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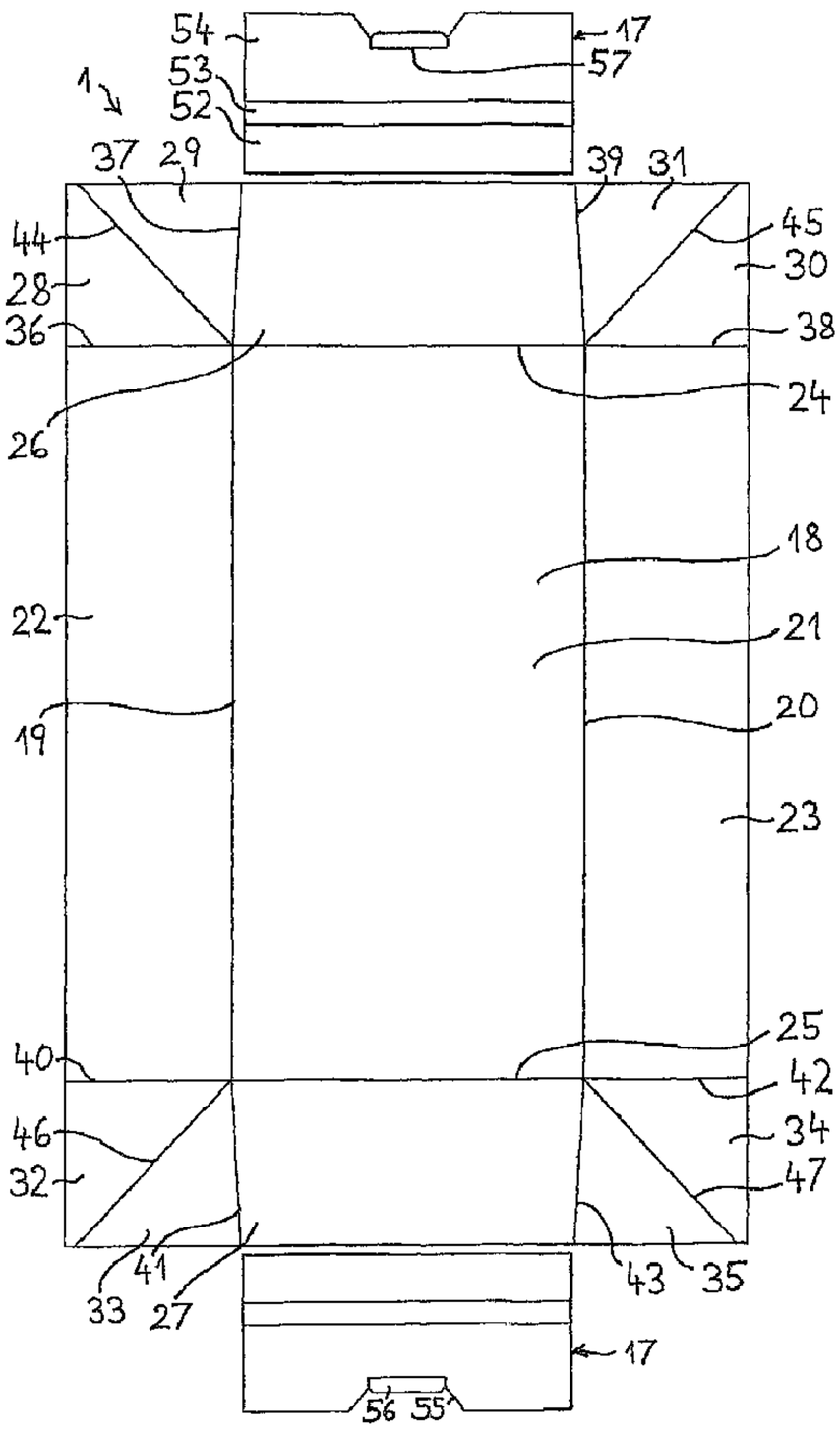

(57) Abrégé/Abstract:
The invention relates to a case (1') with or without a lid (2) and made from a substantially plane blank, which includes a central rectangular field (18; 18'), to which e.g. via folding notches (19; 19' and 20; 20' and 24; 24' and 25; 25' respectively), arranged on

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(57) Abrégé(suite)/Abstract(continued):
the inner side (21; 21'), upwardly foldable side walls (22; 22' and 23; 23') and end walls (26; 26' and 27; 27') respectively are attached, whereas the corner areas between walls adjacent to each other are filled with folding lugs (28; 28', 29; 29', 30; 30', 31; 31', 32; 32', 33; 33', 34; 34', 35; 35') which in pairs are mutually separated by means of substantially outwardly directed folding notches (44; 44', 45; 45', 46; 46', 47; 47'), which are designed to be folded in pairs to abut an adjacent wall and be fastened to it. According to the invention the folding lug pairs are folded on the outside of an adjacent end wall and a handle element (17; 17') is folded around such an end wall in order to exert a press action of two walls adjacent to each other towards each other, the folding lug pairs being folded away in this way being enclosed, and the handle element is fastened to the outside of these pairs of folding lugs, their total thickness, inherent elasticity and mutual distance being utilized to achieve an increased gripping depth and obtain additional gripping means jointly with the handle means.

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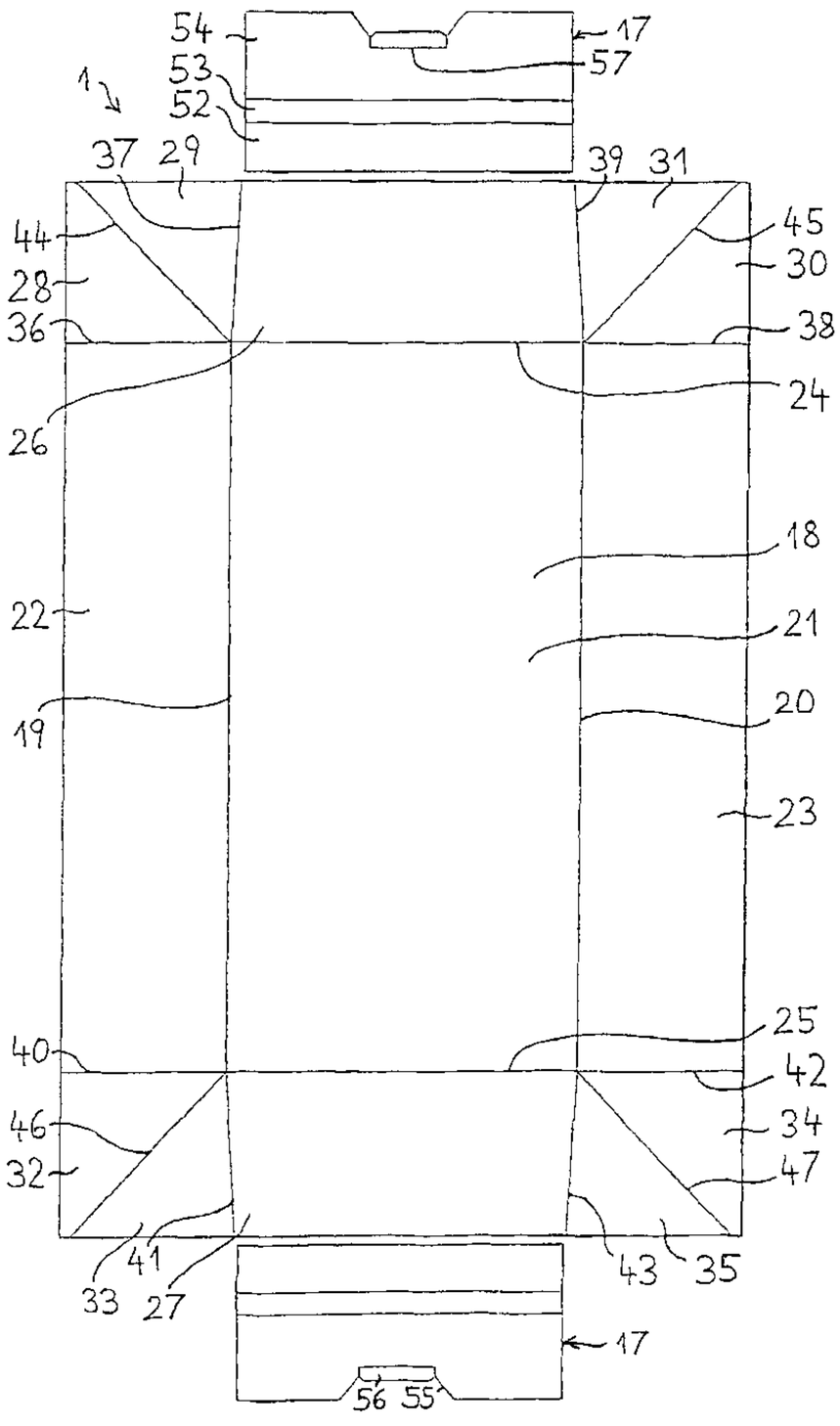
(54) Title: CASE



(57) Abstract: The invention relates to a case (1') with or without a lid (2) and made from a substantially plane blank, which includes a central rectangular field (18; 18'), to which e.g. via folding notches (19; 19' and 20; 20' and 24; 24' and 25; 25' respectively), arranged on the inner side (21; 21'), upwardly foldable side walls (22; 22' and 23; 23') and end walls (26; 26' and 27; 27') respectively are attached, whereas the corner areas between walls adjacent to each other are filled with folding lugs (28; 28', 29; 29', 30; 30', 31; 31', 32; 32', 33; 33', 34; 34', 35; 35') which in pairs are mutually separated by means of substantially outwardly directed folding notches (44; 44', 45; 45', 46; 46', 47; 47'), which are designed to be folded in pairs to abut an adjacent wall and be fastened to it. According to the invention the folding lug pairs are folded on the outside of an adjacent end wall and a handle element (17; 17') is folded around such an end wall in order to exert a press action of two walls adjacent to each other towards each other, the folding lug pairs being folded away in this way being enclosed, and the handle element is fastened to the outside of these pairs of folding lugs, their total thickness, inherent elasticity and mutual distance being utilized to achieve an increased gripping depth and obtain additional gripping means jointly with the handle means.

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CASE AND METHOD OF MANUFACTURING SAME

The present invention relates to a case of the type described more in detail below. With the term "case" is in the connection meant a trough-like bottom portion with or without a lid as well as only a lid separately. The present invention also relates to a method of manufacturing a case.

The invention particularly relates to cases for food products, particularly fresh fish, e.g. salmon from salmon breedings. Such cases have so far been made of materials, which can resist moisture, i.e. wood, metals or plastic materials. However, none of these materials can without special considerations and construction measures be regarded as harmless to the environment and sanitary, since it is inherent in the nature of these materials, that a recycling ought to be realized due to economic and other reasons. However, a recycling is a very lengthy, time consuming and expensive procedure, since the relatively expensive starting product must be subjected to a reliable cleaning, control and possibly repair work as well as a returning to the starting point. Consequently a recycling is not considered in praxis.

Applicant then discovered, that it is possible to use a more typical one-way material i.e. cardboard or corrugated cardboard, which is provided with one or several very thin plastic layers as a barrier against moisture. Applicant has also found, that this idea works quite well in praxis. However, stability and sanitation requirements have not been easily met in a fully satisfactory way and neither a frequent requirement, that the case for storage and transport reasons must be provided as a finished, prepared plane blank, which quickly, simply and reliably can be converted into a useful case in e.g. a filling station for fresh fish. Finally, problems can arise in connection with the arrangement of handles and the application or mounting of a lid respectively and also a disassembly of the case and the handles and the lid respectively to a plane blank again for removal to e.g. a recycling plant. Also a lid, the use of which not always is mandatory, can have its own weakness and not be compatible with the case in a desirable way respectively.

Thus, the present invention may, by using a manufacturing material which is particularly suitable for a one-way use, further develop already known cases and cardboard-like constructions, in order to make them meet relatively high stability and sanitation requirements, make them heat insulating against the environment, make them allow a relatively simple and economic production, and let finished, prepared blanks be transformed to useful cases in a convenient, simple and quick way, e.g. in a filling station, let the handling of the cases be carried out in an advantageous way, e.g. in ergonomical respects, as well as let the disassembly for recycling purposes be carried out simply and expeditiously. Another object of the invention is to develop an optimally functioning lid, when a lid for the case is needed.

In accordance with one aspect of the invention there is provided a case (1) with a lid (2), wherein the case is configured for packing, storing and transporting food stuffs, and wherein the case is manufactured from a substantially plane blank, which includes a

central rectangular field (18) to which via first, second, third, and fourth notched hinges (19; 20; 24; and 25), arranged on the inside (21), upwardly foldable side walls (22 and 23) and end walls (26 and 27), respectively, are attached, wherein the corner areas between walls adjacent each other are filled with folding lugs (28, 29, 30, 31, 32, 33, 34, 35), which in pairs are mutually separated by substantially diagonally outwardly directed fifth, sixth, seventh, and eighth notched hinges (44, 45, 46, 47), and which are designed to be folded together in pairs in order to abut against an adjacent wall and be fastened to the adjacent wall, the folding lug pairs being designed to in a folded condition be folded on the outside of an adjacent end wall, a handle element (17) being designed to be folded around such an end wall in order to in a lever-like way exert a press action of two walls adjacent each other against each other, the folding lug pairs folded away in this way being included, the handle element being designed to be fastened to the outside of these folding lug pairs, their total thickness, inherent elasticity and mutual distance being utilized to achieve an increased gripping depth and where appropriate extra gripping action jointly with the handle element, a lid comprising a plane main field (58) and adjacent border parts (63, 64, 65, 66) in order to form at least one cover, which can be opened up and reclosed again, the border parts and the main field in at least one area being cut through and between such through cuts being provided a ninth notched hinge interconnecting the ends of the cuts within the main field in the form of a groove or perforation, the through cuts, up to the time, when the hinge function is to be utilized, being held together jointly with the adjacent lid material by provisions of a protective tape, which is provided to be removed or be applied again, wherein the border parts (65, 66) on the end wall sides of the lid are at their free longitudinal edges provided with cuts (96, 97), which converge towards the central field, and between the inner ends of the cuts extend double-folding notches (98, 99) forming trapezoidal locking flaps (100, 101), which may be folded inwards and downwards subsequent to the folding upwards of the border parts in order to with their points be directed towards the end areas of the side wall border parts and lock them in their positions, and that the end wall border parts open the access to the handle elements of the case design and form gripping elements jointly with them respectively.

The case (1) and the lid (2), respectively, entirely or partially may be made from corrugated cardboard, the lid may be made from plain corrugated cardboard (3) comprising a corrugated paper layer (4), which on its two sides is coated with plane paper layers (5 and 6 respectively), and a very thin plastic layer (7 and 8) as a moisture barrier between the corrugated paper layer (4) and the plane paper layers (5 and 6 respectively). The case (1) may include first and second corrugated paper layers (11 and 12 respectively) facing a plane, wherein at least one of the sides of the first and second corrugated paper layers (11 and 12) may be in contact with a respective side of a plastic-coated paper layer (10), which corrugated paper layers in their turn face plane, outer paper layers (13 and 14 respectively), with intermediate thin plastic layers (15 and 16 respectively) as a moisture barrier. The paper layers may have a thickness of about 20 μm, and the plastic layer may have a thickness of about 15 μm.

The corner areas between walls adjacent each other may be filled, within the framework of a rectangular shape for the entire blank, with the folding lugs (28, 29, 30, 31, 32, 33,

34 and 35), and wherein adjacent the inside 21 are tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteenth, and seventeenth notched hinges (36, 37, 38, 39, 40, 41, 42 and 43) to allow a folding of the lugs towards the adjacent wall sides whereas the fifth, sixth, seventh, and eighth notched hinges (44, 45, 46 and 47) may be positioned substantially diagonally between each lug pair and outwardly directed to form a hypotenuse for each lug and mutually separate the lug pairs. The fifth, sixth, seventh, and eighth notched hinges (44, 45, 46, 47) may be positioned between the central field and two walls adjacent each other and end on the end wall sides at a distance from the outer corner point of the blank in order to obtain a folding shape with truncated corners.

The third, tenth, and twelfth notched hinges (24, 36, 38) and the fourth, fourteenth, and sixteenth notched hinges (25, 40, 42) between the side walls and the folding lugs as well as between the central field and the end walls may be located along a continuous notched hinge. The eleventh and fifteenth and the thirteenth and seventeenth notched hinges (37 and 41 and 39 and 43 respectively) between the end walls and the folding lugs may tilt inwards towards the center of the respective end wall with an angle of 1-10°, and the side walls (22, 23) may slightly tilt inwards towards the inlet opening of the case in order to give a possible lid a slightly larger play for a mounting and a certain press fit respectively during the final application phase.

The eleventh and fifteenth and the thirteenth and seventeenth notched hinges (37 and 41 and 39 and 43 respectively) between the end walls and the folding lugs may tilt inwards towards the center of the respective end wall within an angle of about 4°.

The finished, folded case may be designed to be supplemented to a shape, which may be carried by provisions of handle elements (17) having a width, which width corresponds to the width of the end walls and including a field (53) designed to bridge the total thickness of the end walls and the lug pairs, folded against them, and a field (54) for fastening the outside of the lugs (28;30 and 32;34) folded against the end walls.

The field (54), may be designed to be fastened to the lugs, folded against the end walls, along its free longitudinal edge a central, substantially trapezoidal recess (55) with a tongue (56), insertable into the innermost part of the recess, which tongue extends longitudinally and parallel to the central field (18) and may be connected to the first mentioned field (54) solely via a longitudinal side, which may be formed by a folding notch (57) on the side facing the end wall, and in that the tongue may be designed to be folded inwards towards the end wall with an angle of about 90° and may be supported in the inwardly folded position with its short sides also by the obliquely downwardly directed doublefolded edges of the inwardly folded lug pairs.

The handle elements (17) may be designed as loose elements, a field (52) being connected to the bridge field (53) and being designed to be fastened, to the inner side of the respective end wall.

The handle elements (17) may be made from a strong cardboard material.

The lid (2) may have a central rectangular field (58), which is slightly larger than the outer dimensions of the case (1), which field via eighteenth, ninteenth, twentieth, and twenty-first notched hinges (59, 60, 61, 62) adjoins border parts (63, 64, 65, 66), which between them in the corner areas via twenty-second, twenty-third, twenty-fourth, twenty-fifth, twenty-sixth, twenty-seventh, twenty-eighth, and twenty-ninth notched hinges (67, 68, 69, 70, 71, 72, 73, 74) include lugs (75, 76, 77, 78, 79, 80, 81, 82), which by provisions of diagonally extending thirtieth, thirty-first, thirty-second, and thirty-third notched hinges (83, 84, 85, 86) in pairs may be mutually separated, and wherein flaps (102, 103) may be located adjacent to the side border parts, via doublefolding hinges (104, 105), and de-signed to from within abut the side border parts, wherein short rectangular projections (87, 88, 89, 90) may be designed to be inserted into the side edge areas of the control field (58), which on the inner side (91) are provided with smooth recesses (92, 93, 94, 95), only cut in the innermost upper layer. The projections may be designed to hook behind cuts, which constitute the inner longitudinal edges of the recesses, and in this way lock the flaps in their inwardly folded position, the double-folded lugs being positioned between the flaps and the side border parts.

