May 30, 1961 K. J. HARWOOD 2,986,270

CELLULOSIC PRODUCT

Filed Feb. 10, 1958 3 Sheets-Sheet 1

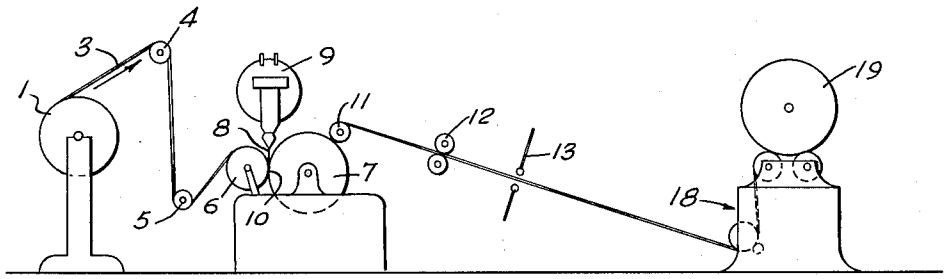


FIG. 1

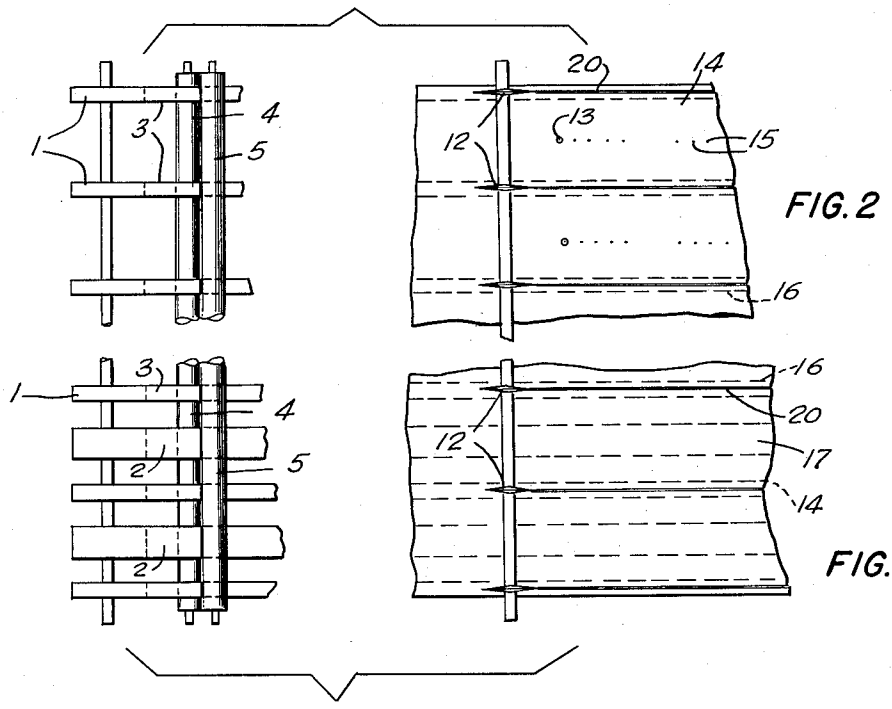


FIG. 2

FIG. 3

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FIG. 4

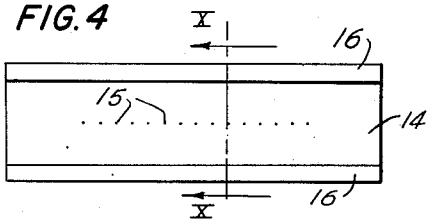
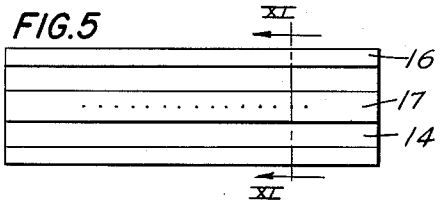


