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(54) **Method for forming weakness lines in a blank intended for making a container**

Verfahren zum Erzeugen von Schwächungslinien an einen Zuschnitt für Faltschachteln

Procédé pour réaliser des lignes d'affaiblissement sur un découpe pour une boîte pliante

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Description

[0001] The invention relates to a method for forming weakening lines in a blank intended for making a container, in particular a container for smoke articles.

[0002] The weakening lines, which are also known as crease lines, are the lines along which the blank is folded for making the corresponding container.

[0003] The present invention finds particularly advantageous application in the production of packets and/or cartons of cigarettes of rigid type obtained from respective flat blanks of cardboard, card or similar material, provided with corner walls that have a transverse dimension that is variable along the longitudinal axis of the packet and/or the transverse axis of the carton.

[0004] The discussion that follows will make explicit reference to such types of packets without thereby losing overall scope.

[0005] A rigid packet of cigarettes mainly consists of a container that is open at one end, of a lid, hinged to an end edge of the container, and of an inner frame fixed inside the container. Rigid packets are known that extend along a prevalent longitudinal axis and comprise a front wall, a rear wall, two lateral sides, a top wall and a bottom wall. The front wall and the rear wall are connected to the two sides by respective corner walls that have a transverse dimension that is variable along the longitudinal axis of the packet. The term "transverse" means a dimension measured transversely, more precisely on a plane that is orthogonal to the longitudinal axis of the packet.

[0006] In a known embodiment, the corner walls have a transverse dimension that is variable linearly along the longitudinal axis of the packet. In this known embodiment, each corner wall comprises a triangular panel and is defined between two rectilinear edges, each connected respectively to the front wall or rear wall and to one of the lateral sides. In particular, the two edges extend from a common vertex, positioned at the top wall, or, respectively, the bottom wall, diverging from one another, along the longitudinal axis of the packet, moving away from the top wall, or, respectively, from the bottom wall.

[0007] In another known embodiment, each corner wall comprises a lenticular panel that is concave towards the inside of the packet. In this known embodiment each corner wall is defined between two arched curvilinear edges each connected respectively to the front wall or rear wall and to one of the lateral sides. In particular, the two edges extend diverging from a first common vertex and converging on a second common vertex.

[0008] In a further known embodiment, each corner wall comprises a panel that is convex towards the outside of the packet. In this known embodiment each corner wall is defined between two arched curvilinear edges each connected respectively to the front wall or rear wall and to one of the lateral sides. More precisely, the two edges are defined by respective circumference arches that are symmetrical to one another with respect to a plane that is parallel to the longitudinal axis. The edges extend by diverging from a central zone of the lateral sides approaching the top wall and the bottom wall. In other words, the two edges are at a minimum distance at the central zone of the sides and at a maximum distance at the top wall and at the bottom wall.

[0009] It is known, for making the weakening lines, or crease lines, intended for forming, after folding of the blank, the edges of the corner walls disclosed above, a method comprising using dinking machines consisting of a male dinking die and of a female dinking die. The male dinking die is provided with creasing threads having a shape and length reproducing the shape and length of the weakening lines to be formed, whereas the female dinking die is provided with creasing channels of a complementary shape to the shape of the respective creasing threads. In use, the creasing threads, in cooperation with the respective creasing channels, form in the blank the aforesaid weakening lines.

[0010] A drawback of this method is that the dinking machines do not enable weakening lines, and thus edges to be made that extend from a common vertex defining a very small angle, for example of the order of 5 degrees, or weakening lines that are tangent to one another or substantially tangent, or anyway weakening lines that are very near to one another.

[0011] In order to overcome this drawback, the prior art proposes forming only partially the weakening lines, i.e. not forming the zones in which the weakening lines are very near to one another, for example the zones in which the weakening lines should converge to form a common vertex or a tangent point. To make this solution, creasing threads are used, and respective creasing channels are used that have a lesser length than the length of the weakening lines to be formed. In other words, the creasing threads, and the respective creasing channels do not reproduce the aforesaid zone in which the weakening lines will have to be very near to one another, relying on the probability that the weakening lines, only partially formed by the respective creasing threads and creasing channels, meet, after folding of the blank, at the vertex or at the tangent point. This solution does not, however, ensure the required minimum precision requisite, with consequent deterioration of the aesthetic appeal of the packet.

[0012] US-A-5064409 shows a creasing tool for forming convex portions in a blank wherein each convex portion has one pair of parallel weakening lines at its sides.

[0013] In patent document WO 2012/007302 a creasing tool is disclosed that enables weakening lines to be made that converge in a vertex. The creasing tool comprises two creasing threads that converge in a single creasing thread. This solution, although it enables weakening lines converging in a vertex to be made, appears to be excessively costly because of the incurring costs to make the creasing tool.

[0014] The object of the present invention is to provide a method for forming weakening lines in a blank intended

for making a container that is able to overcome the aforementioned drawbacks.

[0015] According to the present invention a method is provided for forming weakening lines in a blank intended for making a container having the features set out in independent claim 1. The present invention will now be disclosed with reference to the attached drawings that illustrate some embodiments thereof by way of non-limiting example, in which:

- figures 1 and 2 are perspective views of a container made from a blank of which at least some of the weakening lines have been formed with the method according to the present invention;
- figure 3 is a plan view of the blank used to make the container in figure 1;
- figures 4 and 5 are plan views of tools used for forming weakening lines in the blank in figure 3 according to the method according to the invention;
- figure 6 is a perspective block diagram view of a production line of the container in figure 1;
- figures 7 and 8 are perspective schematic views of two different embodiments of a forming station included in the production line in figure 6;
- figures 9, 10 and 11 are perspective views of a packet for smoke articles made from a blank of which at least some of the weakening lines have been formed with the method according to the present invention;
- figure 12 is a plan view of a blank used to make a detail of the packet in figures 9-11;
- figure 13 is a plan view of the blank used to make the packet in figures 9-11;
- figures 14 and 15 are plan views of tools used for forming weakening lines in the blank in figure 13 in accordance with the method according to the invention;
- figures 16 and 17 are plan views of tools used for forming weakening lines in the blank in figure 12 in accordance with the method according to the invention;
- figure 18 is a perspective view of a further packet for smoke articles made from a blank of which at least some of the weakening lines have been formed with the method according to the present invention;
- figure 19 is a plan view of a blank used to make a detail of the packet in figure 18;
- figure 20 is a plan view of the blank used to make the packet in figure 18;
- figures 21 and 22 are plan views of tools used for forming weakening lines in the blank in figure 20 in accordance with the method according to the invention; and
- figures 23 and 24 are plan views of tools used for forming weakening lines in the blank in figure 19 in accordance with the method according to the invention.

[0016] With reference to the attached figures 1-3, with number 1 there is indicated a container of generic type made from a blank 100 having weakening lines, or crease lines, 104a, 104b, 105a, 105b, made with the method according to the present invention.

[0017] The container 1 is of the rigid type, extends according to a substantially parallelpipedon structure around a main direction A and has inside a compartment V intended for housing one or more articles, which are not shown.

[0018] In particular, the main direction A is the direction along which the container 1 extends prevalently.

[0019] More precisely, the container 1 comprises a front wall 2, a rear wall 3 facing the front wall 2, a pair of lateral sides 4, 5, an opening 6 and a bottom wall 7.

[0020] The front wall 2 is substantially flat and extends parallel to the rear wall 3, whereas the two lateral sides 4, 5 (parallel to one another) are transverse thereto.

[0021] The opening 6 and the bottom wall 7 are orthogonal to the main direction A and have a plurality of sides from which the front wall 2 and rear wall 3 and the lateral sides 4, 5 extend.

[0022] It should be noted that the opening 6 and the bottom wall 7 have the same perimeter extent. Consequently, the perimeter of the bottom wall 7 is the same (in value) as that of the opening 6.

[0023] Further, the bottom wall 7 has also the same geometry as the opening 6, but overturned with respect thereto.

[0024] The container 1 comprises at least one first corner wall 8 and at least one second corner wall 9, each interposed between a lateral side 4, 5 and the respective front wall 2 or rear wall 3.

[0025] In other words, the container 1 comprises at least two corner walls that are tilted both with respect to the front wall 2 or rear wall 3 and with respect to the side 4, 5.

[0026] The first corner wall 8 and the second corner wall 9 have a transverse dimension that is variable along the main direction A of the container 1.

[0027] In particular, the first corner wall 8 and the second corner wall 9 have a transverse dimension that is variable linearly along the main direction A of the container 1.

[0028] It should be noted that the term "transverse" means a dimension measured transversely (more precisely on a plane that is orthogonal) to the main direction A of the container 1.

[0029] In detail, each corner wall 8, 9 extends between two edges 8a, 8b, 9a, 9b, each connected respectively to the front wall 2 or rear wall 3 and to the side wall 4, 5.

[0030] More precisely, the edges 8a, 8b extend from a common vertex v1 positioned at the bottom wall 7 diverging from one another along the main direction A moving away from the bottom wall 7, whereas the edges 9a, 9b extend from a common vertex v2 positioned at the opening 6 diverging from one another along the main direction A moving away from the opening 6.

[0031] Consequently, the measurement of the dis-

tance between the two edges 8a and 8b and between the two edges 9a and 9b of a respective single corner wall 8, 9 is variable along the main direction A.

[0032] Thus for different transverse dimensions (i.e. orthogonal to the main direction A) of the container 1 there is a different transverse dimension of each corner wall 8, 9.

[0033] In order to maintain the perimeter constant (i.e. the perimeter extent) of each cross section of the container 1, the first corner wall 8 has a geometry that is complementary to that of the second corner wall 9.

[0034] The phrase "complementary geometry" in this disclosure specifies that a variation in the transverse dimension of the first corner wall 8 corresponds to an equal and contrary variation of the transverse dimension of the second corner wall 9.

[0035] In other words, an increase in the transverse dimension of the first corner wall 8 is matched by a decrease in the transverse dimension of the second corner wall 9 (and viceversa), so as to maintain the sum of the two transverse dimensions constant.

[0036] Advantageously, in this manner, the sum of these transverse dimensions is maintained constant along the entire extent of the container along the main direction A.

[0037] Further, in this manner greater grippability of the container is obtained without loss of packageability of the container because although there is a variation in the shape of the container along the main direction A the perimeter extent thereof is kept constant.

[0038] This prevents the formation of gaps or wrinkles in the cellophane wrapping of the container 1.

[0039] Preferably, the first corner wall 8 has a transverse dimension increasing as it approaches the opening 6 and the second corner wall 9 has a transverse dimension decreasing in a manner that is complementary to the first corner wall 8.

[0040] Thus the two edges 8a, 8b of the first corner wall 8 extend diverging from one another, from the common vertex v1, along the main direction A approaching the opening 6.

[0041] On the other hand, the two edges 9a, 9b of the second corner wall 9 extend diverging from one another, from the common vertex v2, along the main direction A approaching the bottom wall 7.

[0042] Still more preferably, the edges 8a, 8b, 9a, 9b of the corner walls 8, 9 have a monotonic curve, i.e. do not have curvature changes.

[0043] Such corner walls 8, 9 extend along the entire extent of the container 1, between a first end connected to the bottom wall 7 and a second end connected to the opening 6. Alternatively, the corner walls 8, 9 can have a partial extent, in which one end is connected to the bottom wall 7 or to the opening 6, whereas the other end is located in an intermediate zone of the longitudinal extent of the container 1. In these embodiments, which are not shown, the corner walls 8, 9 have a triangular or trapezoidal geometry. Preferably, the corner walls 8, 9 have a substantially planar conformation. More precisely, they lie on respective planes that are tilted by an angle comprised between 20 and 80 degrees, preferably comprised between 30 and 60 degrees, more preferably equal to 45 degrees, with respect to the adjacent side wall 4, 5.

[0044] Alternatively, the corner walls 8, 9 can have a curved connecting surface between the side wall 4, 5 and the respective front wall 2 or rear wall 3. In this embodiment, which is not shown, each corner wall 8, 9 has a conical or frustum-conical geometry.

