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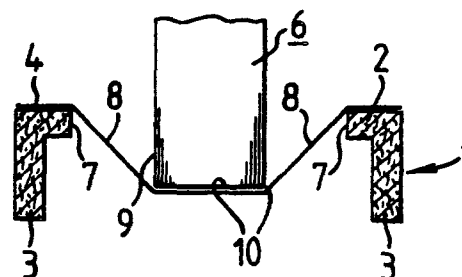
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⑤4 **Blister-pack and process for its production.**

⑤7 A blister pack comprises a plastic trough projecting from a window-like cut out in a frame. The frame has at least two lateral support sections at an angle to the outer periphery of the frame. The plastic only covers the frame as far as the junction of the lateral support sections thus saving plastic when compared with known blister packs and facilitating mould release in manufacture.



Blister-pack and process for its production

The invention relates to a blister-pack with a frame consisting of plane material with a window-like cut-out, and at least two lateral support sections at an angle to the outer periphery of the frame, to which a plastic foil is applied in the window in the form of a trough.

Blister-packs of the type mentioned above are known from DE-GM 76 37 448. Their production consists of laying the frame, usually a corrugated cardboard blank, with the window over a positive mould, then laying a heated foil on the projections of the mould and the cardboard blank. By means of partial vacuum it is sucked close to the projections and the surface of the cardboard, and in doing so it forms a skin on the surface of the cardboard, and finally after mould release the embossed foil is pressed through the window to form the foil trough.

Blister-packs serve for the transportation and storage of packaged goods which are sensitive to impact and easily breakable. The blister-pack carrying the packaged goods is either enclosed in a despatch carton or two blister-packs surround the packaged goods and form in themselves the packing for transport when suitably fixed by a band.

In the case of known blister-packs the foil forms a skin over the entire cardboard blank, including the lateral support sections. This is bound up on the one hand with the mode of production used, in which the cardboard blank is laid flat on a set of moulds over the extent of the drawing-bench.

the other hand, by means of the skin process only a limited adhesion between foil and cardboard can be achieved, because if one exceeds a certain temperature in the attempt to improve adhesion, when the partial vacuum is applied the foil is sucked into the fine channels of the corrugated cardboard at the inner edges of the window, so that a kind of perforation line develops there which accordingly possesses diminished strength.

The known blister-packs thus involve a higher foil consumption than would be required to take the packaged goods. In addition, as a result of this the mould release is made so much more difficult that in practice after the foils have formed the skin the blister-packs are released from the moulds by hand with a knife. Under certain conditions, it is true, the use of mechanical cutters is possible; yet here too, a considerable waste of foil cannot be avoided.

The Invention is based on the problem of producing a blister-pack of the type mentioned above in which the foil consumption is considerably reduced whilst maintaining an adequate adhesion and without considerably influencing the tearing strength at the inner edges of the window.

Starting from a blister-pack of the type mentioned at the outset, this problem is solved according to the invention by the fact that the foil is joined to the part of the frame only as far as the point of junction with the lateral support sections, by heat-sealing.

In the blister-pack according to the Invention, the foil covers only the part of the frame as far as the points

of junction or folding lines of the lateral support sections, or possibly one millimetre beyond. As compared with the known blister-packs this represents a considerable saving in foil, for example 50 per cent or more. Packaging using the blister-packs according to the Invention can then be even cheaper than the cheapest known packages on the basis of rigid foam substances, which suffer from special problems of space requirements and their destruction after use. Furthermore as a result of the restricted amount of foil covering no mould release problems occur when producing the blister-packs according to the invention.

By means of heat sealing the foil is firmly joined to the plane material, which facilitates both a good adhesion to the plane material and also the avoidance of an adverse effect on the tearing strength at the inner edges of the window.

The production of the blister-packs according to the Invention can for example take place by pushing the frames on to upright sets of moulds in thermoforming machines, so that the lateral support sections are located in a vertical arrangement inside the set of moulds and are not sealed, or else one inserts the frames in line into individual moulds which are simultaneously sealed to the foil and separated by a hot sealing plate, so that a deep-drawing process takes place by means of contact heating and compressed air shaping in one working cycle, similar to what happens in the usual automatic deep-drawing machines for compound foil shaping in the foodstuffs industry. A particularly suitable process will be described later on.

Solid cardboard, corrugated cardboard or even laminated sealable plastic resembling corrugated cardboard can be used for the plane material for the frame, but corrugated cardboard is preferred.

The plastics foil, ie sheets or films used in the present invention are preferably transparent sheets suitable for deep-drawing especially polyethylene laminated foils, which are coated on the inner side, ie the one which comes into contact with the plane material, with an adhesion layer, eg of an ethylene polymer eg, an ethylene/vinyl acetate co-polymer or an ethylene/acrylic acid/acrylate ester terpolymer. These co-polymers possess an excellent adhesion both to polyethylene and the plane material.

However, one can also coat the plane material in the sealing area first of all with polyethylene or an ethylene/vinyl acetate co-polymer dispersion or an ionomer resin dispersion, and then apply by means of hot sealing and simultaneous deep-drawing a normal polyethylene foil, ethylene/vinyl acetate co-polymer foil or ionomeric foil. The ionomers in question are pseudo-cross-linked, thermoplastic, transparent plastics, chiefly co-polymer of ethylene with monomers containing carboxyl groups. (See Römpps' Chemielexikon, 7th Edn, Frank'sche Verlagsbuchhandlung, Stuttgart 1973, pp 1622, 1623.) A particularly suitable ionomer is commercially obtainable under the trade name "Surlyn A" (Manufacturers: Du Pont).

Moreover, the plane material can be coated in the sealing area first of all with a coating containing polyvinyl-chloride, which makes possible the use of PVC foils.

To achieve greater stability laminated foils of three or more layers are used, in which the outer layer consists of a polyamide or polyester and the inner layer consists of plastic which can be sealed with the plane material, for example the abovementioned ethylene/vinyl acetate copolymers, ethylene/acrylic acid/acrylate ester terpolym or ionomer resins. These foils also possess the advantage that during the heat sealing process they do not stick to the contact heating devices even at high temperatures.

