

Dec. 6, 1960

P. H. NORRHOLM
APPARATUS FOR APPLYING FLEXIBLE TAPE
TO A CYLINDRICAL MAGAZINE

2,963,291

Filed Feb. 7, 1958

4 Sheets-Sheet 1

FIG. 1

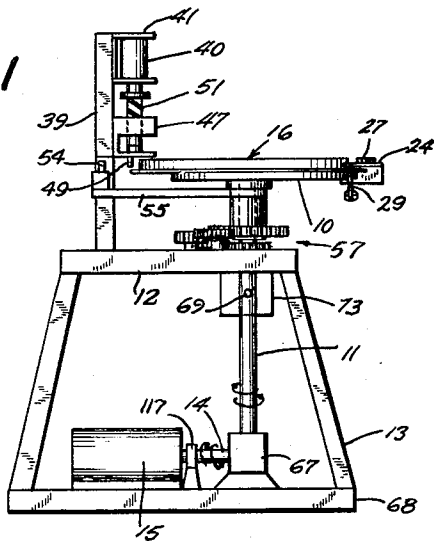
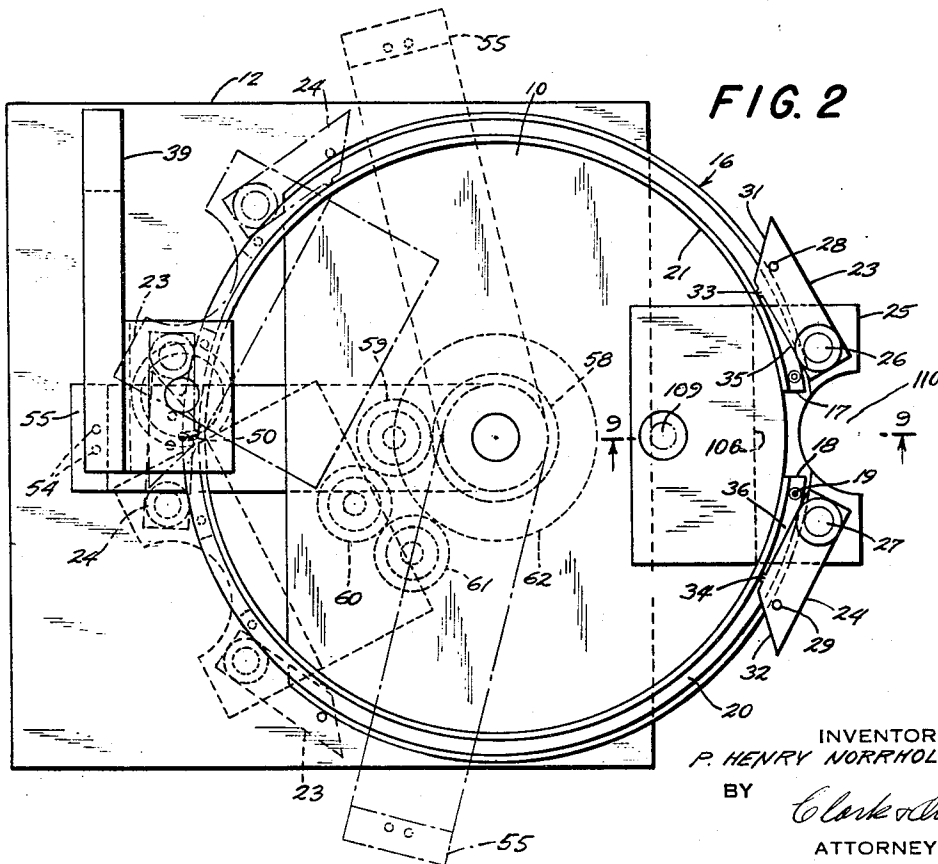


