Feb. 9, 1954 H. J. WOLFE 2,668,675

WINDING MACHINE

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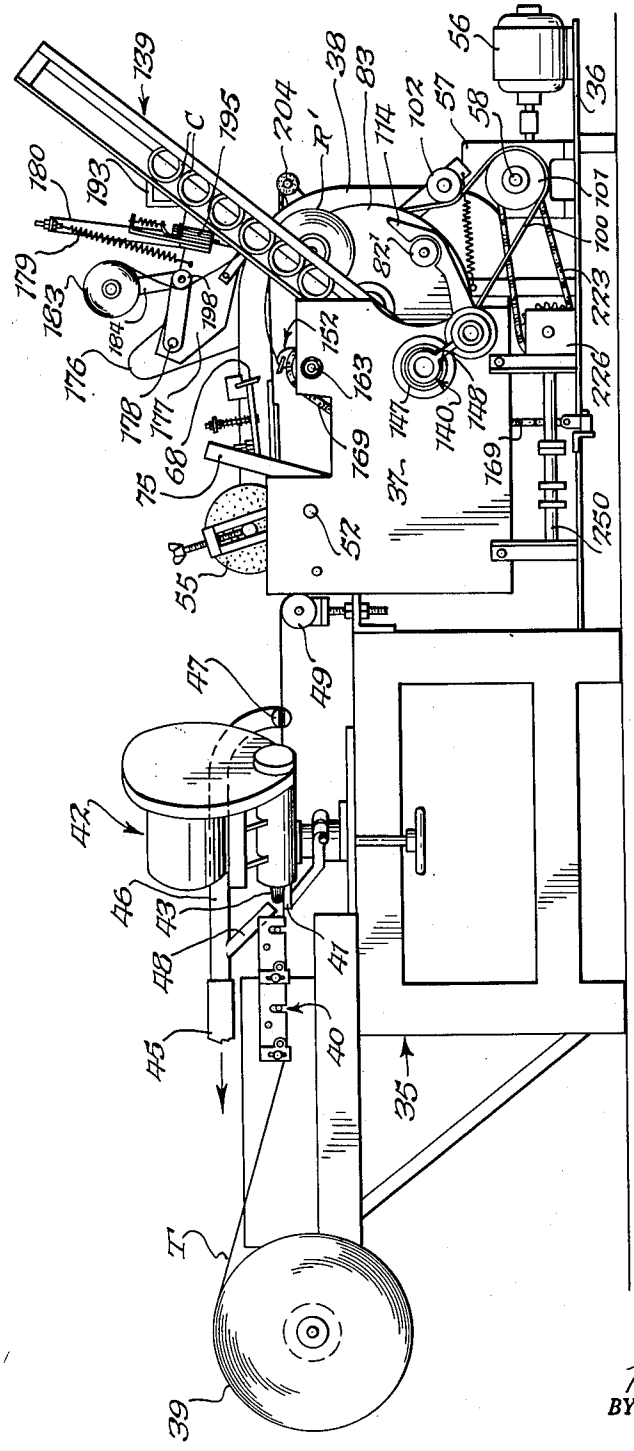

Fig. 1.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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Fig. 3.

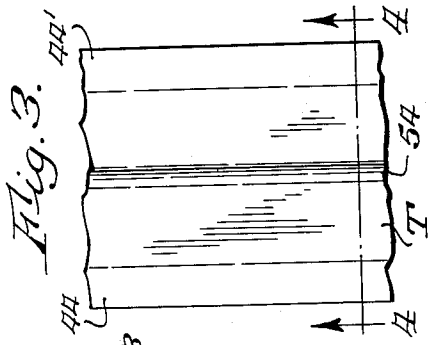

Fig. 4.

Fig. 2.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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Fig. 5.

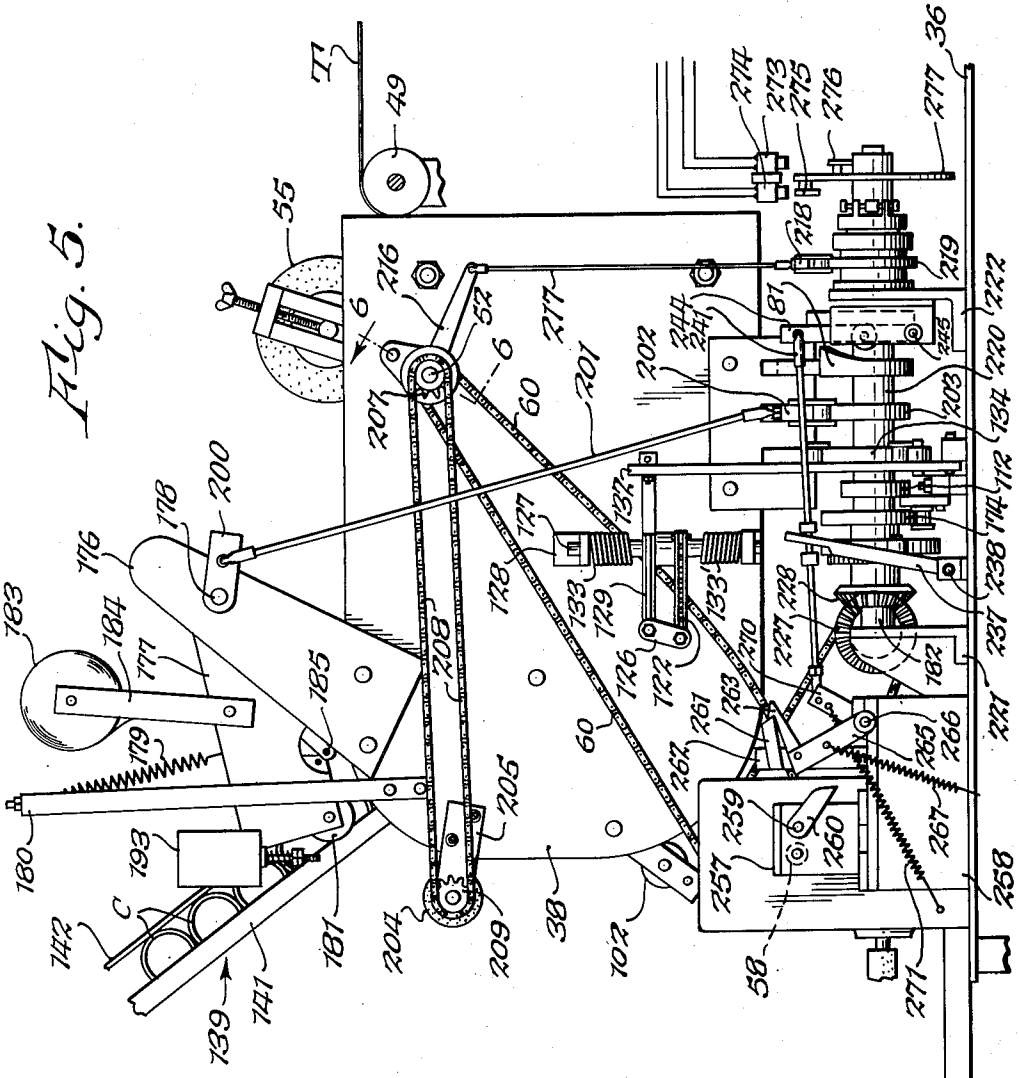
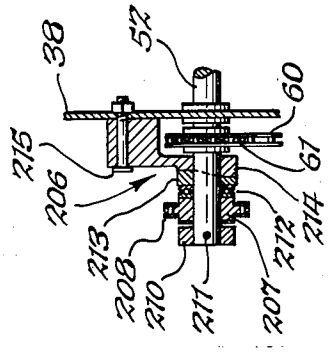


Fig. 6.



INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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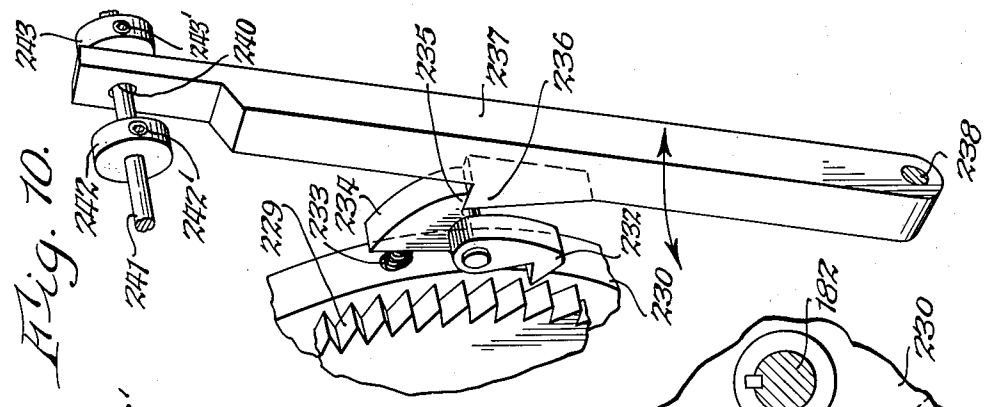

Fig. 10.

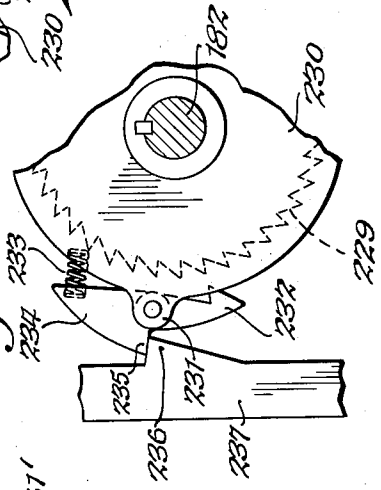

Fig. 11.

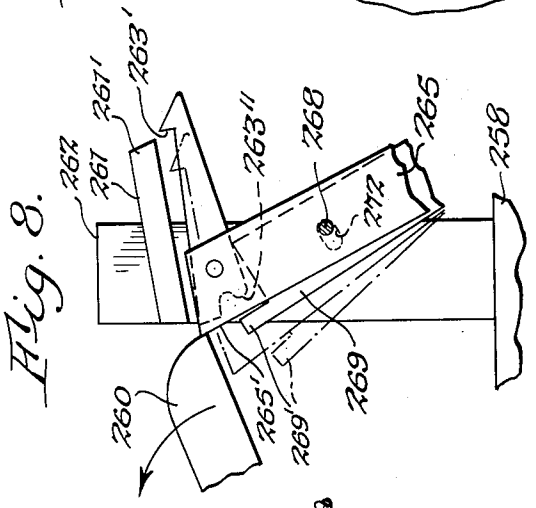

Fig. 8.

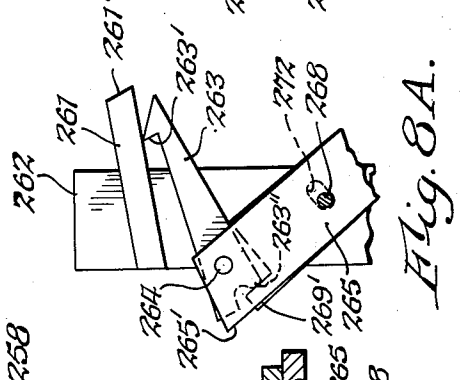

Fig. 8A.

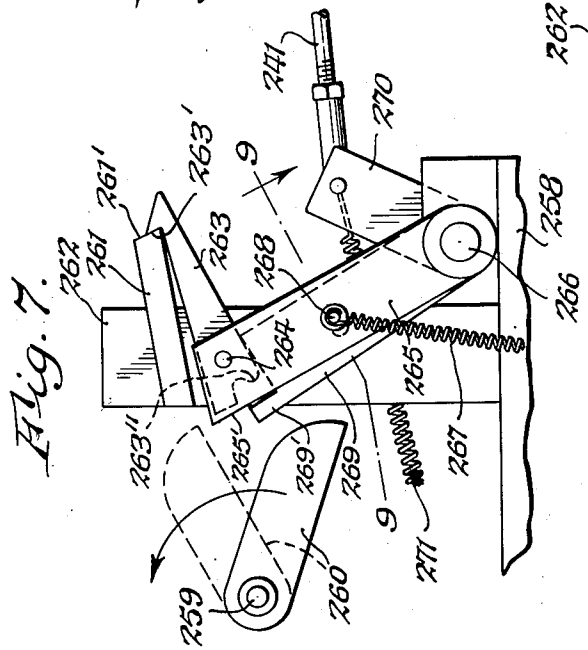

Fig. 7.

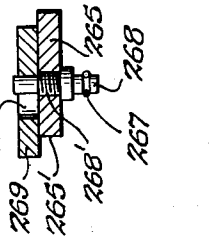

Fig. 9.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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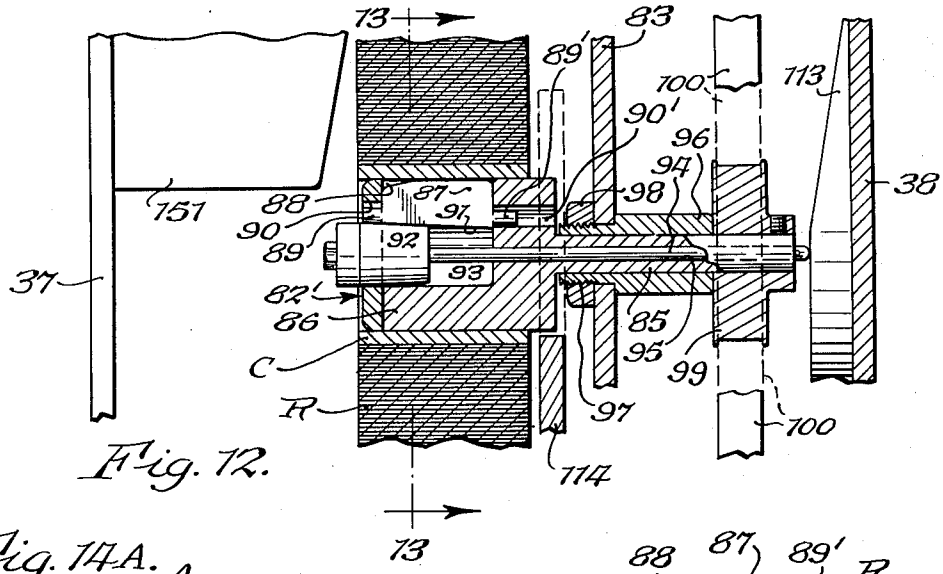


Fig. 12.

Fig. 14A.

