Feb. 2, 1954 H. G. VORE ET AL 2,667,999

BOTTLE CAPPING MACHINE

Filed March 5, 1952

4 Sheets-Sheet 1

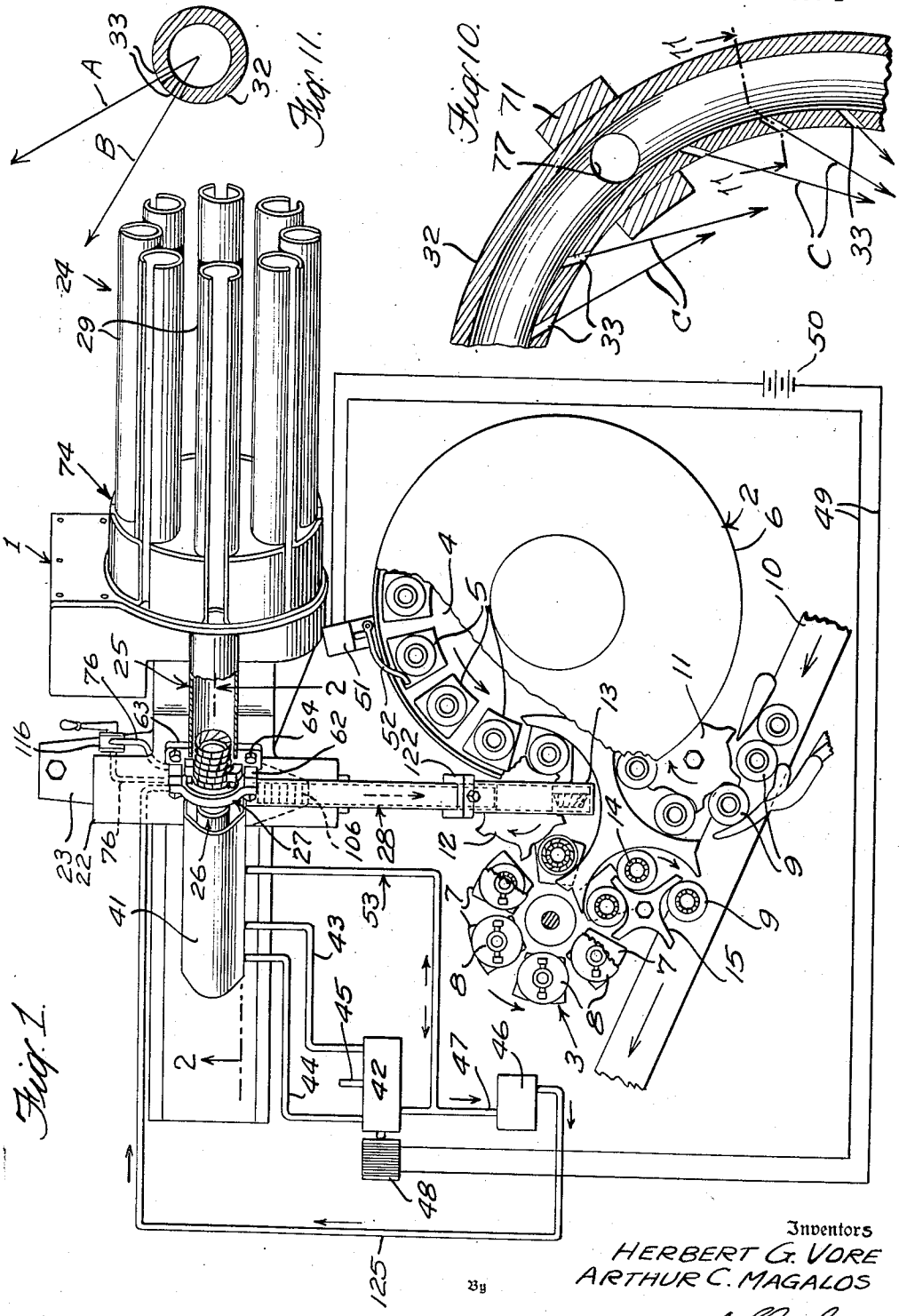


Fig. 1.

Fig. 11.

Fig. 10.

