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(54) Tear-open mailing envelope.

(57) A mailing envelope (10) of tear-resistant sheetstock can be easily torn open by forming a pair of closely spaced parallel cuts (16,17) through the sheetstock and bonding over the cuts a length of reinforcing tape (18) that has good resistance to impact, good longitudinal tensile strength, and readily tears longitudinally while being highly resistant to transverse tearing. When the reinforcing tape is bonded to an inner surface of the envelope and is cut at one end coincident with the cuts in the envelope, that end of the tape serves as a pull tab by which a strip of the tape can be pulled through the envelope to open it between said parallel cuts.

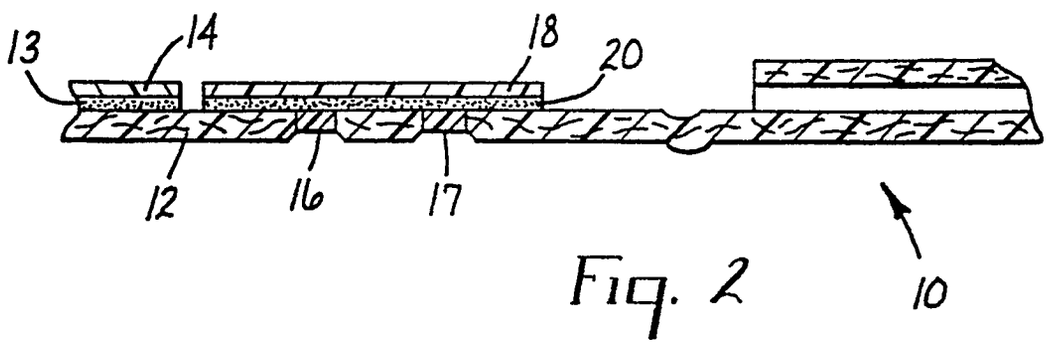

Fig. 2

EP 0 447 209 A1

TEAR-OPEN MAILING ENVELOPE

Background of the Invention

Field of the Invention

The invention concerns a tear-open mailing envelope. More specifically, the invention concerns an envelope that has a tear strip at lines of weakness in the sheetstock of which the envelope is made.

Description of the Related Art

The presently preferred sheetstock for tear-resistant mailing envelopes is spunbonded polyolefin which is sold by E.I. du Pont de Nemours under the trademark "Tyvek". It is so resistant to tearing that that it must be formed with lines of weakness to be torn open by a tear strip, but it delaminates fairly easily and thus tends to leave visual evidence of any attempt to surreptitiously open a flap or a seam.

The only disclosure of a tear strip for Tyvek-type sheetstock of which we are aware is in U.S. Pat. No. 4,781,296 (Morris et al.). It teaches the application of ultrasonic energy to change the fibers to a film along a pair of closely spaced parallel lines. Apparatus for doing so is shown in Figs. 3 and 4 of the Morris patent which says: "To provide a bag with the toughness of the original bag material but with an easy open tape system, a length of thermoplastic tape having a pressure-sensitive adhesive on one surface is adhered by the adhesive over the score lines where the fibers have been formed into a film and surrounding bag surface and further applying to the backing of said tape a tear strip having reinforcing filaments therein and a pressure-sensitive adhesive coating on one surface to adhere the same to the tape in a position between the lines" (col. 1, lines 61 ff).

Summary of the Invention

The present invention provides a mailing envelope that is made of tear-resistant sheetstock and can easily be opened by a tear strip, but won't open accidentally. As compared to that of the Morris envelope, the tear-open feature of the invention should be more economical to manufacture, because it employs only one tape, instead of two. It should also leave smoother edges at the opening.

The term "mailing envelope" is here used to encompass shipping bags and any other shipping container made with a tear-resistant sheetstock such as "Tyvek" spunbonded polyolefin.

Briefly, the tear-open mailing envelope of the invention, like that of the Morris patent, is a tear-resistant sheetstock having a pair of closely spaced parallel lines of weakness over which is bonded a length of flexible, reinforcing tape. In addition to employing only one tape, the novel tear-open mailing envelope differs from that of Morris in that the reinforcing tape has an Impact Value (as herein defined) of at least 300 N/dm, a longitudinal break strength (ASTM D-3759) of at least 1500 N/dm, readily tears longitudinally while being highly resistant to transverse tearing, and has a Tear Value (as herein defined) of less than 4 oz. (1 N) so that only a strip of the reinforcing tape that lies between said lines is peeled off to open the envelope.

