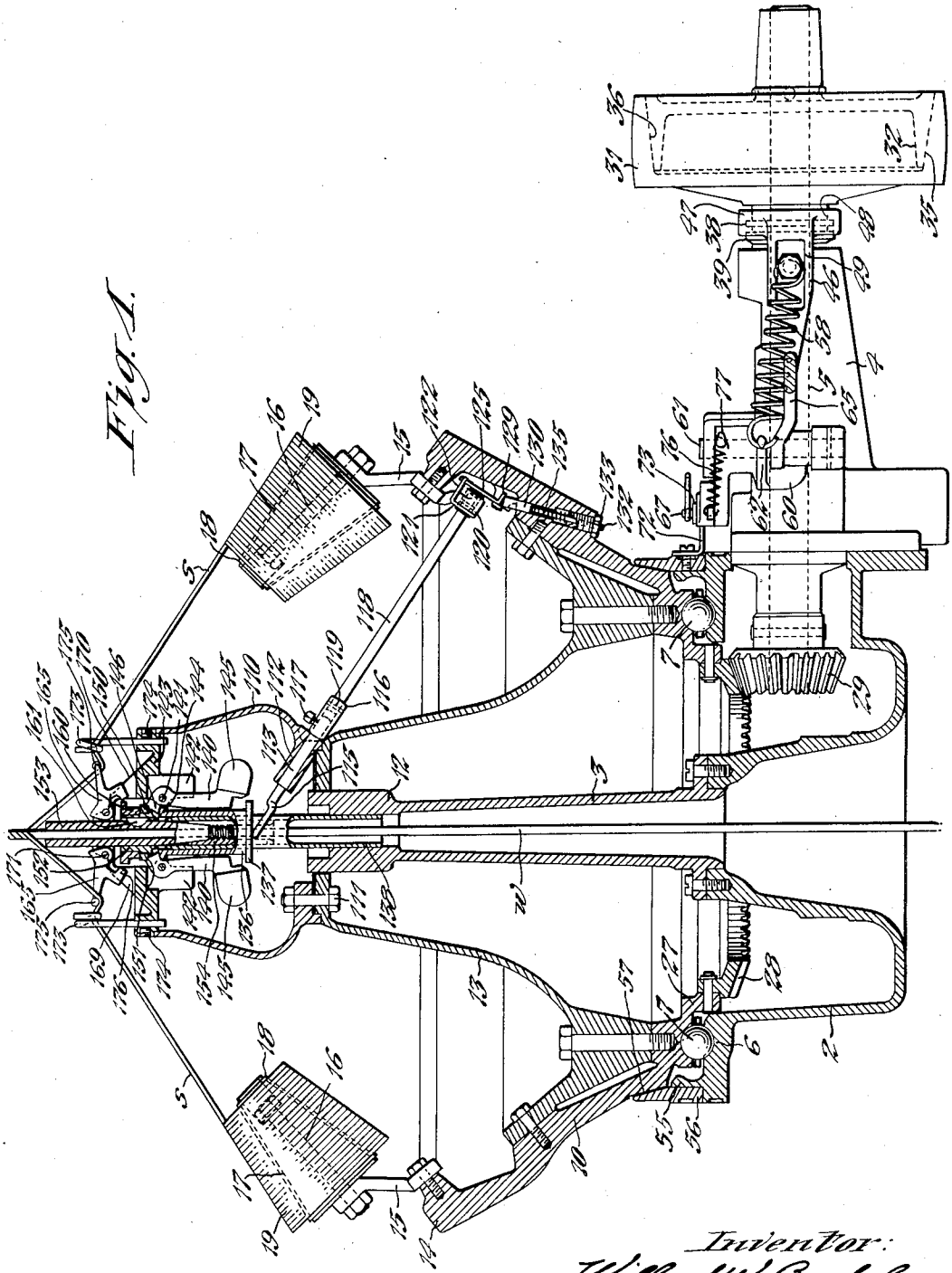
Jan. 16, 1934. W. W. BARDSLEY 1,943,716

SERVING MACHINE

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Fig. 1.



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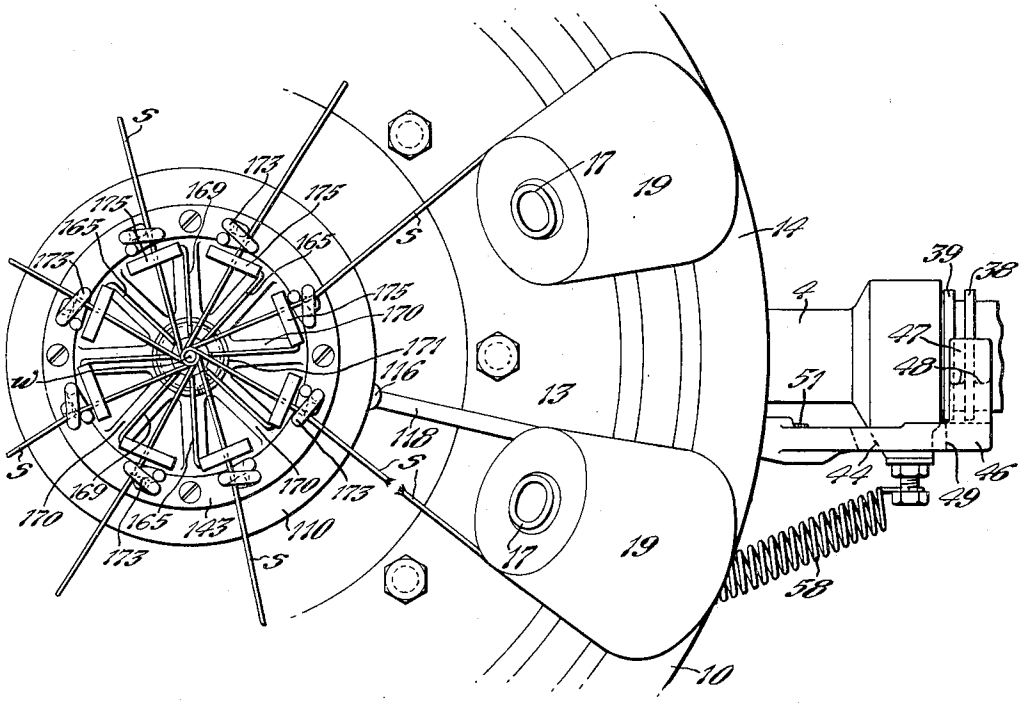


Fig. 2.