[0045] It should be remembered that the first 8 and the second corner wall 9 can be arranged at any corner between the front wall 2 or rear wall 3 and the respective side 4, 5.

[0046] Preferably, the container 1 comprises a pair of first corner walls 8 and a pair of second corner walls 9. Thus the container 1 has four corner walls 8, 9, which in substance replace totally the sharp edges at right angle of normal containers.

[0047] Each first corner wall 8 has a geometry that is complementary to that of a respective second corner wall 9 so as to maintain substantially constant the perimeter extent of each section of the container 1 transverse to the main direction A.

[0048] In the embodiment in figure 1, each first corner wall 8 is symmetrical to the other first corner wall 8 with respect to a median plane that is transverse to the front wall 2 and parallel to the main direction A. Further, in this embodiment, each second corner wall 9 is symmetrical to the other second corner wall 9 with respect to the aforesaid median plane. In other words, each first 8 and/or second corner wall 9 is symmetrical to the other first 8 and/or second corner wall 9 with respect to the median plane which is transverse to the front wall 2 and parallel to the main direction A.

[0049] Alternatively, the first corner walls 8 are symmetrical to one another with respect to a plane parallel to the main direction A and connecting two opposite vertices of the bottom wall 7 (or to the opening 6) of the container 1.

[0050] Similarly, also the second corner walls 9 are symmetrical to one another with respect to this plane.

[0051] Substantially, each first 8 and/or second corner wall 9 is symmetrical to the other first 8 and/or second corner wall 9 with respect to a plane parallel to the main direction A and connecting two opposite vertices of the bottom wall 7 or of the opening 6.

[0052] The container 1 disclosed until now is preferably made from a flat blank 100, made of cardboard or the like (figure 3).

[0053] This blank 100 has a direction C of greater extent, corresponding to the main direction A of the container 1, and a substantially rectangular shape.

[0054] More precisely, the blank 100 comprises a plurality of panels 101 arranged in succession along the direction of greatest extent C of the blank that are each connected to the next one by a transverse weakening line 102, transverse to the direction of greatest extent C.

[0055] These panels 101 define the front wall 2, the rear wall 3 and the bottom wall 7 of the container 1.

[0056] Further, the blank 100 comprises a pair of wings 103a, 103b arranged on opposite sides of one or more panels 101, in which each wing 103a, 103b defines an inner or outer face of a lateral wall 4, 5 of the container 1.

[0057] The blank 100 comprises further a pair of first flaps 104 and a pair of second flaps 105 each interposed between a wing 103a, 103b and the respective panel 101.

[0058] Each of the flaps 104, 105, of triangular shape, has a transverse dimension that is variable along the direction of greatest extent C of the blank 100.

[0059] Similarly to what has already been explained previously, the term "transverse" means a dimension that is transverse (more precisely orthogonal) to the direction of greatest extent C of the blank 100.

[0060] In detail, each flap 104, 105 extends, along the direction of greatest extent C of the blank 100, between a first 104a, 105a and a second weakening line 104b, 105b.

[0061] More precisely, each flap 104, 105, along the direction of greatest extent C of the blank 100, is connected to the respective panel 101 by the first weakening line 104a, 105a and to the respective wing 103a, 103b by the second weakening line 104b, 105b.

[0062] Consequently, the measurement of the distance between the two weakening lines 104a and 104b and between the two weakening lines 105a and 105b of a respective single flap 104, 105 is variable along the direction of greatest extent C starting from a common vertex. More precisely, the weakening lines 104a, 104b extend from a common vertex v1' positioned at the panel 101 intended for forming the bottom wall 7 of the container 1, diverging from one another along the direction of greatest extent C moving away from the panel 101 intended for forming the bottom wall 7, whereas the weakening lines 105a, 105b extend from a common vertex v2' positioned at a first cutting line 106a of the blank 100 intended for forming, partially, the opening 6 of the container 1, diverging from one another along the direction of greatest extent C moving away from the first cutting line 106a.

[0063] It should be noted that the weakening lines 104a, 104b, 105a, 105b define the respective edges 8a, 8b, 9a, 9b of the corner walls 8, 9 of the container 1.

[0064] Also, each first flap 104 is delimited, transversely with respect to the direction of greatest extent C of the blank 100, by a second cutting line 106b, whereas each second flap 105 is delimited, transversely with respect to the direction of greatest extent C of the blank 100, by a third cutting line 106c.

[0065] In this manner, the flaps 104, 105 define respective circumscribed surfaces 107, 108 of the blank 100 of triangular shape.

[0066] In order to define the first 8 and the second corner wall 9 of the container 1, the first flap 104 has a geometry that is complementary to that of the second flap 105.

[0067] Thus, the second weakening line 104b of the first flap 104 defines a contour that is complementary to the second weakening line 105b of the second flap 105.

[0068] Each first flap 104 is complementary both to the other first flap 104, aligned therewith to define a single first corner wall 8 of the container 1, and to the second flap 105 with which it is associated to maintain constant the transverse dimension of the blank 100.

[0069] Similarly, each second flap 105 is complementary both to the other second flap 105, aligned therewith to define a single second corner wall 9 of the container 1, and to the first flap 104 with which it is associated to maintain constant the transverse dimension of the blank 100.

[0070] The method, according to the present invention, for forming the weakening lines 104a, 104b, 105a and 105b, is disclosed below.

[0071] With reference to figure 6, with L an advancement line is indicated of a succession of blanks 100, shown schematically, from which, after folding, the containers 1 are obtained. The line L extends through a forming station F until a wrapping unit I is fed.

[0072] The forming station F may or may not constitute an integrating part of a packaging machine H illustrated for the sake of simplicity with a dashed block.

[0073] At the forming station F the flaps 104, 105 of each blank 100 are subjected to a plastic deforming operation for forming respectively first convex portions 104' and second convex portions 105' (figure 7).

[0074] The first convex portions 104' are delimited peripherally by a first closed contour B defined by a first side b1, a second side b2 and a third side b3. In particular, the first side b1 and the second side b2 define respectively the weakening lines 104a and 104b of the blank 100.

[0075] On the other hand, the second convex portions 105' are peripherally delimited by a second closed contour S defined by a first side s1, a second side s2 and a third side s3. In particular, the first side s1 and the second side s2 define respectively the weakening lines 105a and 105b of the blank 100.

[0076] In particular, the plastic deforming convexing operation can be obtained by a drawing operation that makes stepped contours that are permanently deformed.

[0077] It should be noted that the convexing deformation produces first 104' and second 105' convex portions that have a rounded cross section liked to the flat surface of the blank 100, and the orientation of which can be concave towards the interior or convex towards the exterior with reference to the container 1. The weakening lines 104a, 104b, 105a and 105b coincide with parts of the contour of the respective convex portions 104', 105' linked to the flat surface of the blank 100.

[0078] The deformation by drawing produces first 104' and second 105' drawn portions that have a cross section shaped as a step between two flat surfaces of the blank 100 that are parallel but located at a short distance from one another, equal to the drawing depth. The weakening

lines 104a, 104b, 105a and 105b coincide with parts of the step contour of the respective drawn portions 104', 105'.

[0079] According to the embodiment illustrated in figures 4, 5 and 7, the plastic deforming operation is achieved by drawing and it is performed, in the course of a stop of each blank 100 at the forming station F, by a pair of tools U1, U2 comprising a punch U1 and a corresponding counter-punch U2 cooperating between themselves and movable with reciprocating movement along a path that is transverse to the advancement line L. The tools U1, U2 are arranged on opposite sides of the advancement line L, and at least one of the tools U1, U2, in the case in point the punch U1, has projections 130 suitable for making, in cooperation with respective recesses 131 in the counter-punch U2 and in a manner that is suitable for coupling with the projections 130, the convex portions 104', 105'.

[0080] In particular, the projections 130 and the recesses 131 have, in a plan view, substantially the same shape and dimension as the flaps 104, 105 to be deformed plastically.

[0081] According to one embodiment that is not illustrated, the counter-punch U2 is made of resilient material, so as to constitute a yielding contrasting element with respect to the projections 130 of the punch U1, with consequent formation of convex portions 104', 105' in each blank 100.

[0082] According to the embodiment illustrated in figure 8, the blanks 100 are fed continuously and the plastic deforming operation is achieved by drawing by a pair of rollers R1, R2 counter-rotating and cooperating together. The rollers R1, R2 have axes that are transverse to the advancement line L and are arranged on opposite sides to the latter.

[0083] At least one of the rollers R1, R2, in the case in point the upper roller U1, has on the cylindrical surface 140 thereof projections 130' that are suitable for making, in cooperation with corresponding recesses 131' which are present on the cylindrical surface 141 of the lower roller R2 and which are suitable for coupling with the projections 130', the triangular convex portions 104', 105'.

[0084] According to one embodiment that is not illustrated, the lower roller R2 is made of resilient material, so as to constitute a yielding contrasting element with respect to the projections 130' of the upper roller R1, with consequent formation of convex portions 104', 105' in each blank 100.

[0085] In one embodiment that is not illustrated, the blank 100 constitutes part of a strip defined by a succession of blanks joined together and arranged with their main directions A parallel to the advancement line L of the strip.

[0086] It should be noted that, in order to form the weakening lines 104a, 104b, 105a and 105b it is indifferent whether deformation occurs towards the exterior ("debossing") or towards the interior ("embossing") of the blank 100 inasmuch as the container 1 formed after folding of the blank 100 will anyway not have, at the corner walls 8, 9, convex zones of an appreciable dimension towards the inside or the outside.

[0087] The method disclosed above can be advantageously used to make packets of cigarettes of the rigid type obtained from respective flat blanks of cardboard, card or similar material of the type disclosed below.

[0088] In particular, with reference to figures 12 and 13, the method disclosed above can be advantageously used to make weakening lines 304a, 304b, 305a and 305b of a blank 300 and weakening lines 352a, 352b, 353a and 353b of a blank 350 intended to form, after folding, a packet 201 of the type illustrated in figures 9 to 11.

[0089] In the description that follows reference will be made to smoke articles consisting of cigarettes without the scope of the present invention being restricted thereby.

[0090] It should be noted that the packets disclosed are of the hinged lid type, nevertheless, the present invention refers to any packet for smoke articles, whether with a hinged lid or of another type.

[0091] The packet 201 is of rigid type, extends according to a substantially parallelpipedon structure around a main direction A and has inside a compartment V intended for housing a group of cigarettes, which are not shown.

[0092] In particular, the main direction A is the direction along which the packet 201 extends prevalently.

[0093] More precisely, the packet 201 comprises a front wall 202, a rear wall 203 facing the front wall 202, a pair of lateral sides 204, 205, a top wall 206 and a bottom wall 207.

[0094] The front wall 202 is substantially flat and extends parallel to the rear wall 203, whereas the two lateral sides 204, 205 (parallel to one another) are transverse thereto.

[0095] The top wall 206 and bottom wall 207 are (at least in one closed configuration of the packet 1) orthogonal to the main direction A and have a plurality of sides from which the front wall 202 and rear wall 203 and the lateral sides 204, 205 extend.

[0096] It should be noted that the bottom wall 207 and the top wall 206 have the same perimeter extent also here.

[0097] Consequently, the perimeter of the top wall 206 is the same (in value) as that of the bottom wall 207.

[0098] Further, the top wall 206 also has the same geometry as the bottom wall 207, but overturned in relation thereto.

[0099] The packet 201 comprises at least one first corner wall 208 and at least one second corner wall 209, each interposed between a lateral side 204, 205 and the respective front wall 202 or rear wall 203.

[0100] In other words, the packet 201 comprises at least two corner walls that are tilted both with respect to the front wall 202 or rear wall 203 and with the respect to the respective side 204, 205.

[0101] The first corner wall 208 and the second corner

wall 209 have a transverse dimension that is variable along the main direction A of the packet 201.

[0102] In particular, the first corner wall 208 and the second corner wall 209 have a transverse dimension, in the above meaning, which is variable linearly along the main direction A of the packet 201.

