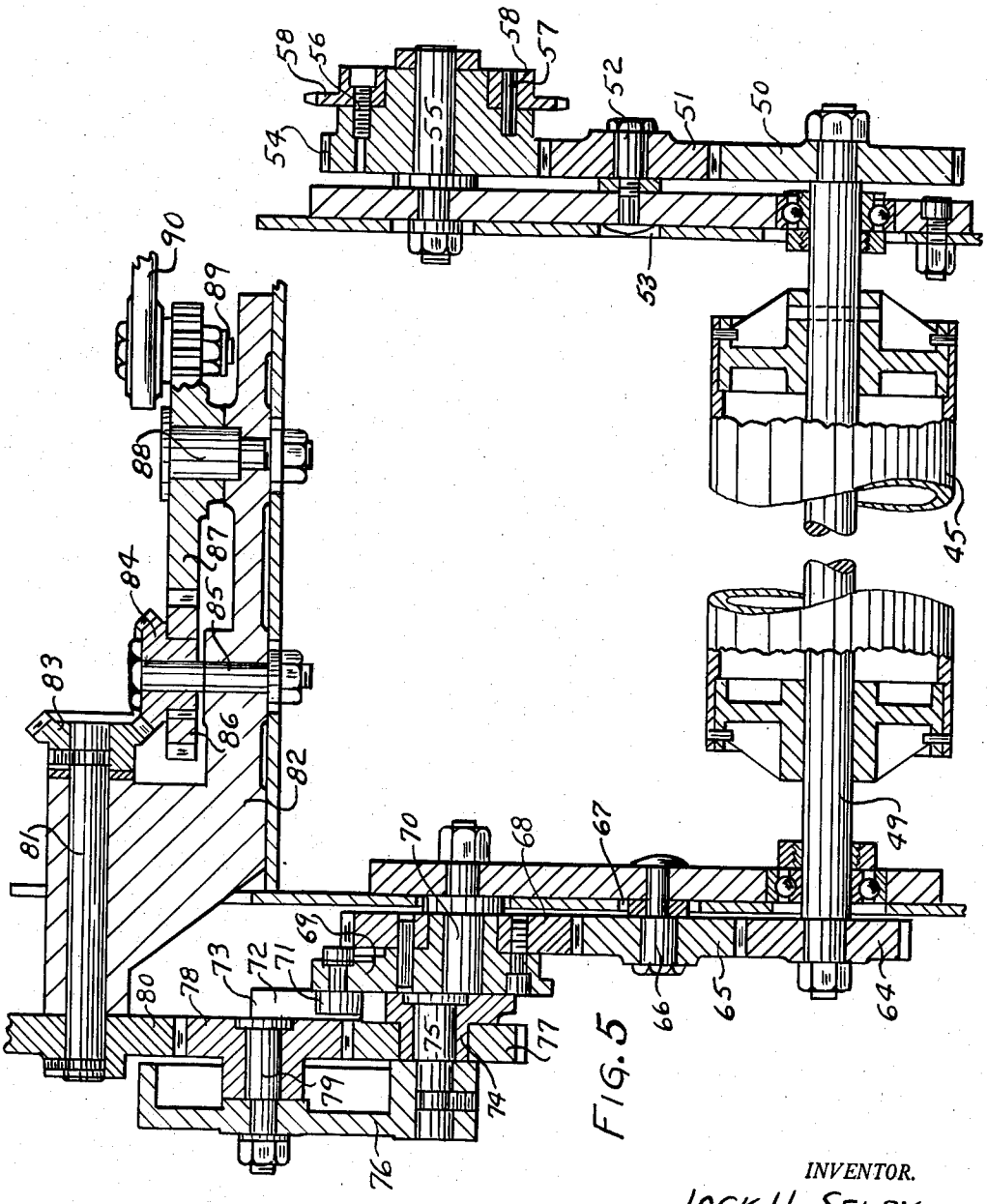


FIG. 5

INVENTOR.
JACK H. SELBY
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

Jan. 17, 1961 J. H. SELBY 2,968,446

BALLER HEAD

Filed Nov. 19, 1956 5 Sheets-Sheet 5

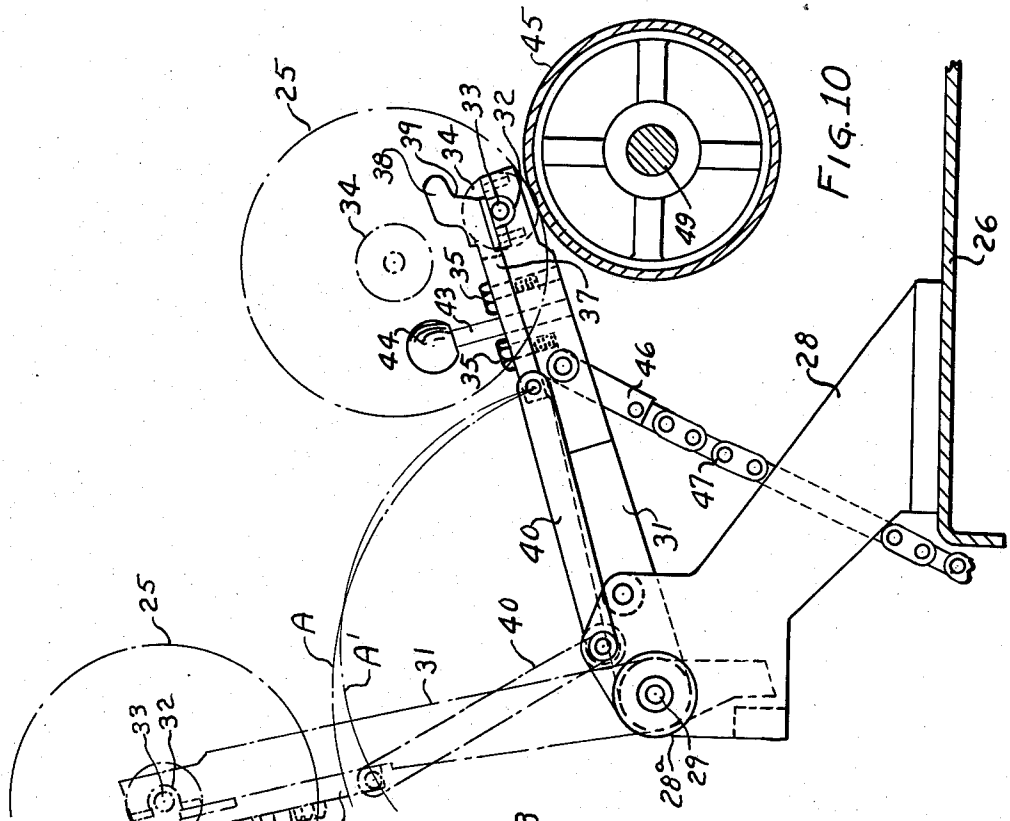


FIG. 10

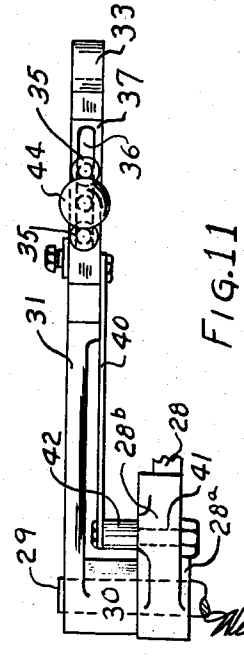


FIG. 11

INVENTOR.
JACK H. SELBY
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

United States Patent Office 2,968,446
Patented Jan. 17, 1961

2,968,446

BALLER HEAD

Jack H. Selby, Twinsburg, Ohio, assignor to The Warner & Swasey Company, Cleveland, Ohio, a corporation of Ohio

Filed Nov. 19, 1956, Ser. No. 623,204
7 Claims. (Cl. 242—54.4)

This invention relates to a balling head mechanism such as is used with carding machines, gill boxes and other similar machines to wind slivers of natural or synthetic fibers into ball-like packages.

