July 27, 1943. H. G. VORE 2,325,086

HEATING APPARATUS

Filed July 9, 1941

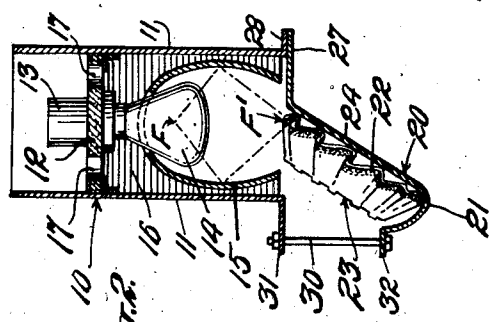


Fig. 2.

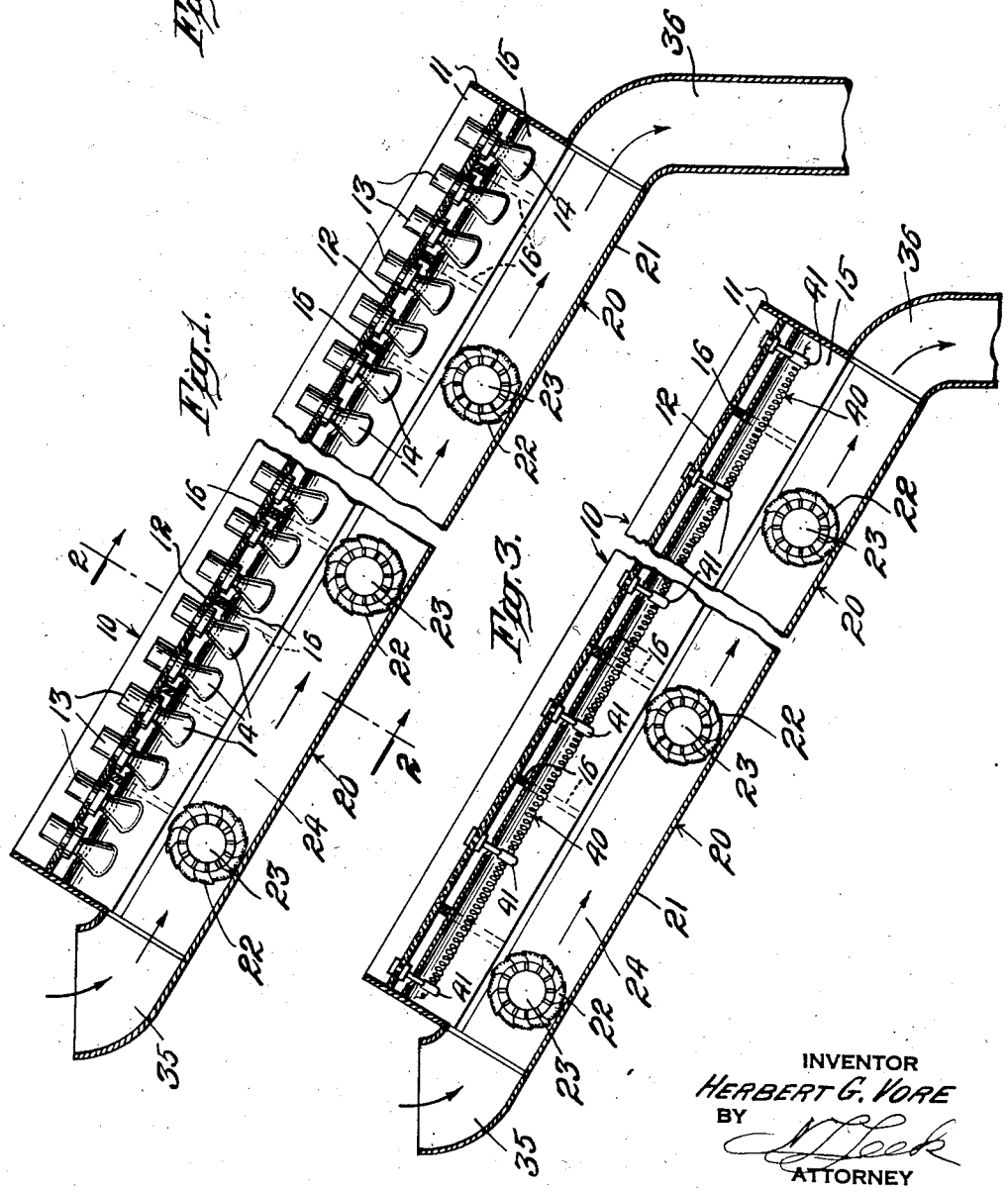


Fig. 1.

Fig. 3.

INVENTOR
HERBERT G. VORE
BY
ATTORNEY

Patented July 27, 1943 2,325,086

UNITED STATES PATENT OFFICE

2,325,086

HEATING APPARATUS

Herbert G. Vore, Jackson Heights, N. Y., assignor to American Seal-Kap Corporation of Delaware, Wilmington, Del., a corporation of Delaware

Application July 9, 1941, Serial No. 401,624

5 Claims. (Cl. 219—34)

This invention relates to a method and apparatus for heating the surface of an article and is particularly useful for heating a surface film, such as a thermoplastic coating, without substantially heating the body of the article itself.

