April 25, 1967 H. G. KRAUT 3,315,434

METHOD AND APPARATUS FOR PACKAGING

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FIG. 1

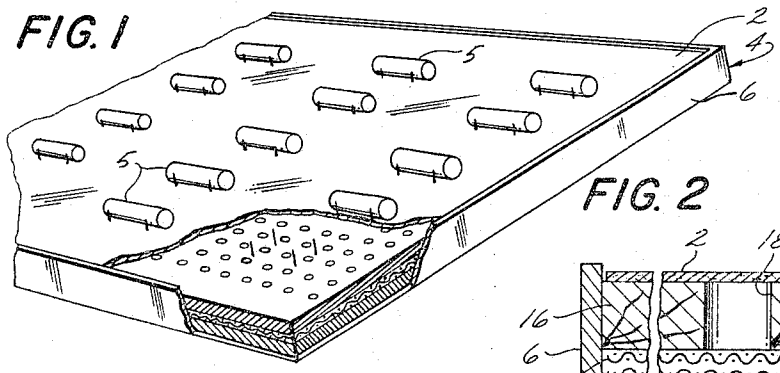


FIG. 2

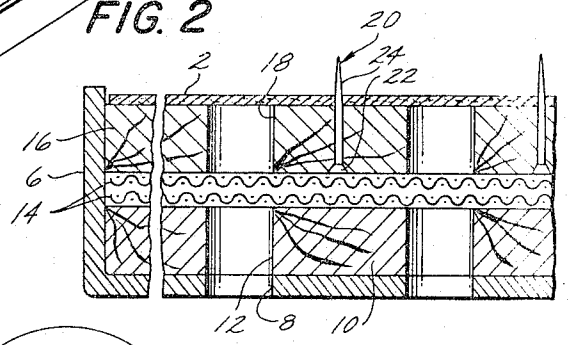


FIG. 3

FIG. 4

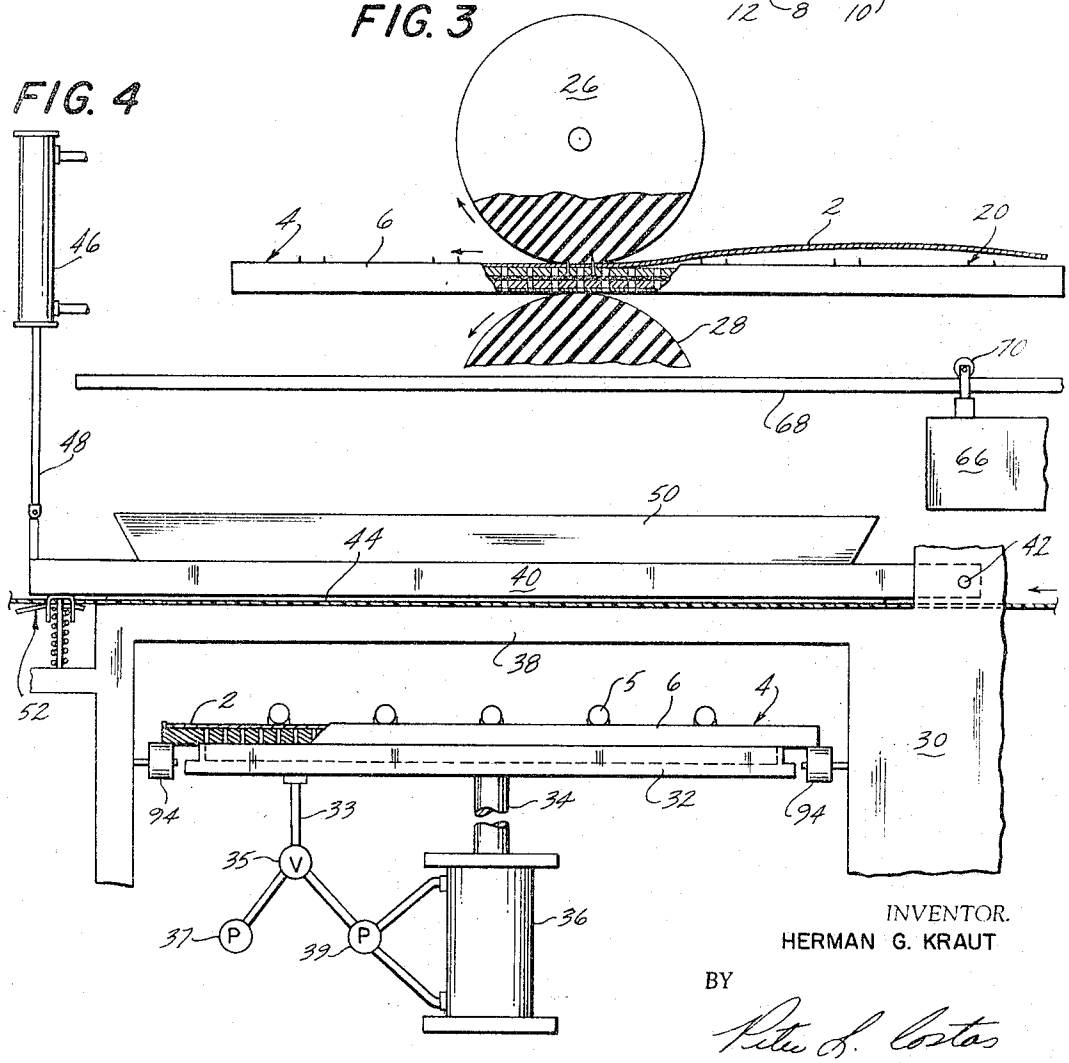


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FIG. 5

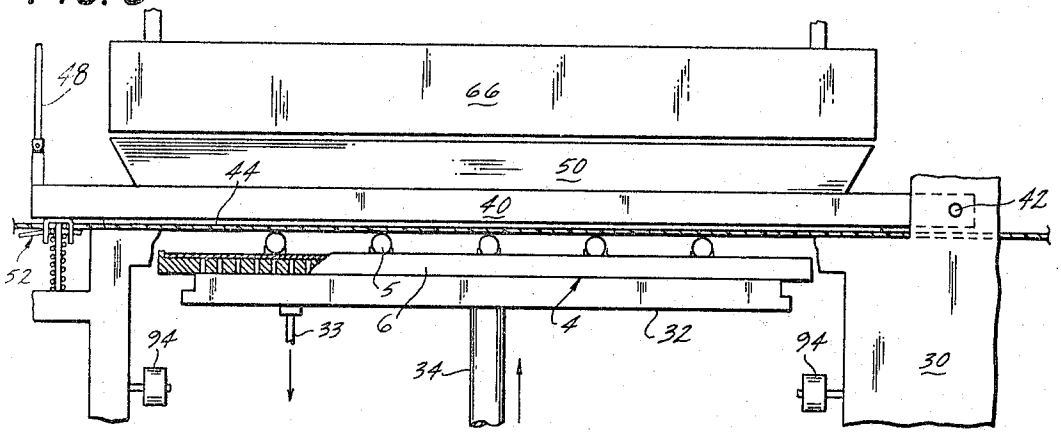


