

FILMS, PACKAGING AND METHODS FOR MAKING THEM

This invention concerns packaging films and packages produced therefrom which include means for facilitating their opening as well as methods for producing such films and packages.

Flexible polymeric films are widely used as packaging materials for a vast range of goods. A variety of synthetic polymers may be used as packaging materials, for example films made from synthetic polymers such as polyolefins (e.g. polyethylene and/or polypropylene), polystyrene and/or polyesters; and/or films made from natural polymers such as cellulosic materials and/or other biopolymers (e.g. polylactic acid).

One particular packaging use for such films is as an overwrap for a variety of goods, for example for cigarette packets, compact discs, video tapes, foodstuffs etc., the films being sealed tightly over the goods. However, the very properties which confer desirable properties on the films as packaging materials, for example high strength and tear resistance, make such packages difficult to open because the films of which they are made are difficult to tear.

In order to facilitate the opening of such packages, so-called "tear tapes" have been provided which consist of a narrow strip of a polymeric film adhered to the internal surface of the packaging film, a tab of the tear tape being left free on the outside of package to facilitate its opening. The package can then be opened by pulling the tear tape through the packaging film.

Another method proposed to open a package wrapped in film is to provide inherent in the film one or more lines of weakness on the film. Two lines are generally preferred to define a film strip of sufficient width so a free tab end attached thereto can be easily grasped and pulled. To open the pack the tab is pulled to tear the film completely around the pack along both lines of weakness to remove the strip which severs the film and hence opens the pack.

Lines of weakness on the film have advantages over use of a separate tear tape as they are integral to the film and do not require additional processing steps or extra material. A tear tape increases the thickness of the film where it is added resulting in an uneven film surface which can be difficult to seal evenly, thus reducing the seal integrity of a package overwrapped with such film. The mechanical properties desired for a separate tear tape are different from those required for an overwrap film. So the tear tape and film are often made from different, incompatible materials which can also make it difficult to provide a good heat seal in regions of the pack where the overwrap film is adjacent the tear tape.

Lines of weakness on a film can be made by any suitable methods for example by mechanical scoring (e.g. with a controlled blade or roller to apply pressure to the film surface), by cut or scored perforations, by non contact means such as laser or other radiation to ablate and/or

burn off film material (e.g. as described in US 3,909,582; US 5,630,308 (both American Can) or US 5,010,325 and US 5,010,231 (both LPF)); by use of a laser to scramble orientation along a line on the oriented film without ablating the film surface (as described in the applicant's co-pending application PCT/EP02/00075); and/or by the methods described in WO 01/15594 (Hoescht) or WO 01/94098 (University of Warwick).

Although tear tapes and tear lines can be a good and efficient way of opening such packages, it can be difficult to initiate the tear. To this end a notch or tab is typically cut on the sheet around the tear tape or line so that the tab can be easily grasped and pulled to propagate a tear along the weakened line or tear tape to completely sever the wrapped film around the package. Such tabs is generally U shaped with tab sides parallel to the tear line or V shaped where the tab sides taper inward towards the free end. These shapes were used for tabs because they are easily cut in the film and it was believed were necessary to prevent the tab breaking off when pulled as the widest part of the tab is at its point of attachment to the film.

However one disadvantage of current tabs is that when the tab is pulled often the film does not tear properly along the defined tear line or tear tape, which can lead to difficulties in opening the pack as the tear may not fully propagate around the pack or the tab may break off from the film. For example in the preferred arrangement (where the tab straddles two weakened lines on the film to define a removable strip of film) when a conventionally shaped tab is pulled, a tear can propagate inwards towards the centre of the strip away from the pre-defined tear lines. This can cause a partially torn strip to break away from the film before the strip has been completely removed from around the pack and the overwrap film has been completely severed into two pieces.

Thus it is desirable to provide a improved means for initiating a tear along a tear line on a packing film such that an initiated tear more easily tracks pre-defined tear line(s).

