(12) UK Patent Application (19) GB (11) 2 031 345 A

(21) Application No **7930439**
(22) Date of filing **3 Sep 1979**
(23) Claims filed **3 Sep 1979**
(30) Priority data
(31) **7809268**
(32) **4 Sep 1978**
(33) **Sweden (SE)**
(43) Application published
23 Apr 1980
(51) **INT CL³**
B31F 1/08
(52) Domestic classification
B6J 802 F1
(56) Documents cited
None
(58) Field of search
B6J
(71) Applicant
Tetra Pak International AB, Fack, S-221 01 Lund 1, Sweden
(72) Inventors
Wilhelm Reil,
Jörg Trabitzsch
(74) Agent
W.H. Beck, Greener & Co.

(54) **Creasing Packing Laminates**

(57) Laminated packing material which is intended to be converted to packing containers is often provided with crease lines 7,8 so as to facitilate folding and forming. At the points where the crease lines cross one another, a multiple folding of the laminate takes place on conversion to packing containers which sometimes can lead to the appearance of small cracks in the different material layers. These difficulties are overcome by using a laminate that has been provided with auxiliary crease lines 9, 10, which supplement or replace the crease lines proper 8 in the areas where the risk of crack formation is great.

Fig. 3

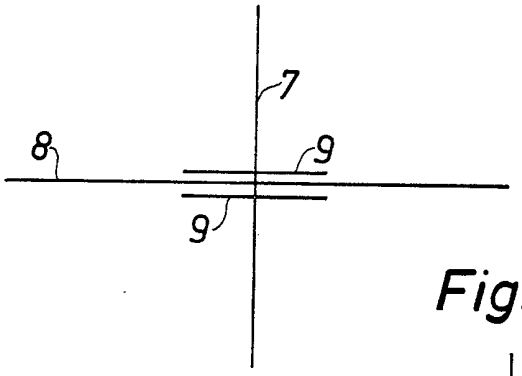
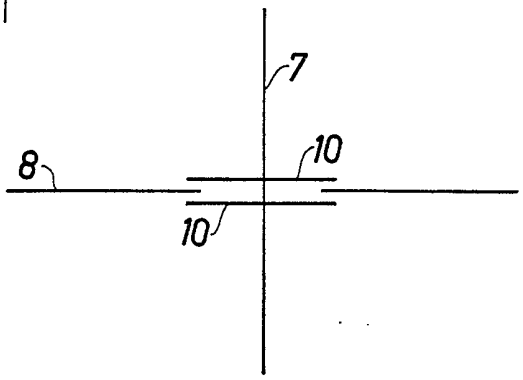