Packaging with the blister-packs according to the Invention is done either by inverting a blister-pack over the goods to be packaged, which are prepared in a despatch box on anti-crush pad, or else by using two blister-packs which may be surrounded by a packing carton, in which case preferably care should be taken to see that both blister-packs are given a certain amount of pre-tensioning.

The blister-packs of the Invention possess at least two lateral supporting sections. The strength of the blister-pack when assembled is thus, it is true, not optimum, but is adequate for some purposes, especially if the blister-packs are used in conjunction with packing cartons. Possibly parts of the packing carton, especially flaps, could take over support functions as well. Without the use of a packing carton a considerably greater strength can be attained by means of lateral support sections on all four sides of the frame.

Naturally one must take care to see that the height of the supporting sections is at least as great as the depth of the foil troughs.

The dimensions and shape of the frame and also the shape of the window are not subject in principle to any special restrictions. On the grounds of economising on material one selects the frame to be only as wide as is absolutely necessary, but one should not go below a certain minimum width for reasons of breaking strength and foil adhesion. The shapes of the window and the trough are chosen to suit the dimensions of the goods to be packaged and the type of pack (one or two blister-packs, with or without packing carton).

In an advantageous design the blister-pack according to the Invention has a window-like cut-out which is larger than the packed goods to be accommodated or larger than the part of the packed goods to be accommodated.

In the packs formed from two blister-packs known from DE-GM 76 37 448, the blister-packs have windows of the size of the part of the packed goods lying in them. Whilst the packed goods are not meant to come in contact with the outer walls of the packing carton, the edges of the packed goods are to be partially retained by the window cut-outs in the plane material and to this end it is further provided that bent-over parts of the cardboard blanks located on the lateral support sections rest against the packed goods.

When corrugated cardboard is used, however, it has been found that the upright ridges in the corrugated cardboard area chafe through the foil, which affects the strength of the packaging, but also the packed goods are so badly damaged by the rubbing movements, even if the foil is not chafed right through, that for example in the case of veneered loudspeaker units the goods are no longer saleable.

Furthermore, in the case of corrugated cardboard which is in contact with the packed product, the deceleration figures for the drop test leave something to be desired, since in free fall there is a very strong braking action exerted on the packed product because of the high compression value.

The above problems are avoided if the window-type cut-out is larger than the packed product to be enclosed or is larger than the part of the packed product to be enclosed.

In a further advantageous design the lateral parts of the foil trough in the blister pack containing the packed product do not run parallel to the external surfaces of the packed product lying there, but run outwards from the edges of the packed product surfaces located on the bottom of the foil trough. In respect to the blister-pack this means that the side walls of the foil trough from the inner edge of the window outwards do not run downwards vertically to the plane of the frame, but deviate inwards from the perpendicular by an angle amounting to at least about 10° . The top limit is determined by economic considerations, which would render angles of more than 70° of no interest. Generally speaking the angle is from 20° to 60° , preferably 30 to 50° , an angle of about 45° giving particularly good results in many cases. In most cases only a small depth of the foil trough is necessary, since it has only to be large enough to ensure that the packed product is fixed, e.g. between two blister-packs.

Production of the foil trough as shown can be achieved in an advantageous manner by using a mould which is obtained by means of forming a suitably dimensioned piece of foil

over the packed product in the state suitable for deep-drawing, by means of a draw frame, the window of the draw frame being adapted to the desired window of the subsequent blister-pack, that is to say, the window of the draw frame preferably possesses approximately the same dimensions as the window of the subsequent blister-pack. A suitable mould is obtained from the foil cast, e.g. by plaster-casting. In special cases the window of the draw-frame is chosen somewhat smaller for the production of the mould. This is described below.

The design of the blister-pack in such a manner that on the blister-pack containing the packed product the inner edges of the frame window do not come into contact at any point with the packed product can be achieved in yet another advantageous model, however, by letting the blister-pack have a foil border running round the inner edges of the window which projects over the frame. As a result of the foil border one achieves a better strength distribution and thus a spring effect if the pack falls. This foil border is obtained by designing the mould used in such a way that the upper edge of the mould has a greater width than the frame of the blister-pack. But one can also produce the foil border in such a manner that one keeps a correspondingly dimensioned strip free from heat contact inside the window during the heat-sealing process, e.g. by means of a groove in the heating plate used for sealing.

An especially good distribution of strength is achieved by using blister-packs which possess both a foil border projecting inwards and trough side walls deviating inwards from the perpendicular.

For producing these blister-packs preferably a mould is used obtained as a result of excess pressure of a foil sheet in a condition suitable for deep-drawing, by means of a tensioning frame over the packed product and casting of the foil mould so obtained with a moulding compound, the dimensions of the tensioning frame window, however, being somewhat smaller as compared with the window of the subsequent blister-pack, namely are reduced by the width of the foil border.

In a further advantageous design of the new blister-pack having a subdivided window with several separate troughs, these latter are separated not by ridges made of the frame material but formed of the foil. This has the advantage that one can produce blister-packs with a differing number of troughs from the same blank. In addition, with partitions consisting of foil no safety gap is required as is the case with partitions of corrugated cardboard.

In a further advantageous design the blister-pack according to the invention possesses four lateral supporting sections, two adjoining sections being joined to each other in each case, and a crease running diagonally over the frame which in each case continues in the narrow support sections in such a way that the creases between frame and narrow support sections form the angle bisectors for the angles enclosed by the creases. For it has been found that assembling blister-packs provided only with four lateral support sections or assembling blanks which are merely pre-creased requires such a high time outlay at the packing factory that the costs incurred by this are higher than the costs for the blank.

The blank used for the production of the blister-pack according to the Invention is stored in the collapsed condition (diagonally folded) and erected by positive action by the application of slight lateral pressure before the foil is applied. The finished blister-packs are then collapsed diagonally again, stored flat and despatched, and when used are again erected by positive action by a slight lateral pressure.

In a further advantageous design the blister-pack of the Invention possesses four lateral support sections joined to one another, creases running centrally along the narrow lateral support sections and parallel to the connecting edges of the support sections, which creases continue in the frame, and creases or slots running from the outer edges of the window diagonally to the inner edges of the window. Preferably flaps are located at least on the narrow support sections, in which the creases of the narrow support sections continue. The advantage of these designs consists in the fact that by means of a light pressure on the centre of the narrow lateral support sections the blister-pack can be collapsed, which results in the erection of the frame and possibly of the flaps, the narrow lateral support sections are folded inwards over the creases and the broad lateral support sections come to lie on top of each other.

