

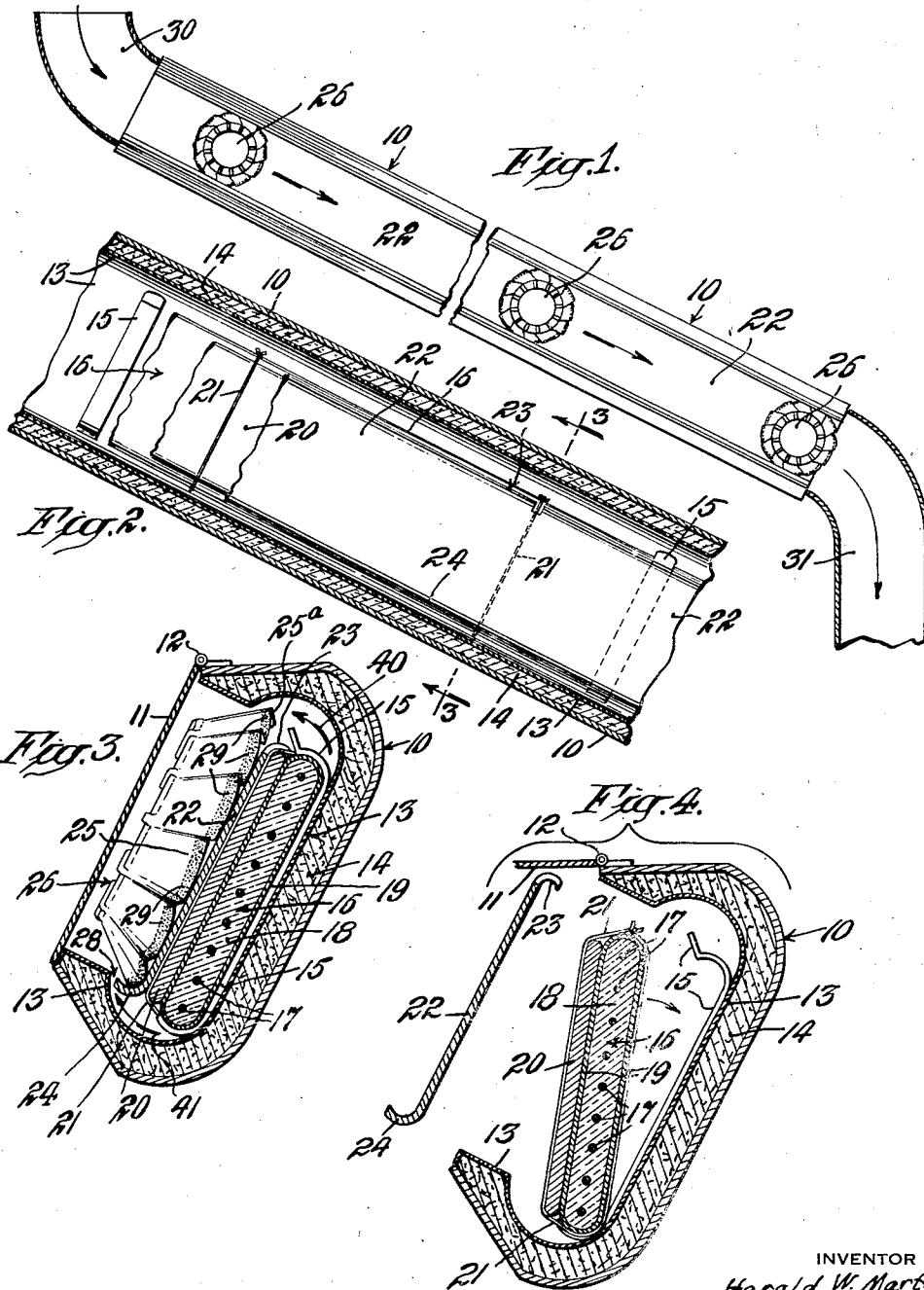
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HEATING DEVICE

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HEATING DEVICE

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This invention relates to an apparatus for heating articles such as partially preformed bottle caps of the hood type, and more particularly to a device for heating a film of thermoplastic adhesive on the skirts of such bottle caps and for discharging the same in condition for sealing.

In one embodiment the device may be used for softening the thermoplastic adhesive on the skirts of milk bottle caps in a capping machine of the type shown in the copending application of Goodwin and Martin, Ser. 399,280, filed June 23, 1941.

An object of the invention is to provide an apparatus of the type above indicated having novel and improved features of operation and details of construction.

Another object is to provide an apparatus of the above type which is suited to commercial operations.

