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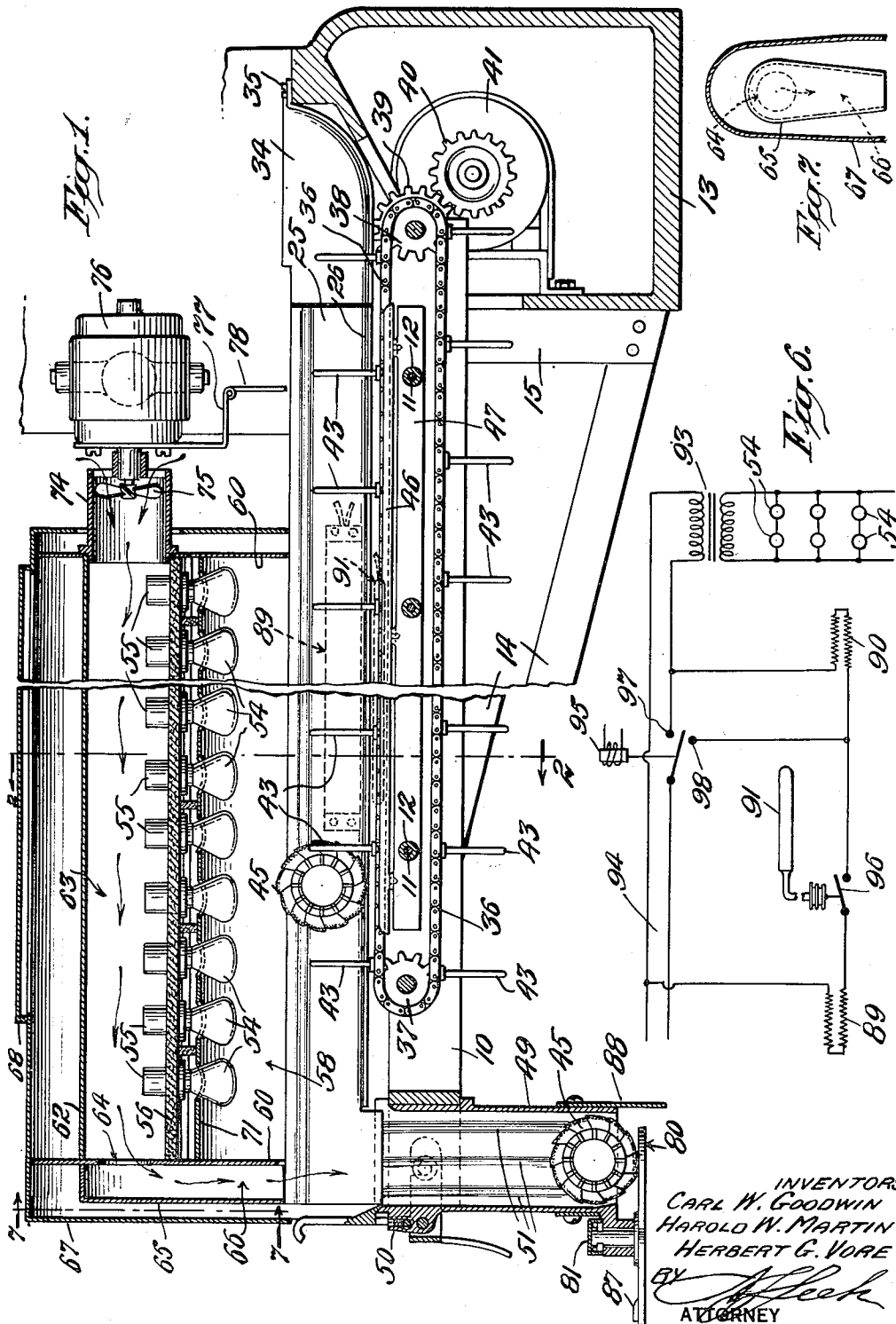
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HEATING DEVICE FOR BOTTLE CAPS