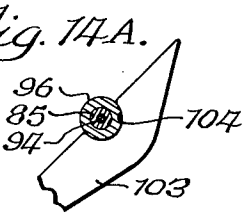
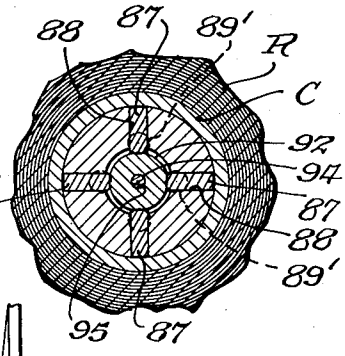


Fig. 13.



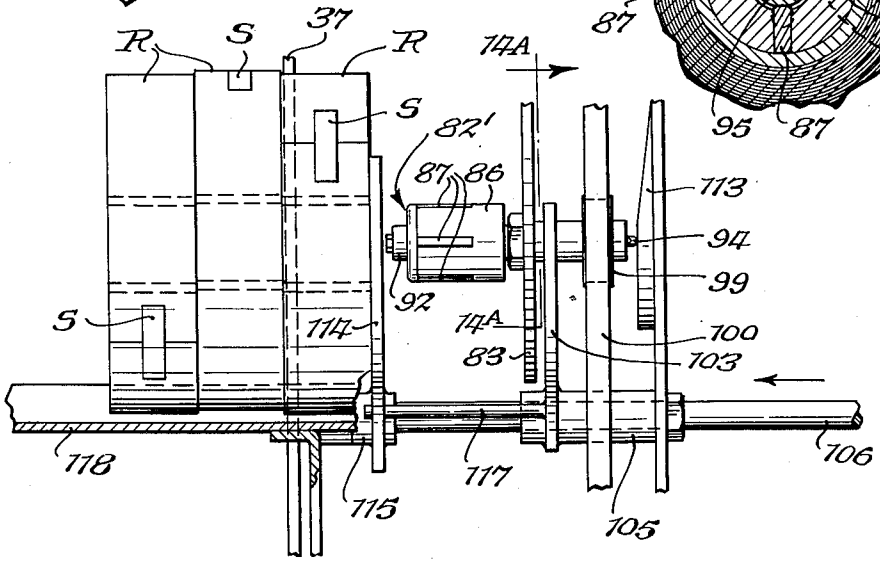


Fig. 14.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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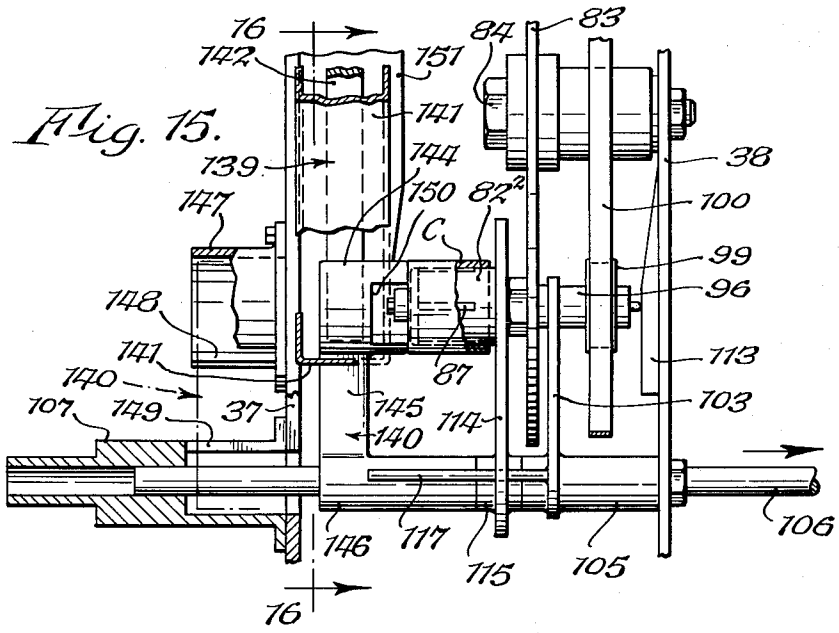
Fig. 15.



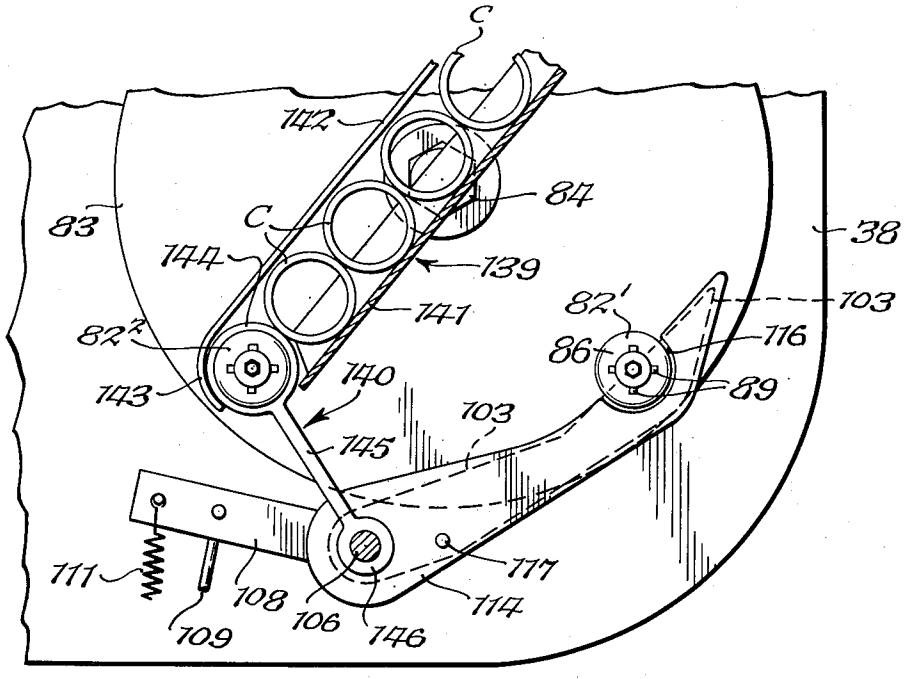


Fig. 16.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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Fig. 17.

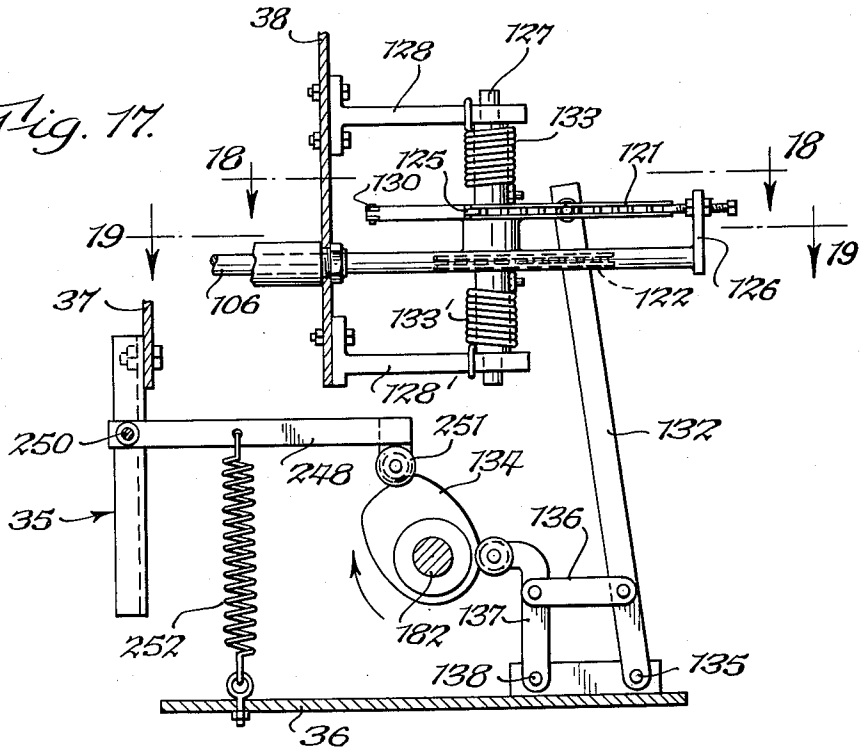


Fig. 18.

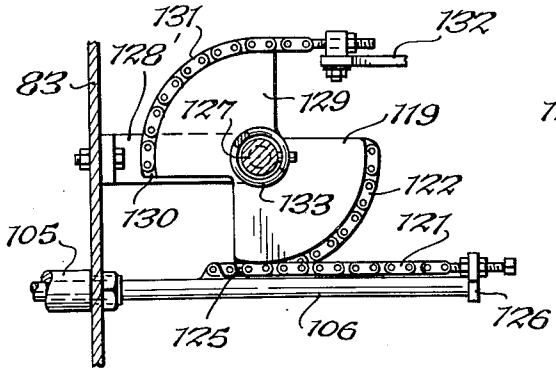
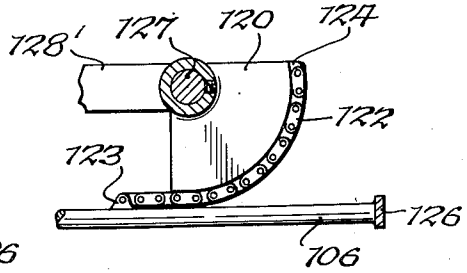


Fig. 19.



INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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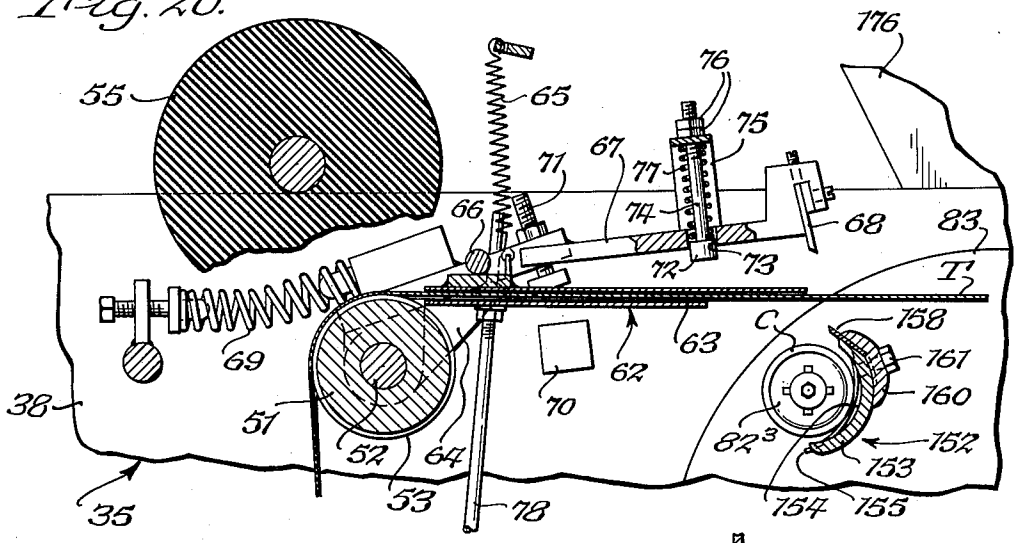
Fig. 20.



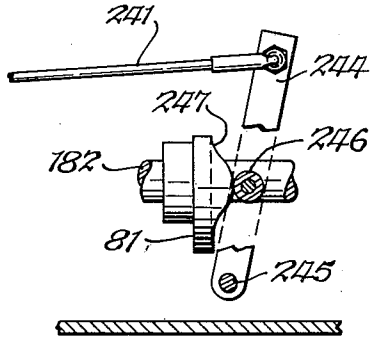


Fig. 22.

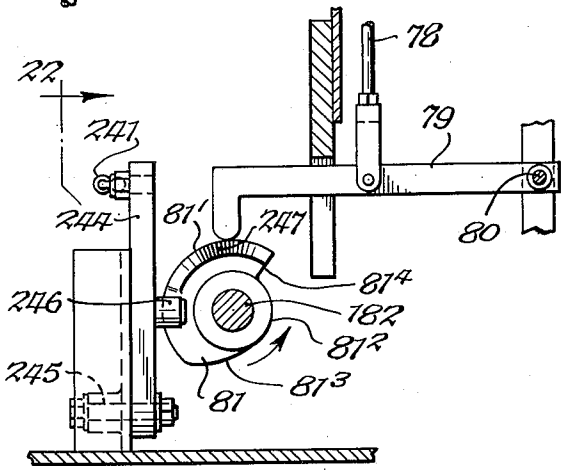


Fig. 21.

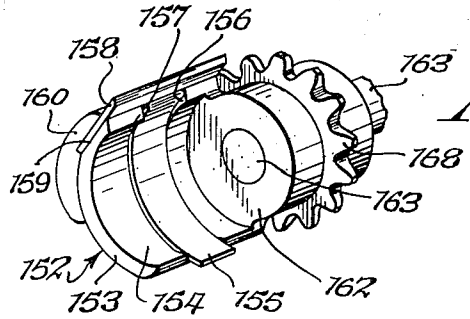


Fig. 23.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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Fig. 24.

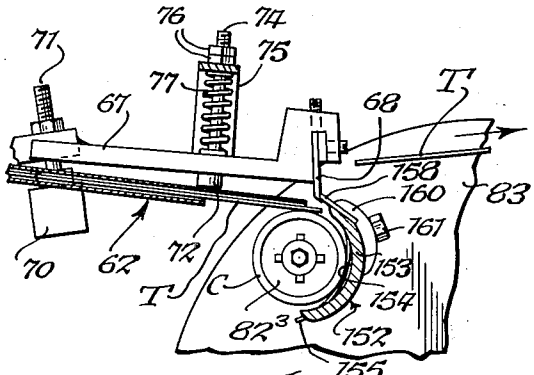
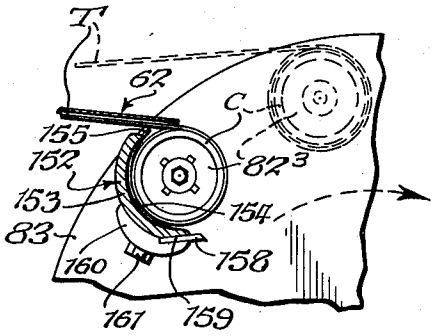


Fig. 25.



