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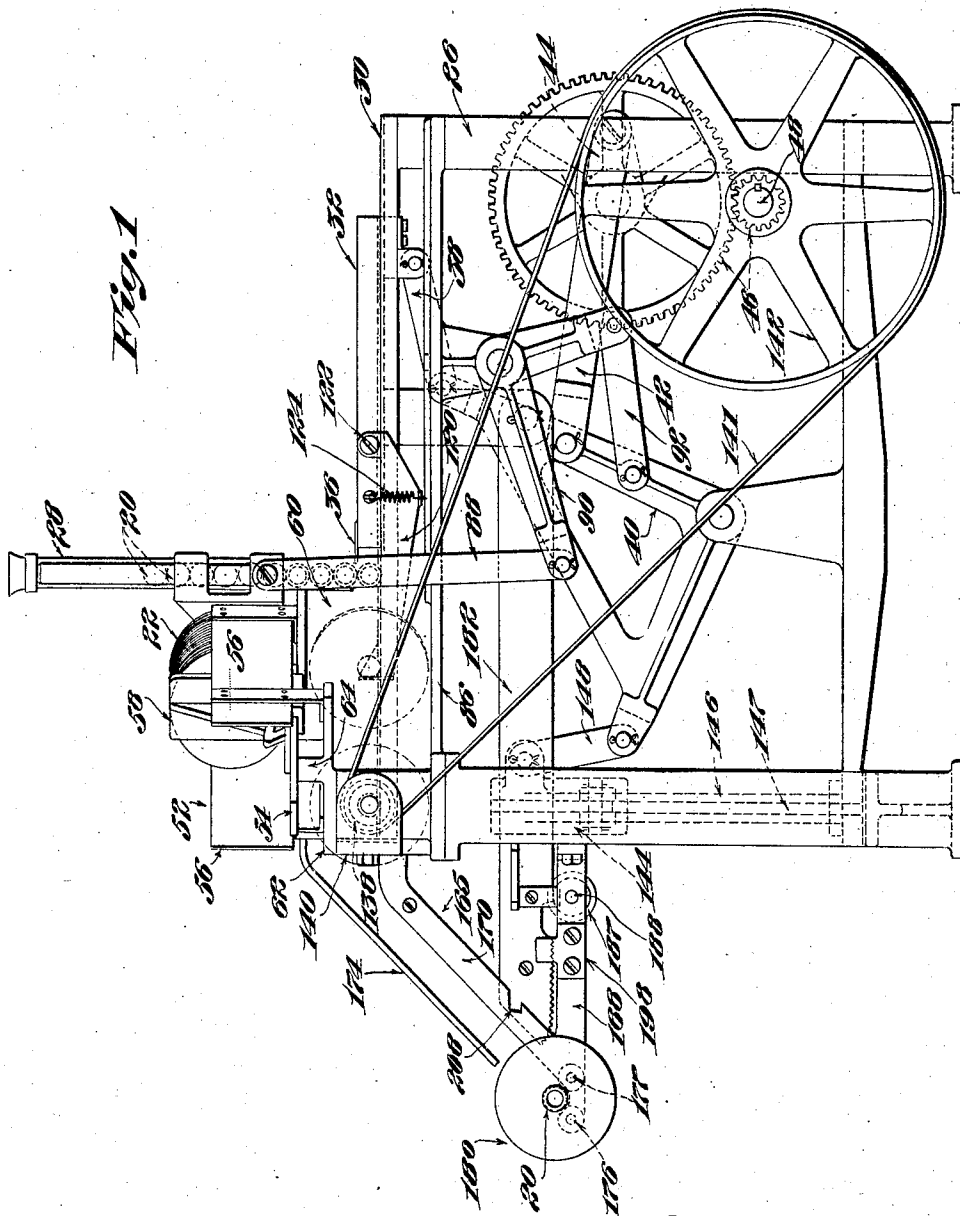
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METHOD AND MACHINE FOR ASSEMBLING SPOOLS