Filed Feb. 26, 1942

2 Sheets-Sheet 1



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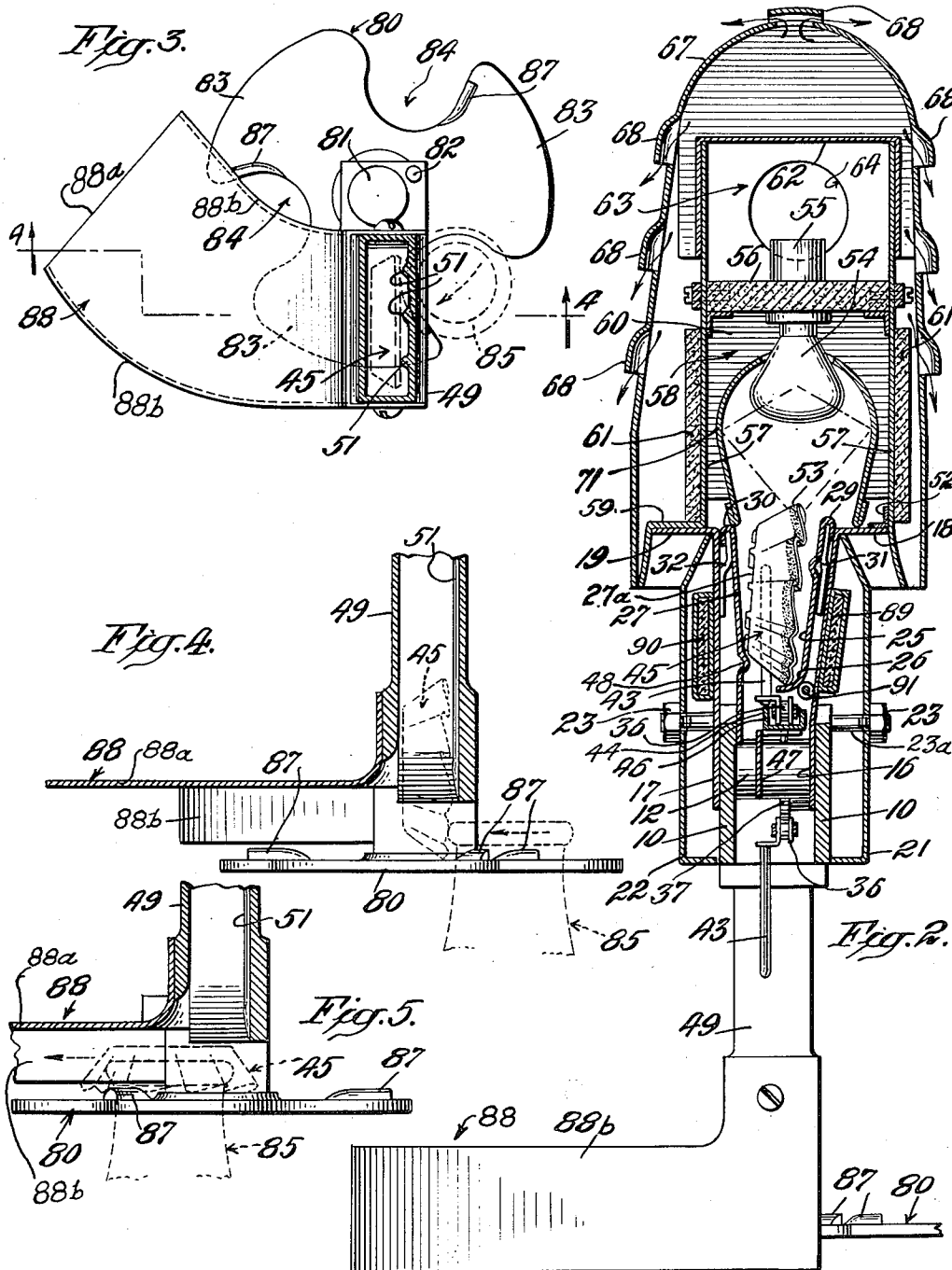
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HEATING DEVICE FOR BOTTLE CAPS

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5 Claims. (Cl. 219—34)

This invention relates to a machine for applying flexible skirted hood caps to milk bottles or the like and more particularly to a machine for applying and sealing caps of the above type having a pleated skirt coated in whole or in part with a thermoplastic adhesive which requires heat and pressure for sealing.

An object of the invention is to provide a mechanism of the above type having novel and improved details of construction and features of operation.

Another object is to provide a novel and improved mechanism of the above type having characteristics suited for commercial operation.