FIG. 5



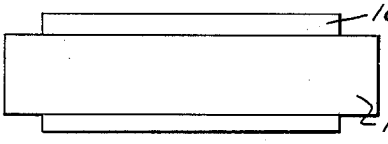


FIG. 6

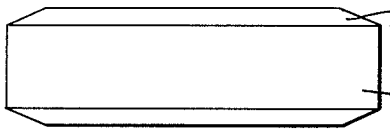


FIG. 7

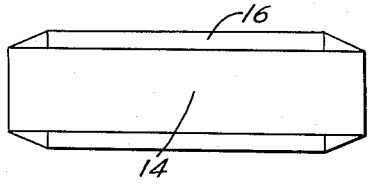
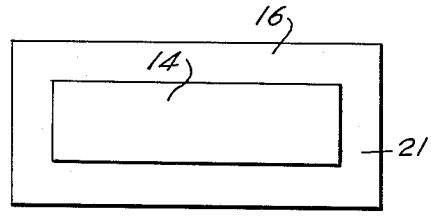


FIG. 8

FIG. 9



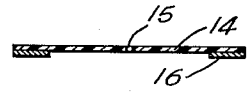


FIG. 10



FIG. 11

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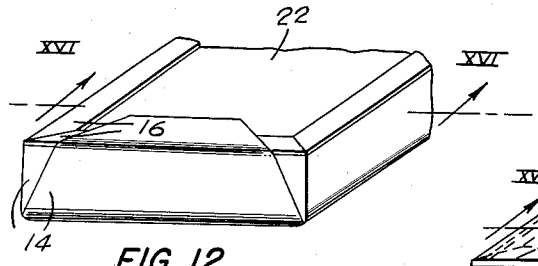


FIG. 12

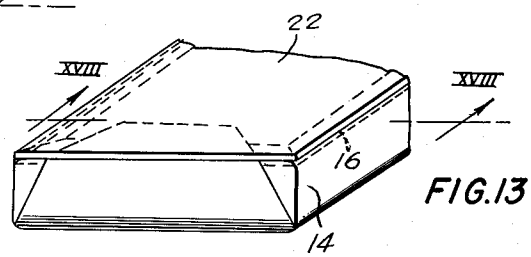


FIG. 13

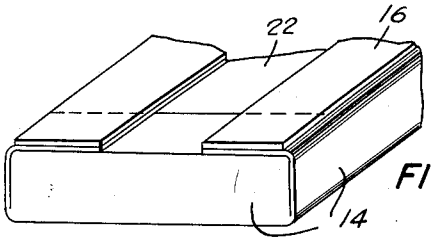


FIG. 14

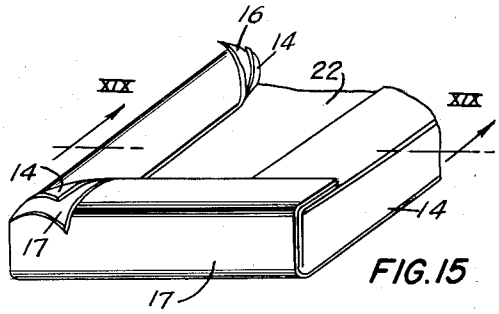


FIG. 15

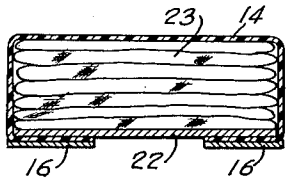


FIG. 16

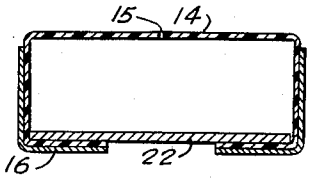


FIG. 17

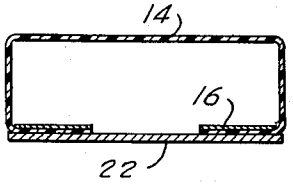


FIG. 18

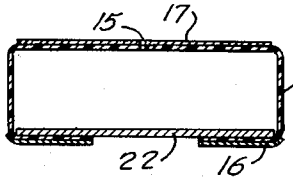


FIG. 19

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United States Patent Office 2,986,270 Patented May 30, 1961

2,986,270

CELLULOSIC PRODUCT

Kenneth J. Harwood, Neenah, Wis., assignor to Kimberly-Clark Corporation, Neenah, Wis., a corporation of Delaware

Filed Feb. 10, 1958, Ser. No. 714,110

6 Claims. (Cl. 206—45.33)

This invention relates to packages having a perceptibly soft, agreeable hand or feel in which, a thermosensitive wrapper is used in making the package. The thermosensitive wrapper may have a light transmitting portion which is transparent or translucent or it may be opaque. A preferred thermosensitive material is polyethylene.

