United States Patent [19]

Carter

[11] **3,864,187**

[45] **Feb. 4, 1975**

[54] **LABELING MACHINE**

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[73] Assignee: **A-T-O Inc.,** Cleveland, Ohio

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[21] Appl. No.: **346,125**

[52] **U.S. Cl.** **156/364,** 156/568, 156/571

[51] **Int. Cl.** **B65c 9/08**

[58] **Field of Search** 156/568, 566, 567, 569, 156/570, 571, 364, 362, 363, 351, 365, 366, 156/446, 444, 447

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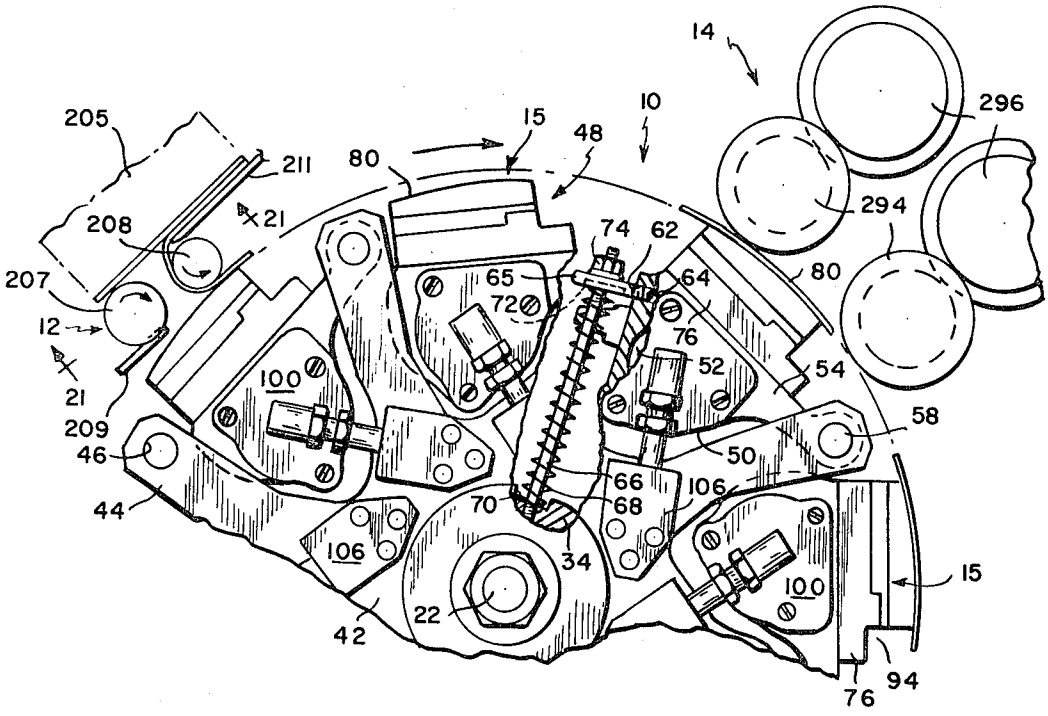
Primary Examiner—Charles E. Van Horn
Assistant Examiner—David A. Simmons
Attorney, Agent, or Firm—Dike, Bronstein, Roberts, Cushman & Pfund

[57] **ABSTRACT**

A labeling machine comprising a rotor on which there are mounted at peripherally spaced intervals vacuum pads for movement in a circular path about said axis and a label picking assembly, adhesive-applying rolls and a container support arranged concentrically around the rotor in tangential relation to the path of movement of the pads. The pads are mounted on the rotor for retraction toward the center of rotation of the rotor and springs hold the pads distended into said path so that labels delivered thereto by the picker assembly are presented to the adhesive-applying rolls for an application of adhesive and then pressed into engagement with the containers. The pads contain orifices which are connected by way of a manifold to a source of vacuum to hold labels presented thereto by the picker assembly while they travel from the picker assembly past the adhesive-applying rolls to the container and disconnected at the place of application to release the labels whereupon air pressure is supplied by the manifold to the orifices to release the labels. A circular cam is mounted below the path of movement of the pads and each pad carries a cam follower which is held out of engagement with the cam as long as a label is held to the pad but in the absence of a label is released to engage the cam. The cam is contoured to move the released cam follower and hence the pad inwardly toward the center of rotation of the rotor before it reaches the adhesive-applying rolls to provide a gap between the pad and the adhesive-applying rolls. There are strippers for removing the labels from the rotor in the event that no containers are in a position to receive them and photoelectric controls for stopping the picker when no containers are delivered to a position for receiving labels.