Fig. 4



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

GB 2 031 345 A

Fig. 1

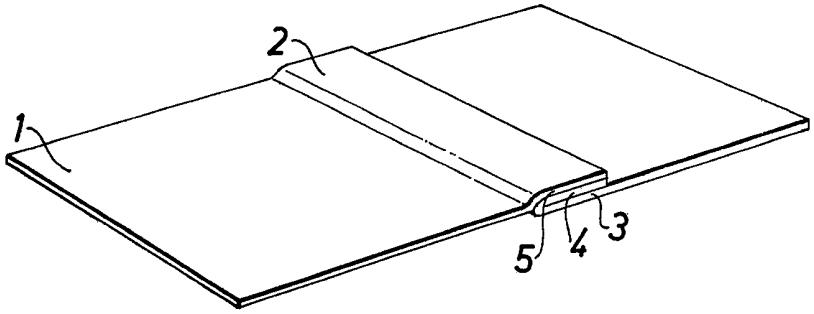


Fig. 2

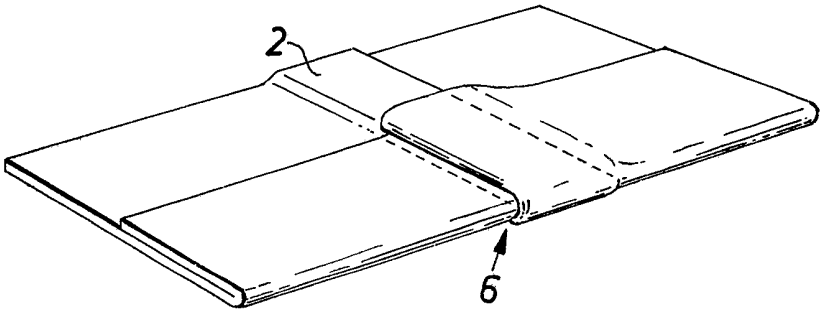


Fig. 3

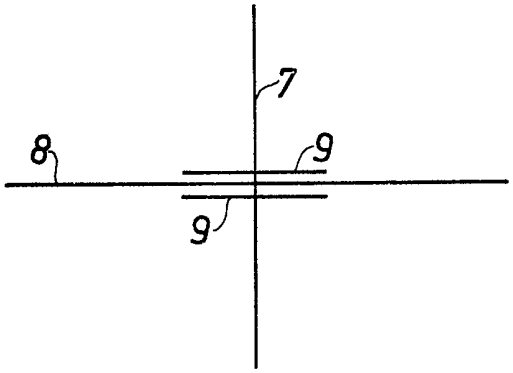
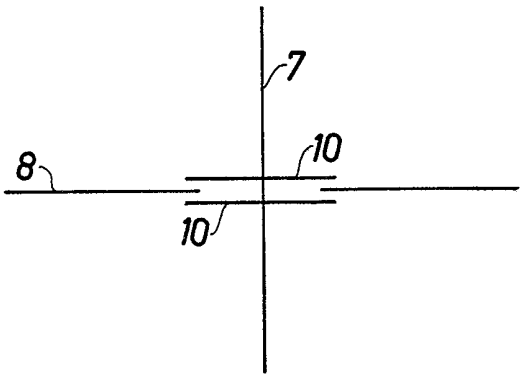


Fig. 4



SPECIFICATION

A Packing Laminate Provided with Crease Lines

The present invention relates to a packing laminate provided with crease lines for conversion to packing containers.

The invention also relates to a method for the manufacture of a packing laminate.

Packing containers of the non-returnable type are often manufactured in that material in the form of webs or sheets provided with crease lines is converted by folding and sealing to a packing container of the desired shape. To this end a laminated material is used, among others, which contains different material layers which impart to the combined laminate the desired properties when stiffness, strength and impermeability to liquids are required. A packing laminate used frequently comprises a centrally positioned relatively thick carrier layer of fibrous material which layer is covered on both sides with homogeneous plastic layers. The plastic layers are constituted of thermoplastic material which makes possible a simple sealing of the material by heating and compression of the plastic layers on the two parts of material which are to be joined together.

To reduce the light transmittance of the packing laminate, the laminate frequently contains further layers, e.g. a layer of aluminium foil placed between the carrier layer and one of the thermoplastic layers, which in the finished packing container very effectively protects the packed goods from the effect of light.

In the forming of the packing containers the laminated material is subjected to considerable stresses. This applies particularly to the folding of the material, since a folding of the material, owing to the relatively great stiffness of the carrier layers, means that one of the thermoplastic layers is subjected to an appreciable stretching, whilst the opposite thermoplastic layer is pressed together along the whole folding line. However, owing to the great extensibility of the thermoplastic material, this does not often cause the thermoplastics to suffer damage or to lose its impermeability to liquids. The situation becomes worse, however, if the packing laminate also comprises layers of aluminium foil, which compared with the thermoplastic layer possess only low extensibility and thus tend to crack when the laminate is folded.

Even though a simple folding of a packing laminate of the described type about 180° will not have any serious consequences insofar as the impermeability of the material to liquids or its light transparence are concerned, considerable difficulties arise when two such folding lines cross each other. This is often the case along the seal or seals which are always present on packing containers. Seals are usually realized by heating the thermoplastic layers which are facing towards the inside of the packing container along the edge zones of the packing laminate which are to be joined together, whereupon the two areas of layer heated to softening are placed together and compressed so that a sealing fin is produced which is situated at the outside of the packing container and comprises two laminate layers. So as not to form an obstacle, the sealing fin is often folded down against the outside of the packing container, which means that the one laminate layer undergoes a 180° folding and that the packing container wall in the actual sealing area consists of three laminate layers, that is to say, it has threefold thickness.