The free outer edges of the lugs (75, 76, 77, 78, 79, 80, 81, 82) may slightly tilt inwards in relation to the border part, from which the edges project and obliquely, downwardly towards the field (58) directed extension of the free edges of the lugs being formed, when the lug pairs are folded.

The border parts of the lid (2) on the end wall sides at their free longitudinal edges may be provided with cuts (96, 97), which converge towards the central field (58), wherein doublefolding hinges (98, 99) extend between the inner ends of the cuts (96, 97) in order to form trapezoidal locking flaps (100, 101), which may be designed to be folded inwards and downwards in relation to the upwardly folded border parts in order to be directed with their points towards the end areas of the side border parts and lock them in their position, and simultaneously allow a double function, since the end wall border parts with their cut out areas leave free an access to the handle elements of the case and form gripping provisions jointly with them respectively, which gripping provisions may be designed to always be active for the lid but also for the case, if the case and the lid, mounted on it, may be fastened to each other.

The longitudinal border sides of the lid, at a small distance from one of the end walls, may be slotted all the way to the main plane of the lid, parallel to the end wall, which slotting may be provided in connection with the punching, grooving, or perforating of the lid blank, also a downwardly open recess being provided in the two end walls, which facilitates the gripping of the lid and the case in their handle elements at about the same level and which leaves free a field on the end walls of the case.

The field, which constitutes the main plane (58) of the lid, may be provided between the two adjacent slotting ends with the ninth notched hinge allowing the hinge action, a blank

for such a lid being provided, in its plane condition, with the protective tape along the two elongated sides, covering a portion along the inner side and the outer side and consequently covering the moisture sensitive underside of the border sides.

The field, which constitutes the main plane (58) of the lid, may be provided with gripping holes for an edge tape application device being provided in the inner corners of the outer corner lugs.

Upon application of the protective tape, the lid may be provided to be folded and fastened to obtain its finished shape, whereby the cuts may be prevented from functioning, a strapping being provided to be stretched around the lid applied on the case, straight above the section, which extends from the adjacent end wall and all the way to the ninth notched hinge, and wherein, in case of icing up, an inspection, or a limited product removal, the strapping may be provided to be displaced towards and past the ninth notched hinge and the protective tape being provided to be split along the cuts, a detached cover being provided to be lifted up towards the main field of the lid, a reclosure being provided to be effected by lowering the lid and pushing back the strapping to its original position to keep the cover in place and keep the lid and the case together, strappings being provided to be placed around the two ends of finished packs.

The protective tape may cover the through cuts and may be adapted to, in a later phase, be divided along the through cuts, the protective tape being provided, before division, to serve as a protective as well as a uniting provisions.

The protective tape may be an adhesive tape, which may be reapplied.

In accordance with another aspect of the invention, there is provided a method of manufacturing a case, wherein draining holes may be made by punched holes, that, in a machine which folds and glues the case blanks to their finished shape, fingerlike nozzles may be inserted into the holes until a stop flange on the nozzles abuts the wall material, which surrounds the holes, the nozzles being made, with their points, to penetrate the holes and to end up with outlet openings for melted adhesive roughly in the middle of the depth of the holes, adhesive being introduced and simultaneously the nozzles being rotated, a die being driven towards the case blank side, which may be turned away from the nozzles, against and around the nozzle points and against the wall material around the holes, which material may be forcefully compressed between the die and nozzle flange, the introduced melted adhesive being made to penetrate and be pressed into the material around the holes and solidifying immediately, a sealing of the hole wall being obtained, which prevents water from penetrating into the wall material and softening it.

Additional characterizing features and advantages of the invention are set forth in the following description, reference being made to the accompanying drawings, which show a few preferred, but not limiting embodiments of the invention. The drawings show in detail in:

Fig. 1 a perspective view from above of a first embodiment of a finished case according to the invention;

Fig. 2 a perspective view from below of the case according to Fig. 1;

Figs. 3 and 4 views similar to Fig. 1 of the same case in production and disassembly phases;
Fig. 5 a planar view of already punched and grooved respectively plane blanks for a case according to Figs. 1-4;
Figs. 6 and 7 views similar to Figs. 1 and 2 of a second embodiment of a finished case according to the invention;
Fig. 8 a planar view of an already punched and grooved respectively plane blank for a case according to Figs. 6 and 7;
Fig. 9 a planar view of the interior of an already punched and grooved respectively blank for a lid according to the invention for any of the possible case embodiments;
Figs. 10 and 11 respectively cross sectional views of a corrugated cardboard material for case designs and lid designs respectively;
Fig. 12 a planar view from below/from the interior of a modified alternative lid according to the invention;
Figs. 13 and 14 perspective views from below and from above respectively of the lid according to Fig. 9;
Figs. 15 and 16 perspective views from below and from above respectively of the lid according to Fig. 12;
Fig. 17 a perspective view from above of a lid according to Fig. 9 and 13, 14 respectively, mounted on a case according to any of the possible designs;
Fig. 18 a planar view of a blank for an additional embodiment of a case according to the invention as well as a few detailed views showing a few phases of the manufacturing process;
Fig. 19 a perspective view from above of an additional embodiment of a case according to the invention with a mounted and secured lid;

Fig. 20 a corresponding view of the same case with an upwardly folded lid section;

Fig. 21 a planar view of a blank for a lid according to Figs. 19 and 20 ;

Fig. 22 a perspective view from below of a case made of a blank according to Fig. 19 ;

Fig. 23 a perspective view from above of a case according to Fig. 22 ;

Fig. 24 a planar view of a blank for an additional case design according to the invention ;

Fig. 25 a perspective view from below of a case made of a blank according to Fig. 24 ; and

Fig. 26 a perspective view from above of a case according to Fig. 25.

In Figs. 1-5 a case design is shown it its entirety, whereas in Figs. 6 and 8 a case design 1´ is shown in its entirety. The two designs are substantially identical or similar, and thus the same reference numerals are used for both, but a prime sign is added for the second case design. In the two embodiments corrugated cardboard is a preferred manufacturing material, and this material is also preferred, when a lid 2 is manufactured, which suitably comprises a plain corrugated cardboard 3, i.e. a corrugated paper layer 4, which on its two sides is coated with a plane paper layer 5 and 6 respectively, preferably with a very thin plastic layer 7 and 8 respectively as a vapor barrier between layer 4 and layer 5 and 6 respectively. Corrugated cardboard 9 for the case suitably is double, i.e. to a plane, preferably on at least one side plastic-coated paper layer 10, corrugated paper layers 11 and 12 respectively are applied on both sides, to which in their turn outer paper layers 13 and 14 respectively , preferably with intermediate thin plastic layers 15 and 16 respectively as a vapor barrier, are applied. The paper layers preferably have a thickness of about 20 µm and the plastic layers, suitably made of polyethylene, preferably have a thickness of about 15 µm. Corrugated cardboard materials of this type are particularly suitable for recycling purposes and for direct contact with food products and are very strong and shape permanent as well as can resist moisture for a relatively long time without loosing the main part of its strength. Also they have very satisfactory heat insulating properties. The term ”case” of course is in this connection to include a case with a lid or without a lid. The case design according to Figs. 1-5 comprises a loose handle element 17, which according to Figs. 6-8 is made integral with the respective case blank, with reference number 17´.

Figs. 5 and 8 show, that the blanks for a case according to the invention include a central rectangular field 18 and 18´ respectively, to which via folding notches 19 and 19´ respectively and 20 and 20´ respectively on e.g. inner side 21 and 21´ respectively upwardly tiltable side walls 22 and 22´ respectively and 23 and 23´ respectively are attached. In a similar fashion end walls 26 and 26´ respectively and 27 and 27´ respectively are via folding notches 24 and 24´ respectively and 25 and 25´ respectively attached to the other two sides. The corner areas between walls adjacent to each other are filled up within the framework of a rectangular shape for the entire blank with folding lugs

28 and 28′ respectively, 29 and 29′ respectively, 30 and 30′ respectively, 31 and 31′ respectively, 32 and 32′ respectively, 33 and 33′ respectively , 34 and 34′ respectively and 35 and 35′ respectively. Folding notches 36 and 36′ respectively, 37 and 37′ respectively, 38 and 38′ respectively, 39 and 39′ respectively, 40 and 40′ respectively, 41 and 41′ respectively, 42 and 42′ respectively and 43 and 43′ respectively , also positioned on the inner side, will then facilitate a folding of said lugs towards the adjacent wall sides, whereas roughly diagonally between each pair of lugs outwardly directed folding notches 44 and 44′ respectively, 45 and 45′respectively, 46 and 46′ respectively and 47 and 47′ respectively form a hypotenuse for each lug and separate the two lugs between themselves. According to a preferred embodiment the last-mentioned folding notches start in the corner point between the central field and two walls, adjacent to each other, but they end on the end wall side a few millimeters or a few centimeters from the outer corner point of the blank, which i.a. results in a folding shape having truncated corners, as is shown in Fig. 3. The folding notches mentioned above and below are every type of measure, which facilitates a folding. Thus, it is possible to use e.g. grooves, and/or embossings and/or perforations and/or partial cuts into the blank etc.

Whereas folding notches 24, 36, 38 and 25, 40, 42 and 24′, 36′, 38′ and 25′, 40′, 42′ respectively preferably are located along a folding line, folding notches 37 and 41 and 39 and 43 respectively tilt according to a preferred embodiment inwards towards the center of the respective end wall with an angle of 1-10°, preferably about 4°. This results in, that side walls 22, 23 and 22′, 23′ slightly tilt inwards towards the inlet opening of the case, which in its turn results in, that a lid will have a slightly larger play, when it is applied to the case and can be applied with a certain press fit during this final application phase respectively. Also, products in the case will be kept there with a slightly improved security. It is of course possible to also or as an alternative let folding notches 36 and 38 and 40 and 42 respectively tilt to the corresponding extent towards the center of side walls 22,23 and 22′, 23′ respectively.

According to the invention the lug pairs are folded or left, when the walls are folded upwards to obtain a border shape, outside the walls and are then in their folded shape folded to abut the end walls (see Fig. 3). Then it is possible to use the truncated corner areas like levers, the side walls and the end walls being forcefully pressed against each other and possibly also somewhat into the material, which they are made of, in the final folding phase, which initially is shown in the upper right corner in Fig. 3 and finally in the uppermost corner in Fig. 3. In this way initially existing gaps 48, 49, 50, 51 and 48′, 49′, 50′ , 51′ respectively within the corner areas disappear and completely sealed corners are obtained , which is important as regards the sealing, the stability and the sanita-

tion. In case the double-folded lug pairs had been positioned inside the walls, they had partly detrimentally influenced the interior of the case with the formation of unsanitary pockets and gaps and partly required a gluing and/or a stapling to one of the walls and to each other in a very efficient way in order to keep them sufficiently removed. However, since the inherent elasticity is very large, this would have been difficult to carry out, not least considering the strength of the double corrugated cardboard of this type and that the drawing apart-forces in this case are directed straight away from the gluing surfaces.

The finished, completely folded case (see the uppermost corner in Fig. 3) will then be supplemented to make it portable by attaching loose handle elements 17 having a width, which corresponds to the width of the end walls, and consisting of three fields, namely one field 52 for e.g. gluing the handle elements onto the inner side of the end walls, one field 53 for bridging the total thickness of the end walls and the lug pairs, folded against the end walls, and which lug pairs can be glued onto each other and/or onto the end walls, the latter however preferably being avoided, and one field 54 for gluing in preferably only two points on the outer side of lugs 28 and 30 and 34 and 34 respectively . It is important to note, that possibly resulting drawing apart-forces in this case design act like shear stresses, i.e. within substantially the same plane as the glue surfaces, which can be held together much more efficient against such forces than in the case described above. Field 54 has along its free longitudinal edge a central, substantially trapezoidal recess 55 with a tongue 56, inserted into the innermost portion of the recess. This tongue extends in the longitudinal direction parallel to central field 18, which is tantamount to the bottom of the case, and is attached to field 54 solely via a longitudinal side, which initially is formed by a folding notch 57 on the side facing the end wall. The tongue is folded inwards against the end wall at an angle of about 90° and is supported in its inwardly folded position with its short sides also by the obliquely downwardly directed double-folded edges of the lug pairs. Thanks to the double-folded lug pairs there is also a certain space between field 52 and the respective end wall, and thus, it is easier to hold the case within this area. The inherent elasticity of the lug pairs is also conducive to the maintenance of a space, which is slightly larger than the above-mentioned space due to a budging caused by the elasticity of the material and the structure, and consequently the tongue can be made slightly wider than the total thickness of the end wall and the lug pair and satisfactory gripping features can be obtained at minimal costs, the end walls simultaneously being pressed against the side walls. Applicant has also found, that the shape of the case very closely approaches the parallelepiped shape and that e.g. inappropriately curving case parts are avoided. Handle element 17 suitably is made of a strong cardboard material, which will protect and reinforce the sensitive fastening areas of the case in an optimal way. The folding notches of the handle element and possibly of the case blank suitably are

supplemented by embossings, which consequently on the side, which faces e.g. the grooves as folding notches, becomes elevated, an advantageous hinge-like effect being promoted. Since said folding notch tiltings result in, that the upper edges of the double-folded lug pairs extend slightly obliquely towards the center of the end walls, an advantageous effect of the handle elements resides in the fact, that they completely conceal such oblique extensions.

Fig. 4 indicates, that the recycling will be rather simple, since the glue fastening of the outer handle element field can be torn apart manually or by means of a tool and then the case blank can be unfolded in order to obtain a plane blank shape, the handle element remaining, fastened to the inner side of the end walls, or it is also possible to tear apart this connection in order to recover the handle elements separately.

Case design 1´ according to Figs. 6-8 differ from case design1, described above, only to the extent, that handle elements 17´ are integral parts of the case blank, the end walls, fastening fields 52 being eliminated, via folding notches merging into fields 53´ and 54´. A certain small waste in the corner areas between the lugs and the handle element results in this way. The wave shape is in this case suitably parallel to the side walls, whereas in the former case it preferably extends at right angles to these walls, as the drawings show.

Lid 2 has a central rectangular field 58, which is slightly larger than the outer dimensions of case 1 and case 1´ respectively. Border parts 63, 64, 65, 66 are via folding notches 59, 60, 61, 62 positioned adjacent this field, which border parts between themselves in the corner areas via folding notches 67, 68, 69, 70, 71, 72, 73, 74 include lugs 75, 76, 77, 78, 79, 80, 81, 82 , which by means of diagonal folding notches 83, 84, 85, 86 in pairs are separated from each other. However, the free outer edges of the lugs are slightly oblique inwards, seen from the border part, from which the edges project, an obliquely, downwardly, towards field 58 directed extension of the free edges of the lugs being formed , when the lug pairs are folded. Thanks to this incline flaps 102, 103, adjacent to the side border parts via double-folding notches 104, 105 will not be stretched too much away from said side border parts, against which the flaps will abut from within. Short rectangular projections 87, 88, 89, 90 will in this way be forced into the side edge areas of field 58, which on the inner side 91 are provided with flat recesses 92, 93, 94, 95, which suitably are cut into only the innermost paper layer. The projections are hooked there behind sections, comprising the inner longitudinal edges of the recesses, and consequently lock the flaps in their inwardly folded positions with the double-folded lugs between themselves and the side border parts. The wave shape suitably extends at right angles to the flaps.

The border parts on the end wall sides are at their free longitudinal edges provided with cuts 96,97, which converge towards the central field, and between the inner ends of said cuts double-folding notches 98, 99 extend. In this way trapezoidal locking flaps 100, 101 are formed, which are folded inwards and downwards subsequent to the folding upwards of the border parts in order to with their points be directed towards the end areas of the side wall border parts and lock them in their positions. At the same time also a double-function is obtained in this way, since the end wall border parts within the areas, cut out in this way, open the access to the handle elements of the case design and form gripping elements jointly with them respectively. Such gripping elements are always active for the case but also for the lid, provided the case and the lid applied on the case, are fastened to each other, e.g. by surrounding them with locking tape or the like.

As an alternative to or despite a lid the open side of the case can be provided with an e.g. film-like closure, preferably with a possibility to reclose it or with special means, designed for this purpose, e.g. a ”window” in the film, which is overlapped by a film having self-adhesive edges. It is also possible to provide the lid with such a ”window”. Is it not desirable to be able to reclose the closure; it never the less may be desirable to define the ”window” by means of a so called tear tape. In this way products and supplements to them, e.g. ice and water respectively, can be introduced into and be removed from respectively the case according to desires. If the case will be used to keep e.g. fish, it is suitable to place a liquid-absorbing layer at the bottom of the case.

One embodiment of such a lid 2′ , which primarily is designed for cases as air-freight to foreign countries, often with a warm climate, is shown in Fig. 12. The lid has a central field 58′ and side walls 63′, 64′ and end walls 65′, 66′ respectively, attached to it via folding notches, 59′, 60′ and 61′, 62′ respectively. Lugs 106, 107, 108, 109 are attached to the short sides of the end walls via folding notches 67′, 69′, 71′, 73′ , gaps 110, 111, 112, 113 being provided between them and the intermediate end walls by allowing the short sides of the latter converge outwards and/or by slightly displacing the sides of the former, which are exposed to these short sides, and in relation to the folding notches of the side walls. The folding notches of the lugs suitably are slightly displaced towards each other in relation to the folding notches of the end walls

Such a lid blank is formed to a lid by folding the lugs 90° in relation to the corresponding side walls, and the latter are folded 90° in relation to the central field. Subsequently the end walls are folded and will abut against and be fastened by gluing and/or stapling to the lugs.

For recycling purposes subsequent to the use of a case, it is suitable to unfold the lid blank, which is possible according to the invention without tearing apart the connection between the lugs and the end walls. To accomplish this folding notches 114, 115, 116, 117 in the side walls start from the inner end of said gaps at an angle of 45° in relation to the outer edges of the side walls, defining folding notches all the way to the free longitudinal edges of the side walls. In this way it is possible, by one folding around said folding notches and another along the folding notches belonging to the short sides of the side walls, to unfold the blanks without tearing apart any connections, even if double-foldings exist.

Field 58′ is in its center provided with two transverse cuts 118,119, which are made up to their closed shapes by means of partly a tear tape 120 between some of the cut end areas and partly a folding notch 121 between the rest of the ends in order to obtain a hinged cover 122. The tear tape is interrupted in the center by a locking tongue 123, turned away from the folding notch and cut out from field 58′ at the sides and at its free end and having preferably slightly bulging side edges in order to form additional retaining means. The shoulder area of the locking tongue is formed by a folding notch 124, which facilitates the folding of the locking tongue in order to allow it to be inserted into a locking hole 125, already described. The tear tape preferably is applied uninterrupted along the entire lid blank in connection with the manufacture of the material for the blank or when the treatment of the blank is continued. When said cuts 118,119 are made through the blank and also when the locking tongue is punched, these cuts penetrate the tear tape. In the end areas of the cuts cut out gripping ears 126,127 are arranged around the tear tape ; the tear tape parts between the cuts and the locking tongue can be gripped and removed by means of the gripping ears.