33 Claims, 34 Drawing Figures



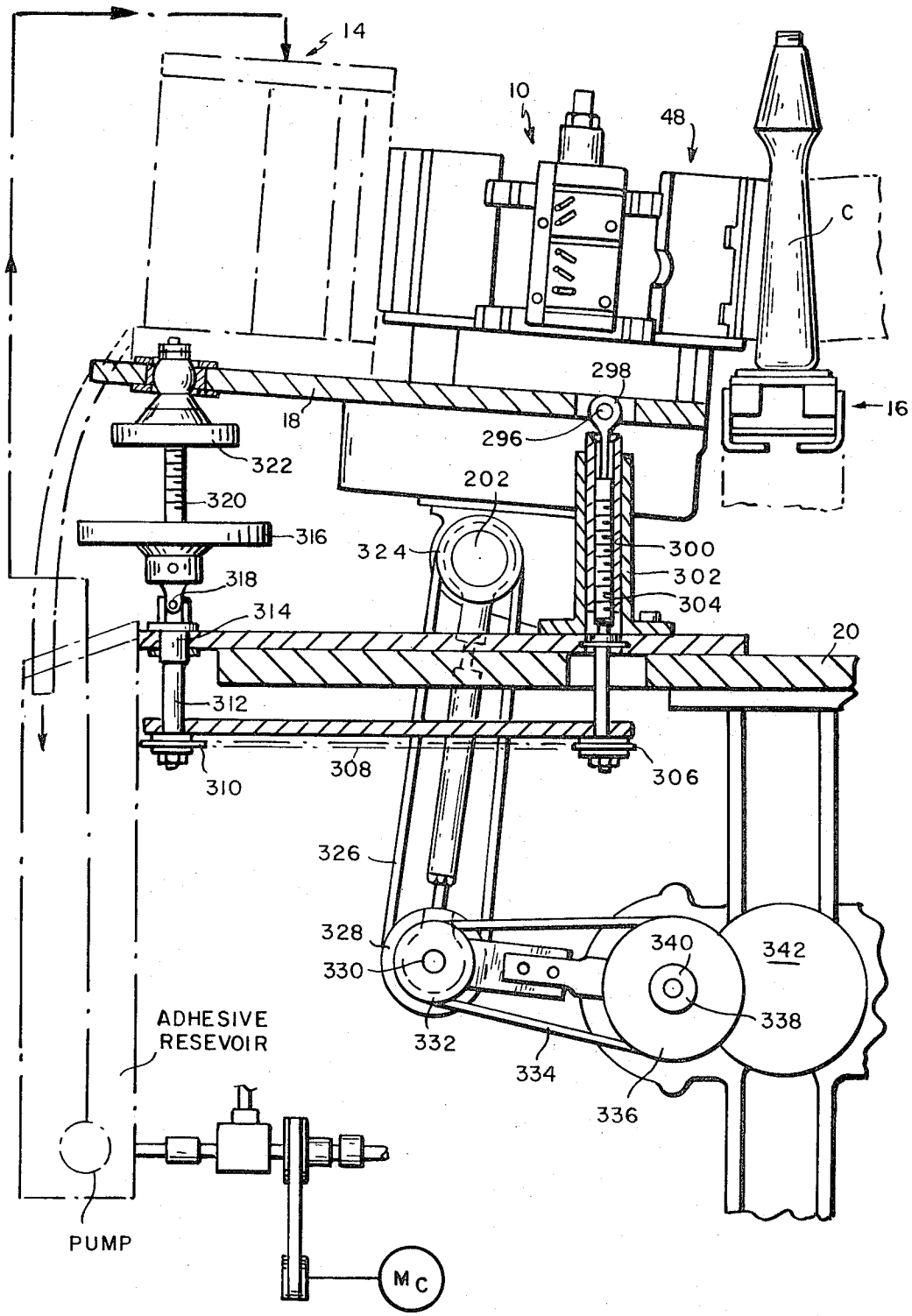

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FIG.1

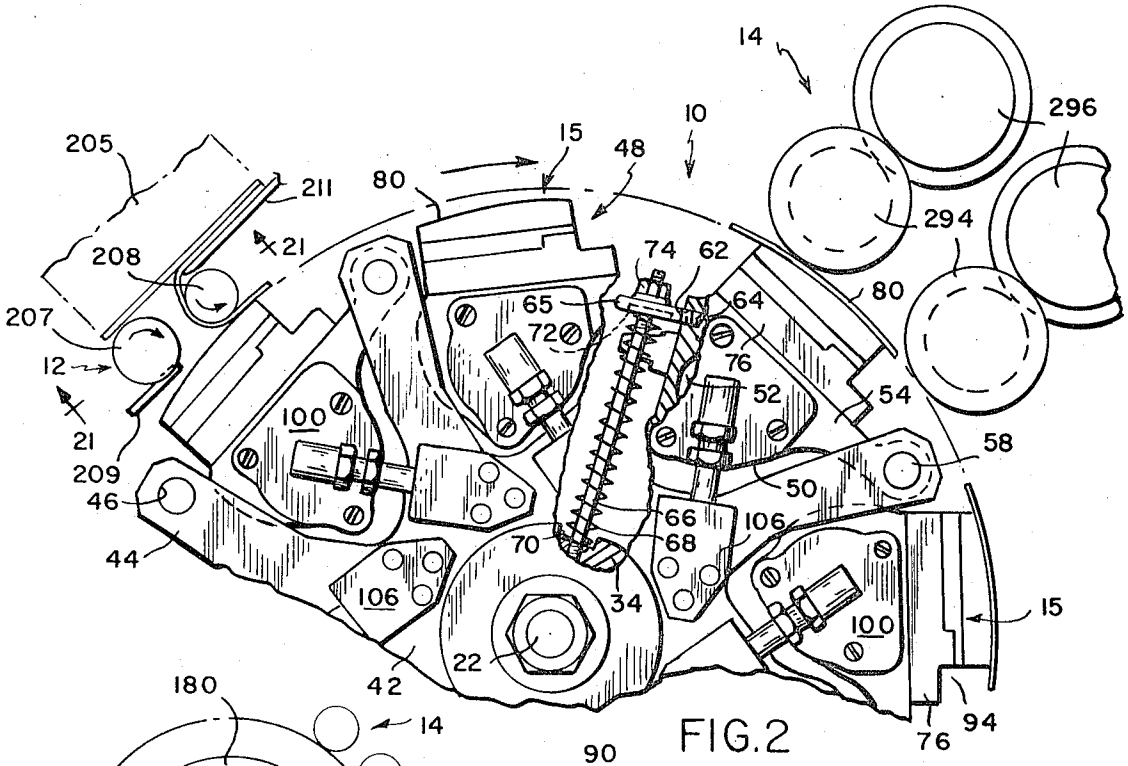


FIG.2

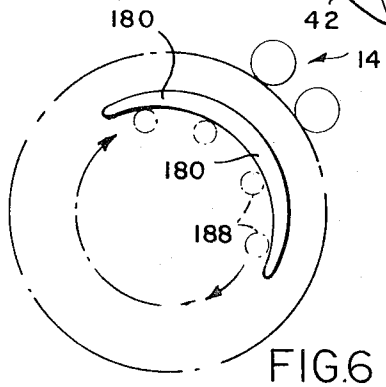


FIG.6

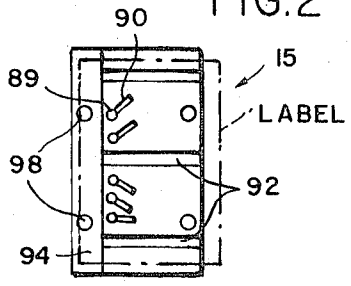


FIG.3

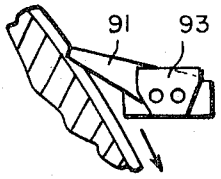


FIG.3a

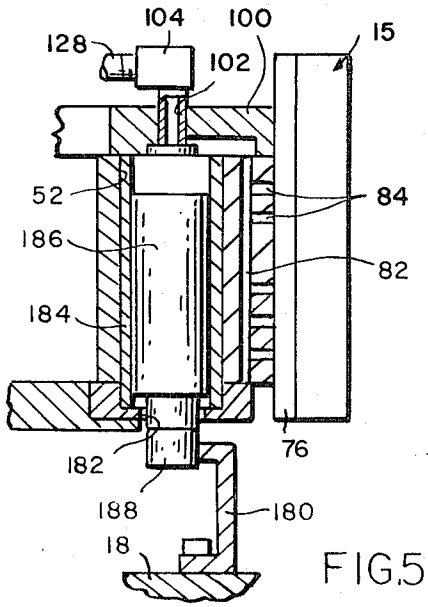


FIG.5

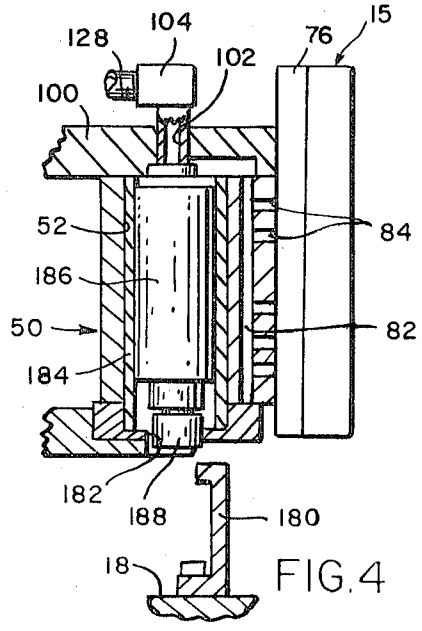


FIG.4

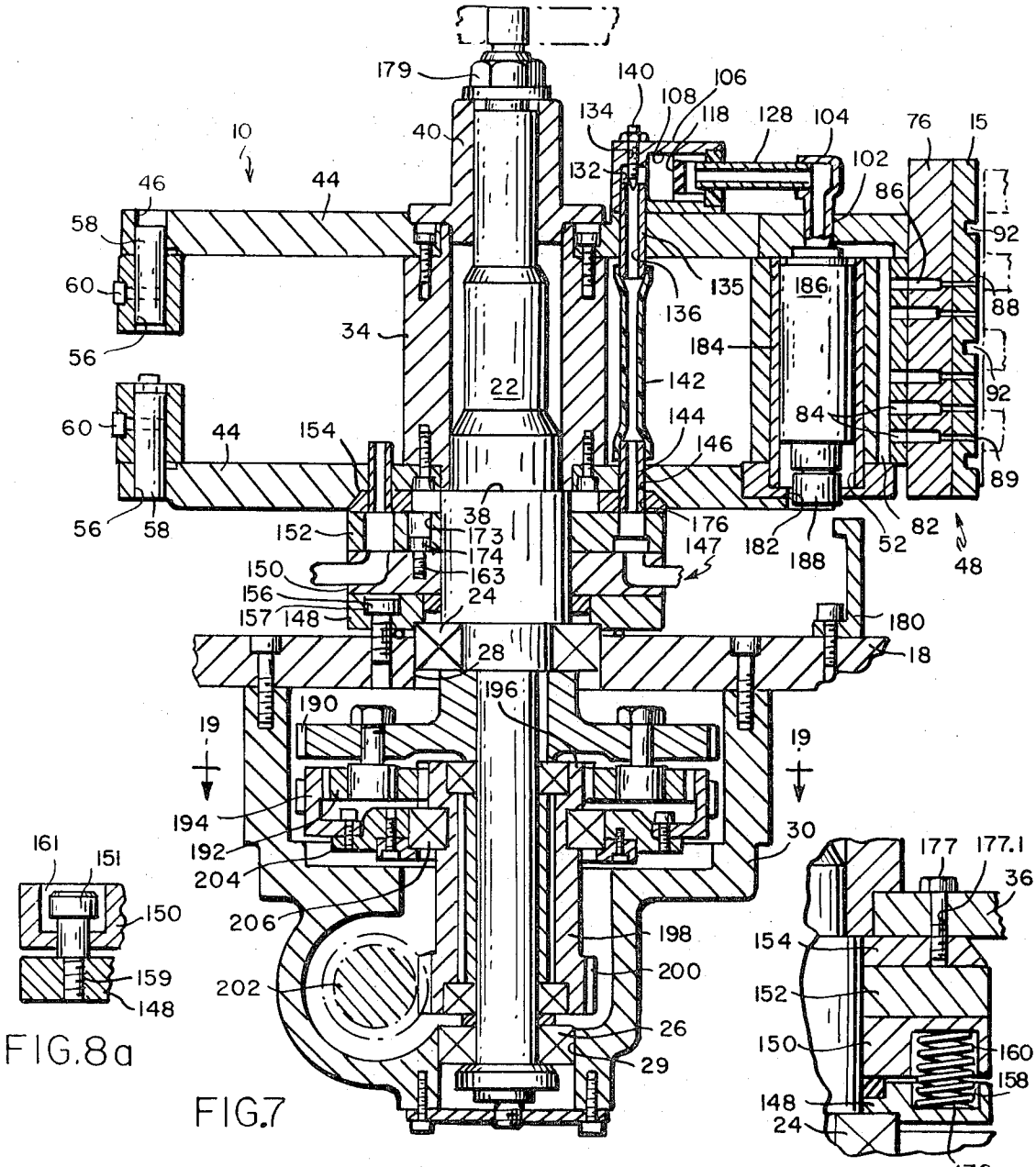


FIG.8a

FIG.7

FIG.8

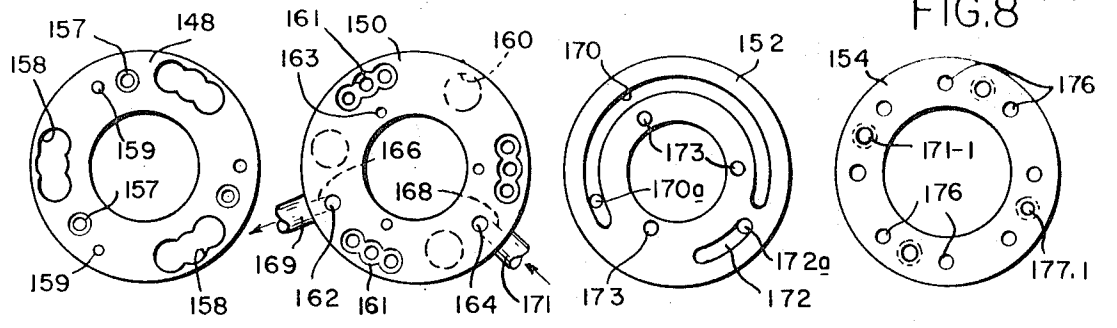


FIG.9

FIG.10

FIG.11

FIG.12

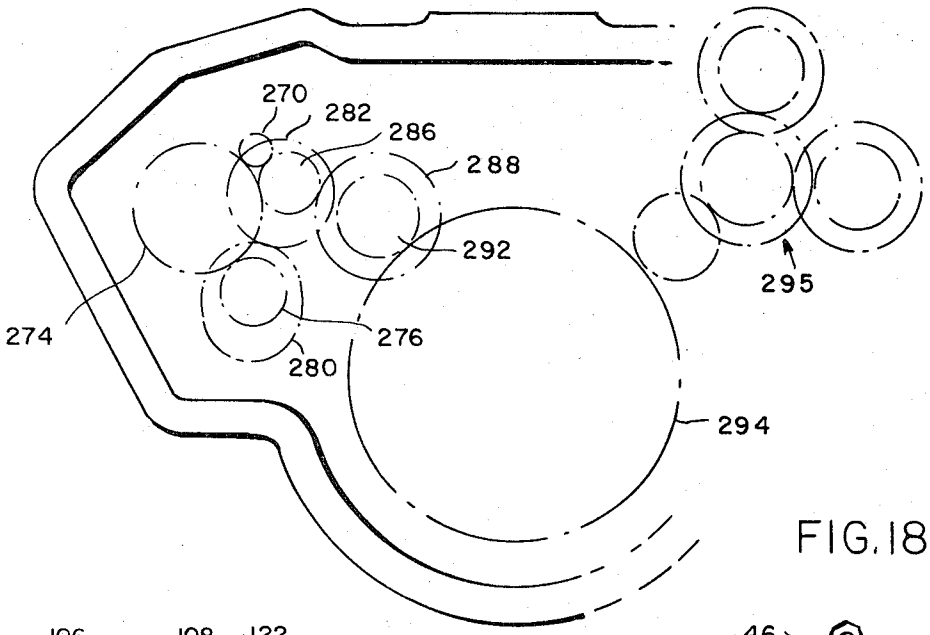


FIG. 18

