July 28, 1959 E. H. VOIGTMAN 2,896,626

DISPOSABLE ABSORBENT PAD

Original Filed March 5, 1953

Fig. 1.

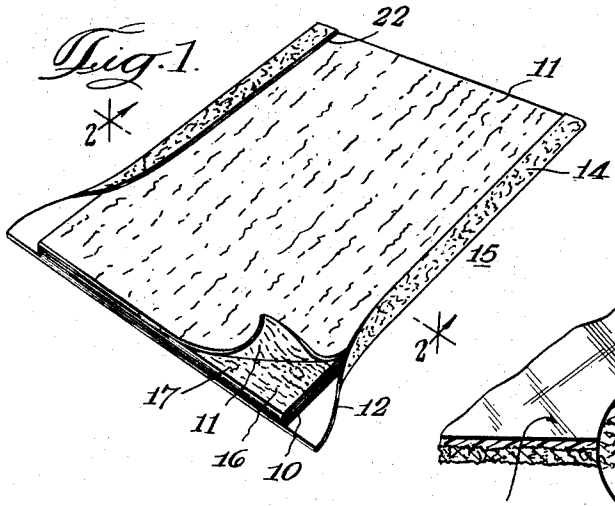


Fig. 3.

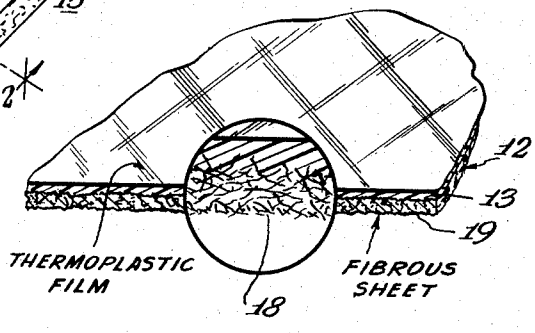
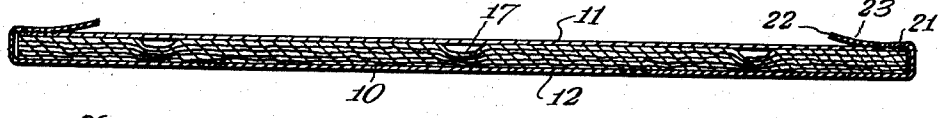


Fig. 2



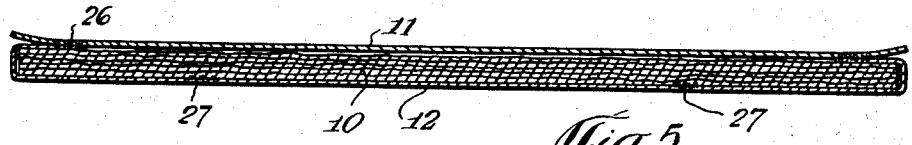


Fig. 5.

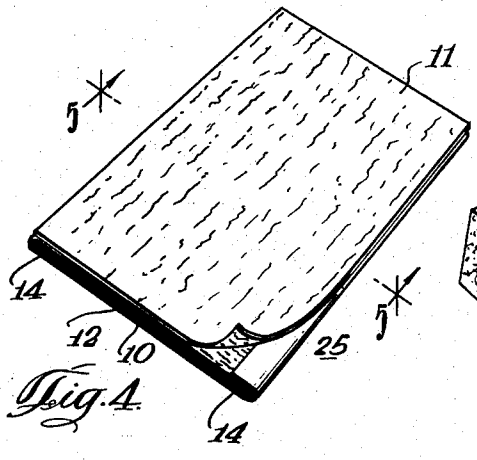


Fig. 4.

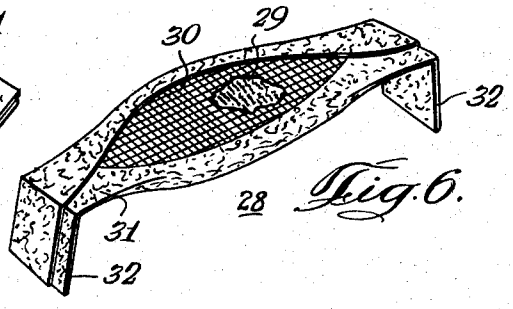


Fig. 6.

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DISPOSABLE ABSORBENT PAD

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Continuation of application Serial No. 340,522, Mar. 5, 1953. This application June 17, 1958, Serial No. 742,544

9 Claims. (Cl. 128—287)

The present invention relates generally to absorbent pads and more particularly, to disposable absorbent pads which are to be used once and then thrown away.

