This invention relates to a cap applying machine.

One object of the invention is to provide a novel and highly efficient machine for applying contractable caps or coverings, such as those of wet regenerated cellulose, to the top and neck portions of bottles in order to provide the bottles with sealing members shrunk in tightly fitting relation upon the top and neck thereof and covering the closure thereof so that the sealing cap is required to be destroyed in order to open the bottle.

With these general objects in view and such others as may hereinafter appear, the invention consists in the cap applying machine and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

While the different features of the invention may be used with advantage in a cap applying machine for the application of various caps to different types of containers, the invention is particularly useful in the application of caps or coverings of wet regenerated cellulose over the top of filled and closed bottles and around the neck thereof in such a manner that when the cap or covering dries it will shrink into tightly fitted relation upon the top and neck of the bottle entirely covering the closure and forming a sealing member which must be destroyed or broken in order to open the bottle.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a side elevation of the machine; Fig. 2 is a perspective view of a cap or covering in opened position; Figs. 3 and 4 are views of a cap applied to a bottle, before and after shrinking respectively; Fig. 5 is a front elevation of the machine with some of the parts omitted; Fig. 6 is an enlarged sectional elevation taken on the line 5—5 of Fig. 5, showing details of the cap feeding and applying mechanism; Fig. 7 is a view similar to Fig. 6 with the parts in different positions; Fig. 8 is a detail view of a cap to be referred to; Figs. 9, 10 and 11 are detail views of the cap applying mechanism in different positions; Fig. 12 is a cross-sectional view taken on the line 12—12 of Fig. 5 showing a cap in position to be applied to a bottle; and Fig. 13 is a cross-sectional detail taken on the line 13—13 of Fig. 6.

In the illustrated machine a supply of the wet regenerated cellulose caps or coverings, in collapsed condition, is preferably stored in a magazine and provision is made for automatically withdrawing successive caps or coverings from the magazine, opening the same, and applying the open caps over the tops of successive bottles in a positive and highly efficient manner and into such positions that the caps upon drying may shrink into tightly fitting relation on the tops and necks of the bottles, entirely covering the closures thereof.

Referring now to the drawings, in the illustrated machine the filled and closed bottles are fed into the machine on an incoming conveyor from which a bottle is transferred into cap applying position intermediate the incoming conveyor and a discharge conveyor. The caps to be applied are transferred from a magazine by a vacuum operated device and then opened and positioned over the bottle to be capped. After the cap has been applied to the bottle, the capped bottle is transferred to the outgoing conveyor to be discharged from the machine.

The machine is mounted upon leg members 2 supporting a platen 3 upon which the main operating mechanism of the machine are mounted. The driving mechanism for driving the various instrumentalities of the machine is mounted beneath the platen 3 upon suitable shafts journaled in bearings in the supporting legs 2. The driving mechanism may be described as follows: A driving pulley 6, driven from any convenient source, such as an electric motor, not shown, is mounted on a short shaft 8. The shaft 8 is provided with a gear 10 secured thereto which is meshed with a gear 16 on the outer end of a main cam shaft 18 and the latter has mounted thereon all of the cams for performing the various operations of the machine, as will be described. The gear 16 is provided with a sprocket 20 secured thereto which is connected through a chain 24 and sprocket 28 to a shaft 32 so that the shaft is driven from the gear 16. The shaft 32 is provided with a sprocket 30 connected by a chain 32 to a sprocket 34 secured to the end of the shaft of a vacuum pump 36 of any usual or preferred construction and the vacuum pump is utilized, as will be described, to create the vacuum employed in transferring and opening the individual caps during the application thereof to the bottles.

As previously pointed out in the operation of
the machine the bottles are fed into the machine on an incoming conveyor 50 driven from any suitable source, not shown, and thereafter the bottle is transferred from the incoming conveyor to a plate 62 and positioned under the caps.