A spacer pad 128 of e.g. cardboard and with dimensions, which are slightly smaller than central field 58′ , is fastened, preferably glued, to the underside of the central field. This pad has below cover 122 a slightly smaller U-cut 129, a smaller inner cover 130 being formed, the base line (folding notch) of which comprises e.g. a double or triple groove 131, which coincides with the folding notch of the outer cover. The spacer pad comprises around the inner cover a shoulder step 132 for the outer cover to prevent, that the two covers will be pressed into the interior of the lid. Finally there is in the spacer pad outside the U-web said locking hole 125 for an insertion of the locking tongue, when the covers are opened up for e.g. an ice filling and a closing again. In addition to the function of creating a reclosable hole in connection with the central field of the lid the spacer pad is also designed to have heat insulation, shock absorption and possibly supplementary moisture isolation properties. The sides of course do not need this, since several walls and lugs etc. overlap each other. In this way a high and valuable heat, shock and possibly moisture isolation in the area of

the entire lid is obtained, despite cost advantages obtained by manufacturing the lid of plain cardboard.

Such a lid according to the invention may weigh only about 1-1.5 kg and hold 20-25 kg fish. We have found that the stability, life, sanitary quality, simple and economic production as well as disassembly for recycling come up to high expectations.

The invention is not limited to the embodiments described above and shown in the drawings, which solely are to be regarded as not limiting embodiments, which can be modified and supplemented in an arbitrary fashion within the scope of the inventive idea and according to the accompanying claims. Also, in special situations corrugated cardboard as a manufacturing material can be completely or partially replaced by non-corrugated cardboard as a manufacturing material can be completely or partially replaced by non-corrugated paper board and/or a plastic material and/or a metal, and yet the typical corrugated cardboard structure may be retained. The folding lug pairs can of course be formed as to dimensions and design in such a way, that they form a part of the gripping elements in connection with the handles.

In the case design, shown in Fig. 18, there are a few transverse through drainage holes (250), preferably arranged within the lower corner area of the end walls, which are used as outlets for melted ice, if the case is to be used as a fish case, which contains ice primarily for road and sea transport. These holes (250) are made preferably by providing the e.g. double-corrugated cardboard material with punched holes. Then finger-like nozzles (252) are inserted into the holes, in a machine, which folds and glues the bottom blanks to their finished shape, according to Fig. 18a, until a stop flange on the nozzles (252) abuts the wall material, which surrounds the holes. The nozzles have then with their points penetrated the holes and ended up with outlet openings for melted adhesive roughly in the middle of the depth of the hole. Adhesive (254) is introduced and simultaneously the nozzles (252) are rotated. A die (256) is now driven towards the side, which is turned away from the nozzles (252), against and around the nozzle points and against the wall material around the holes, which material is forcefully compressed between the die (256) and nozzle flange. The introduced melted adhesive (254) penetrates and is pressed into the material around the holds (250) and solidifies immediately, a sealing of the hole wall being obtained, which stops water from penetrating into the wall material and softening it (see Fig. 18b). In Figure 18, P denotes a laminated paper and polyethylene layer.

The lid according to Fig. 19, which preferably is combined with a case according to Figs. 1-17, is particularly suitable for airplane transport, when drainage of melted ice is not suitable and instead an absorber, known per se, for melted ice, is positioned at the bottom of the case. However, a subsequent so called icing up i.e. that somewhere along the way from a filling station to the

receiver ice is filled, is considered important. To accomplish this in a relatively simple, quick and in additional regards appropriate way, a lid is provided according to the invention, mainly corresponding to one or several of the already described/shown embodiments, in which however the longitudinal border sides of the lid, suitably at a small distance from one of the end walls, are slotted all the way to the main plane of the lid, e.g. parallel to said end wall. This slotting is done in connection with the punching, grooving, perforating or the like of the lid blank, suitably also a downwardly open recess being done in the two end walls, which facilitates the gripping of the lid and the case in their handle elements at about the same level and which leaves free a field on the end walls of the case for e.g. labels or the like. The field, which constitutes the main plane of the lid, is provided between the two adjacent slotting ends with grooves, perforations or the like , a hinge action being allowed. Such a lid blank is provided according to Fig. 21 in its plane condition with a protective tape along the two elongated sides, i.e. a tape strip covers e.g. a centimeter or two along the inner side and the outer side and consequently covers the moisture sensitive underside. In order to be able to draw the blank through an edge tape application device there are e.g. gripping holes in the inner corners of the outer corner lugs.

When the protective tape has been applied, the lid is folded and glued, stapled or the like to obtain its finished shape according to Fig. 19. Said cut is then not functioning and a strapping or the like is stretched around the lid, applied on the case, straight above the section, which extends from the adjacent end wall and all the way to said "hinge line" (see Fig. 19). If an icing up, an inspection or the like is required, the strapping is displaced towards and past said hinge line and the protective tape is split along the cuts and then the detached cover can be lifted up towards the main field of the lid, and an inspection, an icing up, possibly a limited product removal and the like can be done (see Fig. 20). A reclosure is done by lowering the lid and pushing back the strapping to its original position, which consequently will keep the cover in place and keep the lid and the case together, a very advantageous double function being achieved.

Figs. 19 and 20 show, that strappings suitably can be placed around the two ends of finished packs. It is of course possible to arrange said covers at both lid ends. It is also possible to form such covers by means of a cutting or a tearing element, which runs substantially in a central position straight across the main field of the lid and which continues straight through the borders or stepwise through the folding notch between the borders and the main field and through the borders to obtain foldable lugs. Such a design is advantageous, since one or both end covers of the lid can be kept in place, until the contents of the pack has been removed or even subsequent to such a removal. One or both main fields of the lid and the "central covers", formed by the adjacent border parts, can then as a

matter of choice be opened up, possibly with a preceding folding of said lugs, in order to prevent, that the border parts will stop an opening up. One of several additional strappings, adhesive tape pieces or the like can be used to keep the covers in place after an opening up and a closing back, and then the lowering of said border lugs can also contribute to a durable reclosure. The ”end covers” or the ”central covers” can also allow access to divided compartments in a case, e.g. one compartment for only ice.

Finally it is possible to form a cover by extending two cuts along the same side a small distance into the main field of the lid and connect the existing cut ends in this field by means of a ”hinge line”.

In all these cases a protective tape can also cover the cuts, since it is easy, in a later phase, to divide the tape along the cuts. Before the tape is divided, it has a protective as well as uniting action. In this connection it is also possible to use an adhesive tape , which can be reapplied , provided a suitable surface for this purpose is available, e.g. an underlying smooth surface having a suitable adhesion and release ability.

The design according to Fig. 24 is particularly suitable for an automatic mechanical transformation to an upwardly folded lid. Between the corner lugs, which jointly looks like two triangles, an end wall side is included on each short side of the blank, the side edges (folding notches) of the end wall side including a smaller angle then 90°, preferably 86°, in relation to the base side, which also is a folding notch. Initially the two longitudinal sides are folded upwards in relation to the central field, which constitutes the bottom, e.g. about 70°, which is considered sufficient. Thanks to said angle, which is less than 90° , the folding lines between said corner triangles will force them to fold with their hypotenuses outwards, particularly around the central field, and the end walls will be kept in place on a plane support surface. When the end wall sides later are folded upwards against the central field and are folded more than about 100°, the corner lugs will always automatically pivot about said folding notch, which is less than 90° in relation to the base line, and turn towards the outer side of the end walls, to which they will later be attached in any of the ways already described in this text. At least the longitudinal sides will, thanks to the described and shown design, slightly tilt inwards, which facilitates the mounting of a possible lid and stabilizes the construction even more. It is shown in Figs. 7 and 8, that the handle lug, which is attached to each end wall, is applied around the double-folded corner lugs and it is subsequently, jointly with the gripping lug, punched out of the sides, inserted into the area between the double-folded corner lugs.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE CLAIMED ARE DEFINED AS FOLLOWS:

1. A case (1) with a lid (2), wherein the case is configured for packing, storing and transporting food stuffs, and wherein the case is manufactured from a substantially plane blank, which includes a central rectangular field (18) to which via first, second, third, and fourth notched hinges (19; 20; 24; and 25), arranged on the inside (21), upwardly foldable side walls (22 and 23) and end walls (26 and 27), respectively, are attached, wherein the corner areas between walls adjacent each other are filled with folding lugs (28, 29, 30, 31, 32, 33, 34, 35), which in pairs are mutually separated by substantially diagonally outwardly directed fifth, sixth, seventh, and eighth notched hinges (44, 45, 46, 47), and which are designed to be folded together in pairs in order to abut against an adjacent wall and be fastened to said adjacent wall, the folding lug pairs being designed to in a folded condition be folded on the outside of an adjacent end wall, a handle element (17) being designed to be folded around such an end wall in order to in a lever-like way exert a press action of two walls adjacent each other against each other, the folding lug pairs folded away in this way being included, the handle element being designed to be fastened to the outside of these folding lug pairs, their total thickness, inherent elasticity and mutual distance being utilized to achieve an increased gripping depth and where appropriate extra gripping action jointly with the handle element, a lid comprising a plane main field (58) and adjacent border parts (63, 64, 65, 66) in order to form at least one cover, which can be opened up and reclosed again, said border parts and said main field in at least one area being cut through and between such through cuts being provided a ninth notched hinge interconnecting the ends of the said cuts within the main field in the form of a groove or perforation, said through cuts, up to the time, when said hinge function is to be utilized, being held together jointly with the adjacent lid material by means of a protective tape, which is provided to be removed or be applied again, wherein the border parts (65, 66) on the end wall sides of the lid are at their free longitudinal edges provided with cuts (96, 97), which converge towards the central field, and between the inner ends of said cuts extend double-folding notches (98, 99) forming trapezoidal locking flaps (100, 101), which may be folded inwards and downwards subsequent to the folding upwards of the border parts in order to with their points be directed towards the end areas of the side wall border parts and lock them in their positions, and that the end wall border parts open the access to the handle elements of the case design and form gripping elements jointly with them respectively.

2. A case according to claim 1, wherein the case (1) and the lid (2), respectively, entirely or partially are made from corrugated cardboard, the lid being made from plain corrugated cardboard (3) comprising a corrugated paper layer (4), which on its two sides is coated with plane paper layers (5 and 6 respectively), and a very thin plastic layer (7 and 8) as a moisture barrier between the corrugated paper layer (4) and the plane paper layers (5 and 6 respectively), and wherein the case (1) comprises first and second corrugated paper layers (11 and 12 respectively)

facing a plane, wherein at least one of the sides of the first and second corrugated paper layers (11 and 12) is in contact with a respective side of a plastic-coated paper layer (10), which corrugated paper layers in their turn face plane, outer paper layers (13 and 14 respectively),with intermediate thin plastic layers (15 and 16 respectively) as a moisture barrier, wherein the paper layers have a thickness of about 20 µm, and the plastic layer has a thickness of about 15 µm.

3. A case according to claim **1** or **2** wherein the corner areas between walls adjacent each other are filled, within the framework of a rectangular shape for the entire blank, with said folding lugs (28, 29, 30, 31, 32, 33, 34 and 35), and wherein adjacent the inside 21 are tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteenth, and seventeenth notched hinges (36, 37, 38, 39, 40, 41, 42 and 43) to allow a folding of said lugs towards the adjacent wall sides whereas said fifth, sixth, seventh, and eighth notched hinges (44, 45, 46 and 47) are positioned substantially diagonally between each lug pair and outwardly directed to form a hypotenuse for each lug and mutually separate the lug pairs, and wherein the fifth, sixth, seventh, and eighth notched hinges (44, 45, 46, 47) are positioned between the central field and two walls adjacent each other and end on the end wall sides at a distance from the outer corner point of the blank in order to obtain a folding shape with truncated corners.

4. A case according to claim **3**, wherein the third, tenth, and twelfth notched hinges (24, 36, 38) and the fourth, fourteenth, and sixteenth notched hinges (25, 40, 42) between the side walls and the folding lugs as well as between the central field and the end walls are located along a continuous notched hinge, and wherein the eleventh and fifteenth and the thirteenth and seventeenth notched hinges (37 and 41 and 39 and 43 respectively) between the end walls and the folding lugs tilt inwards towards the center of the respective end wall with an angle of 1-10°,, the side walls (22, 23) slightly tilting inwards towards the inlet opening of the case in order to give a possible lid a slightly larger play for a mounting and a certain press fit respectively during the final application phase.

5. A case according to claim **4**, wherein the eleventh and fifteenth and the thirteenth and seventeenth notched hinges (37 and 41 and 39 and 43 respectively) between the end walls and the folding lugs tilt inwards towards the center of the respective end wall with an angle of about 4°.

6. A case according to any one of claims **1** to **5**, wherein the finished, folded case is designed to be supplemented to a shape, which can be carried by means of handle elements (17) having a width, which width corresponds to the width of the end walls and including a field (53) designed to bridge the total thickness of the end walls and the lug pairs, folded against them, and a field (54) for fastening the outside of the lugs (28;30 and 32;34) folded against the end walls.

7. A case according to claim **6**, wherein the field (54), designed to be fastened to the lugs, folded against the end walls, along its free longitudinal edge a central,

substantially trapezoidal recess (55) with a tongue (56), insertable into the innermost part of the recess, which tongue extends longitudinally and parallel to the central field (18) and is connected to the first mentioned field (54) solely via a longitudinal side, which is formed by a folding notch (57) on the side facing the end wall, and in that the tongue is designed to be folded inwards towards the end wall with an angle of about 90° and be supported in the inwardly folded position with its short sides also by the obliquely downwardly directed doublefolded edges of the inwardly folded lug pairs.

8. A case according to any one of claims **1** to **6**, wherein the handle elements (17) are designed as loose elements, a field (52) being connected to said bridge field (53) and being designed to be fastened, to the inner side of the respective end wall.

9. A case according claim **8**, wherein the handle elements (17) are made from a strong cardboard material.

10. A case according to any one of claims **1** to **9**, wherein the lid (2) has a central rectangular field (58), which is slightly larger than the outer dimensions of the case (1), which field via eighteenth, ninteenth, twentieth, and twenty-first notched hinges (59, 60, 61, 62) adjoins border parts (63, 64, 65, 66), which between them in the corner areas via twenty-second, twenty-third, twenty-fourth, twenty-fifth, twenty-sixth, twenty-seventh, twenty-eighth, and twenty-ninth notched hinges (67, 68, 69, 70, 71, 72, 73, 74) include lugs (75, 76, 77, 78, 79, 80, 81, 82), which by means of diagonally extending thirtieth, thirty-first, thirty-second, and thirty-third notched hinges (83, 84, 85, 86) in pairs are mutually separated, and wherein flaps (102, 103) are located adjacent to the side border parts, via doublefolding hinges (104, 105), and de-signed to from within abut said side border parts, wherein short rectangular projections (87, 88, 89, 90) are designed to be inserted into the side edge areas of the control field (58), which on the inner side (91) are provided with smooth recesses (92, 93, 94, 95), only cut in the innermost upper layer, and wherein the projections are designed to hook behind cuts, which constitute the inner longitudinal edges of the recesses, and in this way lock the flaps in their inwardly folded position, the double-folded lugs being positioned between the flaps and the side border parts.

11. A case according to claim **10**, wherein the free outer edges of the lugs (75, 76, 77, 78, 79, 80, 81, 82) slightly tilt inwards in relation to the border part, from which the edges project and obliquely, downwardly towards the field (58) directed extension of the free edges of the lugs being formed, when the lug pairs are folded.

12. A case according to claim **10** or **11**, wherein the border parts of the lid (2) on the end wall sides at their free longitudinal edges are provided with cuts (96, 97), which converge towards the central field (58), wherein doublefolding hinges (98, 99) extend between the inner ends of said cuts (96, 97) in order to form

trapezoidal locking flaps (100, 101), which are designed to be folded inwards and downwards in relation to the upwardly folded border parts in order to be directed with their points towards the end areas of the side border parts and lock them in their position, and simultaneously allow a double function, since the end wall border parts with their cut out areas leave free an access to the handle elements of the case and form gripping means jointly with them respectively, which gripping means are designed to always be active for the lid but also for the case, if the case and the lid, mounted on it, are fastened to each other.

13. A case according to claim **1**, wherein the longitudinal border sides of the lid, at a small distance from one of the end walls, are slotted all the way to the main plane of the lid, parallel to said end wall, which slotting is provided in connection with the punching, grooving, or perforating of the lid blank, also a downwardly open recess being provided in the two end walls, which facilitates the gripping of the lid and the case in their handle elements at about the same level and which leaves free a field on the end walls of the case.

14. A case according to claim **1** or **13**, wherein the field, which constitutes the main plane (58) of the lid, is provided between the two adjacent slotting ends with said ninth notched hinge allowing said hinge action, a blank for such a lid being provided, in its plane condition, with the protective tape along the two elongated sides, covering a portion along the inner side and the outer side and consequently covering the moisture sensitive underside of said border sides.

15. A case according to claim **1**, **13** or **14**, wherein the field, which constitutes the main plane (58) of the lid, is provided with gripping holes for an edge tape application device being provided in the inner corners of the outer corner lugs.

16. A case according to any one of claims **1** and **13** to **15**, wherein upon application of the protective tape, the lid is provided to be folded and fastened to obtain its finished shape, whereby said cuts are prevented from functioning, a strapping being provided to be stretched around the lid applied on the case, straight above the section, which extends from the adjacent end wall and all the way to said ninth notched hinge, and wherein, in case of icing up, an inspection, or a limited product removal , the strapping is provided to be displaced towards and past said ninth notched hinge and the protective tape being provided to be split along the cuts, a detached cover being provided to be lifted up towards the main field of the lid, a reclosure being provided to be effected by lowering the lid and pushing back the strapping to its original position to keep the cover in place and keep the lid and the case together, strappings being provided to be placed around the two ends of finished packs.

17. A case according to any one of claims **1** and **13** to **16**, wherein the protective tape covers the through cuts and is adapted to, in a later phase, be divided along the through cuts, the protective tape being provided, before division, to serve as a protective as well as a uniting means.

18. A case according to claim **17**, wherein the protective tape is an adhesive tape, which can be reapplied.

19. Method of manufacturing a case according to claim **1**, wherein draining holes are made by punched holes , that, in a machine which folds and glues the case blanks to their finished shape, fingerlike nozzles are inserted into the holes until a stop flange on the nozzles abuts the wall material, which surrounds the holes, the nozzles being made, with their points, to penetrate the holes and to end up with outlet openings for melted adhesive roughly in the middle of the depth of the holes, adhesive being introduced and simultaneously the nozzles being rotated, a die being driven towards the case blank side, which is turned away from the nozzles, against and around the nozzle points and against the wall material around the holes, which material is forcefully compressed between the die and nozzle flange, the introduced melted adhesive being made to penetrate and be pressed into the material around the holes and solidifying immediately, a sealing of the hole wall being obtained, which prevents water from penetrating into the wall material and softening it.

