

April 24, 1973

J. B. FRENCH ET AL

3,729,362

LABELING MACHINE

Filed Dec. 21, 1970

4 Sheets-Sheet 1

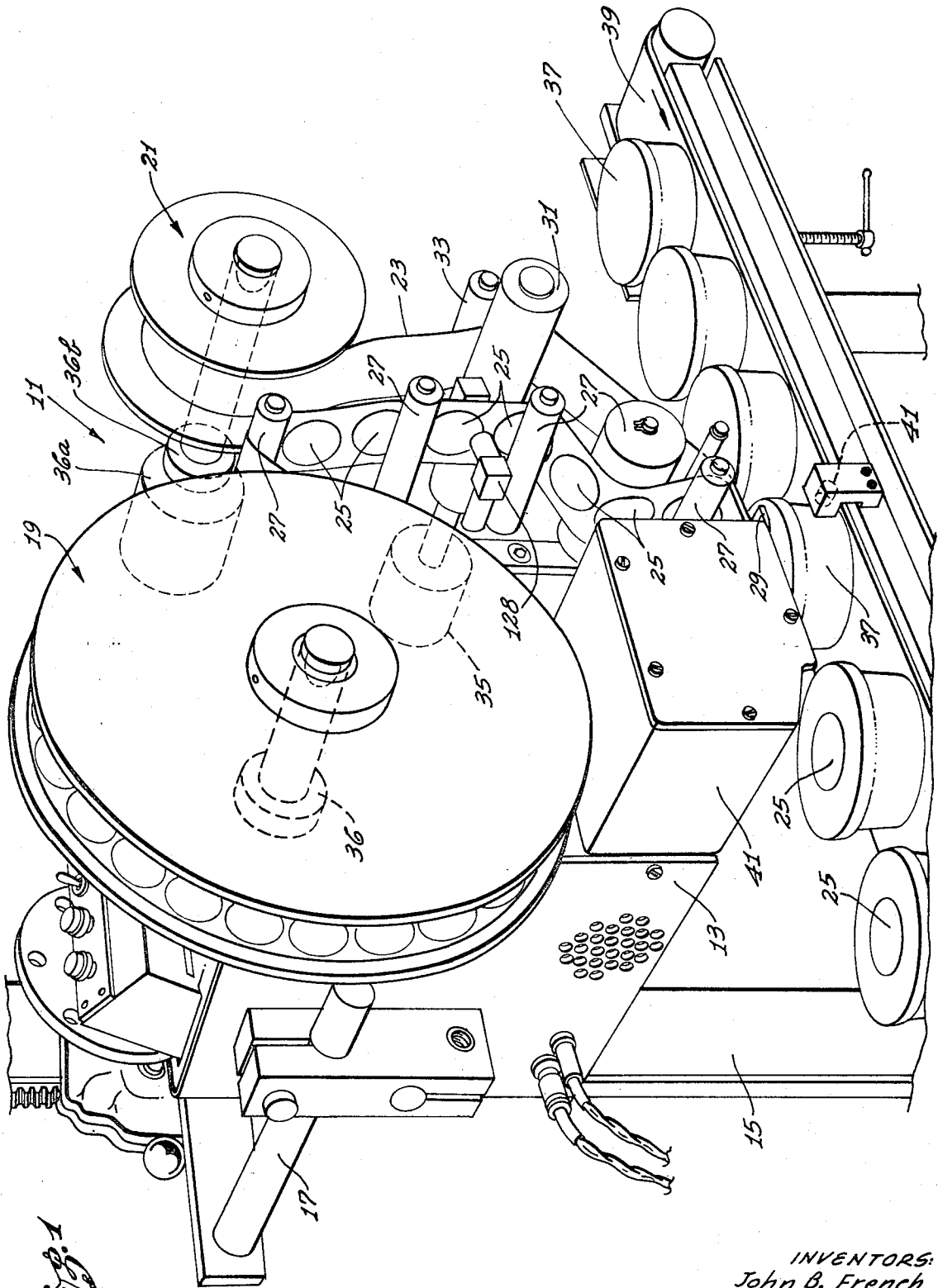


Fig. 1