The term "lines of weakness" is here used to encompass any line at which the tear-resistant sheetstock can be easily and cleanly separated, e.g., a razor cut or a fused score line of the Morris patent. With some tear-resistant sheetstock, it may be sufficient to form closely spaced perforations or partial cuts, but uninterrupted lines of weakness that extend completely through the thickness are required when using "Tyvek" spunbonded polyolefin, the sheetstock of choice for tear-open mailing envelopes of the invention. "Tyvek" spunbonded polyolefin is currently available in thicknesses from about 0.1 to 0.2 mm, all of which have sufficient tear resistance to be useful in tear-open mailing envelopes of the invention.

Preferably, the length of reinforcing tape is applied to cover an inner surface of the novel mailing envelope. At one end, the length of reinforcing tape can be cut for a short distance along the lines of weakness which, if not already cut, are cut to allow that portion of the end of the tape to serve as a pull tab. Upon pulling the tab with ones fingertips, the strip of tape between the lines of weakness readily separates from the rest of the tape and acts as a tear strip through the envelope to open the envelope between the above-described parallel lines of weakness. Alternatively, one end of the length of reinforcing tape can be left unbonded at an opening in the envelope through which the tab can be grasped to initiate the opening.

The reinforcing tape of the novel envelope can be any flexible tape that has the above-listed properties. A preferred reinforcing tape is disclosed in EPO Pat. Publ. No. 343,896 (Leseman) that was published Nov. 29, 1989. The backing of that reinforcing tape is a polymeric film having longitudinal polymeric ribs at one surface that afford easy longitudinal tearing and excellent resistance to crosswise tearing. Preferably the other surface of the backing bears an adhesive by which the tape is adhered to the novel envelope so that the ribs cleave the polymeric film when the tear strip is pulled through the envelope, thus leaving smooth edges at the opening. Also useful as the reinforcing tape are filament-reinforced tapes such as that of U.S. Pat. No. 2,753,294 (Pahl et al.) which has a kraft paper backing that should tear to leave smooth edges when the tear strip is pulled through the

envelope.

However, care should be taken in selecting a filament-reinforced tape that the lines of weakness are not bridged by a film backing of the tape after the tearing action. That is, when the filaments are pulled through the lines of weakness, they should cut through any film backing of the reinforcing tape. Tapes having polymeric film backings that are highly tensilized longitudinally should also be useful as the reinforcing tape. Such a backing could be embossed or scored in the lengthwise direction to enhance both widthwise strength and longitudinal tearing.

The strip of tape that opens the novel mailing envelope is reinforced by the underlying sheetstock and accordingly has greater strength and toughness than does unreinforced tape of the same width, thus significantly minimizing any danger of breakage of the tear strip while the envelope is being opened.

Preferably, the spacing between the lines of weakness is from 3 to 10 mm. At substantially closer spacings, the tear strip would be more difficult to grasp and might hurt the fingers of some persons. Furthermore, a narrow spacing would afford less sheetstock reinforcement to the tape strip, so that it would be more likely to break. On the other hand, spacings substantially larger than 10 mm would require the reinforcing tape to be wider and hence of greater cost with no offsetting advantage.

The length of reinforcing tape preferably has sufficient width to extend at least 6 mm laterally beyond each of the lines of weakness in order to make the mailing envelope adequately resistant to accidental opening in use. On the other hand, to make the reinforcing tape wide enough to extend substantially more than 12 mm beyond each line of weakness might be economically wasteful.

Mailing envelopes typically are formed from long rolls of sheetstock using apparatus that continuously cuts, folds and seals the sheetstock. Preferably, such apparatus. simultaneously forms the novel tear-open feature, either before or after putting the reinforcing tape into place. To permit this to be done without reducing the output, the lines of weakness preferably are razor cuts, because to create the lines ultrasonically would be likely to require slower line speeds. To simplify equipement by which the lines of weakness are formed, they preferably extend in the direction of movement of the sheetstock, typically adjacent an edge of the envelope that is perpendicular to the edge that bears a flap.

For convenience, the length of reinforcing tape that covers the lines of weakness bears an adhesive by which it can be bonded to the sheetstock of the mailing envelop. For utmost convenience, that adhesive is pressure-sensitive, but it can be heat- or solvent-activated. By employing the same adhesive that is used to seal the seams or is used on the flap of the envelope, the flexible tape will be equally resistant to unobtrusive tampering as are the seams and flap.