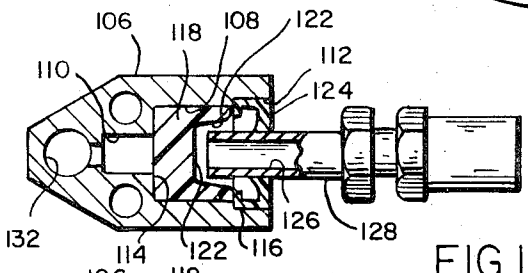


FIG. 13

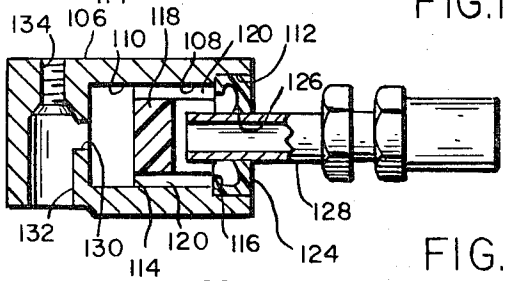


FIG. 14

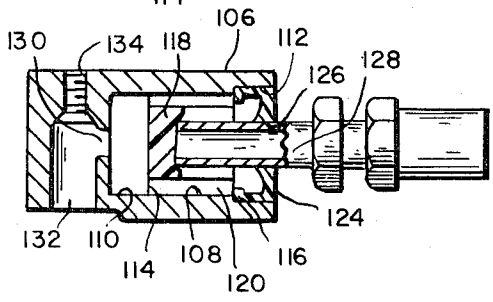


FIG. 15

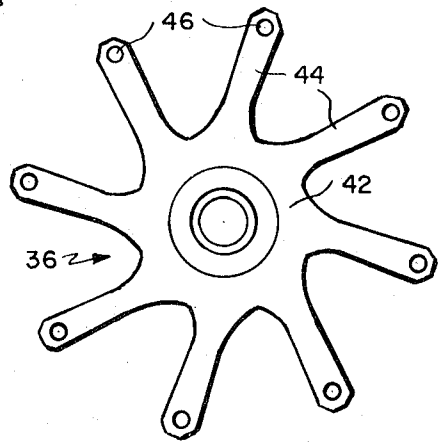


FIG. 16

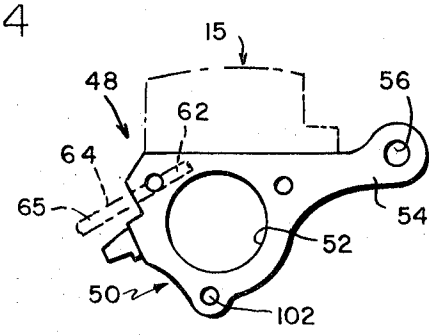


FIG. 17

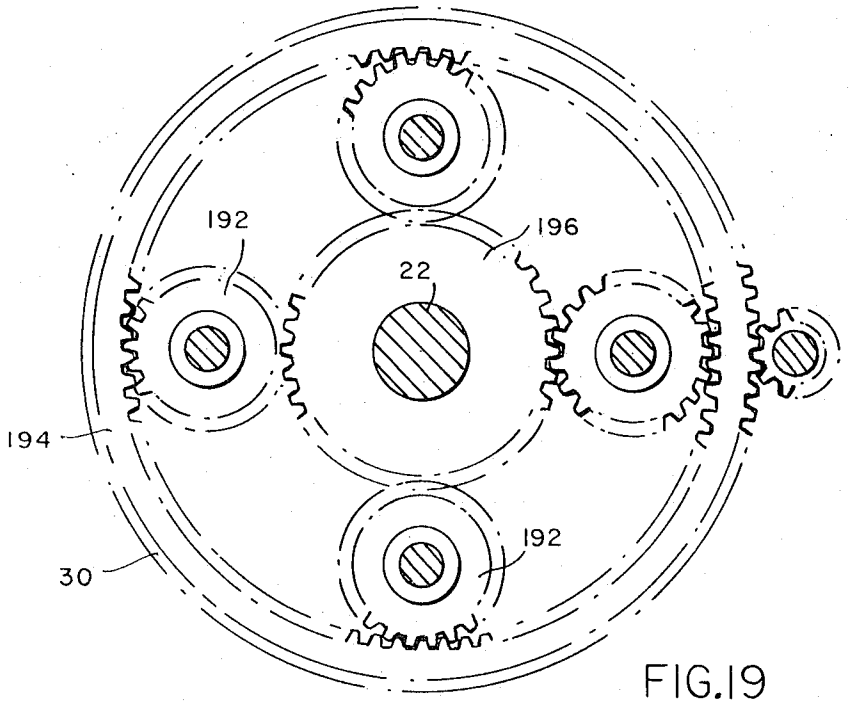


FIG.19

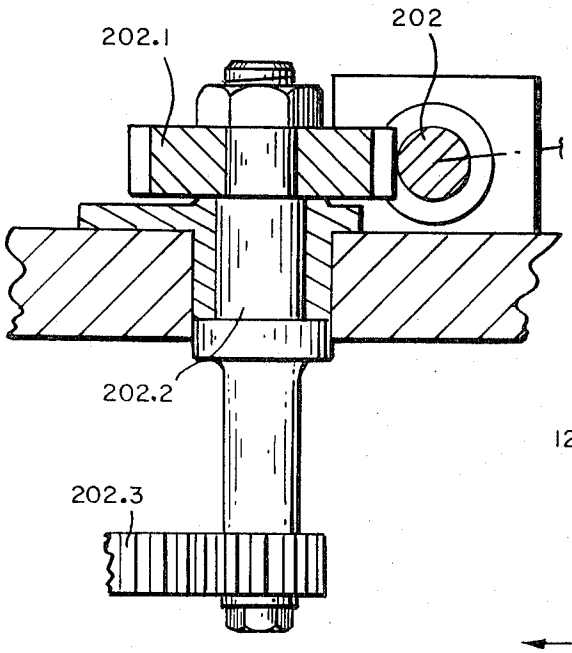


FIG.20

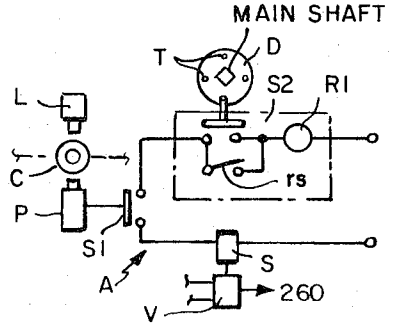


FIG.20b

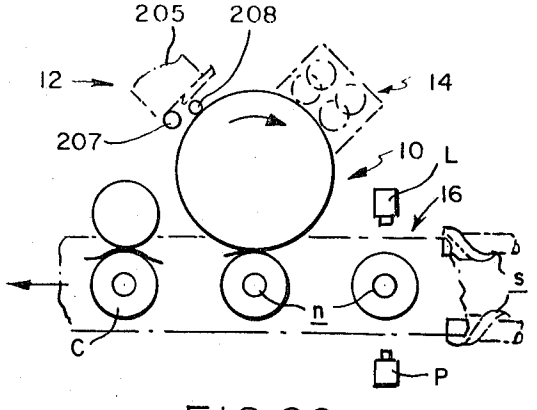


FIG.20a

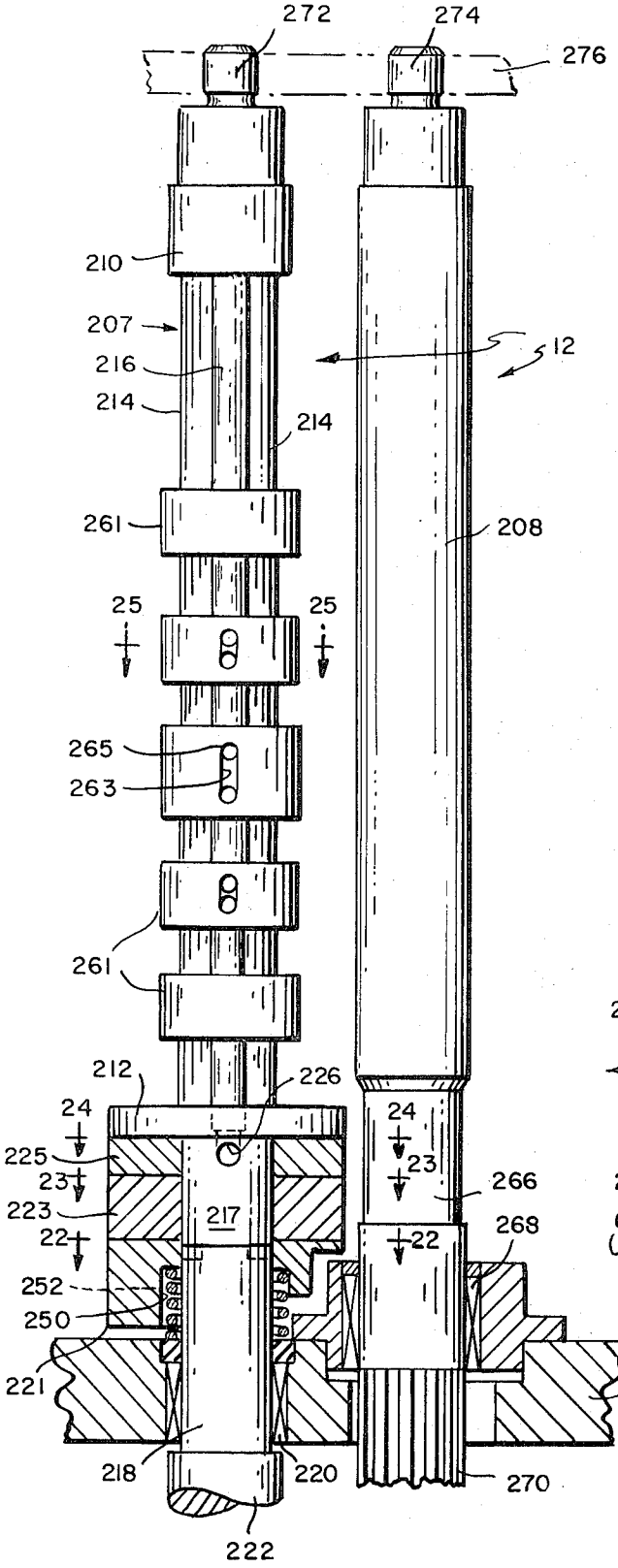
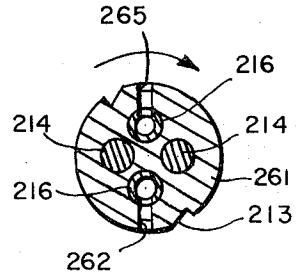


FIG. 21



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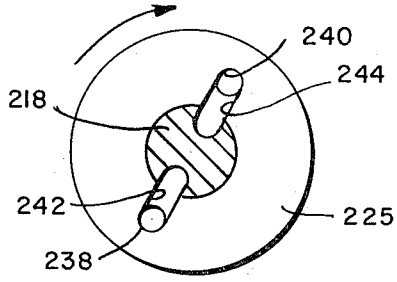

