The present invention relates to a tube stuffing machine and has particular reference to devices for rolling booklets and other flat flexible articles into cylindrical form and stuffing the rolled-up articles into mailing tubes and the like containers for shipment.

An object of the invention is the provision of a machine for inserting booklets and the like flat articles into cylindrical mailing tubes in order to produce a compact package which protects the contents of the tubes against the weather and against rough handling during shipment.

Another object is to effect such packaging of flat articles rapidly and efficiently and to eliminate costly manual operations.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

FIGURE 1 is a front elevation of a machine embodying the instant invention, with parts broken away;

FIG. 2 is a side elevation of the machine as viewed from the left in FIG. 1, with parts broken away;

FIG. 3 is a transverse sectional view taken substantially along the line 3—3 in FIG. 1, with parts broken away;

FIG. 4 is a top plan view of the machine shown in FIG. 1;

FIG. 5 is a side elevation of the machine as viewed from the right in FIG. 1, with parts broken away;

FIG. 6 is an enlarged sectional view taken substantially along the line 5—5 in FIG. 4, with a mailing tube in place in the machine;

FIGS. 7 and 8 are transverse sectional views taken substantially along the line 7—7 in FIG. 6 and showing the start and finish operations of rolling up a flat booklet for insertion into a tube; and

FIGS. 9 and 10 are sectional views similar to FIG. 6 and showing the parts and the tube in different positions as incidents to inserting the rolled up booklet into the tube.

As a preferred and exemplary embodiment of the instant invention the drawings illustrate a semi-automated machine for rolling up a flat booklet (FIG. 7) into cylindrical form and for stuffing or inserting the rolled-up booklet endwise into a cylindrical mailing tube B (FIGS. 6, 9 and 10) having one end closed by a metal end member C and the opposite end open to receive the booklet and to be subsequently closed with another metal end member to completely seal the booklet in the tube for protection during shipment.

The machine comprises a rotatable, horizontally disposed, rolling-up mandrel 21 (FIGS. 3, 4, 6 and 7) formed on one end of a short shaft 22 journaled in a bearing 23 in an upright web member 24 of a machine frame 25. The mandrel 21 is slightly longer than the booklet A to be operated upon, and is formed with a longitudinal channel 27 disposed slightly off-center as best shown in FIG. 7. The channel 27 is chamfered and rounded at 28, 29 respectively to facilitate entrance and rolling-up of the booklet as will be explained in detail hereinafter.

The mandrel 21 is disposed in suspended relation in a spaced and parallel, surrounding guide cylinder 31, one end of which is mounted in fixed relation on the bearing 23 (see FIG. 6). The opposite end of the cylinder 31 is supported in an upright web member 33 of the frame 25. This end of the guide cylinder 31 extends slightly beyond the end of the mandrel 21, and is interiorly chamfered and formed with an annular recessed seat 34 (FIG. 6) of a diameter to receive the open end of a mailing tube B. The guide cylinder 31 preferably is provided with an inside diameter which is substantially equal to the inside diameter of the mailing tube B so that both surfaces will be substantially flush when the end of the tube B is disposed in the recessed seat 34 as will be hereinafter described.

A booklet A in a flat condition to be rolled-up for insertion into a mailing tube B is supported on a horizontal table 36 disposed in front of the guide cylinder 31 and mounted on brackets 37 secured to the upright webs 24, 25 of the frame 25. A guide rail 38 on the table 36 is provided to guide the booklet during its movement along the table.

A booklet A on the table 36 is fed manually along the guide rail 38 and through a slot 41 in the guide cylinder 31 as shown in FIG. 7. The booklet is pushed forward until its leading marginal edge portion enters and is seated in the rolling-up mandrel channel 27 as shown in FIG. 7. With edge of the booklet in this position the rolling-up mandrel 21 is rotated in a clockwise direction as viewed in FIG. 7. The rotation of the mandrel draws the booklet into the guide cylinder 31 and winds or rolls it up onto the mandrel within the cylinder as shown in FIG. 8, the cylinder serving as a guide to confine and retain the rolled-up booklet in a cylindrical form of a predetermined diameter.

Rotation of the mandrel 21 preferably is effected manually by a handle 43 (FIGS. 1 and 5) which is mounted on an operating shaft 44 disposed in parallelism with and adjacent the mandrel 21. The shaft 44 is journaled for rotation in bearings formed in the upright webs 24, 25 and a third upright web 46 disposed in spaced relation to the web 25. The shaft 44 adjacent the web 24, carries a gear 47 whichmeshes with and drives a gear 48 on the mandrel shaft 22 to effect rotation of the mandrel as explained above.

The free end of the handle 43 preferably carries a spring pressed stop pin or detent 51 (FIGS. 1 and 5) which yieldsly locks against a stop 52 on the frame 25 to temporarily hold the handle and locate the channel 27 in the mandrel 21 in alignment with the slot 41 in the guide cylinder 31 to receive the booklet A during a feeding operation. A pull on the handle 43, effected at the start of the rolling-up operation unlocks the detent and permits full operation of the handle to rotate the mandrel. The gears 47, 48 are proportioned to effect full rolling up of the booklet in one full 360 degree rotation of the handle 43, which rotation constitutes one cycle of operation of the machine.