FIG. 6

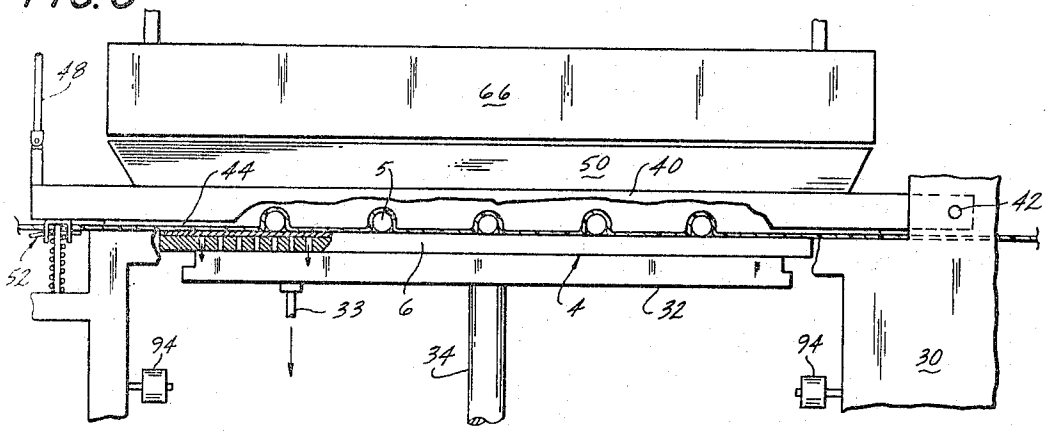


FIG. 7

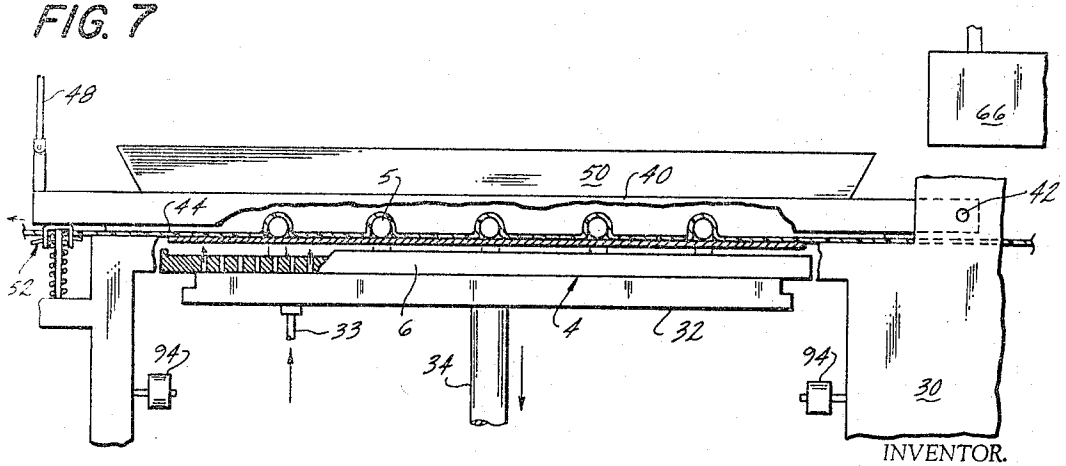


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FIG. 8

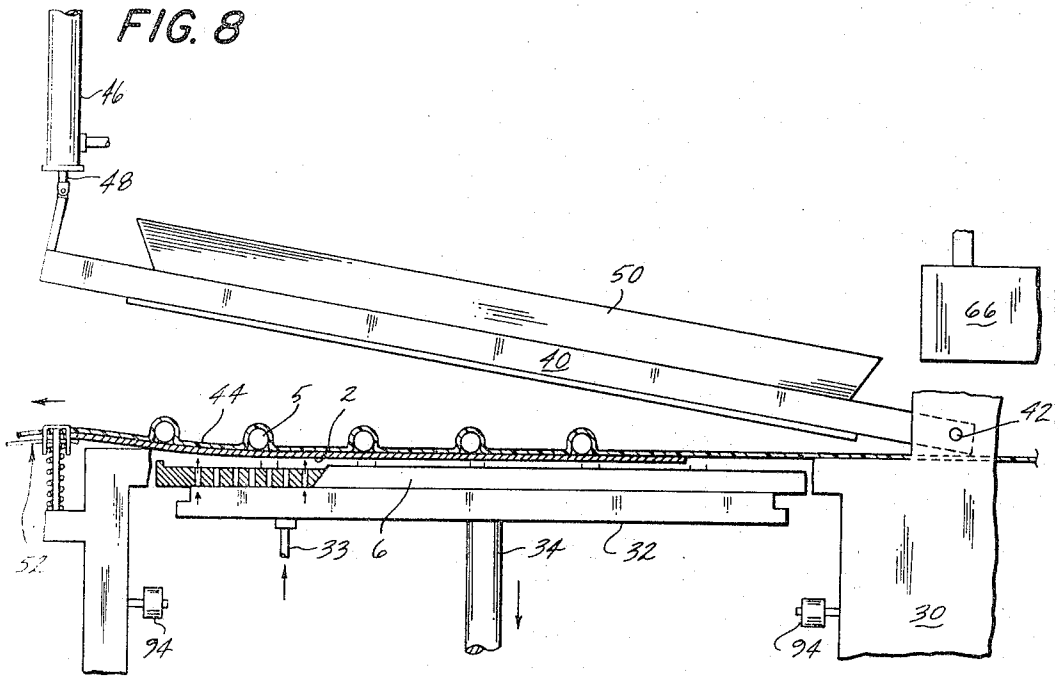



FIG. 9

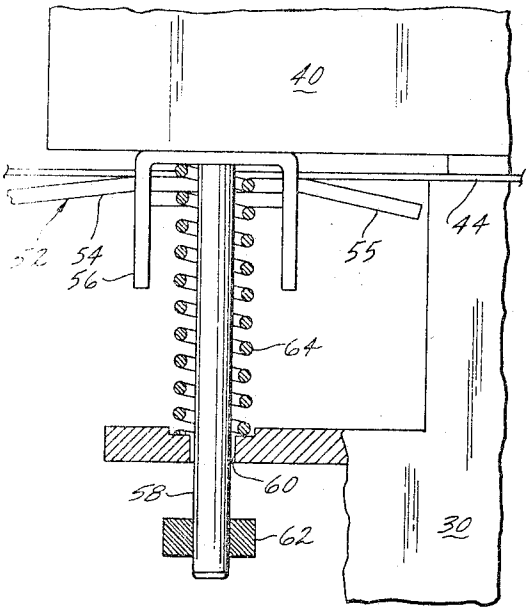
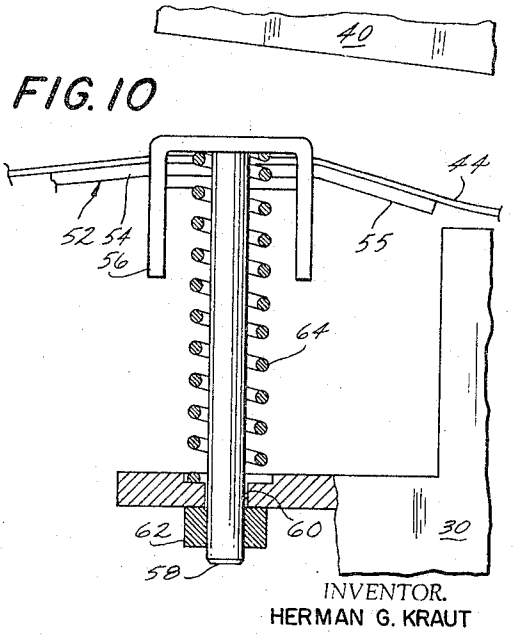



FIG. 10

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METHOD AND APPARATUS FOR PACKAGING

