

April 13, 1926.

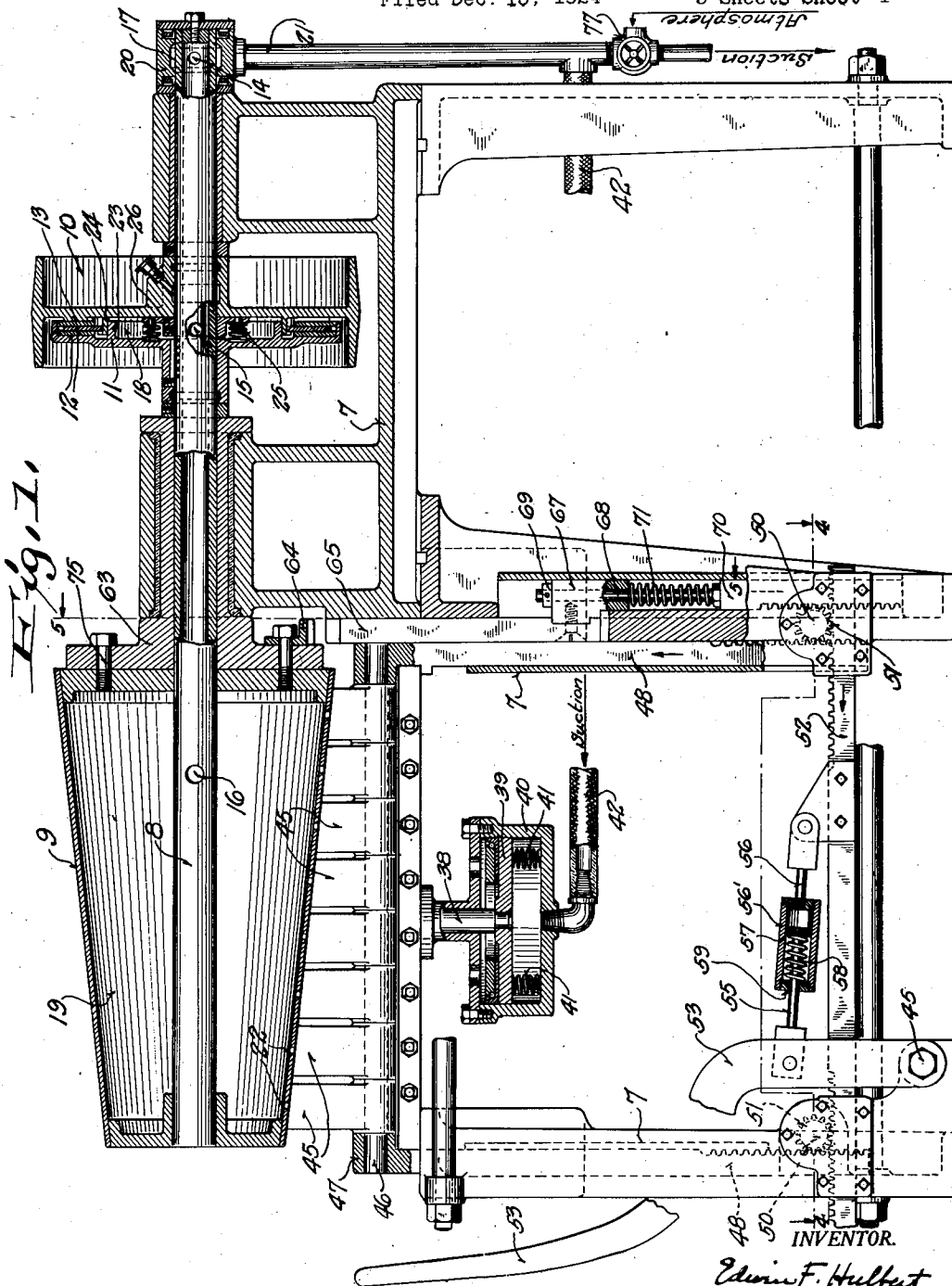
1,580,374

E. F. HULBERT

TUBE WINDING MACHINE

Filed Dec. 15, 1924

3 Sheets-Sheet 1



BY

Edwin F. Hulbert

Quarles & French
ATTORNEYS

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3 Sheets-Sheet 2

Fig. 2.