In a further advantageous design the abovementioned blister-pack possesses four flaps hinged to the lateral support sections which together form a base. In this way one packaging unit can be formed from two blister-packs which, once the bases have been closed in a known manner and a strap has been

applied, does not necessarily require an additional box for despatch. The blister-pack frames can rest against each other, so that the packed product is surrounded by foil on all sides. However, in many cases it is not necessary for the packed product to be enveloped completely in foil, but rather, once the packed product has been laid in position, a greater or lesser gap can exist between the flat surfaces of the frames, the packed product being held in a fixed position from two sides between the blister-packs. Advantageously the blister-packs are placed under a slight pre-tension, which can be done by dimensioning the despatch carton accordingly or using a strap. If the despatch carton is one involving a pull-over sheath or is a slide-on or banded box, this type of packing is particularly economic on material.

In a further advantageous design the blister-pack according to the Invention possesses four lateral support sections joined to each other and of trapezoidal cut broadening towards the frame side, creases running centrally in the narrow lateral support sections and more or less parallel to the connecting edges of the lateral support sections, which creases continue in the frame, triangular peaks located at the four corners of the frame and projecting upwards, and creases or slots running diagonally along the frame.

In this case advantageously there are located at least on the narrow support sections flaps in which the creases of the narrow lateral support sections continue. This design preferably finds application as a stackable fruit or vegetable crate.

In the case of a further advantageous pack two blister-packs having two lateral support sections, in each case on two

sides only. preferably the long sides, are combined with a despatch carton with in each case four base and cover flaps, two base and two cover flaps being turned inwards and thus forming the two missing lateral support sections for the blister-packs. In this connection it is preferable for the flaps of the despatch carton which are to be turned inwards on the sideedges to be reduced by the thickness of the material, so that a snug fit of the blister-packs is ensured. In a further advantageous design the reduction in material thickness does not extend over the entire flap, but towards the outer edge a lip-type projection is obtained. There are then located on the side edges of the blister-pack support sections corresponding recesses into which the lips of the box flaps fit. The two remaining base and cover flaps of the despatch carton in each case have only to ensure the closure of the pack. Forces exerted during transportation, e.g. by falling, are taken up by the cover and base flaps turned inwards, without there being any risk of the pack coming open.

In a further advantageous pack the blister-pack after the packed product has been accommodated is top-sealed by a foil. This packing is suitable for goods sensitive to moisture and gas, e.g. to the effects of oxygen, and also for display packs, and in the case of packed products sensitive to impact or liable to break if dropped a padding, e.g. a compression pad, can be arranged between the packed product and the covering foil which does not appreciably affect the view. With this type of packaging vacuum packs with inspection windows can be produced

by evacuating the air from the blister-pack accommodating the packed product before sealing with the cover foil.

In a further advantageous design along these lines a moisture-proof pack consists of two blister-packs with the trough apertures sealed to each other, a closure being welded in at a suitable point, this being facilitated preferably by the appropriate design of the blister-packs.

When creases or slots are referred to above, this refers exclusively to the blanks used for producing the blister-packs. The foil itself requires no creases for folding the blister-packs after their production, as by its very nature it responds to all folds without difficulty. In a similar manner this also applies to slots, where there is the additional feature that the slots required in the frame for the production of the blank for the blister-packs only undergo an adhesive effect from the sealing on of the foil, so that when the blister-pack is produced after assembling the blank no special adhesion of these slots is absolutely necessary. With square blister-packs, of course, long and short sides can be interchanged.

The invention also relates to a process for the production of a blister-pack, which is characterised by the fact that in one working cycle a plastic foil is sealed on to the frame of a blank made of plane material, applying pressure and heat by means of contact heating, the temperature of which is above the sealing temperature of the foil, it is rendered deformable and brought into a mould corresponding to the subsequent foil trough for the blister-pack.

This process may be performed by inverting the blank over a trough mould with dimensions adapted to the internal measurements

of the assembled blank, in such a way that the frame lies with the punched-out window uppermost. A sheet of foil is then laid on the blank which is adapted to the outside measurements of the frame. If one uses a folding box-type blank, in which the window frame is formed by folding over flaps which correspond to the cover flaps but are shortened to form the window, then the four flaps folded inwards at right angles lie uppermost. These flaps forming the frame are subsequently covered over by the foil.

The mould with the blank thus assembled together with the section of foil applied is then subjected to the contact heating, which can for example be a hot sealing plate provided on the contact side with apertures. The dimensions of the contact heating device are equivalent at least to the outside dimensions of the frame. The temperature of the contact heating device is above that of the sealing and deformation of the foil. This contact heating device is applied with a high pressure on the upper side of the mould accommodating the blank and the foil and during the sealing of the foil to the blank at the same time effects a hermetic seal. Preferably the heating plate is equipped with an anti-stick layer, for example made of polytetrafluorethylene or silicon rubber which prevents the foil from adhering.

When the foil, under the action of the contact heating device, has reached adequate thermoformability, shaping takes place; the foil is cooled by the mould and thus becomes stable in shape. As the foil reaches only to the edge of the frame (or possibly very slightly beyond it, e.g. 1 mm), the mould release of the finished blister-pack presents no difficulties.

In a preferred form of embodiment of the process of the Invention the deformability of the foil is brought about by pressing it by means of compressed air to the contact heating device. To this end compressed air is blown into the mould from below and by means of this the foil is pressed to the contact heating device for just as long as it takes to reach the temperature of deformation.

In a further preferred mode of embodiment the foil-shaping is produced by pressing the foil to the mould by means of compressed air. For this purpose, for example, one proceeds, after removing the air from the mould, to press the foil into the mould by means of compressed air, which is blown in through the heating plate, and in the mould the foil cools and thus becomes stable in shape. With this version of the process one gets a draping action through blowing.

Instead of compressed air, the process of the Invention can also make use of sub-atmospheric pressure, or the two processes can be combined. With this vacuum process, instead of blowing the compressed air, a vacuum is applied at the opposite point. Thus one gets a draping action through suction.