The main objects of the present invention are to provide an absorbent pad which can be produced cheaply enough to permit its being discarded after a single use; to provide a disposable absorbent pad of light weight and small bulk which is possessed of a maximum absorbent power; to provide a single use disposable pad such as a diaper or sanitary napkin which is non-discomforting, extremely efficient, and capable of easy disposal; to provide a disposable absorbent pad which includes a moisture permeable surface for letting liquids into the pad and a substantially moisture impervious opposing surface for retaining liquids within the pad; and to provide a disposable absorbent pad which is simple in construction and extremely efficient for its intended use.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings, wherein there are illustrated various disposable absorbent pads embodying selected forms of the invention.

In the drawings,

Figure 1 is a perspective view of a disposable diaper made in accordance with the present invention with some portions opened up to reveal other portions and certain details of construction;

Figure 2 is a cross sectional view along line 2—2 of Figure 1;

Figure 3 is an enlarged perspective view of the material of which the backing sheet is formed, an end portion of which is further magnified;

Figure 4 is a perspective view of another form of disposable diaper made in accordance with the present invention;

Figure 5 is a cross sectional view along the line 5—5 of Figure 4; and

Figure 6 is a perspective view of a sanitary napkin made in accordance with the present invention with a portion cut away to reveal the underlying construction.

The present invention may be employed in the manufacture of various forms of disposable pads, such as diapers, incontinent pads, antiseptic bandages, sanitary napkins, etc. However, for convenience only, the invention will be mainly considered in connection with disposable diapers.

When the disposable absorbent pad is designed in accordance with the present invention for use as a disposable diaper it includes a filling of absorbent material **10** of selected thickness, a cover sheet of liquid pervious material **11** which is substantially co-extensive in width with the filler material, and a substantially moistureproof, flexible protective backing sheet **12** which has a continuous thermoplastic coating **13** on at least one side thereof. The protective backing sheet **12** has marginal side portions **14** which are folded over the

margins of the top surface of the absorbent filler material **10**. The cover sheet **11** is arranged so as to be in face to face engagement with the coated side of the folded over portion of the protective backing sheet **12** and heat-sealed thereto so as to maintain the cover sheet **11**, filler material **10**, and protective backing sheet **12** in assembled relation.

Figures 1 and 2 illustrate the invention as applied to one form of disposable diaper **15**. In this structure, the pad or filling of absorbent material **10** which generally may be formed of any suitable material, is shown as being formed from a plurality of layers of absorbent creped tissue paper, a sufficient number of plies being employed to provide the thickness and absorbent capacity as desired. As illustrated at **16** in Figure 1, the wrinkling in the creped tissue paper sheets extends transversely of the diaper. Although generally not necessary, the plies of the creped tissue paper may in certain instances be united in relatively small, uniformly distributed areas indicated at **17** so as to maintain the plies in relatively fixed assembled relation wherein they constitute, in effect, a unitary absorbent pad of predetermined thickness. The plies may be united by means of adhesive material or by mechanical interconnection by compressing the superposed plies in the indicated areas, so as to more or less intermingle and interlock the fibers of the creped tissue plies.

The entire upper face of the absorbent filler material **10** of the disposable diaper illustrated in Figures 1 and 2 is covered by the liquid pervious sheet **11**. The cover sheet **11** is formed from a porous, air-laid web of cellulose fibers. It should be understood, however, that the cover sheet **11** may be formed of any porous web material formed from either textile or non-textile fibers by weaving, knitting, carding, water forming, air laying, etc.

The protective backing sheet **12** of the diaper is preferably formed of a flexible, smooth-surfaced, water-proofed material such as is described in my applications Serial No. 255,981, filed November 13, 1951, now abandoned, and Serial No. 511,932, filed May 31, 1955. This material has individual fibers **18** of such materials as cellulose, asbestos, or glass embedded in a continuous thermoplastic film **13**, with fibers extending into but not through the film as illustrated in Figure 3. A suitable thermoplastic film for this purpose might be formed from polyethylene, polyvinyl chloride, polyvinylidene chloride (polymer or copolymer), polyvinyl alcohol, polyvinyl acetate, polyvinyl chloride acetate, polymeric amide, or rubber hydrochloride.