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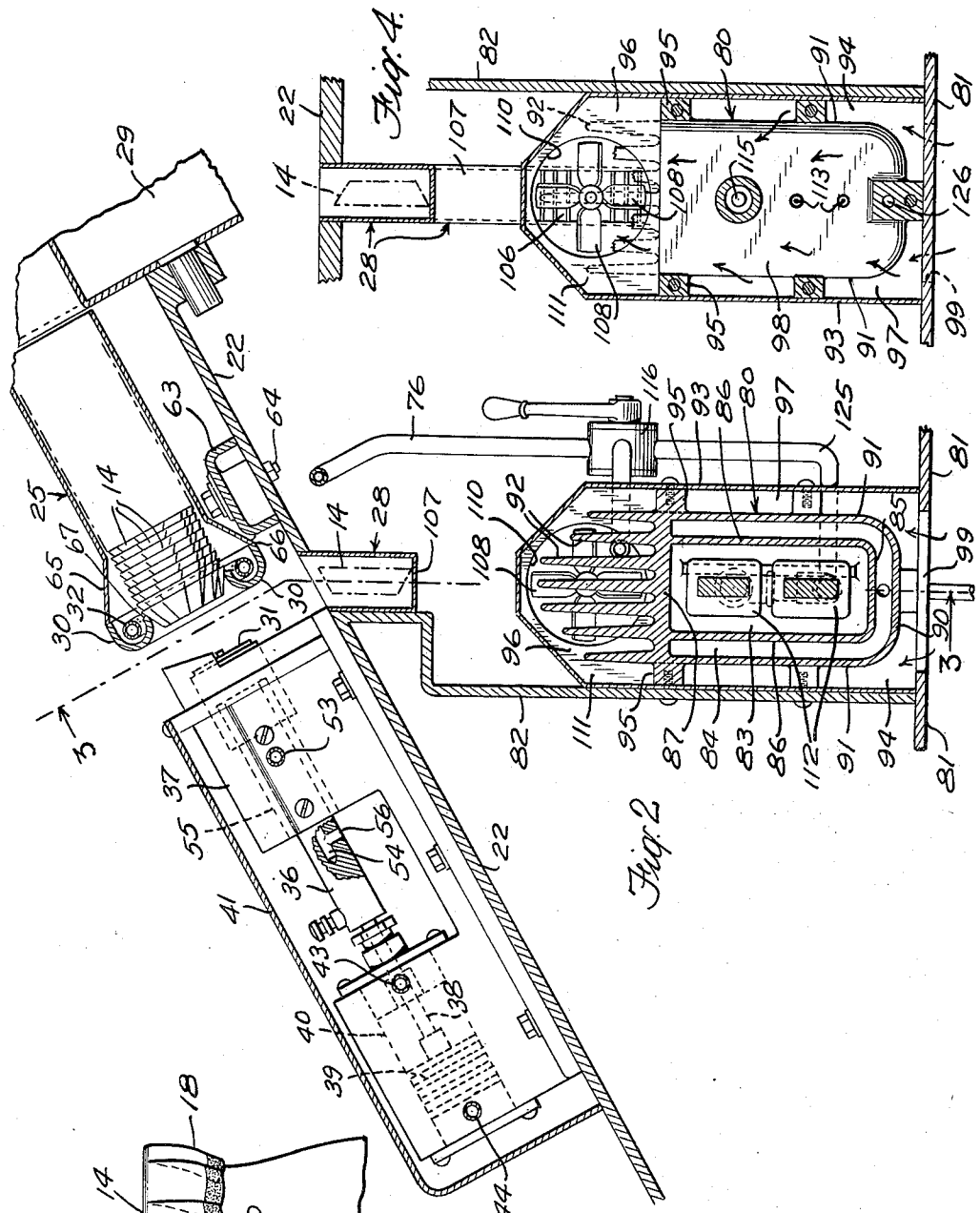


Fig. 2

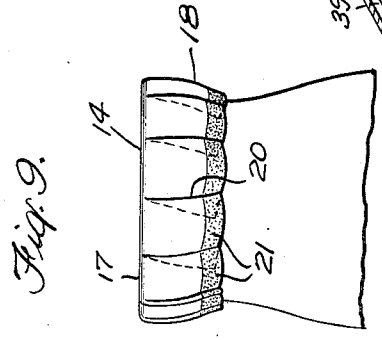


Fig. 3.