Filed Dec. 8, 1923

7 Sheets-Sheet 1



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7 Sheets-Sheet 3

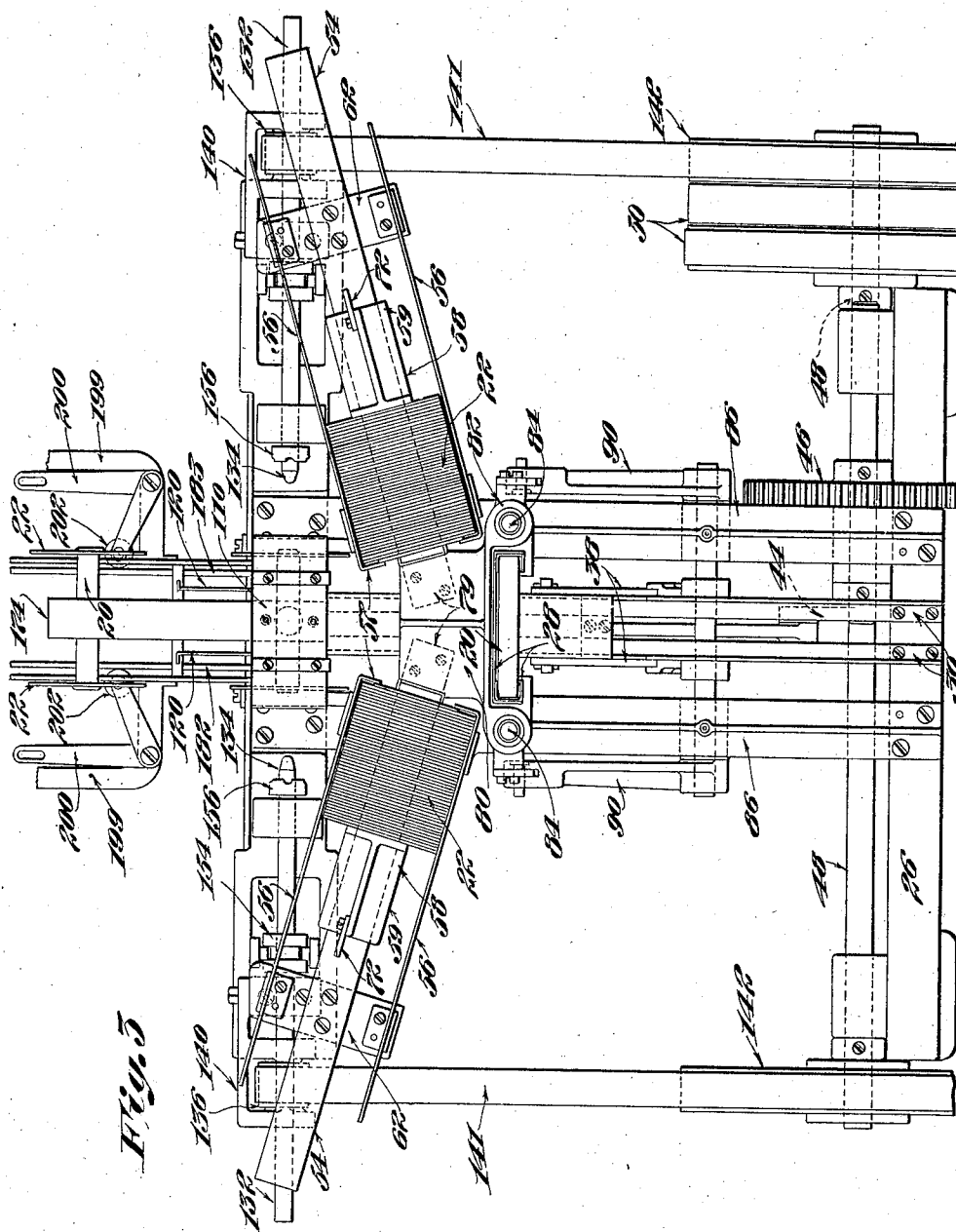


Fig. 5

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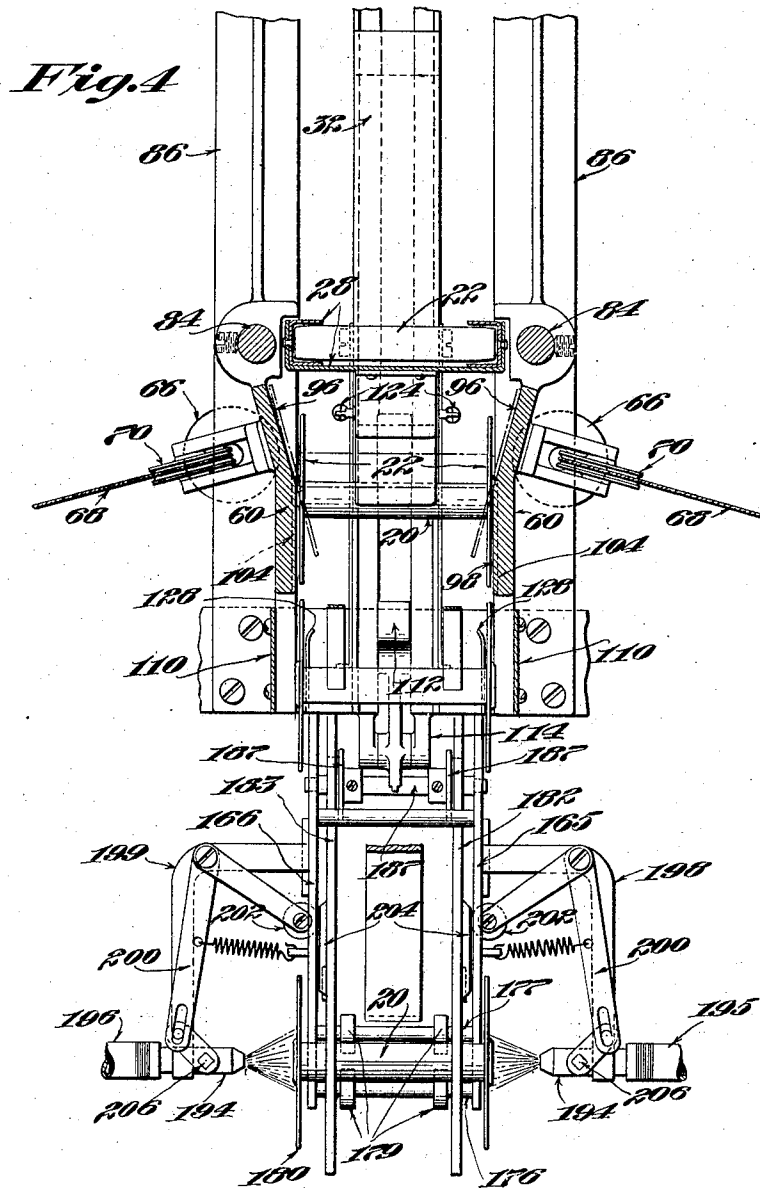
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7 Sheets-Sheet 4