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

In accordance with the present invention I have found that a surface film of thermoplastic material may be heated to softening temperature by applying thereto controlled currents of heated air as the caps roll along a heated chute. The chute may be so formed that the cap rolls along the lower edge of its skirt and may be designed to supply the heated air primarily to the edge of the skirt carrying the adhesive as the cap advances along the chute.

In one embodiment the chute is provided with a removable heating element which extends longitudinally thereof and is spaced from all sides of the chute to provide for the free circulation of heated air. A baffle plate is provided to prevent the caps from coming in contact with the heating element and thereby becoming overheated if the feed of the caps should be interrupted.

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 drawing, in which a specific embodiment thereof has been set forth for purposes of illustration.

In the drawing,

Fig. 1 is a side elevation of a heating chute embodying the present invention with the cover removed to show the position of the caps therein;

Fig. 2 is an enlarged longitudinal section through the chute;

Fig. 3 is a transverse section taken along the line 3—3 of Fig. 2; and

Fig. 4 is a detail view similar to Fig. 3 showing the various parts before assembly.

In the following description certain specific terms are 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 drawing more in detail, the invention is shown as embodied in a chute comprising a housing 10 which is of open channel shape and carries a cover 11 which may be hinged as at 12. A liner 13 is attached to the housing 10 and is spaced therefrom to provide a chamber 14 which is filled with suitable heat insulation such as asbestos. A plurality of clips 15 are attached to the liner 13 at suitable positions along the chute. The clips 15 are designed to removably hold a flat, elongated heating unit 16 which may be of any standard construction and, in the embodiment shown, comprises a plurality of electrical heating elements 17 embedded in a refractory insulating material 18 which is covered by a metal cover 19. The cover 19 is insulated from the electrical heating elements by the insulating material 18 and serves to protect the heating unit and to provide for the handling thereof.

A baffle plate 20 of suitable heat conducting material may be disposed over the heating unit 16 and may be secured thereto by convenient means shown as tie wires 21. A cap guide plate 22 is adapted to be removably attached over the baffle plate 20. The guide plate 22 is co-extensive with the baffle plate 20 and is provided with an upper lip 23 which is adapted to extend over the top of the baffle plate 20 to provide a hanger for securing the guide plate 22 thereto, and with a lower upturned lip 24 forming a flange along which the lower edges of the skirts 25 of the cap 26 roll. The lip 24, as shown in Fig. 3, is designed so to provide a gap 28 between the lip 24 and the liner 13 for the purpose to be described.

Caps are supplied to the chute 10 by means of a supply passage 30 and are discharged therefrom through a discharge passage 31. In the embodiment shown the chute 10 is inclined so as to cause the cap 26 to roll by gravity on the lower edge of its skirt along the flange 24 of the cap guide 22. It is to be understood, however, that positive conveyor means may be used for advancing the cap along the chute 10, in which event, the chute may extend horizontally. The chute is also inclined transversely as shown in

Fig. 3 to cause the caps to rest on the guide plate 22 as they advance.

The cap 26 is shown as a partially preformed paper milk bottle cap having a pleated skirt 25, the lower edge of which carries a band 29 of thermoplastic adhesive which is to be heat-softened in the chute 10 to condition the cap for application to a milk bottle. A cap of this type is disclosed more in detail in the copending application of Goodwin and Martin above referred to.

In the operation of this device the caps with the thermoplastic adhesive 29 on the lower edges of their skirts are supplied to the chute 10 through the supply passage 30 and are caused to roll or advance along said chute. Heat is supplied by means of the heating elements 17 of the heating unit 16. A part of this heat is transferred by conduction to the edges of the cap skirts 25 through the baffle plate 20 and the guide plate 22, both of which become heated to a high temperature during the operation of the device, although not to a temperature sufficiently high to injure the skirts.

The remainder of the heat is supplied by convection as follows:

It is to be noted that the heating unit 16 is spaced from the liner 13 by means of the clips 15 so that an air space is provided entirely around the heating unit. The air enters at the end of the chute, circulates from in back of the heating unit around the upper portion thereof as indicated by the arrow 40 and is supplied to the overhanging edge 25a of the cap skirts 25 as the caps roll along the plate 22. Additional quantities of air pass around the curved lower portion of the chute, as indicated by the arrow 41 and through the gap 23 between the lip 24 and the liner 13 into engagement with the outer surface of the cap skirt 25. In this way the heated air is supplied to the preheated skirt and heats the thermoplastic adhesive thereon to a softening temperature. The air for this convection heating is drawn into the chute from the passage 31 at the lower end thereof and passes along the entire chute in contact with the cap skirts as they advance therealong and is finally discharged from the upper end of the chute through the passage 30.