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BOTTLE CAPPING MACHINE

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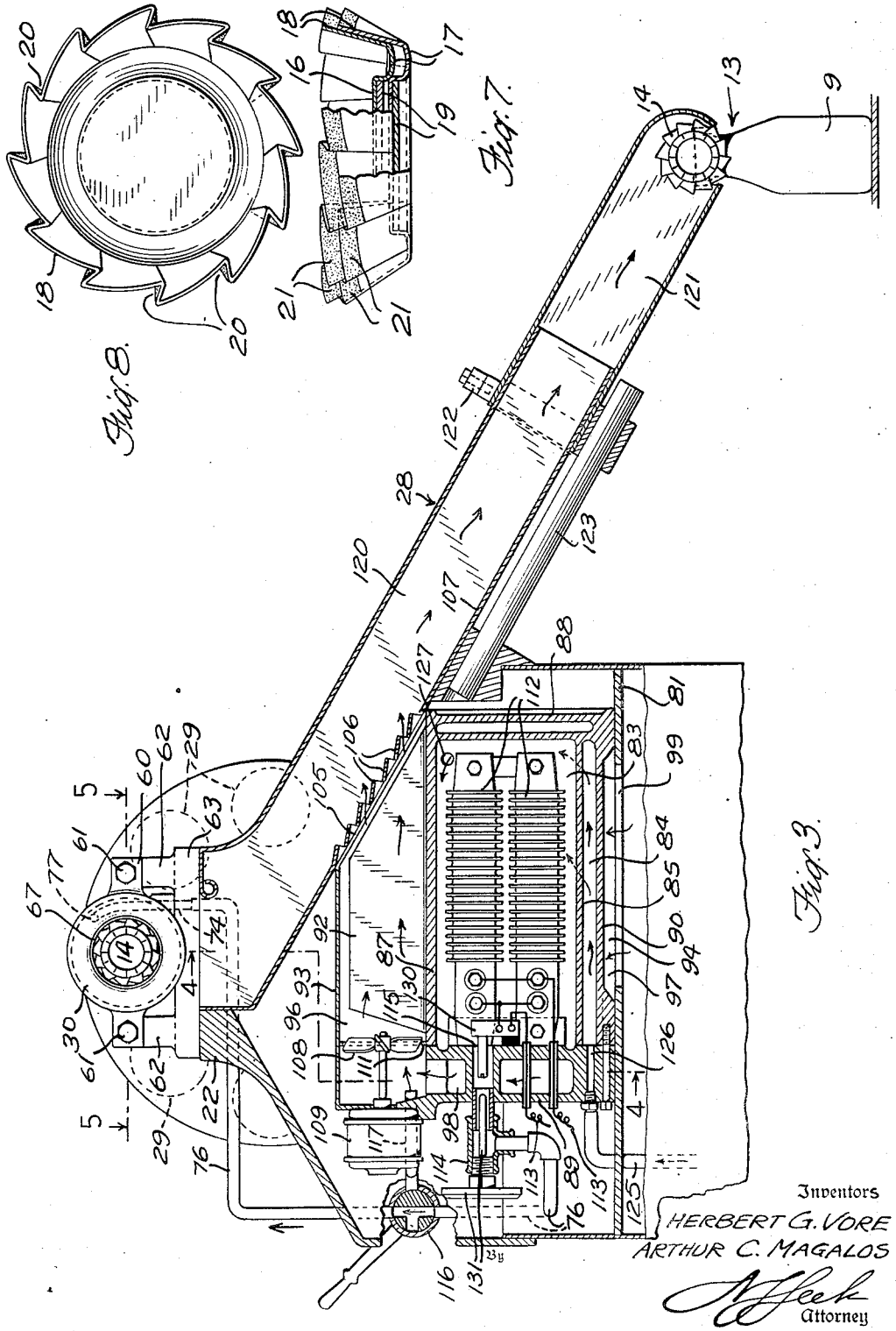


Fig. 8.

Fig. 7.

Fig. 3.

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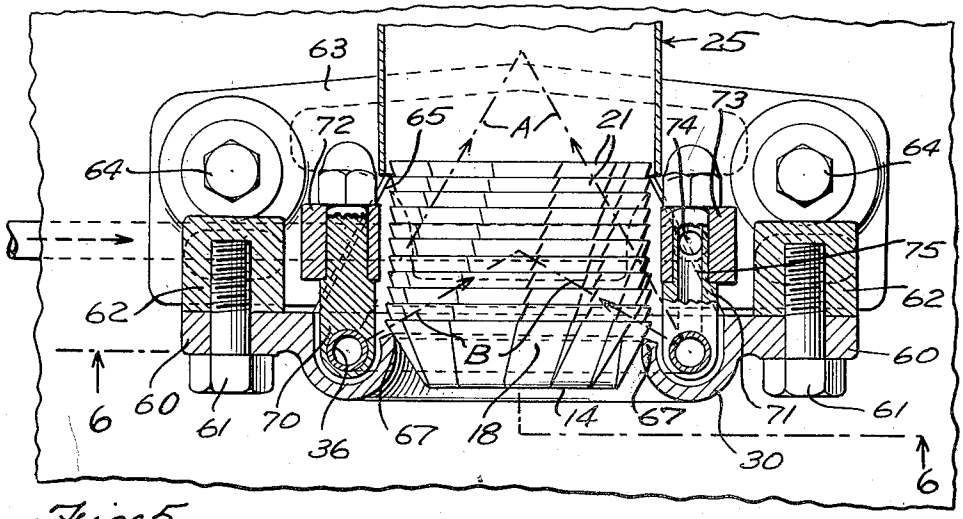


Fig. 5.