FIG. 24

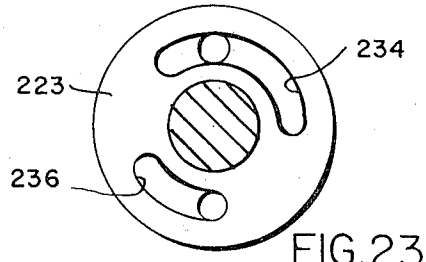

FIG. 23

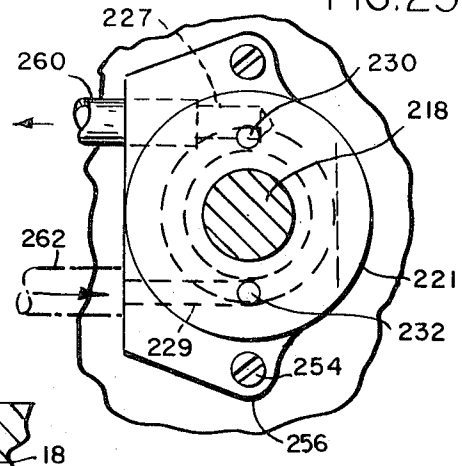

FIG. 22

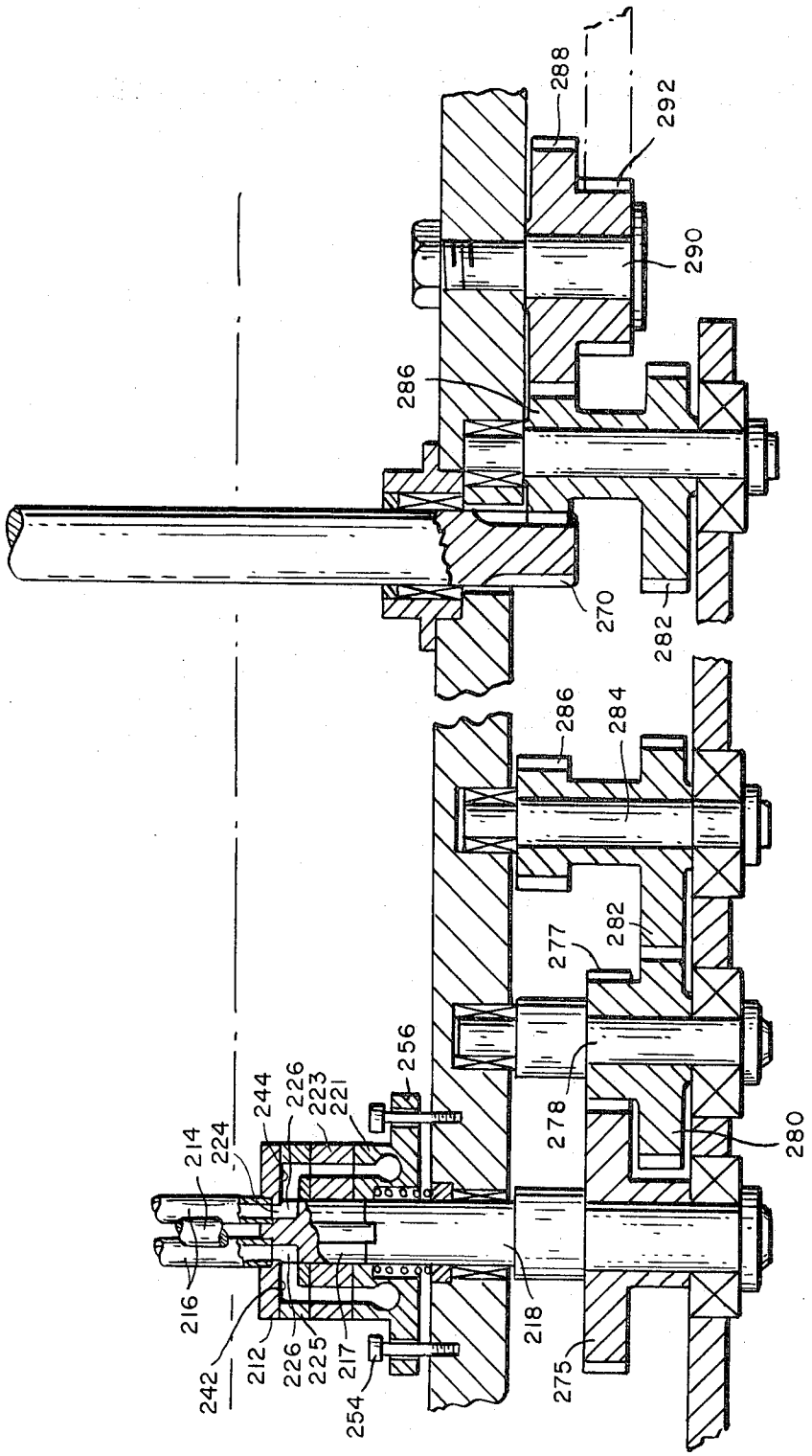
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FIG.26

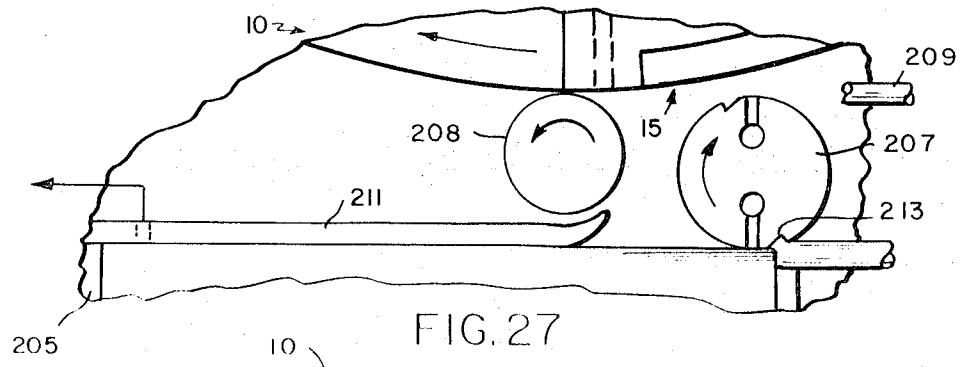

FIG. 27

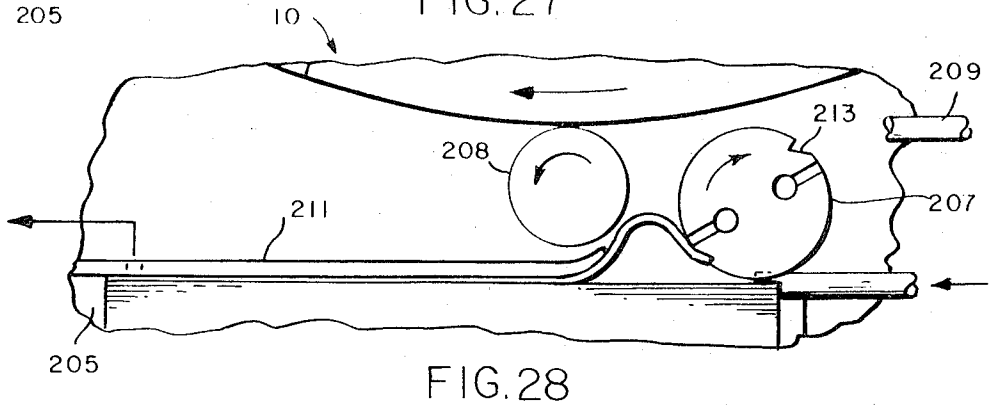

FIG. 28

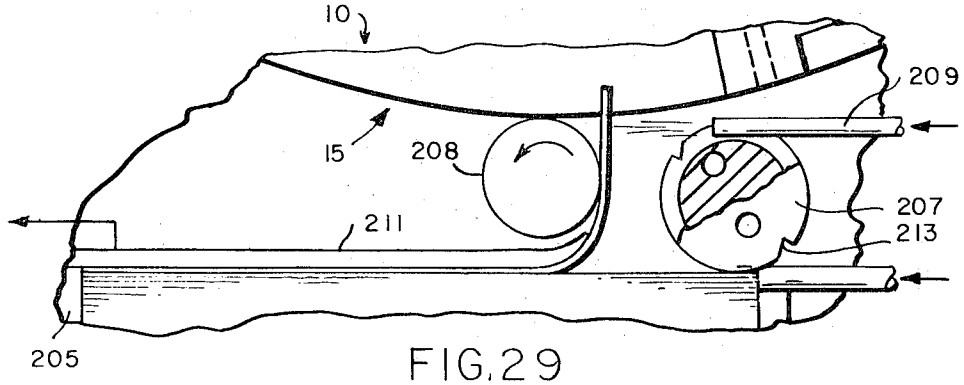

FIG. 29

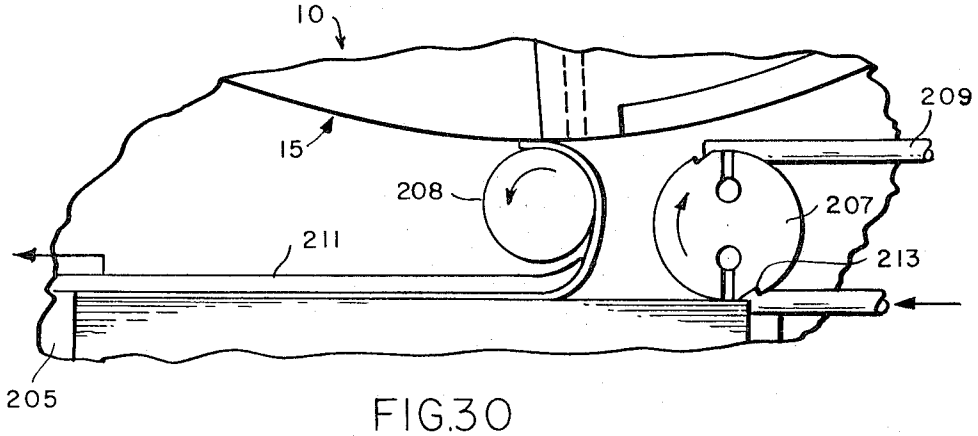

FIG. 30

LABELING MACHINE

BACKGROUND OF THE INVENTION

Labeling machines embodying label picking means, adhesive-applying means and transfer means for applying labels continuously to containers travelling along on a conveyor are well-known in the art. This invention relates to an improved transfer means which is employed in conjunction with the improved vacuum picking means, improved adhesive-applying means and improved container feeding means of my pending applications Ser. No. 308,280, filed November 20, 1972 now U.S. Pat. No. 3,806,114, Ser. No. 315,795, filed Dec. 18, 1972 now U.S. Pat. No. 3,841,946 and Ser. No. 337,579, filed Mar. 2, 1973 and especially to its association with the picking means and adhesive-applying means of the aforesaid applications in such a way as to provide for a high speed operation without failure of the labels to be delivered to the transfer means, to provide for a retraction of the label-applying elements on the transfer means from the adhesive-applying means in the event that a label fails to be supplied to the transfer means, becomes detached before it reaches the adhesive-applying means or the labeler is running without a supply of labels, to provide for stripping the labels which fail to be applied to a container at the place of label application and to provide for stopping the label-picking operation in the event that containers fail to be be delivered to the place of label application. The machine, as herein illustrated, also includes in conjunction with the improved rotary transfer means improved mounting means for mounting the transfer means in association with the picker means and with the adhesive-applying means so as to enable applying labels to vertical or sloping surfaces of containers and to containers of different height.