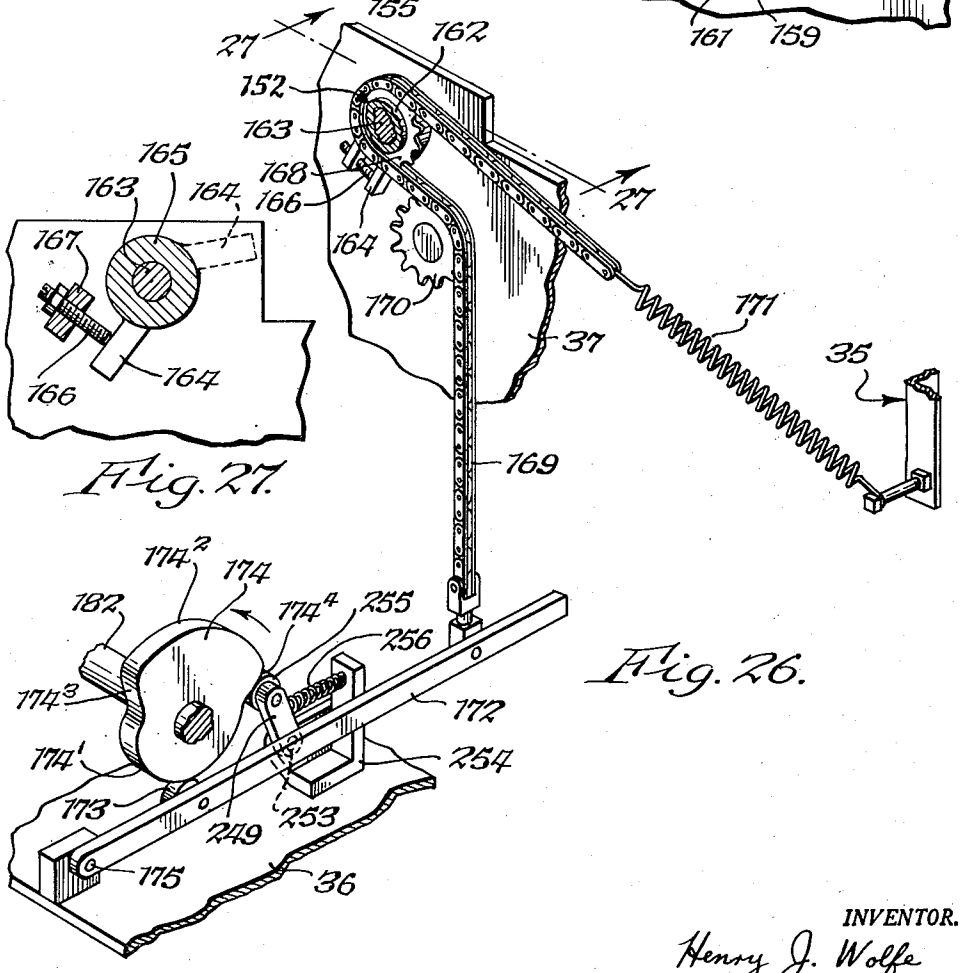


Fig. 27.

Fig. 26.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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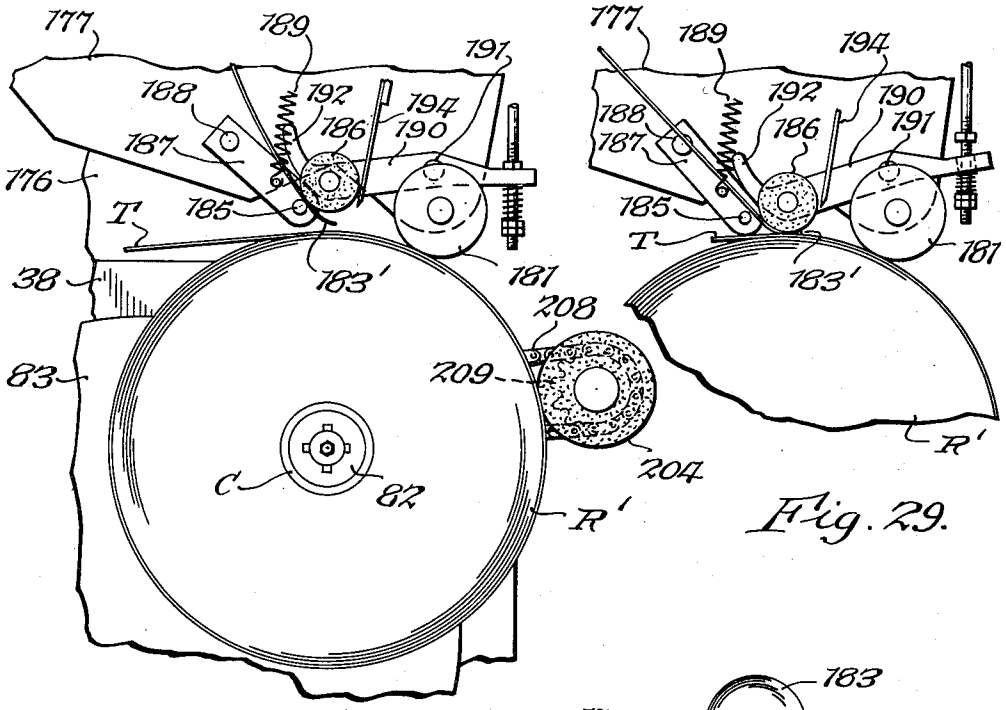

Fig. 28.

Fig. 29.

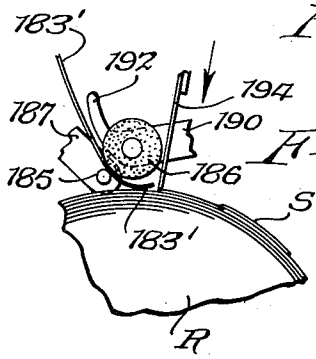

Fig. 31.

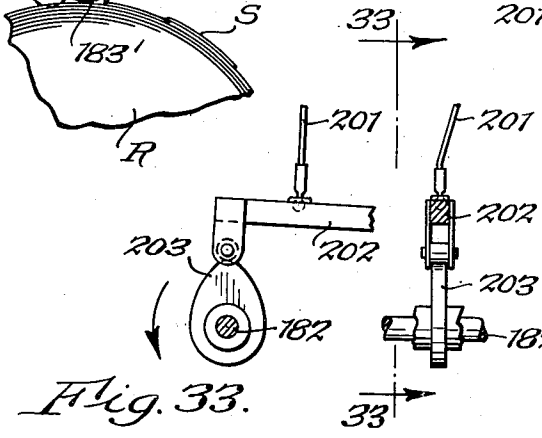

Fig. 33.

Fig. 32.

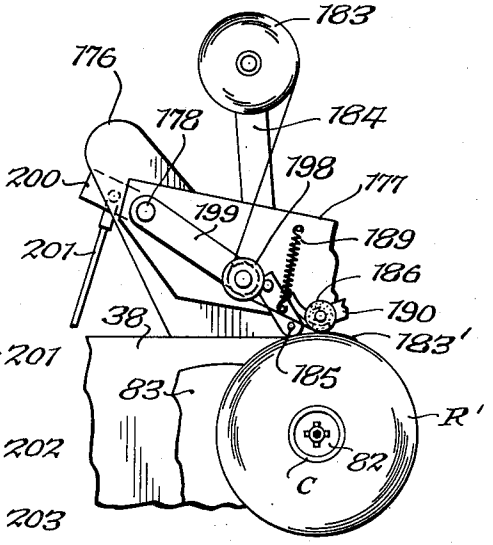

Fig. 30.

INVENTOR.
Henry J. Wolfe
BY
Popp and Popp
Attorneys.

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UNITED STATES PATENT OFFICE

2,668,675

WINDING MACHINE

Henry J. Wolfe, Akron, N. Y., assignor to National Gypsum Company, Clarence Center, N. Y., a corporation of New York

Application August 6, 1948, Serial No. 42,829

6 Claims. (Cl. 242—56)

1

This invention relates to improvements in winding machines, and more particularly to machines of the type adapted to convert a continuously traveling strip or web into a plurality of relatively small consumer rolls.

The primary object of the invention is to provide a machine which automatically forms a web into a succession of individual rolls, each of which has a predetermined length of web wound tightly around a core with no attachment of the inner or leading end of the web to the core and with the outer or trailing end of the web secured to the roll by a strip of gummed tape.

Another object is to provide such a machine in which the means or instrumentalities employed to perform the various functions required to produce such individual rolls automatically, successively and without interruption between the production of successive rolls, are relatively simple.

To these various primary ends, and others hereinafter appearing, the invention further contemplates the provision of certain novel structural and mechanical features and combinations hereinafter described and illustrated in the attached drawings constituting one form of the invention as reduced to practice.

While there is no intention of restricting the present invention to the processing or handling of any specific type of web material, the embodiment disclosed is particularly adapted to the processing of a relatively stiff paper tape such as is used in tape joint systems. The so-called tape joint system for concealing joints of gypsum wallboard to produce smooth, seamless walls and ceilings ready for decoration is a widely used practice. In such a tape joint system it is the practice to fill the joint between boards with a cement, press a paper tape which usually has a perforated design into the cement and allow the cement to dry. Thereafter a second coat of cement is applied to conceal the tape and is usually sanded after thoroughly drying to provide an inconspicuous joint.

In the attached drawings:

Fig. 1 is an elevational view of the right side of a machine embodying the present invention.

Fig. 2 is a fragmentary vertical longitudinal sectional view, on an enlarged scale, through the front part of the machine shown in Fig. 1, the right frame plate being removed.

Fig. 3 is a top plan view of a fragment of paper tape processed on the machine illustrated in the drawings.

Fig. 4 is a transverse sectional view of the paper tape, taken on line 4—4, Fig. 3.

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Fig. 5 is a fragmentary elevational view, on an enlarged scale, of the left side of the front part of the machine shown in Fig. 1.

Fig. 6 is a frgamentary sectional view, on a slightly enlarged scale, taken on line 6—6, Fig. 5.

Fig. 7 is a fragmentary elevational view, on an enlarged scale, of the latch device illustrated at the lower left of Fig. 5 for actuating a one revolution clutch, such device being shown in a latched condition in Fig. 7.

Fig. 8 is a fragmentary view similar to Fig. 7 and showing the latch device in an unlatched condition.

Fig. 8A is a fragmentary view similar to Fig. 8 and illustrating the condition of the latch device immediately prior to relatching.

Fig. 9 is a sectional view taken on line 9—9, Fig. 7.

Fig. 10 is a fragmentary perspective view looking toward the rear of the machine of the one revolution clutch and associated parts and actuated by the cam latch device illustrated in Figs. 7 and 8, this clutch being shown in a disengaged or inoperative condition.

Fig. 11 is a fragmentary end elevational view of the device shown in Fig. 10, taken from the far side of the device as viewed in Fig. 10.

Fig. 12 is a fragmentary sectional view taken transversely of the machine looking toward the rear thereof and centrally longitudinally through one of the mandrels around which a roll of tape is wound and showing this mandrel associated with devices which operate the mandrel, the mandrel being shown in its radially contracted or released condition immediately prior to the removal of a fully wound roll therefrom.

Fig. 13 is a fragmentary vertical sectional view taken on line 13—13, Fig. 12.

Fig. 14 is a fragmentary elevational view similar to Fig. 12 but on a slightly smaller scale and showing particularly the device for removing a fully wound tape roll from the mandrel shown in Fig. 12, such device being illustrated in its operative position after having removed a roll from the mandrel but before the device has returned to its normally inoperative position.

Fig. 14A is a fragmentary vertical sectional view taken on line 14A—14A, Fig. 14.

Fig. 15 is a fragmentary elevational view similar to Fig. 14 with some parts removed and showing in partial section the device for applying a core on a mandrel.

Fig. 16 is a fragmentary vertical sectional view taken on line 16—16, Fig. 15.

Fig. 17 is a fragmentary sectional view taken transversely of the machine looking toward the

rear thereof and showing in elevation the device for actuating the roll removing and core applying devices illustrated in Figs. 14, 15 and 16.

Figs. 18 and 19 are fragmentary horizontal sectional views taken on lines 18—18 and 19—19, respectively in Fig. 17.

Fig. 20 is a fragmentary longitudinal sectional view, on an enlarged scale, through the paper tape guide press and cut off devices illustrated at the upper left of Fig. 2, the guide press device being shown in its normal position for guiding the tape to the upper front mandrel as shown in Fig. 2 and the cut off device being shown in its normally inoperative condition.

Fig. 21 is a fragmentary vertical transverse sectional view, on the same scale as used in Fig. 20, and showing the mechanism for actuating the guide press and cut off devices illustrated in Fig. 20, this view being taken on line 21—21, Fig. 2.

Fig. 22 is a fragmentary sectional view taken generally along line 22—22, Fig. 21 and showing a slightly varied relative position of certain parts.

Fig. 23 is a fragmentary perspective elevational view of the tape guard illustrated in Fig. 20 for initially guiding the leading end of the severed tape around a mandrel, this perspective viewing the tape guard from the left side of the machine and looking toward the front thereof.

Fig. 24 is a fragmentary view similar to Fig. 20, on a reduced scale, and showing the conditions of the tape guide press and cut off devices immediately following the severing of the tape.

Fig. 25 is a fragmentary view similar to Fig. 24 and illustrating the cooperative relation of the tape guide press and tape guard in initiating the formation of a new roll of tape on a mandrel.

Fig. 26 is a fragmentary perspective elevational view taken from the same direction as employed in the perspective view of the tape guard illustrated in Fig. 23 and showing the mechanism for actuating this tape guard.

Fig. 27 is a slightly enlarged fragmentary vertical sectional view taken on line 27—27, Fig. 26.

Fig. 28 is a fragmentary elevational view, on an enlarged scale, of the gummed tape applying device illustrated at the upper right of Fig. 2, such device being shown in its condition shortly before being operated to apply a strip of gummed tape to a fully wound roll of paper tape.

Fig. 29 is a fragmentary elevational view similar to Fig. 28 and showing the condition of the gummed tape applying device during its initial operation.

Fig. 30 is a fragmentary elevational view similar to Fig. 29, on a slightly reduced scale, and showing the gummed tape applying device in a slightly advanced stage of operation and particularly illustrating the operation of a gummed tape slacking device operatively associated with the gummed tape applying device.

Fig. 31 is a fragmentary elevational view similar to Fig. 28 and illustrating the operation of the gummed tape applying device in severing the gummed tape.

Fig. 32 is a fragmentary side elevational view of the lower part of the actuating device for the gummed tape slacking device, this view being taken from the right side of the machine and this view also being complementary to Fig. 30.

Fig. 33 is a sectional view taken on line 33—33, Fig. 32.

The illustrated embodiment of the present invention includes a frame 35 having a bed plate 36 at the front end of the machine and two transversely spaced parallel upstanding frame plates arranged above the bed plate 36, the right frame plate being represented by the numeral 37 and the left frame plate by the numeral 38.