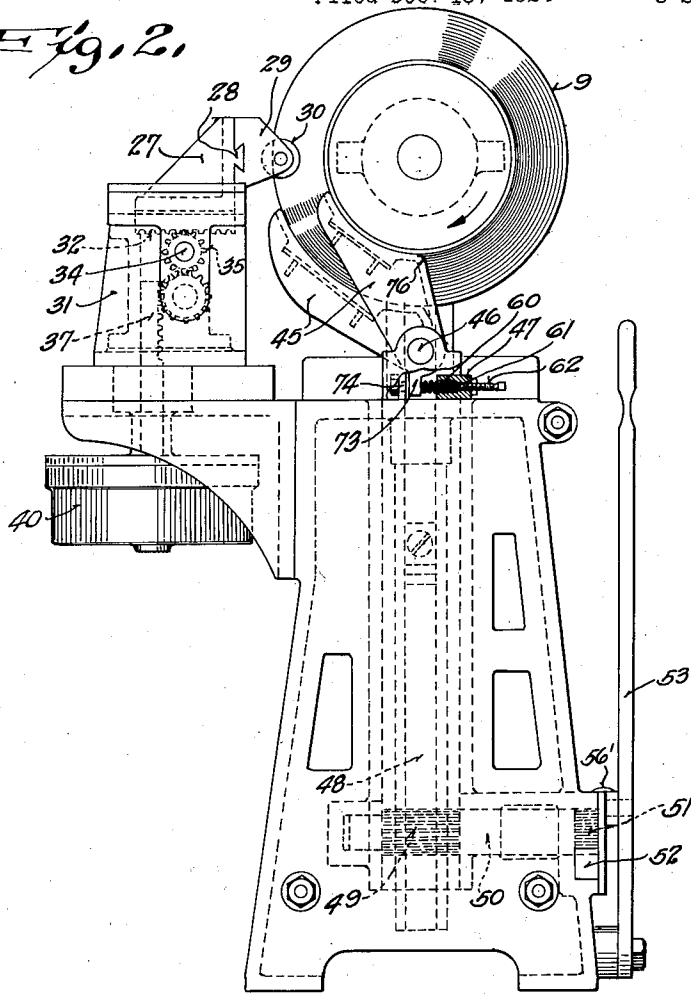
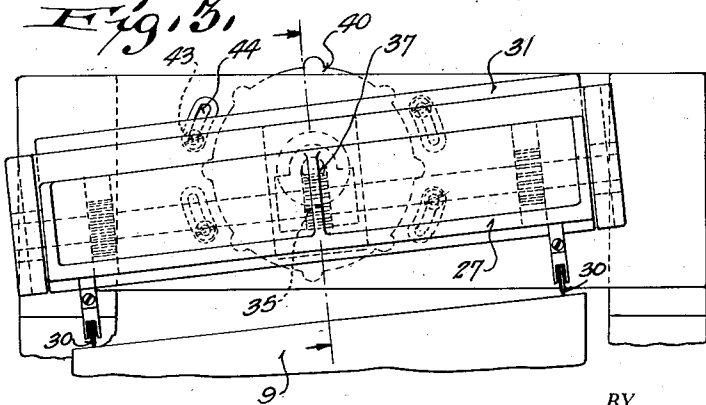


Fig. 5.