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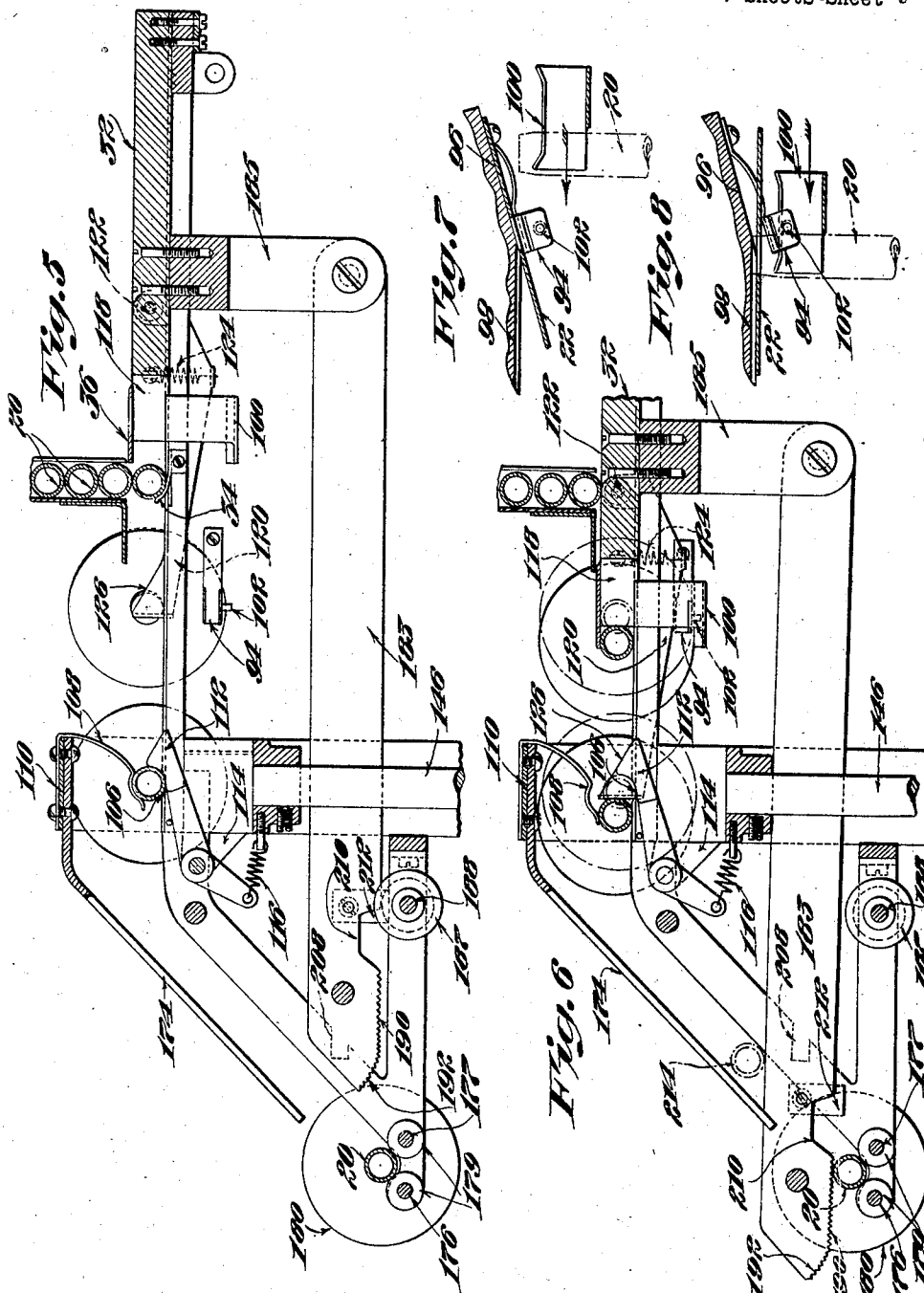
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METHOD AND MACHINE FOR ASSEMBLING SPOOLS