[0103] Each corner wall 208, 209 extends between two edges 208a, 208b, 209a, 209b, each connected respectively to the front wall 202 or rear wall 203 and to the side wall 204, 205. Consequently, the measurement of the distance between the two edges 208a and 208b and between the two edges 209a e 209b of a respective single corner wall 208, 209 is variable along the main direction A.

[0104] Thus for different transverse dimensions (i.e. orthogonal to the main direction A) of the packet 201 there is a different transverse dimension of each corner wall 208, 209.

[0105] In order to maintain the perimeter constant (i.e. the perimeter extent) of each transverse section of the packet 201, the first corner wall 208 has geometry that is complementary to that of the second corner wall 209.

[0106] Advantageously, in this manner, the sum of these transverse dimensions is maintained constant along the entire extent of the packet along the main direction A.

[0107] Further, in this manner greater grippability of the packet 201 is obtained without loss of packageability, because although there is a variation in the shape of the packet along the main direction A the perimeter extent thereof is maintained constant.

[0108] This prevents the formation of gaps or wrinkles in the cellophane wrapping of the packet 201.

[0109] Preferably, the first corner wall 208 has a transverse dimension increasing approaching the top wall 206 and the second corner wall 209 has a transverse dimension decreasing in a manner that is complementary to the first corner wall 208.

[0110] Thus the two edges 208a, 208b of the first corner wall 208 extend diverging from one another, starting from a common vertex v1 positioned at the bottom wall 207, along the main direction A approaching the top wall 206.

[0111] On the contrary, the two edges 209a, 209b of the second corner wall 209 extend diverging from one another, starting from a common vertex v2 positioned at the top wall 206, along the main direction A approaching the bottom wall 207.

[0112] Still more preferably, the edges 208a, 208b, 209a, 209b of the corner walls 208, 209 have a monotonic curve, i.e. do not undergo curvature changes.

[0113] Such corner walls 208, 209 extend along the entire extent of the packet 201, between a first end connected to the bottom wall 207 and a second end connected to the top wall 206. Alternatively, the corner walls 208, 209 can have a partial extent, in which one end is connected to the bottom wall 207 or top wall 206, whereas the other end is connected in an intermediate zone of the longitudinal extent of the packet 201.

[0114] Preferably, the corner walls 208, 209 have a substantially planar conformation. More precisely, they lie in respective planes tilted by an angle comprised between 20 and 80 degrees, preferably comprised between 30 and 60 degrees, more preferably equal to 45 degrees, with respect to the adjacent lateral wall 204, 205.

[0115] Alternatively, the corner walls 208, 209 can have a curved connecting surface between the lateral wall 204, 205 and the respective front wall 202 or rear wall 203. In this embodiment, which is not shown, each corner wall 208, 209 has a conical or frustum-conical geometry.

[0116] It should be remembered that the first 208 and the second corner wall 209 can be arranged at any corner between the front wall 202 or rear wall 203 and the respective side 204, 205. Preferably, the packet 201 comprises a pair of first corner walls 208 and a pair of second corner walls 209. Thus the packet 201 has four corner walls 208, 209, which substantially replace totally the sharp edge at right angles of normal packets.

[0117] Each first corner wall 208 has a geometry that is complementary to that of a respective second corner wall 209 so as to maintain substantially constant the perimeter extent of each section of the packet 201 that is transverse to the main direction A.

[0118] In the embodiment in figures 9-11, each first corner wall 208 is symmetrical to the other first corner wall 208 with respect to a median plane that is transverse to the front wall 202 and parallel to the main direction A. Further, in this embodiment, each second corner wall 209 is symmetrical to the other second corner wall 209 with respect to the aforesaid median plane.

[0119] In other words, each first 208 and/or second corner wall 209 is symmetrical to the other first 208 and/or second corner wall 209 with respect to the median plane that is transverse to the front wall 202 and parallel to the main direction A.

[0120] Alternatively, the first corner walls 208 are symmetrical to one another with respect to a plane that is parallel to the main direction A and joins two opposite vertices of the bottom wall 207 (or top wall 206) of the packet 201.

[0121] Similarly, also the second corner walls 209 are symmetrical to one another with respect to this plane.

[0122] Substantially, each first 208 and/or second corner wall 209 is symmetrical to the other first 208 and/or second corner wall 209 with respect to a plane parallel to the main direction A and joining two opposite vertices of the bottom wall 207 or of the top wall 206.

[0123] As previously already mentioned, the illustrated embodiment relates to a rigid packet for smoke articles of the hinged lid type.

[0124] Consequently, the packet 201 in figure 9 comprises a box body 210 provided with a top edge 210a defining an access mouth to the compartment V containing smoke articles and a lid 211 hinged to the box body 210 at the top edge 210a. More precisely, the lid 211 is

hinged along the top edge 210a at the rear wall 203. In this manner, the lid 211 can freely rotate with respect to the box body 210 between a closed position of the access mouth and an open position of the access mouth.

[0125] In this light, the first 208 and second 209 corner walls extend partially on the box body 210 and partially on the lid 211.

[0126] Alternatively, each first 208 and second corner wall 209 can be obtained only on the box body 210 or only on the lid 211.

[0127] More precisely, the box body 210 extends along the main direction A and comprises a front face defining part of the front wall 202, a rear face defining part of the rear wall 203, a pair of lateral faces defining part of the lateral sides 204, 205 and a bottom face defining the bottom wall 207 of the packet 201.

[0128] Similarly, the lid 211 comprises a front face defining part of the front wall 202, a rear face defining part of the rear wall 203, a pair of lateral faces defining part of the lateral sides 204, 205 and a top face defining the top wall 206 of the packet 201.

[0129] When the packet 201 is in the closed position, the faces of the lid 211 are complementary to those of the box body 210 to define the walls of the packet 201.

[0130] The packet 201 also comprises an inner frame 242 connected to the top edge 210a of the box body 210 so as to protrude from the access mouth.

[0131] This inner frame 242 is substantially "U"-shaped so as to define a central cut for removing smoke articles (cigarettes).

[0132] Thus, the inner frame 242 has two lateral sides 242a, 242b and a front wall 242c having a cut top edge so as to define the "U" conformation.

[0133] In this light, the inner frame 242 comprises two corner walls 243, 244 that are counter-shaped with respect to the portion of the corner wall 209 made in the box body 210 and with respect to a corresponding part 209c of the corner wall 209 made in the lid 211. The part 209c of the corner wall 209 is joined to the corner walls 243, 244 and is superimposed on the latter when the lid 211 is in the closed position.

[0134] Each corner wall 243, 244 extends between two edges 243a, 243b, 244a, 244b, each connected respectively to the front wall 242c and to one of the lateral sides 242a, 242b. The packet 201 disclosed until now is preferably made from a flat blank 300, made of cardboard or the like (figure 13).

[0135] This blank 300 has a direction of greatest extent C corresponding to the main direction A of the packet 201 and a substantially rectangular shape.

[0136] More precisely, the blank 300 comprises a plurality of panels 301 arranged in succession along the direction of greatest extent C of the blank that are each connected to the next one by a transverse weakening line 302, transverse to the direction of greatest extent C.

[0137] These panels 301 define the front wall 202, the rear wall 203, the top wall 206 and the bottom wall 207 of the packet 201.

[0138] Further, the blank 300 comprises a pair of wings 303a, 303b arranged on opposite sides of one or more panels 301, in which each wing 303a, 303b defines an inner or outer face of a lateral wall 204, 205 of the packet 201.

[0139] The blank 300 further comprises a pair of first 304 and second 305 flaps each interposed between a wing 303a, 303b and the respective panel 301.

[0140] Each of the flaps 304, 305, of triangular or trapezoidal shape, has a transverse dimension that is variable along the direction of greatest extent C of the blank 300.

[0141] In detail, each flap 304, 305 extends, along the direction of greatest extent C, between a first 304a, 305a and a second 304b, 305b weakening line.

[0142] More precisely, each flap 304, 305, along the direction of greatest extent C, is connected to the respective panel 301 by the first weakening line 304a, 305a and to the respective wing 303a, 303b by the second weakening line 304b, 305b.

[0143] Consequently, the measurement of the distance between the two weakening lines 304a and 304b and between the two weakening lines 305a and 305b of a respective single flap 304, 305 is variable along the direction of greatest extent C.

[0144] More precisely, the weakening lines 304a, 304b extend from a common vertex v1' positioned at the panel 301 intended for forming the bottom wall 207 of the packet 201, diverging from one another along the direction of greatest extent C moving away from the panel 301 intended for forming the bottom wall 207.

[0145] The weakening lines 305a, 305b adjacent to the panel 301 intended for forming the front wall 202 of the packet 201 extend, spaced apart from one another, starting from a first cutting line 306a of the blank 300 intended for forming an abutment for the lid 211 in the closed position of the packet 201, diverging from one another along the direction of greatest extent C moving away from the first cutting line 306a.

[0146] Vice versa, weakening lines 305a, 305b adjacent to the panel 301 intended for forming an outer front face of the lid 211 extend from a common vertex v2' positioned at the panel 301 intended for forming the top wall 206 of the packet 201, diverging from one another along the direction of greatest extent C moving away from the panel 301 intended for forming the top wall 206.

[0147] It should be noted that the weakening lines 304a, 304b, 305a, 305b define the respective edges 208a, 208b, 209a, 209b of the corner walls 208, 209 of the packet 201.

[0148] Also, each first flap 304 is delimited, transversely with respect to the direction of greatest extent C of the blank 300, by a second cutting line 306b.

[0149] Each second flap 305 positioned on opposite sides of the panel 301 intended for forming the front wall 202 is delimited, transversely with respect to the direction of greatest extent C of the blank 300, by the first cutting line 306a and by a third cutting line 306c.

[0150] On the other side, each second flap 305 positioned on opposite sides of the panel 301 intended for forming an outer front face of the lid 211 is delimited, transversely with respect to the direction of greatest extent C of the blank 300, by a fourth cutting line 306d. In this manner, the flaps 304, 305 define respective circumscribed surfaces 307, 308 of the blank 300 of triangular or trapezoidal shape.

[0151] The inner frame 242 disclosed above is preferably made from a flat blank 350, made of cardboard or the like (figure 12).

[0152] The blank 350 has an axis of symmetry D corresponding to the main direction A of the packet 201.

[0153] This blank 350 comprises a central panel 351, a pair of flaps 352, 353 arranged on opposite sides of the central panel 351 and a pair of wings 354, 355 that are each connected to a respective flap 352, 353.

[0154] The central panel 351 defines the front wall 242c of the inner frame 242, the flaps 352, 353 define the corner walls 243, 244 of the inner frame 242, whereas the wings 354, 355 define the lateral sides 242a, 242b of the inner frame 242.

[0155] The flaps 352, 353 have a triangular shape and extend, starting from a common vertex v4 positioned at a first cutting line 306e of the blank 350, between a first 352a, 353a, and a second 352b, 353b weakening line.

[0156] The measurement of the distance between the two weakening lines 352a and 352b and between the two weakening lines 353a and 353b of a respective single flap 352, 353 is variable starting from a common vertex along the axis of symmetry D.

[0157] It should be noted that the weakening lines 352a, 352b, 353a, 353b define the respective edges 243a, 243b, 244a, 244b of the corner walls 243, 244 of the inner frame 242.

[0158] The flaps 352, 353 are delimited transversely by a second cutting line 306f of the blank 350.

[0159] In this manner, the flaps 352, 353 define respective circumscribed surfaces 357, 358 of the blank 350 of triangular shape.

[0160] The method for forming the weakening lines 304a, 304b, 305a, 305b, 352a, 352b, 353a and 353b is substantially similar to what has been disclosed previously with reference to the blank 100 of the container 1.

[0161] With reference to figures 14 and 15 a pair of tools U1, U2 is illustrated that is arranged to perform, by drawing, the plastic deforming operation on the blank 300.

