This invention relates to packaging and sealed packages, i.e., packaging enclosing packaged contents. More particularly, this invention solves the problem of providing such sealed packages with convenient opening means when the packaging therefor is comprised in whole (except for the opening means) or in part of a film of a class hereinafter referred to as "stretchable" packaging films.

The "stretchable" packaging films to which this invention is directed are relatively tough, grainless, non-fibrous organic films characterized by a tendency to stretch and take a permanent deformation before rupture under direct tensile and tearing loads. Hence, unless a film of the class in question were first weakened by a line of perforation or heavy scoring, the areas and location of yield under such rupturing loads would not progress uniformly. As a consequence, tears in such film generally fail to follow a predictable line and, due to such deformation, the torn edges are characteristically randomly ruffled. Many films suitable for packaging exhibit the above characteristics; polyethylene films are currently by far the most widely used films of this nature; others are, for example, other polyolefin films, rubber hydrohalide films, and certain plasticized vinyls, saran, and the like.

An objection of long standing to a sealed package employing practically any organic film is the difficulty of opening the package unless some opening means is provided on the package. When the packaging film is one of the various cellulosic films, or other film having no pronounced tendency to stretch before rupture, the most convenient opening means has long been a tear strip, tape, or string, adhered to the film. Especially when such film is provided with starting nicks adjacent the opening means, the package is readily opened by pulling on such lengths of tear strip or tape. Unfortunately such now practically conventional opening means have not been satisfactory for use with the stretchable packaging films. Where the tearing tear in non-stretchable film will follow and be controlled by the tear tape, in stretchable film an opening tear will not normally tend to follow such tape. Such uncontrolled tearing is not particularly objectionable in some overwraps of stretchable film, except that the obvious uselessness of the tear tape adds to the consumer's irritation at packaging which is not readily torn open. In sealed packaging such as bags and pouches, this uncontrolled tearing of the stretchable film will often destroy the bag or pouch as a container and, thus, is an actual detriment when the bag, for example, should still be a usable container after opening.

Accordingly, it is a principal object and advantage of this invention to provide a tear tape or flap which permits a package of sealed stretchable film to be readily opened with a controlled tear. Another object and advantage of the invention is that the tear tape may be applied as the package is sealed in conventional heat-sealing equipment, thereby allowing the tear tape to be applied without impairing the production equipment or manufacturing or assembling operations. A still further advantage is that, although the opening tear is easily started, the package is not appreciably weakened along the predictable line of opening, as was the case where opening tears were attempted to be controlled by heavy scoring, perforations, or the like.

Other objects and attendant advantages of the invention will become apparent when considered in connection with the following detailed description and the accompanying drawings wherein:

FIGURE 1 is an elevation of a bag stretchable film provided with a tear strip according to this invention.

FIGURE 2 is an enlarged detail of the bag shown in FIGURE 1.

FIGURE 3 is a cross-section taken along the line 3--3 of FIGURE 2.

FIGURE 4 is a perspective of the rear of the bag shown in FIGURE 1.

FIGURE 5 is a detailed elevation showing one modification of this invention; the elevation in FIGURE 5 is of the reverse side of the bag and tape as shown in FIGURE 3.

FIGURE 6 is a cross-section taken along the line 6--6 of FIGURE 5.

In general and broadly, the invention is based on the discovery that if a stretchable film is sealed to a tape of relatively heavier or stiffer material along a line of juncture which tends to corruagte the film and the edge of the seal, then by pulling the tape away from the film, the film will tear at the line of juncture and follow it a controlled tear. Why the tear should follow this line of juncture which undules as a consequence of the corrugation is not fully understood. It is suspected that the effect of the corrugation of the film and heavy tape at the line of juncture tends to keep the film stretched at least slightly along the undulating line, as is evident when the tape is corrugated and the sealing of the film to it tends to pucker the film at the edges of the seal. Thus, as the stretchable film is ruptured, the stretching prior to rupture follows where the film is already stretched by the corrugated line of juncture to the stiffer tape, rather than to extend into the unstretched film. Consequently, rupture follows the controlled line of stretch.