Thermosensitive films for use as wrapping materials have long been known. A particularly desirable material has been recognized in polyethylene. This material is outstanding in its resistance to the passage of moisture and its resistance to chemicals and most common solvents. It is light in weight, having a specific gravity substantially less than 1.0; it may be extruded from a melt, and the films may be heat sealed. However, it has been found that thinner films consisting solely of polyethylene, or a thermoplastic material having similar properties, are often unsatisfactory in use, particularly where it is necessary to use automatic wrapping machinery. This is especially true when the film is relatively thin, i.e., of such thickness that the sheet is relatively flaccid, in which case it is difficult to attain economic, high speed operation on automatic machinery. The melting point and softening point temperatures of polyethylene are quite close, so that where it has been attempted to heat seal thin polyethylene films, the heat sealing element tends to pick up softened material unless the element itself is specially treated. These disadvantages may be partially overcome by using a thicker film but besides increasing the cost of the final package, the thicker film does not provide the soft hand desirable in the finished package.

A proposed solution to meet the above problems has been to use a laminated material, wherein a sheet of paper is laminated overall with the thin film. This does not fully solve the problem in that where the paper is inside the package difficulties in heat sealing remain, and where the paper is outside the package, the desired hand is lost.

The above disadvantages are obviated as set forth in the objects of invention and claims hereinunder.

It is an object of this invention to provide a package having as a wrapping a thin, flaccid, thermoplastic, heat sealed film material having paper strips along each longitudinal edge of the film, said film being laminated to said paper strips over the full width of said strips, without the use of a separate adhesive.

Another object of this invention is to provide a package having a perforated portion adapted to be torn along said perforations, with a strip of paper centrally of the film, in addition to the strips as mentioned in the above object, and with portions of the film free of paper to provide the added advantages of translucency or transparency, and to permit relatively trouble-free printing of the central paper strip, which is an advantage even though an opaque film is used.

Still another object is to provide a package utilizing the wrapping materials as described herein, said wrapper

being heat sealed, and the contents being substantially fully enclosed by the film.

Another object is to provide a package utilizing the above wrapping material, the package being assembled preferably on automatic wrapping machinery, with the paper strips of the wrapping material positioned inside the package and with a rectangular piece of paper or paperboard superposed over folded or tucked portions of the heat sealing material to prevent adherence of the film to heat sealing apparatus.

Another object is to provide a package utilizing the above wrapping material, the package being assembled preferably on automatic wrapping machinery, and having a rectangular piece of paper or paperboard forming one side of the finished package and being located within the edges of the wrapping material with the paper strips positioned on the outside of the finished package for contacting the heat sealing elements during the wrapping sequence and preventing adherence of the film to the heat sealing elements.

In the drawing, Fig. 1 is a side view of suitable apparatus for carrying out the method of the present invention.

Fig. 2 is a partial plan view of Fig. 1 showing the orientation of the paper strips and the extruded film, as well as a cutting and perforating step, and suitable apparatus therefor.

Fig. 3 is similar to Fig. 2 and shows the addition of a central strip of paper.

Fig. 4 shows one embodiment of the transparent or translucent wrapping material having strips of paper along the edges thereof.

Fig. 5 illustrates another embodiment of the invention in which a central strip of paper, in addition to the strips of paper along the edges of the wrapping sheet as shown in Fig. 4, is laminated shortly after extruding the strip of film.