Fig 1

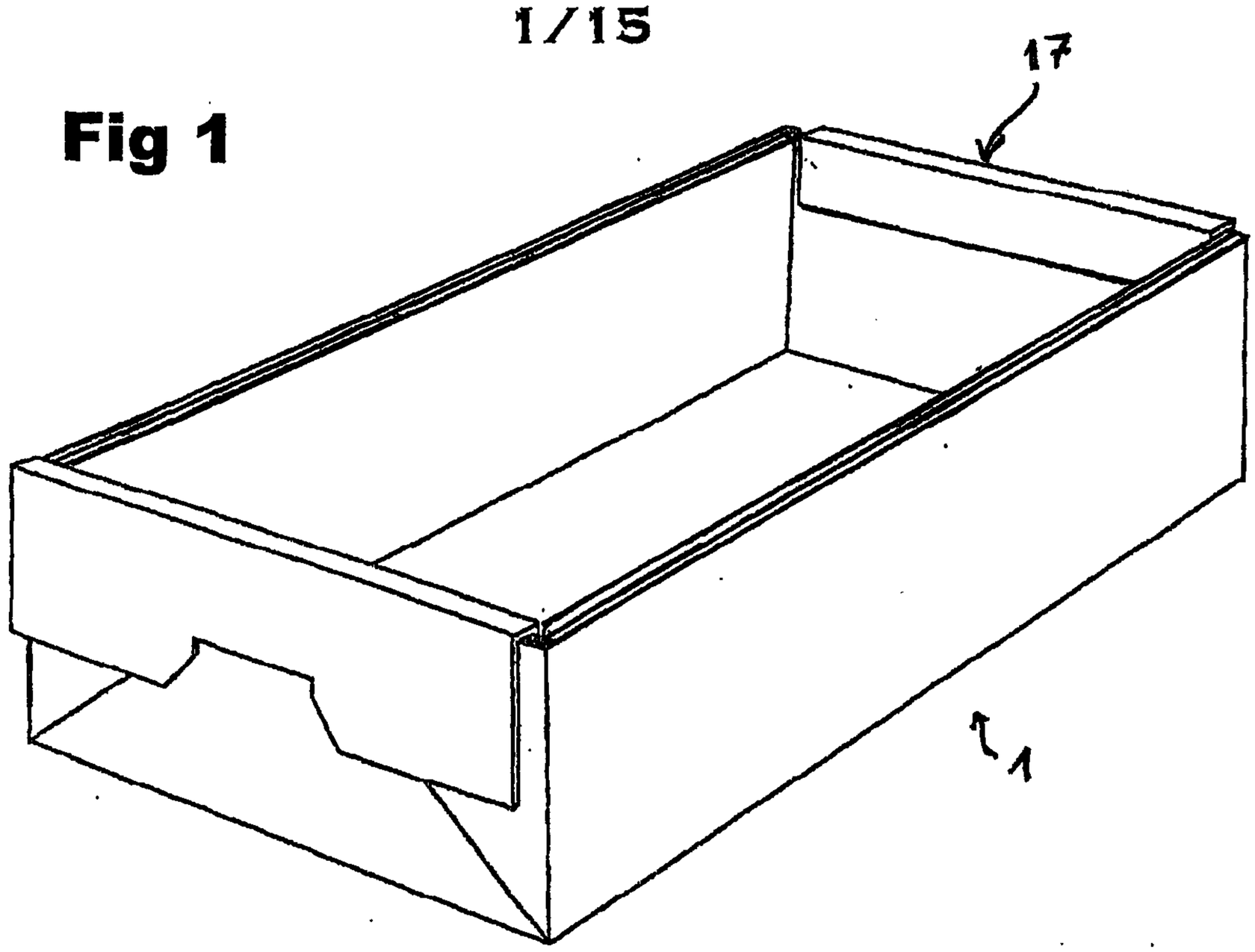
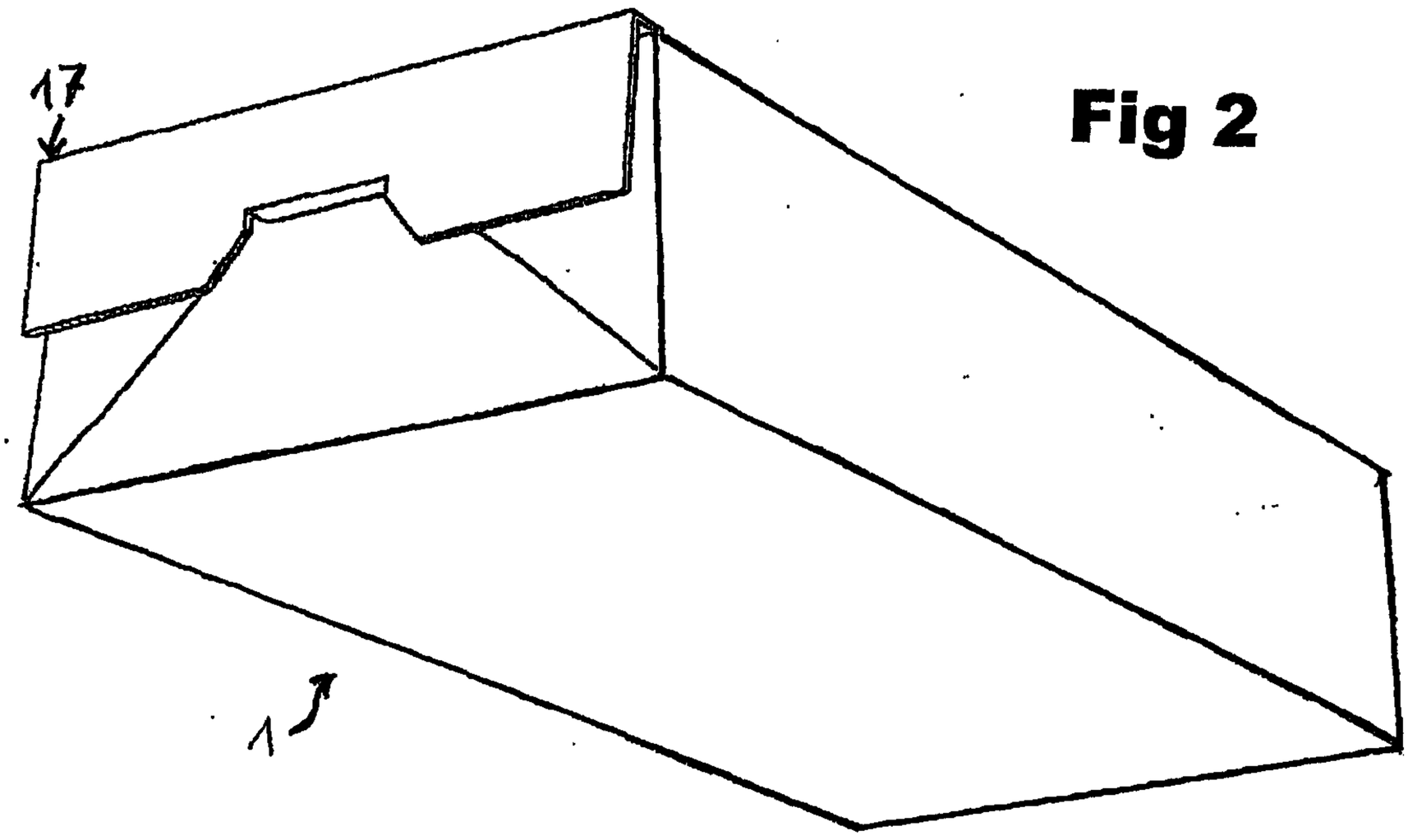


Fig 2



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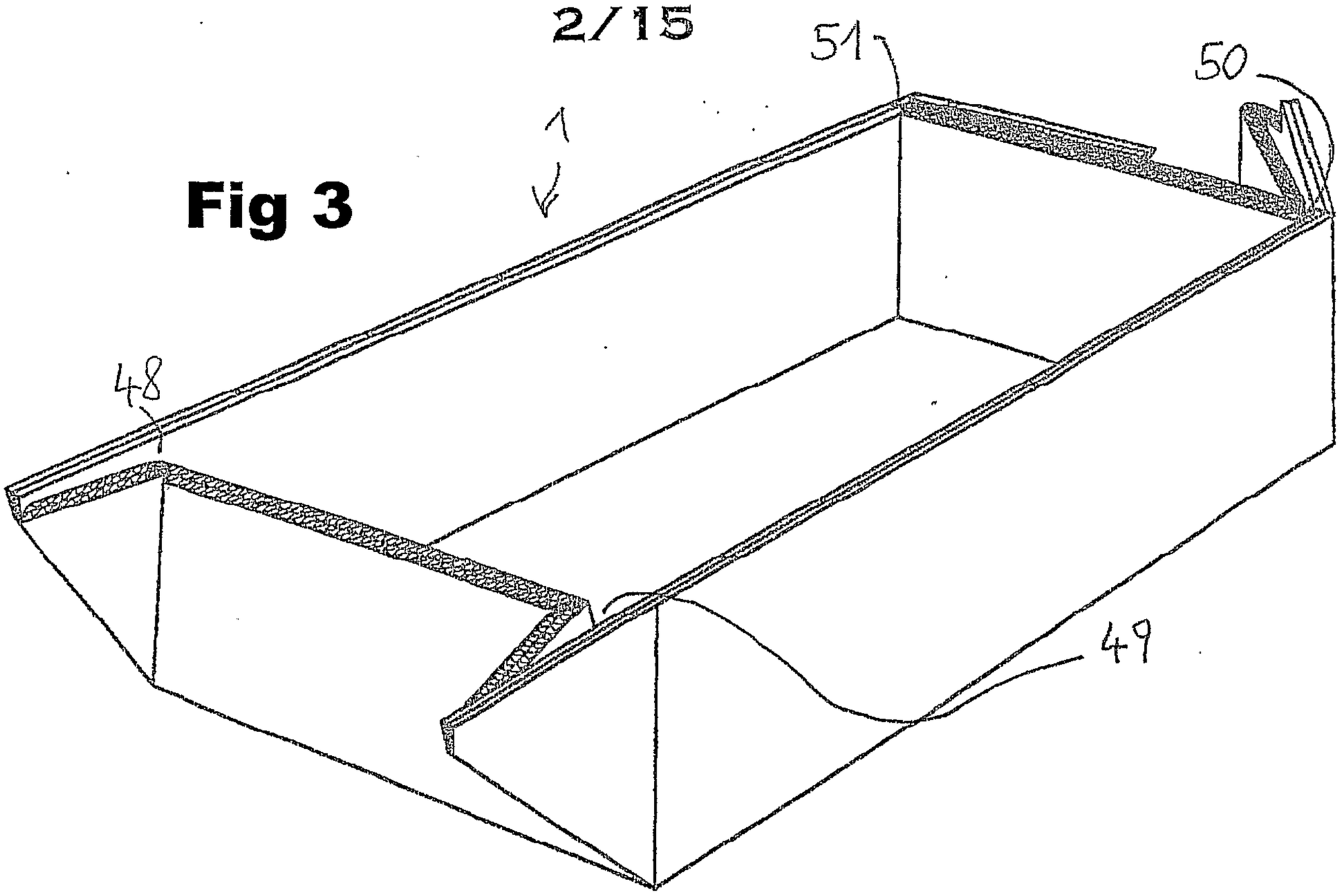

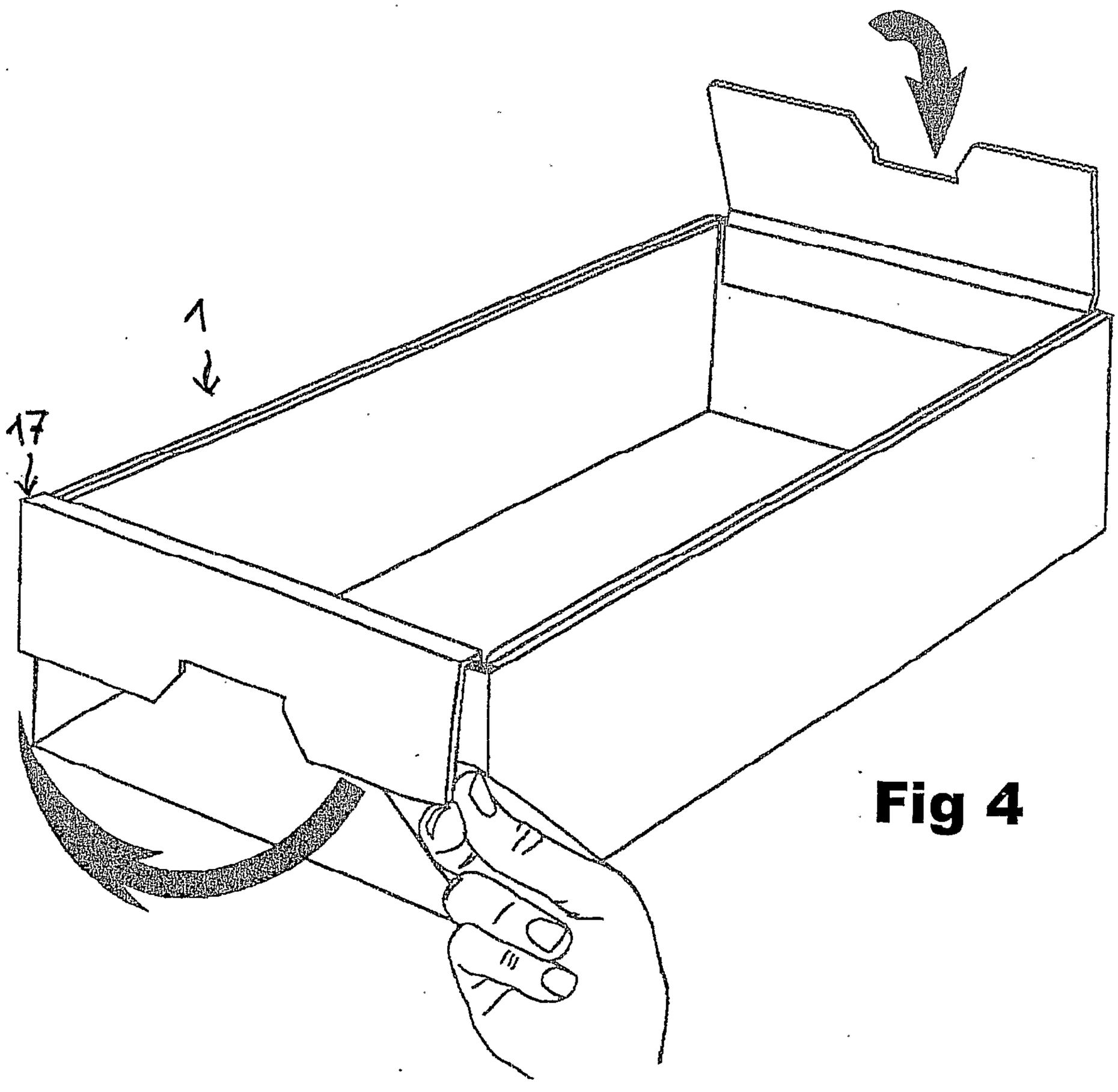

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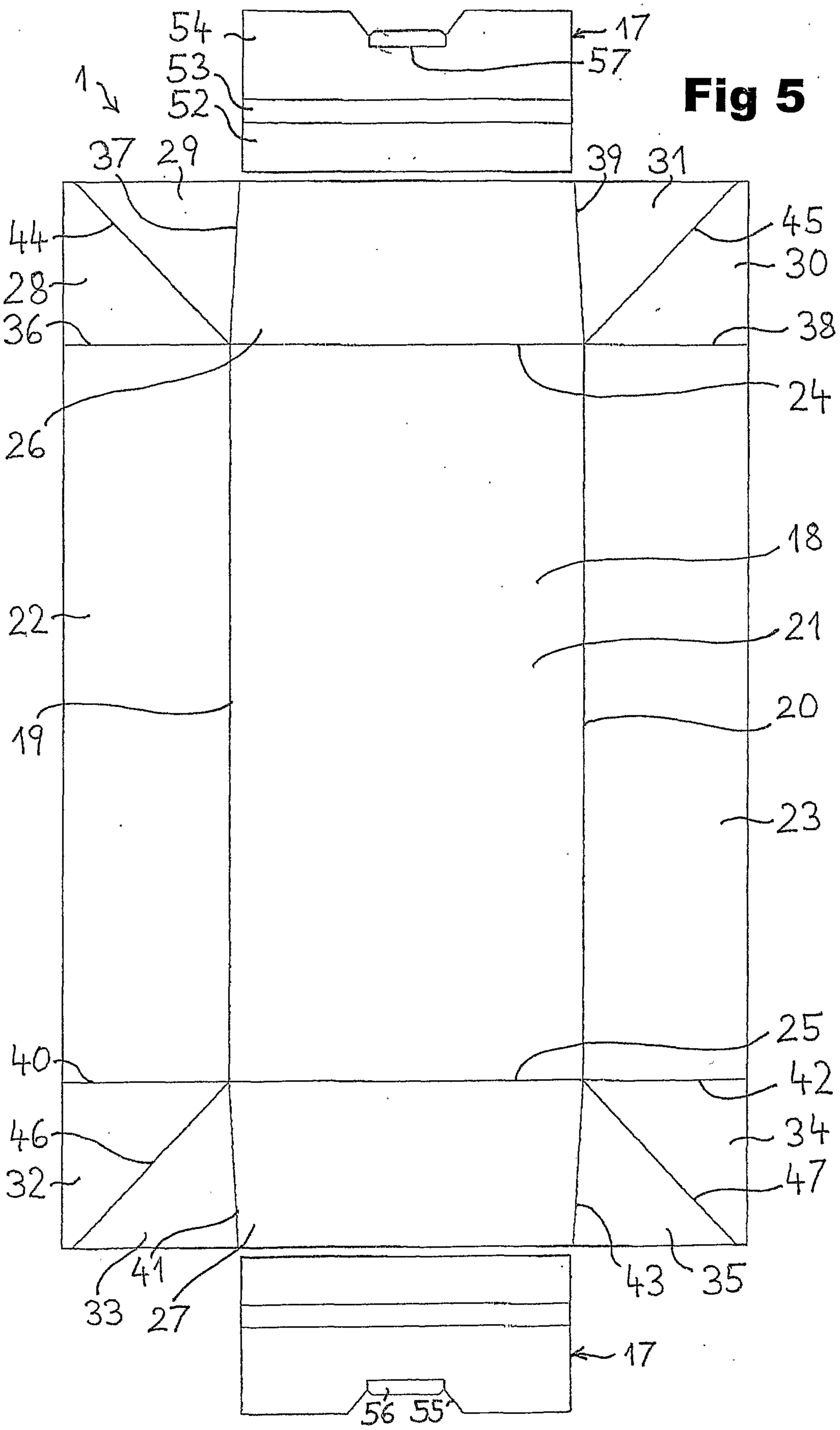
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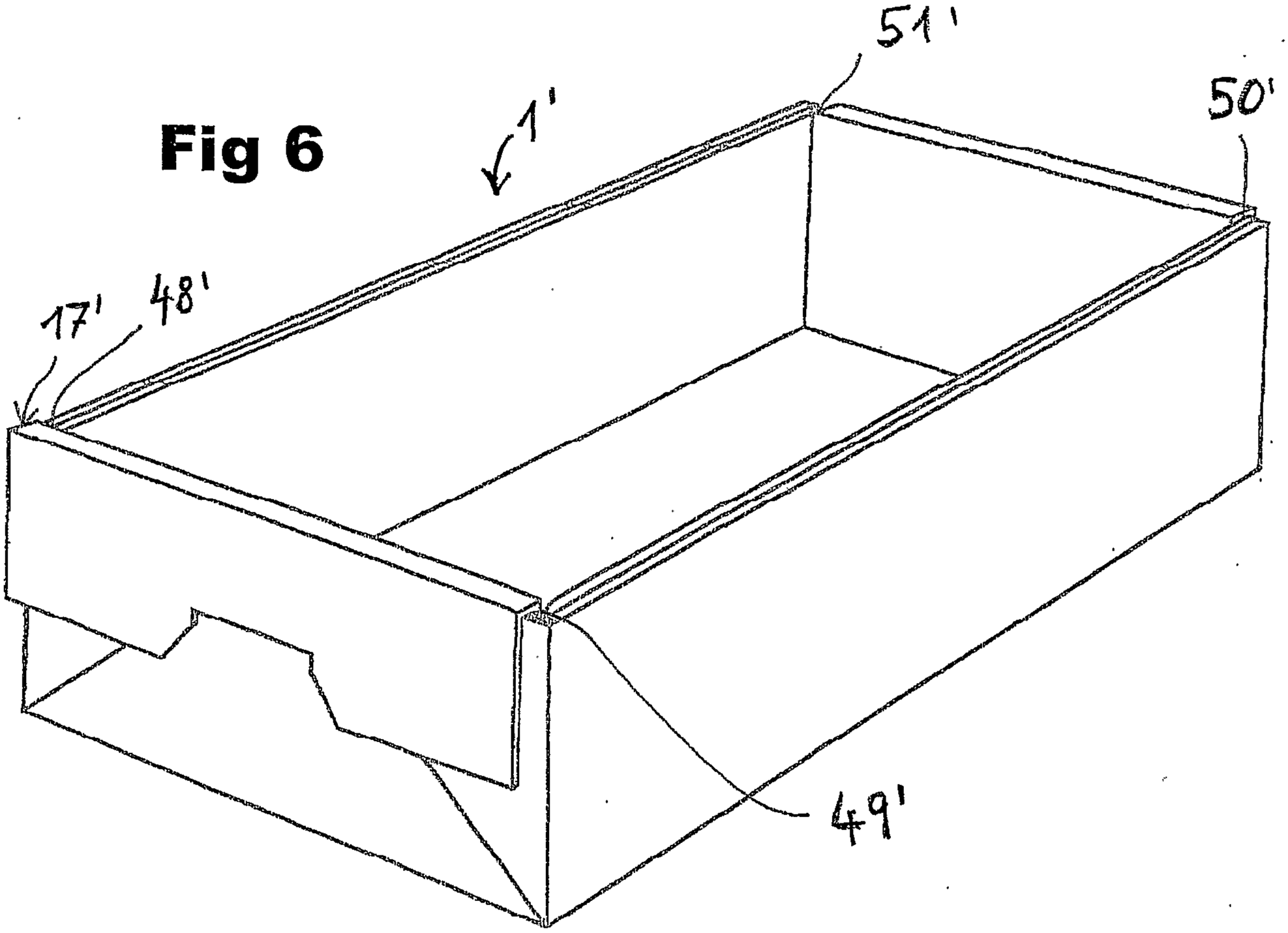
Fig 5

