

[54] PROTECTIVE PACKAGE AND METHOD OF MANUFACTURE

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[57] ABSTRACT

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[58] Field of Search..... 206/80 A, 78 B

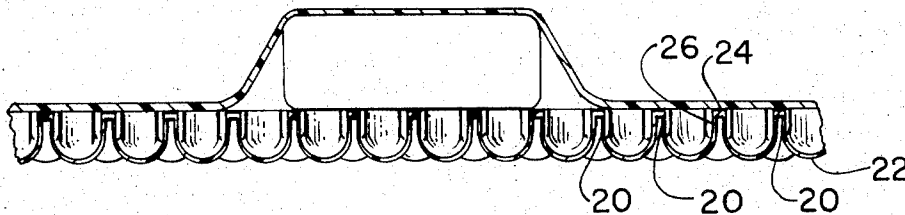
An improved package and method of manufacturing the package in which an article is placed on a plastic cushioning substrate and a second thermoplastic sheet is laminated to the cushioning substrate to enclose the article. The cushioning substrate is of a special design to give it the ability to absorb impact. The cushioning substrate may be provided with a recessed area to accept the article.

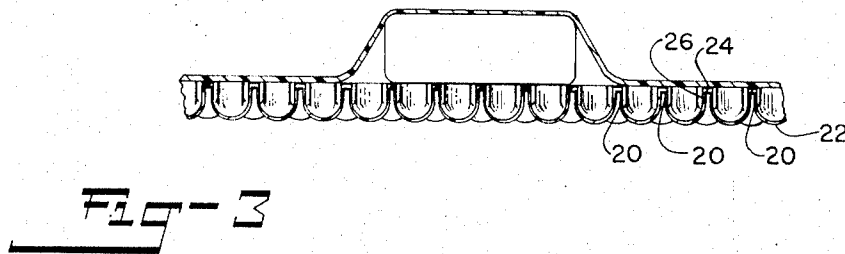
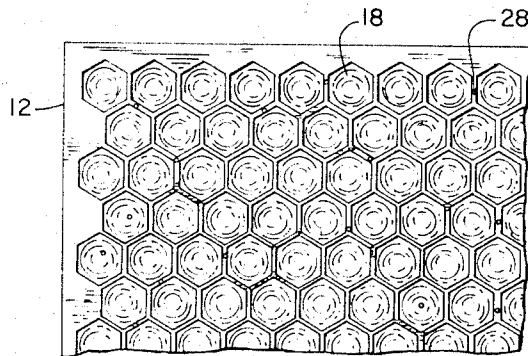
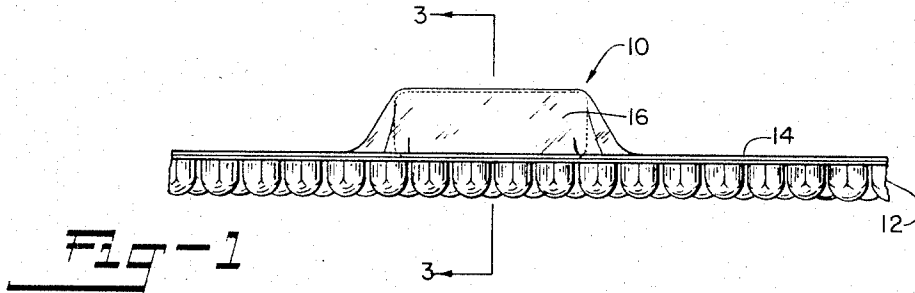
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2 Claims, 10 Drawing Figures