If a fiber such as cellulosic fiber is used in the protective backing sheet **12**, the fiber surface **19** of the sheet will be water-absorbent, while, on the other hand, if a fiber such as fiber glass is used, the fiber surface will not be water-absorbent and the fibers will retain their strength in aqueous media. Thus, it will be apparent that the characteristics of the protective backing sheet **12** will depend upon the type of fiber employed and upon the manner in which the sheet is used.

To produce a backing sheet having characteristics suitable for this invention the fibers **18** in the protective backing sheet **12** should be in a substantially discontinuous phase so that they are individually embedded in the thermoplastic film **13**. This provides a film **13** having maximum flexibility while at the same time having increased body so that it has the handleability and usefulness of a substantially thicker film. It is important that the fibers be embedded in the film **13** without extending therethrough. In the latter connection, if the fibers extend through the film **13**, the continuity of the

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film is broken and many of its desirable characteristics such as strength and moisture resistance are impaired.

The thermoplastic film 13 may be from .15 to 1.5 mils in thickness, though for most commercially satisfactory embodiments, the film will be from .33 to .75 mil in thickness. Films which are less than .15 mil in thickness lose their handleability and certain functional properties such as gas permeability even though the fibers are embedded therein, and are easily damaged, while, on the other hand, films more than 1.5 mils in thickness become too expensive for most commercial purposes.

When the fibers 18 are embedded in the film 13, a firm bond is effected between the fibers and the film. Thus, the fibers 18 are locked in the film 13 and become an integral part thereof.

Embedding of the fibers 18 in the thermoplastic film 13 gives the fiber surface 19 of the film product 12, when cellulose fibers are used, a cosmetic feel which may be desirable when the film product 12 is placed next to the body. The fiber surface 19 will not slide as readily as the thermoplastic film surface 13 when it is in face to face contact with a smooth surface. Still another advantage achieved from embedding cellulosic fibers 18 into the film 13 is the provision of a film product 12 having a readily printable film surface 19 should such be desired.

As previously pointed out, it is desirable to embed the fibers 18 into the film 13 in a discontinuous phase but the accomplishment of this is difficult from the commercial standpoint. Accordingly, it has been found advantageous to prepare a loose, thin web of the fiber 18 and to embed the fibers of the web in the film 13 while the film is in a plastic or viscous condition. However, in so embedding the loose web in the film 13, it is of greatest importance that the fibers 18 of the web do not extend through the film 13. It is also highly important that the web approach the characteristics of the fibers 18 in a discontinuous phase. Thus, the web should present a large number of individual fibers 18 which can be embedded in the film 13, should be highly porous, and should be flexible so as not to impair the features of the thin plastic film 13.

The thin loose fiber web when embedded in the thin film 13 should have a weight of between about 2 and about 12 pounds per 3,000 square feet. It is often of very great advantage to use a creped web in order to present a maximum number of fibers 18 for embedding in the thermoplastic film. The crepe ratio of the web, i.e., the ratio of the length of the web prior to creping and the length of the web after creping is important in order to obtain the most effective embedding of the fibers 18 into the film and this ratio should be between about 1.05 and 2.3, the crepe ratio being, in general, directly proportional to the weight of the web. For purposes of this application, such a creped web is considered to comprise fibers in a substantially discontinuous phase.

In order to provide a film product 12 having the desired cosmetic feel, flexibility and permeability, cellulosic tissue having a basis weight (bone dry) of between about 4.5 pounds and about 12 pounds per ream of 3,000 square feet before creping should be used.

The film product or backing sheet 12 described above may be manufactured in the manner set forth in my applications, Serial No. 255,981, now abandoned, and Serial No. 511,932.

The protective backing sheet 12 is preferably somewhat wider than the width of the absorbent filler material 10 and has its opposite side marginal portions 14 folded around and over the opposite side marginal portions of the absorbent filler material 10. In the diaper illustrated in Figures 1 and 2, the fiber or cosmetic surface 19 of the backing sheet is located on the outer surface of the diaper so that the filler material 10 is in engagement with the thermoplastic film surface of the backing sheet. In this case, the marginal portions 14 of the backing sheet 12 also extend over and around the side marginal portions of the cover sheet 11.

The marginal portions 14 of the backing sheet 12 are heat-sealed in their folded over position to the surface of the cover sheet 11 either along the entire overlapping area or along selected lines as indicated at 21. This may be accomplished in any known manner such as, for example, by running the assembled diaper 15 longitudinally through a set of heated rollers (not shown). If desired, the backing sheet 12 may also be heat-sealed at selected points to the lower surface of the absorbent filler material so as to secure the elements of the diaper into a unitary structure which may be easily and conveniently handled.