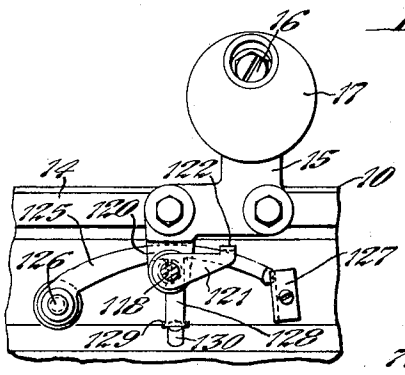


Fig. 5.

Fig. 4.

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SERVING MACHINE

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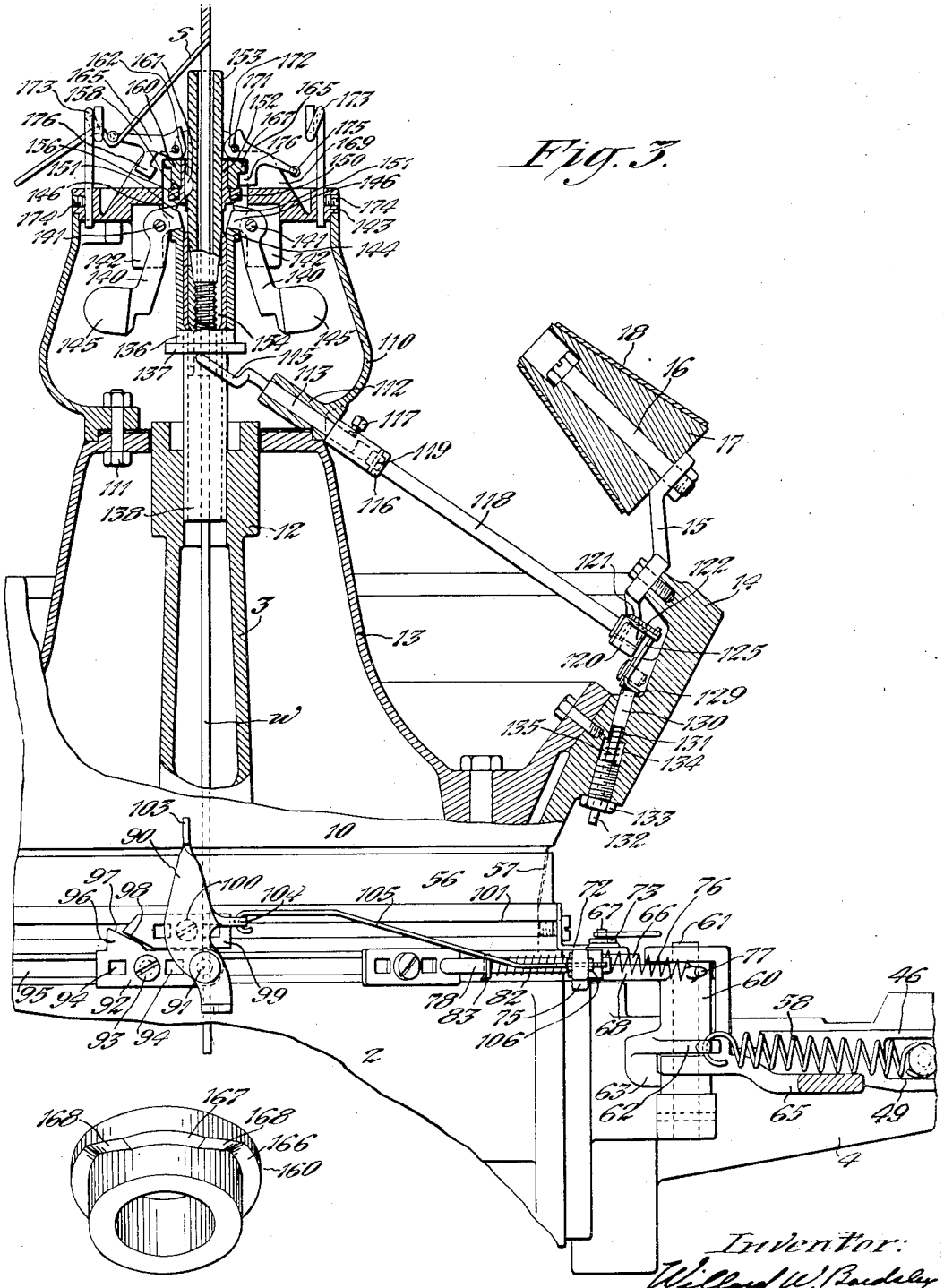


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

1,943,716

SERVING MACHINE

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Application February 1, 1932. Serial No. 590,145

21 Claims. (Cl. 117—45)

This invention relates to improvements in devices for controlling the delivery of strand material from supply-cops or packages, and more particularly to a serving machine for covering wire and like electrical conductors with strands of asbestos or other fragile insulating material.

One object of the invention is to provide a machine of the type specified in which the serving operation is automatically and promptly arrested upon breakage of a strand or exhaustion of its supply.