It has been found that a certain shaped tab acts to better direct the tear along a predefined path to aid opening the pack in a more controlled and consistent manner.

Therefore according to the present invention there is provided a packaging film having at least one tear line and at least one tab thereon, where the tab has a free end, an end attached to the film and free sides connecting the two ends, the tab positioned so the axis of at least one tear line passes through both ends of the tab, characterised in that:

(a) at least one of the free sides of the tab taper outwardly from the attached end and the tear line; and

(b) at least one angle θ is an acute angle greater than about 5° where θ is defined as an angle subtending the free end of the tab measured between

(i) an axis defined by the average direction of one of the tab sides averaged over a the last quarter of the maximum length of the tab starting from the attached

end; and

(ii) an axis defined by the average direction of the tear line along the film.

Preferably the axis (i) is defined as the direction of one of the tab sides substantially adjacent to the attached end of the tab; more preferably the direction of a tab side at the point of attachment of the tab with the film. Most preferably the tab is substantially symmetrical about the tear line so that whichever side of the tab is used to define axis (i) the angle theta between axes (i) and (ii) is the substantially same.

The tab used in the film of the invention is shaped to taper outwardly away from the tear line (i.e. towards the TD if the tear line is in the MD). When the tab is pulled force is directed inwards towards the tear line to initiate tearing therealong.

This is in contrast with "U" and "V" shaped tabs of the prior art where the pulling force tends to be directed in directions which are respectively more parallel to or away from the tear line and thus both initiation of a tear and its propagation along the tear line are less satisfactory, with a tendency to result in incomplete tearing.

It has been found that angle theta (θ) should be an acute angle of at least about 5° which the applicant has found is a value which maintains a good balance between reducing the tendencies for either the tab to separate from the film (where θ is too high e.g. 90° and above) or for the tear not to propagate fully along the tear line and completely sever the film (where θ is too low e.g. less than 5°).

Preferably the tab is cut into the film by any suitable means (mechanical knife, laser cutter etc) so the tab forms an integral part of the film. However it would also be possible to attach to a suitable position on the film a separate, tab shaped as described herein by use of adhesive, heat sealing or any other suitable method. Such a separate tab may be made from the same or different material to the film.

As used herein the term "tear line" denotes one or more of any or all of the following as well as analogous means for severing film: tear tape(s) laminated to the film; and/or line(s) of weakness integral to the film (e.g. two lines which define a tearable film strip). Such tear line(s) may be made by any suitable method such as those described herein. The tear line may be torn therealong by finger pressure when the free end of the tab is grasped and pulled from away from the film. For use with the shaped tabs of the present invention it is preferred that the tear line is a weakened line of the film rather than a separate tear tape at it is such weakened lines which are more prone to the incomplete tearing as described herein and thus where the tabs of the present invention will be of most use to help a tear propagate along the pre-defined line(s). However use of the tabs of the invention with a conventional tear tape is not precluded.

The tear line as described herein may comprise in whole or in part regions which are substantially continuous and/or substantially discontinuous (for example the tear line may comprise at regular intervals a plurality of spots and/or dashes of film defining a perforation on the film). However if the tear line is discontinuous it should still be such that a tear once started
5 will propagate essentially along the line and thus move from one weakened section to the next. For some applications it is preferred that the tear line does not perforate the film as this could seriously reduce the barrier properties of the film. It is also preferred that the tab described herein is cut through only a single layer of film on the pack (i.e. the film wrapped underneath the tab protects the pack).

10 In addition to aiding opening of an overwrapped package by severing a film along a tear line, a shaped tab as described herein may also be used to initiate film tearing along defined lines for other purposes such as to remove certain regions of film to create patterns thereon and/or to create aesthetic and/or other properties on the film.

15 It will be appreciated that to wrap articles, a web of film may first be cut into sheets which can be used to wrap each article. For example the film web may be cut across substantially the whole width of the web in the transverse direction (TD) to form sheets whilst leaving a small gap corresponding to the tab. For convenience the axis of this TD cut is referred to herein as the
20 "sheet line". The tear lines may be arranged on the film web to run in a substantially perpendicular direction to the sheet line, i.e. to run along the film in the machine direction (MD).