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Fig. 2

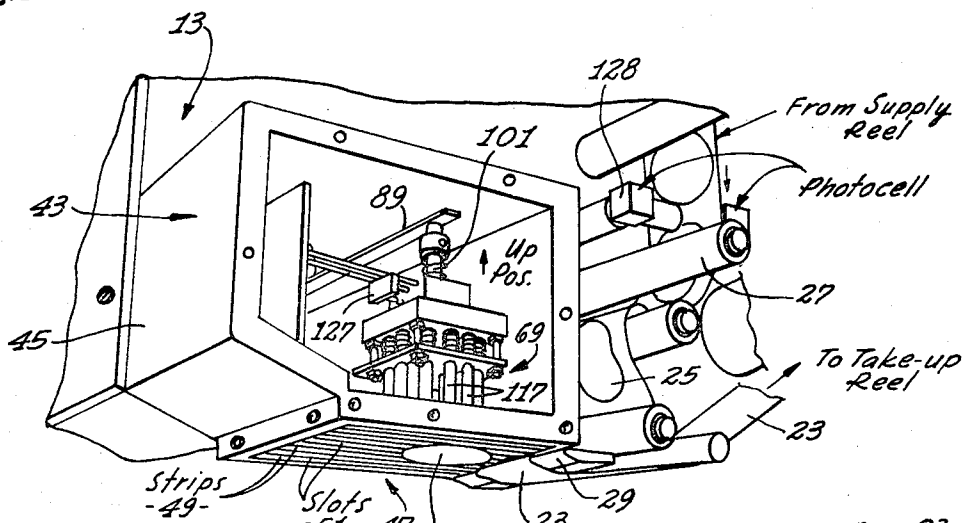


Fig. 3

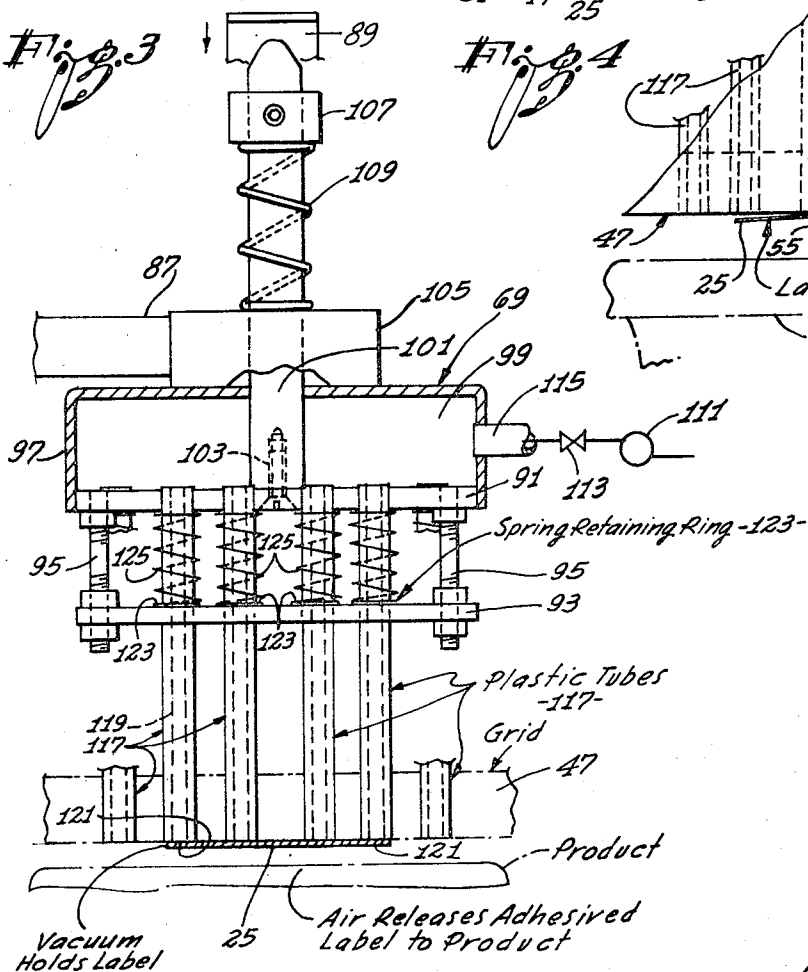
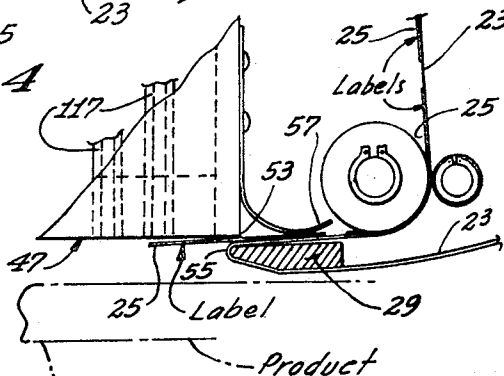