Fig 6



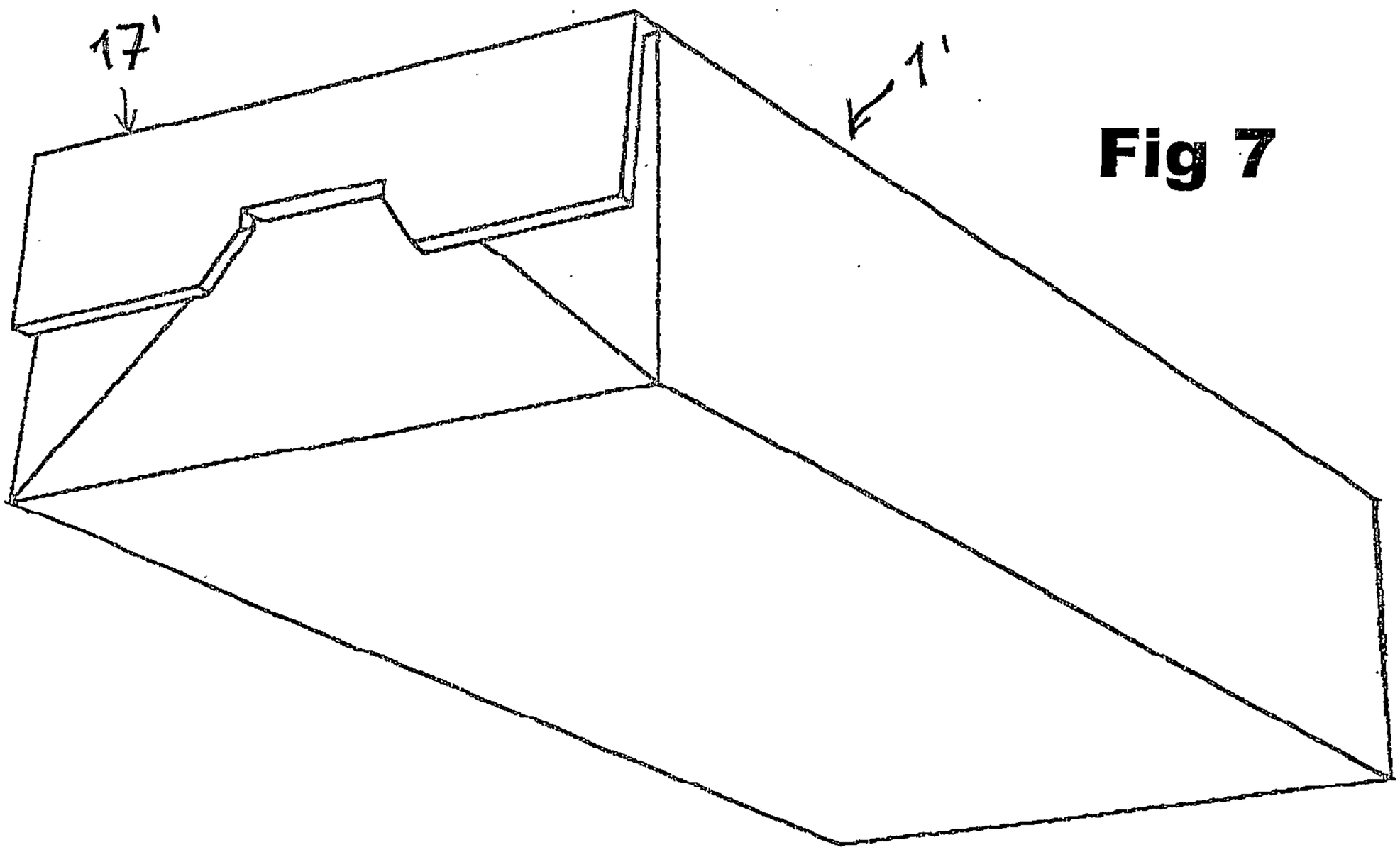


Fig 7

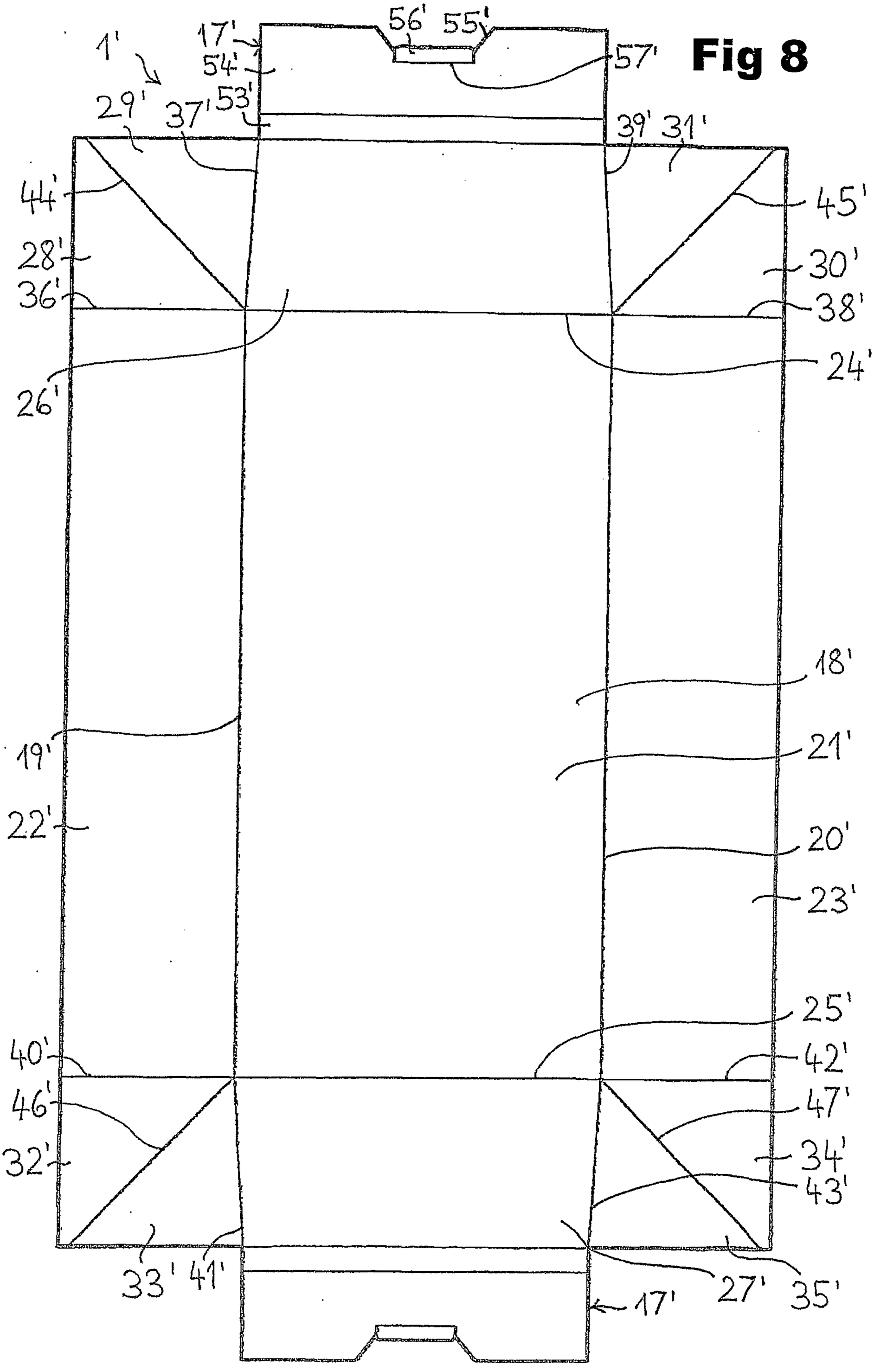

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Fig 8

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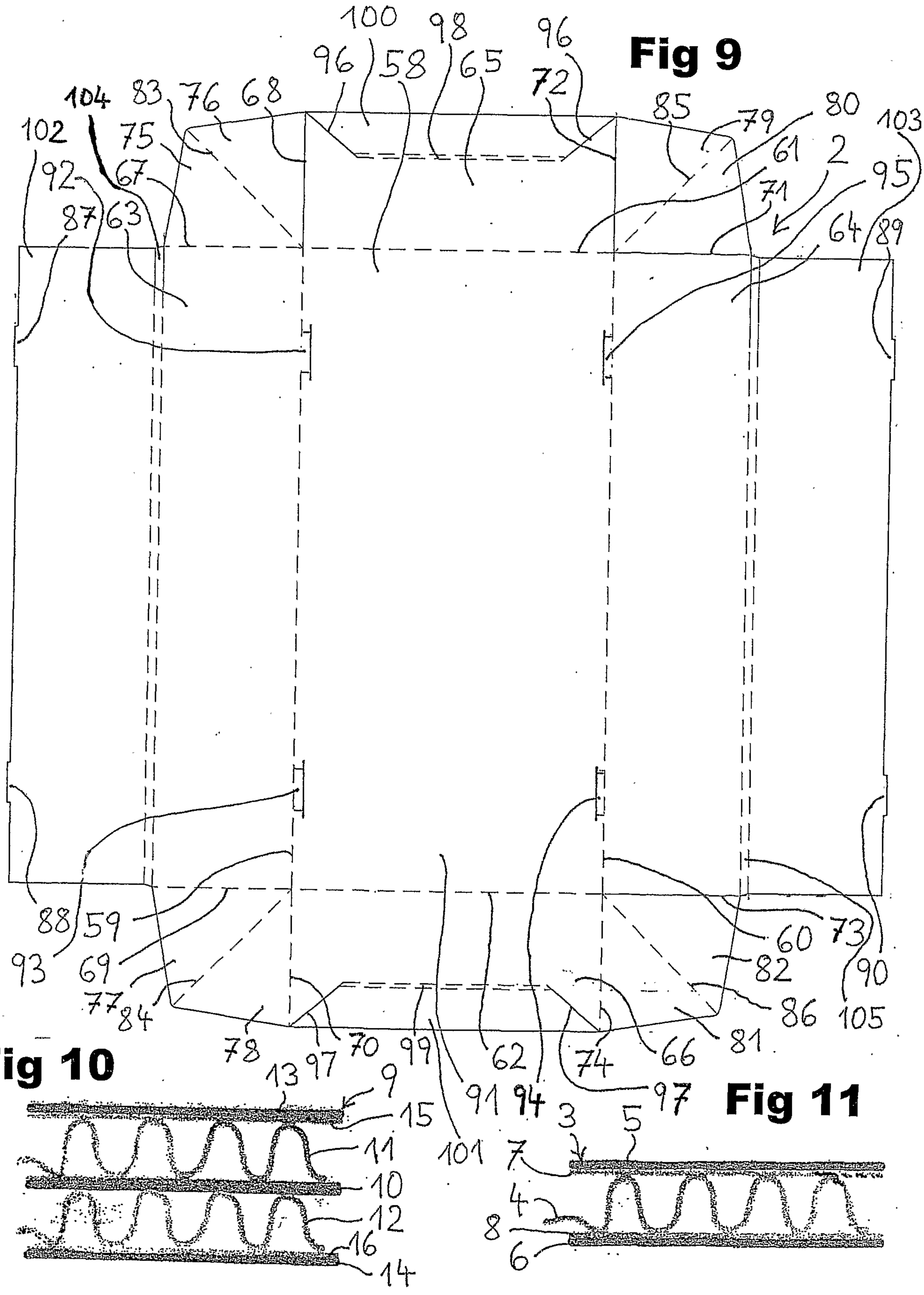

Fig 10

Fig 11

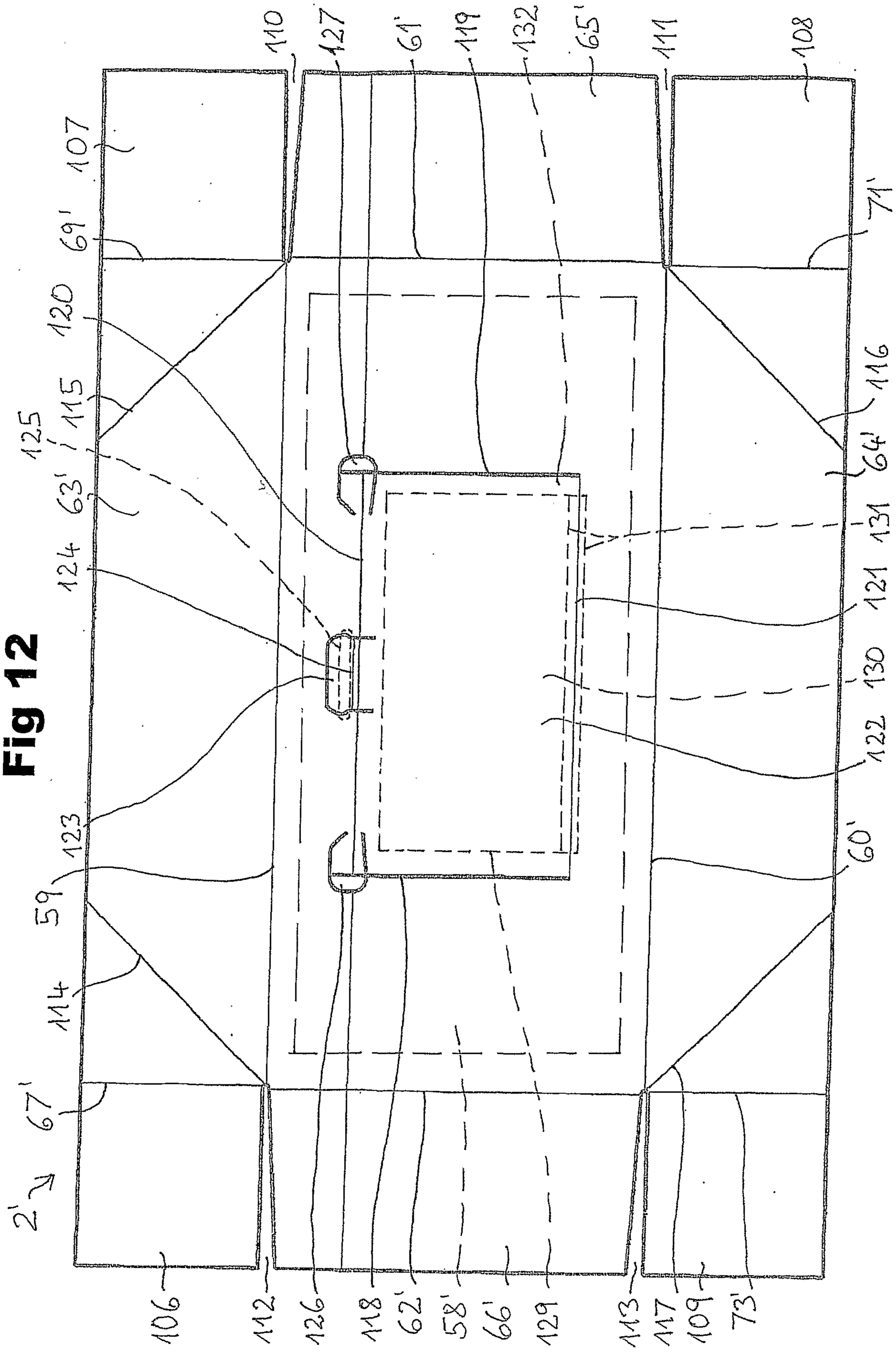
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Fig 12

