United States Patent

Fessenden

[15] **3,645,388**

[45] **Feb. 29, 1972**

[54] PACKAGE FOR A PLURALITY OF PRESSURE-SENSITIVE SENSITIZED SHEETS

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[22] Filed: **Feb. 12, 1970**

[21] Appl. No.: **10,881**

[52] **U.S. Cl.** ..... **206/62 R,** 229/14 C

[51] **Int. Cl.** **B65d 85/00**

[58] **Field of Search** ..... 206/62 R, 46 FC, 46 FR; 229/14 C, 43; 217/34, 35

[56] **References Cited**

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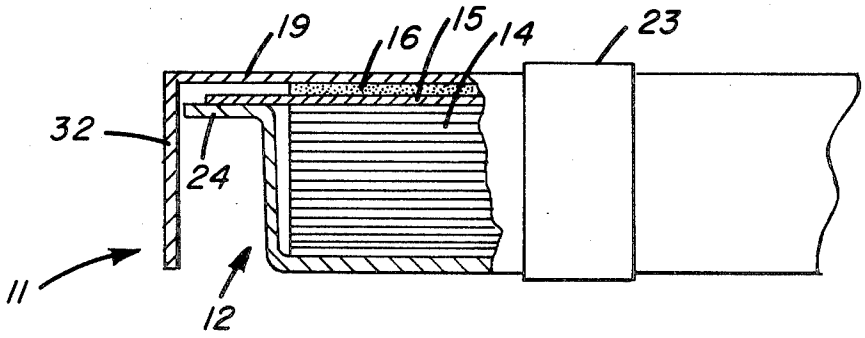
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[57] **ABSTRACT**

A package for a plurality of pressure-sensitive sensitized sheets wherein the sheets are positioned so that at least one of the sheets has its sensitized surface in contact with a surface of an adjacent sensitized sheet. The sheets are enclosed in the package and protected from abrading against one another by having a springlike pad means compressed in the package and maintained in compression by a plurality of walls so that the tendency of the pad means to expand continuously applies a compressive force to the sheets.