Fig. 4



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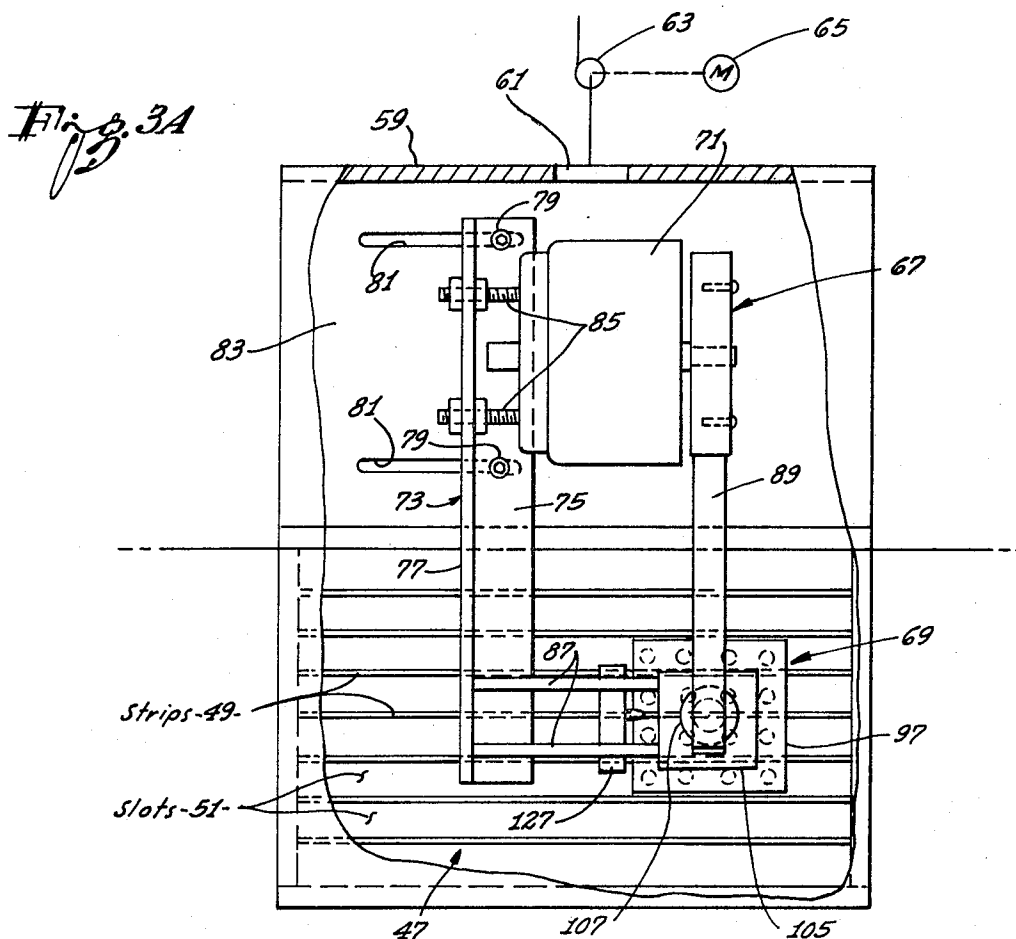
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3,729,362

LABELING MACHINE

Filed Dec. 21, 1970

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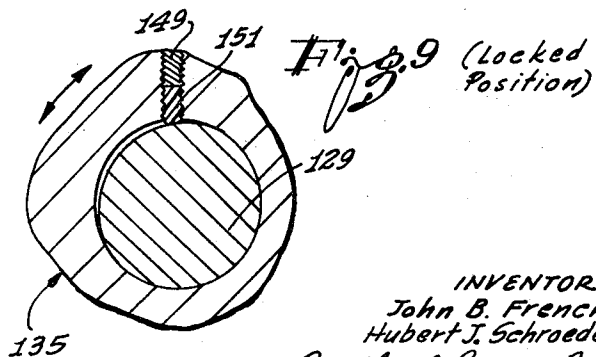
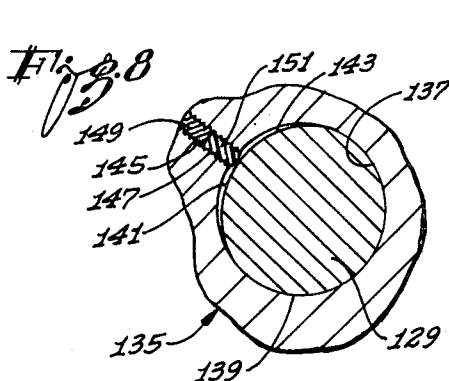
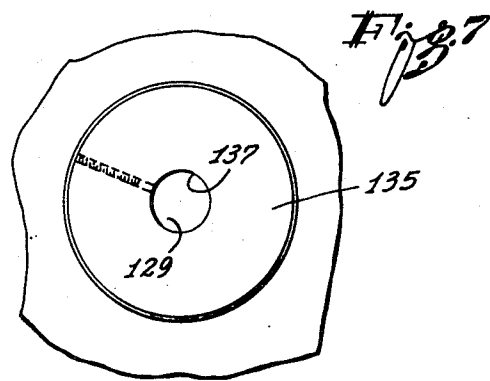
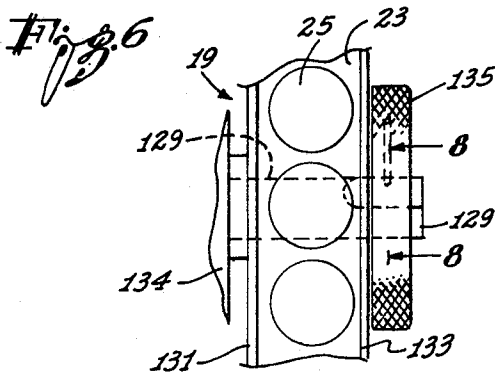
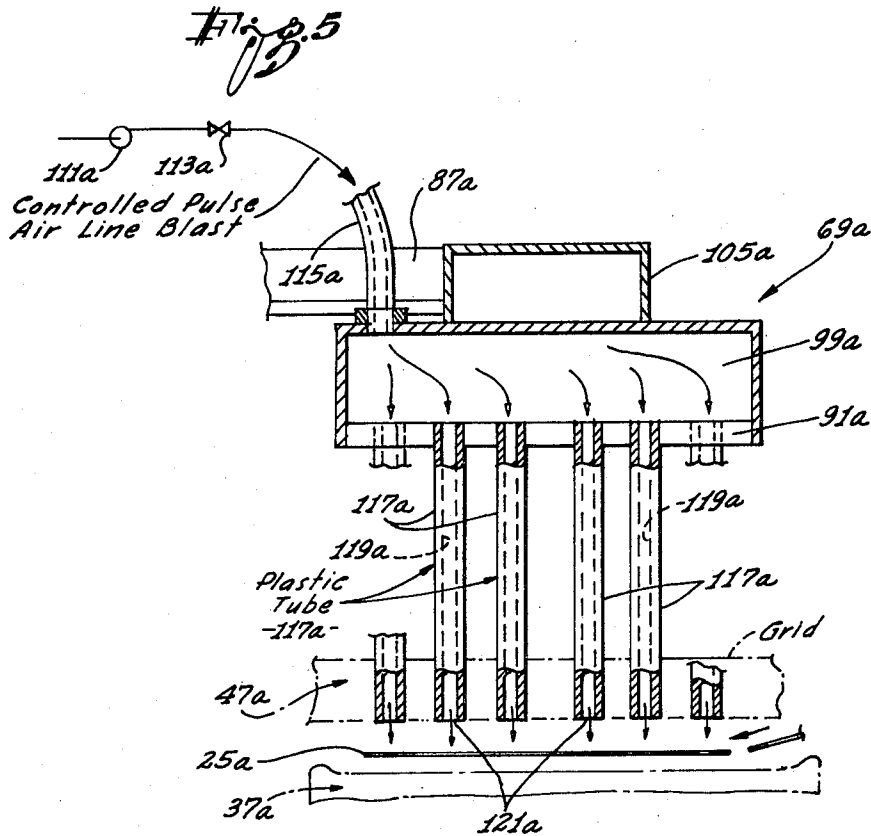
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3,729,362