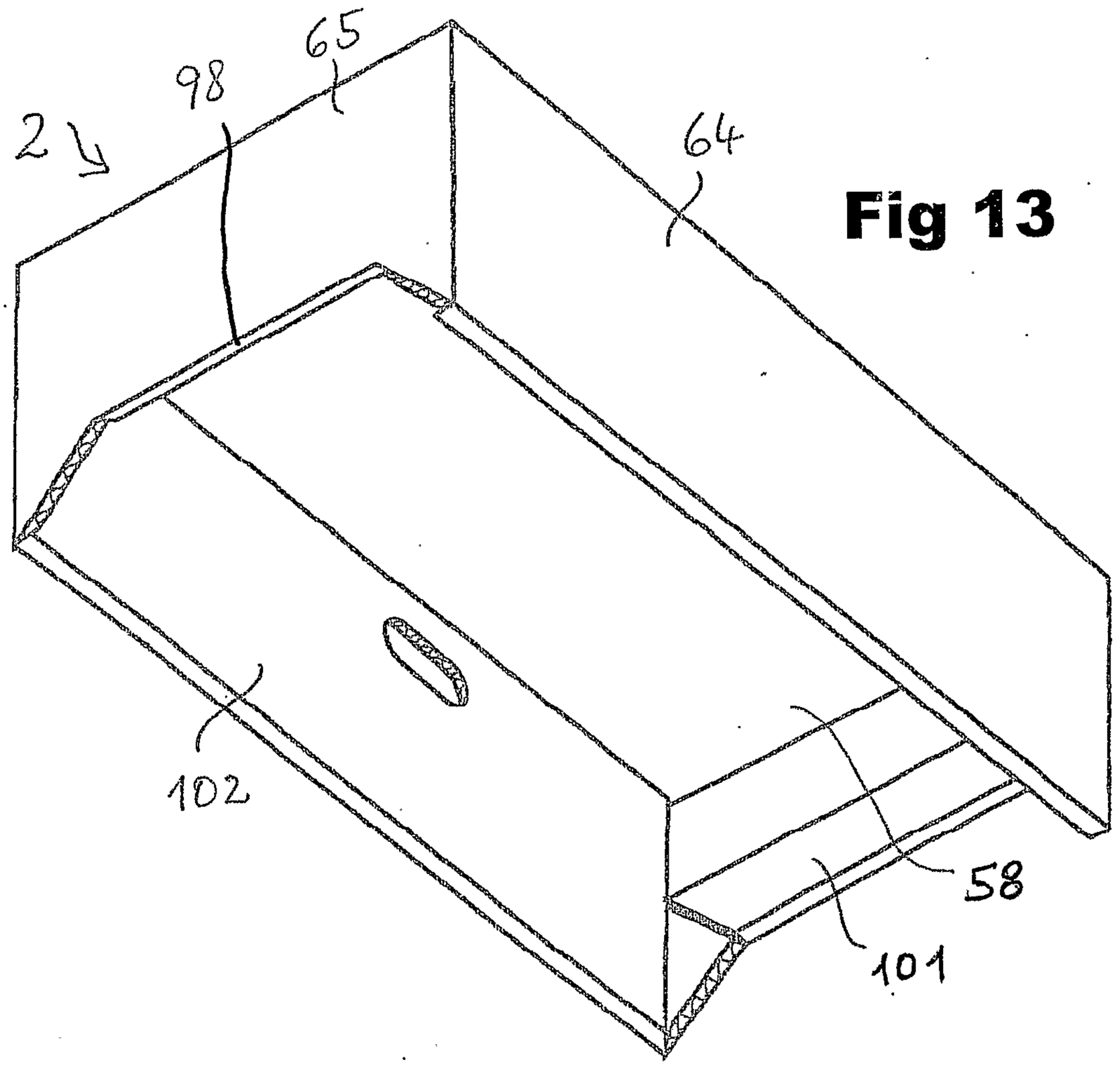
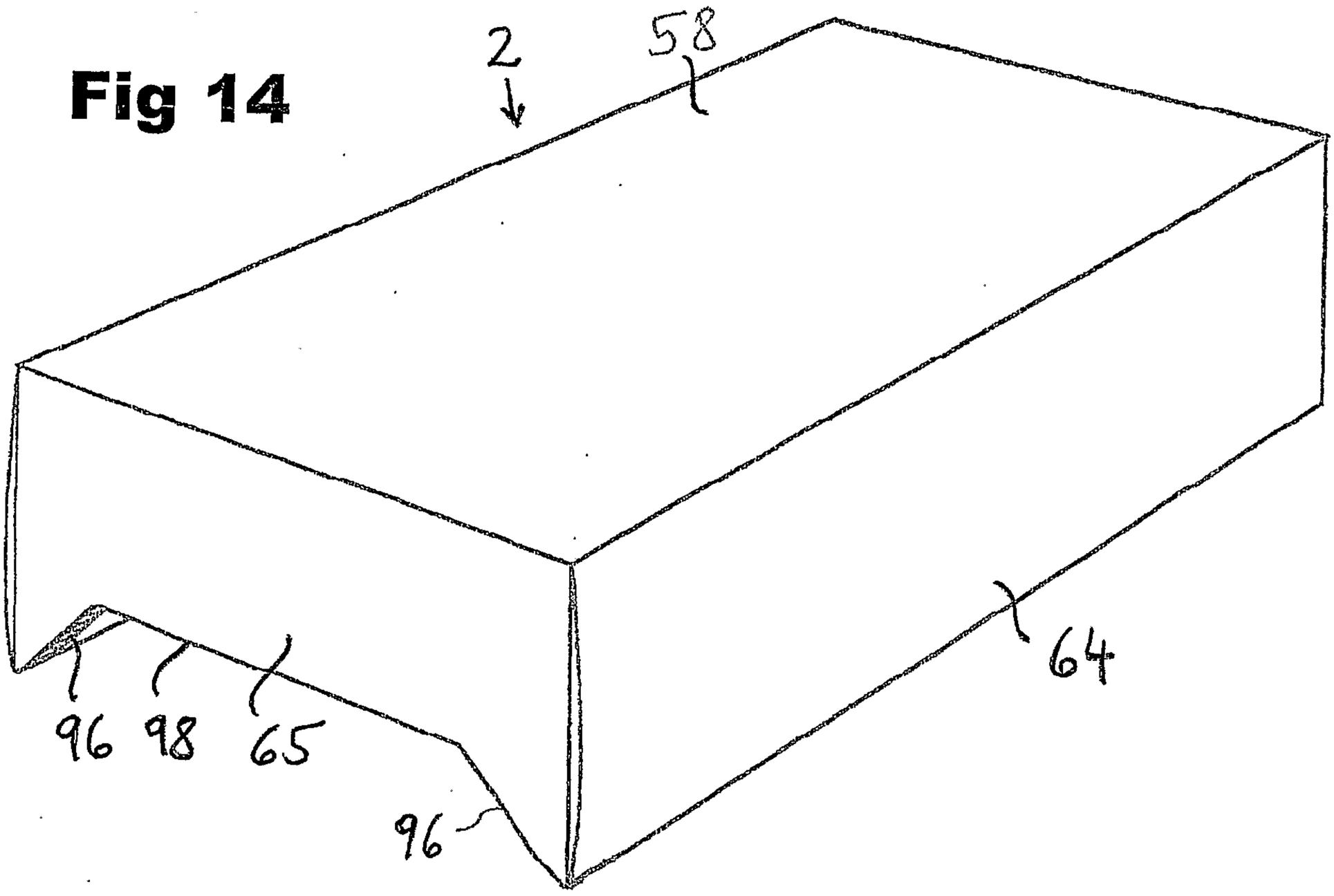


Fig 13

Fig 14



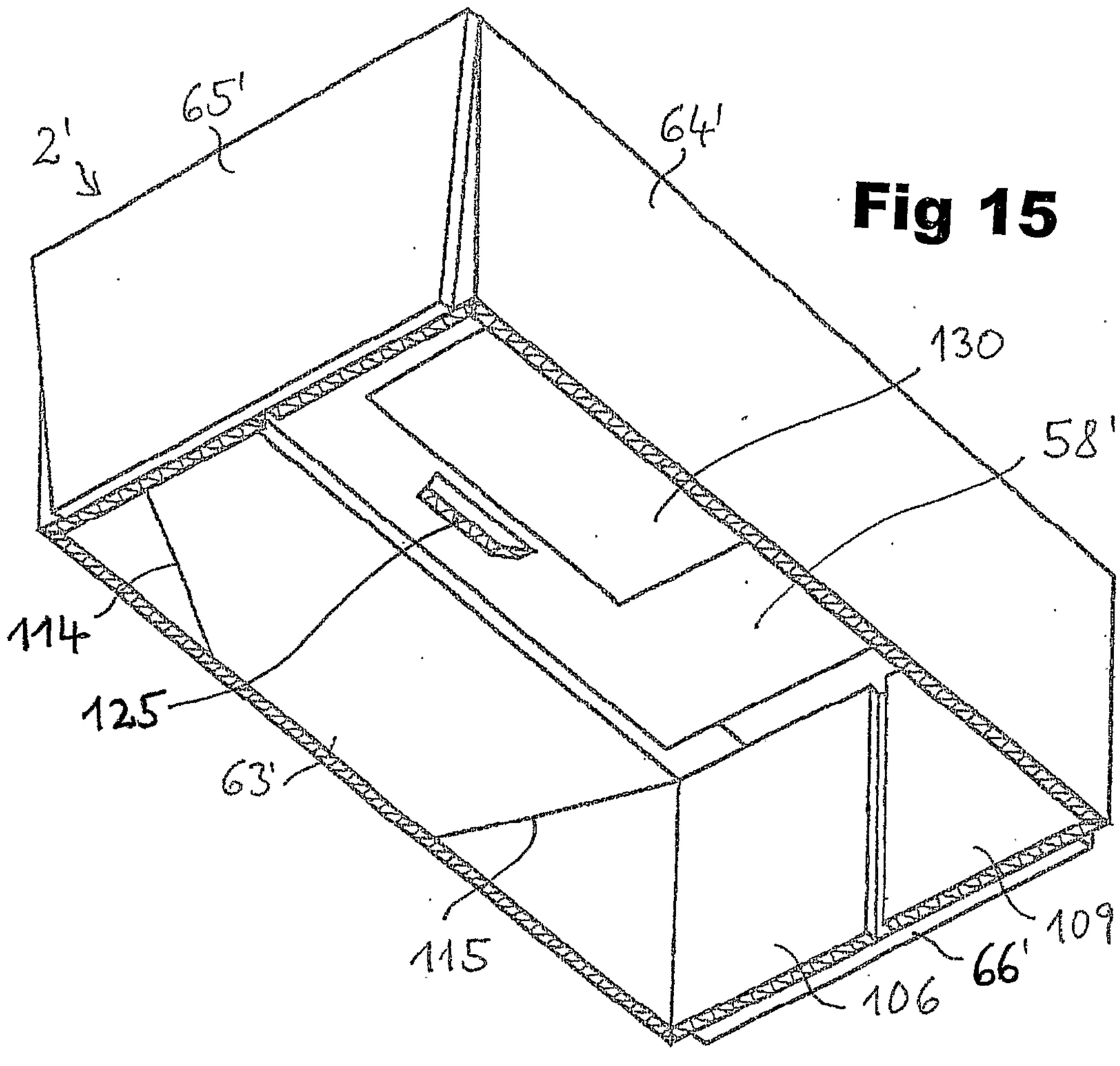


Fig 15

Fig 16

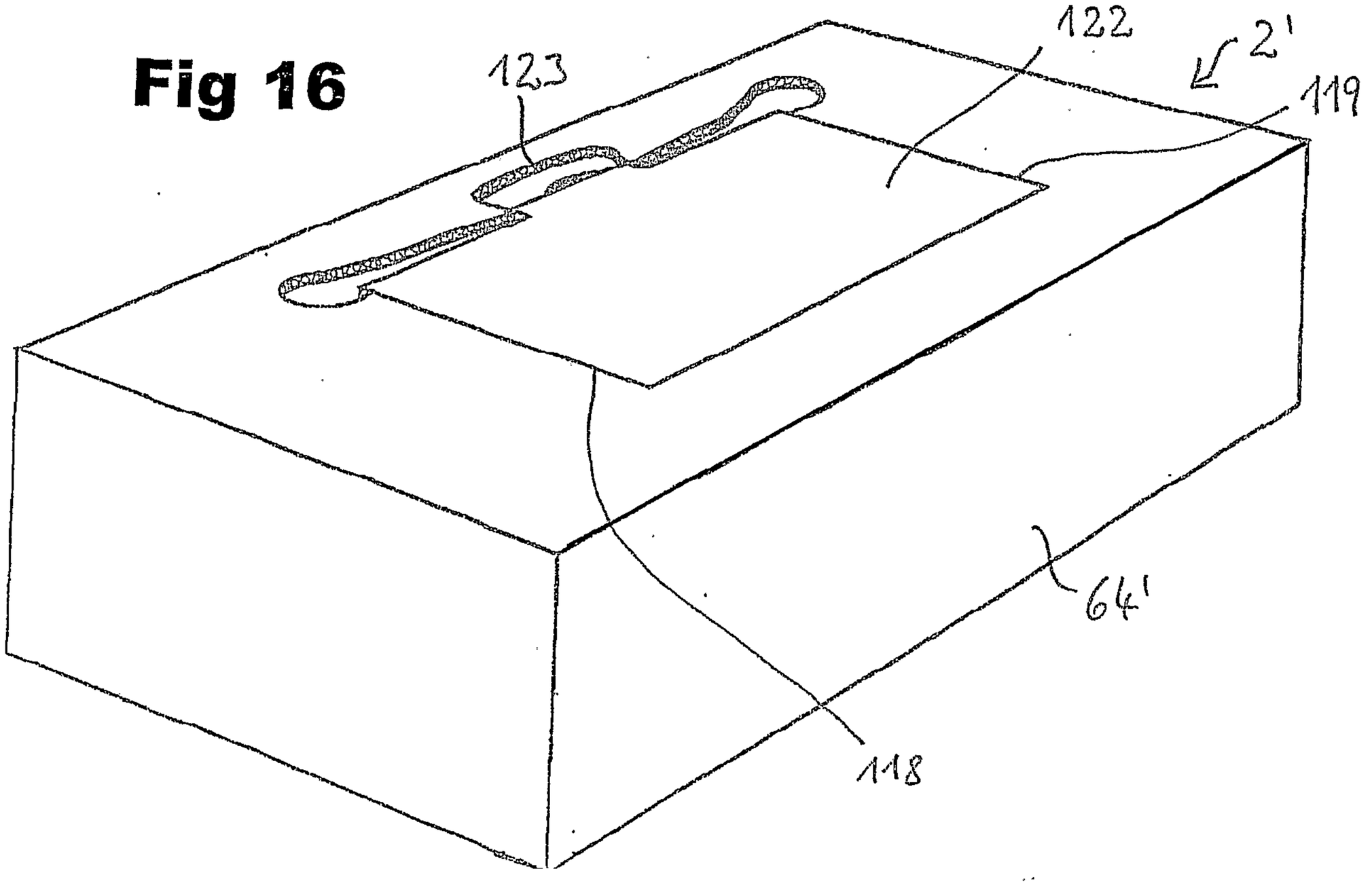
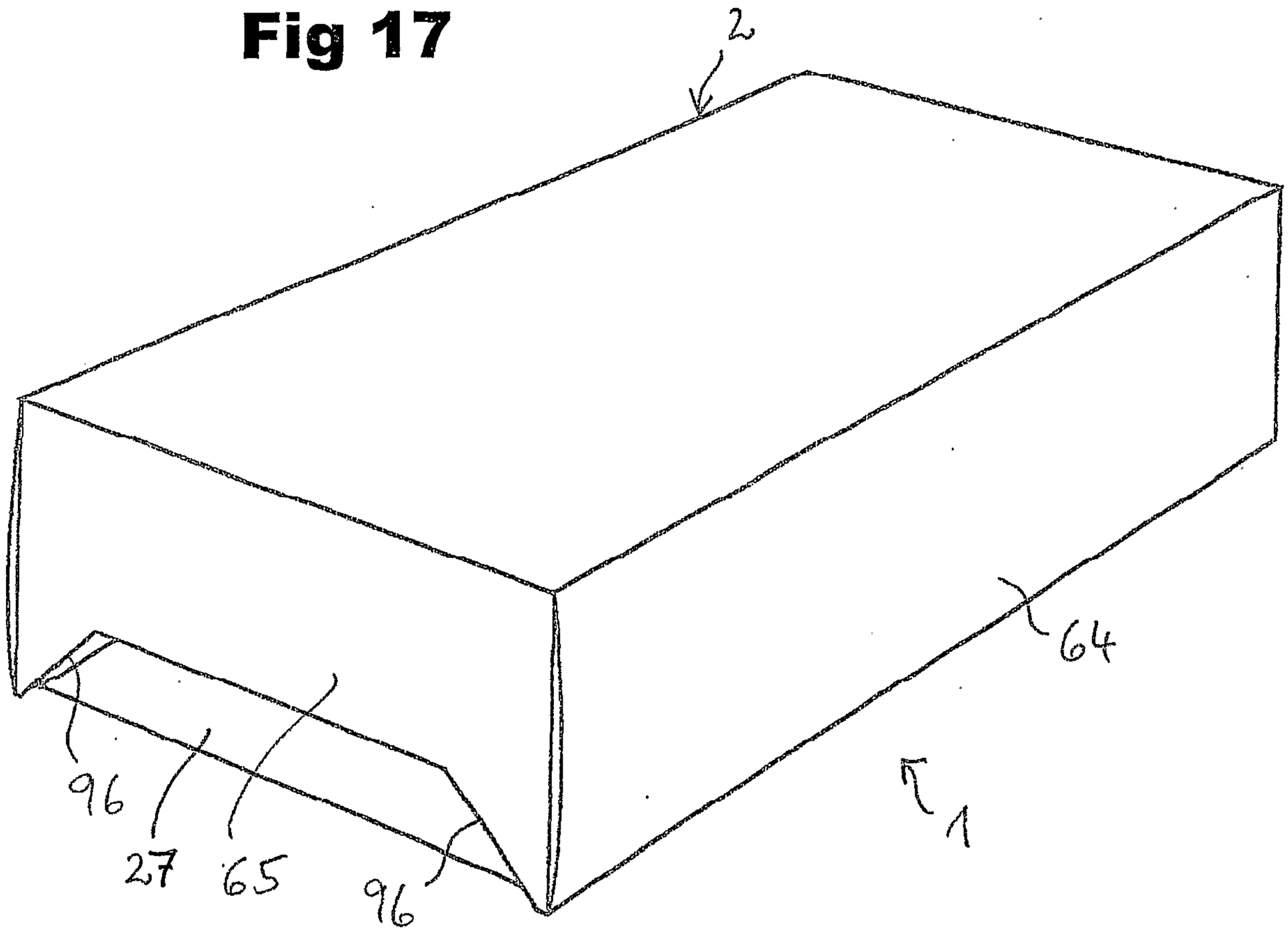
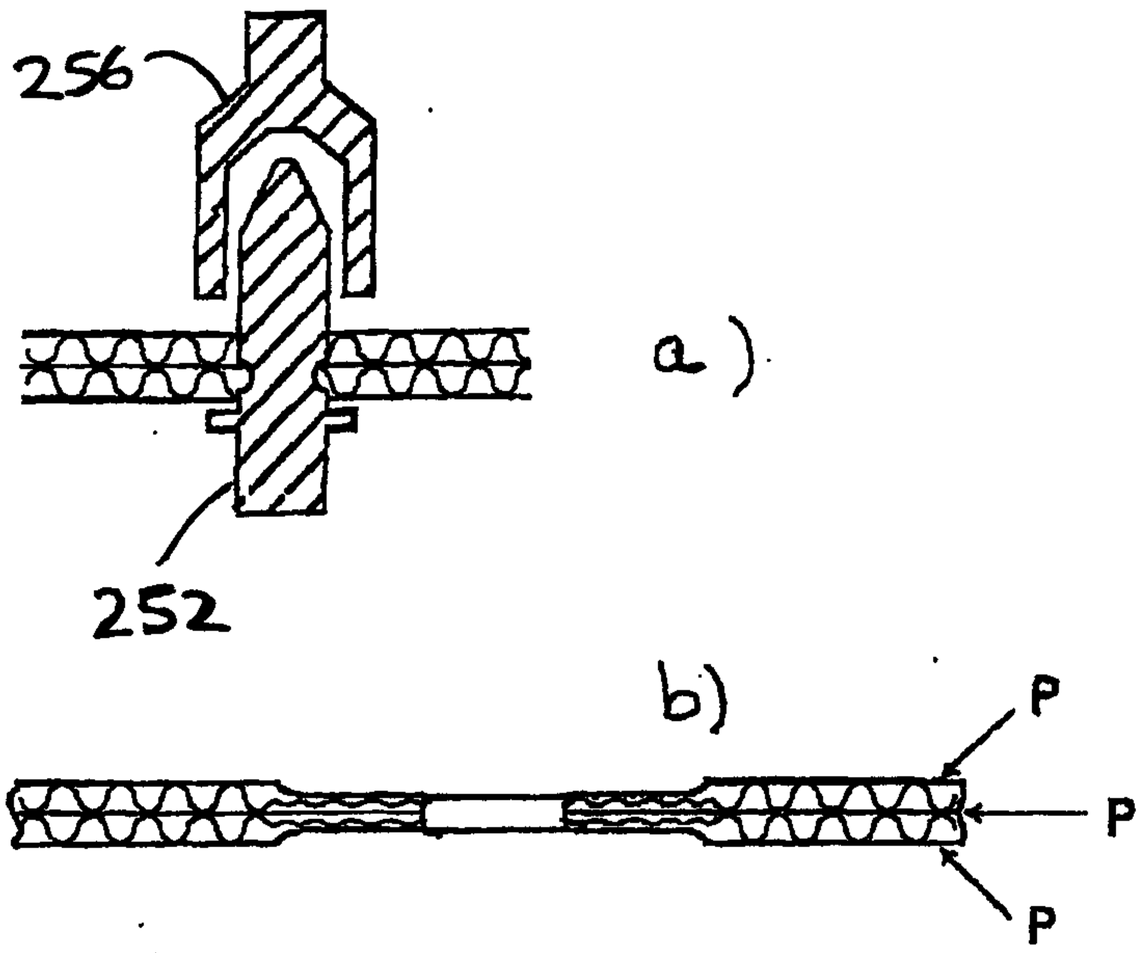
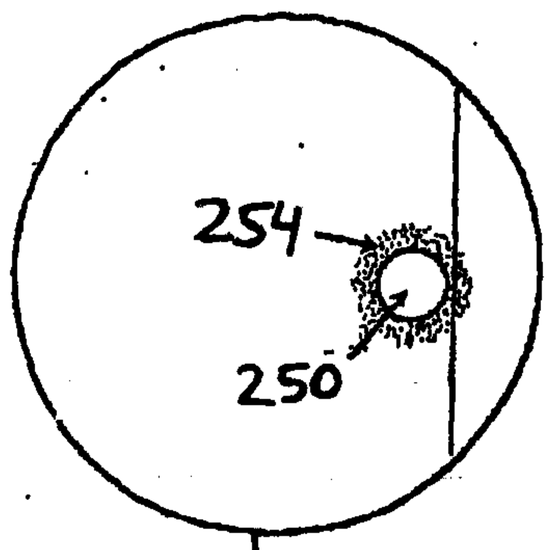