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FIG. 11

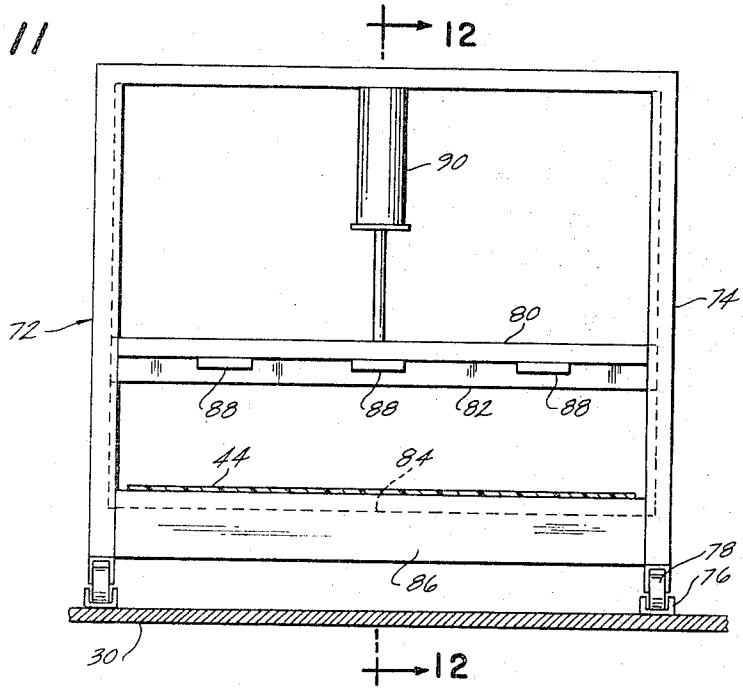


FIG. 12

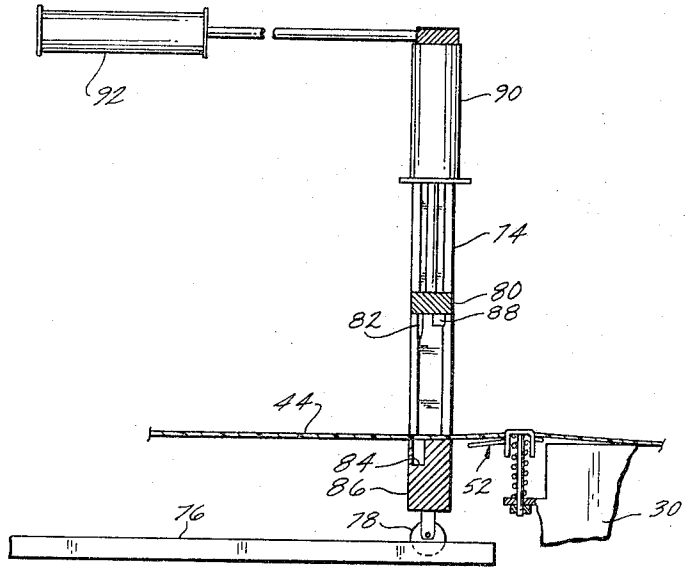


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FIG. 13

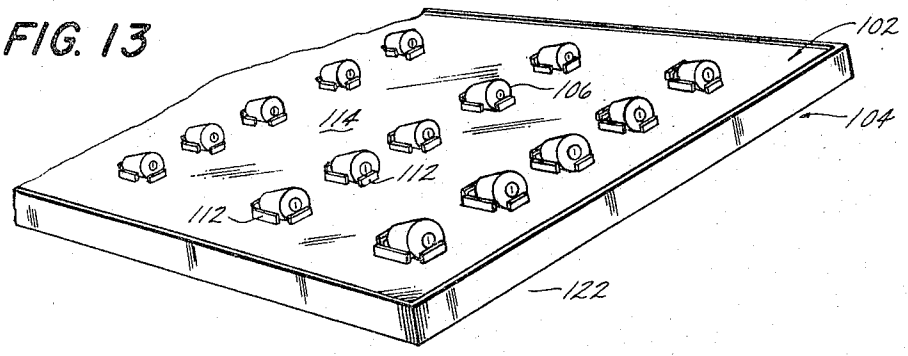



FIG. 14

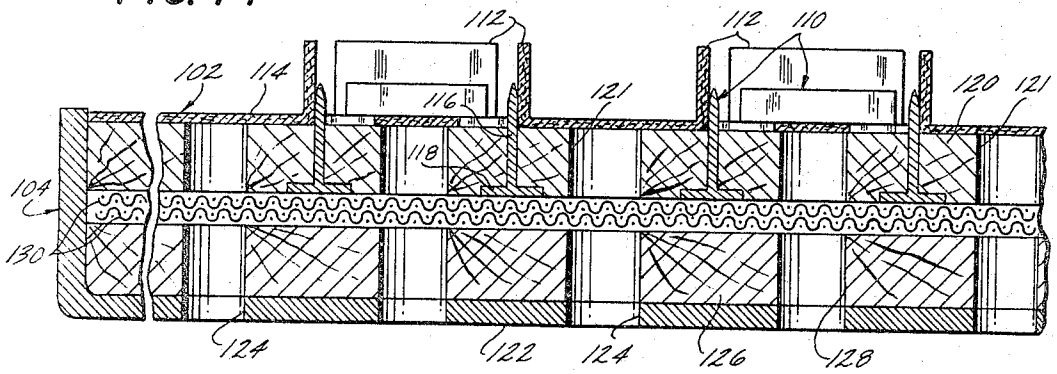



FIG. 15

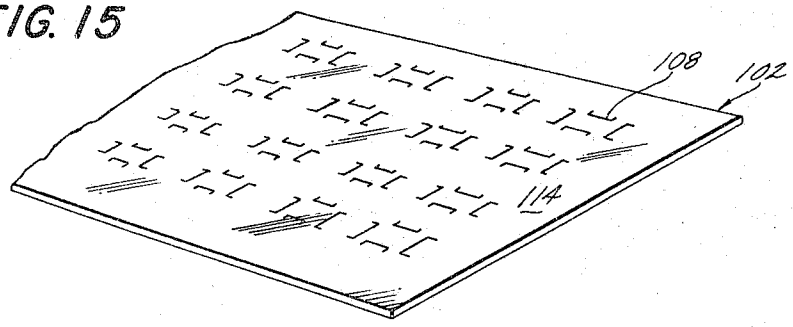
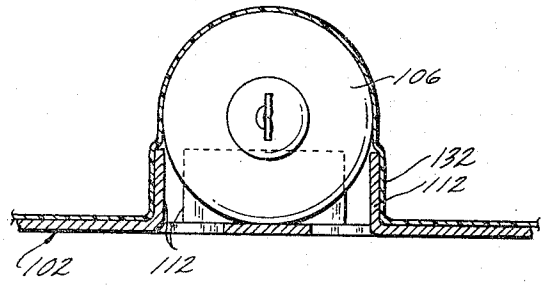



FIG. 16

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United States Patent Office 3,315,434
Patented Apr. 25, 1967



3,315,434

# METHOD AND APPARATUS FOR PACKAGING

Herman G. Kraut, New Britain, Conn., assignor to The Stanley Works, New Britain, Conn., a corporation of Connecticut

Filed Oct. 7, 1963, Ser. No. 314,202
23 Claims. (Cl. 53—22)

The present invention relates to packaging, and, more particularly, to a method and apparatus for packaging articles between a film of synthetic thermoplastic sheet material and a substrate.