LABELING MACHINE

Filed Dec. 21, 1970

4 Sheets-Sheet 4



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3,729,362

LABELING MACHINE

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Filed Dec. 21, 1970, Ser. No. 100,283

Int. Cl. B44c 1/24

U.S. Cl. 156—542

14 Claims

ABSTRACT OF THE DISCLOSURE

A labeling machine comprising a supply reel and a take up reel. Labels are adhesively secured to a backing strip and the backing strip is wound on the supply reel. The backing strip and labels are moved from the storage reel toward the take up reel and the labels are peeled off of the backing strip and momentarily retained at a first station. An applicator transfers the label from the first station to an adjacent article.

Many articles such as containers for products and/or the products themselves must bear a label providing pricing information, product identification, etc. The labels are supplied on an elongated backing strip with the labels being adhesively secured to the backing strip. The labeling function is carried out by a labeling machine which removes the labels and applies them to articles as the articles are conveyed past the labeling machine.

The present invention provides an inexpensive labeling machine which is more flexible than prior art units. One advantage of this machine is that it can be readily adjusted to accommodate labels and articles of different sizes and configurations. In addition, the labeling machine can apply labels to articles which have irregular or curved surfaces without making adjustments in the labeling machine.

The concepts of this invention can be advantageously embodied in a labeling machine which includes a rotatable supply reel adapted to have the labels and backing strip wound thereon, a rotatable take up reel, and drive means for intermittently moving the backing strip from the supply reel to the take up reel. A stripper removes the labels from the backing strip as the backing strip is moved passed the stripper.

Releasable means retains the removed labels at a predetermined location. Such releasable means advantageously includes a grid against which the removed label is positioned by the stripper and means for creating a slight sub-atmospheric pressure on the opposite side of the grid to thereby releasably retain the label against the grid. The grid need not be movably mounted and, accordingly, the grid is preferably stationary relative to the supporting structure or frame of the machine.

An applicator is positioned adjacent the grid and is adapted to remove the label from the grid and transfer the label to the adjacent article. Another feature of this invention is that the applicator is mounted for movement relative to the supporting structure of the machine to thereby facilitate use of the labeling machine on labels of different sizes and configurations.

The labeling machine can be utilized to apply labels to articles having an irregular contour. One way to accomplish this is to provide an applicator which includes a body member movable from a first position along a path toward the article. A plurality of fingers are mounted on the body member for movement relative to each other and relative to the body member between extended and retracted positions. Yieldable means urge the plungers toward the extended position. When movement of one or more of the plungers is resisted by the article, the yieldable means yields to allow the body member and the un-

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restrained fingers to continue their movement along such path relative to the fingers whose movement is prevented by the article.

Another way to apply a label to an irregular surface is to utilize a blast of air at greater than atmospheric pressure. In this form of the invention, the fingers preferably contain air passages and terminate in ports for directing the blast of air against the label. In this form of the invention, the body member and the fingers may be stationary. The present invention also teaches that it is possible to combine the retractable finger concept with the air blast concept to accomplish the label applying function.

The backing strip and the labels are driven intermittently by a motor. This motor can be shut off electrically by a circuit which includes a photocell which shuts off the motor each time a space between labels is brought in confronting relationship to the photocell. The applicator, whether of the movable or fixed finger type, is actuated by an electrical circuit which includes a second photocell. The second photocell senses the presence of an article at the proper location to receive a label and actuates the applicator in response to the occurrence of this condition.

To prevent starting of the backing strip drive motor during the applying operation, the labeling machine preferably includes a proximity switch which opens the motor circuit in response to movement of the applicator to apply the label to the article. The proximity switch closes the motor control circuit upon completion of the label application function, and the return of the body member and fingers to their initial position.

