March 25, 1969 G. N. BLISS 3,434,902

METHOD AND SYSTEM FOR TRANSFERRING HEAT-ACTIVATED LABELS

Filed July 20, 1965 Sheet 1 of 2

FIG. 1

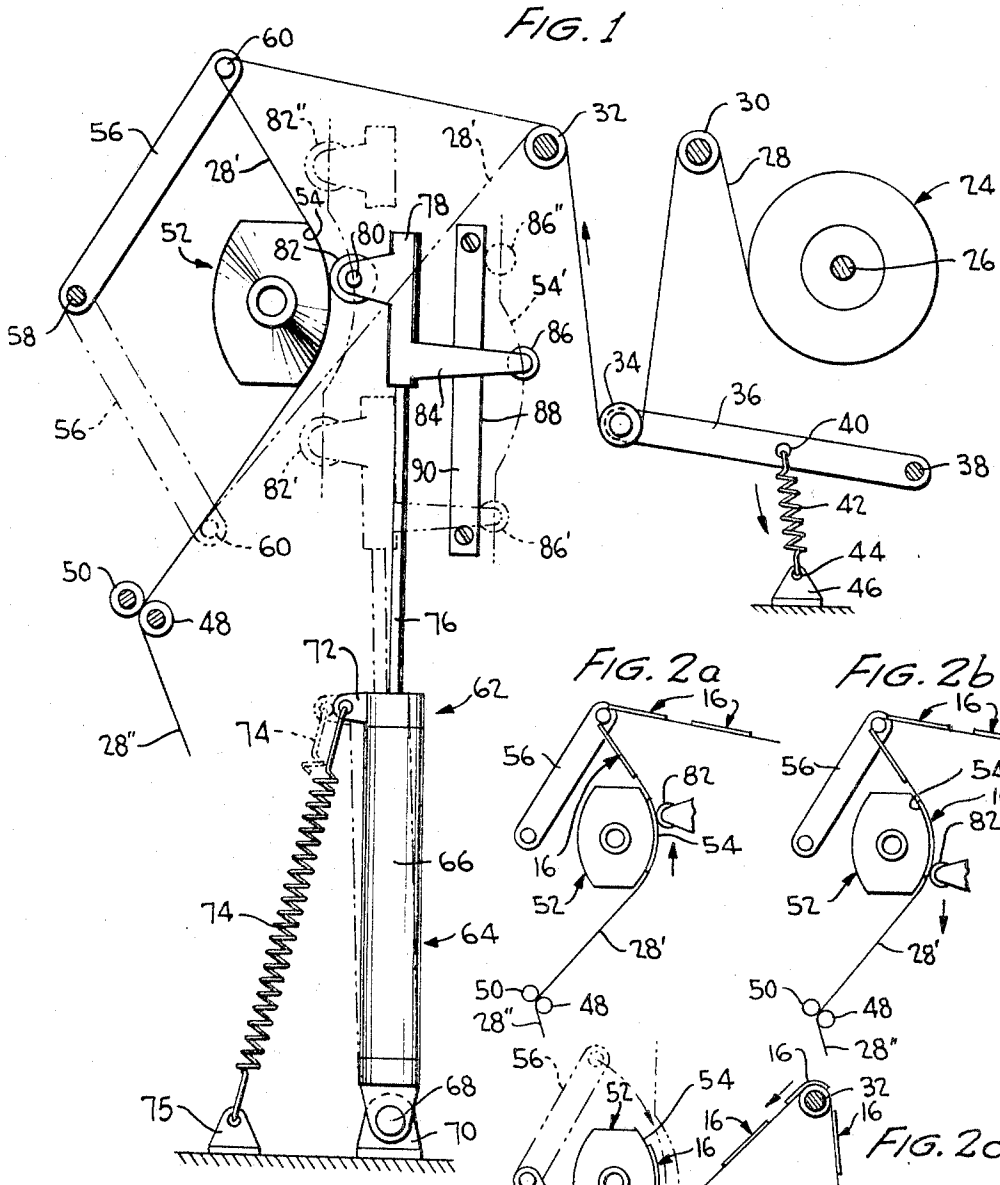
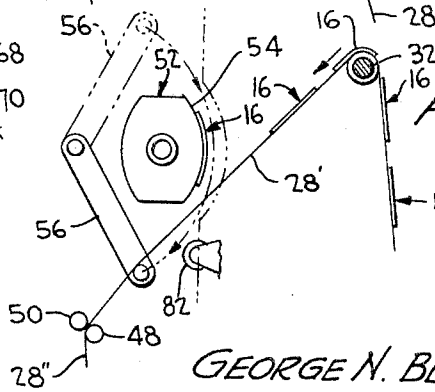