For illustrative purposes the balling head mechanism embodying the invention will be described as used in combination with a gill box which may be of the usual construction in that it includes feed rolls, a series of ballers moving at a predetermined speed relative to the feed rolls and performing a combing action on the fibers, and a pair of delivery rolls which revolve at a still greater surface speed all as is well understood in the art.

An object of the invention is to provide a balling head mechanism which is so constructed that the slivers will be wound into a ball-like package evenly, smoothly, efficiently and expeditiously.

Another object is to provide a balling head mechanism wherein, during the winding of the ball-like package, the sliver will be reciprocated transversely of its longitudinal length and axially of the spool on which the ball is wound with fast direction changes at the ends of the movements in each direction to cause even distribution of the sliver axially of the spool and to eliminate build-up of the sliver adjacent the opposite ends of the spool.

A further object is to provide a balling head mechanism as referred to in the last named object and wherein the reciprocating motion for the sliver is produced by simple and efficient mechanism readily operated or driven from an operating part of the gill box or other machine with which the balling head mechanism is employed.

Another object of the invention is to provide in a balling head mechanism improved and novel means for mounting the spool in position for the ball to be wound thereon and in removing the wound ball package from the mechanism, thus facilitating the use of the balling head mechanism.

Further and additional objects and advantages not hereinbefore specifically referred to will become apparent hereinafter during the detailed description which is to follow of an embodiment of the invention illustrated in the accompanying drawings forming part of this specification and wherein:

Fig. 1 is an elevational view of a gill box and balling head mechanism embodying the invention.

Fig. 2 is a vertical sectional view taken substantially on line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a side view, partly in elevation and partly in section, and is taken approximately on line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is a vertical sectional view taken approximately on line 4—4 of Fig. 1, looking in the direction of the arrows.

Fig. 5 (Sheet 4) is a developed sectional view of the gearing shown in Figs. 2 and 3 and constituting the drives to the drum of the balling head mechanism and to the means for reciprocating the sliver axially of the drum and of the spool upon which the ball is wound.

Fig. 6 (Sheet 3) is a fragmentary elevational view of a portion of the balling head mechanism and shows the operative connections between the gearing and the means for reciprocating the sliver axially of the drum and spool.

Fig. 7 (Sheet 3) is a detached sectional view of a device for imparting a false twist to the sliver before the latter is wound on the spool into the ball.

Fig. 8 (Sheet 1) is a sectional view taken substantially on irregular line 8—8 of Fig. 6, looking in the direction of the arrows.

Fig. 9 (Sheet 1) is a sectional view taken substantially on irregular line 9—9 of Fig. 6, looking in the direction of the arrows.

Fig. 10 (Sheet 5) is a detached view, partly in section and partly in elevation, illustrating the rocking or swinging spool supporting arm of the balling head mechanism; said arm being shown in full lines in the position it has at the start of the winding operation and when the spool is in contact with the circumference of the drum, the fully wound ball package being indicated by broken lines; said view also showing by dash and dot lines the position of the rocking or swinging ball supporting arm when the ball package has been fully wound and said arm has been moved to an unloading position.

Fig. 11 is a plan view of the swinging or rocking ball supporting arm shown in Fig. 10.

The balling head mechanism embodying the invention is attached to a gill box, and includes a supporting frame indicated generally at 26 secured at its inner end to the gill box and having its outer end supported by legs 27. The supporting frame 26 mounts upwardly inclined bracket arms 28 arranged in parallel pairs with each pair of bracket arms rotatably supporting a shaft 29 mounted in bearing bosses 28^a formed at the upper end of the bracket arms.