The shaped tab described herein may be cut in the web to straddle a tear line and also so the free tab end and the attached tab end lie on opposite sides, across the sheet line. Thus the tab
25 will protrude from the leading edge of one sheet and form a correspondingly shaped notch in the trailing edge of the following sheet. It is preferred that the tab is positioned to straddle all the tear lines present. To prevent the tab being ripped off the film when it is pulled it is also preferred that the sheet line has a small uncut portion in register with at least part of the width of the tab at that point, preferably over substantially the whole width of the tab. This can be achieved by any
30 suitable means for example the slitting knife which cuts each sheet may have a notch on the blade edge positioned in register with the tab.

To form a package there will be some overlap between the trailing and leading edges of a sheet as it wraps around the article initially to form a tube whose free ends are then folded around the
35 articles and sealed to create the final sealed package. This region of overlap is where the film is initially heat sealed together. However if the tab was larger than the overlap region the corresponding notch cut in the trailing edge of the sheet would extend beyond the sealed region of overlap and it would be difficult to seal the package. Yet it is desired that the overlap region is as small as possible consistent with a good heat seal as a large area of overlap for each sheet
40 is expensive as it wastes film. The heat sealed overlap region is less transparent than a single thickness of clear film which can spoil the visual appearance of the package; The overlap

region may also be difficult to print. For these reason the sheet line is positioned about half way along the tab so the tab does not protrude from the sheet more than necessary so the area of overlap can be kept to the minimum consistent with forming a package with good seal integrity. An improved method of heat sealing such region of overlap which may be used with any tabs, such as those of the present invention, is described in the applicant's co-pending British patent application (applicant's case reference 31.15 GB) filed the same day as the present application. The contents of this co-pending application are incorporated herein by reference.

It is preferred that the uncut region of the sheet line is for example at least from about 1mm to about 2 mm wider than the width of the defined tear tape or tear strip to reduce the chance of the tab separating from the film when pulled. So for example for a typical tear tape of width about 4 mm (or two tear lines spaced 4mm apart) the uncut region of the sheet line would be about 8 mm wide.

With a conventional triangular ("V") or rectangular ("U") shaped tab, the tab is of the same or narrower width than the uncut region of the sheet line. This has various disadvantages.

The means used to cut sheets from the web (e.g. slitting knife) cannot always be precisely aligned in exact register with the tab on the film for example because of relative movement of the web in the machine (so called "web chatter") and tolerance for some variation must be allowed. But for example if the notch in the slitting knife blade is too wide to allow for this adjacent sheets may be incompletely separated which can be undesirable in some arrangements when separated sheets are required to wrapped articles to form the final package. On the other hand if the uncut region of the sheet line is narrowed to ensure each sheet cleanly separates from the web the narrow U or V shaped tab may be completely or partially severed to such an extent that the tab would separate from the film if used. If the tab is simply widened to allow some penetration of the cut tab by the sheet line then either the tab becomes much wider than the width of the tear tape / tear strip and thus making the direction of the initial tear more difficult to control or the width of the tear tape or tear strip must be increased as well to allow for a bigger sized tab which may be undesirable for reasons such as cost or aesthetics.

In the present invention the tab tapers outwards away from the tear lines so that the maximum width of the tab will be greater than that of the tear tape and the uncut region of the sheet line is the same or less than the maximum width of the tab. The axis of the sheet line is positioned to cross the tab at its widest part (to reduce the overlap region for the reasons above). With a wider tab a small part of the cut sheet line may penetrate the sides of the tab to ensure complete separation of each sheet after cutting across the TD and yet because of the shaped tab sides the wider tab may be used with a much narrower tear tape or tear strip.