4 Claims, 5 Drawing Figures



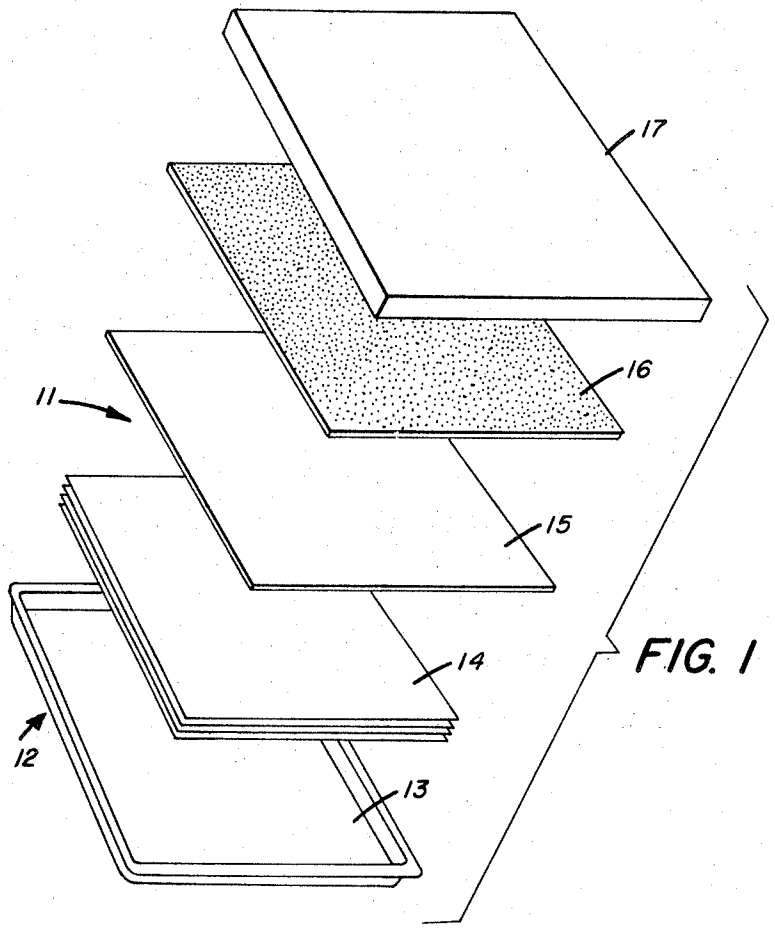


FIG. 1

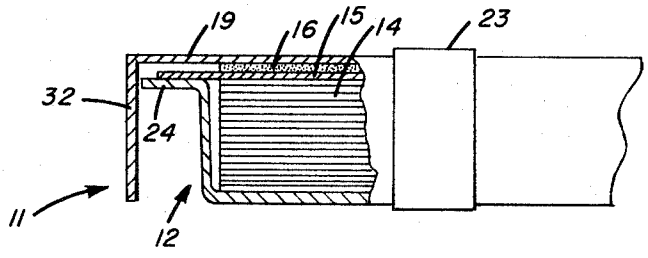


FIG. 2

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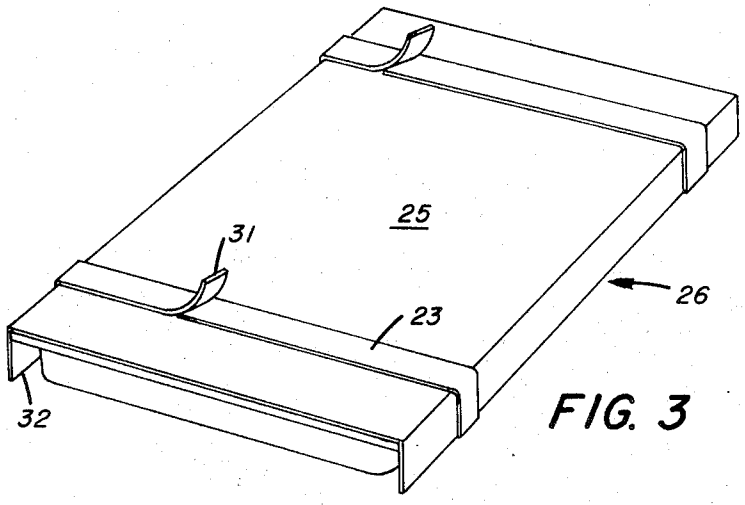