In United States Patent Number 3,031,072, granted April 24, 1962, and entitled Package and Method of Forming Same, there is described a package having an article supported on a paperboard substrate and sheathed by a thermoplastic film which is drawn thereabout and bonded to the substrate about the article by its own substance, and the method of making the package. A similar method and article additionally employing an adhesive coating has been widely employed prior to the invention of the aforementioned patent, which method and article are described in many patents including United States Patent Number 2,855,735, granted October 14, 1958, and United States Patent Number 2,861,405, granted November 25, 1958. This general method of packaging using a sheathing film and a supporting substrate has commonly become known as "skin-packaging."

In using this method, a problem often arises in handling articles of cylindrical, round or other configurations which are prone to move upon the surface of the substrate prior to the formation of the film sheath thereabout, particularly since efficient packaging generally requires a large number of articles to be spaced at regular intervals over the surface of master paperboard substrate of large dimensions and also since it is customary to print repeating indicia and patterns at spaces constituting a single carded item upon severing from the master substrate and in which the article should be properly located. Various techniques of maintaining the article in position have been proposed including the use of magnets under the substrate for ferrous articles and, more recently, the use of pins which project upwardly through the substrate to provide lateral support. The latter technique has been found more versatile but has been subject to difficulties in removing the package assembly from the pins, particularly when rapid semi-automatic operation has been desired.

A further problem occurs in using this method with heavy articles which are prone to move upon the surface of the paperboard substrate, particularly of cylindrical or round configuration, in that there is a tendency for these articles to loosen the bond between the paperboard substrate and film thereabout as a result of frequent small vibratory movement within the film sheath, thus resulting in some peeling of the film from the substrate to reduce the strength and aesthetic appearance of the package.

It is an object of the present invention to provide a method which is rapid and facile for skin-packaging articles which are of a configuration prone to movement upon the surface of the substrate.

It is also an object to provide such a method which provides packages with lateral reinforcement for the film sheath to minimize the tendency for peeling of the film about the article during shipping, storage and handling of the packages.

Another object is to provide such a method which may be adapted by relatively facile and economical modifications to existing skin-packaging apparatus.

Still another object is to provide apparatus for skin-packaging articles which are of a configuration prone to movement upon the surface of the substrate which is relatively economical, facile in operation, relatively rapid and adapted to semi-automatic operation.



Other objects and advantages will be apparent from the following detailed description and claims and the attached drawings wherein:

FIGURE 1 is a fragmentary perspective view of a loaded assembly of paperboard substrate, support member and articles to be packaged in accordance with one embodiment of the present invention, a portion of the paperboard and articles having been removed to reveal the construction of the underlying support member;

FIGURE 2 is a sectional view to a greatly enlarged scale of the subassembly of paperboard substrate and support member in FIGURE 1;

FIGURE 3 is a diagrammatic representation of an apparatus and method for pressing the substrate onto the support member;

FIGURE 4 is a fragmentary and partially diagrammatic front elevational view of the clamping and sealing portion of apparatus embodying the present invention at the beginning of the operating cycle;

FIGURE 5 is a similar view as the film is being heated but before the film has been drawn about the article;

FIGURE 6 is a similar view after the film has been drawn about the article;

FIGURE 7 is a similar view during the initial release portion of the cycle;

FIGURE 8 is a similar view upon opening of the clamping frame;

FIGURE 9 is a fragmentary elevational view to an enlarged scale of the apparatus portion having the release bar assembly and with the clamping frame in closed position;

FIGURE 10 is a view similar to FIGURE 9 with the clamping frame in opening position;

FIGURE 11 is a fragmentary and partially diagrammatic side elevational view in partial section of the discharge portion of the apparatus and looking towards the discharge end thereof;

FIGURE 12 is a fragmentary and partially diagrammatic front elevational view thereof in partial section;

FIGURE 13 is a perspective view of a loaded assembly of paperboard substrate, support member and articles to be packaged in accordance with another embodiment of the invention;

FIGURE 14 is a sectional view to a greatly enlarged scale of the subassembly of the paperboard substrate and support member in FIGURE 13;

FIGURE 15 is a fragmentary perspective view of the paperboard substrate of FIGURES 13 and 14 before pressing upon the support member; and

FIGURE 16 is a sectional view of a final package produced by the support member and substrate of FIGURES 13–15.

It has now been found that the foregoing and related objects may be readily attained in a method of skin-packaging wherein a substrate is pressed upon a perforate support member having a generally planar upper surface portion and a plurality of locating members projecting upwardly therefrom spaced apart to receive the article to be packaged therebetween, sufficiently to project the locating members through the substrate and seat the substrate upon the planar surface, after which the article to be packaged is placed between the locating members. A length of synthetic thermoplastic sheet material is supported adjacent its margins in a position overlying the assembly of substrate, article and support member, and suction is drawn through the support member and substrate to draw the film about the article and into engagement with the upper surface of the substrate about the article to form a skin-packaging assembly. After theen-

gagement has been effected, air is blown upwardly through the support member to lift the skin-packaging assembly upwardly of the planar surface and locating member of the support member, and the support member is lowered relative to the supported ends of the film. Thereafter, the one end of the film is pulled to draw the skin-packaging assembly to one side of the support member.

The blowing of air preferaably coincides with the initial lowering of the support member relative to the supported ends of the film so that the two movements cooperate although the blowing of air may commence prior to the lowering of the support member to achieve the desired release of the skin-packaging assembly from the locating members. As the air is blown upwardly through the support member, preferably at a line pressure of 50–150 pounds, the skin-packaging assembly, which is now relatively non-permeable due to the plastic film on the upper surface thereof, is lifted from the upper planar surface of the support member and upwardly of the locating pins. Preferably, the skin-packaging assembly is lifted completely above the locating members before it is drawn to the side of the support member, although an additional lifting force may be applied simultaneously to the bottom of the film adjacent the end to be pulled to assist in lifting the adjacent end of the skin-packaging assembly completely from the locating pins as it is drawn to the side. This additional lifting force is conveniently provided by an upwardly biased release bar over which the film extends and which is held downwardly by a releasable clamping member supporting the film above the substrate during the heating and drawing operations but which release bar will lift the film upwardly upon release from the restraint of the clamping member.

To move the skin-packaging assembly rapidly to the side and minimize the tendency to rupture the film outwardly of the ends of the substrate under the weight of the assembly and minimize any drag across the locating members, tension is applied to the end of the film to be pulled outwardly of the supported or clamped end portion above the support member so that the skin-packaging assembly is jerked rapidly to the side upon release of the intermediate supporting element. This is conveniently effected by clamping members outwardly of the clamping frame, and release bar where employed, which are movable away from the support member to apply tension prior to release of the clamping member and thereafter to continue to pull the packaging assembly to the discharge point of the apparatus.

The locating members may comprise two or more sharp elements such as pins or blades which pierce the substrate by their own action without previous provision of perforations therefor as the substrate is pressed thereon or the substrate may be provided initially with perforations or cuts through which the locating members readily project without any cutting action at the time the substrate is placed thereon. By providing two or more spaced die-cut generally U-shaped incisions pointing inwardly of the article-receiving area, locating members such as blades, when the substrate is pressed thereon, may lift integrally formed article-restraining tabs extending upwardly from and hinged to the body of the substrate. When the article is placed between these tabs and the film is then drawn outwardly thereof, the tabs serve to hold the article against relative movement and particularly safeguard the critical bonded area of the film and the body portion of substrate immediately about the article from shearing stress since the film extends outwardly of the tabs.