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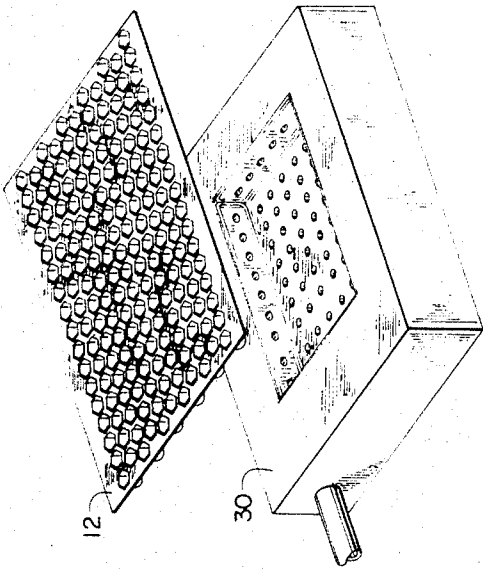


FIG-4

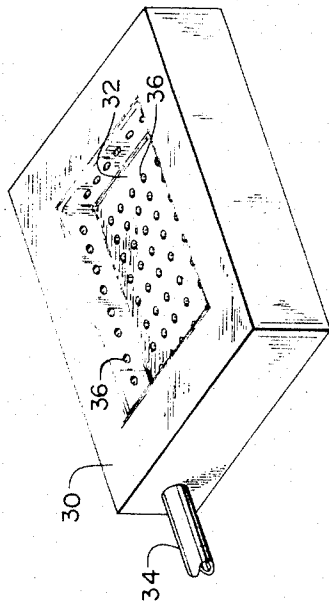


FIG-5

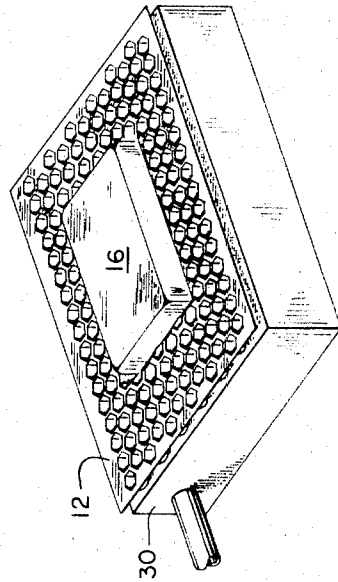


FIG-6



FIG-7

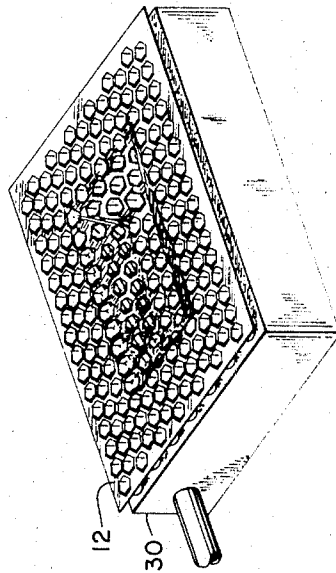
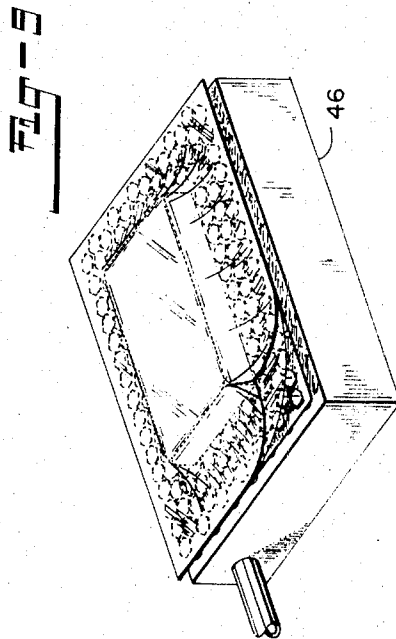
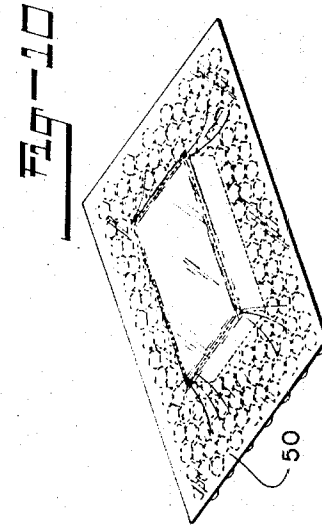
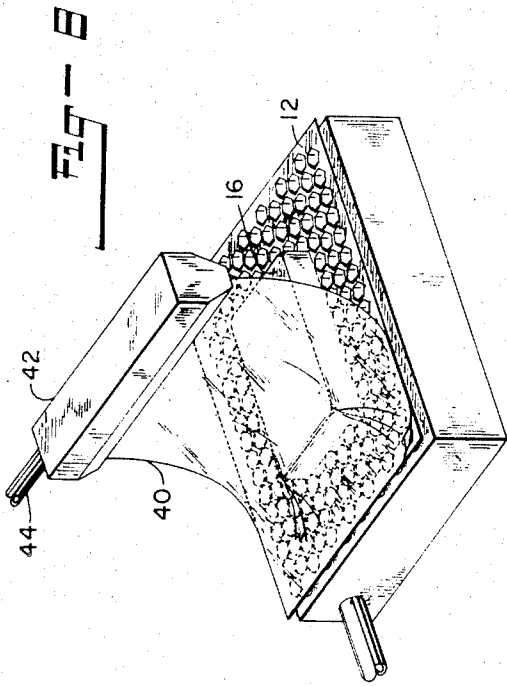