It has been found that in this construction both transverse and longitudinal circulation of air is provided, which effectively contacts with all portions of the cap skirt and provides an efficient heating means for raising the adhesive to the desired temperature. The speed of travel of the caps may be controlled in accordance with the particular characteristics of the heating unit 16 and of the thermoplastic adhesive used.

In assembling the above mentioned elements, the heating unit is snapped into place and held by the clips 15 as shown in Fig. 4, after which the cap guide plate 22 is attached. The chute is then ready for operation. The cover 11 serves to hold the caps in place during their passage down the chute. It is to be understood, however, that this cover may be omitted if desired. It is also to be understood that the baffle plate 20 may be omitted in certain instances, in which event, the cap guide plate 22 may be mounted directly on the heating element.

The construction above described is simple and convenient and may be readily assembled and disassembled. Both the cap guide plate 22 and the heating unit 16 may be easily removed for cleaning purposes, an important considera-

tion when the device is to be used for heating milk bottle caps.

Although a specific embodiment of the invention has been set forth for purposes of illustration, it is to be understood that various changes and modifications may be made therein as will readily appear to a person skilled in the art. The invention is only to be limited in accordance with the following claims.

What is claimed is:

1. A device for heating bottle caps, comprising a chute, a cap guide plate extending longitudinally in said chute, said plate having a lip so positioned and arranged that said caps roll therealong on their lower edges, a heating unit extending along and in back of said guide plate, said heating unit being spaced from said chute to provide an air space through which the air, heated by said unit, circulates, and means directing said heated air onto said caps, whereby said caps are heated by convection from said heated air and by conduction from said guide plate.

2. A device for heating bottle caps comprising an elongated casing, a heating unit extending along said casing, means removably securing said unit in said casing and in spaced relationship with respect thereto to provide an air space entirely around the heating unit, a cap guide plate disposed in conductive heat transfer relationship with said heating unit, said guide plate being positioned and arranged to guide the caps along said device, said guide plate being spaced from said casing both at the top and bottom to provide an air passage for circulation of the air heated by said unit, and means directing said heated air onto said caps, whereby the cap is heated by convection from said heated air and by conduction from said guide plate.

3. A device for heating bottle caps, comprising a housing forming a chute along which said caps advance, a heating unit extending along said chute, clips attached to said housing to removably secure said heating unit in place said clips being arranged to space said unit from said casing to provide clearance for the passage of air therebetween, a baffle plate attached to said heating unit and a cap guide plate attached to said baffle plate, said guide plate having a top flange engaging and hanging on said baffle plate and having a lower flange arranged to form a track along which the lower edges of the caps roll and means to direct a current of air heated by said unit onto said caps, whereby said caps are heated by convection from said heated air and by conduction from said guide plate as they advance along said guide plate.

4. A device for heating bottle caps, comprising a chute, a cap guide plate in said chute, said guide plate having a lip so positioned and arranged that said caps roll therealong on their lower edges, said guide plate being inclined transversely to cause the caps to rest thereon as they advance, a heating unit extending along and in back of said guide plate, said heating unit being spaced from said chute to provide an air space through which the air heated by said unit circulates, and means directing said heated air onto said caps, whereby said caps are heated by convection from said heated air and by conduction from said guide plate.

5. A device for heating bottle caps, comprising a housing forming a chute along which said caps advance, a heat insulating lining in said housing, a metal liner enclosing said insulating lining, a heating unit extending along said chute, clips

attached to said liner, said clips being constructed and arranged to removably secure said heating unit in place, a baffle plate attached to said heating unit and a cap guide plate attached to said baffle plate, said guide plate having a top flange suited to engage and hang on said baffle plate and a lower flange forming a track along which the lower edges of caps roll, and means to direct a current of air heated by said unit onto said caps, whereby said caps are heated by convection from said heated air and by conduction from said guide plate as they advance along said guide plate.

6. A device for heating bottle caps comprising a housing having an open channelled cross-section and forming a chute along which said caps advance, a heat insulating lining in said housing, a metal liner enclosing said insulating lining, a heating unit extending along said chute, clips attached to said liner, said clips being constructed and arranged to removably secure the

heating unit in place, a baffle plate disposed over said heating unit and a cap guide plate attached to said baffle plate, said guide plate having a top flange suited to engage and hang on said baffle plate and a lower flange forming a track along which the lower edges of the caps roll, said lower flange being spaced from said liner to form an air gap therebetween, the upper portion of the channel shaped housing being adapted to direct a current of heated air by said unit onto the upper edges of the caps as they roll along the guide plate, whereby said caps are heated by convection from said heated air and by conduction of said guide plate as they advance along said guide plate, and a cover closing the open side of said housing and forming a guide means to hold the caps in position on said guide plate as they advance.

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