FIG. 2



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FIG. 4

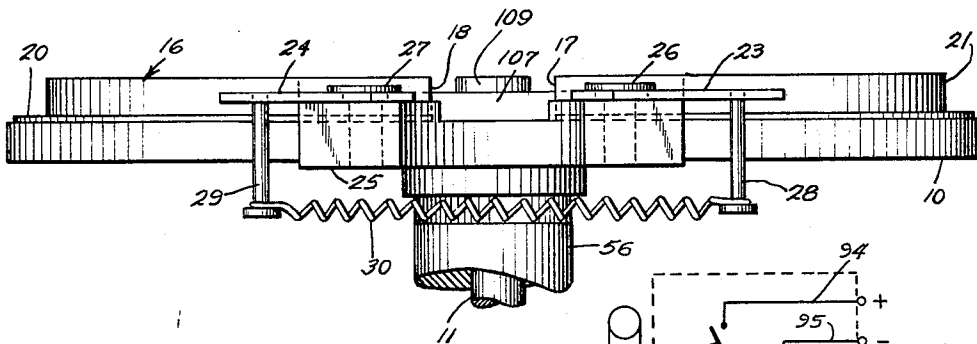


FIG. 3

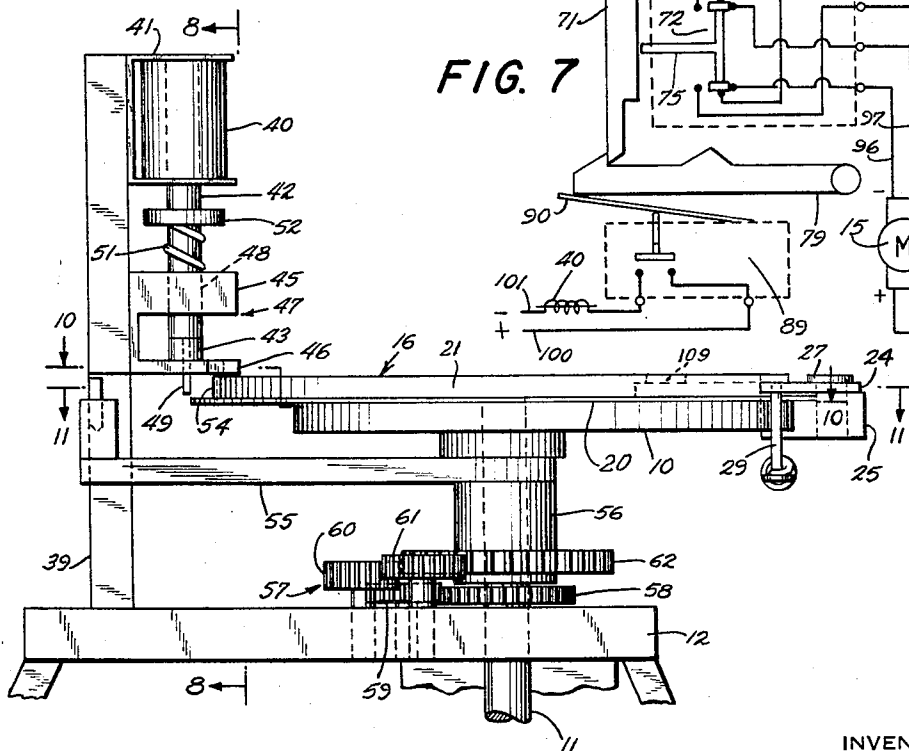
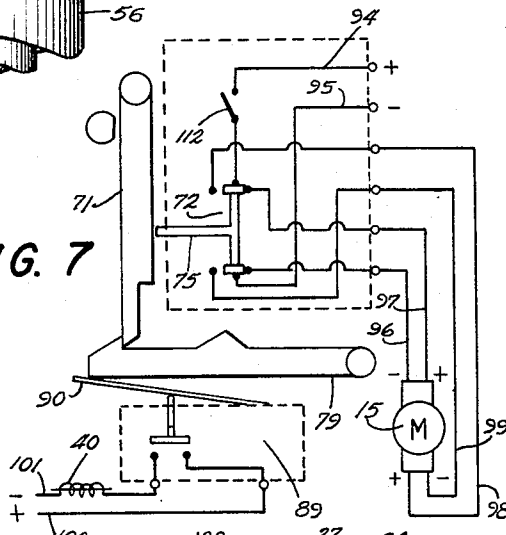


FIG. 7



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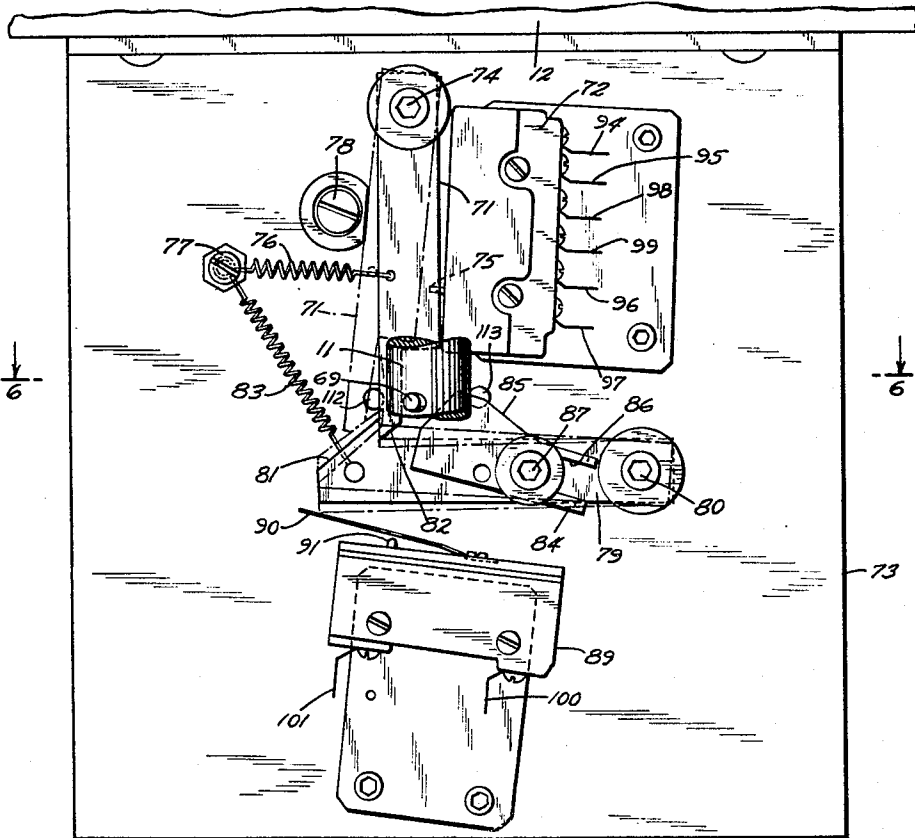