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7 Sheets-Sheet 6

Fig. 9

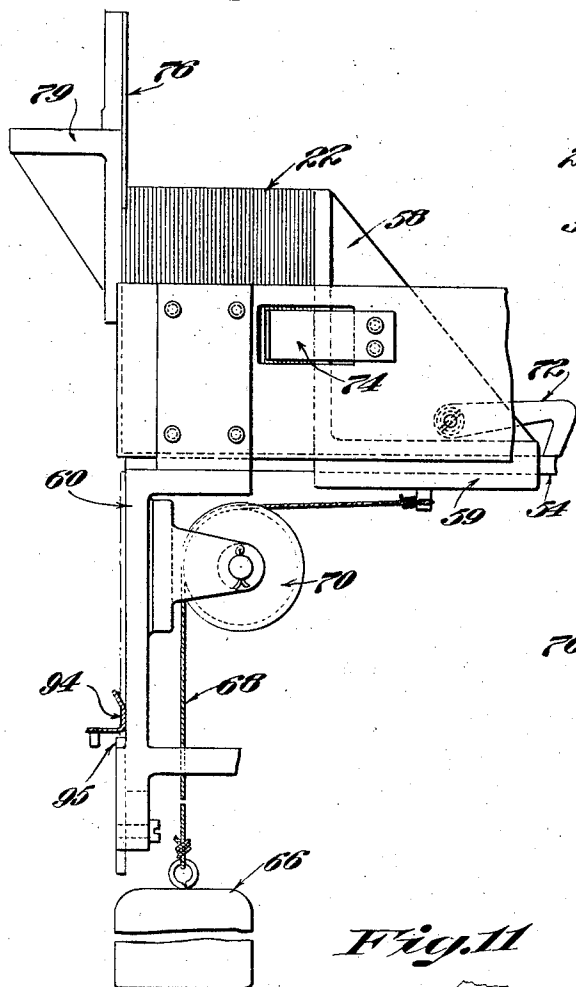


Fig. 10

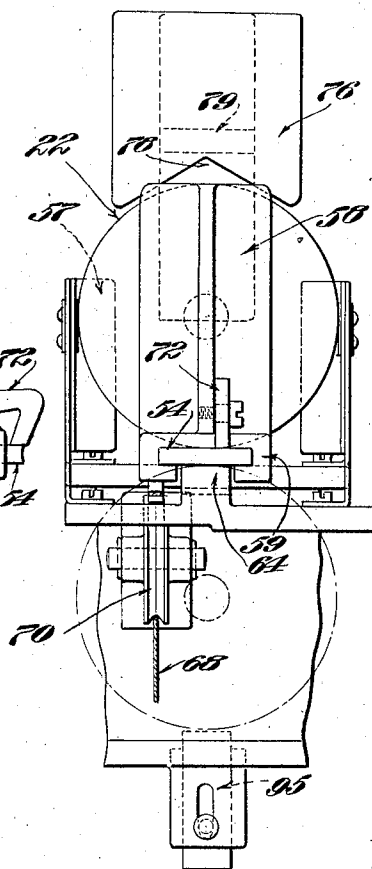
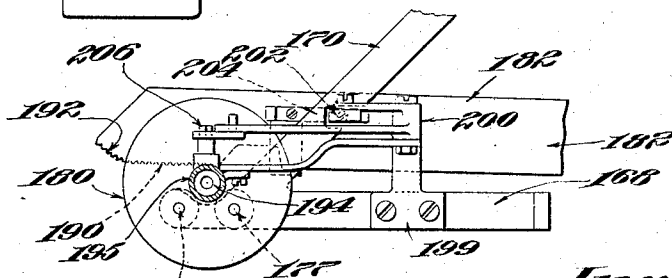


Fig. 11



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1,612,083

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Filed Dec. 8, 1923

7 Sheets-Sheet 7

Fig. 12

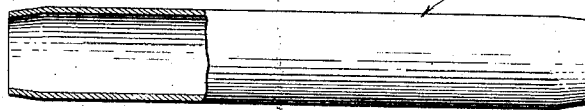


Fig. 13

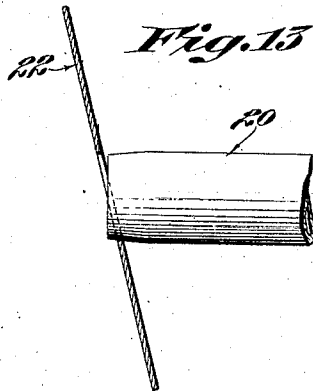


Fig. 14

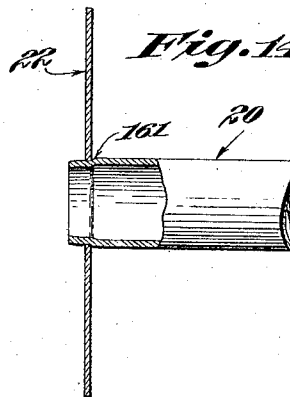


Fig. 15

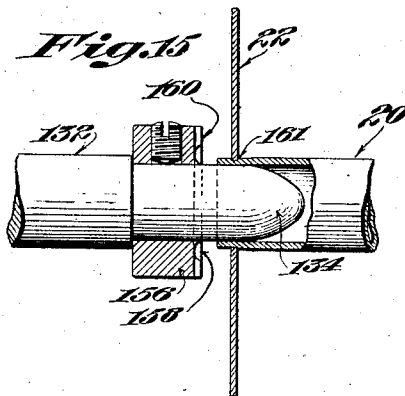


Fig. 16

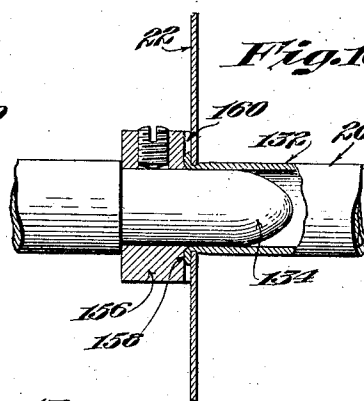
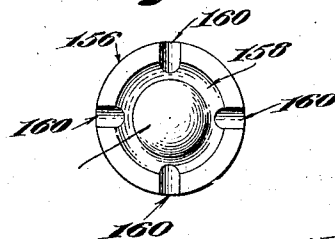


Fig. 17



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UNITED STATES PATENT OFFICE.

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METHOD AND MACHINE FOR ASSEMBLING SPOOLS.

Application filed December 8, 1923. Serial No. 679,333.

The present invention relates to methods and machines for assembling spools, and is more particularly concerned with the assembling of paper spools, each consisting of a central tube or core and a pair of disks on the ends of the core.

The object of the present invention is to provide a method and machine for assembling spools of this general nature in a convenient and economical manner. With this object in view the invention consists in the method and machine hereinafter described and particularly defined in the claims.