The paper tape T to be wound into individual consumer rolls is obtained from a large supply roll 39 suitably mounted on the rear of the machine so as to rotate about a horizontal axis. A suitable brake device (not shown) is preferably operatively associated with the tape supply roll 39 so that a drag is placed on the tape T pulled from this roll. The tape T is pulled toward the front of the machine through any suitable tensioning device 40, such device being shown as comprising a series of vertically staggered horizontal rods spaced longitudinally of the machine and mounted on the frame 35 and alternately over and under which the forwardly moving tape T passes.

After leaving the tensioning device 40 the tape T slides over a supporting base 41 provided on the frame. An adjustable electrically driven skiver 42 is angularly arranged on the frame 35 on each side of the tape T so that the milling cutter 43 of each skiver engages a marginal portion of the upper surface of the tape T to shave or skive the tape. In this manner the tape T is continuously tapered along its opposite longitudinal marginal portions, as represented at 44 and 44' in Figs. 3 and 4, so that the edges will be thinner than the middle portion of the tape and hence when applied over a wallboard joint the marginal portions 44 and 44' tend to taper into the wallboard. If it is desired to leave the tape T unskived, the skivers 42 are vertically adjusted in order to raise their milling cutters 43 out of engagement with the tape passing over the supporting base 41 and the skivers are not electrically driven.

When the skivers 42 are being operated to taper the edges of the tape T it is preferred to remove the paper dust which results from the skiving of the tape. To this end, as shown in Fig. 1, a suction manifold 45 is arranged above the tape T and has a duct or tube 46 which extends longitudinally of the machine to a point in advance of the skivers 42 where this tube turns downwardly toward the tape T, the forward extremity of this tube being formed with a split suction nozzle 47, through which the tape passes so as to remove paper dust from all sides of the tape. The principal amount of skiving dust is removed by a pair of branch ducts or tubes 48, each of which extends downwardly from the tube 46 toward one of the milling cutters 43 and terminating immediately adjacent the respective milling cutters. In this manner, the tape T is left clean of paper dust after being skived.

The forwardly moving tape T then passes over a crowned roller 49, thence downwardly and under a guide roller 50, and thence upwardly and over a drive roller 51 fast to a shaft 52 (Fig. 2). Each of these rollers 49, 50 and 51 is suitably mounted on the frame 35 so as to be rotatable about a horizontal axis extending transversely of the machine. The periphery of the drive roller 51 is shown as being formed with an outwardly projecting and circumferentially continuous central ridge 53 which impresses a continuous longitudinal groove 54 (Figs. 3 and 4) centrally in the tape T passing thereover, an adjustable rubber back-up roller 55 pressing the tape T against the ridged drive roller 51. The interposition of the tape T between the rollers 51 and 55 with the roller 51 being driven serves to unwind or pull the tape off the tape supply roll 39 and feed the tape at a predetermined

lineal speed. The paper tape T is preferably provided with the groove 54 so that the tape can be readily folded along a straight line when used to cover inside or outside corners on walls and the like. If it is not desired to so groove the tape T, a drive roller similar to the roller 51 but unprovided with the tape grooving ridge 53 is employed in place of the roller 51.

The ridged drive roller 51 is driven by means which are shown as comprising an electric motor 56 drivingly coupled to a gear reducer 57 of any suitable conventional type, this motor and gear reducer being arranged on the bed plate 36 at the front of the machine as shown in Fig. 1. The gear reducer 57 is shown as having a horizontal low speed output shaft 58 extending transversely of the machine with a sprocket 59 (Fig. 2) fast to this shaft and driving a chain 60 which passes around a driven sprocket 61 fast to the end of the shaft 52 on the exterior of the left frame plate 38 (Figs. 5 and 6), the ridged drive roller 51 being mounted on this shaft 52.

After passing over the ridged drive roller 51 the tape T passes through a guide press 62 which is pivotally mounted on the transverse shaft 52 and arranged on the forward side thereof. As best shown in Fig. 20, this guide press 62 has a slot or channel 63 in which the tape T is arranged in order to guide the tape in its forward movement therethrough. A bracket 64 pivotally mounted on the shaft 52 carries the guide press 62 which is normally maintained in a substantially horizontal position by a spring 65 suitably connected to the frame 35, this spring 65 urging the bracket 64 against a stop 66 fixed to the frame (Figs. 2 and 20).

Also pivotally mounted on the transverse shaft 52 is a forwardly projecting arm 67 which carries a removable and adjustable knife blade 68 on its forward extremity (Figs. 2 and 20), the cutting edge of this knife blade extending transversely of and normally arranged above the tape T. A compression spring 69 operatively arranged between the frame 35 and the arm 67 urges this arm to rotate about the axis of the transverse shaft 52 so as to move the knife blade downwardly toward the tape T. A knife arm stop 70 is arranged on the frame 35 and is adapted to be engaged by the head of an adjustable screw 71 carried by the arm 67 thereby to limit the downward movement of the knife blade 68.

The knife blade 68 during its descent passes the forward end of the guide press 62. The knife arm 67 intermediate its ends carries a yieldable striker 72 so that the operative lower end of this striker is adapted to engage the guide press 62 and push it downwardly (Figs. 20 and 24). To this end, the striker 72 is shown as being slidably arranged in a hole 73 provided in the knife arm 67 and having a shank 74 slidably arranged in a hole provided in the intermediate cross part of an inverted U-shaped support 75 upstanding from and suitably secured to the knife arm. The upper end of the striker shank 74 is threaded to receive nuts 76 engageable with the support 75 thereby to limit the downward travel of the striker relative to the knife arm 67 and a helical compression spring 77 surrounding the shank 74 and bearing against the striker head 72 at one end and at its other end bearing against the support 75 serves constantly to urge the striker to its extreme downwardly protruding position as shown in Fig. 20.

The knife arm 67 is normally held in a position in which the knife blade 68 is in an elevated inoperative position as shown in Figs. 2 and 20 by a lift rod 78 which has its upper end operatively connected to the arm 67 and has its lower end pivotally connected to a cam lever 79 (Figs. 2, 20 and 21). Referring to Fig. 21, this cam lever 79 extends transversely of the machine and is pivotally mounted at 80 on the frame 35 on the right hand side of the machine and has its operative end riding on a cam 81. This cam 81 is operatively arranged on a cam shaft 82 which extends longitudinally of the machine on the left side thereof for rotation in the direction of the arrow shown in Fig. 21. The periphery of the cam 81 is formed to provide a radially salient portion 81^1 concentric with the axis of the shaft 82, a second concentric portion 81^2 of shorter radius on the side of the shaft 82 opposite to the portion 81^1, a rising portion 81^3 of progressively increasing radius connecting the corresponding ends of the portions 81^1 and 81^2, and a radial portion 81^4 connecting the other corresponding ends of these portions 81^1 and 81^2. When the cam 81 is rotated in the direction of the arrow shown in Fig. 21, the end of the cam lever 79 engaging the cam 81 will ride off the cam portion 81^1 and since the lift rod 78 is then not supported the spring 69 (Fig. 20) expands to swing the knife arm 67 downwardly until the screw 71 engages the stop 70 (Fig. 24). As the cam 81 is further rotated in the direction of the arrow shown in Fig. 21, the operative end of the cam lever 79 engages the rising peripheral portion 81^3 so as to lift this cam lever which in turn lifts the lift rod 78 and which in turn swings the knife arm 67 upwardly to its normal inoperative position (Fig. 20) against the urging of the spring 69.

When the striker 72 pushes the guide press 62 downwardly, this movement of the guide press is against the urging of the return spring 65 so that when the guide press is free to swing upwardly it is pulled upwardly by this spring until the guide press engages the stop 66.

Referring again to the tape T, the same is shown in Figs. 1 and 2 as being wound around a cardboard core C arranged on a mandrel 82 which is one of a series of identical mandrels, the others being identified as 82', 82^2, and 82^3. These mandrels 82, 82', 82^2 and 82^3 are mounted on a mandrel support or turret 83 which is movable so as to move each of these mandrels successively through core loading, roll starting, roll winding and roll unloading stations. As shown in Fig. 2, mandrel 82^2 is in the core loading station, mandrel 82^3 in the roll starting station, mandrel 82 in the roll winding station and mandrel 82' in the roll unloading station. The turret 83 is shown in the form of a disk plate vertically arranged between the frame plates 37 and 38 and suitably rotatably mounted on a pintle 84 projecting horizontally inwardly from the left frame plate 38 (Figs. 1, 2, 12 and 14–16). The mandrels 82, 82', 82^2 and 82^3 are horizontally arranged on the same side of the turret 83 for rotation about their respective axes and are equally spaced radially and circumferentially about the axis of the pintle 84. Thus these mandrels project laterally from one side of the turret 83 and are individually rotatably mounted thereon.

Referring particularly to Figs. 12 and 13, the mandrel 82' which is representative of each mandrel is shown as comprising a shaft member 85 enlarged at one end to provide a cylindrical mandrel head 86. This mandrel head 86 forms a housing for a series of radially movable and

similar jaws 87, four of these jaws being shown. Each jaw 87 is in the form of a flat blade slidably mounted in a radial slot 88 provided in the mandrel head 86 and limited as to radially outward movement by projecting pins 89 and 89' arranged in enlarged holes 90 and 90', respectively, provided in the mandrel head. The outer corner of each jaw 87 is preferably smoothly beveled and the inner edge 91 of each jaw is tapered radially inwardly of the mandrel head 86. The inner tapered edges 91 of the jaws 87 engage a frusto-conical wedge 92 reciprocably arranged in a cylindrical recess 93 provided in the mandrel head 86. This wedge 92 is secured to one end of an operating rod 94 which is slidably arranged in a bore 95 provided centrally through the shaft member 85. The operating rod 94 extends completely through the bore 95 so that the free end of this rod can project from the shaft member 85 as shown in Fig. 12.

As illustrated in Fig. 2, the mandrel 82' at the roll unloading station carries a consumer roll R of paper tape tightly wrapped around one of the cardboard cores C. In Fig. 12, the condition of the mandrel 82' is illustrated immediately prior to the removal of the roll R therefrom. In this condition, the jaws 87 are radially retracted within the mandrel head 86 so that the outer edges of these jaws do not project beyond the periphery of the mandrel head, and hence do not clutch the core C.

In order to mount each mandrel on the turret 83, the shaft member 85 is shown in Fig. 12 as being rotatably arranged in the bore of a sleeve bearing 96 one end of which is of reduced external diameter, to provide a neck 97 projecting through a hole in the turret 83. The outer end of the neck 97 is externally threaded to receive a nut 98 which clamps the turret 83 against the shoulder on the sleeve bearing 96 formed by this neck. A pulley 99 is fast to the outboard end of the mandrel shaft member 85.

The mandrels 82^3, 82 and 82^2 which are illustrated in Fig. 2 at the core loading, roll starting and roll winding stations, respectively, are shown as being rotated in a clockwise direction about their respective axes whereas the mandrel 82' in the roll unloading station is not rotated. This is accomplished by a flat belt 100 passing around the respective pulleys 99 for the mandrels 82^2, 82^3 and 82 and which also passes around a drive pulley 101 fast to the shaft 58 of the gear reducer 57 (Fig. 2). A spring loaded belt tightener 102 engages the belt 100 and maintains the same tight at all times.

If the turret 83 were not restrained, it would rotate continuously about the axis of its pivot 84 by reason of the belt 100 driving the mandrel pulleys 99 and particularly if any of these pulleys engaged by the belt resisted rotation. In order to maintain the turret 83 stationary while the tape T is wound around the core C on the upper front mandrel 82, a turret stop arm 103 (Figs. 14, 14A, 15 and 16) is oscillatably mounted on the machine frame 35 and has its free end formed to provide a semi-circular socket 104 adapted to engage the bearing sleeve 96 (Fig. 14A) of each of the mandrels when in the lower front mandrel position. The hub 105 (Figs. 14 and 15) of the turret stop arm 103 is rotatably mounted on a rod 106 which extends horizontally transversely of the machine and is longitudinally slidably mounted on the left frame plate 38 and also in an outboard bearing 107 on the right frame plate 37. The rod 106 is slidable in the hub 105 of the turret stop arm 103 so that the latter moves in a plane spaced a fixed distance from the turret 83. The turret stop arm 103 is actuated by a rock arm 108 connected to the hub 105 and a shipper rod 109 connects this rock arm with a cam lever 110. A tension spring 111 operatively connects the rock arm 108 with the frame 35 and constantly urges the turret stop arm 103 to rotate on the rod 106 in a direction to effect engagement with one of the mandrel bearing sleeves 96. The cam lever 110 extends transversely of the machine and has one end pivoted on the right side of the frame 35 and its opposite end extends over and engages a cam 112 mounted on the cam shaft 182 (Fig. 2). The cam 112 is so formed that upon its rotation it raises the cam lever 110 thereby lifting the shipper rod 109 and swinging the turret stop arm 103 out of engagement with a mandrel sleeve bearing 96 and permitting the turret 83 to rotate in a clockwise direction as viewed in Figs. 1, 2 and 16.

The lineal speed of the belt 100 is such that it tends to rotate the pulleys 99 on the mandrels 82^2, 82^3 and 82 so that the peripheral speed of the tape T being wound around the upper front mandrel 82 is faster than the feed of this tape. Thus the tape T is tensioned to wind a tight roll and the turret 83 will rotate about its pivot 84 when the turret stop arm 103 releases it to do so. However, while the turret stop arm 103 is in its operative position the turret 83 cannot so rotate and the belt 100 rotates the mandrels 82^2, 82^3 and 82 about their respective axes. As the roll of tape being wound around the upper front mandrel 82 increases in diameter, the belt 100 slips on the pulley 99 for this mandrel so as to maintain tension in the tape T but insufficient tension to rupture the tape.

When the core C on the upper front mandrel 82 has a predetermined length of tape T wound around it, the turret stop arm 103 is actuated to release the turret 83 and the mandrel 82 is moved to the lower front mandrel position or roll unloading station. As the mandrel 82 is so lowered the free end of the operating rod 94 of this mandrel engages a stationary cam 113 on the inner side of the left frame plate 38 in the manner illustrated for the mandrel 82' in Figs. 12, 14 and 15. The stationary cam 113 is formed with a projecting face engageable with the end of the operating rod 94 to cause the wedge 92 to move out of the recess 93 in the mandrel head 86 and hence permit the mandrel jaws 87 which were clutching the core C of the fully wound roll R to move radially inwardly and thereby drivingly disengage or declutch the roll R (Fig. 12.). It will also be noted that the mandrel in the lower front mandrel position is not rotated since its pulley 99 is not engaged by the belt 100.