FIG. 2a

FIG. 2b



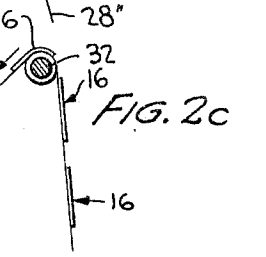


FIG. 2c

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FIG. 3

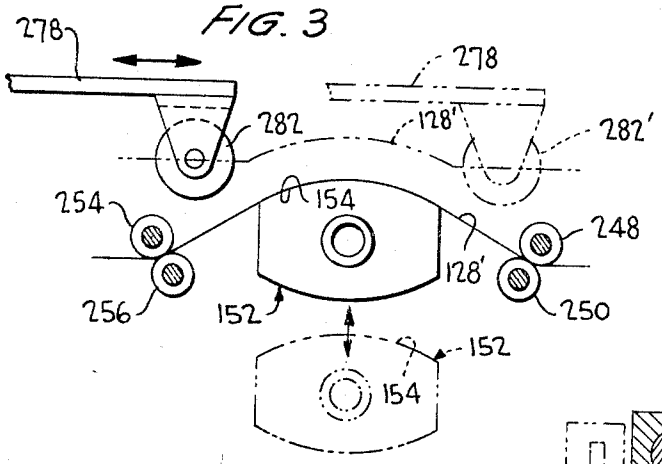


FIG. 4

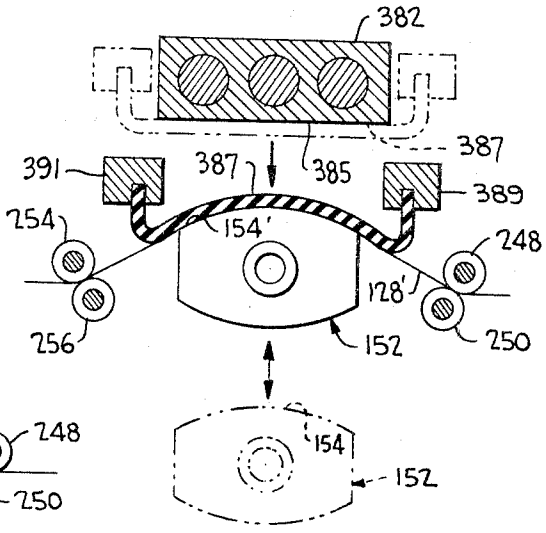


FIG. 5

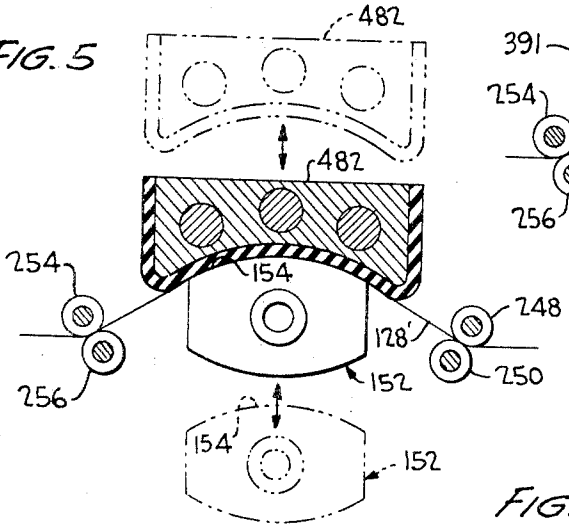


FIG. 6

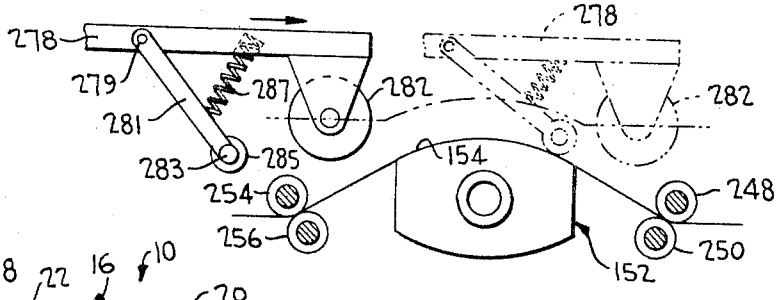
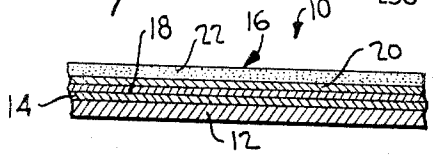