FIG. 5

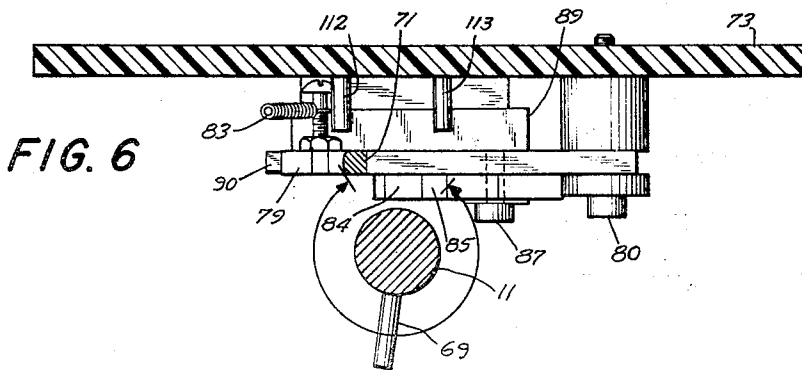
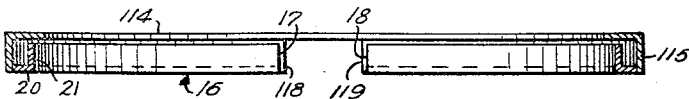


FIG. 6

FIG. 12



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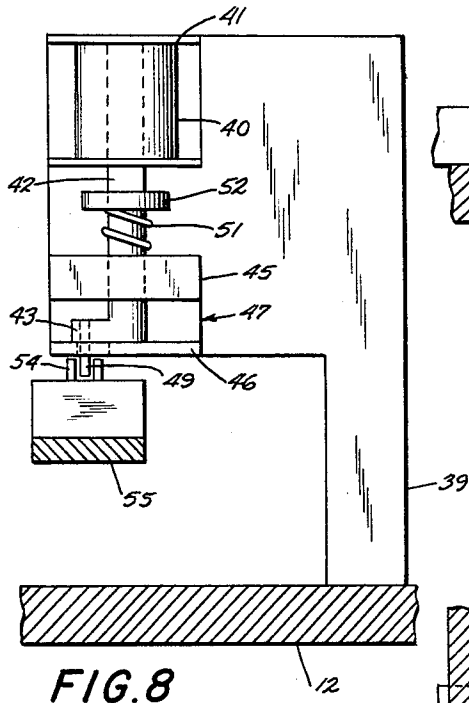