Another object of the invention is to provide a machine of the type specified in which only light contact is maintained on the fragile strands being served whereby to control the stopping mechanism of the machine without applying undue tension on the strand or deleteriously affecting the material thereof.

Another object of the invention is to provide for greater uniformity in the quality of the asbestos or other covering applied on the conductor in serving from a plurality of strand supplies.

Another object of the invention is to provide a machine of the type specified capable of being operated at high speed and to obtain maximum productivity, proof against derangement and durable in use over long periods.

Further objects and advantages of the improvement are set forth in the following specification which describes a preferred embodiment of the invention, by way of example, as illustrated in the accompanying drawings. In the drawings:

Fig. 1 is a vertical, sectional view of a machine embodying a preferred form of construction of the invention and adapted for serving strands to a moving core, the parts of the apparatus being shown in their respective positions while the serving is in progress;

Fig. 2 is a partial plan view of the apparatus shown in Fig. 1 showing the relation of the strands to the controlling means;

Fig. 3 is an enlarged, vertical, sectional view of a portion of the machine, showing the parts of the controlling means in position upon the exhaustion of one of the strands and immediately prior to the operation of the stopping mechanism;

Fig. 4 is a partial plan view of the stopping mechanism of the apparatus shown partly in section with the parts in normal position during the operation of the machine;

Fig. 5 is a detailed view of the trip-mechanism for the stopping mechanism of the machine; and

Fig. 6 is an enlarged view in perspective of the cam-ring forming part of the stopping mechanism.

For insulating copper wire and other conductors it is a practice to apply thereto a covering of asbestos or other mineral dielectric of similar fibrous nature. One method of applying such insulation is by wrapping rovings or strands of asbestos helically about the conductor to form a continuous covering therefor. Considerable difficulty has heretofore been experienced in serving the material to the wire, due to the inherent lack of tensile strength of the asbestos material, and attempts to serve at high speeds have been frustrated by the lack of adequate means for promptly stopping the serving operation upon breakage of the asbestos strands or exhaustion of their supply whereby to prevent overrunning of the machine.

Referring to Fig. 1 of the drawings, a suitable apparatus for serving a plurality of asbestos slivers, rovings or other strands *s* in multiple to helically wrap a wire conductor or other core *w* may be organized as next described. A stationary base or standard 2 is provided with a central, hollow, vertical post or standard 3 for guiding the core to be covered and an overhanging bearing 4 for the drive-shaft 5. At the rim of the base 2 is a ball-race 6 for receiving a series of balls 7 on which a circular turret or flier-head 10 rotates. The vertical post 3 is formed at its upper extremity with an annular enlargement or hub 12 constituting a center bearing for a frusto-coniform dome or cover 13 secured to the head 10.

The periphery of the head 10 is provided with an outwardly-projecting, inclined flange having an upper rim 14, to which are secured a plurality of arms or brackets 15 spaced at suitable intervals around the machine. The brackets 15 carry spindles 16 for mounting a plurality of supply-holders 17 which are adapted to support the cops or packages 19 of strand material. As herein illustrated, the supply-holders 17 are constituted as frusto-conical cores or mandrels on which the paper or fiber tubes 18 of the packages may be held. As illustrated in Fig. 1 of the drawings the machine is fitted to serve strands from eight supplies. It is to be understood, however, that a greater or lesser number of strands than herein shown may be used in the machine and their relative disposition on the flier-head may be varied.

The turret or flier-head 10 is provided at its inner rim with a flange 27, see Fig. 1, to which is bolted or otherwise fixedly secured an annular

bevel-gear 28. The bevel-gear 28 meshes with the teeth of a bevel-pinion 29 keyed or otherwise fixedly secured to the inner end of the drive-shaft 5 which is journaled in the overhanging extension-bearing 4 of the base 2. The shaft 5 is driven by any conventional means such, for instance, as a belt-pulley 31 slidably mounted on the shaft and adapted to be rotatively connected therewith by means of a clutch-member 32. The clutch-member 32 is fast on the outer end of the shaft 5 and provided with an annular, tapered face 35 adapted to engage with a correspondingly tapered interior face 36 on the pulley 31.

The pulley 31 is provided with a hub formed with a flange 38 and adjacent thereto on the shaft 5 is rotatably mounted a spring-collar 39 having recesses 40, in which are seated compression-springs 42 tending to urge the pulley into driving engagement with the clutch-member 32. The end face of the bearing 4 is provided with a washer 43 which is fast on the shaft 5 for rotation therewith to take the thrust of the springs 42 whereby to prevent excessive wear. Extending alongside of the bearing 4 is a shipper-arm 46 terminating in a semicircular yoke 47 having lugs 48 which, as shown in Fig. 4, straddle the sides of the hub-flange 38 of the belt-pulley 31 to provide for sliding the pulley longitudinally of the shaft 5. The shipper-arm 46 is formed with a guiding slot 49 engaged by a lug or projection 44 on the side of the bearing 4. At its opposite end the shipper-arm 46 is provided with an enlarged, interiorly-threaded portion into which is screwed the threaded extremity of an eye-bolt 51 whereof the arm is pivotally connected to a knock-off device, to be later described, for controlling the operation of the clutch-mechanism.

The exterior of the base 2 is formed with a cylindrical, flanged seat 55, on which is mounted a brake-ring 56. The brake-ring 56 is adapted to be rotated about the base 2 and moved upwardly by instrumentalities to be later described which act automatically upon relief of the tension on the rovings or strands *s* being served as caused by breakage or exhaustion of the supply thereof. The rotative movement of the brake-ring 56 is effected by the operation of the above-mentioned knock-off device in disconnecting the driving means and as a result thereof the ring is wedged upwardly, by instrumentalities to be later described, to cause it to act on the head 10.