FIG. 3

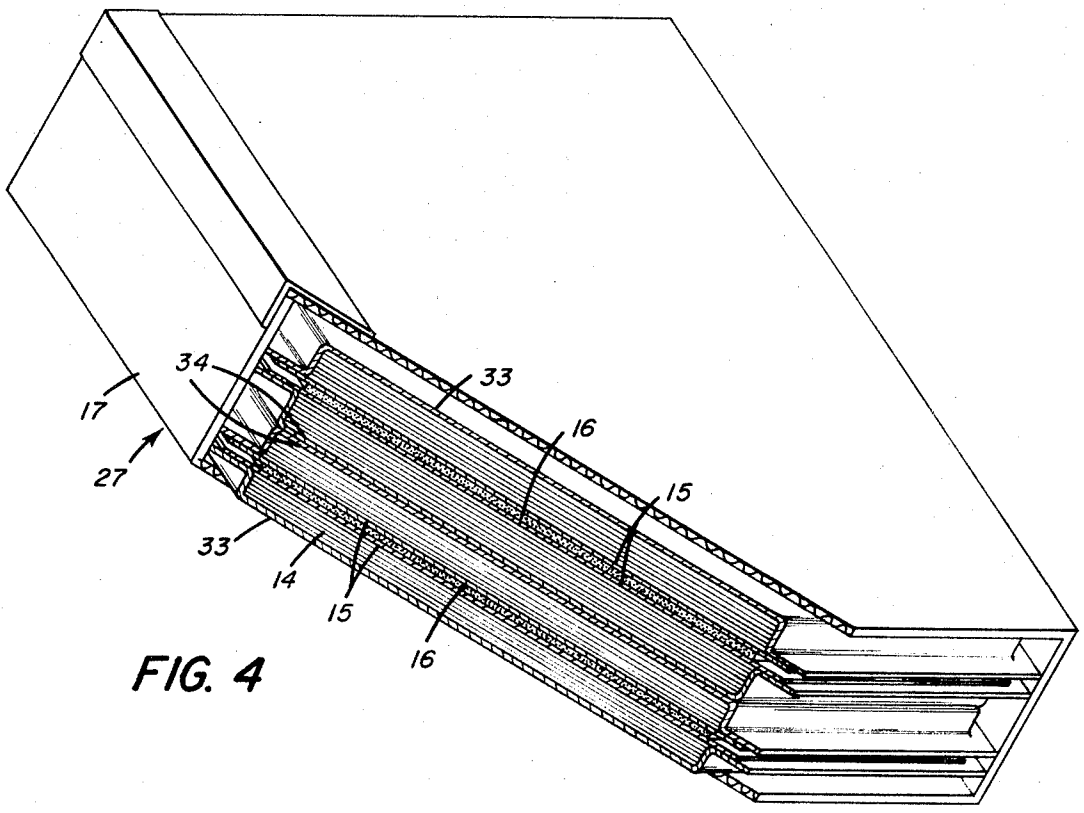


FIG. 4

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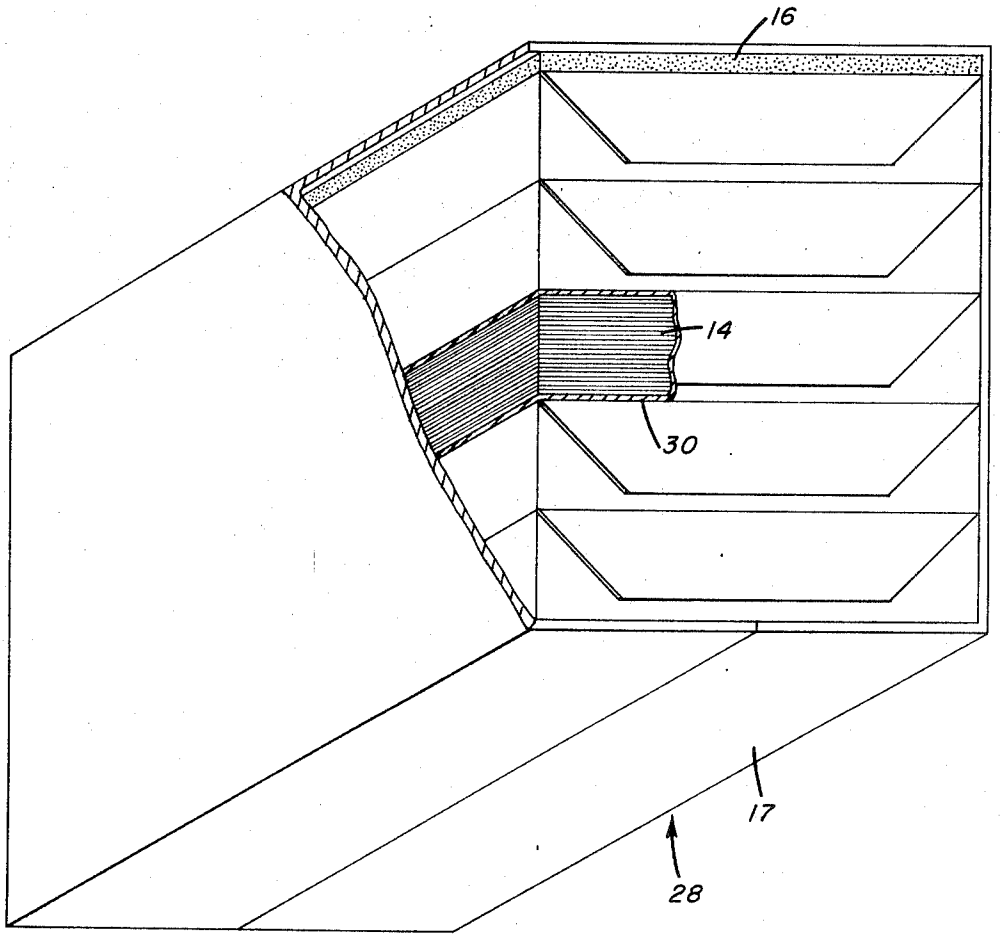


FIG. 5

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PACKAGE FOR A PLURALITY OF PRESSURE-SENSITIVE SENSITIZED SHEETS

BACKGROUND OF THE INVENTION

This invention relates to packages for the handling and storage of pressure-sensitive sensitized sheets, and more particularly for packaging a plurality of these sheets without interleaving therebetween. For example, in the packaging of X-ray film sheets having sensitized coatings it is well known to provide in the package a paper interleaf between adjacent sheets to prevent the sheets from rubbing against each other and thereby damaging their sensitized surfaces during handling and transporting of the package. However, these packages are not very suitable to automatic operations such as in the loading of sheet film into an X-ray cassette since a separate mechanism would be required to dispose of the interleaf.

Proposals have been made in the prior art to eliminate the use of interleaving, but in doing this, the problem of rubbing of adjacent sensitized sheets against each other arises with the attendant desensitization of portions of the film. Various designed packages have been suggested for overcoming this problem but they have not been satisfactory with those films having coatings which are highly pressure-sensitive.