Various other modifications of the wrapping strip shown in Fig. 4 are illustrated in Figs. 6 through 9.

A section on line X—X of Fig. 4 appears in Fig. 10.

A similar section on the line XI—XI of Fig. 5 is shown in Fig. 11.

In Fig. 12 there is illustrated a package showing the relationship of the edge strips, and the use of the wrapping material in conjunction with a reinforcing piece of paperboard or heavy paper at the bottom of the package, with the wrapping material heat sealed thereto, and with the paper strips on the outside of the package.

Fig. 13 shows another mode of utilizing the wrapping material of the invention, wherein the paper strips are next to the contents of a package, and the piece of paperboard or heavy paper is heat sealed to the thermoplastic film, whereby the film is sealed to the paperboard on one side and the paper strips on the other.

Fig. 14 is an illustration of a modification of the wrapping material and the resultant package wherein the corners of the wrapping sheet are cut off or folded, as shown in Figs. 6, 7 or 8, to provide a heat sealing surface along the full length of the package.

Fig. 15 shows a modification wherein the wrapping sheet is provided with a central strip of paper, preferably with at least the sides of the package being transparent or translucent and in any event consisting solely of the thermoplastic film.

Fig. 16 is an inverted section on lines XVI—XVI of Fig. 12. A section similar to that of Fig. 16 is shown in Fig. 17, but with wider strips of paper being utilized, in proportion to the height of the package.

Fig. 18 is a section also inverted, on line XVIII—XVIII of Fig. 13.

Fig. 19 is a section also inverted on line XIX—XIX of Fig. 15.

The drawings are not to the true scale.

The method of the present invention may be carried out on apparatus such as that illustrated in Fig. 1, with modifications as shown in Figs. 2 and 3. A plurality of narrow widths of paper **3** are unwound from rolls **1**, being then led over tension rolls **4**, **5** to a pressure roll **6**, suitably covered with soft silicone rubber or other resilient non-adherent material, held against a polished, chilled roll **7** by means (not shown) giving a resilient application of pressure by the pressure roll **6**. A thin film **8** of polyethylene, or similar thermoplastic material, is extruded from an extruder **9**, and while still soft and tacky or sticky is fed to the nip **10** between the pressure roller and the polished, chilled roll, whereby the tacky film and the paper strips are laminated. The cool roll **7** chills the warm, tacky film, and provides it with a polished surface. The silicone rubber pressure roll **6** may also be cooled by suitable means when extended runs are planned, and may be replaced by a roll having a surface of other suitable material with release characteristics.

The laminated sheet is held in contact with the cool roll until the sheet is cooled and the film is set, preferably at least a distance of one quarter of the circumference of the cool roll.

A take-off roll **11** removes the sheet from the cool roll, from whence it passes to rotary cutting knives **12**, at which point the laminated sheet is cut to divide each of the edge strips **3** into two portions, thus providing a wrapping sheet having a central unlaminated film portion **14** and strips of paper **16** integral therewith and along the edges thereof. The cut edges **20** are illustrated in Figs. 2 and 3.

After being slit by the rotary cutting knives, the individual wrapping strips may be perforated by passing between spark gaps **13**. In place of spark gaps, other perforating means may be used, preferably adapted to provide interrupted perforated portions, said portions being of a length approximately equal to the length of the finished package.

In some cases it is desirable to stiffen and reinforce the film, for example adjacent the perforated area, by providing an additional strip of paper arranged intermediate the side strips **16**. This may be applied similarly to the narrow paper strips **3** from the roll **1** by applying similar narrow strips **2** from similar rolls, but intermediate the two strips which will eventually be at the edges of the finished sheet. Such a process is shown in Fig. 3, and the end product comprises a sheet of flaccid thermoplastic film material **14**, having narrow strips of paper **16** attached to and terminating at the same point as the film along the edges thereof, with a narrow strip of paper **17** between the side strips. Portions of the film **14** having no paper thereover are present in each case.