Although adhesive coatings or laminates may be used on the substrate or the film, the method of the aforementioned United States Patent Number 3,031,072 is preferably used for optimum economy and most facile operation. Accordingly, the substrate is paperboard or like material which is porous and substantially imperforate throughout the area of laminar contact between film and paperboard to ensure film, substantially uniform



bonding therebetween. However, incidental perforations may also be incorporated for purposes for hanging the packages, or for tearing the substrate by the user, etc. Where an adhesive coating or laminate is employed to effect the bond, the substrate may be non-porous and the area of surface contact may contain perforations are often utilized to permit drawing of a vacuum therethrough. In either instance, the substrate should be of sufficient rigidity for the packaging application.

The ideal substrates are porous paperboard sheet material which will permit the drawing of a vacuum therethrough and which preferably are free from an adhesive coating and desirably are only lightly calendered to preserve the inherently porous, gas-permeable nature throughout. A suitable paperboard stock, for example, is the type known in the trade as "patent coated" which has a face or top layer composed essentially of virgin pulp and high-grade waste free of ground wood and presenting an attractive finish and appearance. Alternatively, other types of porous paperboard sheet material may be readily employed, including corrugated board albeit at greater expense. In the event a colored background or base color is to be used to provide an attractive appearance, it is most desirable to select a paperboard material which has been vat-dyed with the desired color during its manufacture so as to eliminate the necessary for printing the background color upon the paperboard.

When the bonding of the film to the paperboard is by the substance of the film itself, as set forth in the aforementioned United States Patent Number 3,031,072, care should be taken to select printing inks for the paperboard which will not interfere with the bonding process since certain inks contain sufficiently high quantities of binders or fillers to interfere with the porosity of the paperboard stock or to otherwise interfere with the bonding operation.

In accordance with the teachings of this patent, the film is a polyolefin which has at least the surface for bonding to the substrate treated so as to render the film heat-sealable by its own substance upon the application of heat while maintaining substantially the integrity of the body of the film. As fully defined in this patent, the term "surface-treated polyolefin film" refers to polyolefin films having one or both surfaces at least partially oxidized or surface-treated to render the surface more susceptible to activation by heat than the body of the film.

The films utilized for the present invention may be of a thickness of about 2–11 mils, and preferably about 3–7 mils, depending upon the degree of distention or draw required to form the sheath about the article.

The suction applied to the bottom of the substrate should be sufficient to distend the film about the articles and to draw the film into tight surface contact with the substrate. In the instance of the method of the aforementioned United States Patent Number 3,031,072, the suction should be sufficient to draw the surface of the film into the pores of the paperboard. In a commercial embodiment, suction rated at about 23 inches of mercury (about 11.5 pounds per square inch) has proven highly satisfactory. The actual amount of suction required will vary with the permeability or porosity of the paperboard substrate and the conditions of operation. Generally, the suction is applied for about two to twenty seconds to bring the film and substrate into laminar engagement, a period of three to five seconds being satisfactory for most operations.

The air blown upwardly through a support member should be at suffiicent pressures to dislodge the paperboard from the locating members, about 50–150 pounds being generally adequate, and 80 pounds being satisfactorily employed in commercial operation.

Turning now in detail to the attached drawings, FIGURES 1 and 2 illustrate the operative assembly of a paperboard substrate **2** and a perforate support member in accordance with one embodiment of the present inven-

tion and generally designated by the numeral 4 upon which are supported against inadvertent movement a plurality of generally cylindrical articles 5 which are to be packaged. As best seen in FIGURE 2, the perforate support member 4 comprises a metal tray 6 having a multiplicity of perforations 8 spaced thereabout and in which are placed a lower fibrous support element 10 having a multiplicity of perforations 12 spaced thereabout and at least in part registering with the perforations 8 of the metal tray 6, and a wire screen element 14 of relatively open weave to provide lateral air paths therethrough. A similar screen element (not shown) for a similar purpose may be provided between the tray bottom wall and lower support element 10 if so desired.

Seated on the screen element 14 is an upper fibrous spacing element 16 such as plywood having a multiplicity of perforations 18 spaced thereabout and having a multiplicity of locating pins generally designated by the numeral 20 which are secured therein and extend thereabove. The pins 20 are arranged in cooperating pairs of pluralities spaced apart to locate articles 5 received between them in relatively fixed position against inadvertent rolling. In this embodiment, the pins 20 have head portions 22 which are countersunk within the lower surface of the upper spacing element 16, and tapering stem portions 24 which provide a relatively sharp point at the upper end. The pins 20 are preferably firmly secured in the spacing element 16 by adhesive (not shown). Preferably, the spacing and projecting height of the locating pins 20 are predetermined to locate them in close relationship, if not actual lateral contact, with the articles supported thereby and to space their upper ends below the upper surface of the articles so that the film is drawn downwardly about the article outwardly of the pins 20. However, the pins have not been found to interfere materially with the operation even where the film is drawn therearound and in contact therewith since the film does not appreciably adhere thereto.

In producing the assembly of FIGURES 1 and 2, the method illustrated in FIGURE 3 is desirably employed wherein the paperboard substrate 2 is pressed onto the perforate support member 4 by passage between a pair of cooperating rollers 26, 28, at least the upper of which is fabricated from resiliently deformable material such as rubber, so as to press the paperboard substrate 2 onto the locating pins 20 and into substantially planar contact with the upper surface of the upper spacing element 16 of the support member 4. Lastly, the articles 5 are placed between the locating pins 20 on the support member 4 to produce the loaded tray assembly for introduction into the heat-sealing apparatus.

Turning now to FIGURES 4–10 of the attached drawings, the several steps in the heat-sealing cycle are shown as performed in apparatus having a frame 30 and a platform 32 mounted for vertical movement within the frame 30 on the shaft 34 which is operated by air cylinder 36. The platform 32 is a hollow member open at the top and having a gasket or seal (not shown) of resilient material such as rubber about the periphery thereof to provide a seal against the bottom of the perforate support member 4 disposed thereon. Suction or air pressure supplied through the conduit 33 and valve 35 from the suction pump 37 or pressure pump 39 is thus transmitted therethrough through the several perforations in the support member 4 to the bottom surface of the paperboard substrate 2 and is then diffused throughout the substrate.

The frame 30 has a generally rectangular clamp portion 38 aligned above the platform 32 which cooperates with the clamping frame 40 which is pivotally mounted on the frame 30 thereabove by the pivot pin 42 to clamp a length of synthetic thermoplastic film 44 therebetween as it is fed from a feed roll (not shown) to the right-hand side of the apparatus as shown in the drawings. The clamping frame 40 is pivoted about the pivot pin 42 into and from clamping engagement with the clamping portion



of the frame 38 by the air cylinder 46 and piston 48 engaged with its free end. The clamp portion 38 of the frame 30 and clamping frame 40 are dimensioned to engage the side margins of the length of film 44 therebetween as well as the ends thereof and both have large rectangular apertures (not shown) therein which expose the major portion of the film. The clamping frame 40 has an inwardly inclined reflector element 50 extending peripherally thereabout and supported thereon for a purpose to be described fully hereinafter.

When the clamping frame 40 is moved into clamping position by the cylinder 46, it depresses the release bar assembly generally designated by the numeral 52, the structure of which is best seen in FIGURES 9 and 10. The release bar assembly 52 has a table element 54 with a downwradly sloping surface 55 adjacent the clamp portion 38 extending transversely under the film 44 and is mounted at its ends upon yoke members 56 and depending spring guide bars 58 which extend downwardly through cooperating apertures 60 in the frame 30. The spring guide bars 58 are limited in their free upward movement relative to the frame 30 by stop members 62 on the lower portion thereof secured below the apertured portion of the frame through which they extend. The release bar assembly 52 is normally biased upwardly by the helical, resiliently compressible spring members 64 which coil about the guide bars 58 and act between the frame 30 and the yoke member 56. As seen in FIGURE 9, the free end of the clamping frame 40 depresses the release bar assembly 52 against the action of the coil springs 64 into general alignment with the upper surface of the clamp portion 38 of the frame 30. Upon pivoting of the clamping frame 40 from the clamp portion 38, the release bar assembly 52 is biased upwardly and lifts the film 44 thereon above the level of the upper surface of the clamp portion 38 as seen in FIGURE 10.