The second end of the connecting rod 350 is connected to a lever 370 mounted free to swing on a pin 372 attached to the vertical slide member 360. A connecting rod 374 is pivotally connected at one end to the lever 370 by a pin 376, and at the other end to one arm 378 of a bell crank lever by a pin 380. The outer end of the second arm 382 of the bell crank lever is connected by a link 384 to a lever 390 secured to the shaft 385 by connecting pins 390. The shaft 385 is rocked by a cam 396 secured to the main cam shaft 16 and having a cam path 398 cooperating with a cam roller 400 supported on a cam lever 402 pivotally mounted on the shaft 60. The cam lever 402 is operatively connected to a lever 405 secured to the shaft by a connecting rod 406.

From the above description it will be observed that the cap feeder slider 326 is moved to the left, viewing Fig. 6, the cap feeder 320 is caused to rotate in a counterclockwise direction to bring the collapsed cap from a horizontal to a vertical position. This rotation is effected by a cam 410 attached to the bracket 322 through contact with a rod 414 fastened on an arm 414 secured to the sleeve 422.

Provision is made for applying suction to the cap feeder at the time in the operation of the machine when the suction plate 268 is in contact with the lowermost cap in the magazine, causing the same to be removed therefrom and held upon the suction plate 268 until the applying device operates to place it on the bottle. To this end, the valve 288 is formed in a bracket 291 attached to the platen 4 and comprises a rocking shaft 293 having a valve port 294 adapted to be rocked by a lever 295 fastened to the outer end of the valve shaft 293 and connected by a connecting rod 297 to one arm 299 of a bell crank 301 pivotally mounted on the shaft 60. The other arm of the bell crank 301 is provided with a cam roller 303 cooperating with an open cam 305 secured to the main cam shaft 16. It will thus be seen that the maintenance of suction at the suction plate 268 is so controlled by the valve 288 that suction is applied when the suction plate 268 contacts the cap feeder 260 by cam 500 keyed to the main cam shaft 16 and provided with a cam path 502 cooperating with a cam roller 504 on a lever 506 pivotally supported on a shaft 66, the outer end of the cam lever 506 being connected to a lever 295 by a connecting rod 298 and imparts a rocking motion to a shaft 300 to which the lever 296 is secured.

A lever 302 is secured to the shaft 300 and imparts a sliding motion to a slide 310 through a slotted connecting rod 304 to which it is connected by a clamping screw 306 in a slot 308.

The second end of the connecting rod 304 is connected to the vertical slide 310 through a pin 312. The vertical slide 310 is slidable mounted in a bracket 316 which in turn is fastened to and supported on a bracket 318 attached to the platen 4. The vertical slide 310 is retained in sliding position by suitable gib 309. Attached to the lower end of the slide 310 is a horizontal slide bracket 322 which forms a sliding support for the slide member 306 mounted on it. The cap feeder 320 is mounted on the slide 324. A horizontal sliding motion is imparted to the slide 284 by means of a link 350, one end of which is connected to the slide by a pin 352 fastened to a hub 354. A slot 365 is provided in
48 fastened in the bracket 316. The tubular sleeve 434 is mounted to turn in the lower end of the arm 436 and has attached to one end thereof an arm 451. The outer end of the arm 451 is connected by a link 453 to a fixed stud 454 secured to the bracket 316. An arm 456 formed as a part of the upper portion of the arm 451 is connected by an adjustable connecting rod 459 to the outer end of an arm 460 secured to a shaft 470.

42. The connecting rod 459 is provided in its upper end with an adjusting slot 463 with which a clamping bolt 464 in the end of the arm 456 cooperates, to adjustably clamp the upper end of the connecting rod 459 with the arm 460. The lower end of the connecting rod 460 is pivotedly connected to the arm 456 by a pin 476 so as to provide substantially straight-line horizontal motion to the suction members 438, 439, as the latter are moved into and from the cap applying station. The shaft 462 has a rocking motion imparted to it by a cam 471 secured to the shaft 462, and the cam has a cam path 472 cooperating with a roller 473 located intermediate the ends of a lever 455 pivoted on the shaft 462. The outer end of the lever 455 is connected by a connecting rod 469 to the outer end of a lever 468 which is secured to the shaft 462.