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Fig. 4,

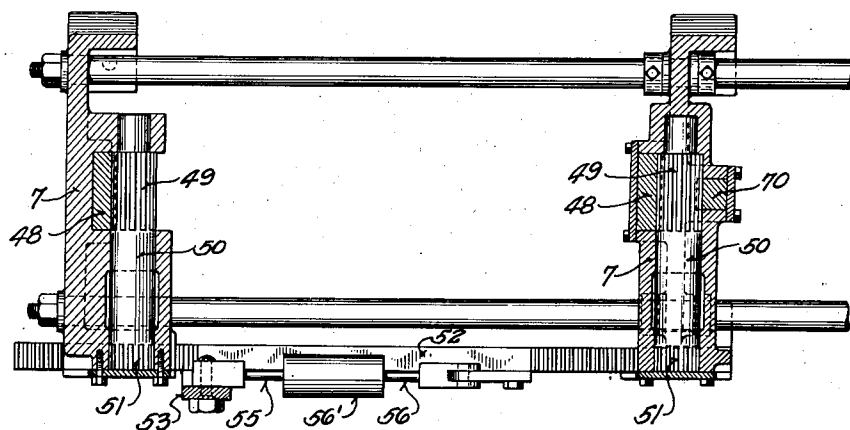


Fig. 5,

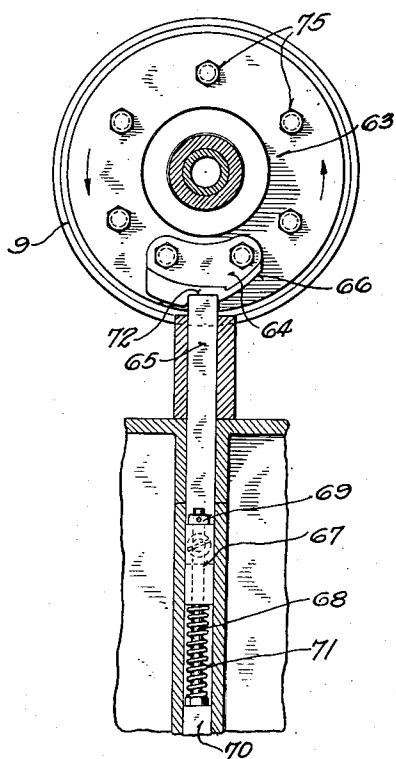
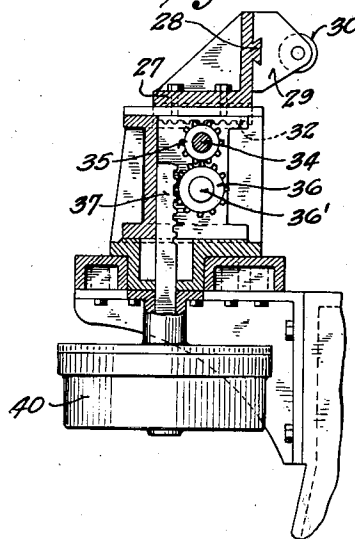


Fig. 6,



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UNITED STATES PATENT OFFICE.

EDWIN F. HULBERT, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE MASTER PACKAGE CORPORATION, OF DELAWARE.

TUBE-WINDING MACHINE.

Application filed December 15, 1924. Serial No. 755,982.

To all whom it may concern:

Be it known that I, EDWIN F. HULBERT, a citizen of the United States of America, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Tube-Winding Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The invention relates to tube winding machines, and more particularly to machines for winding paper or fibre sheets upon one another to form the body or siding of a paper or fibre container.

One of the objects of the invention is to provide a machine in which the sheet is initially secured to the mandrel by suction or vacuum.

A further object of the invention is to provide a clutch to connect the mandrel shaft with a source of power, which clutch is automatically engaged when the sheet is placed on the mandrel through the action of suction.

A further object of the invention is to provide a tube-winding apparatus in which a plurality of yieldably mounted fingers insure a smooth winding of the sheet upon the mandrel, with a support for said fingers which permits them to automatically adjust themselves to the tube as it increases in thickness during the winding operation.

A further object of the invention is to provide a tube-winding machine in which the tube is cut to the desired length as it is being wound, and in which the cutters are automatically held to the work by suction.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Fig. 1 is a side view of a machine embodying the invention, parts being broken away and parts being shown in section;

Fig. 2 is a front end view of the machine, parts being shown in section;

Fig. 3 is a detail plan view of the cutters and their support;

Fig. 4 is a section taken on the line 4—4 of Fig. 1;

Fig. 5 is a section taken on the line 5—5 of Fig. 1;

Fig. 6 is a section taken on the line 6—6 of Fig. 3.