The stopping mechanism of the machine may be of conventional type such as illustrated in Fig. 4, wherein resilient means comprising a spring 58 anchored to the projection 44 of the bearing 4 tends to move the shipper-arm 46 to the left, as viewed in Fig. 4, to disconnect the drive for the machine. The spring 58 is employed to actuate a stopping lever 60 fulcrumed on a stud 61 projecting upwardly from an extension of the bearing 4. The spring 58 is connected to an arm 62 of the lever 60, while a second arm 63 of the lever 62 is pivotally connected at 64 to the bolt 51 secured in the end of the shipper-arm 46. A starting lever or handle 65, also pivoted on the stud 61, is adapted to engage with the lever 60 to rock the latter against the tension of the spring 58 whereby to move the shipper-arm 46 to effect the clutching action in starting the machine. The lever 60 is locked in position as shown in Fig. 4, to render the machine operative, by means of a detent-latch or pawl 66. The pawl 66 is pivoted at 67 to an arm 68 of the lever 60 and is provided at its free end with a hardened block 69, the edge of which is adapted to engage a shoulder 70 on a pin 71 fast in a portion of the bearing 4. A spring 76 anchored to an arm 77 on the lever 60 tends to maintain the latch 66 engaged with the detent-pin 71.

A horizontal arm 72 bolted to the brake-ring 56 extends outwardly therefrom above the bearing 4. A link 73 connected at one end to a stud 74 fast in the arm 72 has its opposite end pivotally connected to the stud 67 on the arm 68 of the stopping lever 60. Through these connections the movement of the lever 60 under the action of its spring 58 acts to rotate the brake-ring 56 on the base 2 in the direction indicated by the arrow in Fig. 4.

To actuate the knock-off device to declutch the driving pulley 31 and arrest the rotation of the flier-head 10 the pawl 66 on the stopping lever 60 is disconnected from the lock-pin 71. This is accomplished through the actuation of a knock-off lever 75, shown in Fig. 3, which is provided at one end with an inclined face 80 adapted to wedge against the correspondingly inclined end of the pawl 66. The lever 75 is pivotally mounted on the lock-pin 71 with its main arm extending forwardly therefrom and braced by a rod or bracket 78 bolted or otherwise rigidly secured to the base 2 of the machine. The rod 78 has a bent portion 79 extending through a slot 81 in the arm of the lever 75. A spring 82, coiled around the rod 78 and held at one end by a washer 83, bears against the lever 75 to force its end outwardly against a collar 86 secured fast on the end of the rod. The collar 86 is adjustable on the rod 78 to regulate the position of the inclined face 80 of the lever 75 in relation to the end of the pawl 66.

The knock-off lever 75 is connected to be actuated from a vertically extending lever 90 pivoted to the base 2 of the machine. As shown in Fig. 3, the lever 90 is pivoted on a stud 91 fast in a plate 92 which is secured to the base 2 by means of a screw 93. The plate 92 has portions 94 punched to provide projections on its inner face which fit into a groove 95 in the base 2, thereby keying the plate to the base to prevent it from rocking on its screw 93. At one end of the plate 92 is an upstanding ear or lug 96 formed with an inclined face 97 adapted to make contact with a similar inclined face 98 on a plate 99 fastened to the periphery of the brake-ring 56. The plate 99 is secured to the brake-ring 56 by means of a screw 100 and also provided with projections on its inner face engaging a peripheral groove 101 in the brake-ring to hold it from rocking on its screw. The two plates 92 and 99 serve as wedge-blocks which act when the brake-ring 56 is rotated to a slight extent to raise it to engage its inner tapered face with the tapered periphery or brake-surface 57 on the head or flier 10. A plurality of the coöperating plates or wedge-blocks 92 and 99 are preferably employed on the machine, being arranged at intervals around the circumference of the base 2 and brake-ring 56 whereby to equalize the lifting force on the latter in applying the brake. The brake-ring 56 is rotated through its connection with the stopping lever 60 under the automatic action of strand-controlled means to be later described. The upper portion of the lever 90 is twisted to provide a lug 103 arranged in the path of the instrumentalities from which it is rocked. On one side of the lever 90 is a perforated ear 104, into which is hooked the end of a rod 105 which connects the lever 90 with the knock-off lever 75. As

herein shown the opposite end of the rod 105 projects through an opening in the end of the lever 75 with nuts 106 engaging threads on the rod to adjustably connect it with the lever.

The strand-controlled means which function to actuate the lever 90 and thereby the knock-off lever 75 constitute the essence of the present invention and will next be described in detail. Fixedly secured to the top of the dome or cover 13 of the head 10 is a bowl-like casing 110 held in place by bolts 111. On one side of the casing 110 is an inclined bearing 112, in which is rockably supported a rod 113. The rod 113 is preferably constructed in two sections, its upper portion which projects through the bearing 112 being bent in the form of a crank-arm 115. A sleeve 116 fastened to the lower end of the rod 113 by means of a set-screw 117 receives the end of the other section 118 of the rod which is secured therein by a pin 119 or other suitable means. The lower end of the rod-section 118 is journaled in a bearing 120 which may be conveniently formed as a part of one of the brackets 15 carrying the supply-holders for the strand supply-packages. Secured fast on the lower end of the rod-extension 118 is a lever 121, shown most clearly in Fig. 5.