According to the Invention working with compressed air is preferred as in this way one has a greater amount of play in regard to the pressure used. Thus for example when producing blister-packs using triply corrugated cardboard, with the blowing process one can always build up an adequate pressure, whilst with the vacuum process too great a loss of suction occurs through the cardboard. On the other hand by using a combination of the blowing and vacuum processes it

is possible to place all the connections either on the mould or on the contact heating device, which is an advantage in certain cases.

Thus for example by arranging the vacuum and compressed air connections on the contact heating device, the foil can first be sucked on to the contact heating device and then blown into the mould. In the case of fully automated production of the blister-packs this is an advantage. Then only de-aerated moulds need pass through a shaping device of this type, and connections which work through the mould are not required.

In a further preferred form of embodiment the process of the Invention is executed in such a way that when shaping the foil one leaves a foil border which runs round the inside edges of the window projecting over the frame. This foil border runs approximately flush with the frame and is preferably continuous. As a result of the foil border one achieves a better strength distribution and hence spring effect if the pack is dropped.

This foil border can be obtained by the design of the mould, by dimensioning the upper edge of the mould wider than the frame of the blank or subsequent blister-pack. But one can also produce the foil border in such a way that one leaves an appropriately dimensioned strip on the inside edges of the window free from heat impact from the contact heating device, e.g. by means of a suitable groove in the hot-plate of the contact heating device.

In a further preferred form of embodiment it is provided that when shaping the foil one leaves ridge-shaped foil sections. By this means one obtains blister-packs with several separate troughs which are separated not by ridges made of the frame material but made from the foil. In this way one produces blister-packs with a differing number of troughs from one and the same blank. The ridges can be produced, like the foil border, either by an appropriate design of the mould, or by keeping the ridge area free from heat impact from the contact heating device, e.g. by means of a suitable groove in the said device.

The mould used for the process of the Invention is preferably produced so that one presses a sheet of foil in a condition suitable for deep-drawing by means of a tensioning or draw-frame over the goods intended for packaging, the window of the draw-frame being adapted to fit the desired window of the subsequent blister-pack, that is to say the window of the draw-frame possesses approximately the same or somewhat smaller dimensions - namely reduced by the width of the foil border - than those of the subsequent blister-pack. After cooling a suitable mould is produced from the form-stable foil casting, for example by plaster-casting.

In the process of the Invention one is dealing in the case of all variants with a negative process, that is to say that the mould supplies the end product direct. A further advantage as compared with known positive processes consists in the fact that one achieves a more favourable distribution of the foil thickness. For one thing the differences between

the thickest and thinnest points are less, and for another the foil at the junction with the frame is thicker than on the floor of the trough and not the other way round.

The invention also relates to a process for the production of a pack which is characterised by the fact that one inverts a blister-pack according to the Invention over the packed product located in the lower part of a carton on a base, e.g. on a compression pad, with the frame downwards, and one then causes the arrangement to pass through a radiation heating device. When this is done the foil is heated accordingly and shrinks to the packed product, so that a good fixing of the packed product is achieved.

With this type of pack the blister-packs employed are preferably produced using a normal heat-shrinking foil. However, this is not absolutely necessary, since when producing the blister-packs by developing the foil trough according to the vacuum or blowing shaping process a stretching takes place anyway, which imparts shrinkage properties to the foil.

The advantage of this process lies in the fact that even with differently shaped packed products, using a blister-pack of unchanged dimensions a contoured packaging unit can still be obtained; the only pre-requisite is that the trough of the blister-pack, even in the vertical direction, should be somewhat larger than the packed product. In the example mentioned above, where the packed product is located on a bed in the lower part of a box, a padded lid can then if necessary be laid on top of it.

Below the invention is described in the drawings on the

basis of advantageous designs.

- Fig. 1 shows a plan view of a blister-pack according to the Invention,
- Fig. 2 shows a longitudinal section through the blister-pack of Fig. 1 along the line A-B,
- Fig. 3 shows a longitudinal section through a further form of embodiment of a blister-pack according to the Invention,
- Fig. 4 shows a blank for a further form of embodiment of a blister-pack according to the Invention,
- Fig. 5 shows a blank for a further form of embodiment of a blister-pack according to the Invention,
- Fig. 6 shows a plan view of the finished blister-pack produced from the blank of Fig. 5
- Fig. 7 shows a blank for a further form of embodiment of a blister-pack according to the invention,
- Fig. 8 shows a plan view of the finished blister-pack produced from the blank of Fig. 7,
- Fig. 9 shows a plan view of a further form of embodiment of a blister-pack according to the invention when laid flat, and
- Fig. 10 shows a blank of a despatch carton for the blister-pack of Fig. 9.

The blister-pack shown in Figures 1 and 2 consists of the surrounding frame 2 with two lateral support sections 3, the corrugated cardboard blank, and the foil 4, which is joined to the frame as far as the point of junction of the lateral support sections 3 by means of hot-sealing. The foil is a polyethylene/ethylene vinyl acetate co-polymerisate transparent laminar foil,

which is sealed with the ethylene vinyl acetate co-polymer-side to the frame. The window 5 of the blister-pack is larger than the packed product accommodated, the lower part of a loudspeaker unit 6. A second blister-pack (not shown) is inverted over the top end of the loudspeaker unit 6, with its lateral support sections facing upwards. The entire arrangement is held together with slight pre-tensioning by a despatch carton (not shown). In this way the inside edges 7 of the window of the frame do not come into contact at any point with the packed product 6. The lateral parts 8 of the foil trough do not run parallel to the outer surfaces 9 of the packed product accommodated therein, but run from the edges 10 of the surface of the packed product lying on the floor of the foil trough outwards, so that the lateral parts 8 have an angle of inclination of 45° to the perpendicular in relation to the plane of the frame.

In the form of embodiment of Fig. 3 the blister-pack has a foil border 11 running round the inside edges 7 of the window and projecting over the frame 2, which border, regardless of the material thickness of the frame 2, runs flush with the frame. The packed product 6 is the loudspeaker unit of Fig. 1, and here the side surfaces 9 of the unit can lie against the side surfaces 8 of the foil trough, as the foil border 11 takes care of the safety margin between it and the inside edges 7 of the window of the blister-pack. Furthermore by means of the foil border 11 one achieves a better strength distribution and hence sprung action if the pack is dropped. Just as in the case of the form of embodiment shown in Fig. 1, at the top

end of the unit 6 a second blister-pack (not shown) is located, the lateral support sections of which face upwards. The entire arrangement is held under pre-tension by a despatch carton (not shown).