Means are provided to remove a roll R from a mandrel at the roll unloading station and after such mandrel has been operated to declutch the core C of such roll. Such means are shown in Figs. 12 and 14–16 as comprising a stripper arm 114 having a hub 115 mounted on the rod 106 to reciprocate with this rod but free to rotate thereon. A semicircular recess 116 is provided on one side of the free end of the stripper arm 114 and is adapted to receive a mandrel head 86 (Fig. 16). The stripper arm 114 is operatively connected with the turret stop arm 103 for rotation therewith by a rod 117 parallel with the operating rod 106. The rod 117 is secured to the turret stop arm 103 and extends through a hole provided in the stripper arm 114 whereby

this stripper arm is slidable on this rod. Normally the stripper arm is in its inoperative position adjacent the turret 83 and on the inner side of the roll R, as shown in Figs. 12 and 15 but is moved to and from its operative position shown in Fig. 14 by the operating rod 106. When the stripper arm 114 is moved to the left as illustrated in Fig. 14, it strips or pushes a roll R from the mandrel. The removed roll R may be deposited in any suitable receiving device 118 (Fig. 14) which is shown as being adapted to support a plurality of such rolls.

The operating rod 106 is shown as reciprocated by pivotally mounted wheel sectors 119 and 120 connected by flexible connectors 121 and 122, respectively, with the operating rod (Figs. 5, 17–19). The wheel sector 120 is arranged in the horizontal plane of the operating rod 106 and its flexible connector 122 which is in the form of a chain is connected at one end to this rod as indicated at 123 and at its opposite end to the remote end of this wheel sector as indicated at 124, the chain 122 being engageable with the periphery of the wheel sector. The wheel sector 119 is arranged above the wheel sector 120 and has its flexible connector 121 which is in the form of a chain connected at one end to this wheel sector as indicated at 125 and at its opposite end with the extremity of an upstanding arm 126 secured to the outer end of the operating rod 106. The wheel sectors 119 and 120 are arranged in this vertically spaced relation on a vertical shaft 127 journaled at its ends in brackets 128 and 128' mounted on the exterior of the left frame plate 38 (Figs. 5 and 17). The shaft 127 to which the wheel sectors 119 and 120 are suitably non-rotatably secured is adapted to be rotated about its own axis by an operating wheel sector 129 connected at 130 to one end of a flexible connector 131 in the form of a chain, the opposite end of this flexible connector or chain 130 being suitably connected to the upper end of a rock lever 132. The rotation of the vertical shaft 127 in a clockwise direction as viewed in Fig. 18 is yieldingly opposed by wind-up springs 133 and 133' operatively interposed between the brackets 128 and 128', respectively, and the shaft 127.

The rock lever 132 is pivotally mounted on the machine frame 35 for movement in a vertical plane extending transversely of the machine. A cam 134 mounted on the cam shaft 82 (Fig. 17) actuates the rock lever 132. Thus the lower end of the rock lever 132 is pivoted on the machine frame as indicated at 135 and this rock lever is connected by a link 136 to a cam lever 137. The cam lever 137 is also pivotally mounted on the machine frame 35 for movement in a plane transverse of the machine, the lower end of this cam lever being pivotally mounted on the machine frame as indicated at 138. The upper and operative end of the cam lever 137 engages the periphery of the cam 134 which is formed with a salient part on one side (Fig. 17).

The operating mechanism for the operating rod 106 is normally arranged in the condition illustrated in Figs. 17–19. Thus the rock lever 132 inclines upwardly and inwardly of the machine, the chains 131 and 122 are wrapped around the peripheries of their respective wheel sectors 129 and 120, and the chain 121 is arranged parallel to the operating rod 106. When the cam 134 rotates in a clockwise direction as viewed in Fig. 17, the salient part thereof swings the cam lever 137 to the right which in turn, through the link 136, also swings the rock lever 132 to the right. Such movement of the rock lever 132 pulls the chain 131 so as to rotate the wheel sectors 129, 119 and 120 in a clockwise direction as viewed in Figs. 18 and 19, and winds up the springs 133 and 133'. This causes the chain 121 to be pulled inwardly of the machine and this chain wraps itself around the periphery of the wheel sector 119 and at the same time pulls the operating lever to the left as viewed in Figs. 17–19. The chain 122 is unwrapped from the wheel sector 120. After the salient part of the cam 134 passes the operative end of the cam lever 137, the springs 133 and 133' unwind so as to rotate the wheel sectors 129, 119 and 120 in a counterclockwise direction as viewed in Figs. 18 and 19 and the chain 122 pulls the operating rod to the right and the chain 131 pulls the upper end of the rock lever 132 to the left as viewed in these figures, the extent of movement of the various parts being limited by engagement of the operative end of the cam lever 137 with the cam 134.

As previously described, when a fully wound consumer roll R is removed from the mandrel in the roll unloading station, the cardboard core C around which the paper tape is wound to form this roll R is also removed from this mandrel. It is therefore necessary to provide means for applying a different core C to such mandrel so that a new tape roll can be subsequently wound around it. Such means are shown as associated with the mandrel in the lower rear mandrel position or core loading station (Fig. 16) and will be described in connection with the mandrel 82^2 although, of course, the same operation is performed on each of the other mandrels 82^3, 82 and 82' when they are brought successively into the core loading station. Such means are shown as including a core magazine 139 and a core loader 140. The core magazine 139 includes an upwardly and forwardly inclined chute 141 and spaced cover plate 142 between which a column of hollow cardboard cores C are arranged with their axes extending horizontally transversely of the machine (Figs. 1 and 16). The core magazine 139 is mounted on the inner side of the right frame plate 37 (Fig. 15) and the lower end of its cover plate 142 is curved as indicated at 143 so as to be concentric with the axis of the mandrel 82^2 (Fig. 16). The curved end 143 serves as a stop against which the lowermost core C of the column of cores in the magazine 139 can rest in a position in coaxial alinement with the mandrel 82^2. The core loader 140 includes a tubular core pusher 144 adapted to engage one end of a core and connected to the upper end of an upwardly and rearwardly inclined arm 145, the opposite or lower end of which is suitably rigidly connected to a hub 146 fast to the operating rod 106 (Figs. 15 and 16). A tubular housing 147 is secured to the exterior of the right frame plate 37 coaxially of the mandrel 82^2 and is provided with a slot 148 in which the core pusher arm 145 is guidingly arranged. A slot 149 is also provided in the outboard bearing 107 for also accommodating this arm 145. When the hub 146 is reciprocated with the operating rod 106, as previously described, the arm 145 and core pusher 144 are reciprocated therewith. The core loader 140 is in its normal position illustrated in Fig. 15 with the core pusher 144 arranged in the bottom of the core magazine 139 with the lowermost core C of the column of cores in the magazine resting against it (Fig. 16). When actuated the core loader 140 moves laterally outwardly of the machine to

the broken line position indicated in Fig. 15. This movement withdraws the core pusher 144 from the core magazine 139 into the housing 147 and permits the column of cores C in this magazine to drop by gravity until the lowermost core rests against the curved end 143. Thereafter the core loader 140 moves to the right as viewed in Fig. 15 whereby the lowermost core C is engaged and pushed by the core pusher 144 onto the mandrel 82^2, the jaws 87 of which are in their radially retracted position so as to permit the mandrel to receive this core. The operative end of the core pusher 144 is provided with a cut out 150 (Fig. 15) on its front and rear sides so as to avoid interference with the protruding wedges 92 of the two lower mandrels when moved by the turret 83. When the turret 83 is rotated the lower rear mandrel with a core C thereon is elevated to the upper rear mandrel position and during such ascent the outer end of the wedge 92 of the mandrel engages a stationary cam 151 (Figs. 12 and 15) arranged on the interior of the right frame plate 37. This stationary cam 151 is formed with a cam face engageable with the outer end of the wedge 92 of each mandrel as such mandrel moves from the lower rear to the upper rear mandrel positions to move the wedge 92 so engaging the cam face inwardly of the respective mandrel head 92 whereby the respective mandrel jaws 87 are forced radially outwardly to clutch or non-rotatably hold the core C to this mandrel. By the time the lower rear mandrel arrives at the upper rear mandrel position the core C on this mandrel is firmly clutched thereby so that the core rotates with the mandrel.

When the tape T being wound up on the upper front mandrel is severed, the leading end of the severed feed tape is immediately caused to be wound around the core C on the mandrel in the upper rear mandrel position or roll starting station. The means for accomplishing this will be described in association with the mandrel 82^3 and the core C thereon (Figs. 2, 20, 24 and 25), although it will be understood that the same operation is performed on each of the other mandrels 82, 82′ and 82^2 when they are brought successively into the roll starting station. Such means are shown as including a movable guard 152 normally embracing the front side of the mandrel 82^3 and core C thereon as shown in Figs. 2, 20 and 24. This movable guard 152 comprises an arcuate body 153 having an inner cylindrical guide face 154, as best shown in Fig. 23, arranged in closely spaced relation and concentric with the periphery of the core C on the mandrel 82^3 to provide a channel into which the leading end of the severed paper tape T can slide between the core periphery and the face 154. In order to yieldingly press the tape against the core the guard 152 carries a spring 155. Referring to Fig. 23, this spring 155 is a curved or bowed leaf arranged in a recess 156 provided centrally in the inner face 154, one end of this leaf spring 155 being suitably anchored in the recess 156 adjacent one edge of the arcuate body 153 as indicated at 157. The opposite end or tail of the leaf spring 155 is free and preferably projects slightly beyond the opposite edge of the arcuate body 153. The leaf spring 155 is formed so that it tends to seek a curvature having a radius greater than that of the face 154 with the result that the intermediate portion of this leaf spring projects from the recess 156 and engages the periphery of the core C as shown in Figs. 20 and 24. The edge of the curved body 153 adjacent which the leaf spring 155 is anchored at 157 carries a knife blade 158 which projects generally tangentially from this edge. This knife blade 158 is shown as being clamped against a flat surface 159 on the exterior of the curved body 153 by a clamping block 160 held by one or more screws 161 screwed into the curved body 153. The knife blade 158 is therefore adjustable and removable. The knife blade 158 cooperates with the movable knife blade 68 to cut the tape T as illustrated in Fig. 24.

One end of the guard 152 is formed to provide an arm 162 which is suitably non-rotatably secured to one end of a rock shaft 163. This rock shaft 163 is suitably journaled on the right frame plate 37 so that its axis is horizontal and extends transversely of the machine. The guard 152 is arranged on the interior of the right frame plate 37 (Fig. 26).

When the upper knife blade 68 drops and cooperates with the lower knife blade 158 to sever the tape T, the tape guide press 62 presses the leading end of the severed tape against the top of the core C on the mandrel 82^3 as illustrated in Fig. 24. Inasmuch as the tape T is continuing to be fed forwardly by the cooperation of the rollers 51 and 55, the leading end of the severed tape is fed into the inlet of the space or channel between the core C on the inner guide face 154 of the guard 152 and advances between the leaf spring 155 and the core, this leaf spring yielding to permit this advance of the tape and at the same time urging the tape against the core. After the leading edge of the severed tape T has been so pressed by the leaf spring 155 against the core C, the guard 152 rotates in a clockwise direction as viewed in Figs. 24 and 25 to the position illustrated in Fig. 25, rotating at a speed such that the tape is constantly advancing slightly relative to the guard 152.

In the fully displaced position of the guard 152 as illustrated in Fig. 25, it will be noted that the unfixed tail of the leaf spring 155 is immediately under the tape T being guided into the nip between the core C and the tape extending thereacross. The guard 152 remains in this fully displaced position on the rear side of the mandrel 82^3 until several convolutions of the tape T have been wrapped around the core C on the mandrel 82^3 after which the turret 83 is rotated so as to move this mandrel with its newly started roll of paper tape forwardly, as illustrated by the broken lines in Fig. 25, to the upper front mandrel position or roll winding station at which the winding is completed. With the guard 152 on the rear side of the mandrel 82^3 (Fig. 25), this mandrel is permitted to be so moved by the turret 83 and after the mandrel 82^3 has left the guard 152 this guard can be rotated back to its original and normal position (Figs. 2, 20 and 24). The rotation back is limited and controlled by a stop lug 164 carried by a collar 165 fast to the rock shaft 163, the stop lug 164 engaging one end of a stop screw 166 adjustably held by a bracket 167 secured to the interior of the right frame plate 37 as illustrated in Fig. 27.

Actuating means are provided to displace and return the guard 152 by rocking the shaft 163 to which the guard arm 162 is secured. Such means are illustrated in Fig. 26 and comprise a drive sprocket 168, a chain 169, an idler sprocket 170, a return spring 171, a cam lever 172, a cam roller 173 and a cam 174. The drive sprocket 168 is arranged on the rock shaft 163 between the guard arm 162 and collar 165 and is suitably non-rotatably secured to this shaft. This chain 169

passes around the front side of the drive sprocket 168 with its upper end connected by the helical tension return spring 171 to the machine frame 35 at any suitable point thereon. The lower part of the chain 169 passes around the rear side of the idler sprocket 170 which is arranged below and in rear of the drive sprocket 168 and the lower end of the chain is suitably connected to the cam lever 172. This cam lever 172 is arranged below the cam shaft 182 and extends transversely of the machine, one end of this cam lever being pivoted on the bed plate 36 of the machine frame 35 on the left side of the machine as indicated at 175 for pivotal movement in a vertical plane. The cam lever is arranged slightly in rear of the cam 174 and carries the cam roller 173 for engagement with the bottom periphery of the cam 174. The periphery of this cam 174 is formed with a concentric inner portion 174' and an opposite salient dwell portion 174^2 also concentric with the axis of the cam shaft 182 and inclined portions 174^3 and 174^4 connecting the corresponding ends of the portions 174' and 174^2. The cam lever 172 is illustrated in Fig. 26 in its normal inoperative position in which the cam roller 173 engages the peripheral portion 174' and in which the tape guard 152 is arranged on the front side of the upper rear mandrel (Figs. 2, 20 and 24). As the cam 174 is rotated in a counterclockwise direction as viewed in Fig. 26, the cam roller 173 leaves the portion 174' and rolls up the inclined portion 174^3 onto the dwell portion 174^2. This swings the cam lever 172 downwardly which in turn pulls the chain 169 downwardly and which in turn rotates the drive sprocket 168 in a counterclockwise direction as viewed in Fig. 26 thereby rotating the rock shaft 163, guard 152 and collar 165 in a clockwise direction as viewed in Fig. 24. During this operation the return spring 171 is stretched. As the cam 174 continues to rotate in the same direction the cam roller 173 leaves the dwell portion 174^2 and rolls radially inwardly of the cam 174 along the inclined portion 174^4 onto the portion 174'. This movement of the cam roller 173 permits the stretched return spring 161 to contract and pull the chain 169 so as to move the various parts associated therewith whereby the tape guard 152 is rotated from its fully displaced position shown in Fig. 25 to the position shown in Fig. 24, this return rotation being terminated when the stop lug 164 carried by the collar 165 engages the stop screw 166.