[0162] Drawing is performed in the course of a stop of each blank 300 at the forming station F, by the tools U1, U2 comprising a punch U1 and a corresponding counter-punch U2 that cooperate between themselves and are movable with reciprocal motion along a path that is transverse to the advancement line L. The tools U1, U2 are arranged on opposite sides of the advancement line L, and at least one of them, in this case the punch U1, has projections 330 that are suitable for making, in cooperation with respective recesses 331 which are present in the counter-punch U2 and are suitable for coupling with the projections 330, the convex portions that are intended to define, with the sides of greatest extent thereof, the weakening lines 304a, 304b, 305a, 305b.

[0163] In particular, the projections 330 and the recesses 331 have, in a plan view, the same shape and dimension as the flaps 304, 305 to be deformed plastically.

[0164] With reference to figures 16 and 17 there is illustrated a pair of tools U1', U2' arranged for performing, by drawing, the plastic deforming operation on the blank 350.

[0165] Drawing is performed in the course of a stop of each blank 350 at a further forming station, which is not shown, by the tools U1', U2' comprising a punch U1' and a corresponding counter-punch U2' that cooperate between themselves and are movable with reciprocal motion along a path that is transverse to a respective advancement line. The tools U1', U2' are arranged on opposite sides of the advancement line, and at least one thereof, in particular the punch U1', has projections 330' that are suitable for making, in cooperation with respective recesses 331' which are present in the counter-punch U2' and are suitable for coupling with the projections 330', the convex portions intended to define, with the sides of maximum extent thereof, the weakening lines 352a, 352b, 353a and 353b.

[0166] In particular, the projections 330' and the recesses 331' have, in a plan view, the same shape and dimension as the flaps 352, 353 to be deformed plastically.

[0167] According to one embodiment that is not illustrated, the counter-punches U2, U2' are made of resilient material, so as to constitute a yielding contrasting element with respect to the projections 330, 330' of the punch U1, U1', with consequent formation of the convex portions in each blank 300, 350.

[0168] According to another embodiment that is not illustrated, the blanks 300, 350 are fed continuously and the plastic deforming operation is achieved by drawing from respective pairs of rollers that counter-rotate and cooperate with one another. The rollers have axes that are transverse to the respective advancement lines of the blanks 300, 350 and are arranged on opposite sides of the advancement lines.

[0169] At least one of the rollers of each pair of rollers, in this case the respective upper rollers, have on the cylindrical surfaces thereof, projections that are suitable for making, in cooperation with respective recesses that are present on the cylindrical surfaces of the lower rollers and are suitable for coupling with the projections of the upper rollers, the convex portions intended to define, with their sides of maximum extent, the weakening lines 304a, 304b, 305a, 305b, 352a, 352b, 353a and 353b of the blanks 300, 350. According to one embodiment that is not illustrated, the lower rollers are made of resilient material, so as to constitute a yielding contrasting element with respect to the projections of the upper rollers, with consequent formation of convex portions in each blank

300, 350. In one embodiment that is not illustrated, the blanks 300, 350 constitute parts of respective strips defined by a succession of blanks joined together and arranged with their longitudinal axes parallel to the feed lines of the strip.

[0170] With reference to figures 19 and 20, the method disclosed above can be advantageously used to make weakening lines 504a, 504b, 505a and 505b of a blank 500 and weakening lines 552a, 552b, 553a and 553b of a blank 550 intended to form, after folding, a packet 401 of the type illustrated in figure 18.

[0171] The packet 401 is of rigid type, extends according to a substantially parallelpipedon structure around a main direction A and has inside a compartment, which is not shown, intended for housing a group of cigarettes, which are not shown.

[0172] In particular, the main direction A is the direction along which the packet 401 prevalently extends.

[0173] The packet 401 comprises a front wall 402, a rear wall 403 facing the front wall 402, a pair of lateral sides 404, 405, a top wall 406 and a bottom wall 407.

[0174] The front wall 402 is substantially flat and extends parallel to the rear wall 403, whereas the two lateral sides 404, 505 (parallel to one another) are transverse thereto.

[0175] The top 406 and bottom 407 walls are (at least in a closed configuration of the packet 401) orthogonal to the main direction A and have a plurality of sides from which the front wall 402 and rear wall 403 and the lateral sides 404, 405 extend.

[0176] The packet 401 comprises at least one first corner wall 408 and at least one second corner wall 409, each interposed between a lateral side 404, 405 and the respective front wall 402 or rear wall 403.

[0177] The first corner wall 408 and the second corner wall 409 have a transverse dimension that is variable along the main direction A of the packet 401.

[0178] In particular, each corner wall 408, 409 has at least one portion of lenticular shape that is concave towards the inside of the packet 401.

[0179] In one alternative embodiment, which is not illustrated, each corner wall 408, 409 has at least one portion of lenticular shape that is convex towards the outside of the packet 401. The corner wall 408 extends between two curved arched edges, not shown, each connected respectively to the rear wall 403 and to one of the lateral sides 404, 405.

[0180] The corner wall 409 extends between two curved arched edges 409a, 409b, each connected respectively to the front wall 402 and to one of the lateral sides 404, 405.

[0181] These edges extend by diverging starting from a first common vertex and converging on a second common vertex.

[0182] If the corner walls 408, 409 comprise a plurality of consecutive portions of lenticular shape, the respective curvilinear edges converge on at least one tangent intermediate point positioned in an intermediate zone between the first and the second common vertex. Preferably, the packet 401 comprises a pair of first corner walls 408 and a pair of second corner walls 409. Thus the packet 401 has four corner walls 408, 409, which in substance totally replace the sharp edge at right angles of the normal packets.

[0183] As previously already mentioned, the illustrated embodiment relates to a rigid packet for smoke articles of the hinged lid type.

[0184] Consequently, the packet 401 in figure 18 comprises a box body 410 provided with a top edge 410a defining an access mouth, which is not shown, to the compartment containing the smoke articles, and a lid 411 hinged to the box body 410 at the top edge 410a. More precisely, the lid 411 is hinged along the top edge 410a at the rear wall 403. In this manner, the lid 411 can freely rotate with respect to the box body 410 between a closed position of the access mouth and an open position of the access mouth.

[0185] In this light, the first 408 and second 409 corner walls extend partially on the box body 410 and partially on the lid 411.

[0186] The box body 410 extends along the main direction A and comprises a front face defining part of the front wall 402, a rear face defining part of the rear wall 403, a pair of lateral faces defining part of the lateral sides 404, 405 and a bottom face defining the bottom wall 407 of the packet 401.

[0187] Similarly, the lid 411 comprises a front face defining part of the front wall 402, a rear face defining part of the rear wall 403, a pair of lateral faces defining part of the lateral sides 404, 405 and a top face defining the top wall 406 of the packet 401.

[0188] The packet 401 also comprises an inner frame, which is not shown, connected to the top edge 410a of the box body 410 so as to protrude from the access mouth.

[0189] This inner frame is substantially "U"-shaped so as to define a central cut for removing smoke articles (cigarettes).

[0190] Thus the inner frame has two lateral sides and a front wall having a cut top edge so as to define the "U" conformation.

[0191] In this light, the inner frame comprises two corner walls that are counter-shaped with respect to the second corner walls 409. Each portion of corner wall of the inner frame that protrudes from the access mouth is intended to engage with a corresponding portion of corner wall 409 arranged at the lid 411 when the lid 411 is in the closed position.

[0192] In particular, the inner face of the corner walls 409 arranged at the lid 411 joins the outer face of the corner walls of the inner frame to prevent the involuntary opening of the packet 401.

[0193] Preferably, to facilitate coupling of the corner walls 409 of the lid 411 and of the inner frame during rotation of the lid 411 around the hinge, the corner walls of the inner frame are cut, i.e. are deprived of the common

vertex by the side of the access mouth.

[0194] The packet 401 disclosed until now is preferably made from a flat blank 500, made of cardboard or the like (figure 20).

[0195] This blank 500 has a direction of greatest extent C corresponding to the main direction A of the packet 401 and a substantially rectangular shape.

[0196] More precisely, the blank 500 comprises a plurality of panels 501 arranged in succession along the direction of greatest extent C of the blank that are each connected to the next one by a transverse weakening line 502, transverse with respect to the direction of greatest extent C.

[0197] These panels 501 define the front wall 402, the rear wall 403, the top wall 406 and the bottom wall 407 of the packet 401.

[0198] Furthermore, the blank 500 comprises a pair of wings 503a, 503b arranged on opposite sides of one or more panels 501, in which each wing 503a, 503b defines an inner or outer face of a lateral wall 404, 405 of the packet 401.

[0199] The blank 500 further comprises a pair of first 504 and second 505 flaps each interposed between a wing 503a, 503b and the respective panel 501.

[0200] Each of the flaps 504, 505, of lenticular shape, has a transverse dimension that is variable along the direction of greatest extent C of the blank 500.

[0201] In detail, each flap 504, 505 extends, along the direction of greatest extent C, between a first 504a, 505a and a second weakening line 504b, 505b which, once they are folded, define the corner walls 408, 409.

[0202] The weakening lines 504a, 504b, 505a, 505b, extend diverging, starting from a first common vertex and converging on a second common vertex.

[0203] More precisely, each flap 504, 505, along the direction of greatest extent C, is connected to the respective panel 501 by the first weakening line 504a, 505a and to the respective wing 503a, 503b by the second weakening line 504b, 505b.

[0204] The weakening lines 504a, 504b, 505a, 505b, extend along a direction that is tilted with respect to the direction C by an angle comprised between 10 and 30 degrees.

[0205] In particular, the weakening lines 504a, 504b, 505a, 505b, create a substantially lenticular shape.

[0206] Consequently, the measurement of the distance between the two weakening lines 504a and 504b and between the two weakening lines 505a and 505b of a respective single flap 504, 505 is variable along the direction of greatest extent C.

[0207] It should be noted that the weakening lines 504a, 504b, 505a, 505b define the respective edges of the corner walls 408, 409 of the packet 401.

[0208] Also, it should be noted that the flaps 504, 505 define respective circumscribed surfaces 507, 508 of lenticular shape.

[0209] The inner frame disclosed above is preferably made from a flat blank 550, made of cardboard or the like (figure 19).

[0210] The blank 550 has an axis of symmetry D corresponding to the main direction A of the packet 401.

[0211] This blank 550 comprises a central panel 551, a pair of flaps 552, 553 arranged on opposite sides of the central panel 551 and a pair of wings 554, 555 that are each connected to a respective flap 552, 553.

[0212] The central panel 551 defines the front wall of the inner frame, the flaps 552, 553 define the corner walls of the inner frame, whereas the wings 554, 555 define the lateral sides of the inner frame.

[0213] The flaps 552, 553 extend between a first 552a, 553a, and a second 552b, 553b weakening line that have a curvilinear shape.

[0214] It should be noted that the weakening lines 552a, 552b, 553a, 553b define the respective edges of the corner walls of the inner frame.

[0215] The flaps 552, 553 are delimited transversely by cutting lines 506e and 506f of the blank 550.

[0216] In this manner, the flaps 552, 553 define respective circumscribed surfaces 557, 558 of the blank 550.

[0217] The method for forming the weakening lines 504a, 504b, 505a, 505b, 552a, 552b, 553a and 553b is substantially similar to that disclosed with reference to the container 1 and to the packet 201, except for the shape of the projections and of the recesses.

[0218] With reference to figures 21 and 22, there is illustrated a pair of tools U1, U2 arranged for performing, by drawing, the plastic deforming operation on the blank 500.

[0219] Drawing is performed in the course of a stop of each blank 500 at the forming station F, by the tools U1, U2 comprising a punch U1 and a corresponding counter-punch U2 that cooperate between themselves and are movable with reciprocal motion along a path that is transverse to the advancement line L. The tools U1, U2 are arranged on opposite sides of the advancement line L, and at least one thereof, in particular the punch U1, has projections 530 that are suitable for making, in cooperation with respective recesses 531 which are present in the die U2 and suitable for coupling with the projections 530, convex portions intended to define, with their sides of maximum extent, the weakening lines 504a, 504b, 505a,505b.

[0220] In particular, the projections 530 and the recesses 531 have, in a plan view, the same shape and dimension as the flaps 504, 505 to be deformed plastically.