It is preferred that the sheet line cut penetrates into the tab sides by no more than from about

1mm to about 2 mm on each side to ensure complete separation between sheets without weakening the tab greatly. For example for a typical tear tape of width about 4 mm (or two tear lines space 4 mm apart) and an uncut region of the sheet line of about 8 mm wide, the tab would preferably taper out to a maximum width of about 12 mm and the cut sheet line would penetrate the cut sides of the tab by about 2 mm on each side. Yet there would be a central region of 8 mm where the tab was securely attached to the sheet. The same arrangement for a conventional tab attached to a 4 mm tear tape would sever the tab.

It will also be appreciated that to avoid an unnecessary large overlap region (as described herein) the length of the tab should be as small as possible consistent with the tab being readily grasped by the fingers in a sufficiently strong manner so the tab can be pulled to initiate tearing of the film.

Preferably the tab is substantially symmetrical about an axis parallel to the tear line(s), more preferably the tear line (if one tear line), the tear strip (if a pair of tear lines) and/or the tear tape substantially bisect the tab.

Preferably the angle θ is from about 10° to about 80° , more preferably from about 15° to about 60° , most preferably from about 20° to about 45° , for example about 30° .

As used herein the angle θ denotes the angle between one or both sides of the tab and the tear lines (the angles of respective sides denoted θ_1 and θ_2) and preferably θ_1 and θ_2 are substantially the same. This can be seen more readily with reference to Figure 4 herein.

Preferred films of the invention may be flexible and may comprise polymeric material. More preferably the film comprises oriented polymeric material, most preferably biaxially oriented polymers, for example BOPP.

The applicant has found that films as described herein with tear lines and tabs shaped as described herein have various advantages over conventional tear tape films using conventional U or V shaped tabs.

The shaped tabs used in the present invention can be created on the film web on-line with only simple modifications to existing machinery for example by replacing the cutting head for a conventional tab; or by reprogramming a laser (which may be already present if it used for example to create the tear lines and/or cut the sheet lines).

The preferred combination of an integral tear line and the shaped tab as described herein result in the combined advantages of an integral tear line (less wrinkled film, no complicated threading of a tear tape, improved heat sealing of the film around the tear line, less sophisticated control of web tension required, less jamming of the cutting head due to curl of film sheet, less

maintenance, reduced stoppages to change tear tape reels, etc.) combined with the advantages of the tear tape (more reliable tracking of the tear line resulting in a more reliable and neater severance of the pack film by the end user).

- 5 For some end uses opening of an over-wrapped pack in a more consistent, cleaner manner (e.g. leaving two parts of the film neatly separated on the pack) is particularly advantageous for example should it be desired to retain part of the packing film around the article where the film is overprinted with promotional designs or instructional material.
- 10 A further aspect of the invention further provides a method for preparing packaging film having at least one tear line and at least one tab thereon, the method comprising the steps of:
- (I) directing onto a web of film a means to make at least one tear line thereon; and
 - (II) forming at least one tab on the film, where the tab has a free end, an end attached to the film and free sides connecting the two ends, the tab positioned so the axis of at least one tear
- 15 line passes through both ends, characterised in that:
- (a) at least one of the free sides of the tab taper outwardly from the attached end and the tear line; and
 - (b) at least one angle θ (θ) is an acute angle greater than about 5° where θ (θ) is defined as an angle subtending the free end of the tab measured between
- 20 (i) an axis defined by the average direction of one of the tab sides averaged over a the last quarter of the maximum length of the tab starting from the attached end; and
- (ii) an axis defined by the average direction of the tear line along the film.
- 25 Preferably the method of the invention further comprises (either sequentially or simultaneously with the other steps) the further step of:
- (III) separating the film web into sheets along a line in the TD, where the sheet line stops at or slightly penetrates the tab sides but does not sever the tab along the sheet line.
- 30 Another aspect of the invention provides a package comprising at least one article wrapped in a flexible film of the invention with a tear line and shaped tab as described herein.

Another aspect of the invention provides at least one article wrapped in a flexible film of the invention with a tear line and shaped tab as described herein.