The lever 121 has a lug or finger 122 at its end which engages across the top of an arcuate arm 125. The arm 125 is pivoted on a stud 126 secured in a boss on the inside of the rim of the head 10 with its opposite end guided by a cleat 127 fastened to the inner face of the rim. The arm 125 has a downwardly-projecting leg 128 formed with a foot 129 at its lower end which rides across the top of a plunger-pin 130. Referring to Fig. 3, the plunger-pin 130 is slidably mounted in a bore 131 in the rim of the head 10 and has a reduced stem 132 projecting through the axial bore of a thimble 133. The thimble 133 is screwed into a counterbore 134 which forms a chamber surrounding the stem 132. Pocketed in the chamber 134 is a helical spring 135 which acts against the enlarged end of the plunger 130 to force it upwardly against the foot 129 on the leg 128 of the arm 125, thereby maintaining the arm in raised position. The lower extremity of the stem 132 of the plunger 130 projects slightly below the end of the thimble 133, but normally the spring holds the plunger in raised position so that its end will clear the top of the lever 90 during the rotation of the turret or flier-head 10 about the axis of the machine. The crank-rod 113 is adapted to be rocked by instrumentalities to be next described whereby to turn its extension 118 to swing the lever 121 to depress the arm 125. The depression of the arm 125 slides the plunger 130 downwardly into position to cause it to engage with the lever 90 to actuate the knock-off mechanism in the manner as later explained. The crank-arm 115 is operated upon by a slidable sleeve 136 which has a flange 137 normally engaging the end of the crank. The sleeve 136 is rotatively and slidably supported on a tubular bushing 138 driven into the bore of the hub 12 on the tubular standard 3. The sleeve 136 is slid downwardly under the action of a pair of weighted arms 140 carried on and rotating with the bowl or casing 110. The arms 140 are pivoted on pins 141 extending through lugs 142 which project downwardly from a cap or cover 143 closing the top of the bowl-member 110. The arms 140 have offset lugs 146, the lower edges of which bear against a crowned flange 144 on the upper end of the sliding sleeve 136. The lower ends of the arms 140 are formed with integral weights 145 which act under the influence of centrifugal force to swing outwardly from the axis of the machine, whereby the lugs 146 on the arms are rocked downwardly to slide the sleeve 136 in an axial direction to rock the crank-arm 115.

The weighted arms or dogs 140 are restrained from swinging outwardly under the action of centrifugal force by a detent-ring 150 which is normally in latching engagement with notches 151 in the edges of the lugs 146 of the arms. The detent-ring 150 is rotatably mounted on a sliding sleeve or collar 152. The sleeve 152 is slidable on a tubular quill or bushing 153 fitted into the sleeve or bushing 138 supported from the vertical standard 3. The lower end of the quill 153 is tapered to fit within the tapered end of the bore of a collet 154 inserted in the bore of the bushing 136. Screw threads on the lower end of the quill 153 engage corresponding threads on the interior of the collet 154, whereby when the quill is screwed into the collet the latter will be expanded to grip the interior of the bore of the bushing 138.

The sleeve 152 is formed with a shoulder 156 at its lower end against which the ring 150 is rotatably seated. Driven on to the upper portion of the sleeve 152 is a cam-ring 160, shown in detail in Fig. 6, the lower edge of which seats against a shoulder 158 on the sleeve. Through this construction the cam-ring 160 holds the detent-ring 150 in place on the sleeve 156 without restricting its rotary movement with respect thereto. A key 161 in the quill 153 engages a keyway 162 in the bore of the sleeve 152 to hold the collar from rotating thereon while adapting it to slide up and down on the quill. The sleeve 152 carrying the cam-ring 160 is normally maintained in its lowermost position under the action of gravity with the edge of the detent-ring 150 engaged with the notches 151 in the lugs of the weighted arms 140, see Fig. 1. The sleeve 152 is adapted to be slid upwardly on the quill 153 to release the detent-ring 150 from locking engagement with the weighted arms 140 through the engagement of any one or more of a series of feeler-levers 165 with the cam-ring 160, the feelers being controlled by the strands feeding to the core being covered or served. For this purpose the cam-ring 160 is provided with a peripheral flange 166, see Fig. 6, which has its under surface formed with a cam-face. The greater portion of the rim 166 of the cam is flat while at one side is a projecting lobe 167 having inclined faces 168 merging thereinto. The feeler-levers 165 have portions adapted to engage under the rim 166 on the cam-ring 160 and to ride on the inclined faces thereof to impart a lifting action thereto.

The feeler-levers 165 may be constructed from sheet-metal to render them light in weight and are pivoted in radial slots 169 formed in upwardly-projecting ribs 170 on the top of the cap or cover 143. A wire ring 171 seated in an annular groove 172 formed in the edges of the ribs 170 serves as a pivot for all the several feeler-levers 165, the latter being of a number corresponding to the number of strands to be served on the machine. As shown in Fig. 2 of the drawings the machine is adapted for serving eight strands or less but in some cases a greater number may be used by providing more supplies and feelers. Adjacent each feeler-lever is a strand-guide 173 conveniently constructed as a wire pig-tail having its end inserted in a bore in the cap 143 and held in place by a set-screw 174.

The outer end of each feeler-lever is bent at right-angles and preferably provided with a hardened sleeve or bushing 175 secured fast thereon in position to adapt a strand *s* to draw thereunder. Each feeler-lever 165 has a downwardly-projecting, hooked finger 176 adapted to engage under the edge of the flange 166 on the cam-ring 160 when the feeler drops upon its release by the breakage or exhaustion of the strand feeding under its end. The hooked finger 176 is permitted to engage under the flat face 166 of the cam-ring 160 during the rotation of the latter and as the finger rides onto the inclined lobe 167 of the cam it will cause the sleeve 152 to be slid upwardly to release the detent-ring 150 from the lugs 146 on the arms 140. Upon such release of the arms 140 centrifugal force acts to throw their weighted ends outwardly, thereby causing the sleeve 136 to be slid downwardly to rock the crank-arm 115 and actuate the stopping mechanism in the manner as later more fully explained.