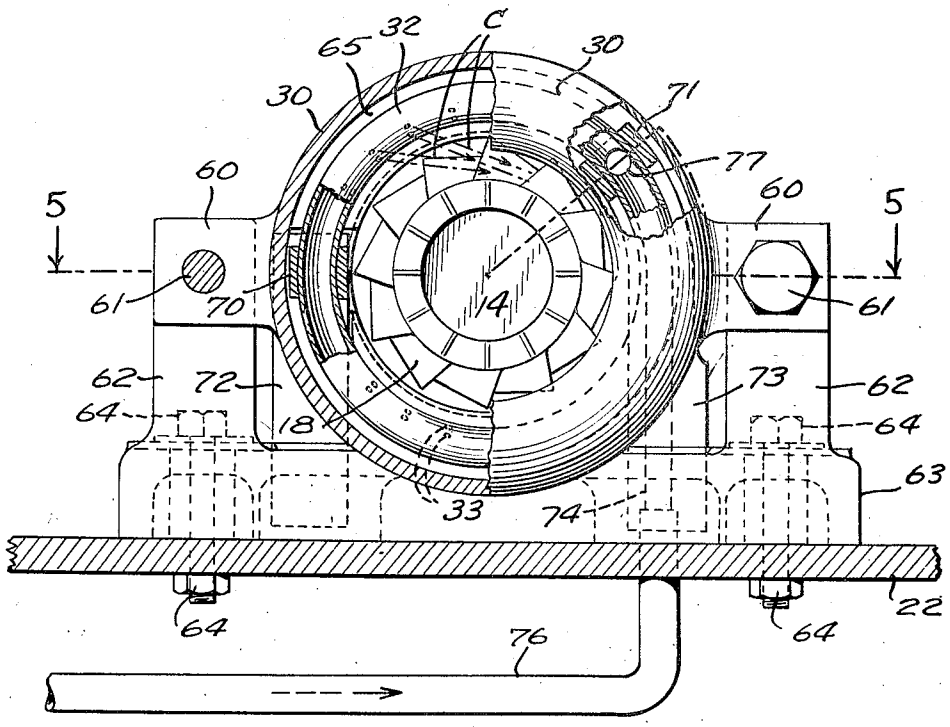


Fig. 6.

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UNITED STATES PATENT OFFICE

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BOTTLE CAPPING MACHINE

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Application March 5, 1952, Serial No. 274,914

7 Claims. (Cl. 226—88.1)

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This invention relates generally to machines for conditioning and dispensing preformed hood caps for milk bottles, and is a modification and improvement of the machines shown in the Goodwin et al. Patent No. 2,325,163, dated July 27, 1943, and in the Mackin et al. Patent No. 2,563,654, dated August 7, 1951. The caps for which the machine is especially designed to condition and dispense comprise a central depressed diaphragm adapted to seat on the internal ledge of a bottle, a raised U-shaped housing adapted to extend over the pouring rim of the bottle, and a flaring pleated outer skirt which is adapted to be contracted and sealed about the neck of a bottle. A narrow band of suitable adhesive by which the cap is sealed in place on a bottle is applied around the outside of the lower end of the skirt.

Conditioning and dispensing machines of this type are used in conjunction with standard filling and capping machines of the rotary type which generally comprise a constantly rotating filling turret and a capping turret which is rotated in timed relation to the filling turret. The filling turret comprises a table and a cylindrical container thereabove which rotate in unison. The table carries a plurality of stools, arranged in an annular row, which are raised and lowered as the table rotates. Directly above each stool is a filling valve which extends down from the underside of the container. Empty bottles are fed by a suitable conveyor and transfer means onto successive stools in vertical alignment with the valves thereabove. As the bottles are carried around by the stools the stools are elevated by suitable mechanism which raises the bottles up into engagement with the valves with the valve nozzle extending into the mouths of the bottles. The engagement of the bottles with the valves opens the valves allowing milk to flow from the container into the bottles. After the bottles are filled they are lowered and transferred by suitable mechanism from the filling turret past a cap applying station and onto the capping turret. As the bottles pass the capping station conditioned caps are loosely applied over the mouths thereof. The capping turret comprises a plurality of capping heads which firmly clamp and hold the caps in position over and around the mouths and necks of the bottles until the caps are firmly sealed thereon.

The cap conditioning and dispensing machine of the present invention comprises generally a cap magazine for stacks of nested caps, a dispensing tube into which successive stacks of caps are fed from the magazine, a cap picker mechanism which withdraws successive caps from the dispensing tube and deposits them in a chute down which the caps roll to the cap applying stations. Means is provided around the discharge end of the dispensing tube for applying

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jets of preheated air to the adhesive rings around the cap skirts, which softens and renders the adhesive tacky and properly conditions the cap for application to the mouths of bottles. Means is also provided for continuously blowing heated air down the cap delivery chute in order to keep the adhesive bands in tacky condition as the caps roll down the chute to the cap applying station.