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Further aspects and preferred features of the present invention are given in the claims herein.

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Once the film has been sealed around the article, tearing of the film substantially along a tear line preferably occurs with peeling of the seal. The film can be heat or cold sealed around the article.

Preferably the tear line extends to the edge of the film on the package to assist tearing therealong and ensure complete severance of the film around the package.

5 A single tear line can be used when integral on the film, so that the package can be opened by tearing it open substantially along this line. But it is generally preferred to include at least a pair of such lines which are substantially mutually parallel and define a strip of film, which can be torn away from the rest of the film, much in the manner in which packages having a tear tape are opened but without the necessity for having such a tape. In such a case it is preferred that the tab straddles both lines (i.e. lies across the width of the complete tear strip) as this better directs the tear to propagate along both sides of the strip so the complete strip can be removed to sever the packaging film.

10 When more than one weakened tear line (integral to the film) is used, the distance between the individual lines is not limited by the cost considerations which apply when separate tear tapes are used because tearing of films and packages in accordance with the present invention can be effected without the use of such tapes. However, it is generally preferred that when two lines are used they be at least about one mm apart in order to facilitate being able physically to take hold of the end of the edge of the film when the package is to be opened and also to minimise the risk that tearing transfers from the two lines into only one when the package is opened. As will be appreciated, the unsealed cut tab shaped as described herein will make this easier. However, the lines can be spaced considerably further apart, for example about 10 mm apart or more, but a preferred distance apart is in the range of from about 2 to about 6 mm.

15 It has been proposed hitherto to use coloured tear tapes in order to facilitate being able to see the end of the tape and thereby opening of the packages. If integral tear lines are used a portion of the film between two tear lines (the tear strip) may be coloured. Also, for example a coloured tear tab can be used rather than colouring the whole of the tear strip. Other suitable means could be used to indicate the position of the tab is where tearing should be initiated to open the film. For example a printed indication near the tab, the optical properties of the film could be adjusted by treated or other means, or another method could be used to mark the tab from the surrounding film.

20 The direction of the tear line(s) herein relative to the film itself is in general unimportant, particularly with films having balanced properties. However, it is usually convenient to make these tear line(s) along the direction in which the film is manufactured (MD), and this can be particularly conveniently effected during operations subsequent to the film production process, for example during slitting of a larger rolls of film to produce reels of film which are to be used on a packaging machine.

25 The films in which shaped tabs as described herein are introduced according to the present invention may be any suitable substrate(s), such as one or more of any of the following:

polymeric materials: synthetic paper, films made from organic polymers, preferably biopolymers, more preferably films made from one or more suitable carbohydrates; polysaccharides (such as starch, cellulose, glycogen, hemi-cellulose, chitin, fructan inulin; lignin and/or pectic substances); gums; proteins, optionally cereal, vegetable and/or animal proteins (such as gluten [e.g. from wheat], whey protein, and/or gelatin); colloids (such as hydro-colloids, for example natural hydrocolloids, e.g. gums); polylactic, polygalactic and/or cellulosic films (e.g. microbial and/or regenerated cellulose film)]; thermoplastic films; polymeric films (for example films comprising: polyolefins [e.g. polypropylene and/or polyethylene] polyurethanes, polyvinylhalides [e.g. PVC], polyesters [e.g. polyethylene terephthalate – PET], polyamides [e.g. nylons] and/or non-hydrocarbon polymers); and/or multilayer and/or composite sheets formed by any suitable combinations and/or mixtures of thereof.

Preferred films of the present invention may be produced from a variety of synthetic polymers, for example may be polyolefin based films, e.g. polyethylene based, polypropylene based or made from polystyrene, or they may be polyester based films. Furthermore, films of the present invention may be in the form of monolayers of a particular polymer, although preferred films comprise two or more layers which can be formed by coextrusion and/or by coating.