Fig 17







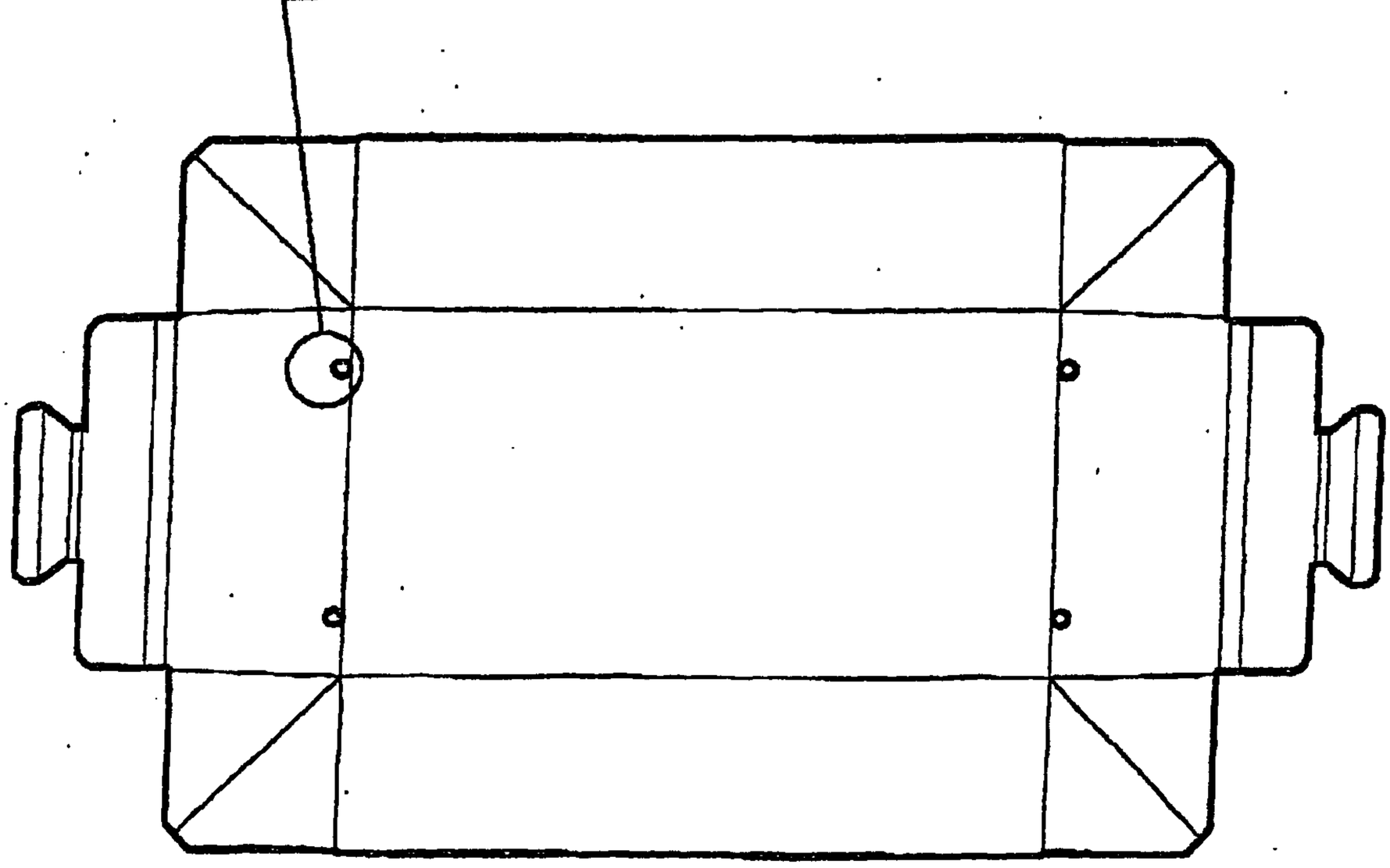


Fig 18

Fig 19

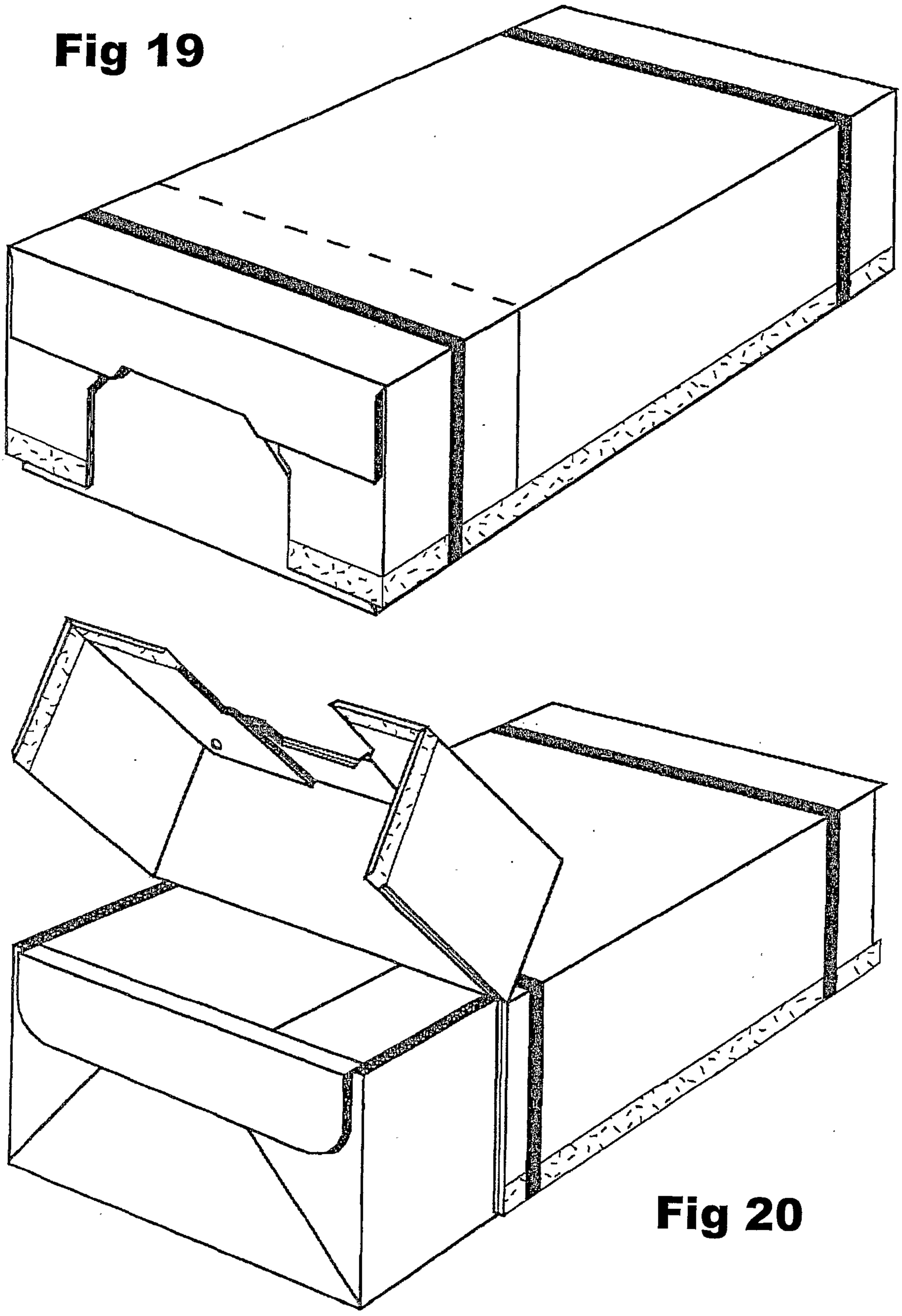
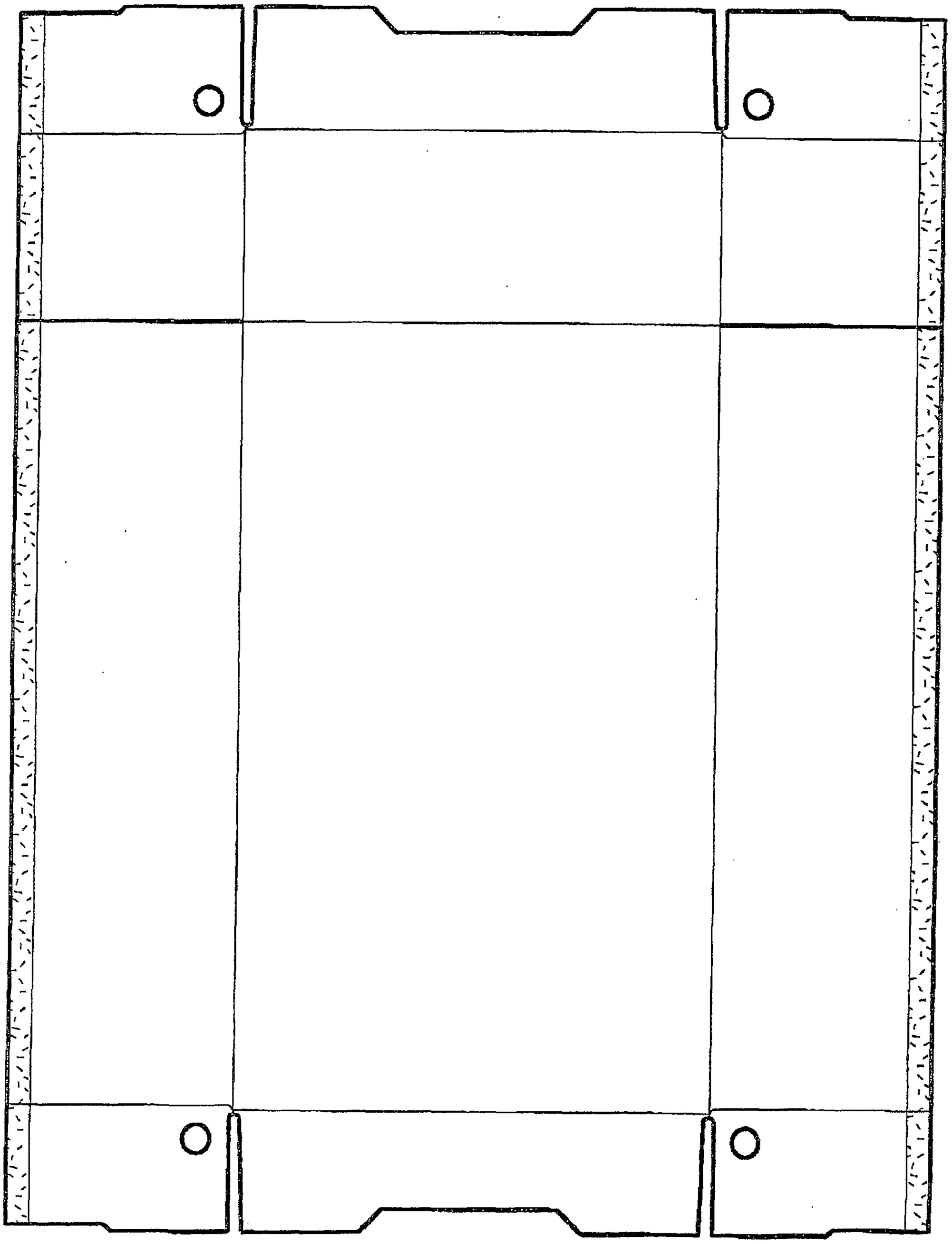


Fig 20



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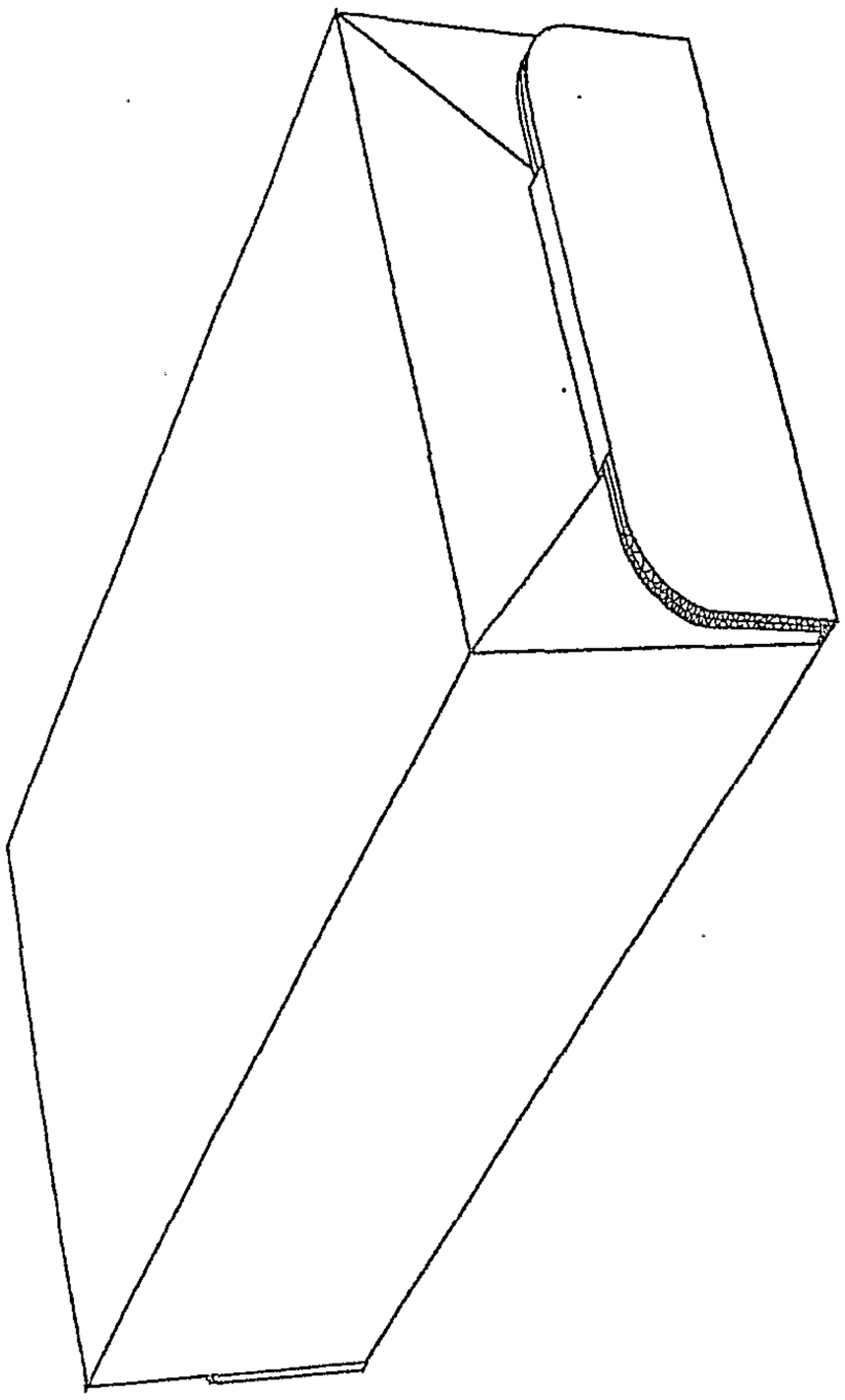