Example

Nine strips of bleached kraft paper, having a basis weight of 40 lbs. per 25 x 38—500 sheet ream were fed into the nip of the press section of an extruding apparatus adapted to extrude a polyethylene film approximately 40 inches wide, said strips being 1½ inches in width and spaced on centers of 4½ inches. Polyethylene, in this case, Bakelite DYNF–3, with an average molecular weight of between 18,000 and 19,000, and a melting point of approximately 108° C., was heated to a temperature of between 270° and 290° C. and extruded at a point just above the nip of the press so that it was tacky at the point of contact with the narrow strips of paper. The press section consisted of a cool, polished steel roll which was kept at a temperature of about 5° C. by circulating brine therethrough, and a silicone-rubber covered roll adjustable to vary the pressure at the nip. The extruder provided a film approximately 40 inches wide and with a thickness of approximately 1 mil. The film was cooled to a temperature of about 25° C. on the cooling roll. The completed laminate was slit longitudinally at the center of each of the paper strips to yield a completed wrapper material 4½ inches wide. While the above is a specific example used by the inventor in carrying out the preferred mode of the process of his invention, certain changes may be made. Thus, polyethylene of molecular weights ranging from about 16,000 to about 23,000, and having melting points of approximately 106° C. to 111° C. may be used in lieu of the specific polyethylene mentioned above. The thickness of the film in the finished material may vary from .5 mil to 3 mils, a preferred range being from 0.8 to 1.25 mils. For the paper strips, a web made from bleached or unbleached sulfite, groundwood, kraft, soda or similar pulps, and/or mixtures thereof may be used, and the basis weight may vary from approximately 8 lbs. to 200 lbs., covering the range from light tissues up to thin boards. Although polyethylene is the preferred material, most of the desirable properties thereof also may be found in polypropylene and other homologues of polyethylene. Other soft flaccid films which are difficult to handle on automatic machinery especially when of thin caliper, are polyvinylidine chloride and its copolymers with other materials, polyvinyl acetate, polyvinyl chloride, and rubber hydrochloride. These materials could be used advantageously in accordance with this invention. In some cases, rather than extruding the film, flame spraying or hot calendering may be used.

Although less satisfactory than simultaneously forming the film and laminating it with the paper strips, the thermoplastic film may be first formed, and then laminated to the narrow strips of paper by the use of heat. During such a laminating step, the film must be restrained and handled similarly to the method used in the extrusion process, so that the film is not distorted by the heat.

Cross sections of the finished sheets made by the steps illustrated in Figs. 2 and 3 are shown in Figs. 10 and 11, plan views of which are shown in Figs. 4 and 5. As may be seen, the thermoplastic film **14** is provided along portions adjacent its longitudinal extremities with narrow paper strips **16**, which are adhered thereto by extensions of the thermoplastic film into surface irregularities of the paper strips.

In place of perforations **15** to provide a weakened area adapted to be spread to give a dispensing opening in the finished package, a tearing strip (not illustrated) could be used, although the weakened line is satisfactory for most applications. To provide rigidity adjacent the area of the weakened line or the dispensing opening, an additional strip of paper **17**, intermediate the side strips **16** and spaced therefrom, may be provided, while leaving portions **14** of the film limp and flaccid, and free of paper laminae.

As shown in Figs. 6, 7, and 8, the wrapping material may be modified by cutting out or folding portions of the corners of the sheet. The advantage in this is that the ends of the sheet may be folded around the ends of the package prior to folding over the paper covered portions, whereby heat sealing is provided along substantially the full length of the package, without interruption by double folds of paper at the corners. The modification of the wrapping sheet shown in Fig. 9 is useful where the sides of the sheet are folded around the package prior to folding the ends of the sheet, and portions **21** are supplied in this instance to serve to prevent sticking of the heat sealing surface to the thermoplastic film. Such portions **21** may be applied separately, or by similar methods (not shown) to those hereinbefore described for applying the side strips **16**, as, for example; by having suitable window portions cut from a continuous paper web before applying the latter to the thermoplastic film.