The films are preferably heat sealable, and it is generally preferred that when they have been heat sealed the heat seals themselves have peel strengths less than the force required to tear the film along the tear line(s) in order to facilitate propagation of these tears through the heat seal and then into non-sealed regions of the film around the packaged articles. If desired, cold seals can be used to seal the packages, and again it is preferred that such seals should peel to allow tearing along line(s) and/or pattern(s) herein to propagate through these seals.

Biaxially oriented polypropylene (BOPP) films are preferred for producing sheets, films and/or packages in accordance with the present invention. It is more preferred that the BOPP films have substantially balanced physical properties, for example as can be produced using substantially equal machine direction and transverse direction stretch ratios. Although sequential stretching can be used, in which heated rollers effect stretching of the film in the machine direction and a stenter oven is thereafter used to effect stretching in the transverse direction, it is generally preferred to use biaxially oriented films which have been produced by simultaneous stretching, for example using the so-called double bubble process or a simultaneous draw stenter. The machine direction and transverse direction stretch ratios are preferably in the range of from 4:1 to 10:1, and more preferably from 6:1 to 8:1.

The films used in accordance with the present invention can be of a variety of thicknesses according to the requirements of the packages which are to be produced. For example they can be from about 10 to about 120 microns thick, and preferably from about 14 to about 40 microns thick.

The tear line(s) should exhibit properties (e.g. a degree of weakening therealong) which are sufficient to enable a tear once started to propagate substantially along the line(s) and/or pattern(s) in which it has started without substantial deviation therefrom. Insufficient tear susceptibility will make it difficult if not impossible to starting a tear therealong. However excessive tear susceptibility (e.g. too much weakening) could result in unwanted opening of the packages during normal handling. As will be appreciated by those skilled in the art, different methods of achieving tear susceptibility of the films can result in different tearability.

Although packages in accordance with the invention can be opened by tearing the films substantially along either tear susceptible line(s) or with use of a tear tape, both a weakened tear line and a tear tape can be used in together for example to facilitate the tearing of films which are otherwise difficult to open with a tear tape, e.g. with particularly thick films or films made of polymers which are inherently resistant to tearing.

Unless the context indicates otherwise, the terms 'effective' and/or 'suitable' as used herein (for example with reference to the present invention) will be understood to refer to those elements which if used in the correct manner provide the required properties (such as an improved tearable film) to the present invention as described herein.

It is appreciated that certain features of the invention, which are for clarity described in the context of separate embodiments may also be provided in combination in a single embodiment. Conversely various features of the invention, which are for brevity, described in the context of a single embodiment, may also be provided separately and/or in any suitable sub-combination.

The term "comprising" as used herein will be understood to mean that the list following is non-exhaustive and may or may not include any other additional suitable items, for example one or more further feature(s), component(s), ingredient(s) and/or substituent(s) as appropriate.

Further and/or alternative features of the present invention are described in the claims.

Embodiments of films and packages according to the present invention will now be described by way of example with reference to the accompanying drawings Figures 1 to 5 which will now be described more fully below with reference to one embodiment of the invention.

Figures 1 to 3 show different views (below, side and plan respectively) of a curved tab knife (1) used to cut a curved tab (7) and corresponding notch (13) in the film web. These figures show the inward inclination of the curve of the knife (1) towards the weakened line(s) (5) (see especially Figure 1). The angle between the ends of the blade (1) is 60° . This angle corresponds to " 2θ " (or $\theta_1 + \theta_2$) where " θ " denotes the angles (i.e. either θ_1 or θ_2 in this embodiment the same) between the curved cut sides of the tab (7) where the sides meet the film and a direction parallel with the tear lines (5) on the film.

Figure 4 shows a typical cut sheet (3) formed by cutting across the film web along a sheet line (9) in the TD. The cut sheet is used to wrap articles such as a cigarette carton. The sheet shown in Figure 4 also comprises a pair of parallel weakened lines (5) induced on the film in the MD by a laser, the lines defining a tear strip (11) on the film. The sheet (3) also comprises a cut tab (7) and corresponding notch (13) in the other side of the sheet (3). Also shown in Figure 4 are the angles θ_1 and θ_2 (denoted generically herein as theta or θ) which are the angles between the tab sides at the point of attachment to the film and the axis parallel to the tear lines. In figure 4, $\theta_1 = \theta_2 = \theta = 30^\circ$ as this has been found to be a value which maintains a good balance between the tendency of the tab to separate from the film when pulled (high θ) versus the tendency of the tear not to propagate fully along the tear line (low θ).