It may be feasible for the novel tear-open mailing envelope to have only one line of weakness and to form a nick in the reinforcing tape at each side of the line of weakness to initiate tearing. When that single line is formed ultrasonically, it should have sufficient width to permit a strip of tape to be pulled through without hurting ones' fingers. To form such a wide line might be unduly slow and wasteful of energy. If a relatively wide line of weakness is created by cutting, the adhesive of the reinforcing tape would be exposed, and the tear strip portion of the reinforcing tape would not derive reinforcement from the sheetstock of the envelope and so would be more likely to break accidentally.

The Drawings

The invention will be more readily understood in reference to the drawings, all figures of which are schematic. In the drawings:

FIG. 1 is a perspective view of a tear-open mailing envelope of the invention;

FIG. 1A is an enlarged portion of FIG. 1;

FIG. 2 is an enlarged cross section along line 2–2 of Fig. 1;

FIG. 3 is a perspective view of a second tear-open mailing envelope of the invention; and

FIG. 4 is an enlarged cross section along line 4–4 of Fig. 3.

Detailed Description of Preferred Embodiments

The mailing envelope 10 of Figs. 1 and 2 is formed of tear-resistant spunbonded polyolefin sheetstock. A flap 12 bears a layer of pressure-sensitive adhesive 13 that is protected by a removable liner 14. Formed in the flap are a pair of closely spaced parallel lines of weakness 16 and 17 at which the fibers of the spunbonded polyolefin have been changed to a film ultrasonically. A length of reinforcing tape 18 has an adhesive layer 20 by which it has been permanently bonded to the flap to cover the lines of weakness 16 and 17. At one end, the tape has been cut at 21 over a short distance to coincide with the underlying lines of weakness which also have been cut over the same distance to create a pull tab 22 as shown in FIG. 1A.

After the liner 14 has been removed and the flap has been adhered to the body of the envelope by its adhesive 13, the tab 22 can be pulled with ones fingertips. This separates the strip of tape between the lines of weakness from the rest of the reinforcing tape 18 so that the strip can act as a tear strip upon being pulled through the flap to open the envelope between the parallel lines of weakness.

The mailing envelope 30 of Figs. 3 and 4 also is formed of tear-resistant sheetstock. Adjacent an edge of the envelope that is perpendicular to the edge that

bears a flap 32 are a pair of closely spaced parallel cuts 33 and 34. A length of reinforcing tape 36 has an adhesive layer 37 by which it has been permanently bonded to the inner surface of the envelope to cover the cuts 33 and 34. At one end, the tape has been cut over a short distance to coincide with the cuts in the envelope to create a pull tab 39.

TESTING

Impact Value

A sample is prepared using two rectangles of "Tyvek" spunbonded polyolefin sheetstock, each 2 by 6 inches (5.1 by 15.2 cm). A gap of 1/4 inch (6 mm) between long edges of the "Tyvek" polyolefin is spanned by a 6-inch (15.2 cm) length of 1-inch (2.54 cm) wide reinforcing tape to be tested. This assembly is mounted between the jaws of an Instron Tensile Tester (CRE), which jaws are 1.5 inches (3.8 cm) wide and spaced 2 inches (5.1 cm) apart. The jaws are separated at a rate of 1000 inches (2.54 m) per minute. The "Impact Value" is peak resistance, reported in N/dm (of jaw width).

Tear Value

A length of reinforcing tape to be tested is razor slit about 4 cm lengthwise at the center. The free ends at either side of the slit are clamped to the jaws of an Instron Tensile Tester (CRE which are then separated longitudinally at a rate of 50 inches (127 cm) per minute, and the average resistance is the "Tear Value".

Example 1

A "2-pound Pak" Express Mail envelope was obtained from the U.S. Postal Service, made of 18-pound "Tyvek" spunbonded polyolefin sheetstock, was 39 cm in length, 31 cm in width, and had a flap. As illustrated in Figs. 1 and 2, two lines of weakness were formed ultrasonically across the flap. The lines of weakness were 2 mm wide, 6 mm apart, and extended through the thickness of the sheetstock from a spacing of 3 mm from a first edge of the flap through the second edge of the flap. Centrally over the lines of weakness, a pressure-sensitive adhesive reinforcing tape one inch (2.54 cm) in width was adhered by its own adhesive as shown in Fig. 1, which tape had been made as disclosed in the above-cited Leseman EPO patent publication. The reinforcing tape had an Impact Value of 490 N/dm, a longitudinal break strength of 3150 N/dm, and a Tear Value of 0.75 N.