The finished package may be of the structure illustrated in Fig. 16, which is an inverted cross section on the line XVI—XVI of Fig. 12, which the contents **23** of the package being exposed to the view of the consumer through the outer film of thermoplastic material **14**, if a translucent or transparent film is used. A stiff paperboard or heavy, somewhat flexible paper **22**, forms the bottom of the package. This assists in holding the shape

of the package, as well as making it possible to use less of the thermoplastic film, thus reducing the cost of the package. In this figure, the paper strips **16** are wholly on the bottom of the package.

Figs. 16, 18, 19, as shown in perspective in Figs. 12, 13, and 15, illustrate modifications of the package. In Fig. 17, a further modification of Fig. 16, the paper strips **16** extend upwardly along the sides of the package, as may be desirable for very small or thin packages such as a pocket package of tissues. For a small package the dispensing opening need not be reinforced with more rigid material, particularly where the contents such as tissues are separately folded and not interconnected or interfolded for dispensing reasons. In the latter case, especially when a larger package is wrapped with the composite sheet of this invention, a reinforcing strip **17** intermediate the side strips **16** may be utilized as illustrated in Fig. 19.

Fig. 18 is a section, also inverted, on the line XVIII—XVIII of Fig. 13, and illustrates an embodiment wherein the side paper strips **16** are placed inside the package next to the contents. In this embodiment, the bottom piece of paperboard or heavy paper is positioned on the outside of the package, and in addition to the shape-retaining function and the function of minimizing the quantity of film required, it serves a purpose similar to the paper strips **16** in the above embodiments during the heat sealing operation by being interposed between the thermoplastic film and the heat sealing elements. The side of the film which is shiny, because of its juxtaposition to the cooled roll in the extruding operation, is exposed, and the satiny side is next to the contents of the package. The slick or smooth feel of the smooth side of the film is preferred by some consumers, and the folds of the wrapping material are for the most part concealed by the heavy paper or paperboard sheet **22**, adding to the attractiveness of the package.

Figs. 15 and 19 illustrate an embodiment suitable for larger containers of commodities, wherein a dispensing opening is utilized along the top of the package such as for cleansing tissues or for other commodities in which it is desirable to provide reinforcement of the top of the package, and to provide a good surface for printing, while retaining the advantage of softness, and/or visibility of the contents at the sides of the container. Although illustrated as extending the full width of the package, the reinforcing sheet of paper **17** at the top of the package may in some instances more desirably be limited to a narrow strip or portion of the top of the package, thus exposing a greater proportion of the contents to view when a transparent film is used, and giving the package greater attractiveness both from the standpoint of appearance and feel. The top sheet of paper **17** may in some instances be inside the package, similarly to the arrangement shown in Figs. 13 and 18.

Fig. 14 is similar to other embodiments, but the corners of the wrapping sheet are folded back or cut off as illustrated in Figs. 7 and 8. In this arrangement, the thermosensitive film portion **14** of the laminate is folded over the end of the package prior to folding the side strips over the bottom of the package. By having the corners modified as described above, the wrapping arrangement illustrated in Fig. 14 may be used, since the film may be heat sealed under substantially the full length of the side strips of paper **16**, whereas with a rectangular sheet of wrapping material the folds at the corners of the package would be such that superposed layers of paper at the folds might interfere with heat sealing at certain points. The wrapper illustrated in Fig. 6 shows the preferred modification, and is used similarly to the wrapping arrangement shown in Fig. 14.

The package may be used for retaining numerous materials, in addition to those mentioned above. Thus dry goods of all types, articles of clothing, food products such as candy bars, and numerous other manufactured and processed articles are conveniently packaged in the manner described herein.

Commercial packaging machinery may be utilized in applying the wrapping material of the invention. Thus, the United States Patent No. 2,602,276 to S. J. Campbell, illustrates apparatus which is useful. As illustrated in the Campbell patent, a package is produced which is similar to that illustrated in Fig. 15, of the present invention. The Campbell aparatus is modified for use in the present invention by adding heat sealing elements, preferably at points where the wrapping material is folded.