It is desirable to provide access to the storage and/or take up reels. For example, the storage reel includes a hub or shaft and at least one side wall or flange which is removably attached to the hub. To accomplish this, the side wall has an opening therein for receiving a section of the hub with the opening and such section of the hub being of slightly different peripheral configuration in cross section. A deformable element is mounted in a bore of the side wall and projects into the opening. The deformable element is deformed so that it interlocks with surface irregularities formed in the bore. By relatively rotating the side wall and the hub through a few degrees, the deformable element engages the periphery of the hub with sufficient force so that the force of friction therebetween lockingly mounts the side wall on the hub. This concept can, of course, be utilized for many different applications where it is desired to releasably mount an outer element on a hub or shaft.

The invention can best be understood by reference to the following description taken in connection with the accompanying illustrative drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a labeling machine constructed in accordance with the teachings of this invention.

FIG. 2 is a fragmentary perspective view of the label applicator portion of the labeling machine with parts broken away to show the interior of the machine.

FIG. 3 is an enlarged front elevational view partially in section of one form of applicator constructed in accordance with the teachings of this invention.

FIG. 3A is a fragmentary top plan view of the applicator means and some of the adjacent structure.

FIG. 4 is an enlarged fragmentary front elevational view partially in section showing the stripping of one of the labels from the backing strip.

FIG. 5 is a front elevational view similar to FIG. 3 of a second embodiment of applicator constructed in accordance with the teachings of this invention.

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FIG. 6 is a fragmentary side elevational view of the supply reel.

FIG. 7 is a fragmentary front elevational view of the central portion of the supply reel.

FIG. 8 is an enlarged fragmentary sectional view taken generally along line 8—8 of FIG. 6 with the lock being in the unlocked position.

FIG. 9 is a view similar to FIG. 8 with the lock being in the locked position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a labeling machine 11 constructed in accordance with the teachings of this invention. The labeling machine 11 includes a housing 13 suitably rigidly mounted on a vertical support 15 as by a connector assembly 17. The housing 13 and/or the connector assembly 17 and the support 15 constitute fixed supporting structure for the labeling machine 11.

A supply reel 19 and a take up reel 21 are rotatably mounted on the housing 13. A backing strip 23 having a plurality of closely spaced, aligned labels 25 adhesively secured thereto is wound on the supply reel 19. The backing strip 23 extends from the supply reel 19 over a plurality of idler rollers 27 and a stripper 29 to a drive roller 31. A clamping roller 33 holds the backing strip 23 against the drive roller 31. From the drive roller 31, the backing strip 23 extends to, and is wound on, the take up reel 21.

Although other driving arrangements could be utilized, in the embodiment illustrated the drive roller 31 is driven by a drive motor 35 within the housing 13. The supply reel 19 is free wheeling and a suitable brake 36 stops the supply reel immediately when the motor 35 stops. The take up reel 21 is driven by a motor 36a through a slip clutch 36b so as to always apply tension to the section of the backing strip 23 between the drive roller 31 and the take up reel 21. When the motor 35 is operating, the drive roller 31 rotates to pull the backing strip 23 off of the supply reel 19 to thereby rotate the supply reel. The take up reel 21 rotates in accordance with the amount of the backing strip 23 which is supplied thereto. When the motor 35 is deenergized, the brake 36 immediately stops the supply reel 19 and the slip clutch 36b begins slipping to prevent further rotation of the take up reel 21. In this manner, the backing strip 23 and the labels 25 can be indexed through the machine 11.

Articles 37 are moved by a conveyor 39 beneath a selected portion of the labeling machine 11. Each time an article 37 comes in line with a sensor such as a photocell 41, the labeling machine 11 applies one of the labels 25 to the upper side thereof in a manner described more fully hereinbelow. The conveyor 37 is preferably motor driven at a rate compatible with the operating speed of the labeling machine 11. The conveyor 39 may be driven either intermittently in synchronism with the labeling machine 11 or continuously.

The labeling machine 11 also includes an applicator section 43 the details of which can best be seen in FIG. 2. The applicator section 43 includes a housing section 45 rigidly attached to the housing 13 and forming a portion thereof. The bottom wall of the housing section 45 is in the form of a grid 47 having longitudinally extending strips 49 (FIGS. 2 and 3A) which define longitudinal slots 51 therebetween.

The stripper 29 is rigidly attached to the housing 13 and extends along an edge 53 of the housing sections 45 (FIG. 4) with sufficient clearance being provided to allow for passage of the backing strip 23 and the labels 25. The stripper 29 has a smooth curved edge 55 which defines a relatively sharp 180° turn for the backing strip 23. The backing strip is somewhat more flexible than the label 25 and can readily make such a sharp turn but the relatively stiff label is peeled from the backing strip as the portion of the backing strip to which it is secured is

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pulled over the edge 55. The movement of the backing strip 23 moves the label 25 to a position on the lower faces of the grid 47 immediately adjacent the stripper 29. The label 25 is guided into the gap between the stripper 29 and the edge 53 by a guide 57.

The housing section 45 has a back wall 59 (FIG. 3A) with an opening 61 therein. An exhaust fan 63 is driven by a motor 65 to partially evacuate the enclosure defined by the housing section 45. Substantially the only other opening in the housing section 45 is formed by the grid 47 and, accordingly, air flows in through the grid 47 through the housing section 45 to the fan 63. The slight sub-atmospheric pressure within the housing section 45 holds the label 25 in position on the lower face of the grid 47.