Means are provided to secure the trailing end of the severed tape T which has been cut by the knife blades 63 and 158 to the roll of such tape being wound around the core C on the mandrel in the upper front mandrel position or roll winding station. Such means are shown in Figs. 1, 2, 5 and 28–33 and will be described in association with the mandrel 82 which is illustrated in the drawings at the roll winding station although it will be understood that the same operation is performed on the other mandrels 82^3, 82^2 and 82^1 as they are moved successively to this station. While the trailing end of the severed tape T may be secured to the roll in any suitable manner, it is preferred to apply a strip of any suitable material having a coating of any suitable pressure sensitive adhesive material on one side thereof, herein referred to as gummed tape. This strip of gummed tape overlaps the severed transverse edge of the trailing end of the tape T and secures this trailing end to the next inner convolution of paper tape to form a complete consumer roll R, such strip in final applied form being illustrated in Figs. 14 and 31 and identified as S.

Such gummed tape applying means are shown as arranged on the upper front part of the machine frame 35 above the mandrel 82. For this purpose, an auxiliary frame plate 176 is arranged on the exterior of the left frame plate 38 and extends upwardly therefrom and is suitably secured thereto (Figs. 1, 2, 5 and 30). A generally horizontally arranged support arm 177 is freely pivotally mounted adjacent its rear end on a pivot pin 178 suitably journaled on the auxiliary frame plate 176. This support arm 177 extends forwardly so that its free front end is generally above the mandrel 82 and is normally held in this elevated position above this mandrel by a tension spring 179 (Figs. 1 and 2). The lower end of this spring 179 is suitably connected to the support arm 177 and its upper end is suitably connected to a support bracket 180 suitably connected to the left frame plate 38 (Fig. 5). The lower front corner of this support arm 177 carries a freely rotatable roller 181 which is adapted to engage the roll of tape T being wound on the mandrel 82 when the diameter of this roll builds up to nearly its full dimension. Engagement of the roller 181 with the paper roll relieves the load of the support arm 177 from the tension spring 179 and as the paper roll increases in diameter the forward end of the support arm rises, pivoting on the pivot 178.

A spool 183 of gummed tape is supported in an elevated position on an upstanding arm 184 suitably secured to the support arm 177. The free end of the gummed tape unwound from the spool 183 extends downwardly and the extreme end portion thereof is arranged between a clamping member in the form of a transverse bar or finger 185 and a presser member in the form of a rubber roller 186. The transverse bar or finger 185 projects horizontally across the back and gummed side of the gummed tape and is carried by the lower free end of an upwardly and rearwardly inclined movable arm 187 pivoted at 188 on the support arm 177. A tension spring 189 is connected at one end to the movable arm 187 and at its other end to the forward arm 177 (Figs. 2 and 20) and constantly urges the movable arm 187 to swing upwardly. The front or ungummed side of the gummed tape is engaged by the rubber roller 186 which is rotatably mounted on the rear end of a generally horizontal lever 190, this lever being pivotally mounted intermediate its ends on the support arm 177 as indicated at 191 (Fig. 28). The rear end of the lever 190 is formed to provide an upturned cam foot 192 engageable with the movable arm 187 so as to swing this arm downwardly thereby to move the clamping bar 185 away from the rubber roller 186. Separation of the clamping bar 185 and rubber roller 186 releases the gummed tape theretofore clamped therebetween.

In order to move the lever 190 about its pivot 191 so as to effect the unclamping of the gummed tape, the front end of the lever is suitably connected to the armature of a solenoid 193 suitably mounted on the support arm 177 above the lever (Fig. 2). Energization of this solenoid 193 lifts the front end of the lever 190 thereby depressing its rear end and lowering the rubber roller 186 as illustrated in Fig. 29. Referring to Fig. 28, it will be noted that the leading end of the gummed tape 183' is arranged under the rubber roller 186 with its gummed or bottom side facing the roll R' on the mandrel 82 so that when

this rubber roller is lowered it will press the leading end 183' into adhesive engagement with the trailing end of the severed paper tape T a short distance in advance of the transverse severed edge thereof (Fig. 29). This movement of the lever 190 also brings the cam foot 192 into engagement with the movable arm 187 so as to push this arm downwardly thereby to push the clamping bar 185 away from the gummed tape. Therefore, since the leading end 183' of the gummed tape has been stuck to the roll R' and the clamping bar 185 and rubber roller 186 have been effectively separated to unclamp the gummed tape, this tape is free to move with the roll R' during its rotation.

The gummed tape is permitted to follow the moving periphery of the roll R' until a suitable length of gummed tape has been applied circumferentially to the roll R' to form a strip S such that the advance half of the strip S overlays the trailing end of the tape T and the trailing half of the strip S overlays an exposed portion of the next innermost convolution of paper tape in the roll R'. When such length of gummed tape has been so applied, the gummed tape is severed. For this purpose a relatively thin knife blade 194 having a horizontal transverse cutting edge on its lower end adapted to engage the gummed tape is arranged immediately forward of the rubber roller 186 for movement in a generally vertical direction. The knife blade 194 is actuated by a solenoid 195, the armature of which is suitably connected to this knife blade and urged upwardly by a tension spring 196 connected to the upper end of an upstanding support bracket 197 suitably secured to the support arm 177 (Fig. 2). Energization of the solenoid 195 forces the knife blade 194 downwardly from its normally elevated inoperative position into engagement with the gummed tape thereby cutting it and forming a strip S (Fig. 31). De-energization of the solenoid 195 permits the stretched return spring 196 to lift the knife blade to its normally elevated inoperative position illustrated in Fig. 28.

The energization of the solenoids 195 and 193 is controlled in a manner to be described later herein.

While the gummed tape is being applied to the roll R' as illustrated in Figs. 29 and 30, means are provided to unwind a length of gummed tape from the spool 183, this slacking operation being necessary since positive effort is usually required to unwind a spool of gummed tape by reason of the convolutions thereof sticking together. Such slacking means are shown in varying degrees of particularity in Figs. 1, 2, 5, 30, 32 and 33 and include a movable guide roller 198 arranged on the front and ungummed side of the stretch of gummed tape extending between the spool 183 and rubber roller 186. This guide roller 198 is freely pivoted on the front end of a normally generally horizontally arranged rock arm 199 (Figs. 1 and 2). The rock arm 199 is arranged on the inner side of the support arm 177 and the rear end of this rock arm is fast to the pivot pin 178. An actuating arm 200 is arranged on the outer side of the auxiliary frame plate 176 and is also fast at one end to the pivot pin 178 (Fig. 5) and when oscillated rocks the rock arm 199. In order to so move the actuating arm 200, the free rear end thereof is connected by a shipper rod 201 to a cam lever 202. This cam lever 202 extends transversely of the machine and has one of its ends pivotally mounted on the right side of the machine frame 35 and has its opposite free end operatively engaging the periphery of a cam 203 (Figs. 32 and 33). The cam 203 is mounted on the cam shaft 182 and is formed with a salient part so that rotation of this cam will swing the cam lever 202 upwardly which in turn lifts the shipper rod 201 and which in turn swings the actuating arm 200 upwardly and the rock arm 199 downwardly thereby forcing the guide roller 198 downwardly and rearwardly of the machine (Fig. 30). Such movement of the guide roller 198 at a time when the free end of the gummed tape is held between the clamping bar 185 and rubber roller 186, pulls a length of gummed tape from the spool 183. Continued rotation of the cam 203 in the same direction permits the cam lever 202 to swing downwardly thereby returning the rock arm 199 and guide roller 198 to their normal inoperative positions. When the guide roller 198 so moves upwardly and forwardly it leaves slack in the unwound stretch of gummed tape which is taken up when the next strip S is applied to a paper roll R.

As previously indicated, when a roll of paper tape T is being wound on the mandrel in the upper front mandrel position or roll winding station, there is an increasing amount of slippage between the belt 100 and the pulley 92 for this mandrel as the roll diameter increases. This tensions the stretch of tape T between this roll and the drive roller 51. When the tape T is severed by the knife blades 68 and 158, this tension is relieved and the mandrel 82 and roll thereon immediately tend to rotate faster. It is desirable to eliminate this tendency to speed up in order to insure that a strip S of gummed tape is properly positioned across the severed transverse edge of the trailing end of the tape T and also to maintain uniformity in the form of complete consumer rolls R formed on the machine. Accordingly, speed up control means are provided and are illustrated in varying degree of particularity in Figs. 1, 2, 5, 6 and 28. Such means are shown as including a soft rubber roller 204 arranged on the front of the machine in advance of the upper front mandrel 82 and suitably journaled in a stationary bracket 205 suitably secured to the left frame plate 38. The periphery of this soft rubber roller 204 is frictionally engageable with the periphery of the paper roll R' when the latter is nearly its full size and shortly before the tape T is severed by the knife blades 68 and 158, the body of this roller 204 being slightly distorted or flattened at the place of engagement with the roll R' in order to accommodate the increasing diameter of the roll (Fig. 28). The roller 204 is thus rotated by the roll R'.

Brake or speed control means are operatively associated with the soft rubber roller 204 and are operable to maintain the peripheral speed of this roller the same as that of the tape T being wound on the roll R' when this tape is severed by the knife blades 68 and 158. Such brake means are shown as including a clutch 206 arranged on the left side of the machine on the outer end of the continuously driven transverse shaft 52 (Figs. 5 and 6). This clutch 206 includes a drive sprocket 207 freely rotatable on the shaft 52 and connected by an endless chain 208 with a driven sprocket 209 coaxially and drivingly coupled with the soft rubber roller 204. The drive sprocket 207 can be caused to rotate with the shaft 52 but is normally free wheeling on this shaft. Referring to Fig. 6, the drive sprocket 207 is arranged between a collar 210 secured to the outer extremity of the

shaft 52 as by a pin 211 and a roller thrust bearing 212 which is backed up by a cam collar 213. This cam collar 213 is rotatably and slidably arranged on the shaft 52 and is formed on its inner side with a cam face engaging a correspondingly formed cam face on a stationary clutch member 214 suitably rigidly connected to the left frame plate 33 as by the bolt 215. A clutch actuating arm 216 is connected with the cam collar 213 and extends laterally therefrom as shown in Fig. 5. A shipper rod 217 connects the free end of the arm 216 with a pivoted cam lever 218 which extends transversely of the machine and rides on the periphery of a cam 219 on the cam shaft 182 (Fig. 5). The cam 219 is suitably formed to raise the cam lever 218 which in turn lifts the shipper rod 217 and thereby swing the cam actuating arm 216 upwardly. Upon so swinging the arm 216 the cam collar 213 is forced to rotate relative to the clutch member 214 so that the cam faces of these parts force the cam collar 213 to slide on the shaft 52 to the left as viewed in Fig. 6. Such movement of the cam collar 213, through the thrust bearing 212, shifts the drive sprocket 207 also to the left and against and into frictional clutching engagement with the collar 210 which is rotating with the shaft 52. Therefore the drive sprocket 207 is clutched to the shaft 52 and it will be compelled to rotate at the speed of this shaft. Swinging the clutch actuating arm downwardly as permitted by the cam 219 operates the clutch parts in a reverse direction and destroys the clutched engagement between the collar 210 and drive sprocket 207.

When the roll R' tends to speed up after the tape T has been cut thereby tending to drive the soft rubber roller 204 faster, the sprocket 209 through the chain 208 also rotates the sprocket 207 faster. However, upon the cutting of the tape T by the knife blades 68 and 156, the clutch 206 is actuated as described above to control the speed of rotation of the soft rubber roller 204 whereby the roll R' is prevented from speeding up. This controlled rotation of the roll R' insures the proper relative timed operation of the gummed tape applying means and hence the proper application of a strip S of gummed tape to the paper roll.

The tape guard cam 174 (Fig. 26), turret stop arm cam 112 (Fig. 2), stripper arm and core loader operating rod cam 134 (Fig. 17), gummed tape slacker cam 203 (Figs. 32 and 33), knife arm cam 81 (Figs. 21 and 22), and clutch arm cam 219 (Fig. 5) are arranged respectively in tandem from front to rear in axially spaced relation and also in proper relative angular relation on the cam shaft 182 as shown in Figs. 2 and 5. These cams are preferably non-rotatably mounted in this arrangement on a cam shaft sleeve 220 keyed or otherwise suitably made fast to the cam shaft 182. The cam shaft 182 is suitably journaled in journal blocks 221 and 222 mounted on the bedplate 36 of the machine frame 35 (Figs. 2 and 5). One revolution of the cam shaft 182 to which the various cams are fast effects operation of the various mechanisms and devices for rendering the machine automatic in operation.

In order to provide an intermittent single revolution of the cam shaft 182 a one-revolution clutch is operatively provided between this cam shaft and a power drive. Referring to Figs. 2 and 5, the power drive mechanism is shown as including a chain 223 connecting a drive sprocket 224 fast to the continuously driven low speed output shaft 58 of the gear reducer 57 with a driven sprocket 225 suitably journaled in a journal block 226 on the bed plate 36 of the machine frame so as to rotate this driven sprocket about an axis extending transversely of the machine. A bevel gear 227 fast to the shaft of the driven sprocket 225 meshes with and drives a bevel gear 228 non-rotatably mounted on the hub of a ratchet wheel 229. The driven bevel gear 228 and ratchet wheel 229 are freely rotatable on the forward end of the cam shaft 182 and are continuously being rotated by the driving mechanism just described.

The one-revolution clutch referred to is provided between the continuously rotating ratchet wheel 229 and the cam shaft 182. Referring to Figs. 10 and 11, a disk 230 is keyed to the cam shaft 182 immediately in front of the cam sleeve 220 and immediately adjacent the ratchet wheel 229 and is slightly larger in diameter than this ratchet wheel. An ear 231 projects outwardly from the periphery of the disk 230 for pivotally mounting a pawl 232 opposite the teeth on the ratchet wheel 229. The pawl 232 extends downwardly and its lower operative end is constantly urged toward the ratchet wheel 229 by a helical compression spring 233 arranged in a recess in the disk 230 and bearing against an offset arm 234 connected to the pawl. The operative end of the pawl 232 is normally held retracted or out of engagement with the teeth on the ratchet wheel 229. For this purpose the arm 234 is provided with a generally horizontal downwardly facing shoulder 235 which normally rests on a lug 236 formed on an upstanding shift arm 237. The lower end of this shift arm 237 is pivoted on the bedplate 36 of the machine frame, as indicated at 238 (Figs. 5 and 10), for movement of the shift arm about a horizontal axis extending transversely of the machine. The upper end of the shift arm 237 is provided with an enlarged hole 240 through which a generally horizontally arranged shift rod 241 extends in a direction longitudinally of the machine frame (Figs. 5 and 10). A pair of collars 242 and 243 are arranged in spaced relation on the shift rod 241 and adjustably secured thereto by set screws 242' and 243', respectively, the collar 242 being arranged on the front side of the upper end of the shift rod and the collar 243 being arranged on the rear side thereof (Fig. 10).