FIG. 8

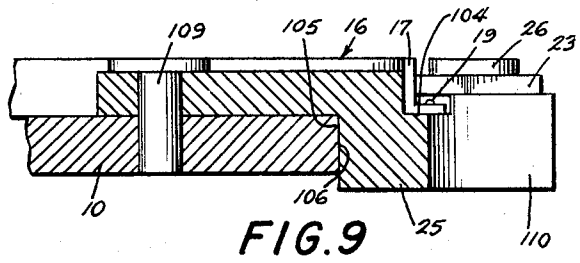


FIG. 9

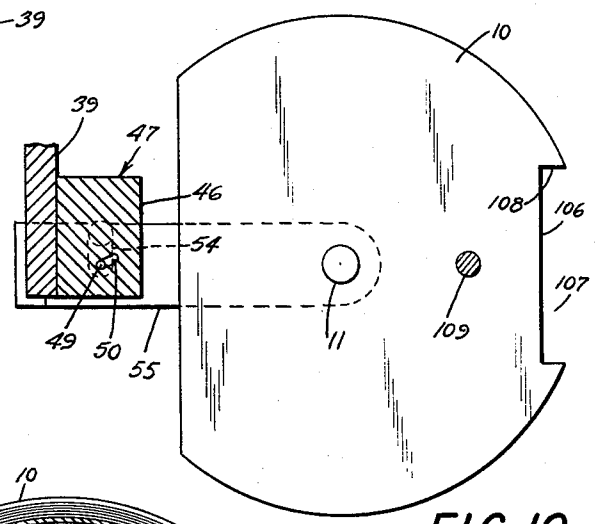


FIG. 10

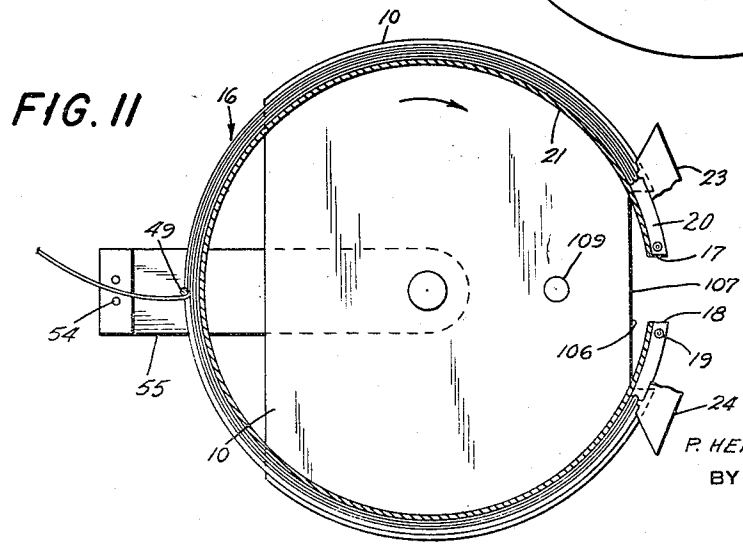


FIG. 11

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APPARATUS FOR APPLYING FLEXIBLE TAPE TO A CYLINDRICAL MAGAZINE

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Filed Feb. 7, 1958, Ser. No. 713,910

8 Claims. (Cl. 270-79)

This invention relates to an apparatus for applying flexible tape to a cylindrical magazine in a back and forth manner extending slightly less than the full convolution thereof.

The invention further relates to a flexible tape package arranged on a cylindrical magazine in layers of a length somewhat less than a complete convolution.

Another object of the invention is to provide an apparatus of said character for feeding tape in superimposed layers in a back and forth manner on a cylindrical magazine as the same is reciprocated in opposite directions somewhat less than a full convolution thereof.

Another object of the invention is to provide means for gripping the ends of the layers of the tape as the same are wound on the magazine and for releasing the gripping means with each reversal of the direction of applying the tape.

Another object of the invention is to provide a reciprocatory table for supporting the magazine in a horizontal plane and for imparting reciprocatory movement to the table and the gripping means for holding the tape on the magazine.

Another object of the invention is to provide guide means for feeding the tape to the magazine supported on the table and for reversing the direction of rotation of the table and the guide means each time the table is rotated somewhat less than a full convolution.

In accordance with the aforesaid objectives, the invention provides a flexible tape package produced by the apparatus which renders it possible to use the magazine for applying tape to the outer surfaces of a number of toroidal coils with one loading of the magazine.

With the foregoing and other objects in view, reference is now made to the following specification and accompanying drawings in which the preferred embodiment of the invention is illustrated.

In the drawings:

Fig. 1 is a view in elevation of a machine constructed in accordance with the invention for applying tape onto a cylindrical magazine and showing the magazine in position thereon.

Fig. 2 is a top plan view thereof.

Fig. 3 is an enlarged side view of the apparatus with the lower portion of the supporting frame broken away.

Fig. 4 is a view taken at right angular relation to the view shown in Fig. 3 and showing the table and the open end of the magazine.

Fig. 5 is an enlarged side view of the switch means for reversing the direction of rotation of the motor and for energizing the solenoid.

Fig. 6 is an enlarged fragmentary sectional view taken approximately on line 6-6 of Fig. 5.

Fig. 7 is a schematic view of the wiring diagram.

Fig. 8 is a vertical sectional view taken approximately on line 8-8 of Fig. 3.

Fig. 9 is an enlarged horizontal fragmentary sectional view taken approximately on line 9-9 of Fig. 2.

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Fig. 10 is a fragmentary sectional view taken approximately on line 10-10 of Fig. 3 showing the top of the table with the magazine removed.

Fig. 11 is a view taken approximately on line 11-11 of Fig. 3 showing the table with the magazine in position.

Fig. 12 is a vertical sectional view through the magazine and cover therefor.

Referring to the drawings, the apparatus includes an arcuately reciprocatory table 10 mounted on the upper end of a driven shaft 11 journaled in the bed 12 of a supporting frame 13 and operatively connected with a driving shaft 14 of a reversible electric motor 15.

The table 10 constitutes a support for a split cylindrical magazine 16 on which a narrow tape is applied by the apparatus in superimposed layers extending slightly less than a complete convolution thereof with each layer connected with an adjacent layer at one end thereof and connected with the other adjacent layer at the opposite end. The tape is thus arranged on the magazine in continuous relation and in superimposed layers with the reciprocatory movement of the table. The magazine is of angular relation in cross-section and of split cylindrical formation having spaced confronting ends 17 and 18. The ends 17 and 18 are apertured for receiving screws 19 or equivalent fastening means for releasably securing the magazine on the table with the horizontal portion 20 of the magazine disposed flatly on the table and the upstanding portion 21 located innermost with reference to the horizontal portion and forming a split cylindrical spool for the tape.