Applicator means 67 (FIG. 3A) is mounted within the housing section 45 and functions to remove the labels 25 from the lower face of the grid 47 and apply the latter to the article 37 therebelow. The applicator means 67 includes a finger or plunger assembly 69 (FIGS. 3 and 3A), a solenoid 71 for actuating the plunger assembly 69 and a mounting bracket 73. The mounting bracket 73 includes a horizontal leg 75 and a vertical leg 77 with the horizontal leg being mounted by bolts 79 in a pair of spaced parallel slots 81 in a lower wall 83 of the housing section 45. The solenoid 71 is suitably mounted on the vertical leg 77 as by bolts 85 and the plunger assembly 69 is also mounted on the vertical leg 77 by connector members 87.

Although the solenoid 71 can take different forms, in the embodiment illustrated it is a rotary solenoid. The solenoid 71 includes an actuator arm 89 which is rotated upon energization of the solenoid 71 to actuate the plunger assembly 69.

The details of the plunger assembly 69 can best be viewed with reference to FIG. 3. The assembly 69 includes an upper mounting plate 91 and a lower mounting plate 93 rigidly interconnected by plurality of threaded connectors 95. A cup-like section 97 is mounted on the upper mounting plate 91 and forms a relatively air-tight chamber 99 therewith. A plunger 101 is mounted on the upper mounting plate 91 as by a screw 103 and projects upwardly through the upper wall of the cup-like section 97. A bearing 105 is mounted on the connector members 87 and the plunger 101 projects upwardly therethrough. The bearing 105 is rigidly connected to the members 87 so that the latter is rigid with the mounting bracket 73. A collar 107 is mounted on the plunger 101 adjacent the upper end thereof, and a coil spring 109 acts between the collar and the bearing 105 to normally urge the assembly 69 to the upper position shown in FIG. 3.

Pulses of air are supplied to the chamber 99 by a fan 111 through a valve 113 and a conduit 115. The valve 113 may be opened by the solenoid 71 if desired or by another solenoid actuated substantially simultaneously with the solenoid 71. The valve 113 is spring loaded so that it is normally in the closed position.

A cluster of fingers or plungers 117 are mounted in suitably aligned apertures in the plates 91 and 93. Each of the fingers 117 is in the form of a tube and has an air passage 119 extending therethrough from the chamber 99 to a port 121 at the lower end thereof. As shown in FIG. 2, there are several rows of the fingers 117.

Each of the fingers 117 has a shoulder 123 which bears on the upper surface of the lower plate 93. Coil springs 125 act between the shoulder and the lower surface of the upper plate 91 to thereby resiliently urge the fingers 117 downwardly to an extended position as shown in FIG. 3. Each of the fingers 117 is movable upwardly as viewed in FIG. 3 independently of the other fingers against the resilient biasing force of its spring 125. With the plunger assembly 69 in the upper position shown in FIG. 3, the tips of the fingers 117 project through the slots 51 of the grid and terminate adjacent the lower face of the grid closely adjacent the label 25.

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A proximity switch 127 (FIG. 3A) is mounted on the members 87 closely adjacent the plunger assembly 69 thereof. The proximity switch 127 is closed when the plunger assembly 69 is in the upper position shown in FIG. 3 and is open when the plunger assembly 69 is depressed by the actuator arm 89 of the solenoid 71. The proximity switch 127 in the embodiment illustrated is a magnetic switch responsive to the nearness of the magnetic material of the plunger assembly 69, however, a switch which is actuated by contact with the plunger assembly could be used.

In operation of the device, the motor 35 drives the drive roller 31 to thereby move the backing strip 23 with the labels 25 thereon from the supply reel 19 to the take up reel 21. Movement of the backing strip 23 continues in this fashion for a length corresponding approximately to the length of one of the labels 25 plus the distance between adjacent labels. At this instant, a photocell 128 (FIG. 1) receives light through the translucent or transparent backing strip 23 to thereby deenergize the motor 35. The label-backing strip laminate is opaque and therefore no light is received by the photocell 128 when a label confronts the photocell. The supply reel 19 is then stopped by the brake 36 and the slip clutch 36b becomes operative to prevent further rotation of the take up reel 21 by the motor 36a.

During the movement of the backing strip 23 from the supply reel 19 to the take up reel 21, one label 25 is urged between the guide 57 and the stripper 29 (FIG. 4) and the relative rigidity of the label 25 tends to cause the latter to continue moving to the left as viewed in FIG. 4 while the relatively flexible backing strip 23 readily rounds the edge 55 of the stripper 29. The result is that the label 25 is deposited on the lower face of the grid 47 and the subatmospheric pressure created by the continuous operation of the fan 63 (FIG. 3A) is sufficient to retain the label 25 on the lower face of the grid 47.

If one of the articles 37 is beneath the label 25, its presence is sensed by the photocell 41 (FIG. 1), and this causes, through appropriate circuitry (not shown), the energization of the solenoid 71. When the solenoid 71 is energized, the actuator arm 89 is forced downwardly thereby to depress the plunger 101 against the biasing force of the spring 109. The plunger 101 and the entire plunger assembly 69 then move downwardly with the bearing 105 remaining stationary. This causes the lower ends of the fingers 117 to engage the label 25 and to force the latter rapidly downwardly against the upper surface of the article 37. The springs 125 permit each of the tubes 117 to retract as necessary depending upon the configuration of the article 37 to thereby prevent damage to the plunger assembly 69. As each of the tubes 117 is retractable independently of the others, the label 25 can be applied to a surface of irregular contour. The lower face of the label 25 has an adhesive which adheres the label to the upper surface of the article 37.