FIG. 7



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METHOD AND SYSTEM FOR TRANSFERRING HEAT-ACTIVATED LABELS

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Int. Cl. B65c 3/12, 9/18, 9/30
U.S. Cl. 156—230 16 Claims

ABSTRACT OF THE DISCLOSURE

Method and system for continuously applying heat-activated labels on articles in which pre-applied labels, spaced along a continuous, flexible transfer-web move from a normal path of travel substantially spaced from oriented articles, out of the normal path of travel into tension-draped relation over an article label-receiving surface, and while both the web and article are in a fixed, dwell position, a combination of heat-and-pressure is applied to the web causing label transfer and maximum adherence to the article, label-receiving surface without smearing when the web is snapped back to its normal path of travel.

This invention relates generally to new and useful improvements in printing machines for containers, and more specifically relates to a novel system and method particularly adapted to apply a heat-activated label on a label-receiving surface of an article.

The present invention is particularly adapted to apply labels or indicia on plastic bottles produced from polyethylene or the like, for example; however, the novel system and method is applicable for applying labels or indicia on articles produced from glass, metal, etc.

Mass produced containers, and particularly blow-molded plastic bottles, are generally subject to manufacturing variations which include variations in wall thicknesses, irregularities due to shrinkage, etc. Additionally, plastic bottles, through the blow-molding process, have been produced with a variety of surface configurations, complex curves, etc. It has been extremely difficult in the past to apply permanent labels to such articles. Further, it has heretofore been thought necessary to strip a spent label web or tape from the articles being labeled simultaneously with the passage of a heat shoe which has been utilized to activate the label. Heat transfer labels of the general character involved are generally applied in spaced relationship on an elongated web by means of waxes. When the heat-responsive label is activated, the waxes are melted, and simultaneous stripping of the web from the activated label, has in the past, often caused distorted and smeared art work.

A primary object of the present invention is to provide a novel method and system for applying heat activated labels to an article in which a label-supporting web is substantially anchored over a label-receiving area of an article, heat and pressure are applied to the label, and after a predetermined interval of time the web is stripped away from the label and article in a manner to avoid distorted and smeared art work.

Another object of the present invention is to provide a novel method and system in which a heated shoe can make at least one or more passes over a heat-activated label to insure proper adhesion between the label and label-receiving surface of an article and insures that voids, uneven areas, etc., due to manufacturing imperfections, have optimum adherence to the label being applied.

A still further object of the present invention is to provide a novel method and system for the application of heat transfer labels in which a moving shoe makes a pass

across a label and surface of an article to which the label is being applied and in which the label tape is laid onto and periodically anchored on a label-receiving surface before the pass, and the label tape is removed from the label-receiving surface after the completed pass.

And yet another important object of the present invention is to provide in the novel method involved, a time interval between the application of heat to the back of a label web and the stripping of the web from the labelled article wherein the time interval, though short in duration, allows heat penetration into the surface of the article being labelled to a temperature wherein the article surface will accommodate label adhesion thereto.

A still further object of the present invention is to provide in the novel method involved, an area of unstripped label web behind a movable heat source, which unstripped label web affords stability and reduces the possibility of label distortion and smear due to relative slippage between the article being labelled and the label during label transfer.

These, together with other and more specific objects and advantages of the present invention will become apparent from a consideration of the following description when taken in conjunction with the drawings forming a part thereof, wherein:

FIG. 1 is a diagrammatic view illustrating apparatus used in the novel method and system for applying a heat-transfer label, and showing by means of phantom lines alternate positions of the cooperating components of the apparatus;

FIGS. 2*a*–2*c* are diagrammatic views sequentially showing the steps of the novel method performed by the apparatus of FIG. 1;

FIG. 3 is a diagrammatic view showing another embodiment of the invention in which the article being labelled is moved relative to the web upon which a heat-transfer label is disposed;

FIG. 4 is a diagrammatic view showing still another embodiment of the invention;

FIG. 5 is a diagrammatic view showing still another embodiment of the invention;

FIG. 6 is a diagrammatic view showing a still further embodiment of the invention; and

FIG. 7 is an enlarged fragmentary section through a label and portion of a label-supporting web.