Fig. 4 shows a further form of embodiment of a blister-pack according to the invention in blank form. This blank possesses four lateral support sections 21a, 21b, 22a, 22b, the narrow supporting sections 21a, 21b having side flaps 23a and 23b. The blank possesses a crease^{25a, 26b} running diagonally over the frame 24 which in each case continues in the narrow support sections 21a, 21b in such a way that the creases 27a, 27b between the frame and the narrow support sections 21a, 21b form the bisectors of the angles enclosed by the creases 25a, 26a and 25b, 26b. These creases make it possible to collapse the blank, after assembling and connecting the lateral support sections 21a, 22a and 21b, 22b through the side flaps 23a and 23b by means of wire stitching. This blank is erected by positive action by a slight lateral pressure before the foil is applied. After the foil has been applied the finished blister-pack is collapsed by diagonal folding, stored in the flat state and despatched and again erected by positive action before use.

Fig. 5 shows a further form of embodiment of a blister-pack according to the invention, in the form of a blank, and Fig. 6 shows a plan view of the finished blister-pack. The blister-pack possesses four lateral support sections 31a, 32a, 31b, 32b, which are joined together by the flap 34 by glueing, the flaps 35a, 36a, 35b, 36b forming the frame. The narrow

support sections 31a, 31b possess creases 33a, 33b running centrally and parallel to the connecting edges 38a, 38b, 38c, 38d of the supporting sections and which continue in the frame flaps 35a, 35b and the stiffening flaps 37a, 37b which are folded inwards when the blank is assembled. After the blank has been assembled it is not absolutely necessary to glue the slots 39a, 39b, 39c, 39d, as a good cohesion of the frame is achieved by the sealing on of the foil. After the foil has been sealed on, the finished blister-pack can be collapsed by a light pressure on the centre of the narrow lateral support sections 31a, 31b, when the frame flaps 35a, 36a, 35b, 36b open out and also the stiffener flaps 37a, 37b, the narrow support sections 31a, 31b are folded inwards over the creases 33a, 33b and the broad support sections 32a, 32b come to lie on top of each other.

Fig. 7 shows a further form of embodiment of a blister-pack according to the invention, in the form of a blank, and Fig. 8 shows a plan view of the blister-pack produced from the blank of Fig. 7. The blister-pack contains four lateral support sections 41a, 42a, 41b, 42b, which are all joined to each other by the side flap 45 by glueing, flaps 43a, 44a, 43b, 44b forming the frame. These flaps are separated by diagonal slots 49a, 49b, 49c, 49d in such a way that when the blank is assembled triangular peaks 50a, 50b, 50c, 50d are left on the frame side. The narrow support sections 41a, 41b possess creases 48a, 48b running centrally and more or less parallel to the connecting edges 47a, 47b, 47c, 47d which creases continue in the narrow frame flaps 43a, 43b. After

the blank has been assembled it is not absolutely necessary to glue the slits 49a, 49b, 49c, 49d, as a good cohesion of the frame is guaranteed by the sealing on of the foil. The lateral support sections 41a, 42a, 41b, 42b possess a trapezoidal blank, and broaden towards the frame side. This broadening is preferably selected so that the deviation from the rightangled blank amounts to a material thickness x . Because of the deviation of the lateral support sections from the rightangled cross-section the creases 48a, 48b do not run strictly parallel to the connecting edges 47a, 47b, 47c, 47d, but are somewhat displaced. The lateral support sections of the blister-pack with the triangular peaks located on them are inclined slightly outwards on all sides because of the trapezoidal shape, so that the blister-pack is capable of being stacked. Accordingly this form of embodiment of Figs. 7 and 8 finds application as stackable fruit or vegetable crates.

The collapsing and assembling of the blanks and blister-packs takes place exactly as in the case of the forms of embodiment of Figures 5 and 6.

Fig. 9 shows a further form of embodiment of a blister-pack according to the invention when laid flat. Two of these blister-packs are combined with a despatch carton, which is shown in Fig. 10 as the blank, to form a single packing unit. The blister-pack possesses two support sections 51a, 51b located on the long sides and having recesses 52a, 52b in which the projecting lips 62a, 62b located on the narrow flaps 61a, 61b of a despatch carton rest. For packaging purposes

an assembled blister-pack with support sections 51a, 51b projecting outside is pushed into the despatch carton far enough so that the narrow cover flaps 61a₁, 61b₁ can be folded inwards, so that they lie against the lateral parts 63a, 63b, the lips 62a₁, 62b₁ resting in the recesses 52a, 52b of the blister-pack and the edges 64a₁, and 64b₁ rest against the frame 53 of the blister-pack. When the goods to be packaged have been inserted, a second assembled blister-pack is pushed in from the other end of the despatch carton, with support sections 51a, 51b sticking out, over which the cover flaps 61a₂, 61b₂ of the despatch carton can be tucked in. The entire packing unit is finally closed by the cover flaps 65a, 65b.

In the embodiment shown in Figure 7 flaps 46a, 46b corresponding to the flaps 37a and 37b of Figure 5 may be provided on the narrow support sections 41a and 41b, the grooves or creases (48a and 48b) of the narrow support section continuing in the flaps in the same way as the grooves in 33a and 33b Figure 5.

PATENT CLAIMS

1. Blister-pack with a frame of plane material with a window-like cut-out and at least two lateral support sections at an angle to the outer periphery of the frame, on which a plastic foil is applied as a trough in the window space, characterised by the fact that the plastic foil is joined by heat-sealing only with the section of the frame (2) as far as the point of junction of the lateral supporting sections (3).
2. Blister-pack in accordance with Claim 1, characterised by the fact that the window-like cut-out (5) is larger than the packaged goods which it must take (6) or larger than the section of the packaged goods which is to be taken.
3. Blister-pack in accordance with at least one of Claims 1 and 2, characterised by the fact that in the blister-pack containing the packaged goods the inside edges of the window (7) of the frame at no point come into contact with the packaged goods (6).