Summary

As herein illustrated, the apparatus comprises a rotary transfer device designed to take a label from a picking assembly, present it to adhesive-applying rolls for application of adhesive thereto and then press the adhesive coated label to the side of a container, means for rotating the rotor about a predetermined axis, means supporting the picking assembly, adhesive-applying rolls and container support peripherally of the rotor, label carrying pads mounted on the rotor, means for connecting the pads to a source of vacuum as they approach the picker assembly to take labels from the picker assembly, carry them therefrom by the adhesive-applying rolls for application of adhesive and from thence into engagement with the container, means for disconnecting the vacuum at the place of label application and connecting the pads to air pressure to release the labels therefrom, and means operable in the event that a label is not present on a pad as it approaches the adhesive-applying means to withdraw the pad as it travels by the adhesive-applying means. The pads contain orifices and there is a manifold connected to a source of vacuum and to a source of air pressure operable during rotation of the rotor alternately to connect orifices in the pads to the vacuum or to the pressure. A cam is supported adjacent the path of travel of the pads and there is a follower mounted with each pad held withdrawn so long as the label is held by the pad but will be released by the absence of the label to permit it to engage the cam. The cam is contoured to retract the pad as the rotor moves the pad by the adhesive-applying rolls. The picker comprises a guide roll arranged in tangential relation to the path of movement of the pad which is rotated in a direction opposite the direction of rotation of the rotor so that an end of a label presented to the bite between the guide roll and rotor is advanced in the direction of rotation of the rotor. A picker element is arranged to vacuum pick the ends of labels from the magazine and present them to the bite between the guide roll and the pad at such time intervals that a label is presented to each pad in succession. The pads contain transverse grooves and there are strippers arranged to be engaged with the grooves as the pads move by them to strip adhesive-coated labels from the pads if left thereon by failure to be applied to containers at the place of labeling. There is also a sensor arranged adjacent the path of delivery of containers to the place of labeling to stop the picking of labels in the event that no containers are in a position such as to receive labels at the place of label application. The container support is a conveyor having a horizontal portion adjacent the rotor on which the containers are supported and onto which they are moved in predetermined spaced relation corresponding to the spacing between pads and there is a support mounting the rotor, picker assembly and adhesive-applying rolls for vertical movement and angular movement relative to the conveyor to adjust the heightwise position of the labels on the containers and to bring the label-applying pads into parallelism with the sides of the containers at the place of application thereto.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

FIG. **1** is an elevation, partly in section, showing the label-applying instrumentalities at one side of the machine only, with reference to the center line of the container supporting conveyor and the other side comprising a duplication of the one side;

FIG. **2** is a fragmentary plan view of the labeling machine showing a portion of the rotor broken away in part and the positions of the label picking means, adhesive-applying means and container supporting means relative to the rotor;

FIG. **3** is an elevation of a pad;

FIG. **3***a* is a fragmentary plan view of the rotor showing strippers for removing adhesive-coated labels from the pads when the labels have not been transferred to the containers at the place of labeling;

FIG. **4** is a fragmentary section of means for retracting a pad from its normal path of movement showing the pad in its unretracted position;

FIG. **5** is a view corresponding to FIG. **4** showing the pad in its retracted position;

FIG. **6** is a plan view of a cam which forms part of the retracting means shown in FIGS. **4** and **5**;

FIG. **7** is a vertical section of the rotor including the driving means therefor;

FIGS. **8** and **8***a* are fragmentary sectional details of the manifold assembly;

FIGS. **9, 10, 11** and **12** are plan views of elements comprising a manifold by means of which vacuum and air pressure are supplied to the pads;

FIG. **13** is a section of a valve assembly for controlling flow of vacuum to the pad;

FIG. **14** is a section of the same valve taken at right angles to FIG. **13**;

FIG. 15 is a section like FIG. 14 showing the valve in a closed position;

FIG. 16 is a plan view of one of the spider like members of the rotor;

FIG. 17 is a plan view of a pad assembly with the head plate removed;

FIG. 18 is a diagrammatic view showing the relation of the drive for the rotor and the adhesive-applying rolls to the main drive shaft;

FIG. 19 is a horizontal section taken on the line 19—19 of FIG. 7;

FIG. 20 is a fragmentary section showing a hand adjustment for rotating the rotor;

FIG. 20*a* diagrammatically illustrates the relation of the picker assembly, adhesive-applying means and container-conveyor in relation to the rotor;

FIG. 20*b* diagrammatically illustrates the no-container, no-label control;

FIG. 21 is an elevation of the picking assembly taken on the line 21—21 of FIG. 2, omitting the label magazine which is shown diagrammatically in FIG. 2;

FIG. 22 is a view taken on the line 22—22 of FIG. 21;

FIG. 23 is a view taken on the line 23—23 of FIG. 21;

FIG. 24 is a view taken on the line 24—24 of FIG. 21;

FIG. 25 is a view taken on the line 25—25 of FIG. 21;

FIG. 26 is an enlarged section of the drive for the picking assembly; and

FIGS. 27, 28, 29 and 30 are plan views of the picker assembly diagrammatically illustrating the removal of successive labels from the label magazine.

Referring to the drawings (FIGS. 1 and 2), the labeling apparatus herein illustrated comprises in general a rotor 10 supported for rotation relative to a picker assembly 12, adhesive-applying means 14 and a conveyor 16 (FIG. 20*a*) which are arranged around the axis of rotation of the rotor. The rotor has vacuum pads 15 on it adapted to take labels presented thereto by the picker and move them in a predetermined circular path in a direction to first carry them into a position for receiving an application of adhesive from the adhesive-applying means and then to a position for applying the adhesive-coated labels to containers C resting on the conveyor 16. The conveyor 16 is arranged in a horizontal position in tangential relation to the rotor so that it moves containers resting thereon successively to positions for receiving the coated labels carried by the rotor and the rotor, picker and adhesive-applying means are all mounted on a supporting table 18 pivotally mounted on the supporting frame 20 of the labeling machine so that it is possible by adjustment to bring the surface of the rotor and the pads carrying the labels into parallelism with the sides of the containers whether these sides are vertical with respect to the conveyor or inclined thereto as shown in FIG. 1. The table 18 is also adjustable perpendicularly with respect to the conveyor to enable varying the heightwise positions of the labels on the containers for containers of different height.

The rotor 10 (FIGS. 2 and 7) is mounted for rotation on a shaft 22 journaled at its lower end in vertically spaced antifriction bearings 24 and 26, the bearing 24 being mounted in an opening 28 in the table 18 so that the shaft 22 passes through it to the lower side and the lower bearing 26 being mounted in an opening 29 provided in a housing 30 bolted to the underside of the table 18 designed to accommodate the means for driving the shaft 22. The rotor itself comprises a cylindrical hub 34, to the upper and lower ends of which are bolted circular spider members 36—36 (FIGS. 7 and 16) and rests on a shoulder 38 on the shaft 22. A cap 40 mounted on the shaft above the upper spider member in engagement therewith holds the rotor centered on the shaft. Each of the spider members 36, as shown in FIG. 16, comprises a central portion 42 from which extend peripherally spaced arms 44. Each arm 44 has at its outer end an opening 46, the arms being vertically spaced and the openings 46 in each pair of arms, comprising an upper and lower arm, being in axial registration. A wiper pad assembly 48 (FIG. 17) is mounted on the rotor between each pair of vertically spaced arms, there being eight such assemblies illustrated herein. Each assembly comprises a casting 50 (FIG. 17) containing a vertical cylindrical opening 52 which extends from top to bottom and has integrally spaced parallel arms 54—54 at the top and bottom containing openings 56—56. The castings 50 are mounted in the spaces between the arms 44 by means of pivot pins 58—58 (FIG. 7) fixed by means of set screws 60—60 in the openings 56—56 in the arms 54—54 and rotatable in the openings 46—46 in the arms 44—44. Each casting has a threaded opening 62 (FIG. 17) at the opposite side from its arms 54—54 in which there is screwed an eye bolt 64 having an eye 65. A rod 66 (FIG. 2) is supported in a radial position with respect to the axis of the rotor with its inner end connected to the hub 34 and at its outer end extending through the eye 64. A coiled spring 68 is mounted on the rod with one end seated in an opening 70 provided in the hub of the rotor and its other end seated against a shoulder 72 circumferentially of the opening in the eye. A nut 74 is threaded onto each rod at the outer side of the eye and provides for adjusting the position of the pad assembly about its pivot thus to increase or decrease the diameter of the path along which the surface of the pad travels. The outer side of each casting with respect to the center of rotation of the rotor is flat and has fastened thereto a block 76 on which there is mounted a pad 15. The pad is resilient and has an outer surface 80 which is arcuate, the radius of curvature of the arc having at its center the axis of rotation of the rotor. The spring 68 holds the casting distended with the arcuate surface of the pad in a position such that the radius of the arc intersects the center of rotation of the rotor. As will appear hereinafter the casting may be swung about its pivot to retract the casting and hence the surface of the pad so that it lies inwardly of the locus of the arcuate surfaces of the pads which are distended.

Each casting 50 (FIGS. 4, 5 and 7) has an axially disposed, elongate passage 82 from top to bottom and ports 84 spaced along the passage 82 extending therefrom through the wall of the casting. The block 76 contains passages 86 corresponding in number to the ports 84 and in registration therewith which have reduced ends 88. The pad contains orifices 89 corresponding in diameter to the reduced portions 88 of the block 76 extending through it so that these orifices are in communication with the passage 82 in the casting. At the outer end of each orifice 89 there is a short groove 90 (FIG. 3) in the surface of the pad. The pad also contains peripherally extending, vertically spaced, parallel grooves 92 and at its leading edge, with respect to the direction of rotation, a vertically extending channel 94. The purpose of the grooves 92 is to enable stripping adhesive-coated labels from the pad in the event that they are not applied to containers at the place of label applica-

tion, for example, if a container is not present in a position to have a label applied thereto and to prevent labels from being carried around by the rotor and applied to the guide roll **208** of the picker assembly and become wrapped around it so that it will be necessary to stop the machine. Removal of the unwanted labels is provided for by stripper means comprising three vertically spaced blades **91** supported by a post **93** (FIG. 3*a*) with the ends of the blades in the grooves. The block **76** is fastened to the casting by bolts **98.** A head plate **100** is fastened to the casting over the upper end of the opening **52** and the upper end of the passage **82** and contains a vertical opening **102** in which there is secured a nipple **104.** A valve housing **106** (FIGS. **7, 13, 14** and **15**) is mounted on the central portion **42** of the upper spider member **36.** The valve housing contains a valve chamber **108** of circular cross-section at one end of which there is an antichamber **110** of rectangular cross-section and at the other end of which there is a peripheral groove **112.** At the junction of the chamber **108** and the antichamber **110** there is a shoulder **114** and at the junction of the chamber **108** and the groove **112** there is a shoulder **116.** A resilient valve member **118** is mounted in the chamber **108,** the valve member being of circular cross-section corresponding to that of the chamber **108,** containing diametrically disposed, axially extending grooves **120—120** and a centrally located circular recess **122.** A sealing ring **124** is set into the groove **112** against the shoulder **116** so as to hold the valve element **118** in the chamber against the shoulder **114.** The sealing ring contains a central opening **126.** A short length of rigid tubing **128** is mounted with one end fixed in the nipple **104** and at its other end slidably engaged within the opening **126** in the sealing ring **124** with its inner end centered within the recess **122** in the valve member **118.** When the pad assembly is in its distended position the end of the rigid tube situated within the recess **122** is spaced from the bottom of the recess (FIG. **13**) and in this position the passage through the tube to the nipple **104** is in communication by way of the grooves **120—120** in the valve member with the antichamber **110.** The antichamber **110** contains a port **130** which opens into a vertical chamber **132,** the upper end of which contains a threaded opening **134** and the lower end of which is open. A short piece of rigid tubing **135** is mounted in the chamber **132** with one end adjacent the top of the chamber and its other end extending downwardly from the open end through a vertical opening **136** (FIG. **7**) in the central portion **42** of the spider to the underside thereof. A valve screw **140** is threaded into the opening **134** with its lower end situated in the upper end of the tube **135** and by rotation relative to the upper end of the tube **135** controls the degree of vacuum. The lower end of the tube **135** is connected by a flexible conductor **142** to a shortlength of tubing **144** extending through an opening **146** in the lower spider member and by way of a manifold **147,** which will now be described, provides means for connecting the orifices in the pads at certain times in the rotation of the rotor either to a source of vacuum for the purpose of holding a label on the surface of the pad or to a source of pressure to insure positive cut-off of the vacuum to release the label from the pad.