Referring to the drawings in detail, and first considering FIG. 7, a fragmentary portion of a typical label supporting web is indicated generally at **10** and comprises a base web **12** generally comprising a paper product material which has adhered thereto by means of a suitable layer of wax **14**, a label indicated generally at **16**. The label **16** comprises a layer of varnish **18** which will have imprinted thereon by meanss of a suitable layer of ink **20** indicia which is covered by a layer of heat-activated adhesive **22**.

When the web **12** is laid upon a label-receiving surface and heat is applied thereto, the wax **14** is melted and the adhesive layer **22** is activated so it will adhere to a label-receiving surface of an article. The melting of the wax **14** permits separation of the label **16** from the web **12**.

The label per se is of the character that those familiar with the art will readily recognize; further description thereof is believed to be unnecessary.

Referring to FIG. 1, a convoluted supply roll is indicated generally at **24** and is mounted on a shaft **26** defining an axis of rotation for the supply roll. The supply roll **26** comprises an elongated web **28** which is draped over a pair of support rolls **30** and **32**. Intermediately of the rolls **30** and **32** is a residual tension roll **34** which is journaled on a suitable support lever **36** pivotally supported at **38**. The lever **36** has secured intermediately thereof at **40** a tension spring **42** which is anchored at

44 to a fixed support 46 and accordingly applies a residual tension to the web.

The web 28 is engaged in the nip of a pair of overlying take-up rolls 48 and 50 disposed in spaced relation from the support roll 32. The portion of the web 28 between the roll 32 and take-up rolls 48, 50 defines a run 28' from which heat transfer labels will be serially removed. The leading end 28'' of the web will be received and rolled upon a suitable storage roll (not shown) and this constitutes the portion of the web after the heat transfer labels have been removed therefrom.

An article, indicated generally at 52, is supported in any suitable manner in fixed, transverse relation from the web portion 28' and includes a label-receiving surface 54. The label-receiving surface 54, in this exemplary embodiment, is arcuate and is illustrated as a convex curve. However, this surface may be flat, or concave or comprise a compound curve. The article, in this exemplary embodiment, may comprise an inflated plastic bottle; see for example, the patent to Bozek et al. No. 3,124,065. However, the bottle or article may also be constructed from glass or metal and comprise a rigid surface.

A lever 56 is pivotally supported at 58 and includes a support roller 60 extending beneath the web 28 and is pivotal between the phantom and solid line positions shown in FIG. 1 during a cycle of operation of the apparatus. When the lever 56 moves from the phantom to the solid line position, as seen in FIG. 1, the web portion 28' is laid is juxtaposed, relatively taut anchored relationship on the label-receiving surface 54 of the article 52 as shown by solid lines in FIG. 1.

Indicated generally at 62 is combined heating-and-pressure-applying means including motor means 64. In this exemplary embodiment, the motor means comprises a double acting fluid motor having a cylindrical housing 66 pivotally supported at 68 to a fixed support 70. The housing 66 includes a lateral bracket 72 connected to one end of a tension spring 74, the other end of the tension spring being anchored at 75 to a fixed support. Reciprocably supported within the cylindrical housing 66 is a piston (not shown) to which is connected a longitudinally projecting support rod 76. Mounted on the support rod 76 is a bracket element 78 upon which is journaled at 80 a suitably heated, pressure-applying roller 82. The roller 82 preferably comprises a resilient or flexible surface susceptible of conforming to the outer label-receiving surface 54 of the article 52. However, in decorating flexible articles, roller 82 can be replaced by a suitably heated, rigid shoe member, i.e., if the article 52 is not rigid or interiorly pressurized, a suitable shoe will be used to apply a firm pressure to insure label transfer. The bracket element 78 includes a projecting support arm 84 having journaled thereon a cam follower roller 86 which will engage the linear surface 88 of a guide bar 90.