In the drawings the numeral 7 designates the frame of the machine, 8 the mandrel shaft, 9 the mandrel, 10 a drive pulley, 11 a clutch disk slidably keyed to the shaft 8, and 12, clutch plates between said disk and a clutch surface 13 on the pulley 10.

The shaft 8 is of hollow tubular construction, closed at its ends to form a suction pipe, provided with openings 14, 15 and 16 registering respectively with a chamber 17, a space 18 within the clutch and the space 19 within the mandrel 9. A tubular member 20, whose ends are suitably seated against air leakage, surrounds the rear end of the shaft 8 and forms the chamber 17 which is connected by a pipe 21 with a vacuum or suction air pump, not shown.

The mandrel 9 is provided with a series of perforations 22 and when the edge of the sheet to be wound is placed over these perforations the suction created by the air pump connected with pipe 21 will draw this edge against the mandrel and cause it to adhere thereto so that the winding of the sheet may be started.

The disk 11 has a flange 23 slidably mounted upon a flange 24 on the pulley 10 and these flanges, with sides of the disk 11 and pulley 10, form the space 18. The disk 11 is normally held out of pressure engagement with the plates 12 by springs 25 mounted in the space 18 between said disk and a collar 26 fixed to the shaft 8. When, however, the sheet to be wound has covered the holes 22 the increased suction pressure is communicated to the space 18 and thus causes the disk 11 to move toward the pulley 10 against the action of the springs 25 and thereby press the plates 12 between them and thus establish a driving relation between the power-driven pulley and shaft 8, thus revolving the mandrel which then winds the sheets upon it until the desired thickness for the finished siding is obtained, it being understood that by the term "sheet" I mean a continuous sheet or strip, or a number of sheets glued together at their ends to form a continuous sheet, and that the layers as wound upon the mandrel are secured together by suitable adhesive. As soon as the winding operation is completed the removal of the tube from the mandrel breaks the vacuum and thereby releases the

pulley 10 from driving connection with the shaft, since the springs 25 then move disk 11 out of pressure engagement with the clutch plates 12.

5 For trimming the tubing to length, I use a cutter support 27 having a way 28 upon which the cutter brackets 29 carrying the knife wheels 30 are adjustably mounted and to which they may be secured in adjusted
10 position in any suitable manner, said cutter support 27 being itself slidably mounted in suitable guides on a supplemental frame 31. The cutters are moved toward and away from the work by moving the support 27
15 relative to the frame 31. This is accomplished by racks 32 on the support 27 meshing with pinions 33 on a shaft 34 mounted in said support, which carries a pinion 35 meshing with a centrally located pinion 36
20 on a shaft 36' which meshes with a rack 37 formed on or connected to a piston rod 38 for a suitably packed piston 39 working in a vacuum cylinder 40, Figs. 2, 3 and 6. Springs 41 within the cylinder 40 act on the
25 piston 39 so as to cause the above mechanism to move the cutters away from the work, but when the cylinder 40 is connected with the suction pump through a flexible pipe 42 connected with the suction pipe 21, the piston
30 39 is caused to be moved downwardly in the cylinder 40 when the sheet is attached to the mandrel, as previously described, and in the same way that the clutch is operated, and thereby move the cutters against the sheet
35 as it is being wound upon the mandrel to cut the sheet or sheets to the desired length. Thus, no additional time is required to trim the tube after it has been formed.

40 For making cone-shaped container bodies, such as for pails, the mandrels may be of various tapers and to accommodate for this the frame 31 with the cylinder 40 which it carries may be turned on the axis of said
45 cylinder as a center and be secured in adjusted position by clamping bolts 43 carried by the frame 31 and passing through arcuate slots 44 in the main frame.