The manifold (FIGS. **7** and **9** to **12**) comprises three flat circular plates **150, 152** and **154.** These plates contain center openings and are mounted on the shaft **22** between a retainer plate **148** fastened to the table **18** over the bearing **24** and the lower side of the lower spider member **36.** The retainer plate **148** is fastened to the table **18** by bolts **156** extending through counterbored holes **157** and contains in its upper side three equally spaced groups of three pockets **158** and three equally spaced threaded holes **159.** The plate **150** contains in its lower side three equally spaced pockets **160** corresponding in angular spacing to the pockets **158** in the plate **148;** three equally spaced groups of three counterbored holes **161;** three equally spaced threaded holes **163;** and in its upper side two ports **162** and **164** connected by radial passages **166** and **168** to the peripheral surface of the plate. The plate **150** is held from moving by bolts **151** (FIG. **8***a*) inserted through the counterbored holes **161** and screwed into the threaded holes **159** in the plate **148.** The plate **152** contains in its upper side an arcuate passage **170** at one end of which is a port **170***a* and an arcuate passage **172** at one end of which there is a port **172***a*. The plate **152** also contains three holes **173** (FIGS. **7** and **11**) and is caused to turn with the plate **150** by bolts **174** inserted through the holes **173** in the plate **152** and screwed into the threaded holes **163** in the plate **150.** The plate **154** contains peripherally thereof eight ports **176** which extend through it from bottom to top corresponding in number to the number of pads and four threaded holes **177.1.** The plate **154** is secured to the underside of the lower spider member **36** by bolts **177** threaded into the holes **177.1** therein (FIG. **8**). The lower ends of the tubes **144** are fixed in the ports **176** in the plate **154.** Springs **178** are mounted in the pockets **158** and **160** in the plates **148** and **150** and these force the plates **150** upwardly relative to the plates **148** which in turn press the plate **152** against the plate **154.** The upper surface of the plate **152** and the lower surface of the plate **154** are made uniformly smooth and flat so that the plate **154** can rotate relative to the plate **152** to move the ports **176** relative to the arcuate ported passages **170** and **172** while maintaining a leak-tight seal between them. To insure a suitable wearing surface the plate **152** is comprised of graphite. The springs enable maintaining the seal without wearing the graphite plate out. The rotor is held down against the spring pressure of the springs **178** by a nut **179** screwed onto the upper end of the shaft **22,** against the upper end of the cap **40.** The lateral passage **166** is connected by a suitable flexible conductor **169** to a vacuum line and the lateral passage **168** is connected by a suitable flexible conductor **171** to an air line. As thus constructed, when the rotor is turning about the vertical axis of the shaft **22,** the ports **176** are connected to the source of vacuum as they travel along the arcuate ported passage **170** and to air pressure as they travel along the arcuate ported passage **172.** The ported passage **170** is of such circumferential length that each port **176** is in communication with the vacuum from the time a label is presented to the pad at the place of delivery of a label to the pad to the time when the label is presented to the container to which it is to be applied and the arcuate ported passage **172** is of such length that each port **176** is then connected to the source of air pressure during the period that the label is pressed against the container. Thus the label is securely held to the pad as it travels from the picker to the adhesive-applying means and from thence to the container to which it is to be applied and then is released from the pad while in engagement with the

container to insure that the label be transferred from the pad to the container. Each spring has three possible positions in the pockets **158** but only one position in the pocket **160.** The groups of three counterbored holes **161** provide for securing the plate **150** to the plate **148** with the springs in any one of the three possible positions. This makes it possible to adjust the position of the plate **152** in one of three locations and thus to be able to pick out the best possible position for cutting off the vacuum and turning on the air supply at the position of label application.

It can happen that a label will not be presented to a pad by the picker or that for some reason the label may become detached from the pad before it reaches the adhesive-applying means and if this happens the adhesive-applying means will apply a coating of adhesive to the surface of the pad which would then require that the machine be stopped and the pad cleaned. It is for this reason that the pads are pivotally mounted on the rotor, as related above, and pivotal movement of the pads to retract them from the adhesive-applying means so that the adhesive will not be applied to the naked surface of the pad in the absence of a label, is provided for by means of an arcuate cam member **180** (FIGS. **4, 5, 6** and **7**) mounted on the table **18** below the rotor. Each casting as previously mentioned contains a vertical opening **52.** The upper end of the opening is in communication with the interior of the head plate **100** and the lower end contains an opening **182.** A sleeve **184** is mounted in the opening extending from bottom to top and within this sleeve there is mounted a piston **186,** at the lower end of which there is a rotatable cam follwer **188.** The upper end of the piston **186** is thus exposed to the pressure existing at the upper end of the opening. When a label is presented to a pad at the place of label picking at which time the orifices are connected to the vacuum the label is held to the surface of the pad by the vacuum and this vacuum is sufficiently strong to move the piston **186** to an elevated position, as shown in FIG. **4,** and in this position the cam follower **188** is situated above the cam **180.** As long as this condition exists the pad will remain in its extended position as it travels from the picker to the adhesive-applying means and from thence to the container to which the label is to be applied. If, however, a label is not presented to the pad at the picking position or becomes detached before the pad reaches the adhesive-applying means so that the orifices in the pad are not closed the vacuum at the upper end of the opening **52** is not sufficient to raise the piston **186** to the upper position and it will remain at the lower position in which the cam follower **188** engages the cam **180** (FIG. **5**) and be moved inwardly thereby, swinging the pad assembly inwardly so that when it travels by the adhesive-applying means the surface of the pad will be spaced from the adhesive-applying means and will not be coated with adhesive. The cam **180** (FIG. **6**) is only long enough to insure maintaining the pad assembly withdrawn or retracted as it moves by the adhesive-applying means.

As heretofore related the valve screw **140** controls the vacuum to the chamber **52** and if opened wide the vacuum will suffice to lift the piston **186** even though there is no label on the pad. In practice the screw is closed down to a point where the piston stays down. With this adjustment the presence of a label will cause the piston to pop up and when the label is removed to drop down quickly.

The drive for the shaft **22** shown in FIG. **7** comprises a large gear **190** keyed to the shaft **22** on which are rotatably mounted gears **192** which are in engagement, respectively, with an annular gear **194** and a pinion gear **196,** the latter being formed at the upper end of a sleeve **198** rotatably mounted on the shaft **22** which has at its lower end a pinion **200** which meshes with a screw **202.** The annular gear **194** is mounted on a ring **204** rotatably supported by a bearing **206** mounted on the sleeve **198.** The aforesaid gearing is contained within the housing **30.** A gear **202.1** (FIG. **20**) in mesh with the screw **202** provides by way of a shaft **202.2** and suitable gearing **202.3** means for adjusting the position of the rotor by hand.

Labels are presented to the pads on the rotor by the picker assembly **12** which picks the labels one at a time from a magazine **205.** The picker assembly (FIG. **21**) comprises a vacuum picker element **207** adapted to take a label from the label magazine **205** and deliver it to the surface of the pad and includes a guide roll **208** arranged in tangential relation to the path of movement of the pads to position and hold a label presented to the pad against its surface until it is completely withdrawn from the magazine. The picker element, as shown in FIG. **21,** is supported for rotation about an axis parallel to the axis of the rotor and comprises upper and lower hub members **210** and **212** rigidly connected to each other in vertically spaced relation by diametrically arranged rigid rods **214—214** fixed at their ends in the respective hubs. There is also mounted between the hubs **210** and **212** a pair of diametrically disposed tubes **216—216,** the axes of the tubes being situated in a plane at right angles to the axes of the rods. The lower hub **212** is connected by an extension **217** to a shaft **218** which extends downwardly through a bearing **220** in the table **18,** at the lower end of which is a gear **275** (FIG. **26**). The hub and extension **217** contain axially arranged holes **224—224** in which the lower ends of the tubes **216—216** extend and radial passages **226—226** (FIG. **26**) extend therefrom through the peripheral surface of the extension **217.** The shaft **218** supports the hub **212** above the table **18** and in the space between the table and the hub **212** there are mounted around the extension three circular rings **221, 223** and **225** (FIGS. **21** to **24**). The ring **221** has spaced parallel passages **227** and **229,** the outer ends of which pass through the edge of the ring **221** and the inner ends of which are connected to vertically disposed passages **230** and **232** respectively. The ring **223** contains arcuate slots **234** and **236** which register with the passages **230** and **232.** The ring **225** has diametrically disposed vertical passages **238** and **240** and connecting radial passages **242** and **244,** the later being in communication with the passages **226—226** in the extension **217.** The ring **221** contains in its lower side a circular opening **250** and a spring **252** is mounted in this opening around the shaft **218** with one end bearing against the bottom of the recess and the other end against the table and forces the ring **221** upwardly against the rings **223** and **225,** providing a leak-tight saal between the abutting surfaces of the several rings. Bolts **254** inserted through ears **256—256** (FIG. **22**) integral with the ring **221** and screwed in the table with their heads spaced from the upper side of the ring **221** prevent rotation of the ring **221** relative to the table while permit-

ting axial movement of the ring. The passages **227** and **229** are connected, respectively, by flexible conductors **260** and **262** to a source of vacuum and to a source of air pressure. Between the hubs **210** and **212** there are mounted on the rods and tubes vertically spaced collars **261,** some of which contain in their peripheral surfaces diametrically disposed, axially extending slots **263** which are connected at their ends by radial passages **265** to the respective tube **216—216** so that the slots are connected by the tubes, alternately to one or the other of the arcuate slots **234, 236** in the ring **223.** The arcuate slot **234** is connected to the vacuum source and the arcuate slot **236** is connected to the air pressure source and so when the picker is rotated the slots **263** will be alternately connected through the arcuate slots **234** and **236** to the vacuum source and to the pressure source. The arcuate slots are so arranged that during rotation of the picker the slots in the collars will be connected to the vacuum source at the moment of engagement of the slots **263** with a label in the magazine so as to pick the label from the magazine and will be maintained through angular movement of approximately 90° whereupon the vacuum will be blocked and within approximately the next 45° of rotation air pressure will be connected to the slots **263** to positively disengage the label from the collars. At this moment as disclosed in my pending application Ser. No. 308,280, filed Nov. 20, 1972, air pressure is also supplied through nozzle members **209** (FIGS. **2** and **27** to **30**) arranged to eject jets of air against the released ends of the labels and blow them in a direction to be engaged in the bite between the surface of a pad travelling by the picker at this moment and the surface of a guide roll **208** which grip the free end of the label, pressing it against the surface of the pad over the orifices therein. The guide roll **208,** which also functions to feed the label and in conjunction with the pad to pull the label from the magazine is a smooth surfaced roll supported for rotation about an axis parallel to that of the picker by a shaft **266** (FIG. **21**) mounted in a bearing member **268** on the table, the shaft extending through the table and having at its lower end a gear **270** by means of which it is rotated in a direction opposite to that of the rotation of the picker and of the rotor. The upper ends of both the picker and the guide roll are provided with bearing nubs **272** and **274,** respectively, rotatably supported in a bracket plate **276,** the latter in turn being mounted on supports fixed to the table **18.**

The picker element **207,** as shown in the aforesaid application and in FIGS. **27** to **30** herein, takes hold of the exposed end of the label in the magazine **205,** displaced it in its own plane in a direction opposite to its withdrawal from the magazine so that it folds outwardly relative to a guide member **211** and is carried by the picker element outwardly between the picker element **207** and the guide roll **208** whereupon it is released and the freed end deflected by jets of air from the nozzles **209** into the bite between the guide roll **208** and a pad. The guide roll **208** in conjunction with the pad pulls the label from the magazine. There are notches **213** (FIG. **25**) on the collars which, by engagement with the leading ends of the labels, assist in moving the end toward the place of release.