Figure 5 shows a film reel (15) with the pair of parallel MD tear lines (5) defining the tear strip (11) with a tab (7) of the present invention positioned thereon. However in a preferred embodiment the tab will be cut into the film web at the same time as (or just before) the sheets are cut and then used to wrap an article. Thus these tabs are generally not cut out in advance and will not generally exist on a film reel as shown in Figure 5.

To illustrate and explain the invention the following non-limiting example of a film of the invention was prepared as follows:

Example 1

A three layer polymeric tube was formed by coextruding a core layer of polypropylene (also as referred to herein as PP) homopolymer with a layer of medium density polyethylene on each side of the core layer. The tube was cooled and subsequently re-heated before being blown to produce a three layer biaxially oriented polypropylene (also referred to herein as BOPP) film having a core layer which was 18.7 microns (μm) thick and two outer layers which were each 0.3 microns thick, the film itself being 19.3 microns thick.

A web of this BOPP film was fed at a speed of 200 ft per minute past a 50 W CO_2 laser of wavelength 10.6 microns to create two parallel weakened lines along the film web in the MD the lines spaced about 4 mm apart to define a tear strip along the film in the MD. The weakened lines are formed by disrupting the orientation of the BOPP film along the line as more fully described in the applicant's co-pending application PCT/EP02/00075. However any suitable method could have been used to create the tear lines on this film.

A tab knife (1) shaped as shown in Figures 1 to 3 was located in a conventional tab cutting machine and was used to cut against a spring loaded anvil at regular intervals along the web to form horse-shoe shaped tabs (7) at regular intervals (the length of one sheet) along the film web. The tab was 11.5 mm wide at its widest point with its side edges positioned at 30° to the

MD (direction of the tear strip). The tab was located on the web to lie with its free and attached ends bisected by the tear strip as shown in Figure 4. The film web was cut into sheets by a sheet knife which cut across the film web in the TD perpendicular to the MD. The sheet knife cut across the full width of the film web except for a 8 mm gap in register with the widest part of the tab (due to a corresponding notch positioned on the sheet knife blade). The cut along the sheet line axis penetrated slightly (by 2 mm each side) into the sides of the tab. This created separate sheets with a tab and notch as shown in Figure 4 which can be fed into a packing machine and used to wrap an article such as a cigarette carton in a conventional manner.

On the wrapped package, the shaped tab can be pulled by finger pressure to initiate tears which readily propagate along both weakened tear lines to remove the tear strip completely from the package allowing access to the package contents. Opening such packages has been found to result in less incomplete tearing or tab separations compared opening similar conventional packages. The use of integral tear lines rather than tear tape improves the seal integrity of the pack.

CLAIMS

1. A packaging film having at least one tear line and at least one tab thereon, where the tab has a free end, an end attached to the film and free sides connecting the two ends, the tab positioned so the axis of at least one tear line passes through both ends of the tab characterised in that:

(a) at least one of the free sides of the tab taper outwardly from the attached end and the tear line; and

(b) at least one angle theta (θ) is an acute angle greater than about 5° where theta (θ) is defined as an angle subtending the free end of the tab measured between

(i) an axis defined by the average direction of one of the tab sides averaged over a the last quarter of the maximum length of the tab starting from the attached end; and

(ii) an axis defined by the average direction of the tear line along the film.

2. A film as claimed in claim 1, in which the axis (i) is defined as the direction of one of the tab sides substantially adjacent to the attached end of the tab.

3. A film as claimed in either preceding claim, in which the axis (ii) is parallel to the at least one tear line where the line crosses the attached end of the tab.