The method of operation of the complete machine is as next explained. To prepare the machine for serving strands onto a wire or other conductor the packages of strand material, which are usually wound on paper tubes 18, are applied to the cop-holders 17. In the present embodiment of the invention the machine is adapted for carrying eight supplies, but a lesser number may be used if desired, or the machine may be extended to provide for a greater number. The wire or other core *w* is led up from a source of supply, not herein shown, but usually arranged below the machine and carried through the central hollow post or standard 3 and the extensions thereof comprising the sleeve 138 and quill 153. Means are provided above the machine for drawing the wire or other core off from its supply-reel and feeding it through the machine at the proper rate. Usually, such means consists of a capstan and wind-up device provided as a part of the serving machine or arranged to be driven in connection therewith, but as this mechanism may be of any suitable construction it is not herein shown and described.

The ends of the several strands *s* are led up from the supply-packages 19, carried through the pigtail guides 173 and attached to the wire *w* or other core feeding out from the upper end of the quill 153. Each strand is led under the offset end of one of the feeler-levers 165 and when the several strands are drawn taut the feelers will be supported in raised position as illustrated in Fig. 1 with their hooked fingers 176 held outwardly away from the peripheral flange 166 on the cam-ring 160.

To start the machine the operator swings the lever 65 in a clockwise direction, as viewed in Fig. 4, thereby rocking the starting lever 60 to engage the latch or pawl 66 with the shouldered detent-pin 71. Under this action the shipper-arm 46 is slid to the right, as viewed in Fig. 4, to cause it to release the belt-pulley 31 whereby the springs 42 act to frictionally engage the pulley with the clutch-member 32. A driving connection is thus effected between the pulley 31 and shaft 5 to cause the bevel-gear 29 to transmit motion to the gear 28 on the turret or flier-head 10 to rotate the latter about the axis of the machine. As the head 10 is rotated in a clockwise direction, in accordance with the arrangement of the machine as herein shown, the strand-supplies 19 are revolved about the feeding wire *w* or other core to helically wrap the strands therearound. The pitch or lead of the wrapped strands is regulated in accordance with the number of strands being served by adjusting the feed of the wire at the required rate.

The machine is driven continuously to serve the strands onto the wire and its operation is interrupted only in case of breakage of the strands or the exhaustion of their supply. When a strand breaks or its supply runs out the respective feeler-lever 165 controlled by this strand is permitted to drop under the effect of gravity. The feelers 165 rotate with the flier-head 10, being pivotally mounted on the cap 143 of the casing 110 which is secured fast to the dome 13 of the head. During the normal operation of the machine the sleeve 152 carrying the cam-ring 160 is in its lowermost position, as illustrated in Fig. 1, with the detent-ring 150 engaged with the notches 151 in the lugs 146 on the pivoted weight-arms 140. The action of gravity maintains the sleeve 152 in this position to lock the arms 140 against swinging outwardly under the action of centrifugal force on their weighted ends 145. It has been explained that the arms 140 are pivoted on the cap 143 and consequently they revolve with the flier 10 about the axis of the machine, while the detent-ring 150 is permitted to turn on the sleeve 152 in order to prevent wear at the points of engagement of the ring with the lugs 146 on the arms. On the other hand, the cam-ring 160 is held from rotative movement by the keyed connection of the sleeve 152 with the stationary quill 153.

Upon breakage or failure of a strand *s* its respective feeler-lever 165 is permitted to drop and the relative rotation of the lever with respect to the cam 160 permits the finger 176 on the lever to ride in under the edge of the flange 166 on the cam. As the feeler-lever 165 drops into this position its finger 176 will ride on the flat under edge of the flange 166 whereby it is caused to travel over the lobe 167 of the cam 160 to impart axial movement to the latter to slide the sleeve 152 upwardly. The upward movement of the sleeve 152 releases the edge of the detent-ring 150 from the notches 151 in the lugs 146 of the arms 140 to render the latter subject to the influence of centrifugal force.

Immediately upon the release of the arms 140 the weights 145 at their lower ends will be influenced by centrifugal force to cause the arms to swing outwardly to rock the lugs 146 downwardly. The downward pressure of the lugs 146 of the arms 140 against the crowned upper end of the sleeve 136 causes the latter to be slid downwardly on the fixed bushing or sleeve 138. Under this action the flange 137 on the sleeve 136, which engages against the rounded end of the crank-arm 115, will turn the crank-rod 113 and its connected section 118. The turning or rocking of the rod 118 swings the lever 121 to depress the pivoted arm 125 and the foot 129 on this latter arm, see Figs. 3 and 5, is thus pressed against the upper end of the plunger-pin 130 to depress the latter against the action of its spring 135. The lower end of the plunger 130 is thus carried down into the position shown in Fig. 3 so that under the rotative movement of the flier-head 10 it will engage the lug 103 on the lever 90. As the end of the plunger-pin 130 wipes across the lug 103 on the lever 90 it rocks the latter to exert a pull on the rod 105 connected with the knock-off lever 75. The knock-off lever 75 is thus moved against the action of its spring

82 to cause its beveled end 80 to pry the detent-latch of pawl 66 off from the pin 71.

Upon release of the detent-latch 66 the spring 58 acts to rock the stopping lever 60 which, as before explained, is connected to the shipper-arm 46. As the lever 60 moves under the force of the spring 58 it draws the shipper-arm 46 to the left, as viewed in Fig. 4, and through the engagement of its yoke 47 with the flange 38 on the pulley 31 the latter is withdrawn from engagement with the clutch-member 32 to disconnect the drive.