The invention may be applied to heat-softening a thermoplastic adhesive coating on a disc, sheet or strip so as to render the same tacky for sealing purposes.

In one embodiment the method may be used for heat-softening the adhesive on the skirt of a milk bottle cap in a capping machine of the type shown in the copending application of Goodwin and Martin, Ser. No. 399,280, filed June 23, 1941.

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

Another object is to provide a method and 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 or film may be heated substantially instantaneously by applying thereto focused radiant heat rays. As applied to a disc, such as a milk bottle cap having a thermoplastic adhesive coating, the heat rays may be focused onto selected portions of the coating as the cap rolls along a chute. If the heat rays are focused onto a selected portion of the disc it is possible to heat soften a band of adhesive extending around the disc without softening the remainder of the material and without substantially heating the disc itself.

I have found that by producing radiant heat from a concentrated source, such as an incandescent light bulb or a row of such light bulbs, it is possible to obtain an area of intense heat which is suitable for the above purpose. In one embodiment I provide a row of incandescent light bulbs which are arranged above a chute down which the discs or caps roll. The heat rays from these bulbs are focused by suitable reflector means onto a predetermined portion of the rolling discs. In another embodiment I provide an elongated heating element which is arranged in one focus of an elongated reflector of elliptical cross section. The portion of the disc or cap to be heated is arranged at the focus of the reflector to receive the concentrated radiant heat rays which are focused at that point by the reflector.

The heat rays may, of course, be focused and supplied to the thermoplastic coating in any suitable manner and may be arranged to engage the entire area of the coating if so desired. In this way substantially instantaneous or flash heating is obtained.

The concentration of the heat rays at the points of focus provides an efficient method of heating inasmuch as it is only necessary to supply sufficient heat to raise the surface of the film to the temperature desired while the body of the article is not heated to any appreciable extent.

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 apparatus for carrying out the present process has been disclosed for purposes of illustration.

In the drawing:

Fig. 1 is a vertical section of a heating unit embodying the present invention;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1 showing the arrangement of the heating elements; and

Fig. 3 is a view similar to Fig. 1 showing a further embodiment of the invention.

Referring to the drawing more in detail, the method is shown as applied for heating a band of thermoplastic adhesive which forms a coating on the edge of the pleated skirt of a milk bottle cap of the hood type. In Figs. 1 and 2 the method is shown as carried out in an apparatus comprising a heating unit 10 having a housing 11, an elongated support 12 carrying sockets 13 in which incandescent lamps 14 are supported and a reflector 15 which extends longitudinally of the housing and in transverse section is in the form of an open ellipse. The lamps 14 are preferably of the type having a concentrated filament and are arranged with said filaments at one focus F of the ellipse, so that due to the property of the ellipse, all rays from said filaments are reflected, concentrated and focused at the second focus F′ The reflector 15 may be mounted in any suitable manner as by means of insulating transverse members 16 which serve to support the reflector 15 and to heat insulate the same from the housing 11. The support 12 may be provided with a plurality of openings 17 for purposes of ventilation.

In the embodiment shown, which is suited for heating a portion of the surface coating of a

milk bottle cap, a chute 20 is provided having a curved bottom portion 21 in which the skirts 22 of the caps 23 roll, and having an inclined side 24 against which the edges of the skirt 22 rest. The chute 20 is so positioned that the upper portion of the film of adhesive on the edge of the skirt 22 of the cap lies at the focal point F' of the elliptical reflector 15.

The chute 20 may be attached to the housing 11 by any suitable means as by cooperating flanges 27 and 28 formed on the chute 20 and housing 11 respectively. Tie-rods 30 may be connected between a flange 31 of the housing 11 and a flange 32 on the chute 20 for strengthening purposes. It is to be understood that the assembly may be supported in any convenient manner and that the chute may be inclined by an amount to cause the caps 23 to roll therealong at a predetermined speed which is selected in accordance with the characteristics of the film and of the focused heat rays, to obtain the desired softening effect. The caps, may, however, be fed along the chute by any convenient means as by a conveyor, in which case the chute need not be inclined.

In the embodiment shown the caps 23 are supplied to the chute 20 through a delivery passage 35 and are discharged from the chute 20 through a discharge passage 36.