The horizontal portion 20 of the magazine extends under spaced oppositely disposed clamps 23 and 24 which are pivoted to a rectangular plate 25 on pivot pins 26 and 27 respectively. The plate 25 is bolted or otherwise affixed to the top of the table 10 with the outer end thereof projecting outwardly therebeyond. The clamps 23 and 24 are provided with pins 28 and 29 located adjacent the forward ends thereof respectively and which depend therefrom and are connected by a coil spring 30 which biases the clamps for normally maintaining the same in inward relation toward the periphery of the table. The clamps are formed with angulated forward edges 31 and 32 respectively and with projections 33 and 34 located at the juncture of the angulated edges 31 and 32 with the inner side edges 35 and 36 respectively.

Mounted on the bed 12 is an upstanding post 39 on which a solenoid 40 is mounted by means of a bracket 41 with the solenoid disposed in superposed relation with reference to the magazine 16 and with the armature 42 of the solenoid arranged in vertical relation. The armature is provided with an offset lower foot 43 which is disposed between upper and lower outwardly projecting portions 45 and 46 of a guide 47. The guide is affixed to the post 39 to dispose the outer ends of the upper and lower portions 45 and 46 in overlying relation with the magazine 16. The upper portion 45 of the guide is formed with an opening 48 in which the armature 42 is slideable and the offset foot 43 is provided with a pin 49 which depends therefrom and is slideable in an arcuate slot 50 in the lower portion 46 of the guide.

The armature is biased by a coil spring 51 to dispose the offset foot 43 normally in seated engagement on the lower portion 46 of the guide. The spring 51 is secured at its upper end to a flange 52 affixed to the armature and at its lower end to the upper portion 45 of the guide so to tension the armature to dispose the pin 49 normally in the outer end of the slot 50, that is, away from the magazine 16 as shown in Fig. 2 of the drawings. The pin 49 is moved to the inner end of the slot 50 by the camming action of the forward

faces 31 and 32 of the clamps 23 and 24 when engaging against the pin 49 by the movement of the table 10. When the solenoid is energized, the armature together with the pin 49 will be raised against the tension of the spring 51 to dispose the lower end of the pin 49 above the clamps.

The tape to be wound on the magazine is delivered tangentially thereto between guide pins 54 mounted on a radially disposed arm 55 affixed to a sleeve 56 rotatably mounted on the driven shaft 11. The sleeve 56 is rotated by the driven shaft 11 through gearing 57 which moves the arm about the shaft 11 in the direction of the rotation of the table 10 and one half the arcuate movement thereof. Thus, when the magazine is positioned as shown in Fig. 2, the outer end of the arm 55 is diametrically disposed and when the magazine is moved in a counterclockwise direction to dispose the clamps 23 and 24 in the broken line position shown in the upper portion of Fig. 2, the arm will be swung in a counterclockwise direction to dispose the same in the broken line position shown at the bottom of Fig. 2 and when the magazine is moved in a clockwise direction to dispose the clamps 23 and 24 in the broken line position shown at the bottom of Fig. 2, the outer end of the arm will be swung in a clockwise direction to dispose the same in the broken line position shown at the top of Fig. 2.

The gearing 57 consists of a gear 58 affixed to the driven shaft 11 and connected through a chain of gears 59, 60 and 61 with a relatively large gear 62 affixed to the sleeve 56. The gears 59, 60 and 61 are mounted on shafts 63, 64 and 65 which are journaled in the bed 12 for rotation in either direction.

The driven shaft 11 is connected with the driving shaft 14 of the motor 15 through reduction gearing and with means for reversing the motor for changing the direction of rotation of the driven shaft 11. The reduction gearing is contained in a casing 67 affixed to the base 68 of the supporting frame 13 on which base the motor is mounted. The driven shaft 11 is provided with a tripper arm 69 which is adapted to engage an actuating arm 71 to actuate a double pole double throw switch 72 arranged in circuit with the motor for reversing the direction of rotation thereof. The switch 72 is mounted on a panel 73 affixed to the under side of the bed 12 to dispose the switch in adjacent relation to the shaft 11. The actuating arm 71 is pivoted on a pivot pin 74 for swinging movement to depress the outwardly biased pin 75 of the switch to thereby actuate the switch. The arm 71 is biased away from the pin 75 by a coil spring 76 affixed at one end to the arm and at its opposite end to the post 77. A stop 78 limits the outward movement of the arm 71. The arm 71 projects below the switch and into the path of movement of the tripper arm 69 whereby the tripper arm will engage and swing the actuating arm 71 to depress the pin 75 with the movement of the shaft 11 in a clockwise direction. This movement of the actuating arm disposes the lower end thereof in latched engagement with a latching arm 79 pivoted on a pivot pin 80 affixed to the panel below the switch so as to retain the pin 75 in depressed relation during the counterclockwise movement of the shaft 11. The latching arm 79 is provided with a cam face 81 at the inner end thereof and with a shoulder 82 providing a latch for the actuating arm. The latching arm 79 is tensioned by a spring 83 to bias the same toward the lower end of the actuating arm. The spring 83 is affixed to the latching arm 79 at one end and to the post 77 at the opposite end.