50 In order to press the newly wound layer upon the previously wound layers of the tubing, I provide a plurality of presser members or fingers 45 whose pressing surfaces are formed to accommodate the shape of the tubing being formed. Each of these fingers is
55 pivotally mounted on a shaft 46 carried by a transverse frame member 47 having racks 48 formed integral therewith or secured thereto and slidably mounted in the main frame. As shown more particularly in Fig. 4, each rack 48 meshes with a pinion 49
60 formed on a shaft 50 which also has pinions 51 formed thereon meshing with a rack bar 52 slidably mounted in the main frame 7. This rack bar is adapted to be moved by the operator to bring the fingers 45 into operation
65 by means of a hand lever 53 pivoted

at 54 and connected intermediate its ends to the bar 52 by a yieldable link. As here shown, this link consists of rods 55 and 56 pivotally connected, respectively, to the lever 53 and bar 52, the rod 56 carrying a cylinder 70 56' in which the headed end 57 of the rod 55 works, a spring 58 being interposed between the head 57 and a head 59 of the cylinder. With this construction when the operator swings the lever 53 toward the left, 75 as viewed in Fig. 1, the rack bar 52 is moved in the same direction and this, through the pinion and rack connections above described, elevates the fingers 45 so that they may engage and press upon the work, each of said 80 fingers being yieldingly held against the work by a spring 60 interposed between the lower end thereof and a part of the frame member 47, and whose pressure is adjusted by a washer 61 and screw 62. When the 85 lever has moved the fingers to operative position, through force transmitted through the spring 58, it is held in any suitable manner and as the winding of the tube proceeds the fingers are permitted to move down as 90 the wall of the tube thickens, because of the yieldable link connection above described which permits movement of the rack bar 52 independent of the lever 53.

95 In order to stop the mandrel in a feeding position, the rear head 63 of the mandrel is provided with a latch plate or keeper 64 automatically engageable with a spring-pressed latch or locking rod 65 through the cam surface 66. The latch 65 is slidably mounted in 100 the frame of the machine and, as shown in Fig. 1, has a bored extension 67 in which a rod 68 is slidably mounted, said rod having a stop collar 69 for engagement with said extension and being connected to a rack 70 105 meshing with the opposite side of the pinion 49 on the rear shaft 50 and a spring 71 surrounding the rod 68 between the rack 70 and extension 67. This last-described connection permits the latch 65 to be moved by the rack 110 bar 70 and relative thereto through the agency of the spring 71. When the operator moves the lever 53 to bring the fingers to operative position, this same movement causes 115 the release of the latch 65 through the downward movement of the rack 70 by the rotating pinion 49. As soon as the tube is wound and the lever 53 is swung back, the fingers 45 are moved out of the way and at the same 120 time the rack 70 is moved up, thus bringing the latch 65 into a position for engagement with the plate 64 whose locking recess 72 is automatically engaged through the action of the cam surface 66 and its relative movement 125 to the rack 70 by reason of the spring 71.

The fingers 45 are limited in their swinging movement by engagement of their lower ends 73 with a part 74 of the frame member 47.

130 The operation in brief is as follows: The

operator first moves the lever 53 to bring the fingers 45 to operative position and release the latch 65 from the mandrel. The suction being on, by the operation of a valve 77 in the suction line, he then feeds the forward end of the paper strip to the mandrel adjacent the holes 22 from a feed table, not shown, the holes 22 being just above the recess formed by the curved ends 76 of the fingers 45. The air suction within the mandrel picks up this forward edge of the sheet and draws it against the mandrel. Immediately thereafter the increased suction produced by the closing off of the holes 22 by the sheet operates the clutch and the mandrel is then revolved through the drive of shaft 8 from the pulley 10 and this suction also moves the cutters 30 to operative position. As the mandrel revolves the fingers 45 press the newly fed part of the sheet down upon the previously laid part and the sheets are cut to length as wound, and when the tube has reached the desired thickness the valve 77 in the suction line is operated to break the suction in the cylinder 40 and in pipe 42 and the cutters 30 are then moved back by the spring 41 and the clutch is released so that the finished tube may be removed from the mandrel. The lever 53 is then reversed to release the fingers and bring the latch 65 into action to cause it to stop the rotation of the mandrel 9. Thereafter the cylinder is removed from the mandrel.