The principal object of the invention is to simplify and improve cap conditioning and dispensing machines of this character.

Another object of the invention is to provide means for softening bands of adhesive of hood caps of the character described by a plurality of jets of hot air.

Other and more limited objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof wherein:

Fig. 1 is a plan view showing our new and improved cap conditioning and dispensing machine associated with a standard filling and capping machine of the rotary type;

Fig. 2 is an enlarged vertical longitudinal fragmentary section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a transverse vertical section taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary vertical section taken on the line 4—4 of Fig. 3;

Fig. 5 is a further enlarged fragmentary horizontal section taken on the lines 5—5 of Figs. 3 and 6.

Fig. 6 is a fragmentary vertical section taken on the line 6—6 of Fig. 5;

Fig. 7 is an enlarged side elevation partially in section of two nested caps;

Fig. 8 is a plan view of the caps as shown in Fig. 7;

Fig. 9 is a side elevation of the upper end of a bottle showing a cap secured thereon;

Fig. 10 is an enlarged fragmentary section through the tubular heater ring; and

Fig. 11 is a horizontal section taken on the line 11—11 of Fig. 10.

Referring now to the drawing by reference characters the numeral 1 indicates generally our improved cap conditioning and dispensing machine which is shown, in Fig. 1, operatively associated with a standard rotary filling and capping machine having a bottle filling turret 2 and a capping turret 3. The filling turret comprises generally a rotating table 4 having a plurality of bottle supporting and elevating stools 5 arranged in an annular row thereon, and a cylindrical milk dispensing container 6 which is mounted above the table 4 and rotates in unison therewith. The capping turret comprises generally a plurality of bottle supporting and elevat-

ing stools 7, which are arranged to be moved in a circular path, and a plurality of capping heads 8 disposed above the stools in alignment therewith and arranged to move in unison with the stools 7.

Empty bottles are fed by a suitable conveyor 10 to a star wheel 11 which transfers the bottles from the conveyor 10 onto the stools 5. As the bottles are carried around on the stools 5 they are elevated into engagement with valves projecting down from the underside of the milk container 6 through which they are filled with milk from the container 6. After the bottles have been filled they are lowered and transferred by a star wheel 12 from the stools 5 onto the stools 7 beneath the capping heads 8. As the filled bottles are being transferred from the stools 5 to the stools 7, they pass a cap applying station 13 where properly conditioned hood caps 14 are loosely applied to the mouths thereof. In the capping turret 3 the bottles are carried around in a circular path upon the stools 7, and as they are being carried around they are elevated into the capping heads 8 which firmly clamp and hold the caps 14 over and around the mouths and necks of the bottles until the caps are securely sealed thereon. After the caps have been secured in place the bottles 9 are transferred by a star wheel 15 back onto the conveyor 10.

Each cap 14 comprised a central depressed diaphragm portion 16, a raised U-shaped pouring rim housing 17, a depending flaring skirt 18, and a plug disc 19 seated within the pouring rim housing 17 over the diaphragm 16. The skirt 18 is formed with a plurality of pleats 20 and has a narrow band 21 of suitable adhesive applied to the outside thereof at the lower end thereof. In capping the capping heads 8 clamp the pleated skirts 18 tightly around and against the bottles and hold them until the adhesive 21 sets and hardens after which the adhesive firmly seals the caps in place. The bands 21 of adhesive are normally dry and hard and must be heated until they become soft and tacky before the caps can be applied to bottles.

The cap conditioning and dispensing mechanism is all mounted upon a table 22 which is secured to a suitable base 23. The mechanism comprises generally a magazine 24, a dispensing tube 25, a cap picker mechanism 26, cap conditioning means 27 and a cap chute 28 which terminates at the cap applying station 13. The magazine 24 consists of a plurality of storage tubes 29 in which stacks of nested caps are placed. The storage tubes 29 are successively brought into register with the dispensing tube 25 into which the caps slide from the storage tubes 29. The caps are held within the dispensing tube 25 by an annulus 30 which engages the depending flaring skirt 18 of the lowermost cap and holds the caps in position for successive withdrawal from the dispensing tube by the picker mechanism. The picker mechanism 26 includes a reciprocal suction head 31 which successively withdraws successive caps from the lower end of the dispensing tube 25 and deposits them in the chute 28, after which the caps roll down the chute 28 to the capping station 13. The cap conditioning means includes an endless tubular heater ring 32 through which the caps pass as they are withdrawn from the dispensing tube 25. The ring 32 is disposed adjacent the discharge end of the tube 25 and has a multiplicity of angularly disposed nozzles 33 through which jets of heated air are projected against the adhesively coated exposed portions of the cap skirts as the caps approach and are withdrawn from the end of the tube 25. These jets of hot air heat and render the bands 21 of adhesive soft and tacky in condition for sealing a cap upon a bottle.