Another object is to provide improved heating means for the above purpose which is adapted to heat the thermoplastic adhesive without excessive heating of the skirt or the material of the cap itself, and to maintain the adhesive in the proper softened condition as long as is necessary regardless of external temperature or weather conditions.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the invention itself may be better understood by referring to the following description, taken in connection with the accompanying drawings forming a part thereof in which a specific embodiment of the invention has been set forth for purposes of illustration.

In the drawings,

Fig. 1 is a longitudinal sectional view of a cap applying and sealing mechanism embodying the present invention;

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of the cap applying mechanism;

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

Fig. 5 is a view similar to Fig. 4 but with the parts in a different position;

Fig. 6 is a diagram of the electrical control circuit employed in the machine; and

Fig. 7 is a section taken on the line 7—7 of Fig. 1.

In the following description and in the claims certain specific terms have been used for convenience in referring to various details of the invention. These terms, however, are to be given

as broad an interpretation as the state of the art will permit.

Referring to the drawings more in detail, the invention is shown in Fig. 1 as applied to a capping and sealing mechanism of the type disclosed in the copending application of Goodwin and Martin, Serial No. 399,280, filed June 23, 1941, for "Capping machine," wherein caps adapted for successive application to milk bottles are supplied to a feed chute along which the caps roll on the edges of their flared skirts in the path of radiant heat rays which are focused onto a band of adhesive 53 carried by the skirt. From the feed chute, the caps pass to a cap applying station where they meet and are picked off by the advancing necks of milk bottles and are carried to a bank of rotating capping heads which contract the skirts around the necks of the bottles and hold the same under sealing pressure.

The feed chute for the caps, as shown in detail in Figs. 1 and 2, comprises a pair of brackets 10 secured in spaced relationship by pins 11 and spacing sleeves 12. The brackets 10 are attached to the bracket 13 and supported by inclined bracing members 14 and vertical struts 15 forming a cantilever truss. A back plate 16 and a front plate 17 are secured by suitable means, as by welding, to the brackets 10 and are formed with top horizontal flanges 18 and 19 respectively. Removable cover plates 21 and 22 are secured to the brackets 10 as by means of pins 23a carrying nuts 23 as shown in Fig. 2.

A cap feed plate 25 is mounted in a slightly inclined position on the back plate 16 and is provided with a bottom lip 26, which is adapted to support the edge of the cap skirt as the cap is rolled along the plate 25 by means hereinafter to be described. A guide plate 27 is spaced from the plate 25 to hold the cap in proper position thereon. The plate 27 is mounted in an inclined position on the front plate 17 so as to engage only the lower edge of the pouring lip housing 27a of the cap.

The feed plate 25 and the guide plate 27 are mounted by any suitable means on the back plate 16 and the front plate 17 respectively, and are preferably arranged so as to be readily removable therefrom to permit convenient disassembling and cleaning of the equipment. In the embodiment shown, the plates 25 and 27 have their upper edges spun over at 29 and 30, respectively, and engaged in the horizontal edges of spacing plates 31 and 32 which are secured to the back plate 16 and front plate 17 in any suitable manner, as by welding.

A guide plate 34 (Fig. 1) may be attached to the bracket 13 by screws 35 in a position to receive caps from a picker mechanism or other source of supply and feed the same to the feed plate 25.

For advancing the caps on the feed plate 25, a chain 36 is provided which passes around sprockets 37 and 38, rotatably mounted between the brackets 10. The sprocket 38 is shown as attached to a gear wheel 39 meshing with a gear 40 driven by an electric motor 41 positioned within the bracket 13. The chain 36 may, however, be driven in any other convenient manner.

The chain 36 carries a series of pins 43 which extend upwardly between the guide plate 27 and the feed plate 25 in a position to engage the cap 45 on the feed plate 25. The pins 43 extend upwardly only a slight distance above the center line of said caps and terminate well beneath the level of the top edges of the skirts for reasons hereinafter explained. The chain 36 runs in and is supported by a removable channel 46 which is carried by a bracket 47 attached to the transverse brackets 10. The channel 46 is provided with a front lip 44 on which the bottoms of the pins 43 ride so that the pins are positioned and guided by the lips 26 and 44 as they advance.