4. Blister-pack in accordance with at least one of Claims 1 to 3, characterised by the fact that in the blister-pack containing the packaged goods the lateral part (8) of the foil trough does not run parallel to the outer surfaces (9) of the packaged goods (6) lying there, but runs outwards from the edges (10) of the surface of the packaged goods to be found on the bottom of the foil trough.
5. Blister-pack in accordance with at least one of Claims 1 to 4, characterised by a foil border (11) surrounding the inside edges of the window (7) and projecting over the frame (2).
6. Blister-pack in accordance with at least one of Claims 1 to 5, characterised by the fact that in the case of a sub-divided window with several separate troughs these are separated not by ridges formed of the frame material, but formed of the foil.
7. Blister-pack in accordance with at least one of Claims 1 to 6, characterised by four lateral support sections (21a, 22a, 21b, 22b), of which in each case two adjoining support sections (21a, 22a and 21b, 22b) are connected with each other, and a crease (25a, 25b), running diagonally over the frame (24) which in each case continues in the narrow supporting sections (21a, 21b) in such a manner that the creases (27a, 27b) between frame and narrow support sections (21a, 21b) form the bisecting lines with the angle enclosed by the creases (25a, 26a and 25b, 26b).
8. Blister-pack in accordance with at least one of Claims 1 to 6, characterised by four lateral support sections (31a, 32a, 31b, 32b) connected with each other, creases (33a, 33b) running centrally in the narrow lateral support sections (31a, 31b) and parallel to the connecting edges (38a, 38b, 38c, 38d) of the support sections, which continue in the frame, and creases or slots (39a, 39b, 39c, 39d) running diagonally from the outside edges of the window to the inside edges of the window.

9. Blister-pack in accordance with at least one of Claims 1 to 6, characterised by four lateral support sections (41a, 42a, 41b, 42b) of trapezoidal section tapering towards the frame side, creases (48a, 48b) running centrally in the narrow lateral support sections (41a, 41b) and almost parallel to the connecting edges (47a, 47b, 47c, 47d) of the lateral support sections, which continue in the frame, triangular peaks (50a, 50b, 50c, 50d) located at the four corners of the frame and projecting upwards, and slots or creases (49a, 49b, 49c, 49d) running diagonally in the frame.

10. Blister-pack in accordance with Claim 8 or 9, characterised by flaps (37a, 37b or 46a, 46b) located at least on the narrow support sections (31a, 31b or 41a, 41b), in which the grooves (33a, 33b or 48a, 48b) of the narrow support section continue.

11. Blister-pack in accordance with Claim 8, characterised by four flaps located on the lateral support sections, which together form a tray.

12. Blister-pack in accordance with at least one of Claims 1 to 11, characterised by the fact that the frame consists of corrugated cardboard and the plastic parts are a transparent foil which is suitable for deep-drawing.

13. Process for the production of a blister-pack in accordance with at least one of Claims 1 to 12, characterised by the fact that in one working cycle one seals a plastic foil to the frame of a blank made of plane material using pressure and heat application by means of contact heating, the temperature of which is above the sealing temperature of the foil, one renders it deformable and brings it into a mould corresponding to the subsequent foil trough of the blister-pack.

14. Process in accordance with Claim 13, characterised by the fact that one brings about the deformability of the foil by pressure by means of compressed air on the contact heating device.

15. Process in accordance with Claims 13 or 14, characterised by the fact that one produces the deformation of the foil by applying it by compressed air to the mould.

16. Process in accordance with at least one of Claims 13 to 15, characterised by the fact that when deforming the foil one leaves a foil rim running round the inside edges of the window and projecting over the frame.

17. Process in accordance with at least one of Claims 13 to 16, characterised by the fact that when deforming the foil one leaves ridge-shaped foil sections.

18. Process in accordance with at least one of Claims 13 to 17, characterised by the fact that one uses a mould which has been produced by excess pressure on the foil sheet when in a suitable condition for deep-drawing by means of a stretcher frame over the goods to be packaged, the window of the stretcher frame possessing the same or somewhat smaller dimensions, namely reduced by the width of the foil border, than the dimensions of the window of the subsequent blister-pack, and by casting the foil mould with a moulding compound.

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FIG. 1

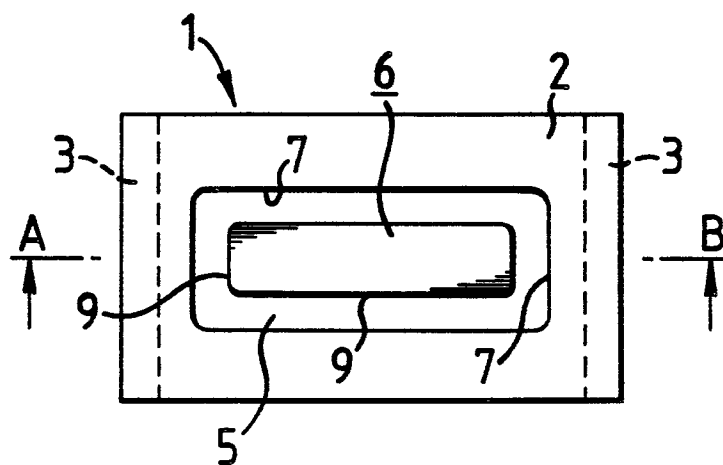


FIG. 2

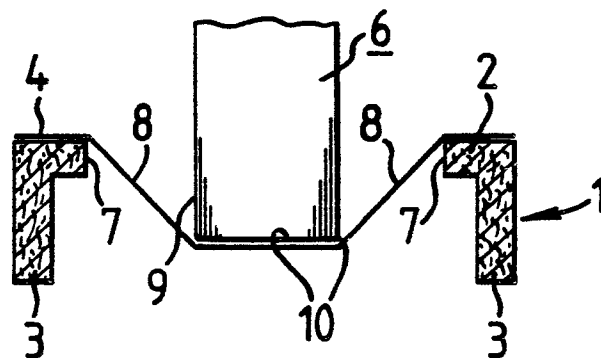
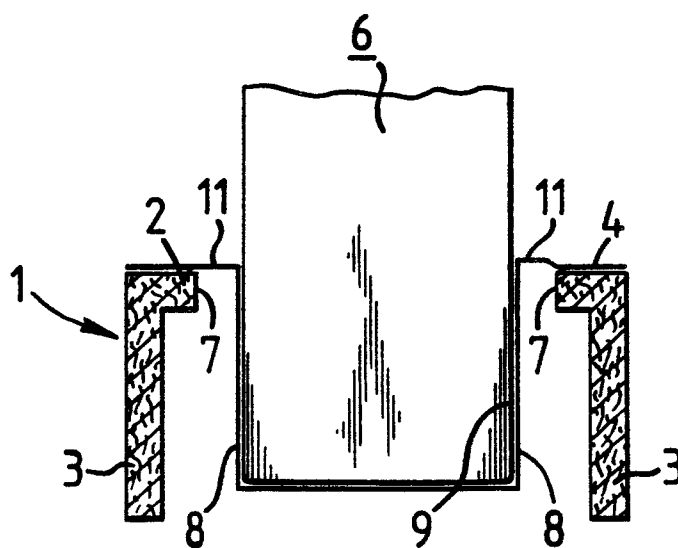