In the accompanying drawings Fig. 1 is a right hand side elevation of the preferred form of spool assembling machine; Fig. 2 is a front elevation of the machine; Fig. 3 is a plan view of the machine; Fig. 4 is a plan view, partly in section, of the central portion of the machine; Fig. 5 is a sectional detail view showing the manner of feeding and assembling the spools; Fig. 6 is similar to Fig. 5 showing the parts in slightly advanced position; Figs. 7 and 8 are detail views of the spring detent for the disk; Fig. 9 is a side elevation of the disk magazine; Fig. 10 is a rear elevation of the disk magazine; Fig. 11 is a detail of the actuating means for the spraying device; Fig. 12 is a detail of the tube portion of the spool; Figs. 13 and 14 are views showing the manner of assembling the end disks on the tube; Figs. 15 and 16 are details illustrating the operations of the heading tools; and Fig. 17 is a front view of one of the heading tools.

The illustrated machine is designed for assembling spools of the type particularly illustrated in Figs. 12 to 16. The spool comprises a core or tube 20 of rolled paper provided with tapered ends upon which are received disks 22, each having a central opening within which the end of the tube extends. After the mounting of the disks on the ends of the tube, the ends are headed or peened over, as illustrated in Fig. 17, to hold the disks securely on the core.

The machine for assembling the spools comprises a frame 26 having mounted thereon a tube magazine or hopper 28 within which a number of the tubes 20 are supported. Beneath the magazine 28 the frame is provided with a pair of longitudinal ways or tracks 30 over which a carriage 32 reciprocates. The carriage when in its rearward position permits the lowermost tube to

fall directly on the ways in the path of the carriage, being held from rolling forward by a pair of spring clips 34, one attached to each one of the ways. The carriage is provided with a forwardly extended lip 36 which engages the tube directly beneath it on the forward movement of the carriage and serves to hold the tube against upward movement. On the forward motion of the carriage the spring clips 34 are depressed, permitting the tube to pass freely thereover. The carriage is reciprocated over the ways by means of a link 38 connecting the rear end of the carriage with one arm of a bell crank lever 40 which, in turn, is connected through a pitman 42 with a crank 44 rotated through gears 46 from the main shaft 48 of the machine, the shaft being rotated from any suitable source of power through fast and loose pulleys 50 of the usual construction (see Fig. 3).

Directly forward of the tube magazine are supported two disk magazines 52, one on each side of the carriage, serving to hold a plurality of the disks 22 and feed them in proper position to be engaged by the tube to form the complete spool. Each disk magazine consists of a bottom plate 54, two side plates 56 bent inwardly at 57, and a presser 58 having a grooved base 59 which slides over the bottom plate 54 to feed the disks inwardly. The bottom and side plates are supported at the inner end upon a bracket 60, presently to be described in detail, and at the outer end upon a bracket 62, the bottom plate being secured to an upwardly extended projection 64 of the bracket to permit the sliding presser to move freely the whole length of the magazine. The presser is urged inwardly by a weight 66 connected with the presser by a cord 68 passing over a pulley 70 on the bracket 60. The presser is provided with a hook 72 which may be dropped over the end of the bottom plate 54 to hold the presser outwardly to permit filling of the magazine. One of the side plates is provided with a spring 74 pressing through a suitable opening against the disks to hold the latter firmly in proper position in the magazine. The innermost disk in each magazine is fed from the magazine at the proper time by means of a vertically reciprocating plate 76 of substantially the same thickness as one of the disks. The plate is provided with a triangular notch 78 to cen-

ter the disk properly on its downward feeding movement. The plate is mounted on a bracket 79 which is attached to the under side of the shelf 80 of a reciprocating carriage 82, the carriage being adapted to slide over posts 84 attached at the lower end to side plates 86 which extend the full length of the machine. The carriage is connected through a link 88 with one arm of a bell crank lever 90, the other arm of which is connected through a link 92 with the bell crank 40. It will be seen from an inspection of Fig. 1 that the feeding devices are actuated to strip off one disk from each magazine as the carriage 32 is approaching its rearward position. As shown in Fig. 9 the disk which is being fed from the magazine slides over the face of the bracket 60 and is engaged by a spring detent 94 secured to the bracket, an adjustable stop 95 serving to position the disk accurately. Each bracket 60, as illustrated in Fig. 4, is formed integral with the side plate 86 and is provided with two angularly disposed faces 96 and 98, the former being directly under the disk magazine, and the latter being parallel to the path of motion of the carriage. The disks after being moved by the feeding devices into engagement with the spring detent 94 assume the positions indicated in dot and dash lines in Fig. 4, the central openings of the disks extending slightly over the edge of the faces 96 in such position that the disks will be engaged by the ends of the tube 22 as the tube is being moved forwardly by the horizontal carriage 32. Immediately upon the engagement of the tube with the disks the latter are released from the spring detents by means of cams 100 depending from the carriage 32 and adapted to engage pins 102 on the spring detents as indicated particularly in Figs. 7 and 8. The continued forward motion of the carriage 32 causes the disks to straighten into a position substantially parallel to the faces 98, the ends of the tube being meanwhile received within recesses 104 of the brackets. The motion of the disks past the forward edge of the face 96 serves to push the disk on to the tube the requisite distance to form the desired length of spool.