4. A film as claimed in any preceding claim; in which both free sides of the tab taper outwardly and both values for theta (θ) either side of the tear line are an acute angle greater than about 5° .

5. A film as claimed in any preceding claim, in which the tab is substantially symmetrical about the at least one tear line and theta (θ) is substantially the same on both sides of tab either side of the tear line.

6. A film as claimed in any preceding claim, where the at least one angle theta (θ) is from about 10° to about 80° .

7. A film as claimed in claim 6, where the at least one angle theta (θ) is from about 15° to about 60° .

8. A film as claimed in claim 7, where the at least one angle theta (θ) is from about 20° to about 45° .

9. A film as claimed in claim 8, where the at least one angle theta (θ) is about 30° .

10. A film as claimed in any preceding claim; which comprises a narrow neck with sides

substantially parallel to the tear line connecting the angled tab sides with the attached end of the tab.

11. A film as claimed in any preceding claim, in which the film comprises a pair of tear lines defining a tear strip on the film and/or the tear line comprises a separate tear tape, where the tab is positioned so that both ends straddle the strip and/or tape.

12. A film as claimed in claim 11; in which the tab is shaped so that part of the tab is wider than the tear strip and/or tear tape.

13. A film as claimed in either claim 11 or 12, in which the tear line on the film consists of a pair of tear lines defining a tear strip integral to the film.

14. A film as claimed in any preceding claim, in which the tear line comprises a scored and/or partially cut line in the film and/or a line of weakness caused by differential and/or scrambled orientation of the film material within the line compared to the rest of the film.

15. A film as claimed in any preceding claim, in which the tear line has substantially the same gauge as the rest of the film.

16. A film as claimed in any preceding claim, in which the film is substantially oriented in at least one direction.

17. A film according to any preceding claim, which comprises a thermoplastic polymer.

18. A film according to any preceding claim, which comprises a polyolefin and/or polyester.

19. A film according to any preceding claim, which comprises polypropylene.

20. A film as claimed in any preceding claim, which is biaxially oriented in substantially perpendicular directions.

21. A film according to any preceding claim in which the tear line is formed by laser treatment.

22. A film according to claim 21, in which has a means thereon to indicate the position for initiating tearing of the film by pulling the tab along at least one tear line.

23. A film obtained and/or obtainable by the method claimed in any of claims 29 to 30.

24. A package comprising at least one article wrapped in a flexible polymeric film as claimed in any preceding claim.

25. A package as claimed in claim 24, which is capable of being opened by finger pressure by pulling the tab substantially along the tear line.

26. A package according to claim 24 or 25, in which the film has been sealed around the article and tearing occurs with peeling of the seal.

27. A package according to any of claims 24 to 26, in which the film has been heat sealed around the article.

28. A package according to any of claims 24 to 27, in which the article comprises tobacco goods, optionally a cigarette carton.

29. A method for preparing a film having at least one tear line and at least one tab thereon, the method comprising the steps of:

(I) directing onto a web of film a means to make at least one tear line thereon; and

(II) forming at least one tab on the film, where the tab has a free end, an end attached to the film and free sides connecting the two ends, the tab positioned so the axis of at least one tear line passes through both ends, characterised in that:

(a) at least one of the free sides of the tab taper outwardly from the attached end and the tear line; and

(b) at least one angle θ is acute where θ is defined as an angle subtending the free end of the tab measured between

(i) an axis defined by the average direction of one of the tab sides averaged over a the last quarter of the maximum length of the tab starting from the attached end; and

(ii) an axis defined by the average direction of the tear line along the film.

30 A method as claimed in claim 29, further comprising sequentially and/or simultaneously with the other steps the further step of:

(III) separating the film web into sheets along a sheet line in the TD, where the sheet line stops at the tab sides or slightly penetrates the tab sides but does not sever the tab along the axis of the sheet line.

31 A film, package and/or method substantially as described herein with reference to the figures and examples herein.