The heater unit 66 is slidably mounted on the tracks 68 by the rollers 70 for movement into alignment over the clamping frame 40 and reflector element 50 and for movement away therefrom by an air cylinder (not shown). The heater unit 66 is relatively closely spaced above the reflector element 50 and contains electrical heating coils or elements (not shown) which generate heat relatively instantaneously upon receipt of current and which heat is funneled to the clamped length of film 44 by the inwardly inclined walls of the reflector element 50.

As best seen in FIGURES 11 and 12, the end of the film 44 also is clamped outwardly from the release bar assembly 52 by a conveying assembly generally designated by the numeral 72. The conveying assembly 72 has a frame 74 mounted on the tracks 76 by rollers 78 for slidable movement on the apparatus frame 30 towards and away from the release bar assembly 52. Slidably mounted for vertical movement within the frame 74 is the cutter and clamp bar member 80 having a cutting blade element 82 projecting from its lower surface and extending across the width of the film 44 and which is receivable within a cooperating slot 84 in the frame cross-piece 86 extending transversely under the film 44, thus permitting facile severing of the film 44 suported thereby. The lower surface of the cutter and clamp bar member 80 also has a plurality of clamping elements 88 spaced to the side of the cutting blade element 82 adjacent the release bar assembly 52 which cooperate with the planar surface portion of the cross-piece 86 to grip firmly the film 44 disposed therebetween. Vertical movement of the cutter and clamp bar member 80 relative to the cross-piece 86 is effected by the air cylinder 90, and movement of the conveying assembly 72 relative to the release bar assembly 52 is effected by the cylinder 92.

Support rollers 94 are also provided on the frame 30 in alignment with the conveyor (not shown) feeding the loaded support members 4 to the apparatus to facilitate loading and semi-automatic operation of the apparatus.

Various other conventional operating elements have been omitted for clarity of illustration.

Referring now in detail to the operation of this embodiment, the assembly of support member **4**, substrate **2** and articles **5** is fed into the apparatus on the support rollers **94** for seating upon the platform **32** as seen in FIGURE 4 at the commencement of the cycle. In this initial position, a length of film **44** is clamped between the clamping portion **38** of the frame **30** and the clamping frame **40** in a position overlying the assembly and the platform **32**. The end of the film **44** adjacent the discharge end of the apparatus (the lefthand side in the drawings) extends over the table element **54** of the release bar assembly **52** which is held downwardly substantially in the plane of the upper surface of the clamping portion **38** by the clamping frame **40**. In this initial portion of the cycle, the heater unit **66** is withdrawn to the side of the clamping frame.

In FIGURE 5, the heater unit **66** has been moved into operative position over the reflector element **50** and the length of film **44** clamped between the clamping frame **40** and clamp portion **38** by an air cylinder (not shown), and current supplied to the heating coils thereof has directed heat into the film **44**. When heat may have an adverse effect upon the substrate **2** or the article **5**, the heating cycle is controlled to supply the necessary heat for the bonding operation and to terminate prior to movement of the platform **32** upwardly into the illustrated position. Generally, however, the heat cycle continues into the vacuum cycle as the film **44** is being drawn about the article **5**, particularly when heat-activatable adhesive coatings or laminates are employed.

For purposes of clarity of illustration, the film **44** is shown taut within the clamped and heated area, although oftentimes the film at this point of the cycle may actually be distended and sagging after heating or may be distended upwardly by an initial blast of air prior to application of vacuum, as set forth in the aforementioned United States Patent Number 3,031,072. Air under pressure is being supplied to the lower portion of the cylinder **36** (shown in FIGURE 4) from the pressure pump **39** (shown in FIGURE 4) to raise the platform **32** towards the film **44** and suction is being drawn through the conduit **33** and thus through the substrate **2** by the action of the suction pump **37** (shown in FIGURE 4).

In FIGURE 6, the platform **32** has been moved upwardly to the full extent of travel and the vacuum has drawn the film **44** into a tight-fitting sheath about the article **5** and into bonding engagement with the substrate **2** in the area of laminar contact thereabout.

In FIGURE 7, the heater unit **66** has been moved to inoperative position by an air cylinder (not shown) as the skin-packaging assembly is cooling. Air from the pressure pump **39** is blown upwardly through the perforate support member **4** against the bottom surface of the now substantially impermeable skin-packaging assembly to lift the skin-packaging assembly upwardly of the upper surface of the upper spacing element **16** and the locating pins **20**. The platform **32** is being lowered by air from the pressure pump **39** entering the upper portion of the cylinder **36**. At the same time, the conveying assembly **72** (shown in FIGURES 11 and 12) starts to move under the action of the cylinder **92** away from the release bar assembly **52** with the film **44** clamped tightly between the clamping elements **88** and planar portion of the frame cross-piece **86**. Since the clamping frame **40** is preventing the portion of the film **44** secured thereby from movement, the portion of the film between the clamping frame **40** and the clamping elements **88** is placed under considerable tension but not sufficient to rupture the film.

In FIGURE 8, which is but a very short time after the situation illustrated in FIGURE 7, the platform **32** has continued to descend and the air is still blowing upwardly through the support member **4** when the clamping frame **40** is lifted by the cylinder **46** and piston **48**, thus releasing the film **44** therebetween and the release bar assembly **52**. Upon this release, the release bar assembly **52** has sprung upwardly to elevate the end of the film **44** supported thereon and the initial tension in the film between the conveying assembly **72** and clamping frame **40** has jerked the skin-packaging assembly towards the discharge end and coupled with the continuing movement of the conveying assembly **72** to draw the film and skin packaging assembly to the position illustrated.

In continuing operation of the apparatus, the conveying assembly **72** draws the skin-packaging assembly completely to the discharge end of the apparatus, thus introducing a fresh length of film **44** over the clamp portion **40** of the frame. After it has completed this movement, the cutter and clamping bar member is lifted by the cylinder **90** and is returned to its initial position by the cylinder **92** at which time the cutter and clamping bar member **80** is depressed by the cylinder **90** to sever the film outwardly of the skin-packaging assembly (or substrate) just processed and to clamp the new length of film. The platform **32** is lowered to its initial position and the clamping frame **40** is depressed to clamp the new length of film, thus readying the apparatus for a new cycle.

Turning now to FIGURES 13–16 of the attached drawings, a porous paperboard substrate generally designated by the numeral **102** is supported upon a similarly constructed perforate support member generally designated by the numeral **104**, and articles **106** to be packaged are placed thereon. As best seen in FIGURE 15, the substrate **102** is provided with a multiplicity of generally U-shaped incisions **108** arranged in cooperating groups of two or more, each pointing towards the article-receiving area defined therebetween so that the imperforate area between the legs thereof is outwardly of the article-receiving area. When the substrate **102** is pressed onto the projecting locating members or blades generally designated by the numeral **110** on the support member **104**, the generally U-shaped tabs **112** defined by the incisions **108** are lifted upwardly from the body **114** of the substrate **102** and are hinged to the body **114** of the substrate **102** outwardly of the article-receiving area. The cooperating group of incisions **108** may be a generally opposed pair when the primary bond-weakening motion of the article **106** is likely to be along one axis, or in two opposed pairs girding the article-receiving area as shown in the illustrated embodiment, or in other multiple orientations. Care should be taken to avoid excessive weakening of the substrate by spacing the incisions **108** too closely. The incisions **108** are preferably die cut on conventional equipment at the time of printing of the substrate **102** to facilitate handling and obtain maximum economy.