A seal of the abovementioned type often runs along one or more of the side faces of the packing container and since these side faces, e.g. in the forming of parallelepipedic packages from cushion-shaped packages are subjected to a 180° folding along a folding line which forms a 90° angle with the seal (described in more detail in the following) the material thickness in certain limited areas of the packing container will amount to 6 times the laminate thickness. In such a 180° folding transversely to the sealing area the material layer which after the folding is situated on the outside of the fold (that is to say, the material layers situated outside the neutral plane produced) will be subjected to very strong tensile stresses with accompanying stretching and crack formations. These tensile stresses are so great that frequently not only any aluminium foil layers included in the laminate crack but also the thermoplastic layer with the result that leakages occur.

In order to overcome the aforementioned disadvantages it has been endeavoured up to now, among other things, to raise the elasticity of the materials included to the highest possible degree which gives a relatively good result insofar as the thermoplastic material is concerned, but does not solve the problem of any aluminium layer included in the laminate.

Another known solution proposes to punch out parts of the carrier layer of the laminate in the critical folding zones so as to make it possible for the remaining plastic and aluminium layers to come near the neutral plane of the fold and more or less accurately follow the same around the fold. This solution give some positive results but makes the manufacture of the material more complicated.

It is an object of the present invention to provide a packing laminate which renders possible the realization of the aforementioned folding without the risk of crack formation or leakage, and without the disadvantages affecting the methods proposed previously.

It is a further object of the present invention to provide a method making possible the folding of several layers of packing laminate comprising layers of aluminium foil or other material of low extensibility without risking crack formation along the folding line in the outer layers.

These and other objects have been achieved in accordance with the invention in that a packing laminate of the type described in the introduction

provided with crease lines has been given the characteristic that in the area of the packing laminate where crease lines converge or cross each other at least one crease line is substituted by or is completed by an auxiliary crease line.

A preferred embodiment of the laminate in accordance with the invention has been given the further characteristic that an auxiliary crease line is arranged on each side of the said crease line or of the imaginary extension of the same.

A preferred embodiment of the laminate in accordance with the invention has been given the further characteristic that the auxiliary crease line is situated substantially adjoining the crease line and extends in the principal direction of the same.

A further preferred embodiment of the laminate in accordance with the invention has been given the further characteristic that the auxiliary crease lines are substantially parallel with the crease line.

A further preferred embodiment of the laminate in accordance with the invention has been given the further characteristic that the auxiliary crease line, in the case of two crease lines crossing each other, is arranged along that of the two crease lines which on conversion of the laminate to a packing container is used last.

A further object of the present invention consists in providing a method for the manufacture of a packing laminate of the type described above.

This object has been achieved in accordance with the invention in that a method for the manufacture of a packing laminate has been given the characteristic that the auxiliary crease lines are formed after the remaining crease lines.

A preferred embodiment of the arrangement in accordance with the invention will now be described in detail with reference to the figures on the enclosed schematic drawing.

Figure 1 shows in perspective a part of a packing container wall with a sealing fin which has been folded to lie against the outside of the packing container laminate.

Figure 2 show in a perspective a portion of the packing container wall in accordance with Figure 1 after folding about 180° along a folding line which extends right-angled to the longitudinal axis of the sealing fin.

Figure 3 shows schematically a crease line pattern in accordance with the invention in the case of two crease lines crossing at right angles.

Figure 4 shows schematically a second embodiment of a crease line pattern in accordance with the invention.

The packing laminate shown schematically in Figure 1 is of a known type and comprises a relatively thick, central carrier layer of e.g. paper, which layer imparts the required stiffness to the material. In order to prevent the fibrous carrier layer from absorbing moisture from the environment and from the packed goods the carrier layer is provided on both sides with thin layers of a homogeneous plastic material which is preferably of the thermoplastic type. Depending on the type of contents which are to be kept in the packing container manufactured from the packing laminate the packing laminate may also comprise further layers for different purposes, e.g. an aluminium layer which is impervious to light so as to prevent the contents from being exposed to and affected by daylight. Further layers with special objectives are also conceivable. Since the type of laminate described is well-known to those versed in the art, the different layers have not been marked on the laminate shown in the figures, but for the sake of greater clarity the laminate has been drawn as if it consisted of a single layer.