[0221] With reference to figures 23 and 24 there is illustrated a pair of tools U1', U2' arranged for performing, by drawing, the plastic deforming operation on the blank 550.

[0222] Drawing is performed in the course of a stop of each blank 550 at a further forming station, which is not shown, by the tools U1', U2' comprising a punch U1' and a corresponding counter-punch U2' that cooperate between themselves and are movable with reciprocal motion along a path that is transverse to a respective advancement line. The tools U1', U2' are arranged on op-

posite sides of the advancement line, and at least one thereof, in particular the punch U1', has projections 530' that are suitable for making, in cooperation with respective recesses 531' which are present in the die U2' and suitable for coupling with the projections 530', the convex portions intended to define, with their sides of maximum extent, the weakening lines 552a, 552b, 553a and 553b.

[0223] In particular, the projections 530' and the recesses 531' have, in a plan view, the same shape and dimension as the flaps 552, 553 to be deformed plastically.

[0224] According to one embodiment that is not illustrated, the counter-punches U2, U2' are made of resilient material, so as to constitute a yielding contrasting element with respect to the projections 530, 530' of the punch U1, U1', with consequent formation of convex portions in each blank 500, 550.

[0225] According to another embodiment that is not illustrated, the blanks 500, 550 are fed continuously and the plastic deforming operation is achieved by drawing respective pairs of rollers that counter-rotate and cooperate between themselves. The rollers have axes that are transverse with respect to the respective advancement lines of the blanks 500, 550 and are arranged on opposite sides of the advancement lines.

[0226] At least one of the rollers of each pair of rollers, in this case the respective upper rollers, have on their cylindrical surfaces projections suitable for making, in cooperation with respective recesses that are made on the cylindrical surfaces of the lower rollers and are suitable for coupling with the projections of the upper rollers, the convex portions intended to define, with their sides of maximum extent, the weakening lines 504a, 504b, 505a, 505b, 552a, 552b, 553a and 553b of the blanks 500, 550.

[0227] According to one embodiment that is not illustrated, the lower rollers are made of resilient material, so as to constitute a yielding contrasting element with respect to the projections of the upper rollers, with consequent formation of the convex portions in each blank 500, 550.

[0228] In one embodiment that is not illustrated, the blanks 500, 550 constitute parts of respective strips defined by a succession of blanks joined together and arranged with the longitudinal axes thereof parallel to the feed lines of the strip.

[0229] It should be noted how the method disclosed above enables weakening lines to be made in blanks simply and cheaply, and thus edges of containers extending from a common vertex defining a very small angle, for example of the order of 5 degrees, or weakening lines that are tangent or substantially tangent to one another or anyway weakening lines that are very near to one another.

Claims

1. Method for forming weakening lines (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) in a blank (100; 300, 350; 500, 550), intended for making a container (1; 201; 401) comprising the step of plastically deforming at least one circumscribed surface (104, 105; 304, 305, 352, 353; 504, 505, 552, 553) of the blank (100; 300, 350; 500, 550) so as to form at least one convex portion (104', 105') in the blank (100; 300, 350; 500, 550) peripherally delimited by a closed contour (B, S) which defines with its sides (b1, b2, s1, s2) at least one pair (104a, 104b; 105a, 105b; 304a, 304b; 305a, 305b; 352a, 352b; 353a, 353b; 504a, 504b; 505a, 505b; 552a, 552b; 553a, 553b) of weakening lines (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) ***characterised in that*** they are converging on at least one common vertex.

2. Method according to claim 1, wherein the closed contour (B, S) of the convex portion (104', 105') defines with its sides (b1, b2, s1, s2) at least one pair (104a, 104b; 105a, 105b; 304a, 304b; 305a, 305b; 352a, 352b; 353a, 353b; 504a, 504b; 505a, 505b; 552a, 552b; 553a, 553b) of weakening lines (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) converging on at least one intermediate point of tangency.

3. Method according to claim 1, or 2, wherein the at least one pair (104a, 104b; 105a, 105b; 304a, 304b; 305a, 305b; 352a, 352b; 353a, 353b; 504a, 504b; 505a, 505b; 552a, 552b; 553a, 553b) of weakening lines (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) extends along a prevalently longitudinal direction (A) of the container (1; 201; 401).

4. Method according to any one of claims 1 to 3, wherein the step of plastically deforming is made by drawing.

5. Method according to claim 4, wherein the drawing is achieved by using a pair of tools (U1, U2; U1', U2') comprising a punch (U1; U1') and a corresponding counter-punch (U2; U2') that cooperate with one another and are movable with reciprocating motion with respect to an advancement line (L) of the blank (100; 300, 350; 500, 550) wherein the punch (U1; U1') has at least one projection (130; 330, 330'; 530, 530') that is suitable for making the convex portion (104', 105').

6. Method according to claim 5, wherein the counter-punch (U2; U2') has at least one recess (131; 331, 331'; 531, 531') that is suitable for coupling with the

projection (130; 330, 330'; 530, 530') of the corresponding punch (U1; U1').

7. Method according to claim 5, wherein the counter-punch (U2; U2') is made of a resilient material.

8. Method according to any one of claims 1 to 4, wherein the drawing is made by a using a pair of rollers (R1, R2) counter-rotating and cooperating together which have axes that are transverse with respect to an advancement line (L) of the blank (100; 300, 350; 500, 550) and are arranged on opposite sides of the advancement line (L), at least one of the rollers (R1) having on its cylindrical surface (140) at least one projection (130) that is suitable for making the convex portion (104', 105').

9. Method according to claim 8, wherein one of the rollers (R2) of the pair of rollers (R1, R2) has on its cylindrical surface (141) at least one recess (131) that is suitable for coupling with the projection (130) of the other roller (R1).

10. Method according to claim 8, wherein one of the rollers (R2) of the pair of rollers (R1, R2) is made of a resilient material.

11. Method according to any preceding claim, wherein the container (1; 201; 401) is a rigid packet (201; 401) for smoke articles.

12. Method according to any preceding claim, wherein the blank is a flat blank (100; 300, 350; 500, 550) made of cardboard, card or similar material.

13. Method according to any preceding claim, wherein the blank (100; 300, 350; 500, 550) is a part of a strip defined by a succession of blanks (100; 300, 350; 500, 550) joined together and arranged with the longitudinal axes thereof parallel to an advancement line (L) of the strip.

14. Method according to any preceding claim, wherein the method is made in a forming station (F) provided on a packaging machine (H) for making containers, in particular rigid packets (201; 401) for smoke articles.

Patentansprüche

1. Verfahren zum Formen von Schwächungslinien (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) in einem Rohling (100; 300, 350; 500, 550), der zur Herstellung eines Behälters (1; 201; 401) vorgesehen ist, umfassend den Schritt des plastischen Verformens von wenigstens einer begrenzten Fläche (104, 105; 304, 305, 352, 353; 504, 505, 552, 553) des Rohlings (100; 300, 350; 500, 550), um so wenigstens einen konvexen Bereich (104', 105') an dem Rohling (100; 300, 350; 500, 550) zu bilden, der umfangsmäßig von einer geschlossenen Kontur (B, S) begrenzt ist, der mit seinen Seiten (b1, b2, s1, s2) wenigstens ein Paar (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) von Schwächungslinien (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) definiert, **dadurch gekennzeichnet, dass** sie in wenigstens einer gemeinsamen Spitze zusammenlaufen.

2. Verfahren nach Anspruch 1, bei dem die geschlossene Kontur (B, S) des konvexen Abschnittes (104', 105') mit ihren Seiten (b1, b2, s1, s2) wenigstens ein Paar (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) von Schwächungslinien (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) definiert, die an wenigstens einem Zwischen-Tangentialpunkt zusammenlaufen.

3. Verfahren nach Anspruch 1 oder 2, bei dem das wenigstens eine Paar (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) von Schwächungslinien (104a, 104b, 105a, 105b; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b; 503a, 505b, 505a, 505b, 552a, 552b, 553a, 553b) sich entlang einer vorwiegenden Längsrichtung (A) des Behälters (1; 201; 401) erstreckt.

4. Verfahren nach irgendeinem der Ansprüche 1 bis 3, bei dem der Schritt des plastischen Deformierens durch Ziehen erfolgt.

5. Verfahren nach Anspruch 4, bei dem das Ziehen unter Verwendung eines Paars von Werkzeugen (U1, U2; U1', U2') mit einem Stempel (U1; U1') und einem zugeordneten Gegenstempel (U2; U2') erreicht wird, die miteinander zusammenwirken und die mit reziproker Bewegung in Bezug auf eine Bewegungslinie (L) des Rohlings (100; 300, 350; 500, 550) beweglich sind, wobei der Stempel (U1; U1') wenigstens einen Vorsprung (130; 330, 330'; 530, 530') aufweist, der geeignet ist, den konvexen Bereich (104', 105') herzustellen.

6. Verfahren nach Anspruch 5, bei dem der Gegenstempel (U2; U2') wenigstens eine Vertiefung (131; 331, 332'; 531, 531') aufweist, die geeignet ist, mit dem Vorsprung (130; 330, 330'; 530, 530') des zu-

geordneten Stempels (U1; U1') zusammenzuwirken.

7. Verfahren nach Anspruch 5, bei dem der Gegenstempel (U2; U2') aus einem nachgiebigen Material hergestellt ist.

8. Verfahren nach irgendeinem der Ansprüche 1 bis 4, bei dem das Ziehen unter Verwendung eines Paars von Rollen (R1, R2) durchgeführt wird, die gegeneinander rotieren und miteinander zusammenwirken, die Achsen aufweisen, die in Bezug auf eine Bewegungslinie (L) des Rohlings (100; 300, 350; 500, 550) quer angeordnet sind und die an gegenüberliegenden Seiten der Bewegungslinie (L) angeordnet sind, wobei wenigstens eine der Rollen (R1) an ihrer zylindrischen Oberfläche (140) wenigstens einen Vorsprung (130) aufweist, der zum Bilden des konvexen Abschnitts (104', 105') geeignet ist.

9. Verfahren nach Anspruch 8, bei dem eine der Rollen (R2) des Paars von Rollen (R, R2) an ihrer zylindrischen Oberfläche (141) wenigstens eine Vertiefung (131) aufweist, die geeignet ist, mit dem Vorsprung (130) der anderen Rolle (R1) zusammenzuwirken.

10. Verfahren nach Anspruch 8, bei dem eine der Rollen (R2) des Paars von Rollen (R1, R2) aus einem nachgiebigen Material besteht.

11. Verfahren nach irgendeinem vorhergehenden Anspruch, bei dem der Behälter (1; 201; 401) ein starres Paket (201; 401) für Raucherartikel darstellt.

12. Verfahren nach irgendeinem vorhergehenden Anspruch, bei dem der Rohling ein flacher Rohling (100; 300, 350; 500, 550) ist, der aus Karton, Kartenmaterial oder einem ähnlichen Material besteht.

13. Verfahren nach irgendeinem vorhergehenden Anspruch, bei dem der Rohling (100; 300, 350; 500, 550) ein Teil eines Streifens ist, der durch eine Folge von Rohlingen (100; 300, 350; 500, 550) gebildet ist, die miteinander verbunden sind und mit ihren Längsachsen parallel zu einer Bewegungslinie (L) des Streifens angeordnet sind.

14. Verfahren nach irgendeinem vorhergehenden Anspruch 1, bei dem das Verfahren in einer Formstation (F) durchgeführt wird, die auf einer Verpackungsmaschine (H) zur Herstellung von Behältern, insbesondere von starren Paketen (201; 401) für Raucherartikel ausgebildet ist.