In the embodiment shown in FIG. 3, the supply of air to the chamber 99 is optional as the mechanical movement of the fingers 119 is fully capable of transferring the label 25 from the lower face of the grid 47 to the article 37 and applying the label thereto. An air blast from the conduit 115 may be used in conjunction with the mechanical movement of the fingers 117 or in lieu thereof. For example, the valve 113 may be opened by the solenoid 71 or by another solenoid which is energized for a predetermined period in response to the cell 41 providing an indication of the presence of one of the articles 37 beneath the label 25. When this occurs, the valve 113 is opened to permit air flow into the chamber 99 and through the air passages 119 of the fingers 117 to thereby assist in applying the label 25 to the article 37.

The solenoid 71 is energized by a pulse of current in response to the presence of one of the articles 37 beneath the label 25 on the grid 47. The pulse is of predetermined duration and upon termination of the pulse, the spring

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109 returns the plunger assembly 69 to the position shown in FIG. 3.

When the plunger assembly 69 was in the applying or lower position in which it was applying the label 25 to the article 37, it was removed a sufficient distance from the proximity switch 127 to cause the latter to open. The proximity switch 127 is suitably connected into the circuit for the motor 35 so that the motor 35 cannot be energized with the switch 127 open. However, when the plunger assembly 69 returns to the nonapplying or upper position shown in FIG. 3, the proximity switch automatically closes to thereby energize the motor 35 to cause the above described cycle to be repeated.

The position of the solenoid 71 and the plunger assembly 69 can be adjusted relative to the grid 47 to accommodate different size labels and articles of different sizes by loosening of the bolts 79 and movement of the mounting bracket in the slots 81 as shown in FIG. 3A.

FIG. 5 shows an alternate plunger assembly 69a which is identical to the plunger assembly 69 in all respects not specifically shown or described herein. Portions of FIG. 5 corresponding to portions of FIG. 3 are designated by corresponding reference characters followed by the letter a.

The functional difference between the plunger assemblies 69 and 69a is that the latter is stationary and the label applying function is accomplished entirely by a blast of air. The connector member 87a mounts the plunger assembly 69a to the mounting bracket 73 as shown in FIG. 3a so that the plunger assembly 69a can be moved for adjustment purposes as described hereinabove with reference to FIG. 3a.

As the plunger assembly 69a is stationary, the plunger 101 and the means for mounting the fingers for movement relative to each other and to the plates 91 and 93 is eliminated in the embodiment of FIG. 5. Specifically, each of the fingers 117a has an air passage 119a and is rigidly mounted on the plate 91a with the passages communicating with a chamber 99a. The chamber 99a is supplied with the pulses of air under pressure by a fan 111a through a valve 113a and a conduit 115a substantially as described with reference to FIG. 3. Accordingly, when a label 25a is positioned on the grid 47a and an article 37a is positioned therebelow, the photocell 41 (FIG. 1) causes opening of the normally closed valve 113a to permit the fan 111a to supply a pulse of air under pressure to the chamber 99a. The air flows from the chamber 99a through the air passages 119a and out ports 121a to blow the label 25a from the lower face of the grid 47a and apply the latter to the upper surface of the article 37a.

FIGS. 6-9 show a lock which is particularly adapted for use with either of the reels 19 or 21. As shown in FIG. 6, the reel 19 includes a hub or shaft 129 and side walls 131 and 133. The hub 129 is suitably mounted for rotation by a bearing 134. The side wall 131 is rigidly affixed to the shaft 129. The side wall 131 has a collar 135 rigidly affixed thereto and forming a part thereof. The collar 135 and the side wall 133 have an opening 137 extending therethrough for receiving the outer end of the shaft 129. As shown in FIG. 8, the configuration of the opening 137 and the periphery of the shaft 129 in cross section are slightly different. Specifically, in the embodiment illustrated, the opening 137 is circular in cross section and the portion of the shaft 129 received by the opening 137 forms an eccentric. A major region 139 of the shaft 129 which is received in the opening 137 may be of circular cross section while another region 141 may be of circular cross section of a different radius or be of slightly noncircular configuration. This forms a crescent shaped gap 143 between the shaft 129 and the collar 135.

The collar 135 has a generally radially extending bore 145 therein with the bore having internal screw threads 147. A screw 149 is received in the outer portion of the radial bore 145 and a plug 151 of deformable material

such as nylon is received in the inner portion of the bore. The plug 151 is deformed into the thread 147 to thereby firmly retain the plug 151 in the bore. The plug 151 projects radially into the opening 135.

With the shaft 129 and the hub 135 being in the relative position shown in FIG. 8, the engagement between the plug 151 and the shaft 129 is light. However, by relatively rotating these members to the position shown in FIG. 9, the plug 151 tightly engages the shaft 129 to thereby form a frictional lock which resists further relative rotation between the shaft and the collar. When the deformable plug 151 becomes worn, the screw 149 can be tightened down further to thereby force or extrude an additional amount of the plug 151 radially inwardly to thereby insure a tight friction lock.