FIG-8

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## PROTECTIVE PACKAGE AND METHOD OF MANUFACTURE

This invention relates to improvements in packaging, and more particularly to a package and method of packaging which utilizes vacuum means to draw a thermoplastic film about an article, securing it to a cushioning substrate whereby intimate contact is achieved between the thermoplastic film and the substrate thereby forming an intimately conforming, composite package.

The packaging of an article between a protective or cushioning substrate and a transparent covering is particularly desirable for merchandising purposes. An article is thereby protected from the time of packaging until ultimate use by the consumer, and during this time it will be susceptible to extensive visual inspection and handling without destroying the protective characteristics of the package. A particularly desirable package is one that is simple and economical to fabricate, while providing reasonable rigidity and excellent dimensional conformity between transparent packaging material and a packaged article.

Many consumer articles, including food, toys, hardware, toilet goods and the like are merchandised in plastic packages. These packages include containers molded to fit the article, those in which film is wrapped around the article, or a combination package made from plastic and another material such as paper, metal foil, and the like. In most instances, the plastic serves as a complete covering or as a window or blister formed in a package made of some other material and permits the consumer to see the article. One of the more recent trends in packaging is to mount the article on a substrate and to apply a transparent plastic film as a coating over the article and the substrate to bind the article to the substrate.

Although the invention is described herein with particular emphasis on forming a layer of the package from a molten thermoplastic film, it should be realized that a preformed sheet may also be used for one layer of the package. It is, however, desirable to use a molten thermoplastic film to cover the article to be packaged after it has been placed on the substrate. Use of a preformed film involves the expense of a material which has already undergone manufacture as an independent, self-supporting sheet. In effect, the expenses of another operation are added to the cost of the final package. Additionally, dimensional conformity is more limited when starting with a solid film or sheet. The present invention overcomes these and other deficiencies of the prior art known as "skin packaging" using preformed sheets. When a preformed film is used, a heat seal or adhesive may be used to secure it to the substrate.