The suction head 31 is secured to the end of a plunger 36 which is slidably mounted in a housing 37. The plunger 36 and the suction head 31 are reciprocated by a piston rod 38 which is attached to a piston 39 in a cylinder 40 which is mounted upon the table 22 within a removable cover 41. The piston 39 is actuated by fluid pressure which is controlled by a four-way valve 42, which is connected to opposite ends of the cylinder 40 by the pipes 43 and 44 and is vented to the atmosphere by a vent pipe 45. The valve 42 is also connected to a suction pump 46 by a suction pipe 47, and is actuated by a solenoid 48 which is connected by the leads 49, through a battery 50, to a bottle actuated switch 51 which is provided with an arm 52 which is adapted to be actuated by successive bottles as they are carried around on the stools 5. While the solenoid is shown as actuated from a battery it is to be understood that an alternating current solenoid which is connected to an outside supply line may be used. The suction pump 46 is also connected to the suction head 31 by the suction pipe 53 and a bore 54 in the plunger 36. The suction in the head 31 is controlled by suitable valve mechanism (not shown) in a sleeve 55, in the housing 37, through which the plunger 36 slides.

In operation when suction is applied to the pipe 43 the piston 39 is drawn to the forward end of the cylinder 40 and the plunger 36 is advanced to bring the suction head 31 into engagement with the lowermost cap 14 in the dispensing tube 25 at which time suction is applied to the suction head 31 by the valve mechanism in the sleeve 55. The solenoid valve 42 is spring biased in such a direction that when the solenoid is de-energized suction is applied to the pipe 43 and the pipe 44 is vented to the atmosphere through the vent 45. Hence the piston 39, plunger 36 and suction head 31 are normally maintained in their advanced position. When a bottle, in advancing around the filling turret 2, engages the arm 52 and closes the switch 51 the solenoid 48 is energized, thereby reversing the position of the four-way valve 42, admitting suction to the pipe 44 and venting the pipe 43 to the atmosphere. This causes the piston 39, plunger 36 and suction head 31 to be retracted. As the plunger 36 is retracted suction is retained in the head 31 until it is over the upper end of the chute 28, at which time the suction head is vented to the atmosphere through the bore 54 and vent 56 in the plunger 36. During this movement the lowermost cap in the discharge tube 25 is withdrawn from the stack of nested caps therein, and when the suction in the head 31 is broken the cap is dropped into the chute 28. The cap then rolls down the chute 28 to the cap applying station 13 from which it is withdrawn by the bottle, which effects its withdrawal from the stack, as it passes the cap applying station. The switch 51 is so positioned with respect to the cap applying station 13 that the time it takes for a cap to be withdrawn from the stack and travel to the cap applying station 13 is substantially the same as it takes for a bottle to travel from the switch 51 to the cap applying station 13, whereby each bottle effects the release of its own cap.

The mechanism for supplying and heating air and discharging jets thereof around and against

the bands 21 of adhesive on the caps 14 as they are withdrawn from the discharge tube 25 in order to properly condition the caps for application to bottles will now be described in detail. The annulus 30 by which the caps 14 are retained in the tube 25 until they are withdrawn by the picker mechanism 26 is mounted in front of the tube 25 in axially alignment therewith by outwardly extending arms 60 which are integral with annulus 30 and are secured by bolts 61 to the upwardly extending legs 62 of a U-shaped bracket 63 which is bolted to the table 22 as indicated at 64. The annulus 30 is semicylindrical in cross section and is mounted with the concave surface thereof facing the discharge tube 25. The discharge end of the tube 25 is flared outwardly, as shown at 65 to engage the outer edge 66 of the annulus 30. The flaring skirt 18 of the lowermost cap of the stack of caps in the tube 25 engages the inner edge 67 of the annulus 30 and keeps the caps from falling out of the tube 25. As the lowermost cap in the tube 25 is withdrawn the skirt thereof is slightly contracted in passing the edge 67. After the lowermost cap has been withdrawn the stack of caps slides down the tube 25 by gravity until the skirt of the next succeeding cap engages the edge 67.