As the carriage 32 completes its forward movement the spool is brought into position to have the ends of the tube headed over. In order to center the spool properly for the heading operation the ways are provided with a slight depression 106 within which the tube is seated. The tube is retained in the depression by springs 108 depending from an overhead arch 110 and also by a latch member 112 pivoted upon a bracket 114 of the machine and urged upwardly by a light tension spring 116 secured between the latch 112 and a part of the machine frame. The carriage 32 is provided with a central groove 118 to provide access for

the rear end of the latch 112 while the spool is being seated. Provision is made for removing from this position a spool which has previously been subjected to the heading operation. For this purpose a pair of pushers 120 pivoted to the carriage at 122 and urged upwardly toward the carriage by tension springs 124 serve to engage the tube portion of the headed spool and to unseat it from the centering devices, as shown in Fig. 6, from which the spool moves into position for subsequent operations presently to be described. On the rearward motion of the carriage, after a new spool has been seated, each pusher is free to pass under the tube against the tension of the springs 124 by virtue of the inclined rear face 126 of the pusher. The end disks are retained against inward movement during the heading operation by means of plates 128 adapted to bear against the inner faces of the disks as indicated in Fig. 4.

The heading operation is performed by a pair of heading tools indicated generally at 130, one on each side of the spool. Each heading tool comprises an arbor 132 having a rounded end 134 adapted to be inserted into the end of the tube. The outer end of the arbor is provided with a sliding keyway 136 by which the arbor engages with a pulley 138 mounted in a yoke 140 attached to the machine frame. Each pulley 138 is rotated through a belt 141 connecting with a pulley 142 mounted on the main shaft 48. The heading tools are moved inwardly for the heading operation by means of a block 144 which reciprocates over a vertical post 146, being connected to the bell crank 40 by means of a link 149. The block 144 connects on either side through a link 147 with a bell crank 148, the upper arm of which is forked at 150 and provided with pins 152 engaging between collars 154 secured to the arbors. By these connections it will be seen that the arbors are continuously rotated and are adapted to be moved inwardly toward the spool at approximately the time that the carriage 32 assumes its rearward position.

The construction of the heading tool is illustrated in Figs. 15 to 17. The arbor carries near its end a die 156 having an annular groove 158 by which the end of the tube is turned over into the position illustrated in Fig. 16. The die is also drilled radially at a number of points 160 in order to take up any chips or peelings from the end of the tube without obstructing the motion of the die.

The particular formation of the spool due to the above mentioned operations is illustrated in Figs. 12 to 16. After the tube has caught the end disk in its angular position, as shown in Fig. 13, the disk is forced on to the tube, as shown in Fig. 14, there being a slight shoulder 161 formed immedi-

ately inside the disk. The entrance of the end of the heading arbor into the tube, as shown in Fig. 15, serves initially to distend the outer end of the tube so that the disk is firmly impressed therein, thus forming a decided shoulder at 161. At the conclusion of the heading operation, as illustrated in Fig. 16, the disk is therefore positively retained on the tube, being held against inward movement by the shoulder 161 and against outward movement by the headed over part of the tube.

In order to enhance the durability of the finished spool, it is desirable that the ends of the tube be hardened so as to retain the disks permanently on the tube. Provision is accordingly made for applying to the ends of the tube an adhesive or hardening agent. This hardening agent may be of any suitable form, but it is preferred to use sodium silicate which, as is well known, may be of such thin consistency when applied as to impregnate the tube thoroughly, and which upon exposure to the air hardens into a practically indestructible, glassy coating. For the accomplishment of this end the machine is provided at the front with a pair of brackets 165, 166, each consisting of a horizontal portion 168 secured to the machine frame, and an inclined portion 170 which is secured through an angle iron 172 to the machine frame immediately adjacent to the position in which the tube is centered for the heading operation. The inclined portions 170 of the brackets constitute a runway down which the assembled spool may roll after being unseated by the pushers 120. A guard 174 secured to the arch 110 and extending down over the runway serves to retain the spool properly on the runway during its downward course. At the lower ends of the brackets 165, 166 are journaled two spindles 176 and 177 each having a pair of rolls 179 secured thereon. The assembled spool after coming from the heading operation assumes the position indicated at 180 in Figs. 1, 5, 6 and 11, the tube portion of the spool being supported by the rolls. While in this position the spool is rotated by means of a pair of reciprocating toothed bars 182 and 183 secured at their rear ends to a fork 185 depending from the carriage 32. The bars are normally supported during the motions of the carriage on rollers 187 mounted on studs 188 journaled in the horizontal portions of the brackets. The forward end of each bar is provided with teeth 190, the extreme end of the bar being inclined at 192 to permit the bars to ride up on the tube of the spool and rotate the latter upon the forward motion of the carriage, as indicated in Fig. 6. During this movement the ends of the tube are sprayed with sodium silicate through nozzles 193 and 194 which connect through tubes 195 and 196 with a suitable source of