The advancing pins 43 cause the caps which are received from the guide plate 34 to roll along the feed plate 25 to the discharge end thereof on the edges of their skirts. During this operation, the edges of the skirts of the caps rest upon the lip 26 of the plate 25, and the caps are slightly inclined rearwardly so as to rest against the face of the plate 25. The guide plate 27 is preferably provided with a horizontal ridge 48 which assists in positioning the caps and prevents the caps from becoming displaced.

The caps are discharged from the plate 25 into a vertical delivery chute 49, wherein they drop to the applying station. The chute 49 may be removably secured between the brackets 10 by a suitable pivoted latch device 50. The chute 49 may be provided with internal vertical ridges 51 to guide the caps 45 therein and to reduce the area of contact between the cap skirt and the chute wall.

For heating the band of adhesive 53 on the edges of the outer surfaces of the skirts of the caps 45 as they roll along the feed plate 25, there is provided a radiant heating means comprising a row of incandescent lamps 54 of the type emitting heat rays from a concentrated source or filament. The lamps 54 are shown as mounted in sockets 55 carried on a base 56 which is mounted between front and back walls 57 of a lamp housing 58, which lamp housing is provided with end walls 60. The front wall 57 is formed with a bottom flange 59 which is adapted to rest on and be clamped to the flange 19 of the plate 17 by any suitable means, while the rear wall 57 carries a bracket or angle 52 which rests on the flange 18 of back plate 16, as indicated in Fig. 2. The lamp housing may thus be readily removed or assembled. The lamp base 56 may be formed of heat insulating material, such as sheet asbestos material, and the front and back walls 57 of the lamp housing 58 are preferably also lined with asbestos sheets 61 to provide additional heat insulation as shown in Fig. 2.

The front and back walls 57 of lamp housing 58 extend upwardly above the lamp base 56 and are closed at the top by cover 62 which fits over the walls 57 and forms with walls 57 and 60

an elongated channel or chamber 63 for the circulation of air for a purpose hereinafter described. The channel 63 communicates through an opening 64 in the end wall 60 (Fig. 1) with a passage 66 which is formed by a casing 65 attached to and spaced from said end wall 60 and is tapered in section (Fig. 7) to form a vertical channel or nozzle for directing heated air from the chamber 63 downwardly into the vertical delivery chute 49 through which the caps 45 pass to the applying station.

The entire housing described above may be closed by a hood 67 which fits over the machine as shown in Fig. 2, and is spaced from the walls 57 to provide an air space suited to reduce heat loss. The top and side walls of hood 67 are shown as provided with louvres 68 for ventilation.

The lamp housing 58 carries a reflector 71 which is attached to the walls in any suitable manner and may be made substantially elliptical in section and arranged so that the filaments of the lamp 54 are located at one focus of the ellipse and bands of adhesive 53 at the top edges of the skirts of caps 45 are located at the other focus. In this way all light rays emanating from the lamps 54 are focused directly upon the adhesive 53 on the cap skirt as the latter rolls along the feed plate 25. The speed of travel of the caps is such that the adhesive is heat softened and rendered tacky by the radiant heat from the lamps 54 as the caps roll along the feed plate 25 without materially heating the paper or body of the skirt or of the cap itself.

The normal time required for feeding a cap along the plate 25 is determined in accordance with the heat requirements so that the caps are discharged with the adhesive in softened, tacky condition suitable for sealing on a bottle in a manner to be described. As the caps roll along the plate 25 on the lower edge of the skirt, all parts of the skirt bearing the adhesive 53 are successively brought into position to receive heat rays from the lamps 54. The rays enter the spaces between the skirt folds and soften the adhesive at the points where maximum adhesion is required.

The caps falling through the vertical delivery chute 49 drop onto a plate 80 as shown in Figs. 3 and 4. The plate 80 is mounted for rotation about a bearing 81, and suitable means may be provided to frictionally position the plate.

The plate 80 is provided with a plurality of arms 83 which are adapted to pass beneath the end of chute 49 and to form stops on which the caps 45 rest in vertical position, as shown in Fig. 4. The arms 83 are separated by recesses 84 which are of a shape suited to receive the neck of an advancing milk bottle 85 so that the plate 80 is rotated by said bottle as it passes the cap applying station. In the embodiment shown in Fig. 3, each bottle rotates the plate 80 one-third of a complete revolution and positions the succeeding recess 84 to be engaged by the neck of the next succeeding bottle.