FIG. 3



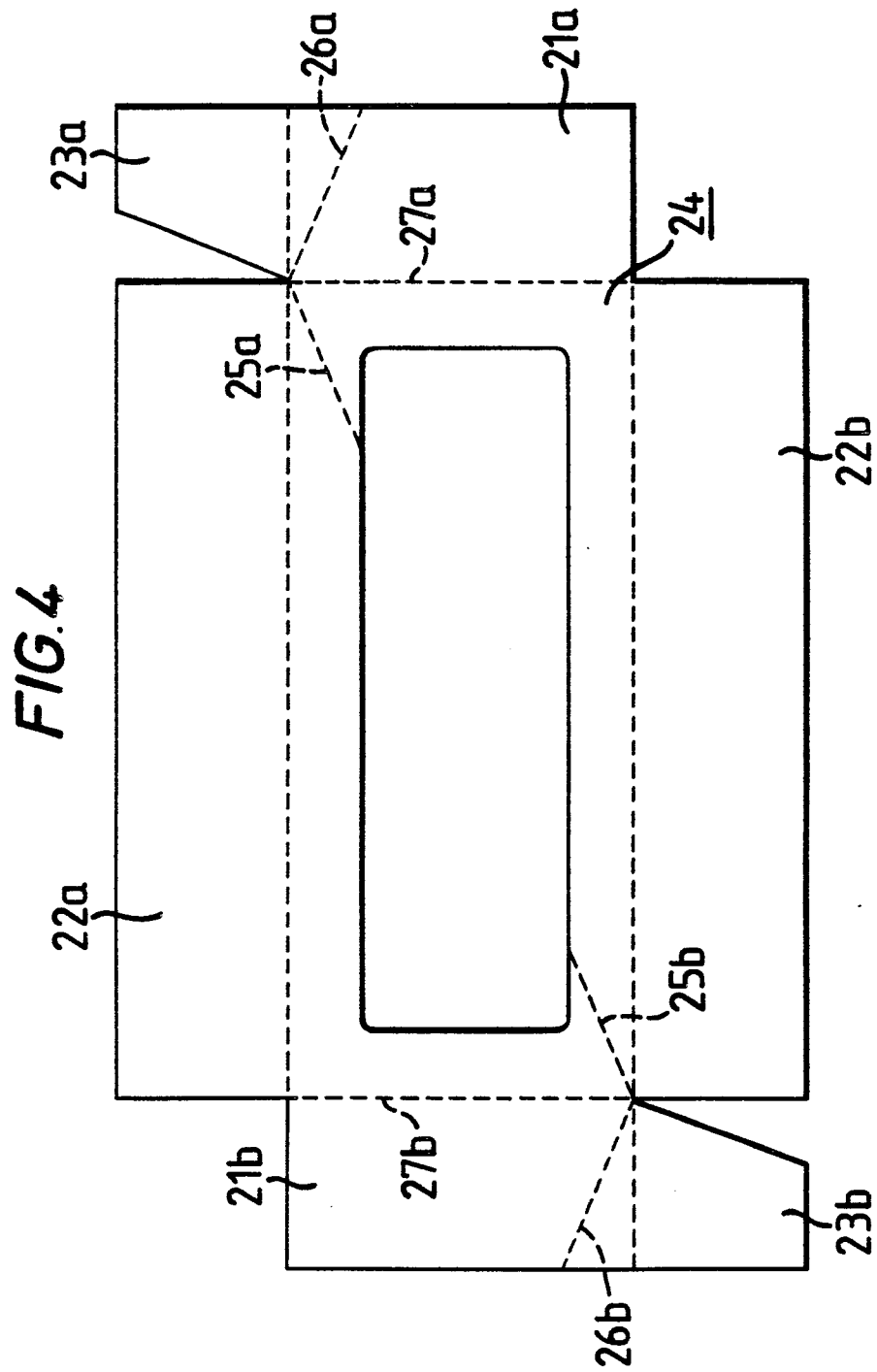


FIG.5

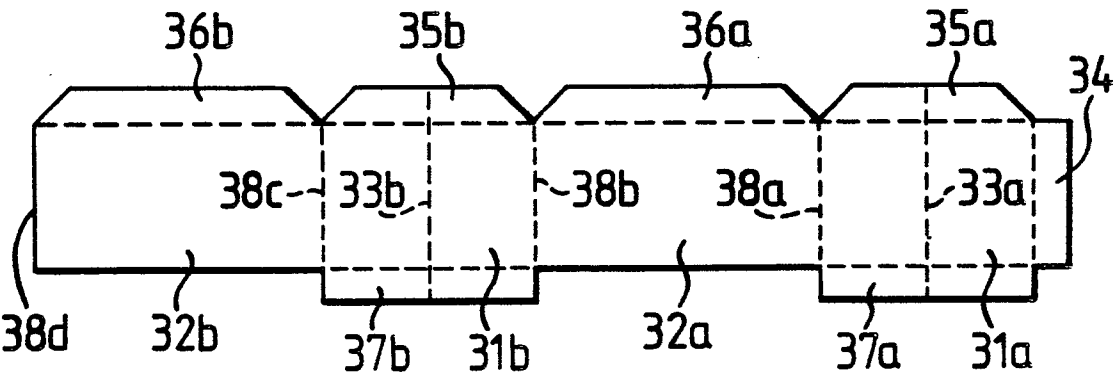
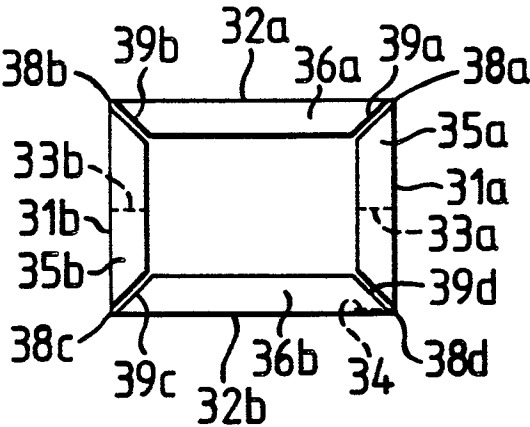
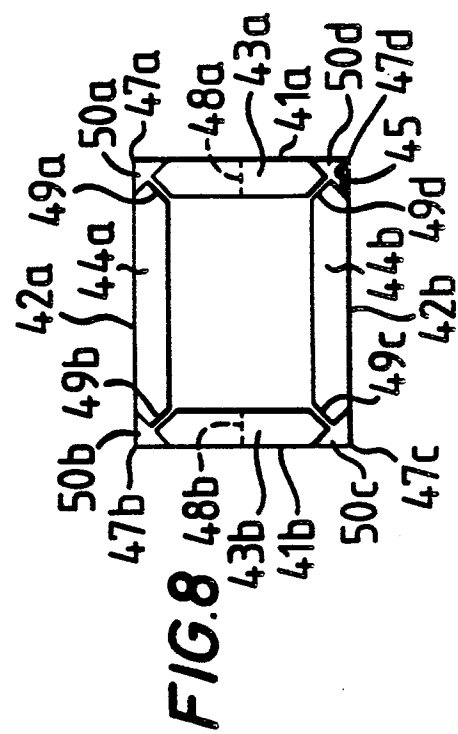