Adjacent the bosses 28^a of each bracket arm 28 of each pair of bracket arms hubs 30 of swinging or rocking ball and spool supporting arms are clamped to the shaft 29 so as to rock in pairs with said shaft.

The rocking ball and spool supporting arms 31 adjacent their upper or free ends and on their upper sides are provided with parallel bearing and supporting grooves 32 to receive and rotatably support the trunnions 33 at the opposite ends of each spool 34 upon which the slivers are wound.

The arms 31 on their upper sides and inwardly of the bearing and supporting grooves 32 are provided with upwardly extending headed bolts 35 spaced apart longitudinally of the arms 31 and extending through longitudinally elongated slots 36 formed in retaining blocks 37 that have sliding movement on the upper sides of the arms 31, it being understood that the headed bolts 35 retain the blocks 37 in position on the arms 31 but that the blocks can slide longitudinally of the arms due to the slots 36.

The blocks 37 are adapted in one of their positions to overlie the grooves 32 and to retain the trunnions 33 of the spools 34 rotatably in position in the grooves 32. The outer or right hand ends of the blocks 37, as viewed in Fig. 10, are provided with angular upwardly and forwardly extending supporting fingers 38, the forward edges of which have trunnion supporting surfaces 39, the purpose of which will soon become apparent.

The blocks 37 adjacent their inner or left hand ends, as viewed in Figs. 10 and 11, have pivotally connected thereto one end of block actuating links 40, the opposite ends of which are pivotally connected to stub shafts 41 carried by upwardly extending portions 28^b on the bearing bosses 28^a of the bracket arms 28, spacer sleeves 42 on the stub shafts 41 being interposed between the sides of the portions 28^b and the links 40.

The axes of the pivotal mounting of the links 40 on the stub shafts 41 are parallel to the axis of the shaft 29 on which the arms 31 rock but are located radially upwardly and outwardly with respect to the axis of the shaft 29.

Referring to Fig. 10, it will be seen that when the arms 31 are swung from their full line position upwardly to their dot and dash line position the radii between the shaft 29 and the pivotal connection between slide blocks 37 and links 40 subscribe the dot and dash line arcs A. Also it will be seen that when the arms 31 are swung upwardly the radii between the stub shafts 41 and the pivotal connections between the links 40 and the slide blocks 37 will subscribe the dot and dash arcs A'. Consequently when the arms 31 are in their uppermost position, i.e., their loading and unloading position as indicated in Fig. 10, the links 40 will have acted on the slide blocks 37 to move the latter inwardly of the arms 31 a distance equal to the distance between the arcs A and A' at the location where the arms 31 are in their raised or upper position. Consequently when the arms 31 are moved or rocked from their raised loading and unloading position of Fig. 10 downwardly to their full line position the links 40 will act to slide the blocks 37 forwardly so that the blocks overlie the grooves 33.

It has been previously stated that the arms 31 function in pairs with the arms of each pair having simultaneous rocking movement on the axis of the shaft 29. The arms 31 of each pair are spaced apart the proper distance to receive therebetween the spools 34 upon which the balls 25 are wound and with the trunnions 33 of the spools resting in the grooves 32 of the arms. In order to facilitate the swinging or rocking movements of the arms 31 by the operator each arm is provided with an upwardly extending rod 43 that passes through the slot 36 in the retaining slide block 37 and is located intermediate the headed guiding bolts 35. The upper end of the rod 43 is provided with an actuating knob 44.