One package which has been suggested has the stack of X-ray sheets tightly packed in wrapping paper which is then closely surrounded by a cardboard box. Another known method of packaging is to have the sheet film wrapped in a paper envelope which is thereafter tightly secured by wrapping adhesive tape about the envelope. A third known method disclosed in U.S. Pat. No. 3,185,298, is to place a paper sheet at the top and bottom of the stack of sheet film, and then place a cardboard sheet against each of the paper sheets. Thereafter, clips are placed at opposite ends of the stack to press the sheet film together to limit mobility. The stack thus held together by the clips is placed in an aluminum envelope which is then slid into a cardboard box.

The first two techniques have proved unfavorable since damage to the film still occurred when the stacks were transported under other than the most favorable conditions. In addition the first method involves a cumbersome method of packaging and thus results in increased costs of production. The second technique causes local pressure desensitization on some of the film sheets by the pressure of the tape on these sheets and thus produces fogging of the most vital areas of the film sheet. The third method is also unfavorable in some instances, since pressure from the clips can cause local pressure desensitization of a number of the film sheets which are closest to the clips. In addition, the separate manufacture and assembly of these clips on the stack involves additional costs to the manufacturer.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a package for a plurality of pressure-sensitive sensitized sheets which is light in weight, easy to assemble, economical and which substantially prevents the abrasion and desensitization of the sensitive contents.

It is a further object of the invention to provide a package for a plurality of pressure-sensitive sensitized sheets which eliminates the use of interleaving paper sheets between adjacent sensitized sheets without causing local pressure desensitization of the sheets.

These and other objects are accomplished by providing a package having a stack of sensitized sheets positioned one directly above the other so that at least one of the sheets has its sensitized surface in contact with a surface of an adjacent sensitized sheet; the sheets being compressed together by a compressed springlike pad which has a tendency to expand against the sheets and maintain them in compression to restrict surface-to-surface abrasion.

I have recognized that the deficiency in the prior art devices discussed above is that the paper or cardboard not being springlike tends to set in those areas where pressure is applied. As a result of this tendency to set the force from pressure-exerting means of the prior art packages using adhesive tape or clips is not adequately distributed over an area sufficient to prevent local pressure desensitization of those film sheets closest to the pressure-exerting means.

I have found that with the use of compressed springlike pad means this deficiency in the prior art devices of causing local fog on the sheets may be substantially prevented. In addition, I have found that surface-to-surface abrasion between adjacent sheets is restricted by the continuous urging of the sheets together by the springlike pad means. Since the pad means is springlike it does not set in the package and is at all times maintaining the sheets under compression.

In addition the pad means' lightweight, ready availability, low cost, nonbulkiness and easy workability make the package of my invention ideally suited for handling and transporting pressure-sensitive sensitized sheets.

Further advantages of sheet film packages in accordance with my invention will be apparent from the following description when taken in conjunction with the accompanying drawings, in which several embodiments of the invention are shown by way of example only.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view of one form of the invention.

FIG. 2 is a partially cut away fragmentary side view of a package similar to that shown in FIG. 1 but showing binding strips and more detail in the cover.

FIG. 3 is a perspective view of a package modified from that shown in FIG. 2.

FIG. 4 is a partially cut away perspective view of another embodiment of the invention.

FIG. 5 is a perspective view partially cut away of still another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing where like members are identified by the same reference number, FIG. 1 illustrates a package 11 including a tray 12 having a rigid wall 13 disposed adjacent to a plurality of pressure-sensitive sensitized sheets 14 positioned one directly above the other such that each sheet has a sensitized surface in contact with a surface of an adjacent sensitized sheet. Positioned above the sheets 14 and hermetically sealed to the tray 12 is a flexible opaque membrane 15 which prevents light and ambient moisture from reaching the sheets. Although membrane 15 is shown as having one layer, it will be appreciated that it may be comprised of a plurality of layers. Adjacent membrane 15 there is placed in superposed relationship to the sheets a springlike pad 16 which may, for example, be formed of an expanded polyurethane foam. Another material which may be used is an expanded polyethylene, but other materials other than those mentioned may be used which possess the highly resilient compressible springlike properties of the particular materials stated above. Disposed adjacent the springlike pad is a cover 17 which may be formed of a rigid cardboard. The cover 17 has a wall which abuts against the pad 16 and cooperates with wall 13 to compress the enclosed contents. The package may be securely closed by placing a plastic band under tension about the package and heat sealing the band to prevent release of the tension. In the closed package the two walls cooperate to constrain the compressed pad against expansion and thus maintain the pad in a stressed state so that its tendency to expand maintains a compressive force on the stack of sensitized sheets. Because of the springlike properties of the pad, a compressive force having a direction transverse to the plane of the sheets is continuously applied against the sheets, and thus at all times, surface-to-surface movement between adjacent sheets is substantially restricted. It has been found that for a foamed pad best results are achieved when the pad is compressed to about 50 percent of its unstressed thickness.