Referring to Figs. 5 and 10, when the shift rod 241 is moved to the left or toward the front of the machine, the collar 243 pushes the shift arm 237 to swing this arm so that the lug 236 is pushed out from under the pawl arm 234. Immediately upon this freeing or unlatching of the pawl 232, its operative end is moved into engagement with a tooth on the continuously rotating ratchet wheel 229 by the spring 233. This engagement of the pawl 232 and ratchet wheel 229 drivingly couples the disk 230 with the ratchet wheel whereby rotation of the cam shaft 182, cam shaft sleeve 220 and cams 174, 112, 134, 203, 81 and 219 is effected.

At the end of one revolution, the cam shaft 182 and the cams thereon are stopped. To this end, the rear end of the shift rod 241 is suitably pivotally connected to the upper end of a cam operated reset lever 244 which has its lower end pivoted on the machine frame 35, as indicated at 245 (Figs. 5, 21 and 22) for rotation of this lever about a horizontal axis extending transversely of the machine. A cam roller 246 is carried by the lever 244 intermediate the ends thereof and is engageable with an axially facing cam

surface 247 formed on the rear side of the cam 81. When the shift rod 241 is moved forwardly the lever 244 is swung so as to bring its cam roller 246 into engagement with the cam face 247. This cam face 247 is formed with an axially projecting salient part over which the roller 246 rides (Fig. 22) so that the lever 244 and the shift rod 241 will be returned to their original inoperative positions before the cam 81 has completed one revolution. During the return or rearward movement of the shift rod 241, the collar 242 thereon (Fig. 10) engages and pushes the shift arm 237 to swing this arm back to its original position in which the lug 236 thereon will be in the path of the approaching shoulder 235 of the pawl arm 234 on the disk 230 which is rotating at this time. As the disk 230 completes one revolution the shoulder 235 engages the lug 236 to pivot the pawl 232 against the urging of the spring 233 whereby the operative end of the pawl is withdrawn from engagement with the ratchet wheel 229. This disengagement of the pawl 232 and ratchet wheel 229 breaks the driving couple to the disk 230 and this disk, the cam shaft 182 and the cams thereon thus come to rest after having been rotated one revolution.

In order to prevent over ride, to the extent permitted by the pawl arm 234 striking the periphery of the disk 230 or reverse movement of the cam shaft 182 at the end of its one revolution, means are provided to apply a slightly predominant torque to this cam shaft so that the shoulder 235 is urged lightly against and maintained in engagement with the lug 236. Such means are shown in Figs. 17 and 26 and includes spring loaded snubber arms 248 and 249. The snubber arm 248 (Fig. 17) is horizontally arranged with one end pivoted at 250 on the machine frame 35 and with its other end carrying a roller 251 engaging the top of the cam 134 on one side of the axis of the cam shaft 182, a tension spring 252 connected to the bedplate 36 and arm 248 urging the roller against the cam. This spring loaded snubber arm 248 applies a torque to the cam shaft 182 to prevent this shaft from overriding. The snubber arm 249 (Fig. 26) inclines upwardly toward the cam 174 in a direction to one side of the axis of the cam shaft 182 and is suitably pivoted at its lower end at 253 on a bracket 254 secured to the bedplate 36 and carries a roller 255 on its upper end which engages the periphery of cam 174. A compression spring 256 is operatively interposed between the arm 249 and bracket 254 and operates to urge the roller 255 against the cam 174. This spring loaded snubber arm 249 applies a torque to the cam shaft 182 to prevent this shaft from reversing.

Means are provided to intermittently actuate the shift rod 241 to permit the cam shaft 182 to be driven. Such means are shown in Figs. 5, 7, 8, 8A and 9 and include a timing gear reducer 257 driven by the low speed output shaft 58 of the main gear reducer 57 and supported on a base 258 secured to the bedplate 36 of the machine frame. The output shaft 259 of the timing gear reducer 257 rotates very slowly and has a trip arm 260 fast to the outboard end thereof. As viewed in Figs. 5, 7, 8 and 8A, the trip arm 260 rotates in a counterclockwise direction. A quickly releasable latch device is arranged adjacent the continuously rotating trip arm 260 for actuation thereby. This latch device includes a latch stop 261 supported on an upstanding bracket 262 mounted on the base 258. The rear end 261' of this latch stop 261 is beveled and is normally engaged by a shoulder 263' on a movable latch hook 263 which is pivoted at 264 on the free upper end of an upwardly and forwardly inclined arm 265. The center of gravity of the latch hook 263 is in rear of the pivot 264. The opposite and lower end of the arm 265 is freely rotatably mounted on the outer end of a transverse pivot pin 266 suitably journaled on the base 258. The arm 265 is constantly urged to rotate about the axis of its pivot pin 266 in a counterclockwise direction as viewed in Figs. 5, 7, 8 and 8A by a tension spring 267. The lower end of this spring 267 is suitably connected to the machine frame 35 and the upper end thereof is connected to the outer end of a pin 268 carried by the arm 265. Referring to Fig. 9, the pin 268 extends completely through the arm 265 with an end projecting from each side of the arm and has an intermediate threaded portion 268' screwed in a hole provided in the arm. The outer end of the trip arm 260 is adapted to wipingly engage the forward edge 265' of the arm 265, as illustrated in Fig. 8, to swing this arm 265 in a clockwise direction against the urging of the spring 267.

A second arm 269 is arranged alongside the arm 265 on the inner side of and generally parallel with the arm 265. The lower end of this inner arm 269 is fast to the pivot pin 266 and its upper end is formed to provide a radially outwardly projecting finger 269'. This finger 269' is adapted to engage a salient part 263'' formed on the lower front corner of the latch hook 263 so that when the finger is forced against this salient part the rear end of the latch hook swings upwardly. On the other hand, when the finger 269' is out of engagement with the salient part 263'' the latch hook 263 is free to swing downwardly by gravity when its shoulder 263' is disengaged from the end 261' of the latch stop 261.

An upwardly and rearwardly inclined arm 270 is fast to the inner end of the pivot pin 266 and the outer end of this arm is suitably connected to the front end of the shift rod 241 (Fig. 7). A tension spring 271 is suitably connected to the arm 270 and to the machine frame 35 (Fig. 5) and constantly urges this arm to swing forwardly. Inasmuch as the arm 270, pivot pin 266 and inner arm 269 are a unitary structure, the spring 271 acts upon the inner arm 269 to constantly urge the same to rotate in a counterclockwise direction as viewed in Figs. 7, 8 and 8A. Limited relative rotative movement between the arms 265 and 269 is permitted by the inner end of the pin 268 being arranged in a slot 272 provided in the inner arm 269.

When the outer arm 265 has its latch hook 263 engaging the latch stop 261, the inner arm 269 is forwardly displaced with respect to this outer arm the maximum permitted by the inner end of the pin 268 engaging the rear end of the slot 272. The latch hook 263 is held in engagement with the latch stop 261 by the spring 267. In this condition of the parts, as illustrated in Fig. 7, the finger 269' on the inner arm 269 is forwardly spaced from the salient part 263'' on the latch hook 263 under the urging of the spring 271. As the trip arm 260 engages the outer arm 265 this arm is swung thereby in a clockwise direction as viewed in Fig. 8 and such movement also swings the inner arm 269 by reason of the pin 268 being arranged in the rear end of the slot 272. Such movement of the inner arm 269 also swings the arm 270 toward the rear of the machine thereby shifting the shift rod 241 slightly to the rear

but this movement of the shift rod does not displace the shift arm 237 inasmuch as clearance exists between the front collar 242 on the shift rod and the upper end of the shift arm. When the outer arm 265 has been swung rearwardly a sufficient distance to disengage the stop latch 261 and latch hook 263 the rear end of this latch hook lowers until the bottom of this latch hook strikes the upper rear corner of the inner arm 269 as illustrated in Fig. 8. In this position the rear end of the latch hook 263 is arranged below the latch stop 261 so that when the trip arm 260 releases the outer arm 265 the arms 265, 266 and 270 are swung forwardly by the springs 267 and 271. This pulls the shift rod 241 forwardly which in turn brings the rear collar 243 against the shift arm 237 and swings this shift arm so as to disengage the lug 236 and pawl arm 234 thereby permitting the pawl 232 to engage the ratchet wheel 229.

When the shift rod 241 is so pulled forward the reset lever 244 is brought into operative engagement with the cam surface 247 on the cam 81. Rotation of this cam operates to swing the reset lever rearwardly thereby pulling the shift rod 241 rearwardly. This rearward movement of the shift rod 241 brings the front collar 242 against the shift arm 237 and swings this shift arm rearwardly so that the lug 236 will be in the path of the pawl arm 234. Also, rearward movement of the shift lever pulls the arm 270 and swings this arm and the inner arm 269 rearwardly against the urging of the spring 271. Since the spring 267 is constantly urging the outer arm 265 to swing forwardly the inner end of the pin 268 carried thereby shifts to the front end of the slot 272 whereupon the outer arm is compelled to swing rearwardly with the inner arm against the urging of the spring 267. During this relative movement between the arms 265 and 269 the finger 269' is forced against the salient part 263'' which forces the latch hook 263 to swing on its pivot 264 whereby the rear end of the latch hook is elevated. Upward movement of the rear end of the latch hook 263, however, is limited by its engagement with the underside of the latch stop 261 along which it rides (Fig. 8A) until the shoulder 263' passes the rear end 261' on the latch stop. When this occurs the rear end of the latch hook 263 rises further so that when the cam surface 247 operatively releases the reset lever 244 the springs 267 and 271 operate to pull the arms 265 and 269 slightly forwardly until the shoulder 263' engages the latch stop end 261'. Thereafter the spring 271 operates to continue to swing the arms 265 and 270 forwardly until the pin 268 engages the rear end of the slot 272. This slight forward movement of the shift rod 241 after the lever 244 has been reset by the cam 81 does not move the shift arm forwardly because of the space between the collars 242 and 243 on the shift rod.

The various parts remain in their respective positions until the trip arm 260 again engages the outer arm 265. The time for one revolution of the trip arm 260 determines the length of tape T wound into each roll R.

The energization of the solenoids 193 and 195 is controlled by micro-switches 273 and 274, respectively (Figs. 2 and 5). These switches 273 and 274 are actuated by trip fingers 275 and 276, respectively, carried by a cam disk 277 adjustably fixed to the cam shaft 182. The trip finger 275 actuates the switch 274 slightly in advance of the actuation of the switch 273 by the trip finger 276 so that the lever 190 is moved to cause the rubber roller 186 to press the free end 183' of the gummed tape onto the trailing end of the severed tape T first and thereafter the knife blade 194 is lowered to cut the gummed tape.

Operation

In describing the operation it is assumed that the paper tape T is being wound around the core C clutched by the upper front mandrel 82 (Fig. 2). In this condition of the machine the electric motor 56 is driving the gear reducers 57 and 257 so that the trip arm 260 is slowly being rotated (Fig. 5). The drive sprocket 59 on the driven shaft 58 of the gear reducer 57 through the chain 60 is driving the sprocket 61 fast to the shaft 52 which in turn rotates the ridged drive roller 51 (Figs. 2, 5 and 6). The drive pulley 101 and flat belt 100 are rotating the mandrels 82^2, 82^3 and 82 in a clockwise direction as viewed in Fig. 2 and there is slippage between the pulley 99 of the mandrel 82 and the belt 100 such that there is a constant pull on or tension in the tape T between the ridged drive roller 51 and the mandrel 82, such slippage increasing as the diameter of the paper roll on this mandrel 82 increases. Drive sprocket 224 through the chain 223 is driving the sprocket 225, bevel gears 227 and 228 and ratchet wheel 229 (Figs. 2 and 5). The shift rod 241 is latched with the lug 236 on the shift arm 237 engaging the pawl arm 234 whereby the cam shaft 182 is stationary (Figs. 5, 10 and 11). The solenoids 193 and 195 are deenergized so that the parts associated therewith are in the condition shown in Fig. 2.

The cooperating drive roller 51 and rubber roller 55 pull the tape T from the supply roll 39 through the tension device 40, past the skivers 42 and feed the tape at a predetermined speed to the mandrel 82 (Figs. 1 and 2). At the skiving station the marginal portions 44 and 44' of the paper tape T are shaved with the dust resulting therefrom withdrawn through the suction manifold 45 and as the tape passes over the ridged drive roller 51 the longitudinal groove 54 is formed in the tape (Figs. 3 and 4).

After leaving the ridged drive roller 51, the skived and grooved tape T passes through the slot 63 in the guide press 62 between the elevated upper knife blade 68 and lower knife blade 158 toward the mandrel 82 (Figs. 2 and 20). The tape guard 152 carrying the knife blade 158 is arranged on the forward side of the upper rear mandrel 82^3.

While the skived and grooved tape T is being wound around the mandrel 82 the turret stop arm 103 engages the sleeve bearing 96 on the mandrel 82' and prevents rotation of the turret 83 (Fig. 14). The stripper arm 114 is in its innermost position adjacent the turret 83 (Fig. 15) and the core pusher 144 of the core loader 140 is also positioned immediately opposite the outer end of the lower rear mandrel 82^2.

As the diameter of the paper roll R' on the mandrel 82 increases, the roller 181 on the support arm 177 engages and rides on the periphery of this roll (Fig. 28). At about the same time the soft rubber roller 204 engages the periphery of the roll R' and is rotated thereby causing the sprocket 209 and chain 208 to rotate the sprocket 207 on the shaft 52 (Figs. 5, 6 and 28). The clutch 206 is inoperative at this time so that the driven sprocket 207 is freely rotated on the shaft 52.

The speed of rotation of the trip arm 260

determines the length of tape T wound into the roll on the mandrel 82. When the trip arm 260 engages the outer arm 265 the latch hook is first released (Fig. 8) and shortly thereafter, upon the trip arm passing out of contact with this outer arm, the shift rod 241 is moved forwardly. This swings the shift arm 237 forwardly and moves the lug 236 thereon out of engagement with the shoulder 235 on the pawl arm 234, thereby permitting the pawl 232 to engage the rotating ratchet wheel 229 (Fig. 10). Engagement of the pawl 232 which is carried by the disk 230 rotates the cam shaft 182 and the cams 174, 112, 134, 203, 81, 219 and the switch disk 277 on this cam shaft.