In Figure 1 is shown a portion of a packing container wall 1 with a seal of the material inside to material inside type. This seal is achieved in that along the edge zones which are to be joined the thermoplastic layers of the material facing towards the inside of the packing container are heated, whereupon the layers are pressed against one another so that a seal is produced with a sealing fin 2 situated on the outside of the package. So that it should not form an obstacle and attach itself to neighbouring packages or the like the sealing fin 2 is subsequently folded so as to lie against the outside of the packing container. In the area of the seal the packing container will therefore have three-fold wall thickness and comprise, more particularly, an inner material layer 3 which constitutes the actual packing container wall in the sealing area, and two material layers 4 and 5 forming the sealing fin 2. The material layer 4 constitutes a part of the material layer 3 folded about 180° and the material layer 5 constitutes a continuation of the opposite of the two wall portions sealed in the sealing fin.

The type of seal described above is customary and occurs in a great number of packing containers of the nonreturnable type. In a known non-returnable package which is used e.g. for liquid dairy products and which is manufactured by conversion of a material web to a tube provided with a longitudinal joint, which is filled with contents and is sealed off by means of transverse seals situated at equal distances, this type of seal is used. These packages which after filling and sealing are given a practically cushion-like shape are subsequently converted with the help of forming jaws to substantially parallelepipedic shape, whereby among other things the cushion-corners are pressed flat and are folded in and sealed against the sides of the packing container. As a result the sides on which the sealing fins are situated will be folded about 180° along a crease line which is situated right-angled to the sealing fin.

This is illustrated in Figure 2 where, as in Figure 1, the sealing fin is indicated by reference numeral 2 whilst the point at which the two 180° folds cross one another is indicated by reference numeral 6. In this point consequently a 180° folding takes place of the sealing fin 2 consisting of three laminate layers along a crease line

extending parallel with the sealing fin, resulting in a six-fold material thickness. When the three-fold material is folded about 180° the neutral plane, that is to say, the plane wherein neither tensile nor compressive stresses occur, will come to lie substantially between the two material layers 4 and 5 forming part of the fold. In other words, the material layer 5 situated within the neutral plane will be pressed together and compressed at the point of folding whilst the two material layers 3 and 4 situated outside the neutral layer will be subjected to tensile stresses, which usually give rise to cracks in the carrier layer of the material layer 3 and often also to crack formation in the carrier layer situated inside the material layer 4. This crack formation is of little consequence. However, owing to the great tensile stresses in the material layer 3 situated outermost cracks will often be formed also in the thermoplastic layers of this laminate layer, which has an adverse effect on the impermeability of the packing container. When the packing container laminate is of the type which comprise layers of aluminium foil the double folding of the laminate described invariably leads to crack formation in the aluminium layer, which crack formation often progresses into the two outer material layers 3 and 4.

The folding of the packing laminate generally takes place along crease lines which guide the fold and ensure that the same finds its right place and obtains the right direction. The crease lines constitute linear weakenings of the material and usually consist of a linear compression or ridge which is achieved in that the material is processed between two cylinders provided with corresponding ridges or ridges and recesses. Since the crease lines necessarily signify a weakening of the material any crack formations will also be concentrated in the material situated in or close to the crease lines and a particularly critical point will be the place on the packing laminate where two or more crease lines converge or cross one another.