In the operation of the illustrated machine, as far described, it will be seen that the cap or covering is placed and retained in position above the bottle by the suction members 288 and 431. Provision is now made for partially opening the cap into a substantially cylindrical form, so that it may be inserted into a cap applying unit 100, and to this end the suction members 288 and 431 are caused to be withdrawn slightly by their respective cams 296 and 411. In the operation of the machine, while the cap is retained by the suction members in a partially opened position, the cap applying unit 100 is lowered and an air nozzle 103 is caused to move up into a position to force a jet of air into the cap so that the cap will be projected into the cap applying unit 100 as it is being lowered. At the same time the suction members 288 and 431 are drawn still further apart and returned to their original positions, as illustrated in Fig. 9. The air nozzle 103 is moved by a cam 102 mounted on the cam shaft 16 and which cooperates with a roller 102 on a cam lever 106 loosely mounted on the rocker shaft 66. The outer end of the cam lever 106 is connected to one arm 108 of a bell-crank by a link 109. The bell-crank is pivotedly mounted on a stud 107 secured to a bracket 108 which is mounted on the plate 4. The other arm 109 of the bell-crank is connected to a lever 110 by a link 111. As shown in Fig. 12, the lever 110 is secured to an air tube 112 which is carried by the bracket 108. The lever 110 and tube 112 are held from longitudinal displacement by retaining washers or collars 113. The air nozzle 103 is connected to one end of the tube 112 and the other end is connected by flexible tubing 151 to an air valve 114 similar in construction to the valves above described in connection with the suction members 288 and 431. The valve 114 is opened and closed at the proper time by a cam 115, see Fig. 5. Air is supplied under pressure to the valve from any convenient source of supply through a pipe 116.

Referring now to Figs. 11 and 12, after the cap has been projected into the cap applying unit 100, the cap is retained in the unit and in complete tubular form by suction applied to the sides thereof. A hollow sleeve 117 forming a part of the cap applying unit 100 is provided with holes 118 which communicate with an air space 119 cut in the sleeve 117, and is connected to the vacuum pump 23 through connection 120, tube 121, flexible tubing 122, and valve 123. The valve 123, similar to the valves above referred to, is actuated to apply and retain suction at the proper intervals by a cam 124 through connections similar to those described in reference to the suction members 286 and 431.

While the cap is retained therein by the suction as above described, the capping unit is now lowered with the cap, over the top of the bottle, to the position shown in Fig. 10, to apply the cap to the bottle. The hollow sleeve 117 is carried by a slide member 125 which is arranged to be raised and lowered on a vertical slide 126 by a cam 127 secured to the cam shaft 16. A roller 128 is mounted on a cam lever 129 which cooperates with a cam path 130 in the cam 127. The cam lever 129, loosely mounted in the shaft 66, is connected at its outer end to a lever 131 secured to a shaft 132 by a link 133. A second lever 134 secured to the cam shaft 133 is connected to the slide member 125 by a link 135, as shown in Fig. 11.

As illustrated in Figs. 10 and 11, it will be seen that the second member of the capping unit 100 comprises a plunger 138 which fits into the hollow sleeve 117 and is shaped at its lower end to conform to the contour of the top of the cap. The plunger 138 is also provided with an air hole 139 through which air is allowed to pass at the proper time, as will be described. The plunger 138 is arranged to descend with the hollow sleeve 117 as a unit, when the cap is being applied as shown in Fig. 10, but is operated individually through the following connections. The plunger is clamped to a second slide member 138 on the vertical slide 126 and the slide member 138 is actuated to be raised and lowered by a cam 139 secured to the cam shaft 16 through connections including a cam roll 140 cooperating with a cam path 141, cam lever 142, link 143, and lever 144 secured to a shaft 145. A second lever 146 on the shaft 145 is connected to the slide member 138 by a link 147.

Referring now to Fig. 11, in order to assure the retention of the cap on the bottle, the suction on the cap is released and the hollow sleeve 117 is raised to the position shown, when the upper 136 remains in contact with the cap. A jet of air is then projected through the hole 137 in the plunger 138 and at the same time the plunger is withdrawn from the cap, leaving the cap on the bottle. The cap applying unit 100 is then returned to its original position in readiness to start another cycle. The air is supplied to the air hole 137 from any convenient source of air under pressure through the valve 148 and flexible tubing 156. The valve 148 is operated to release air at the proper time by a cam 150, see Fig. 5, and through connections similar to those described above. All the cams for operating the valves are open cams and the rollers are held in contact with the cams by springs 152, as shown in Fig. 6.