It has been explained that the brake-ring 56 is connected through its arm 72 and link 73 with the arm 63 of the stopping lever 60. Consequently, as the lever 60 is moved to release the clutch it will act through the link 73 to impart a slight rotative movement to the brake-ring 56 on its bearing 55 on the base 2. The force of the spring 58 is therefore applied to the brake-ring to cause its wedge-blocks 99 to coact with the fixed wedge-plates 92 to frictionally engage the ring with the surface 57 of the head 10. This wedging action of the brake-ring is augmented by the rotation of the head 10 which, by its frictional engagement with the ring, tends to force the wedge-faces 97 and 98 into firmer contact so that prompt arrestment of the rotation of the flier-head is accomplished after the knock-off device has been actuated to disconnect the drive.

It will be observed from the foregoing that the present invention provides a novel and ingenious construction of stopping mechanism for application to serving machines or other similar apparatus wherein one or a plurality of strands is delivered to serve or cover a core. It is to be particularly noted that in the present improved construction the strand is subjected to very light tension in effecting its control of the stopping mechanism of the machine. That is to say, only the weight of the feeler-lever itself is borne by the strand, the feeler having no direct connection with the stopping means when suspended on the strand. Through this provision the strands are relieved of strain and abrasive action so that extremely weak and fragile material may be served in the machine, for example, asbestos sliver or roving, in which the fibers are extremely brittle and held together with very little twist.

The present improved stopping mechanism is energized by centrifugally-operated means, thereby eliminating the use of springs or other resilient elements while providing for a more prompt and efficient arrestment of the machine. The centrifugally-operated arms or levers are maintained inoperative under the action of gravity-controlled detent-means, but when once released they act speedily with considerable force to set the tripping device in position to actuate the knock-off mechanism. The detent-means consist of an extremely light, easily moved element operated by the camming action of the feelers so that the shock and wear is reduced to a minimum even at high speeds.

With a serving apparatus equipped with the present improved strand-control and stopping mechanism it is possible to operate the machine at a high rate of speed without danger of straining or rupturing the strands of fragile material, and upon breakage of a strand or the exhaustion of its supply the operation of the machine is promptly arrested. The automatic stopping of the machine prevents faults in the insulating covering applied to the wire or other conductor, since the machine cannot operate unless all the strands are intact. Waste of insulating material is avoided since the machine is stopped promptly without permitting the strands to be served onto the wire with one or more of them missing so that the insulation must thereafter be stripped at the point where the fault occurs.

It has also been demonstrated that a machine constructed in accordance with the present invention operates to give a greater degree of uniformity in the lay of the strands on the wire and therefore improves the quality of the product.

While the improved strand-controlled stopping mechanism is herein shown as applied to use on a serving machine of a certain type, it is to be understood that it may have other applications and the construction and arrangement of its parts may be varied without departing from the spirit or scope of the invention. Therefore, without limiting myself to the exact embodiment herein shown, I claim:

1. A rotatable flier-head for carrying a strand-supply, means for rotating the head, means for arresting the rotation of the head, centrifugally-operated means for actuating the arresting means, means for normally restraining said centrifugally-operated means from action, and means for releasing the restraining means to cause the centrifugally-operated means to be energized.

2. In a machine of the type specified, means for revolving a strand-supply about a core, centrifugally-operated means for arresting the operation of the machine, detent-means for restraining the centrifugally-operated means from action, and means controlled by the strand delivering from the supply to release the detent-means to cause action of the centrifugally-operated means.

3. In a strand-serving apparatus, a rotatable flier-head, means on the head for supporting a plurality of strand-supplies, means for rotating the head, stopping means for arresting the rotation of the head, centrifugally-operated means for actuating the stopping means, means for restraining said centrifugally-operated means from action, and means controlled by the strands to release the restraining means to cause the centrifugally-operated means to act.

4. In a machine of the type specified, means for revolving a plurality of strand-supplies about a common axis, means for arresting the revolution of the supplies, centrifugally-operated means for actuating the arresting means, detent-means for restraining the centrifugally-operated means from action, and means controlled by the strands delivering from the supplies to release the detent-means to cause the centrifugally-operated means to be energized.

5. In a machine of the type specified, means for revolving a plurality of strand-supplies about a central core, stopping means for arresting the movement of the supplies, centrifugally-operated means for actuating the arresting means, detent-means for restraining the centrifugally-operated means from action, feeler-devices controlled by the strands from the supplies, and means actuated by the feeler-devices upon breakage or failure of a strand to release the detent-means to cause the centrifugally-operated means to be energized.

6. In a machine of the type specified, means for revolving a strand-supply about a core, stopping mechanism for arresting the movement of the strand-supply, detent-means for maintaining the stopping mechanism inactive, a knock-off de-

vice for releasing the detent-means, a cam for effecting operation of the knock-off device, and a feeler-device supported by a strand from the supply and engageable with the cam upon its release to effect movement of the latter to cause action of the knock-off device.

7. In a machine of the type specified, the combination of a rotatable head for carrying strand-supplies, means for rotating the head to serve the strands about a central core, stopping mechanism for arresting the rotation of the head, centrifugally-operated means for actuating the stopping mechanism, detent-means for normally maintaining said centrifugally-operated means inoperative, feeler-devices in contact with the strands being served, and means operated from the feeler-devices to release the detent-means to cause the centrifugally-operated means to be energized.

8. In a machine of the type specified, the combination of a flier for carrying a strand-supply, means for rotating the flier, stopping means for arresting the rotation of the flier, centrifugally-energized means for actuating the stopping means, means for restraining the centrifugally-energized means from action, and means controlled by the strand to release the restraining means for the centrifugally-energized means to cause the latter to be energized.

9. In a machine of the type specified, the combination of a rotatable flier for a strand-supply, means for rotating the flier, stopping mechanism for arresting the rotation of the flier, centrifugally-energized means to actuate the stopping mechanism, means for normally maintaining the centrifugally-energized means inoperative, and a feeler-device engaging the strand and adapted when released thereby to release the centrifugally-energized means.