The latching arm is provided with a plate 84 having a cam edge 85 which is disposed in the path of movement of the tripper arm 69 with the movement thereof in counterclockwise direction. This movement of the tripper arm swings the latching arm 79 to release the actuating arm 71 to thereby release the pin 75 whereby

the switch is actuated to reverse the circuit with the motor 15 to thereby change the direction of rotation thereof. The tripper arm 69 is so located on the shaft 11 that the reversal of rotation of the motor takes place immediately following the camming of the pin 49 to the inner end of the slot 50. The plate 84 is adjustable on the latching arm 79 to dispose the same in the proper position for reversing the direction of rotation of the motor. For this purpose the plate is provided with a forked end 86 through which extends a clamping screw 87.

The latching arm 79 is located adjacent to a single pole single throw switch 89 which is in circuit with the solenoid 40. The switch is provided with a flat spring 90 affixed thereto adjacent a protruding and outwardly biased pin 91 which is adapted to be depressed by movement of the flat spring to actuate the switch. The spring 90 projects upwardly from the switch in adjacent relation to the outer end of the latching arm 79 whereby each time the tripper arm 69 engages the actuating arm 71 and the cam edge 85 of the plate 84 of the latching arm 79 for actuating the switch 72, the actuating arm 71 will depress the flat spring 90 to thereby depress the pin 91 and momentarily close the switch 89 to thereby momentarily energize the solenoid 40 to effect upward movement of the armature.

The switch 72 is adapted to be connected with a source of current supply by conductor wires 94 and 95 and is connected with one side of the electric motor 15 by conductor wires 96 and 97 and with the other side of the motor by conductor wires 98 and 99. It will be understood that when the switch 72 is actuated so as to place the conductor wires 96 and 97 in circuit with the motor, the motor will operate in one direction and when the switch is actuated to connect the conductor wires 98 and 99 in circuit with the motor, the motor will turn in the opposite direction.

The switch 89 is adapted to be connected with a source of current supply by conductor wires 100 and 101 and with the solenoid 40 in circuit therewith whereby each time the switch is closed, the solenoid will be momentarily energized.

The rectangular plate 25 is formed with an arcuate groove 104 in the upper face thereof in which the ends 17 and 18 of the magazine 16 are releasably secured by means of the screws 19. Outwardly of the groove 104, the upper face of the plate 25 at each side is at the required height to dispose the free ends of the clamps 23 and 24 in engagement against the tape as the tape is wound in a back and forth manner on the upstanding portion 21 of the magazine. The inner portion of the plate 25 which rests upon the upper face of the table 10 is of lesser thickness so as to form a shoulder 105. The shoulder 105 abuts against the edge 106 of a rectangular recess 107 formed in the outer periphery of the table 10 with opposite side edges 108 of the recess snugly fitting against the opposite side edges of the plate and with the plate releasably secured to the table by a stud 109. The plate is formed with an arcuate recess 110 in the outer end thereof for facilitating the emplacement and removal of the magazine 16.

The upstanding post 39 is affixed to the bed 12 adjacent one edge thereof with the upper portion of the post widened and spaced above the base to provide a clearance for the arm 55 and the outer end of the plate 25 and to which widened portion the solenoid 40 and the guide 47 are affixed as hereinbefore described.

In operation an empty magazine 16 is secured to the table 10 by the screws 19 and the table preferably swung to the magazine loading position shown in plan in Fig. 2 of the drawings. The tape to be applied to the magazine, such as the tape T shown in Fig. 11 of the drawings, is fed from a spool (not shown) with the tape extending between the guide pins 54 and around one side of the pin 49 with the end of the tape held against the upstanding

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portion 21 of the magazine by means of the spring clamp 23. When in this position, as shown in Fig. 11 of the drawings, the table will be turned in a clockwise direction with the closing of a starting switch 112 to energize the electric motor 15. With the turning of the table 10 in a clockwise direction, the clamps 23 and 24 will be rotated in a clockwise direction to the dotted line position shown in the bottom portion of Fig. 2. When in this position, the angulated forward edge 32 of the clamp 24 engages the pin 49 to thereby cam the same to the inner end of the slot 50. At the same time the tripper arm 69 engages and swings the actuating arm 71 inwardly into the position shown in full line in Fig. 5 of the drawings to thereby depress the pin 75 and actuate the switch 72 so as to reverse the direction of rotation of the electric motor 15. The aforesaid movement of the actuating arm 71 swings the latching arm 79 downwardly so as to depress the spring 90 and actuate the switch 89 to thereby momentarily energize the solenoid 40 and lift its armature 42. This raises the pin 49 out of engagement with the tape T. The table 10 then begins to rotate in a counterclockwise direction and the spring 51 swings the armature so as to move the pin 49 to the outer end of the slot 50 with the lower end of the pin sliding on top of the clamp 24. When the clamp 24 is moved from under the pin 49, the spring 51 functions to move the armature 42 downwardly whereupon the pin 49 engages on the opposite side of the tape T from that shown in Fig. 11 of the drawings so as to feed the tape to the magazine with the movement of the table in the counterclockwise direction.