When the marginal portions 14 of the backing sheet 12 are heat-sealed to the cover sheet 11 along lines which are located inwardly of the inner edges 22 of the marginal portions 14 in the manner illustrated, inner strips 23 of the marginal portions of the backing sheet 12 are free of attachment to the underlying cover sheet 11. These free strips 23 have a tendency to rise from the top surface of the cover sheet 11 and constitute, in effect, marginal retaining strips which tend to keep loose fecal material within the central area of the diaper 15. A diaper 15 constructed in the manner described above has an outwardly facing cosmetic surface 19 which is particularly desirable for use on a child having a sensitive or an irritated skin condition. The diaper 15 may be applied in much the same manner as the ordinary cloth diaper. This diaper is easy to apply, is soft, conforms well to the body, and is not irritating. It has adequate strength to withstand the usual stresses which result from the active movements of a young child and does not rattle.

An alternative form of diaper 25 is shown in Figures 4 and 5. In this construction the cosmetic surface 19 of the backing sheet 12 is placed inwardly so as to be in face-to-face engagement with the absorbent filler material 10. The opposite side marginal portions 14 of the backing sheet are folded around and over opposite side marginal portions of the absorbent filler material 10 in the same manner as in the previously described diaper construction. However, in this case the cover sheet 11 is placed over the filler material 10 and side marginal portions 14 of the backing sheet 12 so that the thermoplastic film surface 13 of the side marginal portions of the backing sheet 12 are in face-to-face engagement with the cover sheet 11. The marginal portions 14 of the backing sheet 12 are preferably heat-sealed to the cover sheet 11 as indicated at 26 so as to leave the outer marginal portions of the cover sheet free of attachment to the underlying portions of the backing sheet. This construction provides the diaper 25 with soft side edges which are generally desirable. The heat-sealing operation may be accomplished in the usual way, which may be similar to the method of heat-sealing used in the construction of the previously described diaper 15. In this modified construction, the absorbent filler material 10 may, if desered, be adhesively secured to the backing sheet by applying adhesive material to selected portions of the inside of the protective backing sheet as indicated at 27 so that when the backing sheet 12 is assembled with the absorbent filler material 10, the adhesive material will secure the two together.

The diaper 25 which is formed with the thermoplastic film surface 13 of the backing sheet 12 facing outwardly has various desirable characteristics. The thermoplastic surface 13 of the diaper has a feel which is easily detectable as the surface to be used away from the body. As in the first mentioned diaper construction, the diaper 25 is non-irritating, conforms well to the body, has adequate strength and is easy to apply. In addition, as the diaper 25 becomes wetted, the fibers (when they are absorbent) are softened, thus making the diaper more

flexible which consequently improves the conformability of the diaper to the body. Furthermore, the added fiber material in the interior of the diaper would, if absorbent, slightly increase the absorbency of the diaper.

Figure 6 illustrates the invention as applied to a sanitary napkin **28**. As illustrated, the sanitary napkin **28** includes a pad of absorbent filler material **29**, a cover sheet **30**, and a backing sheet **31**. These elements may be assembled in the same manner as has been described above in the construction of diapers with the thermoplastic film surface of the backing sheet **31** facing either inwardly or outwardly of the sanitary napkin **28**. In the form illustrated in Figure 6, the thermoplastic surface of the backing sheet **31** is shown as facing inwardly. In order to provide a means of attachment of the sanitary napkin **28** to a belt (not shown), the ends of the backing sheet **31** extend outwardly of the pad of filler material **29** so as to form tabs **32** which may be conveniently secured to the belt.

When the disposable absorbent pad is designed for certain uses such as an antiseptic bandage or incontinent pad (not shown), it may not be necessary to provide the pad with opposite side edges which are impervious to moisture. In such cases the pad may be alternatively constructed with a moistureproof backing sheet which is substantially co-extensive in width with the filler material and with a cover sheet which has opposite marginal side portions folded over and around opposite marginal side portions of the absorbent filler material and sealed in face-to-face engagement with marginal side portions of the thermoplastic film surface of the backing sheet.

One can also produce a commercially acceptable incontinent pad with the filler material slightly narrower than the cover sheet or moistureproof backing sheet. In such case, the marginal side portions of the cover sheet which are heat-sealed in face to face engagement to marginal side portions of the thermoplastic film surface of the backing sheet may be located entirely beyond the side margins of the filler material.