As the advancing milk bottles pass one at a time beneath the delivery chute 49, the mouth of each bottle engages the lower inner skirt portion of the cap 45 which rests at that moment upon the rotating plate 80 as shown in Fig. 4, whereupon further movement of the bottle upsets the cap and causes same to slide down freely onto the bottle neck as indicated in Fig. 5. In the embodiment illustrated, the forward or advancing edge of each recess 84 of plate 80 is provided with a raised lip 87 which facilitates the

proper seating of the caps 45 and prevents any misplaced cap from falling down and becoming wedged in the openings 84 of the rotating plate. The advancing bottles 85 with the caps 45 loosely seated thereon next pass through the enclosed housing 88 to suitable capping heads, not shown, which are adapted to fold and compress the skirts of the caps and to seal the same upon the bottle necks. The housing 88 comprises an arcuate, inverted channel having top 88a and sides 88b, which is shaped to prevent dislocation of the cap on the advancing bottles.

An important feature of the present invention resides in the provision of means for maintaining the adhesive 53 on the caps in the desired softened, tacky condition suitable for sealing, after the caps leave the path of lamps 54 and rest upon the plate 80 and even up to the moment when the caps reach the sealing heads. This is accomplished by blowing air through a tubular passage 74 into the horizontal air chamber 63 above the lamp housing 58 where the air cools the sockets 55 and in so doing becomes warm and thence downwardly through the vertical channel 66 and through the vertical chute 49 to the caps 45 on the plate 80 at the applying station. This current of warm air prevents chilling of the caps by cold air from the room even if the caps happen to remain at the capping station for an extended period of time.

In the embodiment illustrated, air is forced into the air chamber 63 by a fan or blower 75 which is located within the passage 74 and is driven by a motor 76 suitably mounted on the frame of the machine as shown in Fig. 1. A shield 77 terminating in a hinged flap 78 is mounted beneath the motor 76 to shield the motor from the heated air rising from the feed chute. The hinged flap 78 serves to position caps which may be improperly seated when they enter the feed chute. The warm air, passing downwardly through delivery chute 49, flows outwardly and envelops the caps 45 within the housing 88 and thus protects them from chilling through contact with cold air up until the very time when the caps are secured upon the bottles.

In the embodiment of the invention illustrated, electrical resistance heating coils 89 and 90 are mounted on the back plate 16 and front plate 17, respectively, of the cap feed chute as shown in Figs. 1 and 2, for the purpose of supplying heat to the chute, under control of a thermostat 91 which is mounted beneath the bottom lip 26 of feed plate 25. Referring to the circuit diagram of Fig. 6, the incandescent lamps 54 are connected through transformer 93 to the electrical main 94, the lamps being connected in series-parallel. A solenoid switch 95 is connected to be operated with the driving motor or motors of the machine and is energized only when said motors are running. When solenoid switch 95 is energized the lamps 54 are energized at full voltage and the heating coils 89 and 90 are energized in series over a circuit extending from one side of main 94, through coil 89, thermostat switch 96, coil 90 and top contact 97 of solenoid switch 95, to the other side of main 94.

When the machine stops for any reason, solenoid 95 is deenergized, thus opening its top contact 97 and closing bottom contact 98. This causes heating coil 90 to be energized over a circuit extending from one side of main 94, through bottom contact 98 of solenoid switch 95, heating coil 90, and primary winding of transformer 93 to the other side of main 94. The coil 90 is

thus put in series with the transformer 93 and serves as a dimming resistance to dim the lamps 54. The heating coil 89 remains under the control of thermostat 91 and is connected directly across the main 94. The purpose of dimming the lamps 54 in this manner is to prevent overheating of any caps which may be in the feed chute when the machine is stopped, and to prevent unnecessarily supplying heat to the feed chute when it is not being used. The dimmed lamps 54 normally provide sufficient heat to prevent excessive cooling of the feed chute in the event of temporary shut-downs. In order to shut down permanently, the operator throws the main switch (not shown). The purpose of heating coils 89 and 90 is to prevent the cap feed plate 25 from cooling off to a point where it chills the caps. In normal operation of the machine, except on a very cold day, the heating coils 89 and 90 may not be required.