Assuming that the arms 31 of a pair of arms are in the raised loading and unloading position, i.e., the uppermost dot and dash line position of Fig. 10, then the slide blocks 37 are retracted and the bearing and supporting grooves 32 of the arms are uncovered. The operator can now take a spool upon which the ball is to be wound and place the spool between the raised arms with the trunnions 33 at the opposite ends of the spool resting within the fingers 38 and on the trunnion supporting surfaces 39 of said fingers. Then the operator simultaneously lowers the arms 31 of the pair and during this lowering movement the trunnions 33 enter the grooves 32. As the lowering movement continues the blocks 37 are moved by the links 40 forwardly of the arms 31 and act to retain the trunnions in the grooves 32. When the arms 31 of the pair of arms are in their lower or full line position of Fig. 10 the retaining slide blocks 37 are in their most forward position and completely overlie the grooves 32 so that the trunnions 33 of the spool 34 are rotatably held in position in the grooves. At this time the spool 34 will engage the circumference of a rotatable drum 45 later to be referred to. The rotation of said drum 45 frictionally rotates the spool 34 and the sliver to be wound into the ball 25 having been attached to the spool 34 and passing between the drum 45 and the spool 34 will be wound upon the spool until the ball 25 is completed. Of course during the winding of the sliver into the ball 25 the arms 31 will gradually be raised as the diameter of the ball increases. However, this raising movement of the arms 31 during the formation of the ball will not, prior to the completion of the ball, effect retraction of the slide blocks 37 so as to completely uncover the grooves 32 and hence the trunnions 33 of the spool and ball will be locked in position with

freedom to rotate by the overlying blocks 37 during the entire winding operation.

Reference to the arcs A and A' of Fig. 10 will indicate that the blocks 37 during the entire winding operation will overlie the grooves 32. When the ball 25 has been completely wound the operator can grasp the knobs 44 and swing the pair of arms upwardly to the raised, loading and unloading position, i.e., the uppermost dot and dash line position of Fig. 10. When the arms are in the position just referred to the blocks 37 are retracted fully so that the grooves 32 in the arms are exposed, whereupon the operator can move the ball to cause the trunnions 33 to roll outwardly of the grooves and onto the trunnion supporting surfaces 39 of the fingers 38, after which he can readily remove the ball from between the arms and then insert therebetween a new spool so that when the arms are again lowered the winding operation can be repeated.

In order that the spool 34 and the sliver wound thereon will be held in driving contact with the circumference of the drum 45 during the winding operation one of the arms 31 of each pair of arms may be subjected to a force other than gravity and tending to move the pair of arms in a downward direction. As illustrative of a suitable arrangement one arm of each pair of arms has pivoted to its side a strap 46 to which may be connected a chain or cable 47 that extends through suitable guides and beneath the frame 26 where it has secured to it a weight, spring or other means acting to tension the cable or chain as will be well understood.

The drum 45 is fixed to a drum shaft 49 that is rotatably supported in suitable bearings carried by the side walls of the frame 26 (see Figs. 1 and 5). The drum 45 is of such axial length in the present embodiment as to have driving contact with two spools 34 carried by two pairs of rocking ball and spool supporting arms 31 so that two ball packages 25 can be wound simultaneously.

It will be understood, of course, that the balling head mechanism might be so designed as to wind only one ball package at a time or to wind a greater number than two ball packages at a time. The drum shaft 49 and drum 45 are driven from a power operated part of the gill box 24 which, in turn, is driven by suitable power means such as an electric motor as will be well understood.

The drive from the power operated part of the gill box to the shaft 49 will now be described with particular reference to Figs. 2 and 5. The shaft 49 extends beyond its supporting bearing carried by the right-hand side wall of the frame 26, as viewed in the drawings, and on its extending right hand end is provided with a pickoff gear 50. The pickoff gear 50 meshes with an idler pickoff gear 51 that is rotatable on a stub shaft 52. The stub shaft 52 is adjustable in a slot 53 formed in the side wall of the frame 26, wherefore the stub shaft can be moved to and clamped in various adjusted positions so a pickoff gear 51 of a desired size will mesh with a pickoff gear 50 of a desired size and also with a pickoff gear 54 of a desired size. The pickoff gear 54 is rotatable on a stub shaft 55 carried by the side wall of the frame. The pickoff gear 54 is formed with axially extending circularly spaced bores located radially outwardly of its axis, with certain of said bores being threaded to receive securing screws 56 while other of said bores may be unthreaded and adapted to receive locating pins 57.