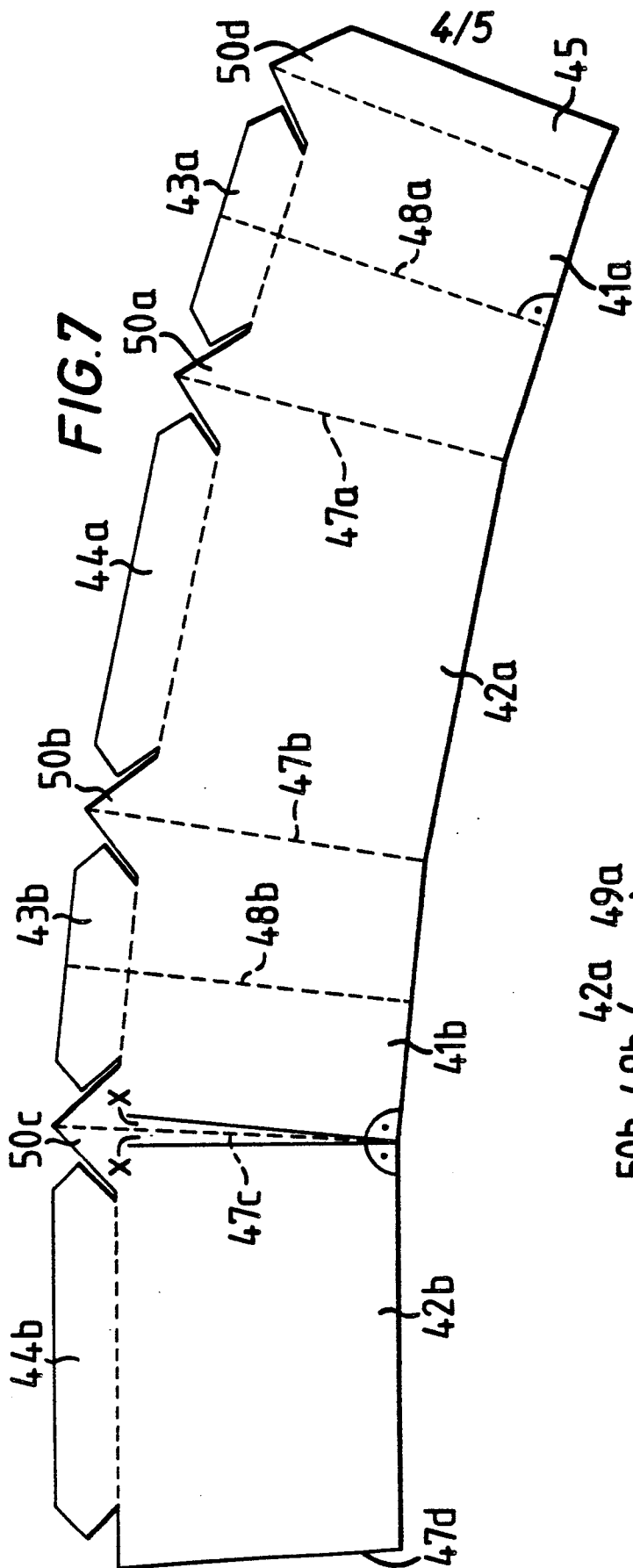
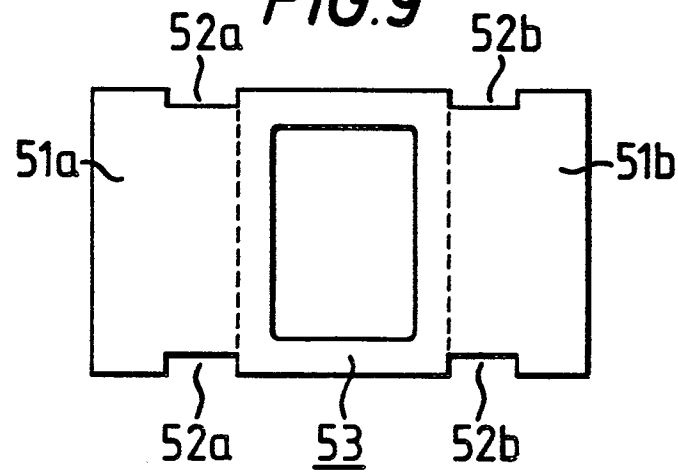


FIG.6





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FIG. 9**FIG. 10**