It will be understood that there is produced a fold in the tape about the pin 49 when the clamp 24 cams the pin toward the inner end of the slot 50. The clamp 24 swings outwardly sufficiently against the tension of its spring by the camming action so that when the pin 49 is elevated, the clamp 24 will again swing inwardly so that the projection 34 engages against the fold to hold the same in position on the magazine 16.

In order to provide for a complete and sudden stopping of the table with the actuation of the switch 72 to effect change of rotation of the motor 15, a stop 112 is provided which is affixed to the panel 73 and extends outwardly therefrom and which is engaged by the tripper arm 69 with the movement of the actuating arm 71 to actuate the switch 72 to thereby prevent further rotation of the shaft 11 in a clockwise direction. A stop 113 is also provided which is engaged by the tripper arm to permit further rotation of the shaft 11 in a counterclockwise direction after the tripper arm has actuated the latching arm 79. In addition thereto, the shaft 14 is provided with a friction clutch 117 which functions to rapidly stop rotation of the shaft 14 when the switch is thrown to stop the electric motor or with each reversal of rotation thereof.

The magazine when loaded with a supply of tape is removed for winding the tape on toroidal coils and the like. For such purpose the magazine is provided with a cover 114 which is formed with a peripheral flange 115 fittingly engaging the flange 20 of the magazine. The flange 115 is formed with an opening therethrough between the ends 118 and 119. The tape is dispensed inwardly from the magazine through the opening between the ends 17 and 18 thereof. Any desired type of tape may be wound on the magazine by the apparatus, the same principally being for insulation or covering purposes which may be formed of cotton, thermoplastic or other materials.

While the preferred form of the invention has been shown and described herein, it is to be understood that the same is not so limited but shall cover and include any and all modifications thereof which fall within the purview of the invention.

What is claimed is:

1. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by

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said table for securing a magazine thereon to which tape is attached which is to be wound thereon in a folded back and forth manner, power means operatively connected with said table for imparting arcuate reciprocatory movement thereto about its rotatable support, a pin carried by said base about which the tape is folded at the end of each reciprocation of the table, means for moving said pin out of engagement with the fold at the end of each reciprocation, and spaced clamp means pivotally carried by said table and biased toward said magazine and having cam faces adapted to be engaged by said pin with the rotation of the table for swinging said clamp means outwardly of the fold at the end of the reciprocations, one of said clamp means by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of said pin out of engagement with the fold at the end of each reciprocation of the table in one direction and the other clamp means by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of the pin out of engagement with the fold at the end of each reciprocation of the table in the other direction.

2. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a cylindrical magazine in concentric relation thereon to which magazine one end of a length of tape is attached which is to be wound thereon in a folded back and forth manner, spaced clamps pivotally carried by said table and biased toward said magazine for clamping the folded ends of the tape against the magazine, power means operatively connected with said table for imparting arcuate reciprocatory movement thereto about its rotatable support, guide means for said tape carried by said base, a pin carried by said base about which the tape is trained from said guide, means operatively connected with said power means and with said guide means for imparting arcuate movement to said guide means with the movement of the table to thereby form a fold in the tape about said pin at the end of each reciprocation of the table, means for moving said pin out of engagement with the fold at the end of each reciprocation, and said clamps having cam faces adapted to be engaged by said pin with the rotation of the table for swinging said clamps outwardly of the folds at the end of the reciprocations, one of said clamps by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of said pin out of engagement with the fold at the end of each reciprocation of the table in one direction and the other clamp means by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of the pin out of engagement with the fold at the end of each reciprocation of the table in the other direction.

3. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a cylindrical magazine in concentric relation thereon to which magazine one end of a length of tape is attached which is to be wound thereon in a folded back and forth manner, spaced clamps pivotally carried by said table and biased toward said magazine for clamping the folded ends of the tape against the magazine, an arm pivotally mounted on said base and having guide means for said tape, power means operatively connected with said table and with said arm for imparting arcuate reciprocatory movement thereto, a pin carried by said base and located in the path of movement of said clamps and about which pin the tape is trained from said guide to thereby form a fold in the tape about said pin at the end of each reciprocation of the table, and means for moving said pin out of engagement with the fold at the end of each reciprocation, said clamps having cam faces adapted to be engaged by said pin with the rotation of the table for swinging said clamps outwardly of the folds at the end of the reciprocations, and said clamps by their bias clamping

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the folded ends of the tape on said magazine with the movement of the pin out of engagement therewith.

4. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a cylindrical magazine in concentric relation thereon to which magazine one end of a length of tape is attached which is to be wound thereon in a folded back and forth manner, spaced clamps pivotally carried by said table and biased toward said magazine for clamping the folded ends of the tape against the magazine, an arm pivotally mounted on said base and having guide means for said tape, power means operatively connected with said table and with said arm for imparting arcuate reciprocatory movement thereto, a pin carried by said base and located in the path of movement of said clamps and about which pin the tape is trained from said guide to thereby form a fold in the tape about said pin at the end of each reciprocation of the table, means for moving said pin out of engagement with the fold at the end of each reciprocation, and said clamps having cam faces adapted to be engaged by said pin with the rotation of the table for swinging said clamps outwardly of the folds at the ends of the reciprocations, one of said clamps by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of said pin out of engagement with the fold at the end of each reciprocation of the table in one direction and the other of said clamps by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of the pin out of engagement with the fold at the end of each reciprocation of the table in the other direction.

5. In an apparatus of the character described, a base, a table affixed to a shaft rotatably mounted on the base, means carried by said table for securing a cylindrical magazine in concentric relation thereon to which magazine one end of a length of tape is attached which is to be wound thereon in a folded back and forth manner, spaced clamps pivotally carried by said table and biased toward said magazine for clamping the folded ends of the tape against the magazine, an arm mounted on said shaft for pivotal turning movement and having guide means for said tape, electrical power means operatively connected with said shaft for imparting arcuate reciprocatory movement to said shaft, gearing connected between said shaft and said arm for rotating said arm in the direction of rotation of the table, a solenoid supported by said base above said table and having an armature provided with an element located in the path of movement of said clamps and about which the tape is trained from said guide to thereby form a fold in the tape about said element at the end of each reciprocation of the table, electrical switch means carried by said base and arranged in a circuit with said solenoid, means carried by said shaft for actuating said switch means to effect energizing of said solenoid for moving said element out of engagement with the fold at the end of each reciprocation, and said clamps having cam faces adapted to be engaged by said element with the rotation of the table for swinging said clamps outwardly of the folds at the ends of the reciprocations, one of said clamps by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of said element out of engagement with the fold at the end of each reciprocation of the table in one direction and the other of said clamps by its bias swinging inwardly to clamp the fold in the tape on the magazine with the movement of the element out of engagement with the fold at the end of each reciprocation of the table in the other direction.

6. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a magazine thereon to which tape is attached to be bound thereon in a folded back and forth manner, power means operatively connected with said table imparting arcuate reciprocatory movement

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thereto, a pin carried by said base for movement toward and away from said magazine and about which pin the tape is trained during each reciprocation of the table, clamp means movably carried by said table for clamping the folded ends of the tape on the magazine, said pin being disposed in the path of movement of said clamp means, said clamp means engaging said pin at the end of each reciprocation of the table to thereby move said clamp means out of clamping engagement with the tape on the magazine, means for moving said pin out of engagement with the tape and out of engagement with said clamp means following the movement of the clamp means out of clamping engagement with the tape on the magazine, and means for moving said clamp means into clamping engagement with the fold in the tape released by the pin.

7. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a magazine thereon to which tape is attached to be bound thereon in a folded back and forth manner, power means operatively connected with said table imparting arcuate reciprocatory movement thereto, a pin carried by said base for movement toward and away from said magazine and about which pin the tape is trained during each reciprocation of the table, a member carried by said base having a guide slot in which said pin is movable, clamp means movably carried by said table for clamping the folded ends of the tape on the magazine, said pin being disposed in the path of movement of said clamp means, said clamp means engaging said pin at the end of each reciprocation of the table to thereby move the pin and the tape trained about the pin toward the inner end of said slot and toward the magazine and to move said clamp means out of clamping engagement with the tape on the magazine, means for moving said pin out of engagement with the tape and out of engagement with said clamp means following the movement of the clamp means out of clamping engagement with the tape on the magazine, and means for moving said clamp means into clamping engagement with the fold in the tape released by the pin.

8. In an apparatus of the character described, a base, a table rotatably mounted on the base, means carried by said table for securing a magazine thereon to which tape is attached to be bound thereon in a folded back and forth manner, power means operatively connected with said table imparting arcuate reciprocatory movement thereto, a pin carried by said base for movement toward and away from said magazine and about which pin the tape is trained during each reciprocation of the table, spaced clamp means carried by said table for clamping the folded ends of the tape on the magazine, said pin being disposed in the path of movement of said clamp means and movable out of the way of said clamp means at the end of each reciprocation of the table, one of said clamp means clamping the tape on the magazine when the tape is released by the pin at the end of each reciprocation of the table in one direction and the other clamp means clamping the tape on the magazine when the tape is released by the pin at the end of each reciprocation of the table in the other direction, means for moving said pin out of engagement with the tape and out of engagement with said clamp means at the end of each reciprocation, and means for moving said clamp means into clamping engagement with the fold in the tape released by the pin.

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