The incisions **108** and the locating blades **110** are arranged in cooperating predetermined spacing and configuration so that the locating blades **110** will register with the incisions **108** adjacent the base of the tabs **112** to raise the tabs into a substantially vertical position and to avoid interference with the article-receving area and the article **106** received therein, as is best seen in FIGURE 14. Similarly, the vertical projecting height of the locating blades **110** should be about one-third to two-thirds the height of the tabs **112** to minimize possible interference with the seating of the articles **106** received therebetween.

As best seen in FIGURE 14, the stem or blade portion **116** o fthe locating blades **110** is similar to a rule die and a head or flange portion **118** at the lower end thereof seats in a cooperating recess in the lower surface of the upper spacing element **120** of the support member **104** which is provided with a multiplicity of perforations **121**. As in the case of the support member **4** of FIGURE 2, the support member **104** includes the perforate metal tray **122** with its perforations **124**, the lower spacing element **126** with its perforations **128** and the screen element **130**.

As seen in FIGURE 16, the final package produced

by this assembly has the article **106** relatively firmly seated betwen the tabs **112**. The thermoplastic film **132** which has been drawn down about the article **106** and the tabs **112** firmly bonds to the body **114** of the substrate **102** in the area of laminar contact surrounding the article **106** and tabs **112**. In this package, it can be seen that movement of the article **106** along either principal horizontal axis of the body portion **114** is limited by the tabs **112** which are hinged at their base portion. This limitation effectively eliminates the shear stress upon the bond between the film **132** and body **114** of the substrate. Moreover, the composite action of the film **132** overlying the outer surface of the tabs **112** effectively eliminates the tendency for them to bow outwardly under the lateral loading of the article **106**. In this manner, a strong package substantially free from tendency to peeling of the film about the article can be ensured even with articles which are relatively heavy and/or of a configuration which does not seat stably upon the substrate.

In forming this package, it will be readily appreciated that the remaining steps of the method of the present invention are similarly employed. Although initially the vacuum will be largely drawn through the openings in the body **114** left by the tabs **112**, the film **132** seals the area outwardly thereof upon initial contact and suction is thus drawn relatively uniformly throughout the remaining area of the substrate **102** to effect the desired strong bond in the area of laminar contact. When the air is blown upwardly through the support member **104**, the packaging assembly will similarly be lifted upwardly of the projecting blades **110**.

Illustrative of the efficacy of the present invention is the following specific example:

## EXAMPLE ONE

A patent coated paperboard substrate which was vat-dyed and printed upon the upper surface and about 0.03 inch in thickness was pressed upon a perforate support member of the type illustrated in FIGURE 2 of the drawings with pairs of locating pins defining article-receiving areas therebetween of about 0.65 inch each repeating pattern of the printed substrate. The pins projected about 0.4 inch above the substrate. Cylindrical lipstick containers of about 0.62 inch diameter were placed between pairs of pins with their axes perpendicular to the line between the pins so as to substantially prevent rolling.

This assembly was introduced into skin-packaging apparatus of the type illustrated in FIGURES 4–12 having a polyethylene film of about 3 mils thickness which had been surface treated on its lower side. Heat was applied to the film by the heater for about 7 seconds as the platform was moved upwardly and a vacuum of about 23.7 inches of mercury was drawn through the support member and substrate to draw the heated film about the articles and pins into a tight-fitting sheath and into laminar contact with the substrate in the areas between pairs of pins and lipstick containers as well as about the margins of the substrate.

The heater was withdrawn as air under about 80 pounds pressure was blasted upwardly through the support member to lift the skin-packaging assembly upwardly of the upper surface of the support member and the locating pins. Simultaneously, the conveying assembly was moved towards the discharge end to tension the film outwardly of the clamping frame, and lowering movement of the platform was commenced. Immediately thereafter, the clamping frame was released and the skin-packaging assembly was jerked onto the table element of the release bar assembly and finally conveyed to the discharge end of the apparatus.

The skin-packaging assembly was cut into individual packages which were found to have the lipstick containers properly oriented within the printed pattern and the film tightly bonded thereabout. Upon close inspection, pin holes could be seen where the locating pins had penetrated the substrate adjacent the sides of the lipstick containers, but the overall appearance of the packages was excellent.

From the foregoing detailed specification and drawings, it can be seen that the present invention provides a novel and highly effective method and apparatus for packaging articles which are of a configuration prone to movement on the substrate and which prevents them from undesired movement. In accordance with one embodiment of the invention, this novel method may provide packages with lateral reinforcement for the film sheath to minimize the tendency for peeling of the film about the article during shipping, storage and handling of the packages, by use of substrates particularly prepared therefor. As will be readily appreciated, the method of the present invention may be readily adapted to many existing skin-packaging machines by relatively simple modifications of structure and operating cycles. The resultant packages are attractive and substantially uniform in appearance as well as being relatively economical by use of semi-automatic operation.

Having thus described the invention, I claim:

**1.** In the method of skin-packaging articles between a substrate and a thermoplastic film, the steps comprising: pressing a substrate onto an air-pervious support member having a generally planar surface and a plurality of locating members projecting upwardly therefrom to project said locating members through said substrate, said locating members being spaced apart to receive an article therebetween; placing an article on said substrate between said plurality of locating members; supporting a length of synthetic thermoplastic film adjacent the margins thereof in a position overlying said substrate, article and support member; drawing suction through said support member and substrate to draw said film about said article and into engagement with the upper surface of said substrate about said article to form a skin-packaging assembly; blowing air upwardly through said support member to lift said skin-packaging assembly upwardly of said planar surface and loctaing members thereof; lowering said support member relative to the supported ends of said length of film; and pulling one end of said film to draw said skin-packaging assembly to one side of said support member.

**2.** The method in accordance with claim **1** wherein said substrate is a porous paperboard and said film is a surface-treated polyolefin and wherein said film is bonded to said substrate by its own substance without the use of adhesives.

**3.** The method in accordance with claim **1** wherein said locating members have relatively sharp upper ends which pierce the substrate during the pressing thereon.

**4.** The method in accordance with claim **1** wherein said substrate is provided with a plurality of generally U-shaped incisions and wherein said locating members lift tabs defined by said incisions upwardly from the body of the substrate when said substrate is pressed thereon, the article being received between said tabs.

**5.** The method in accordance with claim **1** wherein said steps of blowing air upwardly and lowering said support member are contemporaneous.

**6.** The method in accordance with claim **1** wherein the step of lowering said support member commences subsequently to the commencement of the step of blowing air upwardly through the support member.

**7.** The method in accordance with claim **1** wherein said length of film is clamped firmly about its margins to provide the support therefor and wherein an end of the film outwardly of the clamp portion is pulled prior to release of the clamping force to impart tension to the film and facilitate rapid initial lateral movement upon release of the clamping force.