While I have shown the machine designed for winding conical tubes, it will be understood that cylindrical tubes may be wound in the same way by the attachment of the proper mandrel to the head 63, since the mandrel proper is separable from the head 63 and secured thereto by bolts 75.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims or necessitated by the prior art.

What I claim as my invention is:

1. In a tube-winding machine, the combination with a revolving driver, of a shaft, a clutch for connecting said shaft with said driver including a chamber, a mandrel having a chamber and openings from said chamber to the exterior of the mandrel, means for decreasing the pressure in said mandrel chamber below the pressure outside the mandrel whereby a sheet positioned over said openings will be held to said mandrel, said last-named means also causing a reduction of pressure in said clutch chamber whereby when said sheet is engaged with the mandrel said clutch will be operated to establish a driving connection between said driver and shaft.

2. In a tube-winding machine, the combination with a driving member, and a mandrel of means, including a clutch for

connecting said mandrel with said driving member to revolve the same, said mandrel having a suction chamber in restricted communication with its exterior to cause the sheet to be wound to be gripped to said mandrel, said clutch having suction-operated means rendered operative by the attachment of said sheet to said mandrel.

3. In a tube-winding machine, the combination with the revolving mandrel upon which the sheet is wound, of cutting mechanism to cut the tube to finished length, and suctioned-operated means to feed the cutters to their work.

4. In a tube-winding machine, the combination with the revolving mandrel upon which the sheet is wound, of a plurality of fingers for pressing the adjacent windings upon each other, a support upon which said fingers are yielding pivotally mounted, and means permitting a reverse movement of said support as the thickness of the tube increases.

5. In a tube-winding machine, the combination of a revoluble mandrel having a suction chamber and sheet-holding suction openings, a revoluble driver, means including a clutch for connecting said mandrel with said driver, and means for stopping the mandrel in a predetermined feed position.

6. In a tube-winding machine, the combination of a revoluble mandrel, means for attaching the sheet to the mandrel, means for driving the mandrel, a plurality of yielding presser fingers acting on the winding, a support for said fingers, means for locking the mandrel in a feed position, and means for moving said support to a position for operation of said fingers and for releasing said locking means.

7. In a tube-winding machine, the combination with a revoluble mandrel provided with suction sheet-holding means, and driving means for the mandrel including a suction-operated clutch thrown in by the attachment of the sheet to the mandrel.

8. In a tube-winding machine, the combination with a revoluble mandrel provided with suction sheet-holding means, driving means for the mandrel including a suction-operated clutch thrown in by the attachment of the sheet to the mandrel, mechanism to cut the tube to length, and suction-operated means to feed the cutters to their work.

9. In a tube-winding machine, the combination with a revoluble mandrel upon which the sheet is wound, of a plurality of independently yieldable pivoted presser fingers for pressing the adjacent windings upon each other, a support upon which said fingers are mounted, and operator-controlled means for moving said support to bring said fingers to or away from an operative position, said last-named means permit-

ting reverse movement of said support as the thickness of the tube increases.

10. In a tube-winding machine, the combination with a revolving mandrel upon
5 which the sheet is wound, of a plurality of independently yieldable pivoted presser fingers for pressing the adjacent windings upon each other, a support upon which said fingers are mounted, and operator-controlled
10 means for moving said support to bring said fingers to or away from an operative position, said last-named means including a yieldable connection permitting a reverse

movement of said support as the thickness of the tube increases.

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11. In a tube-winding machine, the combination with a revoluble mandrel provided with suction sheet-holding means, of cutters for trimming the sheets as they are wound on the mandrel, and suction-operated means
20 for moving the cutters to their work actuated when the sheet is attached to the mandrel.

In testimony whereof, I affix my signature.

EDWIN F. HULBERT.