During a cycle of operation, i.e., after the web portion 28' is laid and anchored onto the label-receiving surface 54 of the article 52, the normal position of the pressure roller or shoe 82 will be that indicated by phantom lines at 82'. During this condition, the cam-follower 86' will engage surface 88 of the guide bar 90. When the rod 76 is projected out of housing 66 the roller 82' moves to the position indicated at 82''. During an intermediate portion of the reciprocatory travel of the bracket element 78, the roller 82 will engage the label-receiving surface 54 and the cam follower roller 86 will move through the path 54' corresponding to the curvature of the concave label-receiving surface 54 of the article 52. After the roller 82 has moved to the position as shown at 82'', the cam follower roller will once more engage the edge 88 of the guide bar 90 as indicated at 86''. As previously mentioned, a complete cycle of operation consists of movement of the pressure roller 82 from the position shown at 82' to that shown at 82'' and once more to the original position 82'. In other words, the heated roller 82 makes two complete passes over the heat-transfer label juxtaposed on the label-receiving surface 54 of the article 52. It is feasible in the present invention to utilize a single pass of the heated roller or shoe 82.

It will be noted that the tension spring 74 normally urges the roller 82 toward the surface 54 to which the label is applied.

Prior to the reciprocatory cycle of the pressure roller 82, as just mentioned above, the support roller 60 will have moved from the position shown in FIG. 2*c* to that shown in FIG. 2*a*, i.e., from the phantom line position shown in FIG. 1 to the solid line position shown thereon.

When the lever 56 is moved from the phantom line to the solid line positions just mentioned, the tension spring 42 acting on the lever 36 will be slightly stretched to impose an increased tension on the web 28, i.e., on the portion 28' that is laid on and anchored onto the label-receiving surface 54 of the article 52.

Considering the method of the present invention, the web portion 28' is initially disposed and spaced in opposed relationship from the label-receiving surface 54. Next, the portion 28' is laid in juxtaposed relationship onto the label-receiving surface 54 and thereafter the motor means 64 comes into operation. The heated pressure roller 82 moves from the position shown at 82' into engagement with label-receiving surface 54 and freely rides thereover simultaneously applying heat and pressure to the label-receiving surface 54, as well as the heat activated label 16 which is properly oriented and anchored with respect to the label-receiving surface 54. It will be noted that neither the bottle or article 52 or the web portion 28' are moved with respect to each other during activation and application of the heat transfer label, i.e., they are anchored against relative movement. The pressure roller 82 ultimately moves to the position shown at 82'', which constitutes one-half the cycle of operation of this exemplary embodiment. The roller 82 then moves back to the position 82' completing the cycle of operation and the label juxtaposed on the label-receiving surface has then been subjected to two passes of the pressure roller 82. While the second pass is desirable, the invention will also be operable with but a single pass.

During the application of heat and pressure, in the event the label is being applied to a plastic bottle, the adhesive layer 22 of the label will be sufficiently melted to fill voids occurring during manufacture of the article, unusual contours or crevices, etc. After the pressure roller returns to the position 82', and after a sufficient delay, the lever 56 moves to the solid line position shown in FIG. 2*c* and due to the additional tension applied to the web 28, the web will, in a sense, snap away from the label-receiving surface 54 to substantially obviate and eliminate distorted or smeared art work.

It will be noted during the application of heat and pressure to the back of the label web and stripping thereof, a relatively short interval of time occurs prior to stripping of the label from the web upon which the label is initially carried. The time lag is sufficient to provide heat penetration into the surface of the article, i.e., bottle, etc., to insure that the article is temperature-conditioned at a temperature to insure optimum label adhesion.

Further, the web upon which the labels are carried, is stabilized in both leading and trailing relationship with respect to the article being labelled, thus reducing the possibility of label distortion and smear due to relative slippage between the article and the web during label transfer.

Although not shown in detail with respect to embodiments to be subsequently described, the features of the "time interval" and "web stabilization" can be incorporated in the methods utilized with respect to all of the embodiments of this application.

It has been found through the use of the present method excellent adhesion is obtained during the label transfer and an extremely improved velvety texture is provided to the finished label and subsequent heated oven treatment of the articles is unnecessary.

The elimination of heat treatment ovens substantially eliminates the shrinkage factor that often occurs when plastic bottles, for example, are subjected to subsequent heat treatment.