The time of heating of the caps in the feed chute, and the temperature and velocity of the air supplied to the delivery chute, may be selected in accordance with the particular adhesive being used so that the adhesive is first heated to the proper temperature for softening the same and is subsequently maintained in the desired softened condition until the caps reach the capping heads.

Although a specific embodiment of the invention has been shown for purposes of illustration, it is to be understood that various changes and modifications may be made therein as will be readily apparent to a person skilled in the art. Furthermore, the various features set forth above may be applied individually to other types of capping machines and for other uses and are not restricted to the specific combination disclosed. The invention is only to be limited in accordance with the scope of the following claims.

What is claimed is:

1. In a machine for delivering to containers partially preformed hood caps having foldable pleated skirts carrying a thermoplastic adhesive coating with the thermoplastic adhesive tacky for securing the folds together, including an internally heated feed chute along which the caps advance for heat softening the thermoplastic adhesive coating thereon, a delivery chute receiving said caps from said heated feed chute and delivering the same at a capping station, means for passing air to be heated along said feed chute in heat-exchange relationship therewith, and means for passing said heated air through said delivery chute to prevent premature chilling of the adhesive coating on said caps while in said delivery chute, means adjacent the end of said delivery chute for applying said caps to horizontally advancing containers, and a housing forming an inverted channel extending along the path of the containers to position and shield the caps, said channel communicating with said delivery chute to receive heated air therefrom for preventing chilling of the caps in said channel.

2. In a machine for delivering to containers partially preformed hood caps having foldable pleated skirts carrying a thermoplastic adhesive coating with the thermoplastic adhesive tacky for securing the folds together, including a feed chute along which the caps advance, a lamp housing including a base extending along said feed chute and dividing the same into a cap heating section and a separate air chamber, a plurality of incandescent lamps secured to said base and positioned in said cap heating section for heat softening the thermoplastic adhesive coating on

the caps by radiant heat, a delivery chute receiving said caps from said feed chute and delivering the same at a capping station, means blowing air through said air chamber for cooling the base and for heating the air, and means passing said heated air through said delivery chute to prevent premature chilling of the adhesive coating on said caps while in said delivery chute.

3. In a machine for delivering to containers partially preformed hood caps having foldable pleated skirts carrying a thermoplastic adhesive coating with the thermoplastic adhesive tacky for securing the folds together, including a feed chute along which the caps advance, a lamp housing including a base extending along said feed chute and dividing the same into a cap heating section and a separate air chamber, a plurality of incandescent lamps secured to said base and positioned in said cap heating section for heat softening the thermoplastic adhesive coating on the caps by radiant heat, a delivery chute receiving said caps from said feed chute and delivering the same at a capping station, means blowing air through said air chamber for cooling the base and for heating the air, and a tapered channel receiving said heated air from said air chamber and delivering the same into said delivery chute to prevent premature chilling of the adhesive coating on said caps while in said delivery chute.

4. In a machine for delivering to containers partially preformed hood caps having foldable pleated skirts carrying a thermoplastic adhesive coating with the thermoplastic adhesive tacky for securing the folds together, including a feed chute along which the caps advance, a lamp housing including a base extending along said feed chute

and dividing the same into a cap heating section and a separate air chamber, a plurality of incandescent lamps positioned in said cap heating section for heat softening the thermoplastic adhesive coating on the caps by radiant heat and having sockets secured in said base, a delivery chute receiving said caps from said feed chute and delivering the same at a capping station, means blowing air through said air chamber for cooling the base and sockets and for heating the air, and means passing said heated air through said delivery chute to prevent premature chilling of the adhesive coating on said caps while in said delivery chute.

5. In a machine for delivering to containers partially preformed hood caps having foldable pleated skirts carrying a thermoplastic adhesive coating with the thermoplastic adhesive tacky for securing the folds together, including a feed chute along which the caps advance, a lamp housing including a base extending along said feed chute and dividing the same into a cap heating section and a separate air chamber, an elongated radiant heat source secured to said base and positioned in said cap heating section for heat softening the thermoplastic adhesive coating on the caps by radiant heat, a delivery chute receiving said caps from said feed chute and delivering the same at a capping station, means blowing air through said air chamber for cooling the base and for heating the air, and means passing said heated air through said delivery chute to prevent premature chilling of the adhesive coating on said caps while in said delivery chute.

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