A razor slit was then made through each line of weakness and the overlying tape to a distance of 1.3 cm from the second edge of the tape to provide a pull tab. The tab was pulled to carry with it a tear strip from the middle of the tape and underlying envelope sheetstock until reaching the weakness-free area at the first edge of the tab, there coming to an abrupt stop that caused the tab to slip from the fingertips. Thus the torn-off portion of the flap and tear strip remained attached to the envelope to permit both to be discarded as one unit after materials had been removed from the envelope. The edges of the flap at the tear were smooth. It was significantly easier to tear open the envelope of this Example 2 as compared to that of Example 1.

Example 2

An envelope identical to that of Fig. 1 was provided with a tear-open feature like that of Example 1 except that the lines of weakness were razor slits. Pulling on its tab with ones' fingertips removed the strip of tape between the razor slits and thus opened the flap, again leaving the torn-off portion of the flap and tear strip attached to the envelope, and the torn edges were smooth.

Claims

1. A tear-open mailing envelope (10) comprising tear-resistant sheetstock, the invention characterized by a pair of closely spaced parallel lines of weakness (16,17) formed in the sheetstock over which is bonded a length of flexible reinforcing tape (18) that readily tears longitudinally while being highly resistant to transverse tearing, so that only a strip of the reinforcing tape that lies between said lines is peeled off to open the envelope.

2. A tear-open mailing envelope (10) as defined in claim 1 further characterized in that the sheetstock is spunbonded polyolefin.

3. A tear-open mailing envelope (10) as defined in claim 1 further characterized in that the lines of weakness (16,17) are uninterrupted and extend completely through the thickness of the sheetstock.

4. A tear-open mailing envelope (10) as defined in claim 1 further characterized in that the length of reinforcing tape (18) is adhered to an inner surface of the mailing envelope (10).

5. A tear-open mailing envelope (10) as defined in claim 4 further characterized in that the length of reinforcing tape is cut for a short distance along the lines of weakness to allow that portion of the end of the tape to serve as a pull tab.

6. A tear-open mailing envelope (10) as defined in claim 1 further characterized in that the reinforcing tape (18) comprises a polymeric film backing having polymeric ribs at one surface and a layer of adhesive on the other surface by which the tape is adhered to the envelope.

7. A method of making a tear-open mailing envelope (10) of tear-resistant sheetstock, the invention characterized by the steps of
   a) forming in the sheetstock a pair of closely spaced parallel lines of weakness (16,17);
   b) bonding to the sheetstock over said lines of weakness a length of flexible reinforcing tape (18) that readily tears longitudinally while being highly resistant to transverse tearing, and
   c) cutting, folding, and sealing the sheetstock to form the mailing envelope (10).

8. The method as defined in claim 7 where the sheetstock is folded in step c) so that the length of reinforcing tape (18) covers an inner surface of the envelope.

9. The method as defined in claim 8, in step a) the step of forming the lines of weakness (16,17) by cutting completely through the sheetstock over a distance substantially equal to the length of the reinforcing tape (18).

10. The method as defined in claim 9, the invention further characterized by the added step of cutting one end of the reinforcing tape (18) for a short distance along the lines of weakness (16,17) to provide a pull tab.