Revendications

1. Procédé pour former des lignes d'affaiblissement (104a, 104b, 105a, 105b ; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b ; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) dans une ébauche (100 ; 300, 350 ; 500, 550) destinée à fabriquer un récipient (1 ; 201 ; 401), comprenant l'étape qui consiste à déformer de manière plastique au moins une surface circonscrite (104, 105 ; 304, 305, 352, 353 ; 504, 505, 552, 553) de l'ébauche (100 ; 300, 350 ; 500, 550) de manière à former dans l'ébauche (100 ; 300, 350 ; 500, 550) au moins une partie convexe (104', 105') dont la périphérie est délimitée par un contour fermé (B, S) qui définit au moyen de ses côtés (b1, b2, s1, s2) au moins une paire (104a, 104b ; 105a, 105b ; 304a, 304b ; 305a, 305b ; 352a, 352b ; 353a, 353b ; 504a, 504b ; 505a, 505b ; 552a, 552b ; 553a, 553b) de lignes d'affaiblissement (104a, 104b, 105a, 105b ; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b ; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b), **caractérisé en ce que** celles-ci convergent vers au moins un sommet commun.

2. Procédé selon la revendication 1, dans lequel le contour fermé (B, S) de la partie convexe (104', 105') définit au moyen de ses côtés (b1, b2, s1, s2) au moins une paire (104a, 104b ; 105a, 105b ; 304a, 304b ; 305a, 305b ; 352a, 352b ; 353a, 353b ; 504a, 504b ; 505a, 505b ; 552a, 552b ; 553a, 553b) de lignes d'affaiblissement (104a, 104b, 105a, 105b ; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b ; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) convergeant vers au moins un point de tangence intermédiaire.

3. Procédé selon la revendication 1 ou 2, dans lequel la au moins une paire (104a, 104b; 105a, 105b ; 304a, 304b; 305a, 305b; 352a, 352b; 353a, 353b ; 504a, 504b; 505a, 505b ; 552a, 552b; 553a, 553b) de lignes d'affaiblissement (104a, 104b, 105a, 105b ; 304a, 304b, 305a, 305b, 352a, 352b, 353a, 353b ; 504a, 504b, 505a, 505b, 552a, 552b, 553a, 553b) s'étend selon une direction essentiellement longitudinale (A) du récipient (1 ; 201 ; 401).

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel l'étape de déformation de manière plastique est effectuée par emboutissage.

5. Procédé selon la revendication 4, dans lequel l'emboutissage est réalisé en utilisant une paire d'outils (U1, U2 ; U1', U2') comprenant un poinçon (U1 ; U1') et un contre-poinçon (U2 ; U2') correspondant qui coopèrent l'un avec l'autre et sont mobiles en ayant un mouvement alternatif par rapport à une ligne de progression (L) de l'ébauche (100 ; 300, 350 ; 500, 550), le poinçon (U1 ; U1') comportant au moins une partie en saillie (130 ; 330, 330' ; 530, 530') qui est apte à fabriquer la partie convexe (104', 105').

6. Procédé selon la revendication 5, dans lequel le contre-poinçon (U2 ; U2') comporte au moins un évidement (131 ; 331, 331' ; 531, 531') qui est apte à être couplé à la partie en saillie (130 ; 330, 330' ; 530, 530') du poinçon (U1 ; U1') correspondant.

7. Procédé selon la revendication 5, dans lequel le contre-poinçon (U2 ; U2') est réalisé en un matériau élastique.

8. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel l'emboutissage est réalisé en utilisant une paire de rouleaux (R1, R2) qui tournent dans des sens contraires et coopèrent l'un avec l'autre, qui comportent des axes transversaux par rapport à une ligne de progression (L) de l'ébauche (100 ; 300, 350 ; 500, 550), et qui sont disposés sur des côtés opposés de la ligne de progression (L), au moins l'un des rouleaux (R1) comportant sur sa surface cylindrique (140) au moins une partie en saillie (130) qui est apte à fabriquer la partie convexe (104', 105').

9. Procédé selon la revendication 8, dans lequel l'un des rouleaux (R2) de la paire de rouleaux (R1, R2) comporte sur sa surface cylindrique (141) au moins un évidement (131) qui est apte à être couplé à la partie en saillie (130) de l'autre rouleau (R1).

10. Procédé selon la revendication 8, dans lequel l'un des rouleaux (R2) de la paire de rouleaux (R1, R2) est réalisé en un matériau élastique.

11. Procédé selon l'une quelconque des revendications précédentes, dans lequel le récipient (1 ; 201 ; 401) est un boîtier rigide (201 ; 401) destiné à des articles pour fumeurs.

12. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'ébauche est une ébauche plate (100 ; 300, 350 ; 500, 550) constituée de carton, de papier carte ou d'un matériau similaire.

13. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'ébauche (100 ; 300, 350 ; 500, 550) est une partie d'une bande définie par une succession d'ébauches (100 ; 300, 350 ; 500, 550) jointes les unes aux autres et disposées avec leur axe longitudinal parallèle à une ligne de progression (L) de la bande.

14. Procédé selon l'une quelconque des revendications précédentes, le procédé étant mis en oeuvre dans un poste (F) de formage prévu sur une machine d'emballage (H) destinée à la fabrication de récipients, en particulier de boîtiers rigides (201 ; 401) destinés à des articles pour fumeurs.

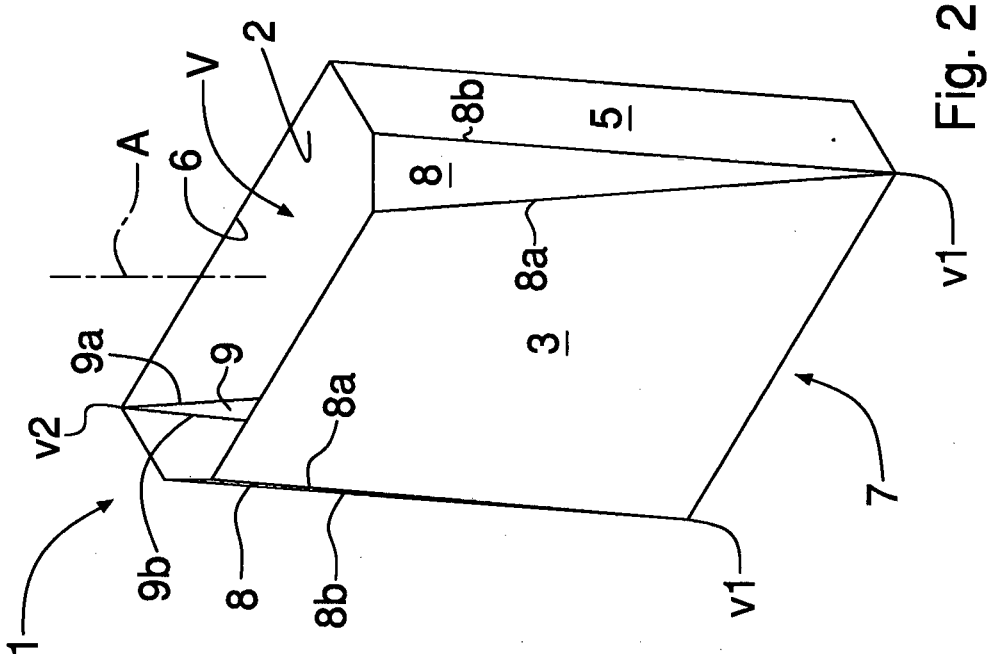

1
9b
8
8b
v2
9a
9
8a
v1
3
7
A
6
V
2
8b
5
8
8a
v1

Fig. 2

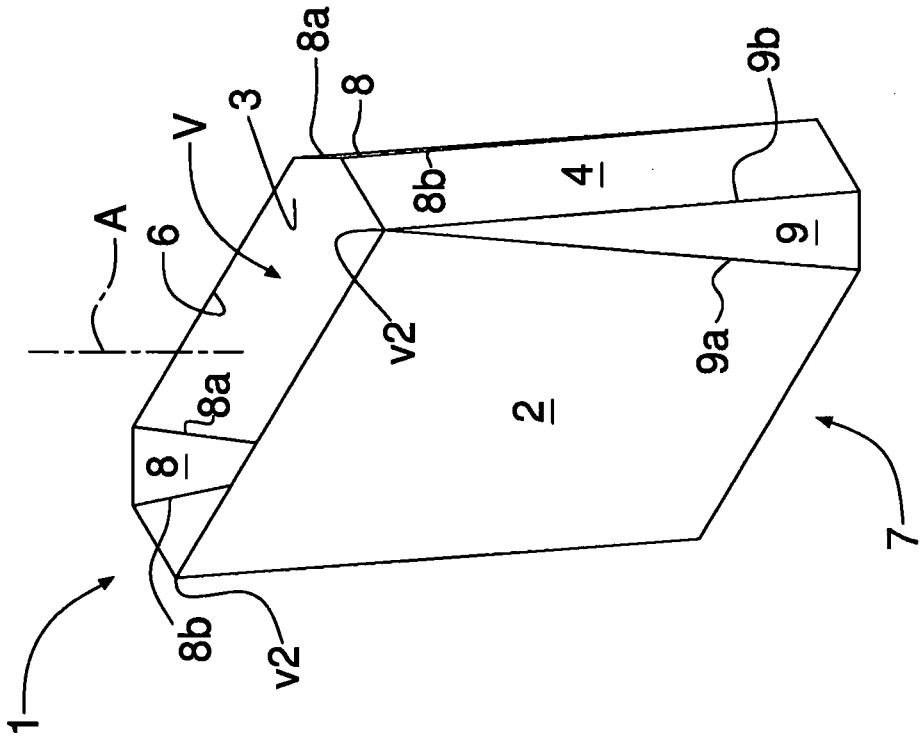

1
8b
v2
8
8a
A
6
V
3
8a
8
8b
4
9b
9
v2
9a
2
7

Fig. 1

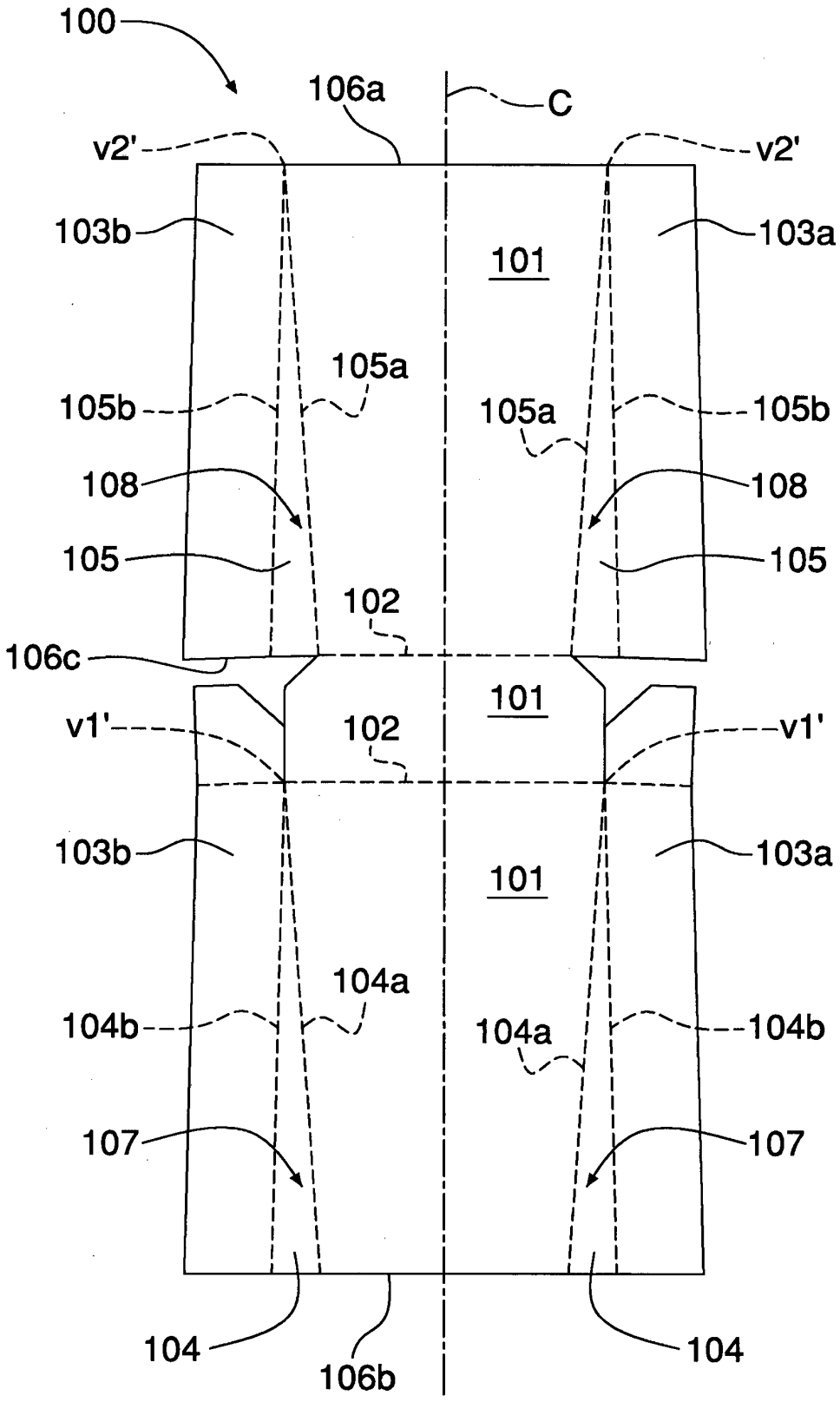

100
106a
C
v2'
v2'
103b
103a
101
105a
105b
105a
105b
108
108
105
105
102
106c
101
v1'
102
v1'
103b
103a
101
104a
104b
104a
104b
107
107
104
104
106b