Illustrating the invention as specifically applied to a conventional polyethylene bag, FIGURE 1 shows a conventional bag 10 of polyethylene film extruded as a tube and sealed at one end by a transverse heat seal 11, the upper end of the bag being cut as a bag loop 12. In such a circular bag, the tape 13 is preferably a tape of polyethylene having a gauge somewhat greater than twice the gauge of the film in the bag 10 (see FIGURE 3). A satisfactory pattern of embossing is a waffle-like pattern of diamond-shaped displacements from the plane of the tape (see FIGURE 2). The depth of the diamond is preferably about equal to the gauge of one thickness of film (see FIGURE 3). When the heat seal bar seals the plies of film constituting the mouth of the bag 10 and the tape 12 together, the resultant seal 14 effectively embosses the film and tape along a transverse band, but, in so reshaping the embossing on the tape 12 it also causes a slight puckering of the free film at the line of juncture between the free plies of film and the sealed plies, as indicated by the puckering shown as 15 in FIGURES 3 and 4.

As also indicated in FIGURE 4, to open the sealed bag, the tape 12 is simply grasped so as to start the bag to tear where the free, unsealed plies enclosing the contents of the bag are sealed to the tape 12, the continuing tear following this line of juncture. As will be noted in FIGURE 4, the torn edges 16 of the plies of the bag are not straight but are slightly serrated or undulating as the tear follows the puckering of the film caused by the seal 14.

FIGURES 5 and 6 are to illustrate a modification of the invention to demonstrate that a key consideration of
the invention is to have the plies of the bag puckered by corrugation in the tape and the line of juncture of the seal and the free plies of the bag enclosing the contents thereof. Thus, instead of laying a strip of corrugated tape across the mouth of the bag, a strip of unembossed tape 112 is laid across the mouth of the bag 110. The bag is then secured by a heat seal closing the mouth of the bag and joining the tape 112 thereto by a seal 114 which forms lengthwise corrugations 117 in the sealed plies and tape. These corrugations 117 also pucker the unsealed plies of the bag at the line of juncture with the seal, as indicated by the penciled lines 115. By grasping the free flap 118 of the tape 112, the bag will be torn along the line of juncture, as in the case of the bag 10 shown in FIGURES 1 to 4.

From the foregoing, it should be apparent that this invention may be modified and varied for all types of sealed packages employing stretchable film. Thus, for example, the illustrative embodiments shown in FIGURES 1 to 6 were described as bags in which the transverse tapes were applied after the bags were filled and ready to be closed by the heat sealer of conventional bag closing machinery. It is to be understood, of course, that to eliminate the operation of applying the tape at the stage, the tape may be applied across the bottom of the bag at the time of making them in a bag machine. Or the tape may be sealed or otherwise carried by one ply at the mouth of the unsealed bag; after filling, the sealing of the mouth of the bag can thus re-seal the tape and all plies together to provide the line of juncture that will be followed when the bag is opened. If the tape is to be applied to a wrap or overwrap, rather than a bag, it may obviously be applied to the web of packaging film which becomes the wrap either before the wrapping operation or during it. Also, in the embodiment described, the tear tape is of a heavier gauge bag of the same heat-sealable material as the packaging film. Provided that the tape may be securely sealed together with the film so as to provide corrugations extending transversely to lines of juncture and is of sufficient strength to permit the film to be ruptured by pulling on the tape, materials other than that of the heat-sealable stretchable film may be used. Likewise, the tape is preferably colored so as to make it readily apparent on the sealed package; it may also be printed with instructions for opening the package and carry advertising matter or such printed matter may be carried on paper or film attached to the tape.

In the specific illustrative embodiments shown, the tape extends below the seal to provide a flap which conveniently permits the tape to be grasped and pulled away as the package is opened. So long as the film is puckered at the line of juncture with the seal, the edge of the tape may coincide with the line of juncture and, thus, the provision of such a flap by the extension of the tape below the seal is often a matter of choice. Also, the tape is shown as sealed to only one ply of film at the seal. If desired, in the case of bags to which the tape is sealed at one end, a wider tape may be folded over the top of the bag and sealed to the other ply.

Accordingly, it is to be understood that this invention is not limited to the embodiments shown but only by the appended claims. As used in the claims, the term "package" or "package of stretchable film" is to be understood to be packaging comprised at least in part of such film and enclosing packaged contents. The term "packaging" (as a noun) or "packaging material" is to be understood to encompass containers, such as bags, as well as sheets and tubes (seamed or seamless) which are either cut to length or are in the form of sheets or roll stock intended for use as wraps or for subsequent conversion to various types of containers. The term "bag" is to be understood to include a pouch, envelope, sack, or other flexible packaging container as well as any one of the various types of bags, any one of which flexible packaging containers may be collapsed prior to filling (and usually is for shipping) so as to constitute a flattened tube (seamed or seamless and with or without re-entrant pleats), said flattened tube being closed by one or more seams or seals except for a mouth portion which may be opened to permit filling.