The pickoff gear on its outer side is provided with a reduced hub portion whereby a sprocket 58 can be mounted on the hub portion and secured to the pickoff gear 54 by the screws 56 and locating pins 57. A drive chain 59 extends around the sprocket 58 and around a sprocket 60 fixed on a shaft 61 that is power driven from the power source of the gill box 24. Inasmuch as the gears 50, 51 and 54 are pickoff gears the rate of rotation

of the drum shaft 49 can be varied by using different size gears 50, 51 and 54 and this enables the shaft 49 and drum 45 to be driven at the proper correlated speed with respect to the speed of operation of the gill box.

The gears 50, 51 and 54 are located in a gear box 62 secured to the outer side of the right hand side wall of the frame 26 as viewed in the drawings.

It is customary in balling head mechanisms to provide means that reciprocates axially of the spool and ball and through which means extends the sliver being wound, the purpose of such an arrangement being to distribute the sliver axially of the spool as it is wound thereon as will be well understood.

Inasmuch as the sliver distributing means just referred to reciprocates and hence reverses its direction of movement at the opposite limits of its reciprocation the sliver being wound on the spool may pile up at the opposite ends of the spool as compared to locations intermediate the ends of the spool. This produces an objectionable, unevenly wound ball package which is thicker at its opposite ends than it is midway of its ends.

The balling head mechanism of the present invention provides an arrangement for distributing the sliver axially of the spool evenly and in such manner that there is no undesired piling up of the sliver adjacent the opposite ends of the spool. This is accomplished by imparting to the sliver distributing means a reciprocating movement, portions of which will move at a faster rate than other portions. More particularly the sliver distributing means of the present invention has a reciprocating movement such that each change of direction is at a fast rate. This arrangement enables the balling head mechanism of the present invention to produce efficiently evenly wound ball packages which are of the same diameter from end to end. The manner in which this advantageous result is accomplished will now be described.

Referring to Figs. 3 and 5, it will be seen that the drum shaft 49 projects beyond its bearing that is carried by the side wall of the frame 26 at the left hand side of the gill box as viewed in the drawings. The left hand end of the shaft 49, as viewed in Fig. 5, beyond the side wall of the frame 26 and within a gear box 63 mounts a pickoff gear 64. The pickoff gear 64 constantly meshes with a pickoff gear 65 that is rotatable on a stub shaft 66. The stub shaft 66 is adapted to be adjusted to various positions within a slot 67 formed in the side wall of the frame and clamped in such adjusted position thereby providing for the use of different size pickoff gears 64 and 65. The pickoff gear 65 constantly meshes with a pickoff gear 68 secured on the hub of a crank arm 69 that is rotatable on a stub shaft 70 carried by the side wall of the frame. It will be understood that various size pickoff gears 68 can be mounted on and secured to the hub of the crank arm 69.

The crank arm 69 is provided with a follower roller 71 that extends into the space 72 in the forked end of a second crank arm 73 which has a hub 74 rotatably mounted on a stub shaft 75 the axis of which is parallel to the axis of the stub shaft 70 but is displaced radially relative thereto. The stub shaft 75 is mounted in a supporting portion 76 that is spaced outwardly of the side wall of the frame but is secured thereto. The hub 74 of the second crank arm 73 mounts a spur gear 77 for rotation with the crank arm 76.