During the rotation of the handle 43 a mailing tube B is positioned in endwise relation to the mandrel 21 and is pushed endwise into the recessed seat 34 in the open end of the guide cylinder 31. For this purpose a mailing tube B rolls along a pair of spaced and parallel slightly inclined tracks 55, 56 (FIGS. 1, 2, 3 and 4) secured to the upright webs 33, 48 respectively. The tracks extend past the open end of the guide cylinder 31 and are formed with a sharply curved or concaved section or pocket 57 disposed in substantially endwise alignment with the guide cylinder 31 so that a mailing tube B in rolling along the tracks falls into the pockets 57 in the tracks and is thereby trapped against further travel. In this position the tube B is substantially in axial alignment with the guide
cylinder 31 and the open end of the tube is adjacent the open end of the cylinder as shown in Fig. 6. The tube B is in this position as shown in Fig. 6 when the booklet is fed into the rolling-up mandrel 21 at the beginning of the rolling-up operation. As the handle 43 is rotated to effect the rolling up of the booklet, the shaft 44 on which the handle is mounted, rotates a face cam 61 (Figs. 1, 2 and 4) on the shaft 44 adjacent the web 46 and this cam at the proper time actuates a plunger 62 which pushes the mailing tube B endwise into the recessed seat 34 of the guide cylinder 31 as mentioned above and as shown in Fig. 9. The cam 61 preferably operates with a quick, kicking action and causes the end of the tube to ride up onto the chamfered edge of the seat 34 so as to properly direct the tube into the seat. For this purpose the plunger 62 operates through an opening 63 (Fig. 6) in the web 46 and engages against the metal end closure C of the mailing tube B.

The plunger 62 is secured in the free end of a lever 64 which is mounted on a pivot screw 65 in a lug 66 on the upright web 46. Intermediate its length the lever 64 is provided with a pin 67 which rides on the face cam 61 to effect the movement of the plunger 62. The pin 67 is yieldably held in contact with the cam by a spring 68 which surrounds a stud 69 which extends through a clearance slot in the lever and is threaded engaged in the web 46.

With the mailing tube B in the position shown in Fig. 9, the rolled-up booklet A on the mandrel 21 is ready to be inserted into the tube. This operation is effected manually by a pusher collar 71 (Fig. 6) which surrounds and is slidably mounted on the mandrel 21 in a normal position adjacent the handle 23 of the mailing tube as shown in Fig. 6. The pusher collar 71 operates inside of the guide cylinder 31 and occupies substantially the full space between the mandrel and the cylinder. The pusher is operated by a handle or knob 72 provided with a threaded shank 73 which extends through an elongated clearance slot 74 in the top of the guide cylinder 31 and is threaded into the collar. The slot 74 extends substantially the full length of the mandrel 21.

With a lateral movement of the pusher collar 71 toward the left, from its position shown in Fig. 6, through the position shown in Fig. 9 and into the position shown in Fig. 10, the booklet A rolled up on the mandrel 21 is stripped off endwise and fully inserted into the mailing tube B through the open end of the tube. As the pusher collar approaches the position shown in Fig. 10, the leading end of the rolled-up booklet engages against the metal end closure C of the tube B and thereby pushes the tube back, out of the recessed seat 34 of the cylinder 31 and leaves the fully loaded tube free on the tracks 55, 56 and still in the pockets 57 of the tracks. The pusher collar 71, having completed its operation is returned to its original position as shown in Fig. 6 for a repeat operation on the next booklet.

With the rolled-up booklet A full stuffed into its mailing tube ready for sealing and alignment, the loaded tube is discharged from its trapped position in the pockets 57 of the tracks 55, 56. This discharge of the loaded tube B is effected near the end of the cycle of operation of the handle 43 and is brought about by a pair of discharge fingers 76 (Figs. 1, 3 and 4) which rotate with and are mounted on the operating shaft 44 in a location between the tracks 55, 56. The fingers 76 rotate in a counterclockwise direction as viewed in Fig. 3 and sweep up behind a mailing tube B in the track pockets 57 and push the loaded tube out of the pockets at the proper time and start the tube rolling along the tracks 55, 56 to any suitable place of deposit for subsequent sealing of the open end of the loaded tube. This completes the cycle of operation of the machine and returns the handle 43 into a locked position for a repeat operation on the next booklet A on the table 36.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

A machine for packaging flat flexible articles in tubular containers, comprising a mandrel having a longitudinal channel of predetermined width and depth formed therein, a cylindrical guide substantially surrounding and spaced from the surface of said mandrel, the internal diameter of said guide being substantially the same as the internal diameter of said container and the wall of said guide having a longitudinal slot formed therein alignable with said channel and not less in width and length than the thickness and width, respectively, of said article, means for aligning the open side of said channel with said slot to receive and engage the leading edge of said flexible article inserted through said slot and into said channel with said edge in gauging abutment against the bottom of said channel, means for rotating said mandrel to roll said engaged flexible article around its outer surface and in a single spiral formation within said cylindrical guide, means for feeding a said container including a pocket adjacent an open end of said guide for receiving and temporarily holding a said container in endwise alignment with said container, guide container holding means at the open end of the guide cylinder including a recessed seat in one end of said cylinder having internal dimensions substantially the same as the external dimensions of the open end of said container, said seat terminating outwardly in a chamfered edge, said holding means also including container pushing means disposed adjacent said pocket for pushing said container endwise past said chamfered edge to round up said open end of the container and said seat to align said end with said guide cylinder and the rolled-up article therein, article pushing means for transferring said rolled article axially from said mandrel into said held tubular container, said article pushing means also acting through said article to strip said container from said recessed seat and return it to said pocket, discharge means disposed adjacent said pocket for raising and ejecting said filled container from said pocket, and means for actuating said mandrel, said container pushing means and said discharge means in timed relation.

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