The drive for the picker element and guide roll comprises, as shown in FIG. **26,** a large gear **275** secured to the lower end of the shaft **218** which meshes with a gear **277** fasted to a shaft **278.** The gear **277** has on it an eccentric gear **280** which meshes with an eccentric gear **282** mounted on a shaft **284.** The eccentric gear **282** has on it a gear **286** and this meshes with a gear **288** mounted on a shaft **290.** The gear **288** has on it a gear **292** which is driven from the main drive shaft of the machine. The gear **286** meshes with the gear **270** mounted to the lower end of the guide roll **208.** The eccentric gears **280** and **282** operate to vary the speed of rotation of the picker element in such a way as to slow the rotation of the picker element down as the vacuum picking slots approach the label magazine to enable obtaining a good hold on the label and the speeding it up to carry it around to a position for presentation to a pad on the rotor in time to be properly positioned thereon.

In order to pick labels in timed relation to the label pads on the rotor and to omit picking labels when no containers are presented for labeling, a sensor comprising a photoelectric cell P and a lamp L are mounted at opposite sides of the conveyor **16** (FIG. **20***a*) on which the containers are distributed at a predetermined spacing by feed screws *s—s* as disclosed in my pending application Ser. No. 315,795 now U.S. Pat. No. 3,841,946. The sensor is supported at a level such that the necks *n* of the containers intercept the beam. The photoelectric cell P when deprived of light by the presence of a container operates to close a switch S^1 (FIG. **20***b*) in a circuit A. In this circuit there is a solenoid-operated valve S-V which is operable to supply vacuum to the respective pads on the rotor and a switch S^2 arranged to be closed and opened in timed relation to the rotation of the pads on the rotor by a cam disc D mounted on the main shaft on which there are pins T corresponding in number to half the number of pads (the rotor makes one-half a revolution for one revolution of the main shaft), a relay R^1 adapted to be energized by closing of the switch S^2, which then closes a switch *rs* to hold the circuit closed until opened by the switch S^1. As thus arranged, as each container interrupts the beam to the cell the switch S^1 will be closed and when the switch S^2 is closed momentarily a vacuum will be applied to the picker and will be maintained until the switch S^2 is opened, but if a container fails to intercept the beam between the time the rotor has rotated a distance corresponding to half the distance between the pin T, the switch S1 will be held open and operation of the switch S^2 will not provide the picker with a vacuum. It is necessary, of course, that the circuit make and break during the time the light beam is intercepted by the presence of a container.

The adhesive-applying means **14** (FIG. **2**) comprises two applicator rolls **294—294** and two doctor rolls **296—296** supported for rotation about axes parallel to the axis of the rotor on the table for applying adhesive to the labels supported by the pads as the latter are moved by the adhesive-applying means toward the place of application of the label to a container. The details of construction of the adhesive-applying means is disclosed and claimed in my copending application Ser. No. 337,579, filed Mar. 2, 1973. The adhesive-applying rolls are driven from the main drive shaft by a train of gears indicated at **295** (FIG. **18**) so that the surface speed of the adhesive-applying rolls is the same as that of the pads as the latter travel by the adhesive-applying rolls.

As herein shown, the rotor, picker means and adhesive-applying means are all mounted on the table **18** (FIG. **1**) which is arranged to tilt about stub shafts

296—296, the axes of which are parallel to the conveyor 16 and are supported for movement perpendicular to the table in eyes 298—298 secured to the upper ends of sleeves 300—300, telescopically mounted in posts 302—302 on screws 304—304. The screws extend through the lower ends of the posts and the table and have fastened thereto sprockets 306—306. A chain 308 is entrained about the sprockets 306—306 and about a sprocket 310 secured to the lower end of a shaft 312, the latter being supported by a suitable bearing 314 in the frame 20. A hand wheel 316 is connected by a flexible coupling 318 to the upper end of a shaft 312 and its rotation will effect rotation of the screws 304—304 and hence elevation or depression of the table 18. The hand wheel 316 has fixed thereto a screw 320 and a hand wheel 322 rotatably connected to the table 18 and threaded onto the screw 320 provides for tilting the table about the axis of the shafts 296—296 relative to the conveyor so as to adjust the peripheral surface of the rotor into parallelism with the sides of the container resting on the conveyor.

The screw 202 (FIG. 1) by means of which the rotor is driven is connected for driving by a sprocket 324 fastened thereto, a chain 326 entrained at one end about the sprocket 324 and at its other end about a sprocket 328 fast to a shaft 330. The shaft 330 has on it a sprocket 332 and a chain 334 entrained about the sprocket 332 and about a sprocket 336. The sprocket 336 is fixed to a shaft 338 on which there is a gear 340 meshing with a gear 342 on the main drive shaft. As thus arranged the driven can be maintained from the main drive shaft to the screw 202 at any position of adjustment of the table 18 relative to the frame of the machine.

It is to be understood that the machine is constructed with duplicate label-applying means at each side of the longitudinal center line of the container-conveyor so that labels may be applied to both sides of the centers at the same time. The containers are advanced along on the conveyor in peripherally spaced relation by the helical screws shown in my pending application Ser. No. 315,795, filed Dec. 18, 1972, now U.S. Pat. No. 3,841,946 and after the labels are applied to the sides of the containers the end portions are wiped down by suitable rotating wipers.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents falling within the scope of the appended claims.

I claim:

1. In a label applying machine, rotary transfer means comprising a rotor rotatable about a predetermined axis, a picker, adhesive applying means, and container supporting means supported about said rotor, label holding pads mounted on the rotor for movement from a normally distended position in which they travel in a path tangent to the picker, adhesive applying means and container supporting means to a retracted position withdrawn from said path of tangency, means for yieldably holding the label holding pads distended and means operable as the pads travel from the picker toward the adhesive applying means in the absence of labels on the pads to withdraw the pads from the path of tangency with the adhesive applying means, said means being rendered inoperative as the pads travel away from the place of application of the labels to the containers to restore the pads to their distended positions before they reach the picker.

2. Labeling apparatus according to claim 1, wherein the pads contain vacuum orifices adapted to be connected to a vacuum source at the place of picking and to be disconnected therefrom at the place of label application and means operative by movement of a pad to its retracted position to disconnect the orifices from the vacuum source.

3. Labeling apparatus according to claim 1, wherein the pads contain vacuum orifices adapted to be connected to a vacuum source at the place of picking and to be disconnected therefrom at the place of application and means operative by movement of a pad to its retracted position to disconnect the orifices from the vacuum source and to connect them to a source of pressure.

4. Apparatus according to claim 1, comprising means situated along the path of travel of the pads from the place of picking to the place of application and means carried by each pad movable to a position of cooperative engagement with said last means in the absence of a label on the pad to retract the pad from the path of tangency before it reaches the adhesive applying means and to restore it to said path after it passes the place of application.

5. Apparatus according to claim 6, comprising a cam extending along the path of travel of the pads, from the place of picking to the place of application and vacuum sustained followers supported above the cam by the vacuum produced when labels are on the pads but allowed to drop down into engagement with the cam in the absence of labels and wherein the cam is so contoured as to swing the pads away from said path of travel before they reach the adhesive applying means.

6. Apparatus according to claim 1, wherein the adhesive-applying means comprises adhesive-applying rolls arranged with their surfaces tangent to the path of movement of the rotary transfer device, and wherein there is means for effecting movement of the transfer means and the adhesive-applying rolls at the place of tangency of the adhesive-applying rolls with the pads so that the surfaces of the adhesive-applying rolls are travelling at the same rate as the surfaces of the labels.

7. In a label applying machine, transfer means comprising a rotor embodying a hub and radially extending, peripherally spaced arms, a pad holder and pad mounted thereon said pad holder having an arcuate surface, means pivotally supporting the pad holder at one of its lateral sides for pivotal movement in a horizontal plane such that when distended relative to the hub the surface of the pad will travel in a circle tangent to the adhesive applying means, a spring supported with one end engaged with the hub and the other with the other lateral side such as to urge the pad holder to its extended position, said pad holder containing a vacuum chamber connected to the pad and to a source of vacuum for producing a vacuum at the orifices, a part slidingly supported in the chamber with one end extending from the chamber, said part being adapted to be raised by the vacuum established in the chamber when a label covers the orifices to withdraw said end and to gravitate to an extended position in the absence of a label and a cam member arranged along the path of travel of rotation of said pad holder operable by engagement with the extended part to move the pad

holder away from tangency with the adhesive applying means.

8. In a label-applying machine, a label picker, a rotary transfer device adapted to receive successive labels from the picker and apply them to successive containers travelling along on a conveyor arranged tangent to the rotary transfer device, and adhesive-applying means situated between the place where the labels are delivered to the transfer device and the place where they are applied to the containers; pivotally mounted pads on the rotary transfer device movable inwardly relative to the path of rotation of the rotary transfer device, said pads containing orifices, a source of vacuum, a manifold connected to said source of vacuum, conductor means connected to the orifices in each pad, said conductor means being arranged to be connected at times by rotation of the transfer device to said manifold, a cam fixed with respect to the axis of rotation of the rotary transfer device, a follower mounted to each pad, said follower being held withdrawn from the cam whenever a conductor is connected to said manifold and a label covers the orifices in the pad, said follower being permitted to move to a position of engagement with the cam in the absence of the label, and said follower operating by engagement with the cam to swing the pad away from said predetermined path, and means operable by the swinging movement of the pad to block the conductor.

9. Apparatus according to claim 7, comprising a vacuum picker at the label supplying station, and stripper means situated beyond the label-applying station in a direction of rotation of the rotor to remove labels from the pads when such labels have not become transferred to the containers at the label-applying station.

10. A label-applying machine according to claim 9, wherein the pads contain transversely extending grooves and a stripper is mounted adjacent the path of rotation of the pads provided with stripper fingers which enter the grooves.