Fig 22

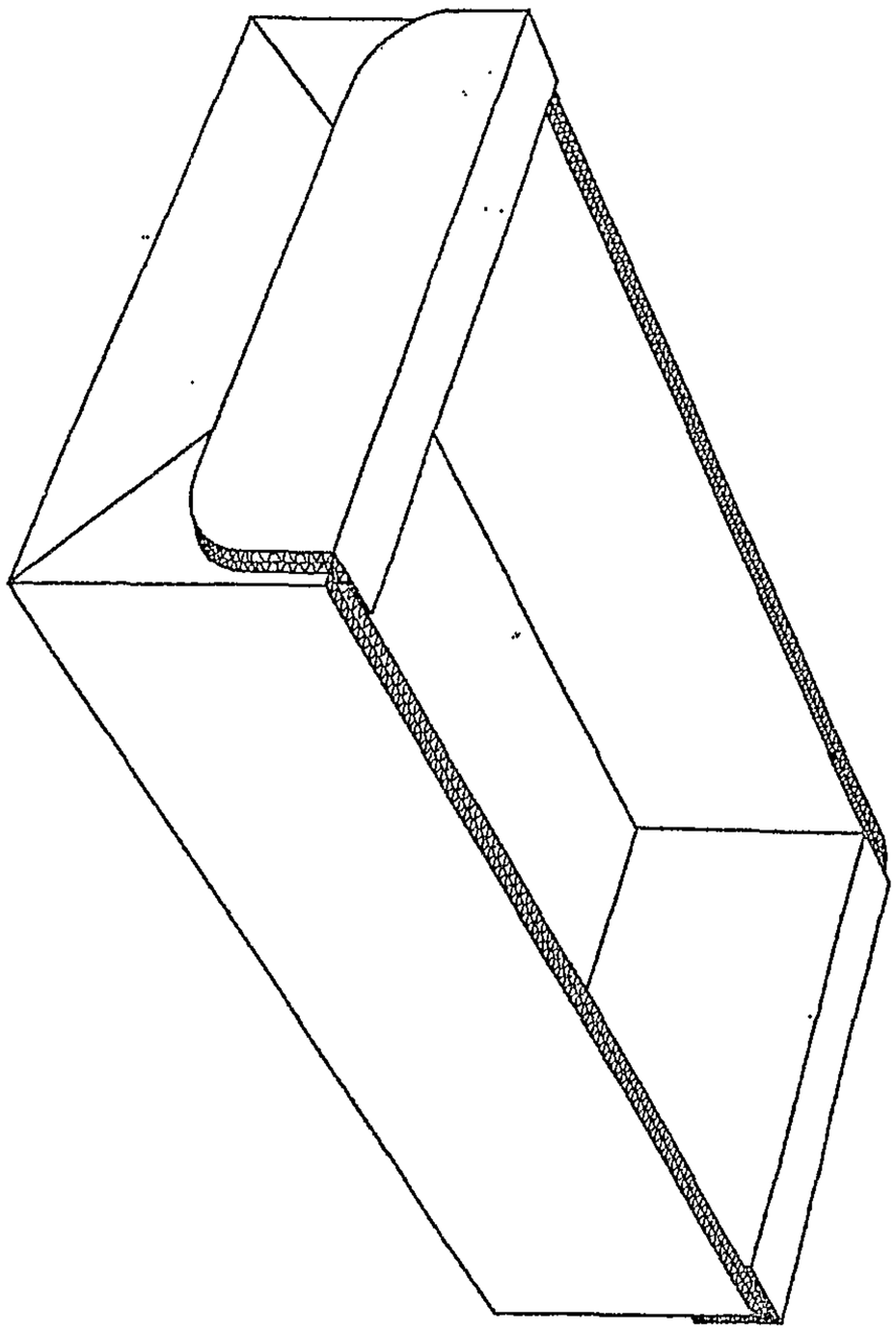
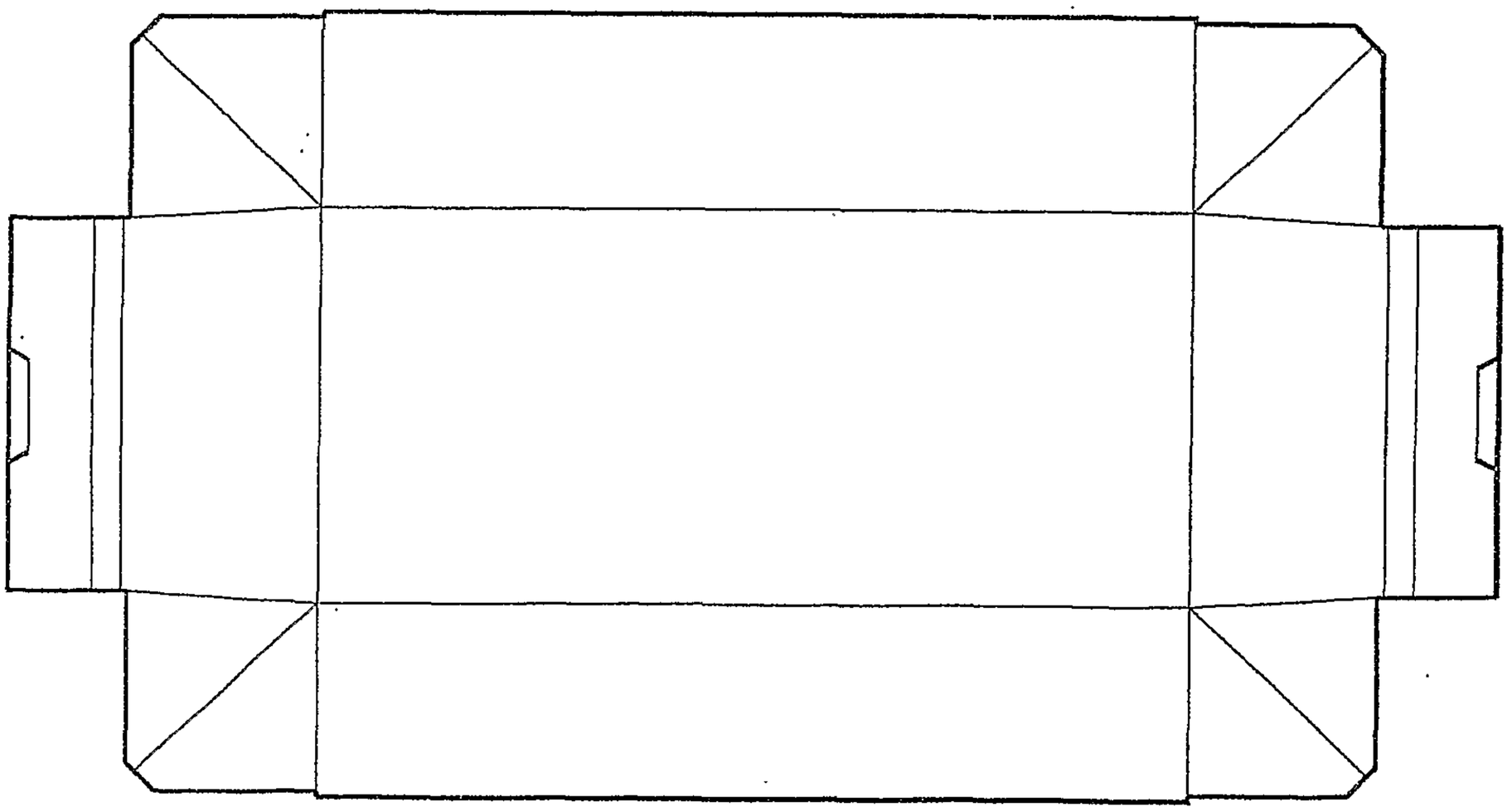


Fig 23

Fig 24



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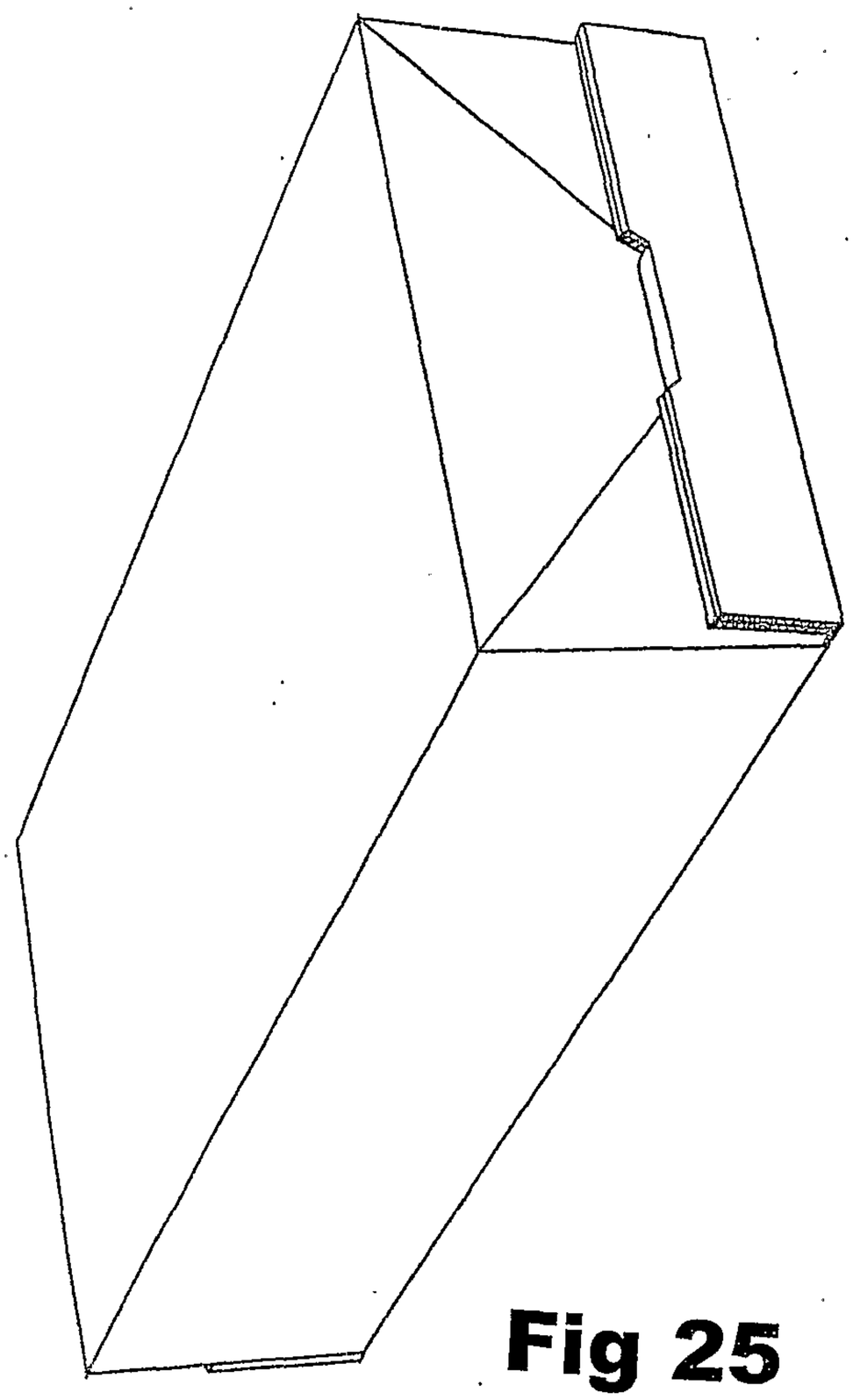


Fig 25

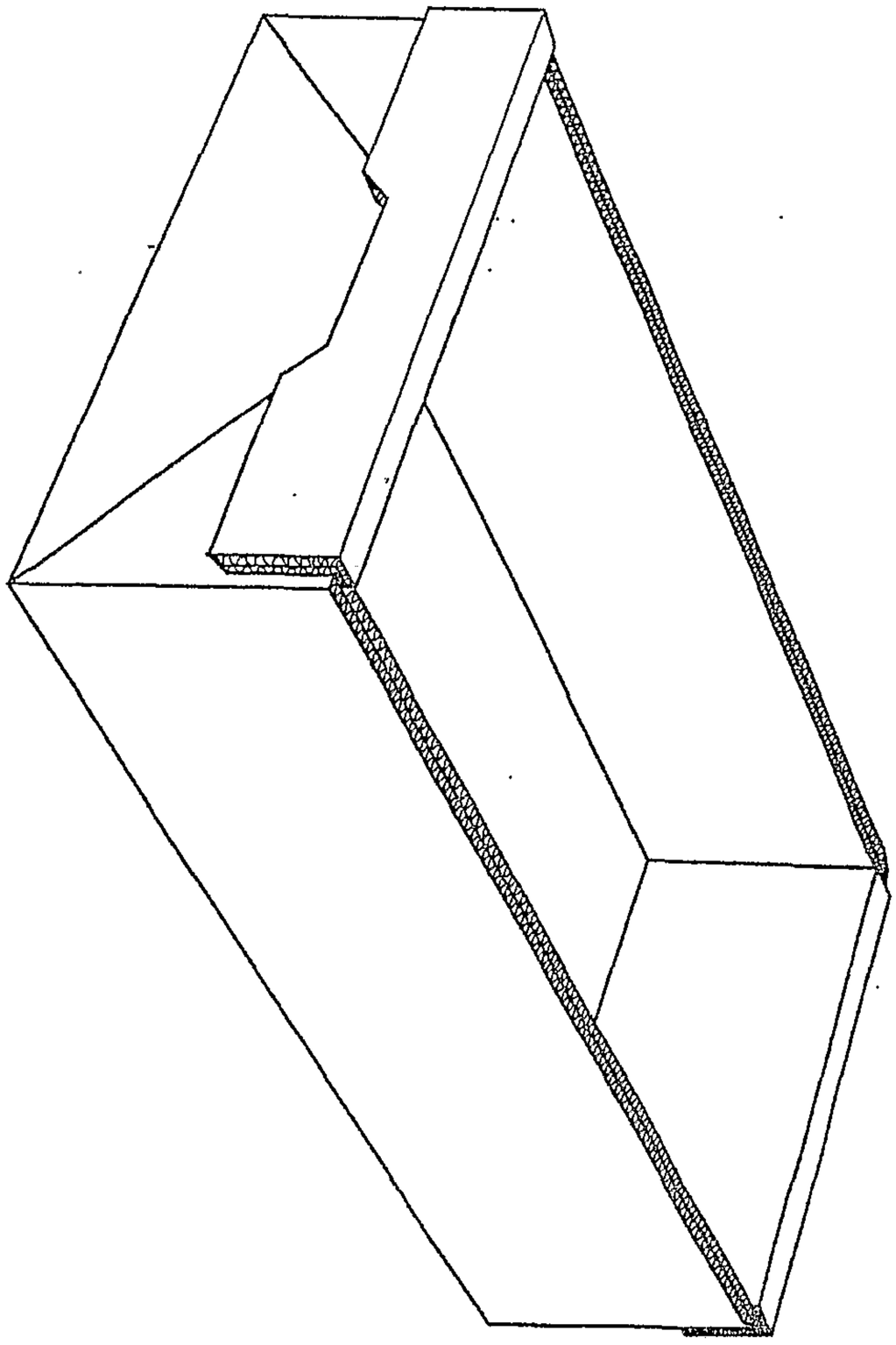
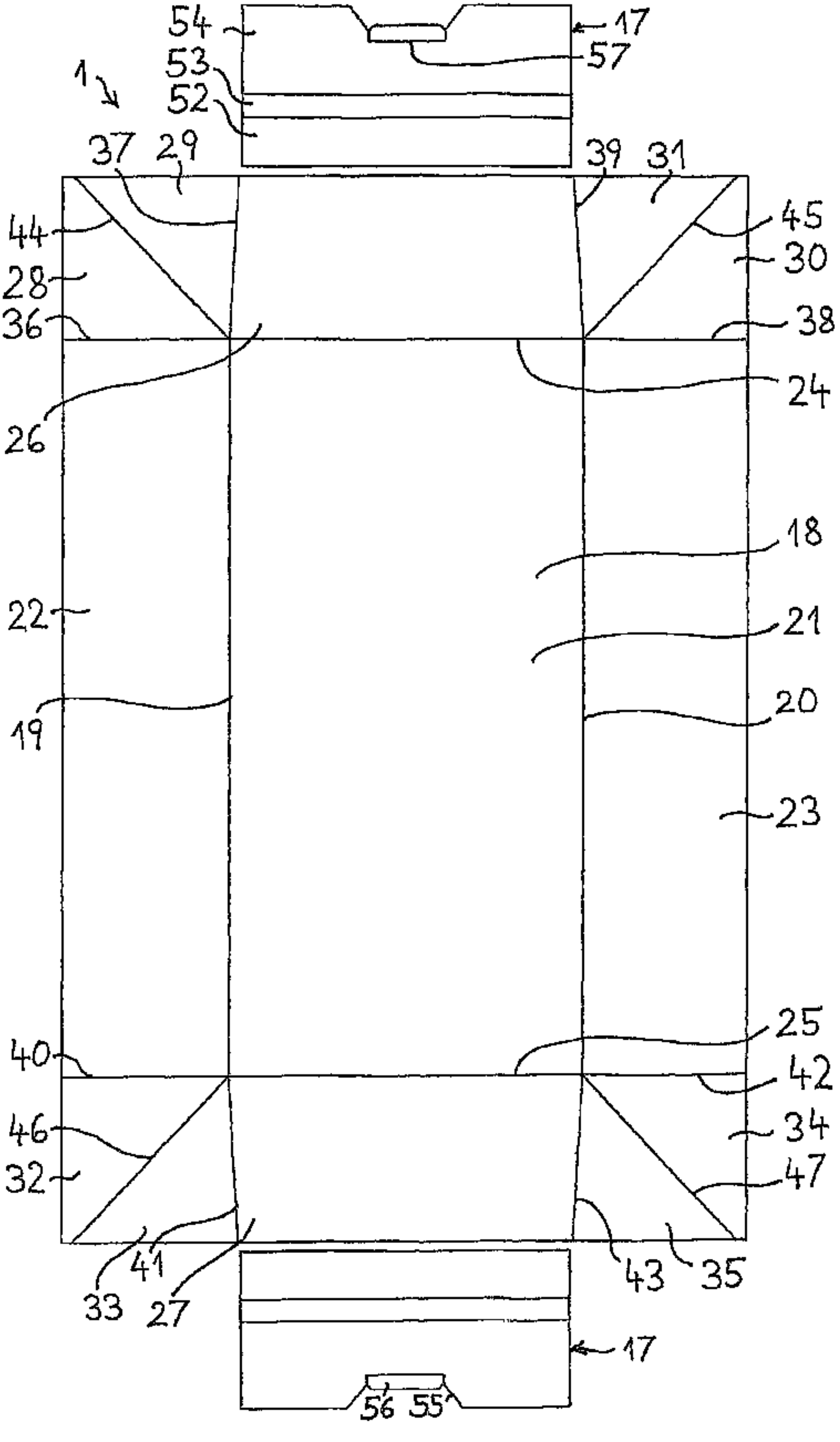


Fig 26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