Although the pad **16** has been illustrated to have approximately the same surface area as the sensitized sheets, it will be appreciated that a picture frame-shaped pad may also be used as well as a plurality of pad strips.

With regard to FIG. **2** there is illustrated the package shown in FIG. **1** as it appears when closed. The sensitized sheets are shown compressed and protected from the outer environment by a flexible membrane **15** heat-sealed to the flat flange **24** which circumscribes the tray **12**. The cover **19** has a depending portion **32** on each side of the tray giving the cover a channel shaped cross section. Compression in the package is maintained by tightly winding binding straps **23** about the package and heat sealing adjacent layers to each other.

With reference to FIG. **3** there is shown a package **26** forming another embodiment of the invention and similar to that illustrated in FIGS. **1** and **2** but having the depending portion **32** of cover **25** on only two sides of the tray. There is also illustrated the binding straps **23** which have a short end **31** extending beyond the seal so that this end may be grasped to facilitate removal of the straps from the package.

In FIG. **4** there is illustrated another embodiment of the invention. Within package **27** there are positioned four hermetically sealed trays. The trays are arranged so that each of the outer trays **33** is in opposed face-to-face relationship with an adjacent inner tray **34** to form an opposed pair. Between each of the trays of an opposed pair there is placed a foam pad **16** which when compressed maintains the sensitized sheets in each of the trays of the opposed pair under compression. Although this embodiment has been illustrated with two opposed pairs it will be appreciated that any desired number of opposed pairs may be tightly packed into a cardboard cover **17** of appropriate dimensions.

In FIG. **5** there is shown a package **28** where a plurality of sheet stacks each surrounded by a hermetically sealed membrane **30** are placed in a rigid cover **17** with a foam pad **16** being positioned adjacent to one of the inner walls of the enclosure or cover **17**. Since the cover is tightly positioned about the contents the sheets are maintained under sufficient compression to restrict surface-to-surface movement between adjacent sensitized sheets.

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

I claim:

1. A package for a plurality of pressure-sensitive sensitized sheets comprising:

a tray, said tray including a generally planar base wall, an upstanding sidewall extending from and circumscribing said base wall so as to define a space into which said sheets may be stacked, said tray further including a flange extending from said sidewall in a direction away from said space and parallel to said base wall;

a stack of said sheets provided in said space, said sheets being positioned one directly above the other, so that at least one sheet has a sensitized surface in contact with a surface of an adjacent sensitized sheet;

a flexible opaque sheetlike cover positioned over and having one surface thereof in contact with said stack of sheets, said cover being sealed to said flange so as to prevent light and ambient moisture from entering said space;

compressive force exerting means including a compressed springlike pad means of foamed material, said springlike pad means being located on the side of said cover which is opposite to that which is in contact with said sheets and said pad means being constrained at least in part by said stack of sheets against expansion to an unstressed state, so that the tendency of said pad to expand continuously applies to said stack of sheets through said cover, a compressive force having a direction transverse to the plane of said sheets to thereby substantially restrict surface-to-surface movement between adjacent sheets.

2. The invention according to claim **1**, wherein said sheets are light-sensitive.

3. The invention according to claim **1**, and including a second tray similar to said first tray, said second tray being in face-to-face relationship with said first tray and said second tray having a similar respective stack of pressure-sensitive sheets provided in the space defined by said second tray, said space of said second tray being sealed by a respective flexible sheetlike opaque cover in a manner similar to that of the sealing of said space of said first tray, and said second tray being located on the opposite side of said pad means from that of said first tray, whereby said compressed pad means applies to said respective stack of sheets in said second tray a compressive force having a direction transverse to the plane of said sheets to thereby substantially restrict surface-to-surface movement between adjacent sheets.

4. The invention according to claim **3** wherein said first and second trays are enclosed within an outer covering of rigid cardboard.

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