What is claimed is:

1. A package of stretchable stretchable film and a tear tape thereof, said tape being sealed to the mouth of the bag and having a greater resistance to tearing than the film sealed thereto, said tape having corrugations formed therein, said corrugations having at least a component extending transversely at least up to the line of juncture of the unsealed film with the seal to pucker the film at said line of juncture, whereby, when said film is ruptured by a pull at the location of the tape, the rupture follows the said line of juncture.

2. A package as defined in claim 1 in which said tape is embossed to provide such corrugations.

3. A package as defined in claim 2 in which said package is a bag enclosing contents sealed therein, the tape is located at the mouth of the bag, and the seal closes said bag by joining opposite plies of film together at the mouth and one of said plies to said tape extending along the seal and across the sealed mouth of the bag.

4. A package as defined in claim 3 in which the stretchable film and the tape are of the same gauge, the gauge of the tape being greater than the plies of film sealed together are to it, and the seal is a heat-seal deforming said tape and plies.

5. Packaging for enclosing contents in a sealed package comprising a stretchable film, a tape having greater resistance to tear than said film, said tape being sealed to said film and corrugated at least up to the line of juncture between sealed and unsealed portions of said film, and the film is thereby puckered at said line of juncture, whereby, when said film is ruptured by pulling on said film and said tape in directions having opposite components to start a rupture at said line of juncture, the rupture will follow said line.

6. Packaging material as defined in claim 5 in which said packaging is a bag formed from a flat tube of said film, said tape extending across one face of said bag and the seal securing said tape to said bag forms an end closure joining the tape and opposite plies of film together.

7. Packaging material as defined in claim 6 in which the stretchable film and the tape are polyethylene, the tape being of heavier gauge than the film.

8. Packaging material as defined in claim 5 in which said packaging is a bag in the form of a flat tube of said film, having a closed end and an open end and said tape is carried on one face of said bag adjacent the open end, whereby, upon sealing the open end of the bag after filling so that a seal extends across said tape, said line of juncture will be formed for a tear to follow when the sealed bag is opened by pulling on said tape.

9. Packaging material as defined in claim 8 in which the stretchable film and the tape are polyethylene, the tape being of heavier gauge than the film.

10. The method of providing packaging employing stretchable film with an opening tear tape comprising the steps of sealing a length of tear tape to the surface of stretchable film by means of a seal the length of the tape, said tape having a greater resistance to tearing than said film, and providing the tape with corrugations having at least a component extending at least up to the line of juncture between the unsealed and sealed portions of the film to pucker the film at such line of juncture, whereby, upon starting the rupture at said line of juncture, the rupture will follow said line.

11. The method as defined in claim 10 in which said film is embossed on its surface adjacent to the surface of the film to which it is to be sealed to provide said corrugations.

12. The method as defined in claim 11 in which the film and tape are of a heat sealable thermoplastic resin, the tape being of a heavier gauge than the film, and the seal forming the puckered line of juncture is a heat seal
formed under heat and pressure to deform the tape and film as it is thereby sealed together.

13. The method as defined in claim 10 in which the corrugations are formed in said tape at the time of sealing the same to the film.

14. The method as defined in claim 13 in which the film and tape are of a heat sealable thermoplastic resin, the tape being of a heavier gauge than the film and the seal forming the puckered line of juncture is a heat seal formed under heat and pressure to deform the tape and film as it is thereby sealed together.

15. The method of packaging comprising the steps of filling a bag of polyethylene film with contents to be packaged, flattening the bag to bring opposite plies of the film together and close the bag, applying a tape, having a greater resistance to tearing than said film, to the outside of one of the contacting plies and heat-sealing said tape and film together along the length of said tape, said tape being corrugated up to the line of juncture between sealed portions of said film and unsealed portions, such corrugations extending in a direction having a component transverse to said line, and the film being puckered by said sealing at said line of juncture.

16. The method as claimed in claim 15 in which said tape is thermoplastic and corrugated on the surface in contact with said film prior to heat-sealing, whereby the heat sealing deforms said tape and said film to form the puckering at said line of juncture.

17. The method as defined in claim 15 in which said tape is thermoplastic and corrugated by the heat-sealing to deform said tape and film and form the puckering in said film at the said line of juncture.

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