supply. The nozzles are mounted on brackets 198 and 199 secured to the brackets 165 and 166. Each of the nozzle brackets has pivoted to it a bell crank lever 200 provided with a cam roll 202 adapted to engage a cam 204 on the toothed bar during the rotating movement of the spool, the other arm of the bell crank lever having a pin and slot connection with a valve 206 of the nozzle, such that upon the rotation of the spool the valves are opened, thus permitting a spray of the hardening agent to be directed against the ends of the tube. The runway portions 170 of the brackets are provided with slots 208 to receive the cam rolls. Upon the continued forward motion of the toothed bars a notch 210 in each bar permits the bars to drop over the tube, the tube being thereafter pushed off the rollers 179 by means of a lug 212 secured directly in back of the notch. The completed spools after being thrown off the rollers may be received and collected in any suitable receptacle. Upon the retraction of the carriage the toothed bars ride upon the rollers 187 which, being at a lower level than the spool, permit the retraction of the bars without engagement of the valve operating cams with the cam rolls. The nozzles are therefore operated only upon the forward motion of the toothed bars when a spool is in proper position, but not during the rearward motion of the bars. It will be seen that after an assembled spool has been released from heading position it does not immediately roll the entire length of the runway into position 180. Since the unseating from heading position takes place during the forward motion of the carriage, the spool will roll down the runway into the position indicated at 214 where it rides upon the top of the toothed bars, being positively retained by the overhanging guard 174. Upon the retraction of the toothed bars the assembled spool rolls down the runway over the remainder of the course and takes its position on the rolls 179 without excessive velocity, thereby insuring proper positioning of the spool on the rolls.

We claim—

1. A machine for making spools having, in combination, mechanisms for automatically applying disks with central openings over the ends of a core tube, and means for securing the disks upon the tube.

2. A machine for making spools having, in combination, a tube magazine, means for moving a tube from the magazine, means for applying end disks having central openings to the tube with the ends of the tube protruding through the disks, and means for securing the disks upon the tube.

3. A machine for making spools having, in combination, a tube magazine, means for moving a tube from the magazine, means for presenting a pair of end disks each with

a central opening angularly in the path of motion of the ends of the tube to place the disks upon the tube, and means for securing the disks to the tube.

5 4. A machine for making spools having, in combination, means for automatically placing end disks upon the ends of a core tube, and mechanisms for heading over the ends of the tube to secure the disks thereon.

10 5. A machine for making spools having, in combination, supports for a pair of end disks, means for moving a core tube in a manner to engage the disks and place them upon the ends of the tube, and mechanisms
15 for heading over the ends of the tube to secure the disks thereon.

6. A machine for making spools having, in combination, tube and disk magazines, heading devices, means for moving a tube
20 from the tube magazine toward the heading devices, means for applying a pair of end disks from the disk magazines to the ends of the tube during the movement of the tube, and means for operating the heading devices
25 to secure the disks upon the tube.

7. A machine for making spools having, in combination, a tube magazine, two disk magazines, means for moving the tube from the tube magazine, means for presenting a
30 pair of disks from the disk magazines angularly in the path of motion of the ends of the tube to apply the disks upon the ends of the tube, and means for securing the disks to the tube.

35 8. A spool assembling machine having, in combination, a tube magazine adapted to contain a plurality of tubes having tapered ends, a track beneath the magazine adapted to receive tubes successively from the tube magazine, a reciprocating carriage for moving the
40 tube over the track, disk magazines, means for presenting disks from the magazines to be engaged by the ends of the tube during the motion of the tube, and means for securing the disks on the tube.
45

9. A spool assembling machine having, in combination, horizontal ways, means for moving a tube over the ways, means for presenting a pair of disks angularly with respect to the ends of the tube, the disks being provided with central openings for engagement with the tube, means for straightening the disks in parallel relation to each other on the continued motion of the tube,
50 and means for securing the disks on the tube.
55

10. A spool assembling machine having, in combination, horizontal ways, means for moving a tube over the ways, a pair of brackets adjacent to the ways, each having a surface inclined toward the ways and a surface parallel to the ways, means for supporting a pair of end disks on the inclined surfaces in position to be picked up by the tube during the motion of the latter, the
60 disks being turned into parallel relation with

each other on passing the parallel surfaces of the brackets, and means for securing the disks on the tube.

11. A spool assembling machine having, in combination, a horizontal track, means for
70 moving a tube along the track, and a bracket adjacent to the track having provision for supporting a disk in position to be engaged by the tube and for moving the disk into position on the tube during the motion of
75 the latter.

12. A machine for assembling a spool from a tube having tapered ends and a pair of disks with central openings, the machine having, in combination, a reciprocating carriage having provision for engaging the tube, a pair of brackets having surfaces parallel to the path of motion of the tube and surfaces inclined thereto, means for supporting the disks on the inclined surfaces
80 in position to receive the tapered ends of the tubes in the central openings, the disks turning into positions perpendicular to the axis of the tube upon passing the parallel surfaces of the brackets, and means for securing the disks on the tube.
90

13. A spool assembling machine having, in combination, a tube magazine, two disk magazines, means for moving a tube from the tube magazine toward the disk magazines, and means for presenting a disk from each of the disk magazines in position to be picked up by the tube during the movement of the latter.
95

14. A spool assembling machine having, in combination, means for placing end disks upon a tube, means for securing the disks on the tube including centering devices for the tube, and means for heading over the ends of the tube while the latter is centered.
105

15. A spool assembling machine having, in combination, means for automatically placing end disks upon a tube, means for centering the tube, rotating heading dies, and means for moving the heading dies toward the tube to head over the ends of the tube and hold the disks securely in place.
110

16. A spool assembling machine having, in combination means for automatically placing end disks upon the tube, means for centering the tube, heading tools disposed adjacent to the ends of the centered tube, and means for moving the heading tools inwardly to head over the ends of the tube and hold the disks securely thereon.
115

17. A spool assembling machine having, in combination, a horizontally reciprocating carriage, a tube magazine, two disk magazines, the carriage having provision for moving a tube from the tube magazine to engage
120 a pair of disks from the disk magazines at the ends of the tube, centering devices for engaging the tube at the limit of movement of the carriage, means for heading over the ends of the tube while in centering position,
130

and pushers mounted on the carriage for unseating the assembled spool on the next forward movement of the carriage.