To load a reel of the backing strip 23 on the shaft 129, the collar 135 is rotated counterclockwise to the releasing position shown in FIG. 8. This permits withdrawal of the side wall 133 from the shaft 129 to thereby permit the backing strip 23 to be positioned on the shaft. The side wall 133 is then repositioned on the shaft 129, and the side wall 133 is rotated clockwise to the locking position shown in FIG. 9.

Although exemplary embodiments of the invention have been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

We claim:

1. A labeling machine for applying labels to articles wherein the labels are supplied on a backing strip and said articles are moved through a first location, said machine comprising:

a supporting structure;

a supply reel mounted for rotation on the supporting structure and adapted to have the backing strip wound thereon;

a take up reel mounted for rotation on the supporting structure, said backing strip adapted to extend from the supply reel to the take up reel and to be wound on the take up reel;

drive means for moving the backing strip from the supply reel to the take up reel;

a grid mounted on the supporting structure;

stripper means mounted on said supporting structure adjacent the grid for removing the labels from the backing strip as the backing strip is moved past the stripper means and transferring the labels to said grid;

vacuum means for releasably retaining the removed labels against the grid;

label applicator means responsive to the presence of an article at said first location for applying a force to the label to remove the label from the grid and transferring the label to the article at said first location, said label applicator means including a member for applying said force to the label;

means for mounting said member on the supporting structure to allow movement of the member relative to the grid to change the location at which the force is applied to the label; and

means for fixing the position of said member at any one of a plurality of positions relative to the grid.

2. A machine as defined in claim 1 wherein at least one of said reels includes a hub and a side wall, said side wall having an opening therein receiving a section of said hub, said opening and said section of said hub being of slightly different cross sectional configuration, said side wall carrying a deformable member which projects into said opening and slidably engages said section of said hub whereby the side wall can be releasably locked to said section of said hub by rotating the side wall relative to the hub.

3. A labeling machine as defined in claim 1 wherein said member includes means defining an air chamber having a

plurality of ports for directing a blast of air through said grid to remove the label from the grid, said mounting means mounting said chamber and ports for movement together relative to said grid to thereby adjust the location on the grid through which the blast of air comes.

4. A labeling machine as defined in claim 3 wherein said label applicator means includes a plurality of plungers and a solenoid for operating said plungers, said mounting means allowing said solenoid to be moved with said plungers relative to said grid.

5. A machine as defined in claim 3 wherein the label applicator means includes a body member, means for mounting the body member for movement from a first position along a path toward said first location, a plurality of fingers mounted on the body member for movement relative to each other and relative to the body member between extended and retracted positions, yieldable means for urging the fingers toward the extended position, movement of said fingers with said body member along said path causing said fingers to engage the label on the grid and transfer the label to the article at said first location.

6. A labeling machine as defined in claim 3 wherein said grid includes a plurality of spaced strips defining slots, said member includes a plurality of tubes attached to and depending from said means defining the air chamber, said tubes extending into said slots and defining said ports, said mounting means allowing the tubes to be moved in a direction parallel to said slots.

7. A labeling machine as defined in claim 3 wherein said mounting means includes a mounting bracket attached to the means defining the air chamber, a slot in said supporting structure, and releasable threaded means for attaching the mounting bracket to the supporting structure.

8. A labeling machine as defined in claim 7 wherein said grid includes a plurality of spaced strips defining slots, said member means includes a plurality of tubes attached to and depending from said means defining the air chamber, said tubes extending into said slots and defining said ports, said mounting means allowing the tubes to be moved in a direction parallel to said slots.

9. A machine for transferring a label to an article wherein the article is positionable at a first location, said machine comprising:

a body member;

means for mounting said body member for movement from a first position along a path toward said first location to a second position;

a plurality of plungers;

means for mounting said plungers on said body member for movement relative to said body member and relative to each other between an extended position and a retracted position;

yieldable means for urging said plungers toward said extended position, said yieldable means being yieldable to allow said plungers to move individually toward said retracted position in response to a force resisting movement thereof;

releasable means for retaining a label at a second location along said path whereby movement of the body member along said path from said first position toward said first location causes said plungers to remove said label from said releasable means and to transfer the label to the article, said yieldable means yielding when further movement of a plunger along said path is resisted by the article; and

means for supplying labels to said releasable means.

10. A machine as defined in claim 9 wherein at least one of said plungers has an air passage therein and including means for supplying air under pressure to said air passage to assist in transferring the label from said releasable means to the article.

11. A machine as defined in claim 9 including switch means responsive to said body member being in said second position to prevent the supply of a second label to said releasable means.

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12. A machine as defined in claim 9 including means for mounting said body member for movement along a second path extending in a direction generally transverse to said first mentioned path and means for fixing the body member at any one of a plurality of positions.

13. A machine as defined in claim 9 wherein said releasable means includes a grid and means for producing a partial vacuum to thereby releasably retain the label on the grid, said grid having openings through which the plungers can extend at least when the body member is in the second position.

14. A machine as defined in claim 13 including means for mounting said body member for movement along a second path in a direction generally transverse to said first mentioned path, said openings in said grid being elongated and extending generally parallel to said second path.

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U.S. Cl. X.R.

15 156—230, 363, 541, 584