While certain features of the invention are particularly designed for use in the application of caps of wet regenerated cellulose to the tops of the bottles, nevertheless, it is not desired to limit the use of the invention thereto, as other caps may be applied to other forms of containers.

Having thus described the invention, what is claimed is:

1. In a machine for applying a cap of the character described to a bottle, in combination, means for storing a bulk supply of collapsed caps, means for withdrawing successive caps from said supply,
and means for applying a cap over the top of and onto the neck of the bottle, including a hollow cap applying unit adapted to be lowered over the top and neck of the bottle, and means for directing an air blast within a cap to project it into said unit, and operating mechanism for raising and lowering the cap applying unit.

2. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to the bottle over the top thereof, including a hollow cap applying member, and means for directing an air blast within the cap to project it into the hollow cap applying member in an open condition.

3. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to a bottle over the top thereof, including a hollow cap applying member, means for introducing a cap in an open condition into said cap applying member, and means for retaining the same therein during movement of the cap applying member over the top of the bottle.

4. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to the bottle over the top thereof, including a hollow cap applying member, means for relatively moving the cap applying member and bottle, means for directing an air blast within a cap to open the same and project it into the cap applying member, and suction means for holding the open cap within the cap applying member.

5. In a machine for applying a cap to a bottle, in combination, bottle supporting means, a hollow cap applying member movable toward and from the bottle supporting means, operating means for moving the cap applying member, a cap engaging member for positioning successive caps below the cap applying member, an air nozzle movable into a position beneath the cap thus positioned to introduce a blast of air within the cap and project it into the cap applying member, and suction means for holding the open cap within the cap applying member during the movement thereof over the top of the bottle.

6. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to a bottle over the top thereof, including a hollow cap applying member, means for introducing an open cap therein, means for retaining the cap in the cap applying member in an open condition, and projecting means cooperating with the cap for insuring the separation of the cap from the cap applying member after the deposition of the cap onto the bottle, said means including a plunger, and means for effecting relative movement of the plunger and cap applying member.

7. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to the bottle over the top thereof, including a hollow cap applying member, means for introducing an open cap therein, means for retaining the cap in the cap applying member in an open condition, and projecting means cooperating with the cap for insuring the separation of the cap from the cap applying member after the deposition of the cap onto the bottle, said means including a plunger, and means for effecting relative movement of the plunger and cap applying member.

8. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to the bottle over the top thereof, including a hollow cap applying member, means for introducing an open cap therein, means for retaining the cap in the cap applying member in an open condition, and projecting means cooperating with the cap for insuring the separation of the cap from the cap applying member after the deposition of the cap onto the bottle, said means including a plunger, and means for directing an air blast through said plunger.

9. In a machine for applying a cap of the character described to a bottle, in combination, means for supporting a bottle, means for engaging and holding a cap in a collapsed condition, and means for applying the cap to the bottle over the top thereof, including a cap applying member comprising a sleeve and a plunger movable within the sleeve, said plunger being provided with an air passage, the sleeve and plunger cooperating to form a hollow cap applying member of a size sufficient to fit over the top of the bottle, means for introducing a cap in an open condition into the cap applying member, means for moving the cap applying member to apply the cap onto the bottle, means for moving the sleeve with relation to the plunger to withdraw the sleeve from around the cap after the latter has been applied to the bottle, and means for directing an air blast through the passage in the plunger during the upward movement of the sleeve and plunger.

10. In a cap applying machine, in combination, container supporting means, means for engaging and holding a cap in a collapsed condition, means for applying the cap to the container over the top thereof, including a hollow cap applying member, and cap opening means cooperating therewith.

11. In a cap applying machine, in combination, container supporting means, means for engaging and holding a cap in a collapsed condition, means for applying the cap to the container over the top thereof, including a cap applying member, means for opening the cap and moving it into operative engagement by the cap applying member, means for relatively moving the cap applying member and container to deposit the cap over the top of the container.

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