The general method of curtain coating is described in an article in "Modern Packaging," May, 1965, entitled "Skin Pack That Flows On." This article describes the placing of articles which are to be packaged on a substrate which is sufficiently porous for air to flow through the substrate. A vacuum is applied beneath the substrate, causing the pressure immediately above the substrate to be reduced. With a vacuum applied beneath the substrate, a curtain of viscous, molten thermoplastic material is spread over the articles and the substrate. The vacuum causes the molten curtain to be pulled snugly over the articles and over the upper surface of the substrate. When the thermoplastic material solidifies in place, it forms an excellent wrapper so as

to provide a package for the articles. When the package is to be opened, the plastic coating and the substrate are easily manually separated from the article. Inasmuch as curtain coating employs a molten liquid coating which solidifies very quickly due to the substantial absence of radiant heat while the coating is applied, there is no appreciable tendency in most situations for the coating material to crush, compress or distort the article being packaged nor to penetrate voids in the article so as to interfere with unwrapping. The principal problem in curtain coating is to avoid the thinning out of the coating near the line of contact with the substrate. This is obviously a distinctly different problem contrasted to skin packaging using cover sheets.

In accordance with this invention, a cushioned package for articles is provided by using sheet material as a substrate provided with a plurality of cellular protrusions shaving sidewalls generally perpendicular to the plane of the sheet material and of tapering thickness such as that described in copending application Ser. No. 880,587, filed Nov. 28, 1969. This material is used as a substrate for forming one side of the package according to this invention. The article to be packaged is placed on the substrate, and the substrate and a falling curtain of molten thermoplastic material are moved relative to each other such that the top of the cushioning substrate is coated with a molten film entrapping the article to be packaged between the cushioning substrate and the film.

A package made in accordance with the above briefly described method provides an inexpensive package for fragile products, and provides a substrate with built-in cushioning properties. It can readily be seen that such a package is easy to handle in several respects. The step of inserting separate cushioning material between products in a carton is eliminated. Also, with such a package, several articles could be packaged on a single sheet and sold in multiples.

It is therefore an object of this invention to provide an improved economical plastic cushioning container.

Another object of this invention is to provide a method of packaging using a substrate of plastic sheet material having a plurality of cushioning cellular protrusions.

These and other objects and advantages of this invention will be more apparent upon reference to the following specification, appended claims and drawings.

In the drawings:

FIG. 1 is an elevation view of a cushioning package according to the present invention.

FIG. 2 is a partial plan view of the cushioning package.

FIG. 3 is a section view taken substantially along line 3-3 of FIG. 1.

FIG. 4 is a schematic perspective view of a mold for shaping the plastic cushioning substrate.

FIG. 5 is a view similar to FIG. 4, showing a sheet of plastic cushioning material being placed on the mold.

FIG. 6 is a view similar to FIG. 4, showing the plastic cushioning substrate being formed with a recessed area.

FIG. 7 is a view similar to FIG. 4, showing an article to be packaged placed in the recessed area of the cushioning substrate.

FIG. 8 is another view similar to FIG. 4, showing a curtain of molten thermoplastic material being extruded as a cover film for the package.

FIG. 9 is another view similar to FIG. 4, illustrating the molten film drawn into close contact with the article and the cushioning substrate.

FIG. 10 is a perspective view of the completed package.

Referring now to the drawings wherein like numerals designate similar parts throughout the various views and with initial attention directed to FIGS. 1-3, reference numeral 10 designates generally a package according to this invention including a cushioning substrate 12 and a thermoplastic covering 14. An article enclosed within the package is represented by the numeral 16. The thermoplastic covering film 14 is secured in face-to-face contact with the cushioning substrate 12 by means of a heat-seal or adhesive connection. The film 14 and cushioning substrate 12 are, of course, held apart by the article 16 for a portion of their areas.