Referring to FIG. 3, an article **152** includes a label-receiving surface **154**. The article **152** is suitably supported for movement toward and away from a web portion **128'**. A label web having heat transfer labels thereon is supported between the nip of cooperating pairs of rollers **248, 250** and **254, 256**.

A reciprocatory support **278** has journaled thereon a combined heating and pressure resilient applying roller **282** which will freely conform the contour of the label-receiving surface **154** of the article **152**.

In this embodiment, initially, the article **152** is moved from the phantom line position to the solid line position shown in FIG. 3 and the web portion **128'** is urged into juxtaposed relation onto the label-receiving surface **154**. Next, the roller **282** moves in the reciprocatory path indicated by the respective solid and dotted lines of FIG. 3 to activate a label on portion **128'** of web **128**, and after this cycle of movement, the article **152** is rapidly moved away from the web portion **128'**, i.e., and substantially normal thereto. It will be noted that the article **152** can be moved to the phantom line position after roller **282'** is in the phantom line position and only a single roller-pass is used.

In this embodiment, just as in those previously described, when the label is being applied to the label-receiving surface **154**, the web portion **128'** and the article **152** are retained in a fixed or anchored juxtaposed relationship to permit at least one or two passes of the heat and pressure applying roller **282**.

Also, the roller **282** can be replaced by a suitably heated shoe rigidly fixed to support **278**. The second pass of the heat and pressure applying means is desirable, but not essential to the application of the invention.

Considering FIG. 4, in this embodiment, the article **152** is reciprocably supported as in FIG. 3. Further, the web portion **128'** is engaged on opposite sides of the article **152** in the nip of cooperating rollers **248, 250** and **254, 256**. A heating shoe **382** is suitably heated and has engaged over a conduction surface **385**, a flexible conduction-heated, pressure-applying element **387**, for example, a strip of "silicon" rubber or the like. The element **387** is suitably supported for reciprocatory movement by means of suitable clamps **389** and **391**, for example.

In the embodiment of FIG. 4, the article **152** is moved from the phantom line position to the solid line position urging the label-receiving surface **154** into juxtaposed relation with respect to a label on the web portion **128'**. Thereafter, the heated element **387**, which has been heated by conduction by means of the heating shoe **382**, is stretched and anchored into overlying juxtaposed relation on the web and label-receiving surface **154**. After a suitable interval, the element **387** is moved to the phantom line position shown in FIG. 4, where it was originally disposed and after a suitable dwell period, the article **152** is rapidly moved to the phantom line position shown in FIG. 4.

Referring to FIG. 5, the article **152** is suitably supported for relative movement with respect to the web portion **128'** supported as previously described with respect to FIGS. 3 and 4, for example. The combined heating and pressure applying shoe **482** includes on the surface opposed to the label-receiving surface **154** of the article **152**, a pressure face comprising "chain mail" or the like. The shoe **482** is suitably heated by means of a self-contained low temperature alloy in the heating shoe, for example, and the "chain mail" is of such a flexibility that it has the function of conforming to the entire label-receiving surface of the article **152**.

In this embodiment, as indicated by the phantom lines, the article **152** is moved from the phantom to the solid line position shown, whereby the web portion **128'** is juxtaposed over the label-receiving surface **152** of the article. The shoe **482** is moved from the phantom to the solid line position shown, and heat is applied to activate the label on the web portion **128'** as well as heating the entire surface of the article. Next, the shoe **482** is moved to the phantom line position, and after a suitable interval, the article **152** is also moved to the phantom line position.

Referring to FIG. 6, an embodiment similar to that of FIG. 3 is illustrated, and similar reference characters are used for similar parts.

In order to insure mating of the label on the surface **154** to which it is being applied, a support **278** has pivotally mounted at **279** a support **281** upon which is journaled at **283** a trailing supplemental pressure roller **285** of any suitable material, i.e., soft "silicon" rubber or the like. The support **281** is spring-urged downwardly by means of a suitable compression spring **287**, i.e., below the label-receiving surface **154**.

During a single or double pass due to reciprocation of the combined heating and pressure applying roller **282**, the supplemental roller **285** provides a supplemental pressure or "ironing" of the activated heat transfer label onto the label-receiving surface **154**.

Although the drawings illustrate the apparatus as having parts oriented for vertical movement, this is for purposes of illustration and not limitation, since those skilled in the art will readily appreciate that other positions of orientation of the cooperating parts are contemplated to be within the scope of the invention.