The tubular ring 32 is disposed behind the annulus 30 within the semicylindrical section thereof in front of the flaring end 65 of the dispensing tube as shown in Figs. 2, 5 and 6. The ring is held in position by bolts 70 and 71 which extend forwardly from posts 72 and 73, respectively, which extend upwardly from the base of the bracket 63. The post 73 has a vertical passageway 74 therein, the upper end of which is connected to the rear end of an axial bore 75 in the bolt 71 and the lower end of which is connected to a pipe 76. The forward end of the bore 75 communicates with the inside of the tubular ring 32 through an aperture 77 in the wall thereof. The nozzles 33 in the ring 32 are arranged in two slightly spaced parallel annular rows. The nozzles of the innermost row are disposed at such an angle to the plane of the ring that they project jets of heated air a substantial distance along the stack of caps in the tube 25 as indicated by the arrows "A" in Figs. 5 and 11, to preheat the bands 21 of thermoplastic adhesive on the cap skirts, and the nozzles of the outermost row are arranged at a lesser angle to the plane of the ring to project jets of heated air a lesser distance along the stack of caps in the tube 25 as indicated by the arrows "B" in Figs. 5 and 11, and to complete the heating and softening of the adhesive bands 21. The nozzles of both rows are further disposed at such angles to the radius of the ring that the jets of air therefrom impinge on the band of thermoplastic adhesive on the cap skirts and into the folds or pleats 20 therein as indicated by the arrows "C" in Figs. 6 and 10, in order to thoroughly heat and soften the entire bands of adhesive. By positioning the air inlet 77 to the ring 32 to one side of and a short distance below the uppermost section of the ring 32 as shown in Figs. 6 and 10 a better distribution of heat around the cap skirts is obtained due to the fact that hot air naturally gravitates upwardly and that the highest pressure within the ring 32 is at the inlet 77. The angular arrangement of the nozzles 33 and the position of the air inlet 77 into the tubular ring 32 are more clearly shown in Figs. 10 and 11.

The air supplied to the tubular ring 32 for application to the cap is heated to the desired temperature by a heater 80 which is disposed below the cap delivery chute 28 and is mounted upon a platform 81 carried by a bracket 82 which extends down from the underside of the table 22. The heater 80 comprises a rectangular elongated inner chamber 83 and an outer elongated U-shaped chamber 84. The inner chamber 83 is defined by the bottom wall 85, the side walls 86, the top wall 87 and the end walls 88 and 89. The outer chamber 84, which is disposed about the bottom and the sides of the inner chamber, is defined by the bottom wall 90, the side walls 91, and the top wall 87 and the two end walls 88 and 89 which are common to both chambers. The top wall 87 of the heater has a plurality of heat dissipating fins 92 formed integrally therewith and extending upwardly therefrom. The heater is enclosed within a removable sheet metal casing 93 which provides a third chamber 94 which surrounds the bottom side and top of the heater. Outwardly projecting horizontal ribs 95 which extend from end wall to end wall of the heater divide the chamber 94 into upper and lower sections 96 and 97, which are connected by a duct 98 in the end wall 89. The platform 81 has an enlarged opening 99 therethrough into the lower section 97 of the chamber 94. The open end 105 of the upper section 96 of the chamber 94 registers with a plurality of louvers 106 in the bottom wall 107 of the chute 28. An exhaust fan 108, which is driven by a suitable motor 109, is mounted in an opening 110 in a transverse partition 111 which extends across the upper section 96 of the chamber 94 between the fins 92 and the duct 98. A pair of electric heating elements 112, to which current is supplied by the leads 113 are mounted by suitable means within the inner chamber 83. The pipe 76 through which heated air is supplied under pressure to the tubular heating ring 32 is connected to a T-fitting 114 which in turn is connected to an outlet port 115 through the end wall 89 of the heater. A three-way valve 116, which is interposed in the pipe 76, may be set to direct air straight through the pipe 76 to the ring 32 or through a branch pipe 117 into the upper section 96 of the chamber 94 behind the partition 111 for a purpose hereinafter explained.

As shown herein the chute 28 is composed of two telescoping sections 120 and 121 which are clamped in adjusted position by suitable clamping means 122. The upper end of the chute is suitably secured to the table 22 and the lower end thereof is supported by a rod 123 extending downwardly and outwardly from the table 22 under the chute.