In addition to the advantages that the edge strips of paper stiffen the limp or flaccid polyethylene film and make it easier to handle in automatic machinery, and that the polyethylene or other film extends over the full width of the paper strips, thereby permitting heat sealing of the polyethylene which underlies the paper, the paper strips serve to stabilize, dimensionally, the polyethylene or other film. Thus, the strips permit longitudinal tension to be applied without causing the film to distort, stretch or break. This allows various treatments to be given to the polyethylene film which otherwise would be impractical. As one example, it permits printing to be done in register during the printing process and permits the register of the printed material to be controlled effectively when the wrapper is used in automatic packaging machinery. As another example, various methods of perforating the plastic film, hitherto done only with difficulty, can now be employed, satisfactorily, particularly where thin films useful in the present invention are utilized, as between .5 and 3 mils in thickness.

An example of this is using electricity to burn tiny holes in the film to provide a weakened area for opening the package to permit dispensing of the contents. Where it is attempted to treat films of polyethylene of the thickness utilized in the present invention in such manner, that is by printing or perforating, in the absence of the use of the reinforcing side strips of this invention, the film distorts and ruptures quite easily.

In the past, it has been extremely difficult to utilize thin films of the nature of polyethylene on automatic packaging machinery. As indicated earlier, the principal reasons for this are that polyethylene films do not adapt readily to heat sealing on automatic machinery because the film tends to fuse and degrade when it contacts the heating elements mainly because of the narrow temperature range between melting and softening points, in some instances fouling the heating elements, and also because tension could not be placed on the polyethylene film to the degree necessary to run it through such automatic machinery satisfactorily. Thus the film tends to gather at certain spots and stretch at other spots, unless the film is so thick as to be prohibitively expensive. In this invention, the paper strips prevent the polyethylene from contacting the heating elements, eliminating the fusion problem, and they provide tension points, thus eliminating the stretching problem, as well as preventing gathering.

A further advantage accrues when this wrapper is used with automatic packaging machinery in that the design of the heat sealing section can be simplified because the dangers of sticking and gumming-up of the equipment are eliminated.

In cases where printing is utilized, the film itself may be used as a base for the printing ink, with the printing being either on the inside or outside surface of the wrapper. In the modification described above wherein an additional strip of paper is utilized intermediate the side strips, while still leaving exposed certain portions of the film to take advantage of its soft, limp properties, said intermediate strip may be printed before or after laminating the sheets.

The advantages of a polyethylene wrapping material include its transparency, pleasant hand, and water resistance, and in addition, the material is notably abrasion resistant. This has been illustrated by applying

standard abrasion tests to the polyethylene film, and comparing the results with abrasion tests applied to other films and sheet material such as paper.

I claim:

1. A package having a top, sides, bottom and contents comprising a commodity wrapped with a thin, flaccid, thermoplastic film, said film extending over the top and sides of the package and at least partially over the bottom area thereof, a separate sheet of self-supporting paper or paperboard being adjacent the bottom of the contents of the package and adhered to the film solely by its thermoplastic properties with at least two edges of the thermoplastic film being substantially parallel to one another and adhered to separate narrow strips of paper terminating at said edges and adhered to the side of said film opposite said self-supporting sheet, a portion of said film being free of said strips of paper, said film being heat sealed between said strips of paper and said self-supporting sheet of paper or paperboard.

2. The package of claim 1 in which the self-supporting sheet of paper or paperboard and the contents of the package are juxtaposed, and the narrow strips of paper are outside the package.

3. The package of claim 1 in which the narrow strips of paper are inside the package and in contact with the contents thereof, and the self-supporting sheet of paper or paperboard is outside the package.

4. The package of claim 1 in which an additional strip of paper is adhered to said film at the top portion of the package, with at least the sides of the package free of paper.

5. The package of claim 1 in which the thermoplastic material is polyethylene, and the thickness of the film is between .5 and 3 mils.

6. The package of claim 1 in which the film is perforated along a line, whereby the film is adapted to be torn along said line for dispensing the contents of the package.

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