Fig. 3

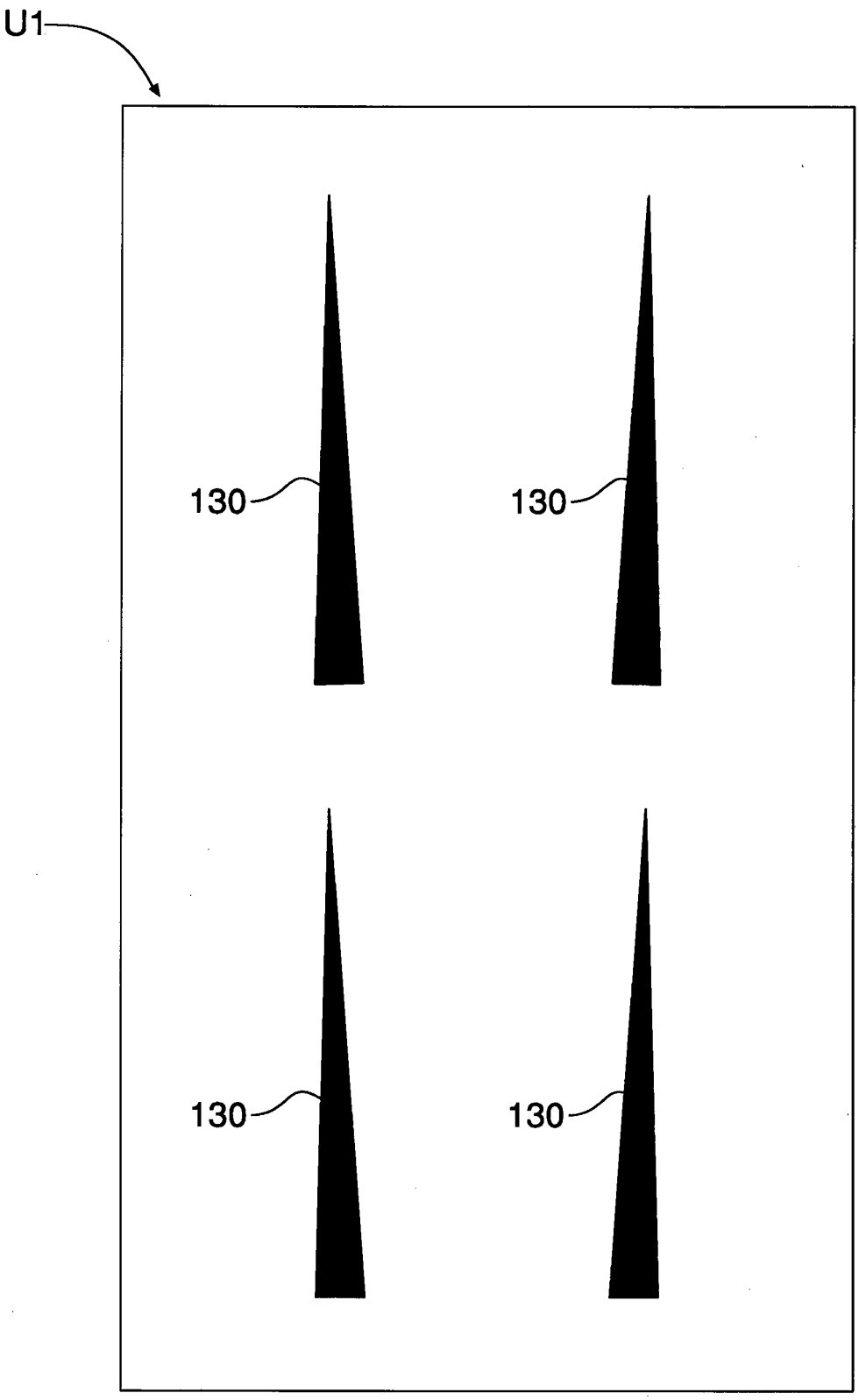


Fig. 4

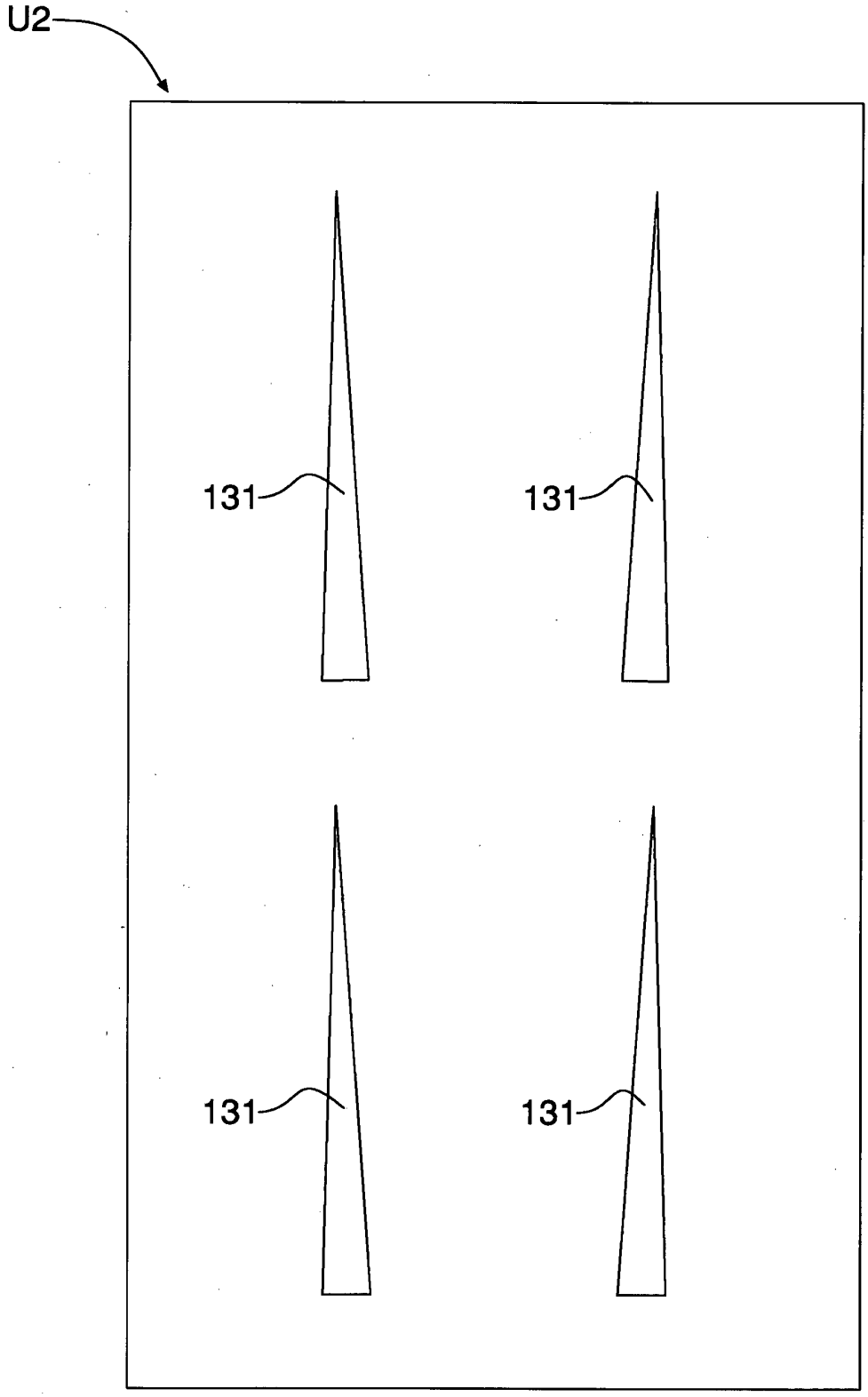


Fig. 5

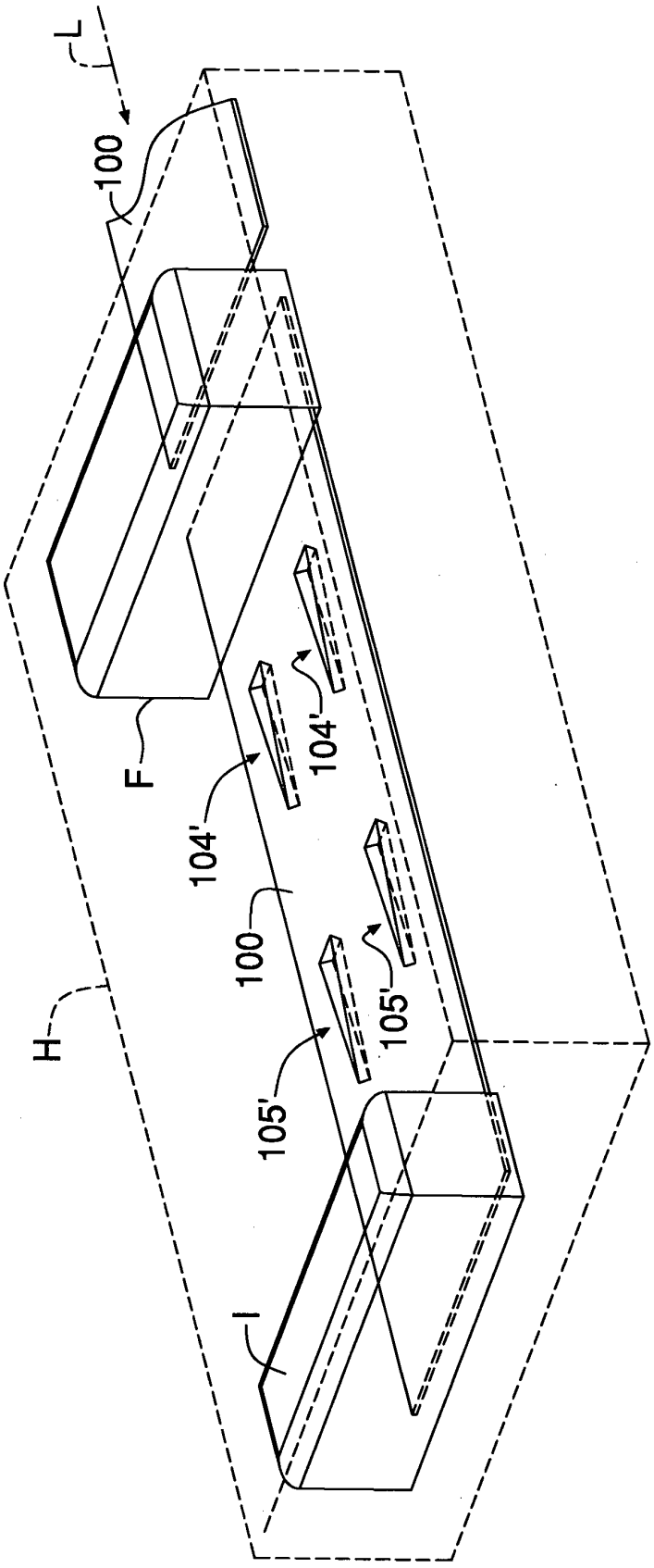


Fig. 6

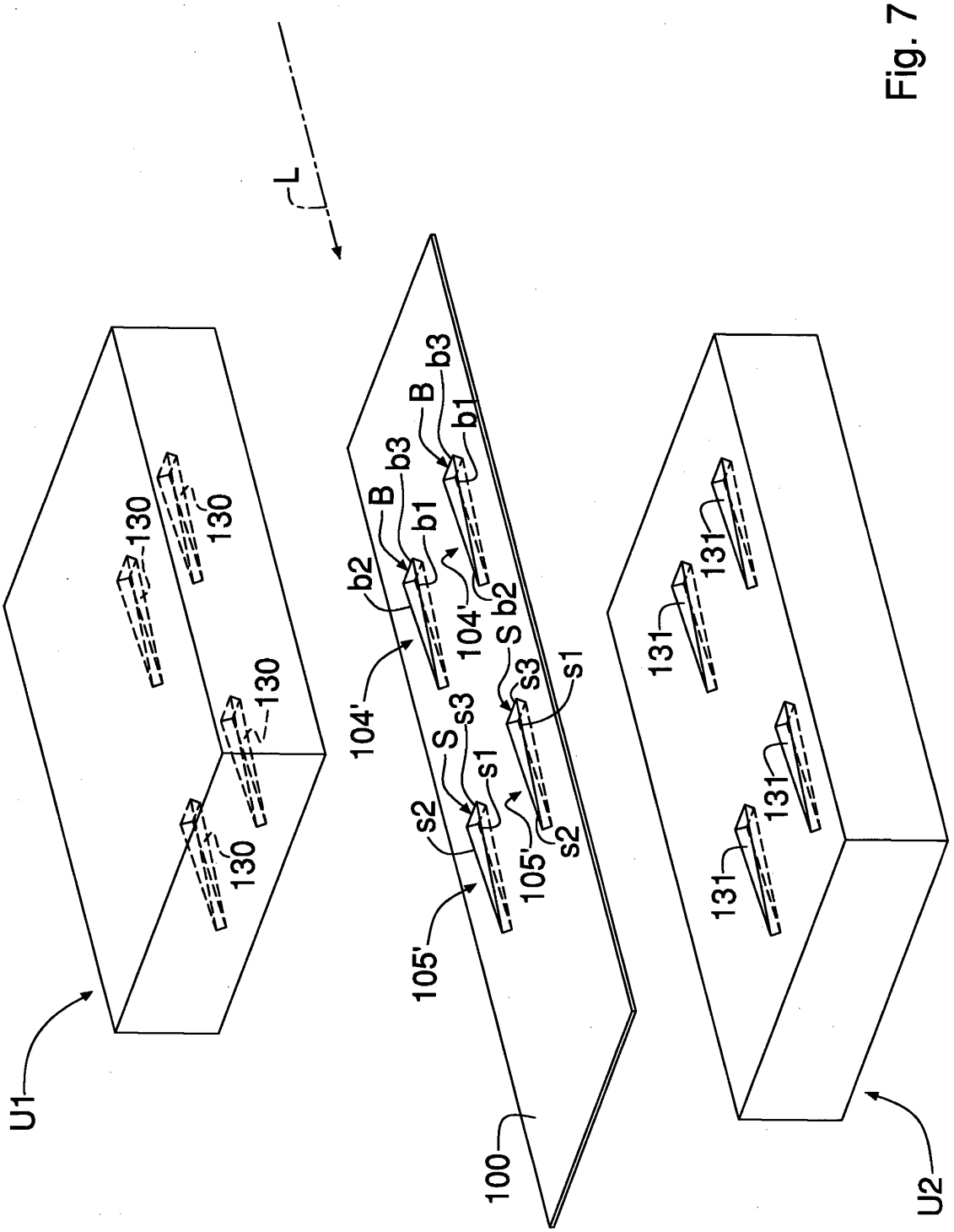


Fig. 7

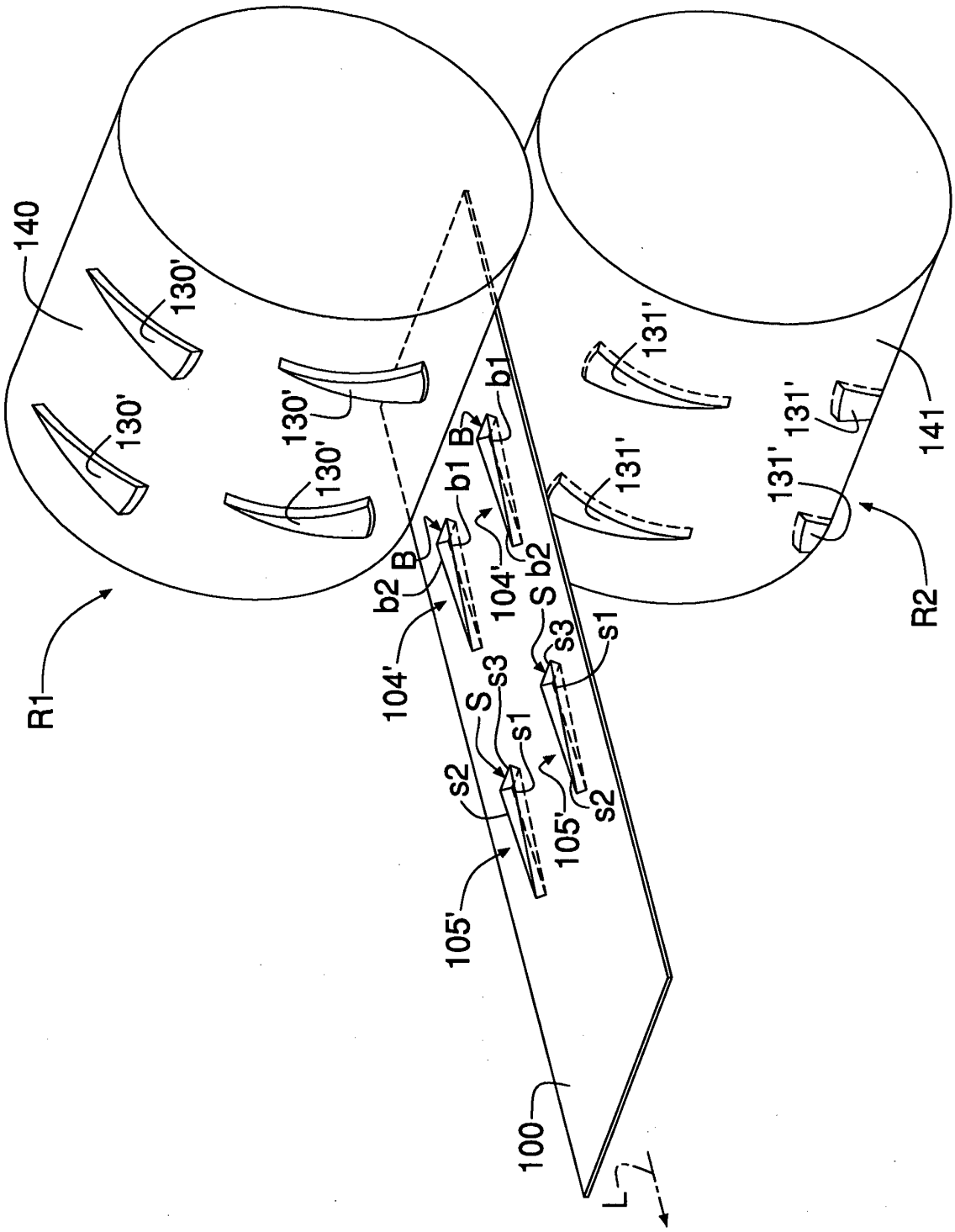

140
130'
130'
130'
130'