**8.** In the method of skin-packaging articles between a substrate and a thermoplastic film, the steps comprising: pressing a porous paperboard substrate onto an air-per-

vious support member haivng a generally planar surface and a multiplicity of cooperating pluralities of locating members projecting upwardly therefrom, said pressing causing said locating members to project through said substrate and said locating members of each plurality being spaced apart to receive an article therebetween; placing articles on said substrate between the locating members of said cooperating pluralities; clamping a length of synthetic plastic film adjacent the margins thereof in a position overlying said substrate, articles and support member; drawing suction through said support member and substrate to draw said film about said articles and into engagement with the upper surface of said substrate about said articles to form a skin-packaging assembly; blowing air upwardly through said support member to lift said skin-packaging assembly upwardly of said planar surface and locating members; lowering said support member relative to the supported ends of said length of film; initially pulling upon one end of said film outwardly of the clamped margins to apply lateral tension thereto; and releasing the clamping force and continuing to pull said one end of said film to draw said skin-packaging assembly to one side of said support member, said initial pulling of said one end of said film and said lowering steps being contemporaneous.

**9.** The method in accordance with claim **8** wherein said air-blowing step is contemporaneous with said lowering and initial pulling steps.

**10.** The method in accordance with claim **8** wherein said air-blowing step commences prior to said lowering step.

**11.** The method in accordance with claim **8** wherein said locating members have relatively sharp upper ends which pierce the substrate during the pressing thereon.

**12.** The method in accordance with claim **8** wherein said paperboard substrate is provided with a multiplicity of cooperating pluralities of generally U-shaped incisions and wherein said locating members lift tabs defined by said incisions upwardly from the body of the substrate when said substrate is pressed thereon, the articles being received between said tabs.

**13.** The method in accordance with claim **8** wherein said substrate is a porous paperboard and said film is a surface-treated polyolefin and wherein said film is bonded to said substrate by its own substance without the use of adhesives.

**14.** Apparatus for skin-packaging articles between a pervious substrate and a synthetic thermoplastic film to form a skin-packaging assembly, said apparatus including an air-pervious support member having a planar upper surface and a plurality of locating members projecting upwardly therefrom and spaced apart to define an article-receiving area therebetween, said locating members being adapted to project through an associated air-pervious substrate pressed thereon; a clamping assembly for clamping an associated length of synthetic thermoplastic film about the margins thereof in a position overlying said support member; platform means supporting and moving said support member upwardly and downwardly relative to said clamping assembly and associated thermoplastic film clamped therein; a conduit means to said support member opening on the upper surface thereof; means supplying a vacuum to said conduit means; means supplying air under pressure to said conduit means; a discharging assembly for pulling upon one end of an associated length of thermoplastic film outwardly of said clamping assembly to move the associated length of film to one side of said support member; and power and control means operable to draw suction through said support member and an associated support member pressed thereon to draw an associated length of thermoplastic film supported in said clamping assembly about an associated article placed on the associated substrate between said locating members and into engagement with the upper surface of the associated substrate to form a skin-packaging assembly, to blow air upwardly through said support member to lift the associated skin-packaging assembly formed thereby upwardly of said planar upper surface and said locating members of said support member, to lower said platform means and thereby said support member relative to the clamping assembly and the margins of the associated length of thermoplastic film clamped thereby, and to move said discharging means away from the said support member to pull an end of the associated length of thermoplastic film and thereby an associated skin-packaging assembly to one side of said support member, thereby permitting facile and rapid disengagement of an associated skin-packaging assembly from said projecting locating members of said support member.

**15.** The apparatus of claim **14** wherein said power and control means is operative to supply air under pressure to said conduit means contemporaneously with the supplying of power to said platform to lower said support member.

**16.** The apparatus of claim **14** wherein said power and control means is operative to supply power to said platform means to lower said support member subsequent to the supplying of air under pressure to said conduit means.

**17.** The apparatus of claim **14** wherein said locating members have relatively sharp upper ends to pierce the associated substrate during the pressing thereon.

**18.** The apparatus of claim **14** wherein said locating members are of elongate cross section and adapted to lift tabs upwardly from the body of an associated substrate formed therein by generally U-shaped incisions when the substrate is pressed thereon.

**19.** The apparatus of claim **14** wherein said power and control means supplies power to said discharging assembly to pull upon one end of the associated length of thermoplastic film and to release the film from said clamping assembly subsequent to the initiation of power discharging assembly whereby tension is initially imparted to the film outwardly of said clamping assembly to facilitate rapid initial lateral movement of the length of thermoplastic film upon release of the clamping force.

**20.** The apparatus of claim **19** wherein said power and control means is operative to supply power to said platform means to lower said support member contemporaneously with the initial supplying of power to said discharging means.

**21.** Apparatus for packaging articles between a pervious substrate and a synthetic thermoplastic film drawn tightly about the articles to be packaged and into engagement with the upper surface of the pervious substrate to form a skin-packaging assembly, said apparatus including an apparatus frame; a clamping assembly extending generally horizontally on said apparatus frame and having a pair of elements between which a length of associated thermoplastic film may extend, one of said elements being movable relative to the other of said elements to clamp an associated length of thermoplastic film therebetween about the margins thereof, said assembly having a substantially open center portion exposing both the upper and the lower surfaces of the major portion of an associated length of thermoplastic film received therein; power means for moving said one element relative to the other element; an air-pervious support member having a generally planar upper surface and a plurality of locating members projecting upwardly therefrom and spaced apart to receive an article therebetween, said locating members being adapted to project through an associated pervious substrate pressed thereon; platform means supporting said support member and movable upwardly and downwardly of said clamping assembly and registering with the center portion thereof to move an associated substrate on said support member into contact with associated film in said clamping assembly; power means for moving said platform means; conduit means to said support member opening on the upper surface thereof; heater means

positionable over the center portion of said clamping assembly and adapted to heat associated thermoplastic film clamped therein; means supplying a vacuum through said conduit means and said support member and thereby through an associated substrate pressed thereon to draw an associated heated thermoplastic film about an article on an associated substrate and into engagement with the upper surface of the associated substrate to form a skin-packaging assembly; means supplying air under pressure to said conduit means and upwardly of said support member and against the bottom surface of an associated substrate pressed thereon to lift the associated substrate upwardly of said planar surface and locating members of said support member; discharging means on said frame for clamping and pulling upon one end of an associated length of thermoplastic film outwardly of said clamping assembly to move an associated skin-packaging assembly formed in the apparatus to one side of said support means; power means for operating said discharging means; and control means for said several power means, vacuum-drawing means and air-blowing means operable to draw suction through said suport member and an associated substrate pressed thereon to draw an associated length of thermoplastic film supported in said clamping assembly and heated by said heater means about an associated article placed on the associated substrate between said locating members and into engagement with the upper surface of the associated substrate to form a skin-packaging assembly, to blow air upwardly through said support member to lift the associated skin-packaging assembly formed thereby upwardly of said planar upper surface and said locating members of said support member, to lower said platform means and thereby said support member relative to the clamping assembly and the margins of the associated length of thermoplastic film clamped thereby, and to move said discharging means away from the said support member to pull an end of the associated



length of thermoplastic film and thereby an associated skin-packaging assembly to one side of said support member, thereby permitting facile and rapid disengagement of an associated skin packaging assembly from said projecting locating members of said support member.

**22.** The apparatus of claim **21** wherein said control means is operative to actuate said power means for said discharging means and said power means for said platform means and to actuate said means for supplying air under pressure contemporaneously, thereby intitially pulling one end of the associated length of film contemporaneously with the blowing of air upwardly through the support member to lift the associated substrate as the platform means and support member therefor are being lowered relative to the clamping assembly.

**23.** The apparatus of claim **21** wherein said control means is operative to actuate said means for supplying air under pressure prior to actuating said power means for said platform means.


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