In the operation of this device the caps 23, having a thermoplastic adhesive film on at least the skirt portion thereof, are introduced by suitable means into the supply passage 35 and thence roll on the lower edges of their skirts down the bottom portion 21 of the inclined chute 20 and are discharged to the discharge passage 36. As the caps thus roll along the inclined chute 20 the upper edges of their skirts are so positioned that a selected portion of the adhesive coating thereon lies at the focal point F' of the elliptical reflector. Hence concentrated heat rays from the filaments of the lamps 14 are supplied directly to the selected portion of the film and heat the same to softening temperature as the caps advance. Inasmuch as the caps rotate as they advance along the inclined chute 20, this heating means serves to heat a band of adhesive extending around the skirt 22. The timing of the feed of the caps is selected to render this band of thermoplastic adhesive tacky for sealing purposes when the caps are discharged from the discharge passage 36.

Inasmuch as no portion of the caps, with the exception of the narrow band of thermoplastic adhesive, is subjected to the intense concentrated heat rays, the cap itself remains substantially unheated. Consequently, the thermoplastic adhesive is quickly cooled and set when the cap is subsequently applied to a milk bottle, as for example in the machine shown in the copending application of Goodwin and Martin above referred to.

It is to be noted that the focused heat rays enter the folds of adjacent pleats of the cap so that the adhesive is softened around the entire cap skirt and particularly between the folds where the adhesive sealing is required.

In the embodiment shown in Figs. 1 and 2, a row of incandescent bulbs 14 are arranged along the heating unit 10 at the focal point F of the elliptical reflector 15. It is to be understood, of course, that the number of such lamps are varied as desired or, in certain instances, continuous heating elements may be used as shown in Fig. 3. Referring to this figure, the various details similar to Figs. 1 and 2 have been given corresponding reference characters. In this figure, however, the lamps 14 are omitted and an elongated heating element 40 is substituted therefor. This heating element 40 may comprise a coiled heating element or a resistance rod or the like and is mounted on brackets 41 which support the same at the focal point F of the elliptical reflector 15. In this way the radiant heat rays from the element 40 are focused by the reflector 15 to the second focal point F' as described above.

It will be noted that I have provided a heating unit which is adapted to heat only a surface film or a portion of a surface film without substantially heating the article itself. The invention has been particularly described as applied to a mechanism for heating the thermoplastic adhesive coating on the edge of a milk bottle cap skirt. It is to be understood, however, that the invention is not to be restricted thereto, but may be used for surface heating of various articles such as tape, ribbon, bands, discs or the like and, in certain instances, may be used for spot soldering purposes.

Although a specific embodiment has been shown for purposes of illustration, it is to be understood that various changes and modifications may be made therein without departing from the scope of the invention as set forth in the following claims.

What is claimed is:

1. A device for heat-softening a thermoplastic adhesive coating on a bottle cap, comprising a feed chute having a surface along which said bottle cap is adapted to roll, means causing said caps to roll along said surface, an elongated radiant heat source extending along said chute, and means concentrating radiant heat from said source onto the coating on the cap skirt as the cap rolls along said chute, to thereby render the thermoplastic adhesive tacky for sealing without substantially heating the body of the cap or skirt.

2. A device for heat-softening a thermoplastic adhesive coating on the skirt of a bottle cap of the hood type, comprising a feed chute having a surface along which said caps are adapted to roll in substantially vertical edgewise position, means causing said caps to roll along said surface on the lower edges of their skirts, a radiant heat source, and means focusing radiant heat rays from said source onto the adhesive coating on the cap skirts as the caps roll along said chute, said radiant heat rays being adapted to render said thermoplastic adhesive tacky for sealing without substantially heating the body of the cap or skirt.

3. A device for heat-softening a thermoplastic adhesive coating on the skirt of a bottle cap of the hood type, comprising a feed chute having a surface along which said caps are adapted to roll, means causing said caps to roll along said surface, heating means comprising a row of incandescent filament lamps disposed along said chute and reflector means focusing the heat rays from said filaments onto the adhesive coating on the cap skirts as said caps roll along said chute, to thereby render the thermoplastic adhesive tacky for sealing without substantially heating the body of the cap or skirt.

4. A device for heat-softening a thermoplastic adhesive coating on the skirt of a bottle cap of the hood type, comprising a feed chute having a surface along which said caps are adapted to roll, means causing said caps to roll along said surface, heating means comprising an elongated radiant

heat source extending along said chute and reflector means focusing the heat rays from said source onto the adhesive coating on said caps as the caps roll along the chute, for thereby rendering the thermoplastic adhesive tacky for sealing without substantially heating the body of the cap or skirt.

5. A device for heat-softening a thermoplastic adhesive coating on a bottle cap comprising a feed chute having a surface along which said caps are adapted to roll, means causing said caps to roll along said surface, heating means comprising an elongated heat source extending along said chute and reflector means focusing the heat rays from said source onto the adhesive coating on said caps as the caps roll along the chute, for thereby rendering the thermoplastic adhesive tacky for sealing without substantially heating the body of the cap or skirt, said reflector means having substantially the cross section of a portion of an ellipse and being arranged with said heat source at one focus of the ellipse and with a portion of the thermoplastic coating to be heated at the other focus of said ellipse, whereby said rays are concentrated by said reflector onto the portion of the coating to be heated.

HERBERT G. VORE.