This application is a continuation-in-part of my application Serial No. 255,981, "Plastic Film Product," filed November 13, 1951, now abandoned, a continuation-in-part of which was filed on May 31, 1955 and assigned Serial No. 511,932, and is a continuation of my copending application Serial No. 340,522, "Disposable Absorbent Pad," filed March 5, 1953.

Various changes of construction as well as various additional applications may be resorted to without departing from the spirit or scope of the invention. Various features of the invention which are believed to be new are set forth in the following claims.

I claim:

1. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible protective backing sheet comprising a thin film of thermoplastic material having a loose web of fibrous material embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said protective backing sheet being in face to face engagement and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material, and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

2. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible, protective backing sheet comprising a thin film of thermoplastic material having a loose web of fibrous material embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement and heat-sealed to said cover sheet so as to maintain the cover sheet, filler material, and backing sheet in assembled relation, said folded over marginal portions having strips extending beyond the zone of attachment of said portions to said cover sheet and free of attachment thereto and having a tendency to rise from the surface of the cover sheet so as to constitute, in effect, marginal retaining strips.

3. A single use absorbent pad comprising a plurality of relatively superposed plies of absorbent crepe tissue paper constituting a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible, protective backing sheet comprising a web having a surface coating of a thermoplastic material on one side thereof, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, said backing sheet being secured to the bottom of said filler material at selected areas thereof so as not to impair the softness and flexibility of the pad, the coated side of said folded over portions of said backing sheet being in face to face engagement and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material, and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

4. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible, protective backing sheet comprising a thin film of thermoplastic material having fibers which approach a substantially discontinuous phase embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

5. A single use absorbent pad comprising a plurality of relatively superposed plies of absorbent crepe tissue constituting a filling of absorbent material of selected thickness, a cover sheet of pervious material substantially coexistence in width with said filler material and a flexible, protective backing sheet comprising a thin film of thermoplastic material having fibers which approach a substantially discontinuous phase embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, said backing sheet being sealed to the bottom of said filler material at selected areas thereof so as not to impair the softness and flexibility of the pad, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

6. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of

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a pervious material substantially co-extensive in width with said filler material and a flexible protective backing sheet comprising a thin film of thermoplastic material having fibers which approach a substantially discontinuous phase embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet so as to maintain the cover sheet, filler material and backing sheet in assembled relation, said folded over marginal portions having strips extending beyond the zone of attachment of said portions to said cover sheet and free of attachment thereto and having a tendency to rise from the surface of the cover sheet so as to constitute, in effect, marginal retaining strips.

7. A single use absorbent pad comprising a plurality of relatively superposed plies of absorbent crepe tissue constituting a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible protective backing sheet comprising a thin film of thermoplastic material having fibers which approach a substantially discontinuous phase embedded in one face thereof and extending only partially therethrough, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, said backing sheet being sealed to the bottom of said filler material at selected areas thereof so as not to impair the softness and flexibility of the pad, theh fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet so as to maintain the cover sheet, filler material and backing sheet in assembled relation, said folded over marginal portions having strips extending beyond the zone of attachment of said portions to said cover sheet and free of attachment thereto and having a tendency to rise from the surface of the cover sheet so as to constitute, in effect, marginal retaining strips.

8. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible protective backing sheet comprising a film of thermoplastic material having a thickness between .15 mil and 1.5 mils, said film having fibers which approach a substantially discontinuous phase embedded therein, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

9. A single use absorbent pad comprising a filling of absorbent material of selected thickness, a cover sheet of a pervious material substantially co-extensive in width with said filler material and a flexible protective backing sheet comprising a film of thermoplastic material having a thickness between .15 and 1.5 mils, said film having a loose web of fibrous material embedded in one face thereof, said web having a weight between about 4.5 and about 12 pounds per 3,000 square feet, said backing sheet having marginal side portions folded over the margins of the top surface of said absorbent filler material, the fiber-free side of said folded over portions of said backing sheet being in face to face engagement with and heat-sealed to said cover sheet along lines spaced from the side edges of one of said sheets so as to maintain the cover sheet, filler material and backing sheet in assembled relation and so as to leave edge strips which are free of attachment to the underlying sheet and which have a tendency to rise therefrom.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,896,626 July 28, 1959

Edward H. Voigtman

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, lines 59 and 60, for "desered" read -- desired --; column 6, lines 55 and 56, for "co-existence" read -- co-extensive --; column 7, line 31, for "theh" read -- the --.

Signed and sealed this 8th day of March 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

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