When the cam 81 is rotated the lift rod 78 is lowered thereby permitting the upper knife blade 68 to drop and cooperate with the then stationary lower knife blade 158 to sever the tape T (Fig. 24). After cutting the tape T the upper knife blade is immediately raised by the cam 81, cam lever 79, lift rod 78 and knife arm 67 (Figs. 2, 20 and 21).

Rotation of the cam 219 actuates the clutch 206 to drivingly couple the sprocket 207 to the driven shaft 52 and thereby control the speed of rotation of the soft rubber roller 204 and in turn prevent the mandrel 82 from speeding up. By the time the trailing end of the severed tape approaches the mandrel 82 the switch disk 277 swings the switch finger 275 into engagement with the micro-switch 274. This closes an electrical circuit through the solenoid 193 to energize the same whereby the front end of the lever 190 is raised and the rubber roller 186 carried on the rear end of this lever is lowered and presses the free leading end 183' of the gummed tape into adhesive contact with the trailing end of the tape T. At the same time the cam foot 192 on the lever 190 swings the arm 187 so as to separate the clamping bar 185 and rubber roller 186 and permit the gummed tape to pass freely therebetween. Upon de-energization of the solenoid 193, the rubber roller 186 is raised and the clamping bar 185 moves together to clamp the gummed tape therebetween.

Substantially simultaneously with the de-energization of the solenoid 193, the trip finger 276 trips the micro-switch 273. This energizes the solenoid 195 which thereupon releases the knife blade 194 which moves downwardly to sever the gummed tape (Fig. 31). De-energization of the solenoid 195 causes the knife blade to be lifted again to its inoperative position. The rollers 181 and 204 press the strip S of gummed tape firmly against the roll R.

While the gummed tape is being applied to the roll R' on the mandrel 82 and before this tape is cut by the knife blade 194, the rock arm 199 is rocked by the rotation of the cam 203 to unwind a length of gummed tape from the spool 183. This rock arm 199 is actuated by the actuating arm 200, shipper rod 201 and cam lever 202 which engages the cam 203 (Fig. 5).

When the upper knife blade 68 is lowered to sever the tape T the guide press 62 is pushed against the core C clutched on the rotating upper rear mandrel 82^3 by the striker 72 so as to feed the leading end of the severed tape T between this core and the tape guard 152. After a short length of tape T has passed between the tape guard 152 and this core C, the tape guard is rotated to the position shown in Fig. 25 so that the leading end of the tape is held to the core C and is properly introduced between this core and the overlying tape being wrapped around this core. The tape guard 152 is actuated through the mechanism including the cam 174, cam lever 172, chain 169, sprockets 170 and 168, and spring 171 (Fig. 26). The tape guard 152 is maintained in this displaced position on the rear side of the mandrel 82^3 until several turns of tape T have been wound around the core C on this mandrel. Since the mandrel 82^3 is urged to rotate faster than the tape T is being fed thereto, the core C thereon moves relative to these first several convolutions of tape and thereby tightens the tape on the core.

While a new roll of tape T is being formed on the mandrel 82^3 in the roll starting station, the stripper arm 114 and core loader 140 are moved laterally outwardly. Such movement of the stripper arm 114 strips or pushes a fully wound roll R from the lower front mandrel 82' whose jaws 87 are radially contracted onto the receiving device 118 (Fig. 14). Also, such movement of the core loader 140 permits the lowermost core C in the core magazine 139 to drop into a position between the core pusher 144 and the lower rear mandrel 82^2. The stripper arm 114 and core loader 140 are thereafter immediately returned to their original positions. This return movement of the core loader 140 pushes the lowermost core C onto the mandrel 82^2 whose jaws 87 are radially contracted. Such lateral movement of the stripper arm 114 and core loader 140 is effected by reciprocation of the operating rod 106, which in turn is actuated by the mechanism shown in Figs. 17–19 and including wheel sectors 119, 120 and 129, connecting chains 121, 122 and 131, levers 132 and 137, connecting link 136 and cam 134.

After the tape guard 152 has been moved to the position on the rear side of the mandrel 82^3 (Fig. 25) and before being returned to its normal forward position (Fig. 20), the turret stop arm 103 and stripper arm 114 are swung forwardly so as to release the turret 83 and permit it to rotate so that the mandrel 83^3 with its newly started roll are moved forwardly as illustrated by broken lines in Fig. 25. During this forward movement of the mandrel 82^3 the guide press 62 swings to follow the tape T being guided therethrough. The turret stop arm 103 is returned to its original position to engage the sleeve bearing 96 of the descending upper front mandrel 82 and thereby prevent rotation of the turret 83 for more than one-quarter of a turn. The stripper arm 114 also returns with the turret stop arm 103. The arms 103 and 114 are so rocked by the rock arm 108 which in turn is actuated by the shipper rod 109, cam lever 110 and cam 112 (Fig. 2).

Before the turret 83 completes this one-quarter turn, the cam 174 permits the spring 171 to operate to return the tape guard 152 to its normal forward position as shown in Fig. 20 so that it will be in proper position to receive the mandrel 82^2 moving upwardly from the core loading station.

As the turret 83 is rotating its one-quarter revolution, the jaws 87 of the rising mandrel 82^2 are caused to be moved radially outwardly to clutch the core C thereon, this clutching being accomplished by the outer end of the wedge 92 engaging the stationary cam 151. At the same time, the jaws 87 of the descending mandrel 82 with a roll R thereon are permitted to move radially inwardly and declutch the core of this roll R since the free end of the operating rod engages the stationary cam 113 thereby to slide the

respective wedge 92 outwardly of this mandrel.

Rotation of the cam shaft 182 is stopped at the end of one revolution thereof by disengaging the pawl 232 and ratchet wheel 229, this being effected by return of the shift arm 237 to its original position before the cam shaft completes its single revolution. This return movement of the shift arm 237 is effected through engagement of the cam roller 246 on the reset lever 244 with the cam face 247 on the cam 81 (Figs. 21 and 22) and moves the lug 236 into the path of the pawl arm 234. Engagement of the lug 236 and shoulder 235 operates to withdraw the pawl 232 from engagement with the ratchet wheel 229. The latch hook 263 also is permitted to engage the latch stop 261 and thus maintains the shift rod 241 in its rearward position until the latch hook 263 is again released by engagement of the continuously rotating trip arm 260 with the arm 265.

It will be understood that the various mechanisms and devices included in the illustrative embodiment of the invention described hereinabove operate either simultaneously or in closely timed sequence to perform the various automatic operations described and these operations all take place within one revolution of the cam shaft 182, the various cams on this shaft being suitably designed to perform this sequence of operations. These various operations occur very rapidly and for the purpose of explanation have been described individually.

In this manner each of the mandrels is moved successively and intermittently through core loading, roll starting, roll winding and roll unloading stations whereby a continuously fed web is automatically converted into a succession of consumer rolls each of which has a predetermined length of web wound tightly around a core with no attachment of the inner end of the web to the core and with the outer end of the web secured to the roll.

Usually paper tape used in tape joint systems is provided with a perforated design to anchor the tape to the cement employed therewith. The mechanism for perforating the tape can also be incorporated in the present machine or the tape in the tape supply roll 39 can be perforated before being used on the machine. As previously explained herein, the paper tape can be left either unskived or ungrooved, or both, as desired.

From the foregoing it will be seen that the present invention provides a machine which automatically winds a web into individual consumer rolls with each roll having a predetermined length of the web wound tightly around a core and with the trailing outer end of the web secured to the roll.

I claim:

1. In a winding machine for converting a continuously traveling web into rolls and having a mandrel, means arranged to wind the web around said mandrel, and means arranged to sever the web after a predetermined length thereof has been wound around said mandrel thereby to form a roll, the combination therewith of means arranged to secure the trailing end of the severed web to said roll comprising a roller movable toward and away from the periphery of said roll and normally spaced therefrom, a clamping member movable toward and away from said roller and normally clamping a strip of gummed tape therebetween to hold one end of said strip between said roller and said periphery, means arranged to move said roller toward said periphery thereby to press said one end of said strip against said roll in advance of the severed edge of said trailing end, means arranged to move said clamping member away from said roller thereby to release said strip, and knife means arranged to sever said strip at a place in rear of said severed edge.

2. In a winding machine for converting a continuously traveling web into rolls, the combination comprising a rotatable turret, a mandrel rotatably mounted on said turret and projecting laterally therefrom and having radially movable jaws, means arranged to rotate said turret whereby the mandrel is moved successively through core loading, roll starting, roll winding and roll unloading stations, means arranged to slide a core onto the mandrel when at said core loading position, means arranged to move said jaws radially outwardly of the mandrel when the mandrel is moved from said core loading station to said roll starting station whereby said core is clutched to the mandrel, means arranged to wind the web initially around said clutched core on the mandrel when at said roll starting station, means arranged to complete the winding of the web around said clutched core on the mandrel when at the roll winding station, means arranged to sever the web after a predetermined length thereof has been wound around said clutched core thereby to form a roll, means arranged to secure the trailing end of the severed web to said roll, means arranged to move said jaws radially inwardly of the mandrel when the mandrel is moved from said roll winding station to said roll unloading station whereby said core is declutched from the mandrel, and means arranged to remove the completed roll from the mandrel when at said roll unloading station.

3. In a winding machine for converting a continuously traveling web into rolls, the combination comprising means arranged to feed the web at a predetermined speed, a rotatable turret, a radially expansible and contractible mandrel rotatably mounted on said turret, means arranged to rotate said turret whereby the mandrel is moved successively through core loading, roll starting, roll winding and roll unloading stations, means arranged to mount a core on the mandrel when at said core loading position, means arranged to expand the mandrel when the mandrel is moved from said core loading station to said roll starting station whereby said core is clutched to the mandrel, means arranged to wind the web fed by said feed means initially around said clutched core on the mandrel when at said roll starting station thereby to initiate a new roll, said new roll being movable to said roll winding station at which the winding of the web around said clutched core is completed, means arranged to urge the mandrel when at said roll winding station to rotate so that the web is tensioned, means arranged to sever the web after a predetermined length thereof has been wound around said clutched core thereby to form a roll, means arranged to secure the trailing end of the severed web to said roll, means arranged to contract the mandrel when the mandrel is moved from said roll winding station to said roll unloading station whereby said core is de-clutched from the mandrel, and means arranged to remove the completed roll from the contracted mandrel when at said roll unloading station.

4. In a winding machine for converting a continuously traveling web into rolls, the combination comprising a rotatable turret, a plurality of mandrels rotatably mounted on said turret and each movable thereby successively through roll

starting and roll winding stations, means arranged to feed the web, a guide press movably mounted adjacent said roll starting station and normally arranged to guide the web past the mandrel at said roll starting station and toward the mandrel at said roll winding station, means arranged to rotate the mandrels when at said roll starting and roll winding stations, a movable guard partially surrounding the mandrel at said roll starting station and having a guide face arranged in spaced relation to such mandrel to provide a channel following the periphery of such mandrel, the inlet to said channel being normally arranged adjacent the web discharge end of said guide press, means arranged to sever the web leading to the mandrel at said winding station, means arranged to move said guide press toward said guard after the web has been severed thereby to guide the leading end of the severed web into said inlet, means arranged to move said guard circumferentially around the mandrel at said roll starting station after said leading end has entered said inlet thereby to initiate the formation of a new roll, and means arranged to subsequently move said turret whereby the mandrel carrying such new roll is moved from said roll starting station to said roll winding station at which latter station the winding of the web around such mandrel is completed.

5. In a winding machine for converting a continuously traveling web into rolls, the combination comprising a rotatable turret, a plurality of core carrying mandrels rotatably mounted on said turret and each movable thereby successively through roll starting and roll winding stations, means arranged to feed the web, a guide press for guiding the fed web and having its web discharge end arranged adjacent the mandrel at said roll starting station and movable toward and away from such mandrel, said guide press being normally arranged to guide the web past the mandrel at said roll starting station and toward the mandrel at said roll winding station, means arranged to rotate the mandrels when at said roll starting and roll winding stations, a rotatable guard partially surrounding the mandrel at said roll starting station and having a curved inner face concentrically arranged in closely spaced relation to the core on such mandrel to provide a channel, the inlet to said channel being normally arranged adjacent said web discharge end, leaf spring means carried by said guard and arranged in said channel, means arranged to sever the web leading to the mandrel at said winding station including a movable knife arm arranged on one side of said guide press and adapted to move said guide press toward said core, a knife blade carried by said knife arm and movable past said web discharge end, a knife blade carried by said guard and cooperable with the other knife blade to sever the web and means arranged to actuate said knife arm whereby the web is severed and said web discharge end is pressed against said core thereby to guide the leading end of the severed web into said inlet and between said core and said leaf spring means, means arranged to thereafter rotate said guard after said leading end has been engaged by said leaf spring means to confine said leading end to the periphery of said core thereby initiating the formation of a new roll, and means arranged to subsequently move said turret whereby the mandrel carrying said new roll is moved from said roll starting station to said roll winding station at which latter station the winding of the web around such mandrel is completed.

6. In a winding machine for converting a continuously traveling web into rolls, the combination comprising a frame, a turret rotatably mounted on said frame, a plurality of mandrels rotatably mounted on said turret, common driving means arranged to rotate said turret and mandrels, a turert stop arm oscillatably mounted on said frame and engageable and disengageable alternately with said turret to provide intermittent rotation of said turret whereby each of the mandrels is moved successively through core loading, roll starting, roll winding and roll unloading stations, actuating means arranged to oscillate said turret stop arm, a reciprocable core loader arranged on said frame adjacent said core loading station, movable web severing means arranged on said frame adjacent said roll starting station, actuating means arranged to operatively move said web severing means, movable roll initiating means arranged on said frame adjacent said roll starting station, actuating means arranged to operatively move said roll initiating means, movable gummed tape applying means arranged on said frame adjacent said roll winding station, actuating means arranged to operatively move said gummed tape applying means, a reciprocable stripper arm arranged on said frame adjacent said roll unloading station, common actuating means arranged on said frame to reciprocate said core loader and stripper arm, each of said actuating means including a cam, a cam shaft carried by said frame and on which said cams are arranged in axially spaced and proper operative relation to one another thereby to form a rotatable unitary cam assembly and means arranged to intermittently rotate said unitary cam assembly.

HENRY J. WOLFE.

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