The risk of crack formation is eliminated in accordance with the invention in that at the places where crease lines converge or cross one another the packing laminate is given a new crease line pattern which reduces and disperses the stresses at the critical point 6. In the figures 3 and 4 two embodiments of such a crease line pattern are shown wherein two crease lines 7 and 8 respectively intersect each other at right angles. As can be seen from these figures, one of the crease lines crossing each other is substituted or completed in the area of intersection by one or nore auxiliary crease lines which extend in the principal direction of this crease line. The auxiliary crease lines are indicated in Figure 3 by reference numeral 9 and in Figure 4 by reference numeral 10. The auxiliary lines 9 and 10 respectively, as can be seen from the drawing, are preferably arranged on either side of the main crease line 8 or, as is the case in Figure 4, on either side of an imaginary extension of the main crease line 8. The auxiliary crease lines are situated closely adjoining the main crease line or its extention, which means that the material in connection with the crease line will be softened up so that it can better withstand the stresses arising in the subsequent folding. The placing also has the effect that the material on creasing will be stretched in two or three lines adjoining one another, so that a material surplus arises which is then made use of for diminishing the stresses in the fold. Finally, the parallel crease lines also mean that the folding does not occur concentrated along one folding line but that it is divided over the main crease line as well as the auxiliary crease lines. The auxiliary crease lines are substantially parallel with the main crease line, but different realizations may also exist and the auxiliary crease lines may also be curved or angular. In cases where the two crease lines 7 and 8 respectively do not cross each other at right angles, further shapes may occur and the chief principle therefore is only that the auxiliary crease lines should be formed and placed in such a manner that tensile stresses arising in the material are reduced and distributed to an optimum extent.

Since the stresses in the material and the risk of crack formation are greatest along the crease line along which the second or final folding takes place (crease line 8 in Figures 3 and 4), it is advisable that in the case of two crease lines crossing one another the auxiliary crease line should be arranged along that of the two crease lines which in the conversion of the laminate to the packing container is used last. In general it is not appropriate to arrange auxiliary crease lines along crease line 7 as well as crease line 8, since the material would then be weakened excessively so that the risk of crack formation would be increased again and the fold moreover becomes inaccurate because of the unsatisfactory guiding.

The packing material should appropriately not be provided simultaneously with main crease lines and auxiliary crease lines, but the auxiliary crease lines should only be formed after the forming of the other crease lines. This separation in time is particularly desirable in the embodiment of the invention which is shown in Figure 3, since the stretching of the material in the making of three parallel crease lines will be appreciable, especially if the crease lines are produced at the same time and are of the prevalent type, that is to say, ridgelike raisings of the material. If instead the crease lines 9 are produced at a later operating stage it is possible to utilize in the formation of the crease lines 9 partly the material accummulated in the crease line 8 situated between them, so that the danger of excessive weakening of the laminate is eliminated.

The crease line pattern shown in Figure 4 differs from the pattern shown in Figure 3 only in that the main crease line 8 has been discontinued on a stretch which corresponds substantially to the length of the auxiliary crease lines 10. In this manner two parallel crease lines at the most

occur side by side which appreciably reduces the risk of crack formation in the crease, and in this crease line pattern it is normally possible therefore for the main crease lines and the auxiliary crease lines to be pressed in at the same time which naturally can be an advantage in practice.

In accordance with the invention a method and a packing laminate are provided wherein the problem existing hitherto of crossing or converging 180° folds have been effectively eliminated. The arrangement is simple, not expensive and allows savings to be made, since the material quality can be lowered and adapted to the appreciably smaller stresses which arise over the remaining part of the packing container surface.

Claims

1. A packing laminate provided with crease lines for conversion to packing containers, characterized in that in the area of the packing laminate where crease lines converge or cross each other at least one crease line is replaced by or is completed by an auxiliary crease line.

2. A packing laminate in accordance with claim 1, characterized in that an auxiliary line is arranged on each side of the said crease line or of the imaginary extension of the same.

3. A packing laminate in accordance with claim 1 or 2, characterized in that the auxiliary crease line is situated substantially adjoining the crease line and extends in the principal direction of the same.

4. A packing laminate in accordance with any of the preceding claims, characterized in that the auxiliary crease lines are substantially parallel with the crease line.

5. A packing laminate in accordance with any one of the preceding claims, characterized in that the auxiliary crease line in the case of two crease lines crossing each other is arranged along that of the two crease lines which on conversion of the laminate to a packing container is used last.

6. A method for the manufacture of a packing laminate in accordance with claim 1, characterized in that the auxiliary crease lines are formed after the remaining crease lines.

7. A method of producing a laminate substantially as described herein with reference to the accompanying drawings.

8. A laminate with creases substantially as described herein with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.