11. In a label-applying machine a label picker, a rotary transfer device adapted to receive successive labels from the picker and apply them to successive containers travelling on a conveyor arranged tangent to the rotary transfer device, and adhesive-applying means situated between the place where the labels are delivered to the transfer device and the place where they are applied to the containers; pivotally mounted pads on the rotary transfer device movable inwardly relative to the path of rotation of the rotary transfer device, a source of vacuum, a manifold connected to said source of vacuum, conductor means arranged to be connected at times by rotation of the transfer device to the manifold, said conductor means being connected to said orifices, a cam fixed with respect to the axis of rotation of the rotor, a cam follower mounted on each pad movable with the rotor about its axis of rotation relative to said cam, means operable in response to a vacuum in the conductor means when a label covers the orifices to hold the follower withdrawn from engagement with said cam, said means being disabled by the absence of a label on the pad, and said cam being operable to swing the pad inwardly relative to the axis of rotation, and a valve member movable by swinging movement of the pad to block the conductor means.

12. Apparatus according to claim 11, wherein the valve means comprises a valve housing mounted on the rotary transfer device, means connecting the conductor means to the housing, a conductor tube pivotally connected at one end to the pad and in communication with the orifices therein and slidingly connected at its other end to the housing, a yieldable valve element in said housing sealing the opening about the slidingly engaged portion of the conductor tube, said valve element in one position being spaced from the end of the tube when the pad is extended providing communication through the tube to the orifices and in another position by engagement with the end of the tube when the pad is retracted blocking communication through the tube to the orifices.

13. In a label-applying machine, a label picker, a rotary transfer device adapted to receive successive labels from the picker and apply them to successive containers travelling along on a conveyor arranged tangent to the rotary transfer device, and adhesive-applying means situated between the place where the labels are delivered to the transfer device and the place where they are applied to containers; carriers pivotally mounted on the rotor, a pad fixed to each carrier, each pad containing orifices, means yieldably urging the carriers relative to the axis of rotation of the rotary transfer device outwardly so that the surfaces of the pads travel in a predetermined path tangent to the picker, adhesive-applying means and container supporting means, each carrier containing a chamber, a source of vacuum, a manifold connected to said source of vacuum, conductor means connected at one end to said chamber and arranged to be connected at its other end at times by rotation of the rotor to said manifold, ports connecting the chamber to the pad, a piston in the chamber movable to one end of the chamber when the latter is connected with said manifold and a label covers the orifices in the pad, and the other end of the chamber when the orifices in the pad are uncovered, a cam fixed relative to the axis of rotation of the rotor, a follower connected to the piston and movable thereby into and out of engagement with the cam, said cam being operable when engaged with the follower to swing the carrier about its pivot in a direction to withdraw the pad from said path, and valve means on the carrier operable by said pivotal movement to close said conductor means.

14. Apparatus according to claim 13, wherein the valve means comprises a valve housing mounted on the rotary transfer device, said valve housing being connected to the manifold, a conductor tube pivotally connected at one end to the pad and in communication with the orifices therein, said conductor tube being slidingly connected at its other end with the valve housing, and a valve element associated with the valve housing and the slidingly engaged portion of the conductor tube operable when the pad is distended to permit flow through the tube and when retracted to block flow.

15. In a label-applying machine, a rotor, a shaft supporting the rotor for rotation about a substantially vertical axis, said rotor comprising a hub mounted on the shaft and spider members at the ends of the hub, a plurality of pad assemblies mounted radially of the hub between the spider members for pivotal movement about axes parallel to the axis of the shaft from a position in which the locus of the surfaces of the pads form a circle of predetermined diameter to a position inwardly of said circle, means yieldingly holding the pads distended with respect to said axis with their surfaces in said circle, a source of vacuum, each pad containing orifices

adapted, at times, to be connected to said vacuum, a label picker, adhesive-applying means and container supporting means arranged concentrically around the axis of the rotor in tangential relation to said circle of movement of the pads, means for causing the label picker to present labels to the pads travelling by it at a time when the orifices therein are connected to said vacuum, said pads supporting the labels while they travel by the adhesive-applying means for an application of adhesive thereto and pressing the adhesive coated labels into engagement with containers on the support, means for terminating the vacuum at the orifices while the pad supported labels are in engagement with the containers, means for simultaneously ejecting air pressure through the orifices to release the labels from the pads, a cam situated along said circle in the region of the adhesive applying means and vacuum actuated means cooperative with said cam when the vacuum at the orifices is less than that which would be produced by a label on the pad to withdraw the pad from said circle.

16. Apparatus according to claim **15,** wherein the pads are resilient.

17. Apparatus according to claim **15,** wherein the picker presents the label to the pad with its leading edge extending beyond the leading edge of the pad in the direction of rotation.

18. Apparatus according to claim **15,** wherein there is means for adjusting the pads relative to the axis of rotation of the rotary transfer device to increase or decrease the diameter of the locus of travel of the pads relative to the picker, adhesive-applying means and container support.

19. In a label-applying machine, a rotor to which labels are presented for application of adhesive thereto and for pressing the adhesive-coated labels into engagement with the container, peripherally spaced label receiving pads on the rotor movable along a predetermined path, a label supplying station, an adhesive-applying station and a label-applying station located around the rotor along said path, a vacuum picker at the label supplying station for delivering labels to the successive pads, a conveyor at the label-applying station for delivering containers to the label-applying station in timed relation to the arrival of label-applying pads at said station to receive labels from the pads, a detector for determining the presence of containers on the conveyor in a position to be delivered to the place of label application in coincidence with the arrival of pads at said station, a control circuit comprising a valve operable to connect the picker to a vacuum, a switch in the circuit, a cam for closing said switch at intervals corresponding to the intervals between pads on the rotor, a second switch for making and breaking the circuit, said second switch being operable by the detector for detecting a container to make the circuit and when detecting the absence of a container to break the circuit.

20. In a labeling machine, a rotor, rotatable about a predetermined axis, a plurality of peripherally spaced pad assemblies mounted on the rotor, a pad on each assembly, said pads having surfaces for receiving labels and orifices adapted to be connected to a vacuum, said pads being movable circularly about the axis of the rotor in a predetermined path for receiving a label, applying adhesive thereto and pressing the label into engagement with a container on a container support; a picker assembly, adhesive-applying means and container supporting means arranged peripherally of the rotor adjacent the path of movement of the pads, said picker assembly comprising a guide roll rotatable about an axis parallel to the rotor with its surface in tangential relation to the path of travel of the pads as they travel successively by the picker assembly and rotating counter to the rotation of the rotor, a label magazine and a picker element arranged to withdraw labels from the magazine and present them to the bite between a pad and the guide roll, a source of vacuum, means for connecting the orifices in each pad to said source of vacuum as it approaches its place of tangency with the guide roll, said means continuing to connect the orifices through the angular distance the pads travel from their place of tangency with the guide roll to the place of application to a container on the container support, said means disconnecting the vacuum from the orifices at the place of label application, means for connecting the orifices as the pad presses the label into engagement with a container to a source of air pressure, and cam means comprising a fixed part situated along said path in the region of the adhesive applying means and a vacuum sustained follower arranged to gravitationally drop into engagement with the fixed part in the event that the vacuum at the orifices is less than that required to hold a label on the pad to cause the pad to move inwardly from said predetermined path before it reaches the adhesive-applying means and to be restored to its distended position after it has travelled by the adhesive-applying means.

21. Apparatus according to claim **20,** wherein the peripheral surfaces of the pads are substantially concentric with the axis of rotation of the rotor and of a peripheral length less than the widths of the labels.

22. Apparatus according to claim **20,** wherein the picker element rotates about an axis parallel to that of the rotor and contains diametrically disposed sets of picking orifices adapted to be connected to said vacuum as they approach the magazine and to be disconnected therefrom as they approach the bite between the guide roll and a pad moving into tangential engagement therewith, and means for rotating the picker at a rate such as to cause the successive orifices of the picker to pick and release a label to the successive pads on the rotor.

23. Apparatus according to claim **22,** wherein the picking orifices are arranged to travel in a circular path tangent to the surface of the label and in a direction opposite to withdrawal of the labels from the magazine so as to grip an end of the endmost label, displace it away from the succeeding label into engagement with the guide roll and release the end between the counter-rotating surfaces of the picker and guide roll.

24. Apparatus according to claim **23,** wherein there is means for deflecting the released end of the label in a direction to enter into the bite between the guide roll and a pad on the rotor.

25. Apparatus according to claim **23,** wherein there is means for connecting the picking orifices in the picker to a source of air pressure at the place of release of the labels.

26. Apparatus according to claim **22,** wherein there are means on the picker rearwardly of the picking orifices arranged to receive the leading ends of the labels and urge said leading ends in the direction of rotation of the picker.

27. Apparatus according to claim **20**, wherein the container support comprises a conveyor having a horizontal surface on which the containers rest and are moved successively relative to the place of tangency with the rotor, and there is a support mounting the rotor, picker and adhesive-applying means for tilting about an axis parallel to the surface of the container support and movement perpendicular to said surface.

28. Apparatus according to claim **20**, comprising a machine frame, means supporting the container-conveyor on the frame with that part of its supporting surface adjacent the rotor in a horizontal plane, a table having a flat surface on which are mounted the rotor, picker assembly and adhesive-applying means, and means supporting the table on the frame for angular movement of its surface about a horizontal axis to bring the surfaces of the pads into parallelism with the side of a container resting on the container support and for movement perpendicular to said coutainer support to adjust the level of application of a label to the container.

29. Apparatus according to claim **20**, comprising a machine frame, means supporting the container-conveyor on the frame with that part of its supporting surface adjacent the rotor in a horizontal plane, a table mounting the rotor, picker and adhesive-applying means, means supporting the table on the frame for angular and perpendicular movement comprising vertically mounted posts on the machine frame embodying screws, bearing elements vertically movable thereby and means for effecting vertical movement of the screws, pivot pins pivotally mounting the table on said bearings for angular movement about a horizontal axis, and means for effecting angular movement of the table.

30. Apparatus according to claim **20**, wherein said container supporting means is adapted to move containers at a predetermined spacing to a predetermined position adjacent the rotor for receiving labels from the rotor, said label picking assembly being operable to apply labels to the rotor, means for timing the operation of the label picking assembly with the delivery of containers to the place of labeling comprising a sensor arranged adjacent the conveyor means for detecting the presence of a container in a position to reach the place of labeling at a predetermined time, and means operable by the sensor in response to detection of a container to effect operation of the picker.

31. Apparatus according to claim **30**, wherein said last-named means is operable in the absence of a container to disable the picker.

32. Label applying apparatus according to claim **30**, wherein the label picker is vacuum operated comprising a detector for detecting containers at a position on the conveyor such as to be delivered to the place of label application at a predetermined time, and means operable by failure of the detector to detect a container to disable the means for connecting the picker to said source of vacuum.

33. Apparatus according to claim **32**, wherein the detector comprises a photoelectric assembly comprising a cell and lamp arranged along opposite sides of the conveyor at a height to scan the necks of the containers resting on the conveyor.

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