FIG. 2 is a partial plan view of a corner of the package according to our invention. The cushioning substrate is formed of a thin sheet of plastic material having a plurality of closely spaced cellular protrusions 18 formed therein. The protrusions 18 are bounded by generally vertical walls 20 and a thin bubble-like membrane 22 across the bottom. The membrane is formed during manufacture of the cushioning substrate by a thinning-out of the material as the cells are drawn in a mold by vacuum. The vertical walls 20 and adjacent cells 18 are connected by a planar-shaped portion 24 which in combination with the adjacent walls 20 form an inverted, U-shaped hollow beam 26. As seen in FIG. 3, the vertical walls 20 extend into the protrusions 18 for a distance and then gradually curve to merge into the thin, bubble-like membrane 22. The small interconnected beams formed by vertical walls 20 and planar portions 24 resist deformation and also exhibit the ability to regain their shape after being deformed. Also, the grid of network of interconnected beams results in a structure which distributes any applied load over a substantial portion of the network. Because the beams are formed of a flexible and deformable material, the combined strength of the network of beams will not be so great as to completely resist all deformation. The ability to deform under an impact load is important in absorbing the shock produced thereby and not transmitting it to the article being packaged. The ability to substantially regain the pre-deformation shape is important in resisting any subsequent impacts.

Most thermoplastic material suitable for forming films can be utilized in producing the protective shock-absorbent substrate. These include certain cellulose derivatives, polyacrylates, polyamides, polyesters, polyethers, polyhydroxy alcohols, polyolefins, polystyrenes, polyurethanes, and polyvinyls. A preferred material is low-density polyethylene.

As it will be necessary to transmit a vacuum through the cushioning substrate, a plurality of randomly spaced apertures 28 are formed in the cushioning substrate as best illustrated in FIG. 2. A film of thermoplastic material 14 is applied to the planar portion of the cushioning material after the article 16 has been placed thereon by a method to be described hereinafter. The article 16 is encapsulated between the cushioning substrate 12 and the film 14. FIGS. 6-10 illustrate a conve-

nient method for packaging articles in the cushioned package. In some instances, it may be desirable to form a recessed area in the cushioning substrate for the reception of an article to be packaged. In other situations, it will not be necessary for such a recessed area to be formed. If the recessed area is desired, the cushioning substrate 12 is placed over the mold 30 containing cavity 32. The mold 30 is connected to a source of vacuum through pipe 34 which communicates with the apertures 36 and the depressed portion of the mold. The cushioning substrate is placed on the top of the mold, illustrated in FIG. 5 and as illustrated in FIG. 6, heat and vacuum are simultaneously applied to the cushioning substrate in the area in which the recessed area is to be formed. In FIG. 7, after the recessed area is formed, an article 16 is placed therein for packaging.

In FIG. 8, as illustrated, a curtain of molten thermoplastic material is being draped over the substrate on which the article 16 is placed. The curtain of molten thermoplastic material is extruded from a nozzle 42 through which the material is transferred from a supply source not shown, through the pipe 44. The extrusion nozzle 42 and the cushioning substrate 12 are moved relative to each other so that the curtain 40 is draped over the cushioning substrate. A vacuum is then applied through the block 46 containing apertures in contact with the cushioning substrate to draw the film into close contact with the cushioning substrate and thereby form a heat-seal between the film 14 and the planar portions 24 of the cushioning substrate. The complete package 50 containing an article between the film and cushioning substrate is then removed from the block 46 for further processing or packaging.

The formation of the covering film 14 over a substrate on which an article to be packaged has been placed is further described in the "Modern Packaging" article referred to above.

The invention has been described in considerable detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. A protective package comprising,
  - a. a substrate
    1. formed of a thin sheet of thermoplastic material having a substantially planar portion,
    2. a plurality of adjacent, closely spaced hollow cells formed in said sheet and defined by walls extending substantially perpendicular to said planar portion, to thereby form a relatively thick, low bulk density cushioning material,
    3. said walls forming with said planar portion a plurality of interconnected, hollow beams having a relatively high resistance to crushing and the ability to regain their shape after an applied load is released,
  - b. one or more articles on said planar portion of said substrate,
  - c. a film attached by means of a heat-seal bond between said film and said substrate to at least a portion of said substrate in a zone surrounding said one or more articles, and
  - d. said film and said substrate having at least one portion which is not sealed to thereby form a protective container or pouch enclosing said one or more articles.
2. A package according to claim 1 in which said substrate is provided with a permanent depression for locating the article therein.

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