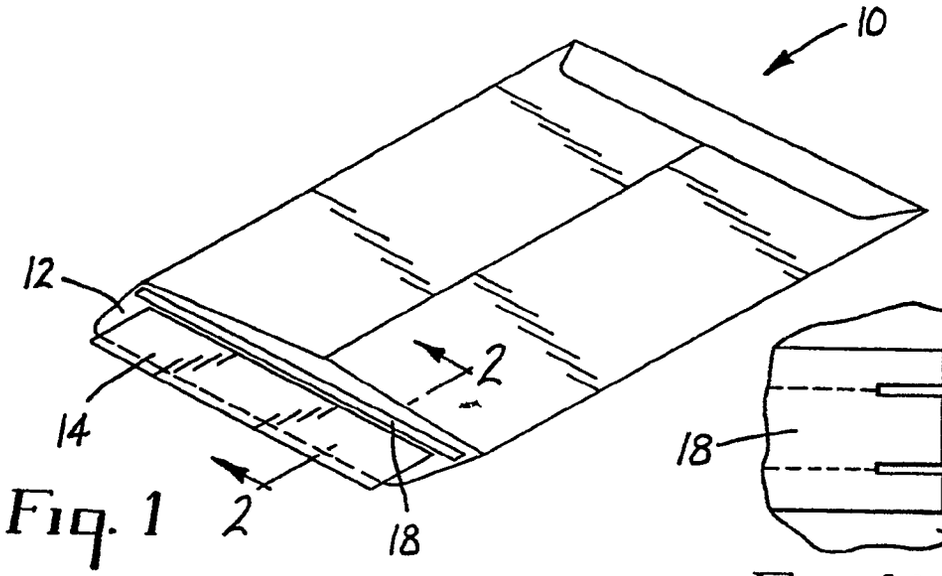

Fig. 1

Fig. 1A

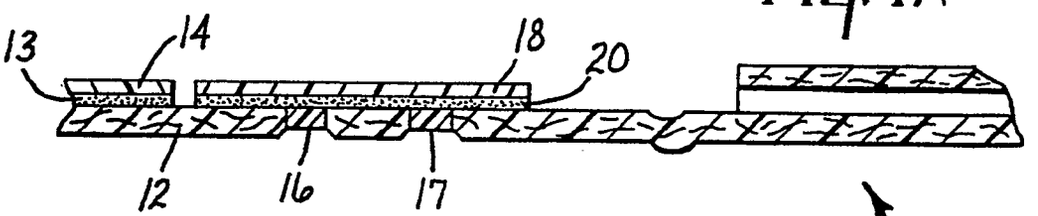

Fig. 2

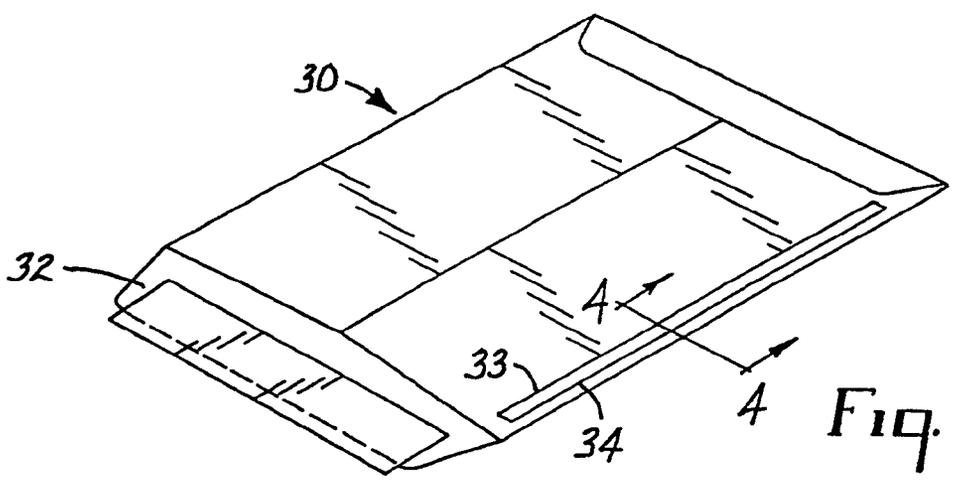

Fig. 3

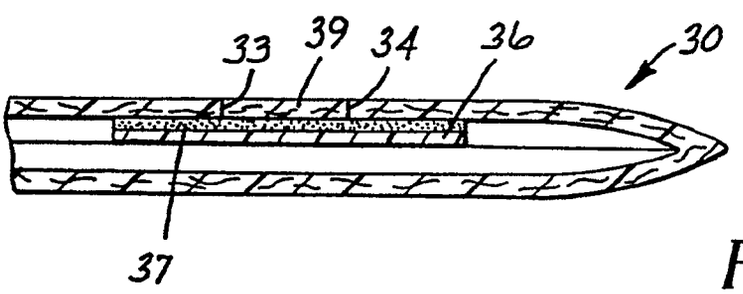

Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2114

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y,D	US-A-4 781 296 (MORRIS) * column 2, line 51 - column 3, line 2 * * column 2, line 14 - column 2, line 24 * * column 3, line 29 - column 3, line 50; figures 1,2,5,6 *	1-10	B65D27/38
Y,D	EP-A-0 343 896 (MINNESOTA MINING) * the whole document *	1-10	
A	DE-A-3 234 867 (FELDHAUS) * page 7, line 5 - line 10; figures 1-3 *	3,8,9	
A	GB-A-965 295 (FRÖHLING) * page 1, line 61 - line 73; figures 1,2 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 MAY 1991	BERRINGTON N.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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