18. A machine for securing end disks upon a tube core to form a spool having, in combination, means for supporting the core, and rotating mechanisms for automatically heading over the ends of the tube.

19. A machine for securing end disks upon a central core tube to form a spool having, in combination, centering devices for the core, and rotating means adapted to be moved into engagement with the ends of the core for heading over the ends of the core to secure the disks thereon.

20. A machine for securing end disks upon a central core tube to form a spool having, in combination, a pair of rotating heading devices, and means for operating the heading devices to engage the protruding ends of the core to secure both disks upon the ends of the tube simultaneously.

21. A machine for securing end disks upon a central core tube to form a spool having, in combination, means for heading over the ends of the tube, and means for hardening the ends of the tube thus headed over.

22. A machine for securing end disks upon a central core tube to form a spool having, in combination, mechanisms for heading over the ends of the tube, and means for applying a hardening compound to the ends of the tube.

23. A spool assembling machine having, in combination, tube and disk magazines adapted to contain respectively a plurality of tubes and end disks, means for assembling an end disk on each end of a tube, heading devices for securing the disks on the tube, and means for impregnating the ends of the tube with a hardening agent.

24. A spool assembling machine having, in combination, a tube magazine adapted to contain a plurality of paper tubes, disk magazines containing a plurality of end disks with central openings, means for placing a pair of disks on the ends of a tube, means for heading over the ends of the tube, means for spraying the ends of the tube with a hardening agent, and means for rotating the tube during the spraying operation.

25. A spool assembling machine having, in combination, a carriage, a pair of ways for the carriage, means for reciprocating the carriage over the ways, a tube magazine containing a plurality of paper tubes and adapted to drop the lowermost tube in position to be moved by the carriage, two disk magazines each containing a plurality of paper disks with central openings, means for stripping off a disk from each magazine into position to be engaged by the tube on the forward motion of the carriage, centering devices on which the tube is seated at

the limit of the forward movement of the carriage, means for heading over the ends of the tube while the tube is centered to hold the disks securely thereon, pushers mounted on the carriage for unseating the assembled spool from the centering devices on the next forward movement of the carriage, nozzles for spraying the ends of the tube with a hardening agent, a support for the spool during the spraying operation, and means connected with the carriage for rotating the spool on the support while the tube is being sprayed.

26. A machine for making spools having, in combination, means for applying end disks to a paper core, means for heading over the ends of the core, and means for applying a hardening compound to the ends of the core to hold the disks securely thereon.

27. An apparatus for securing end disks upon a central core tube to form a spool having, in combination, means for heading over the ends of the tube, and means for impregnating the ends of the tube with a hardening compound.

28. An apparatus for securing end disks upon a central core tube to form a spool having, in combination, a support for the core, and means for applying a hardening agent to the ends of the core.

29. An apparatus for securing end disks upon a central core tube to form a spool having, in combination, a support for the core, means for rotating the core, and means for spraying a hardening compound upon the ends of the core during the rotation thereof.

30. The method of making a spool which consists in forming a tube with tapered ends, placing end disks simultaneously on the ends of the tapered tube to form shoulders on the tube and thereafter simultaneously heading over both ends of the tube.

31. The method of making a paper spool which consists in placing end disks on the ends of a paper tube to form shoulders on the tube, heading over the ends of the tube and thereafter hardening the ends of the tube to retain the disks thereon.

32. The method of making a paper spool which consists in placing end disks simultaneously on a paper tube which is formed with tapered ends in a manner to form shoulders preventing removal of the disks, heading over the ends of the tube, and thereafter spraying the ends of the tube with a hardening agent to retain the disks firmly thereon.

33. A machine for making spools having, in combination, a pair of magazines for holding end disks each with a central opening, means for stripping a disk from each magazine, means for presenting a core tube to be

received within the openings of the disks, and means for securing the disks upon the tube.

34. A machine for making spools having, in combination, a tube magazine, a pair of disk magazines adapted to hold a plurality of disks, each provided with a central opening, a reciprocating carriage adapted to engage with a tube, means for stripping an end disk from each magazine to be presented in the path of movement of the tube and adapted to be engaged thereby, and means for securing the disks upon the tube.

35. A machine for making spools having, in combination, a tube magazine, a track, a reciprocating carriage for engaging a tube from the magazine and moving it along the track, a bracket adjacent to the track, a disk magazine arranged to hold a plurality of disks, each with a central opening, a reciprocating stripper for removing a disk from the magazine and moving out over the bracket in position to be engaged by the end of the tube, and means for securing the disk on the tube.

36. A machine for making spools having, in combination, a disk magazine adapted to hold a plurality of disks, a stripping mechanism comprising a reciprocating member, a stripper plate secured to the reciprocating member and of a thickness approximately equal to that of one of the disks, and means for placing a disk thus stripped from the magazine on the end of a core tube.

37. A machine for making spools having, in combination, a track, means for moving a tube along the track, a pair of disk magazines arranged at an angle with respect to the track and adapted to hold a plurality of end disks, each with a central opening, reciprocating stripping means for removing a disk from each magazine and placing it with its central opening in the path of motion of the end of the tube, means for adjusting the end disks in a position perpendicular to the axis of the tube during further movement of the tube, and means for securing the disks upon the tube.

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