From the foregoing, it will be observed that novel and advantageous provision has been made for carrying out and producing the novel method and system of the present invention.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and therefore the invention is not limited to what is shown in the exemplary embodiments illustrated by the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A method of applying a printed, heat-activated label on articles such as bottles or the like comprising the steps of:
   (a) orienting a label-receiving surface on which a heat-activated label is to be applied;
   (b) moving a continuous, flexible web with heat-activated labels serially positioned thereon in a normal path of travel substantially spaced from said label-receiving surface and orienting a label in opposed relation to said label-receiving surface;
   (c) moving said web out of its normal path of travel towards said label-receiving surface and orienting a label on said surface and maintaining said web in draped, taut relation over said surface;
   (d) maintaining said web and label-receiving surface in a fixed position;
   (e) applying heat-and-pressure to said web while said web and label-receiving surface are maintained fixed and transferring the label onto said label-receiving surface;
   (f) rapidly separating said web from said label-receiving surface by relieving tension on said web and rapidly returning the web to its normal path of travel spaced from the label-receiving surface on which the label has been transferred.

2. The method of claim **1** including: applying said heat-and-pressure in traversing relationship to said web while said web, label and label-receiving surface are maintained in the fixed position.

3. The method of claim **2** including: applying said heat-and-pressure in a reciprocatory cycle.

4. The method of claim **2** including: forming said label-receiving surface as a curved surface, and applying said heat-pressure in traversing relationship along a path

determined by the curvature of said label-receiving surface.

5. A system for applying a heat-activated label from a continuous flexible web to a label-receiving surface of an article comprising:

supply means including a continuous web having a plurality of heat-activated labels serially spaced therealong;

web support means engaging and supporting said web along a normal path of travel;

mounting means supporting an article with a label-receiving surface in spaced, opposed relation from the normal path of travel of said web;

means for engaging an intermediate portion of said web and orienting the web out of its normal path of travel and a heat-activated label thereon onto said label-receiving surface while subjecting the web to tension;

means for applying heat and pressure to said web while the web-receiving surface and web are maintained in a fixed dwell position;

and web stripping means, operable after sufficient time lag needed for label adhesion to said label-receiving surface, for rapidly separating said web from the label and label-receiving surface of the article.

6. The system as set forth in claim 5 in which said web stripping means comprises a heated shoe for applying said heat and pressure.

7. The system as claimed in claim 6 for supporting said article in a path of movement generally transverse to said web and heated shoe.

8. The system of claim 7 in which said heated shoe includes a heat-retaining element having a flexible surface for conforming to said label-receiving surface of the article, and means for supporting said heat-retaining element for movement between said web and article.

9. The system of claim 7 in which said heated shoe includes a flexible surface for conforming to the label-receiving surface of said article.

10. The system of claim 6 in which said heated shoe comprises a roller supported for movement along the general direction which said web extends.

11. The system of claim 10 including supplemental, pressing-rolling means disposed in trailing relation to said heated shoe for applying rolling pressure to said label after the label has been activated by said heated shoe and before said web is separated from said article.

12. The system of claim 5 including means for applying residual tension to said supply web means, said web support means for said web comprising means for laying and periodically anchoring said web and label onto said article-receiving surface and a heated element supported in a path of travel for engaging said web in opposed relation to said label-receiving surface of said article.

13. The system of claim 12 including driving means supporting said heated element for reciprocatory movement.

14. The system of claim 12 in which said heated element is supported on an axis of movement extending generally along the length of said web whereby said heated element may conform to complex curvatures of said label-receiving surface of said article.

15. The system of claim 12 in which said means for laying said web and label comprises a pivoted lever including a portion extending transversely beneath said web, said pivoted lever being movable in a path of travel traversing the label-receiving surface of said article independently of movement of said heated element.

16. The system of claim 12 including cam guide means operatively engaged with said means for laying said web for causing said web to be juxtaposed on said article-receiving surface during a cycle of web-engaging movement of said heated element.

References Cited

UNITED STATES PATENTS

2,319,969	5/1943	Besemer	156—493 XR
2,981,432	4/1961	Flood	156—475
3,058,514	10/1962	Flood	156—542

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U.S. Cl. X.R.

156—249, 493, 542, 581, 583