10. In a machine of the type specified, the combination of a rotatable flier for carrying a strand-supply, means for rotating the flier, stopping mechanism for arresting the rotation of the flier, centrifugally-energized means for actuating the stopping mechanism, detent-means for normally maintaining the centrifugally-energized means inoperative, a cam for moving the detent-means to release the centrifugally-energized means, and a feeler-device controlled by the strand and adapted when released therefrom to engage the cam to move the detent-means.

11. In a machine of the type specified, the combination of means for revolving a strand-supply about a core, stopping mechanism for arresting the motion of the supply, centrifugally-energized means for actuating the stopping mechanism, gravity-operated detent-means for normally maintaining the centrifugally-energized means inoperative, and means controlled by the strand delivering from the supply to release the detent-means from the centrifugally-energized means.

12. In a machine of the type specified, the combination of means for revolving a strand-supply about a core, stopping mechanism for arresting the movement of the strand-supply, centrifugally-energized means for actuating the stopping mechanism, detent-means for normally maintaining the centrifugally-energized means inoperative, and gravity-operated means suspended from the strand delivering from the supply and adapted to operate upon release therefrom to release the detent-means from the centrifugally-energized means.

13. In a machine of the type specified, the combination of a rotatable flier for carrying a strand-supply, means for rotating the flier, stopping mechanism for arresting the rotation of the flier, a sleeve slidable to actuate the stopping-mechanism, centrifugally-energized arms for sliding the sleeve, detent-means for normally restraining said arms from movement, and means operative upon failure of the strand to release the detent-means to cause the centrifugally-energized arms to slide the sleeve to actuate the stopping mechanism.

14. In a machine of the type specified, the combination of a rotatable flier for carrying a strand-supply, means to rotate the flier, stopping-mechanism for arresting the rotation of the flier, a pair of centrifugally-energized arms pivoted on the flier to rotate therewith, means operated by the movement of the arms to actuate the stopping mechanism, detent-means normally engaged with the arms to prevent their movement, a cam to release the detent-means, and a feeler-lever engageable with the cam to cause it to release the detent-means.

15. In a machine of the type specified, the combination of a rotatable flier for carrying a strand-supply, means for rotating the flier, stopping mechanism for arresting the rotation of the flier, centrifugally-energized means for actuating the stopping mechanism, detent-means for normally maintaining the centrifugally-energized means inoperative, a cam for moving the detent-means, and a feeler-lever adapted to be suspended by the strand feeding from the supply and having means engageable with the cam upon its release from the strand to effect the release of the detent-means.

16. In a machine of the type specified, the combination of a rotatable flier-head, means for supporting a plurality of strand-supplies on the head, means for rotating the head, stopping mechanism for arresting the rotation of the head, a slidable sleeve for actuating the stopping mechanism, a pair of centrifugally-energized arms rotatable with the head and arranged to slide the sleeve, a second slidable sleeve, a ring on the second sleeve engageable with the centrifugally-energized arms to restrain them from movement, a cam-ring on the second sleeve, and a plurality of levers rotatable with the flier and having means engageable with the strands delivering from the supplies, said levers having means engageable with the cam-ring upon their release from the strands to cause the latter to slide the second sleeve to release the detent-ring from the centrifugally-energized arms.

17. In a machine of the type specified, the combination of a rotatable flier for carrying a strand-supply, means to rotate the flier, stopping mechanism for arresting the rotation of the flied, centrifugally-energized means for actuating the stopping mechanism, detent-means for restraining the centrifugally-energized means from action, a cam for releasing the detent-means, and a feeler-device engageable with the cam to cause it to release the detent-means.

18. In a machine of the type indicated, means for revolving a strand-supply about a core, stopping means for arresting the revolution of the supply, a member located centrally of the machine and movable to effect action of the stopping means, said member having an annular cam-face surrounding the axis of the machine, and a feeler-member normally held inactive by the strand delivering from the supply and adapted to ride on the annular cam-face upon its release from the strand to move said movable mem-

ber to cause the latter to actuate the stopping means.

19. In a machine of the type indicated, the combination of a rotatable flier for carrying strand-supplies, stopping mechanism for arresting the rotation of the flier, means for actuating the stopping mechanism including a slidable member arranged axially of the machine and provided with an annular cam-face, and feeler-members supported by the strands delivering from the supplies and movable into position upon release from the strands to cause them to ride on the annular cam-face to cause the slidable member to be moved to actuate the stopping mechanism.

20. In a machine of the type indicated, means for revolving strand-supplies about a common axis, stopping mechanism for arresting the revolution of the supplies, a cylindrical sleeve located centrally of the machine and slidable in the direction of its axis, said sleeve provided with an annular cam-face arranged concentric with the axis of the machine, and feeler-elements revolving with the supplies and adapted to be suspended by the strands delivering therefrom, said feeler elements having means engageable with the annular cam-face on the sleeve to ride thereon to cause a sliding movement of said sleeve to actuate the stopping mechanism.

21. In a machine of the type specified, a rotatable head for carrying a strand-supply, means for rotating the head, stopping mechanism for arresting rotation of the head, means for energizing the stopping mechanism including a slidable member located axially of the machine and provided with an annular cam-face concentric with said axis, and a feeler element adapted to be suspended from the strand delivering from the supply and having means engageable with the annular cam-face to ride thereon to slide the slidable member to cause energization of the stopping mechanism.

WILLARD W. BARDSLEY.

CERTIFICATE OF CORRECTION.

Patent No. 1,943,716. January 16, 1934.

WILLARD W. BARDSLEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, line 138, claim 5, for "arresting" read stopping; page 6, line 134, claim 17, for "flied" read flier; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of March, A. D. 1934.

F. M. Hopkins

(Seal) Acting Commissioner of Patents.