It will be seen that rotation of the shaft 49 functions through the pickoff gears 64, 65 and 68 to rotate the first crank arm 69 and through the follower roller 71 the second crank arm 73 and the gear 77. However, due to the use of the crank arms the gear 77 is driven at a variable rate in each complete revolution and this variable rate is composed of a maximum rate and a minimum rate of movement phased substantially 180° apart. The maximum rate of movement is more sharply defined than the minimum rate and although of shorter duration is of greater amplitude. As illustrative of an arrangement suitable for a production machine the ratio of the maximum rate might be 1.26 and of the minimum rate .83 arranged so that the output speed would be faster than the input for approximately 168° of a rotative cycle. The gear 77 constantly meshes with an idler spur gear 78 rotatable on a stub shaft 79 carried by the supporting portion 76. The idler spur gear 78 constantly meshes with a spur gear 80 that is fixed to one end of a shaft 81 that is rotatable in a supporting and bearing portion 82 of the frame. The gear 80 is fixed to one end of the shaft 81 while the opposite end of said shaft has fixed to it a miter gear 83. The miter gear 83 meshes with a miter gear 84 rotatable on a stub shaft 85 carried by the supporting and bearing portion 82 of the frame, said miter gear 84 having a hub portion on which is mounted a spur gear 86 for rotation with the miter gear. The spur gear 86 constantly meshes with a spur gear 87 rotatable on a stub shaft 88 carried by the supporting and bearing portion 82 of the frame. The spur gear 87 radially outwardly of its axis of rotation and adjacent to its circumference is provided with a bearing pin 89, see Figs. 5 and 6. One end of a crank 90 is pivotally mounted on the pin 89 and the opposite end of the crank 90 is pivotally mounted on a pin 91 carried by lever 92 intermediate the upper and lower ends thereof but nearer to the lower end. The lower end of the lever 92 is mounted to swing or rock on a stub shaft 93 carried by bracket 93*a* secured to a portion of the frame, see Figs. 6 and 8. The lever 92 is pivotally connected at its upper end to one end of a link 94, the opposite end of which link 94 is pivotally connected to a connecting member 95 that has a split sleeve portion clamped to one end of an elongated tube 96. The tube 96 adjacent its opposite ends is provided internally with cylindrical shoes or bushings 97 that interfit and slide upon a supporting and guiding rod 98 having its opposite ends mounted in the side members of the frame and extending parallel to the drum shaft 49 and to the axis of rotation of the spools upon which the slivers are wound into ball packages.

It will be seen that the elongated tube 96 will be reciprocated on the rod 98 since rotation of gear 87 will impart movement to crank 90 to rock lever 92 and through the link 94 to reciprocate the tube. Each change of direction in the reciprocating movement will be at fast rate and this fast rate at each reversal is obtained, in this instance, by a two-to-one gear reduction in the drive train between the second crank arm 73 and the spur gear 87. The amplitude of the reciprocating movement in each direction is the axial length of the spool upon which the sliver is to be wound into the ball package.

The connecting member 95 supports a sliver guiding funnel 99. A second sliver guiding funnel 100 is carried by a connecting member 101 that is clamped to the elongated tube 96 in spaced relation to the connecting member 95 so that the funnels 99 and 100 are spaced apart to cooperate respectively with the two different spools upon which the slivers are wound into ball packages.

The sliver guiding funnels 99 and 100 carry supporting rods 102, see Figs. 4 and 7, and these rods support inverted U-shaped members 103 which rotatably support trumpets 104. The trumpets 104 are provided intermediate the legs of the members 103 with pinions 105 that roll and mesh with a stationary rack 106 extending between the side walls of the frame 26 of the balling head mechanism.

It will be seen that the reciprocating movement imparted to the funnels 99 and 100 will similarly move the inverted U-shaped members 103 and this will cause the pinions 105 to roll along the rack 106 and to rotate the trumpets 104 first in one direction and then in the opposite direction.

The slivers to be wound into ball packages pass through the guiding funnels 99 and 100 and then through the trumpets 104 and are given a "false twist" by turning with the trumpet first in one direction and then in the other

direction. The purpose of this will be well understood in the art.