In operation the exhaust side of the suction pump 46 is utilized to force air under pressure into the outer U-shaped chamber 84 of the heater 80 through a pipe 125, and an inlet port 126 in the end wall 89 of the heater. The air is preheated in the outer chamber 84 and then passes into the inner chamber 83 through inlet ports 127 in the side walls 86 adjacent the end wall 88 just below the top wall 87. The air is heated to the desired temperature as it flows through the chamber 83 around the heating elements 112 and is then forced through the outlet port 115 and pipe 76 to the heater ring 32 from which it is projected through the nozzles 33 against the skirts of the caps being withdrawn from the dispensing tube 25. The desired temperature of the air leaving the chamber 83 is maintained by a thermally responsive switch 130 which controls the energiza-

tion of the heating elements 112. A temperature gauge 131 is provided to visually indicate this temperature. As the caps roll down the chute 28 to the cap applying station 13 it is essential that the bands 21 or adhesive thereon, which were heated and softened as the caps were being withdrawn from the dispensing tube, do not cool and harden. To this end a secondary current of heated air is forced into the chute 28 through the louvres 106 by the fan 108. This secondary current of air is drawn through the opening 99 into the lower section 97 of the chamber 94 around the heater 80 and thence through the duct 98 into the upper section 96 of the chamber 94 behind the partition 111 by the exhaust fan 103. This air is then driven by the fan 108 through the upper section 96 around and past the fins 92 and out through the louvers 105 into the chute 28. As the secondary air flows around and past the outer walls 90 and 91 of the heater and the fins 92 it is heated thereby. The secondary current of air serves the two-fold purpose of heating the chute 28 and cooling the outer surface of the heater which keeps the machine as a whole from being unduly heated.

In first starting operation it is necessary to quickly preheat the chute 28. To do this the valve 116 is set to direct the highly heated air from the chamber 83 through the branch pipe 117 into the upper section 96 of the chamber 94 behind the partition 111 where it mixes with a current of secondary air. The combined currents of air are then driven by the fan 103 into the chute 28.

From the foregoing it will be apparent to those skilled in this art that we have provided a very simple and efficient machine for accomplishing the objects of the invention.

It is to be understood that we are not limited to the specific construction shown and described herein as various modifications may be made therein within the scope of the appended claims.

What is claimed is:

1. A machine for conditioning and dispensing preformed hood caps having a pleated skirt with a band of thermoplastic adhesive therearound for application to bottles, said machine comprising, a magazine including a dispensing tube for holding a stack of nested caps, a chute through which caps are delivered to the cap applying station of a bottle filling and capping machine, a cap picker mechanism by which caps are successively withdrawn from said dispensing tube and deposited in said chute, heating means comprising a plurality of air nozzles spaced around the discharge end of said dispensing tube to project a plurality of jets of hot air against the cap skirts of the leading caps in said dispensing tube and means for supplying heated air under pressure to said nozzles to render the bands of adhesive on the cap skirts soft and tacky.

2. A machine as defined in claim 1 in which said heating means comprises a tubular ring having a plurality of nozzles arranged in an annular row and through which ring caps are withdrawn from said dispensing tube by said picker mechanism.

3. A machine as defined in claim 2 in which said nozzles are disposed at an angle to the radius of said ring suited to project jets of air inwardly in a direction to impinge on the band of adhesive on said cap skirts and into the skirt fold.

4. A machine as defined in claim 1 in which said heating means comprises a tubular ring having a plurality of nozzles arranged in two spaced parallel annular rows and through which ring caps are withdrawn from said dispensing tube by said picker mechanism, the nozzles in one of said rows being disposed at an angle to the plane of said ring to project jets of air a substantial distance into said dispensing tube along the stack of caps in said tube, and the nozzles in the other of said rows being disposed at a lesser angle to the plane of said ring to project jets of air a lesser distance into said dispensing tube along said stack of caps.

5. A machine as defined in claim 1 in which means to force a current of hot air into said chute is provided.

6. A machine for conditioning and dispensing preformed hood caps having a pleated skirt with a band of thermoplastic adhesive therearound for application to bottles, said machine comprising, a magazine including a dispensing tube for holding a stack of nested caps, a chute through which caps are delivered to the cap applying station of a bottle filling and capping machine, a cap picker mechanism by which caps are successively withdrawn from said dispensing tube and deposited in said chute, heating means adjacent the discharge end of said dispensing tube operative to project a plurality of jets of hot air against cap skirts as caps are withdrawn from said dispensing tube to render the bands of adhesive on the cap skirts soft and tacky, an air heater having walls defining an inner chamber, heating elements in said inner chamber, a conduit extending between said inner chamber and said heating means, and means for forcing air through said inner chamber and said conduit into said heating means, a casing which defines upper and lower outer chambers about said air heater, an air inlet into said lower outer chamber, a duct between said lower outer chamber and said upper outer chamber, an air outlet from said upper outer chamber into said chute, an exhaust fan mounted in said upper chamber, said fan being operative to draw air through said inlet into said lower outer chamber and from said lower outer chamber through said duct into said upper outer chamber and to force air from said upper outer chamber through said outlet into said chute.

7. A machine as set forth in claim 6 in which a three-way valve is interposed in said conduit, said valve being operative to selectively direct air straight through said conduit to said heating means or through a branch conduit into said upper outer chamber behind said fan.

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