From the foregoing description it will have been seen that the balling head mechanism embodying the present invention includes provision for easily, quickly and efficiently loading the mechanism with the spools for the winding of the ball packages and for unloading the wound ball packages from the mechanism. Also it will have been seen that the balling head mechanism efficiently performs the winding of the slivers into the ball packages with an even distribution of the wound slivers axially of the packages and without "build-up" at the opposite ends of the packages.

Although a preferred embodiment of the invention has been illustrated and described herein, it will be understood that the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described my invention what I claim is:

1. In a balling head mechanism for winding a sliver of fibers into a ball-like package, a rotatable drum adapted to frictionally drive the spool upon which the sliver is being wound, power operated means for rotating said drum at a predetermined speed, feeding means for directing the sliver between the drum and the spool to be wound upon the latter and for reciprocating the sliver transversely of its length and axially of the drum and spool and including means supported for reciprocating movement axially of the drum and through which the sliver extends, and operative connections between said drum and said last named means for reciprocating the latter with a fast reversal of direction at the ends of the movement in each direction and at a substantially uniform rate intermediate the ends of the movement in each direction, said operative connections comprising a first gear train driven in timed relationship with said drum a second gear train, a drive train operatively connected with said second gear train and said means supported for reciprocating movement axially of the drum, a driving crank arm driven by said first gear train and mounting a follower roller, a driven crank arm provided with a forked portion straddling said roller and rotatable on an axis parallel to but displaced radially of the axis of the driving crank arm, and means operatively connecting said driven crank arm and said second gear train.

2. In a balling head mechanism as defined in claim 1 wherein said first gear train includes a gear driven in timed relation with said drum, a final gear, and operative connections between said gears including an idler gear and means mounting said idler gear for adjusting its axis in radial directions to cause said idler gear to properly intermesh with its cooperating gears.

3. In a balling head mechanism as defined in claim 1 wherein said driving crank arm is provided with a hub portion while the last gear of said first gear train is mounted on said hub portion and is removably secured to said first crank arm.

4. In a balling head mechanism as defined in claim 3 wherein the gears of said first gear train are pick-off gears.

5. In a balling head mechanism as defined in claim 1 wherein said driven crank arm has a hub portion and the first gear of said second gear train is mounted on said hub portion and is secured thereto.

6. In a balling head mechanism as defined in claim 1 wherein said driving and driven crank arms both are provided with hub portions with the last gear of said first gear train mounted on the hub portion of said driving crank arm and is removably secured to said driving crank arm, the first gear of said second gear train being mounted on and secured to the hub portion of said driven crank arm, the gears of said first gear train being pick-off gears and including an idler gear and means for adjusting the axis of said idler gear radially to properly intermesh said idler gear with the gears adjacent thereto in said first gear train.

7. In a balling head mechanism as defined in claim 1 wherein said drive train includes a gear provided radially outwardly of its axis with a pin, a crank having one of its ends pivotally mounted on said pin, a lever pivotally mounted at one end and pivotally connected at its opposite end to one end of a link the opposite end of which is pivotally connected to said means that is supported for reciprocating movement axially of the drum and through which the sliver extends, said crank having its opposite end pivotally connected to said lever intermediate the ends of the latter.

References Cited in the file of this patent

UNITED STATES PATENTS

1,882,152	Larmuth	Oct. 11, 1932
2,004,045	Fraser et al.	June 4, 1935
2,262,850	Lea	Nov. 18, 1941
2,388,557	Little et al.	Nov. 6, 1945
2,544,348	Nystrom	Mar. 6, 1951
2,632,607	Heygel	Mar. 24, 1953
2,659,539	Stenglein	Nov. 17, 1953
2,664,594	Anderson	Jan. 5, 1954
2,674,013	Place	Apr. 6, 1954
2,757,876	Smith et al.	Aug. 7, 1956

FOREIGN PATENTS

729,438	Great Britain	May 4, 1955
906,788	Germany	Mar. 18, 1954