R1
104'
b2
B
b1
B
b1
104'
b2
S
s3
s1
S
s3
s1
s2
s2
105'
105'
100
L
131'
131'
131'
131'
141
R2

Fig. 8

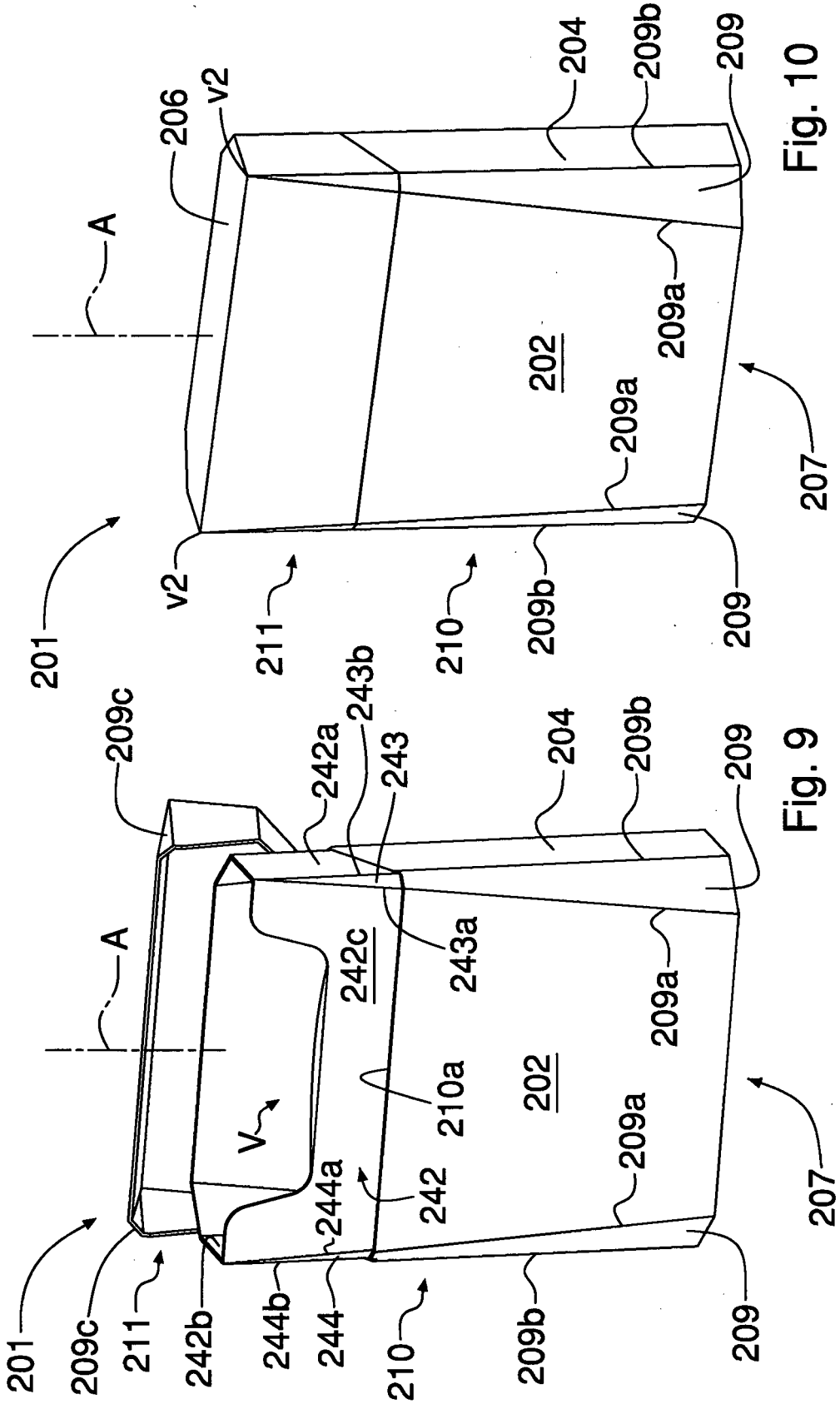

201
209c
211
242b
244b
244
210
209b
209
207
209a
202
242c
243a
210a
V
244a
242
242a
243b
243
204
209b
A
206
v2

Fig. 9

Fig. 10

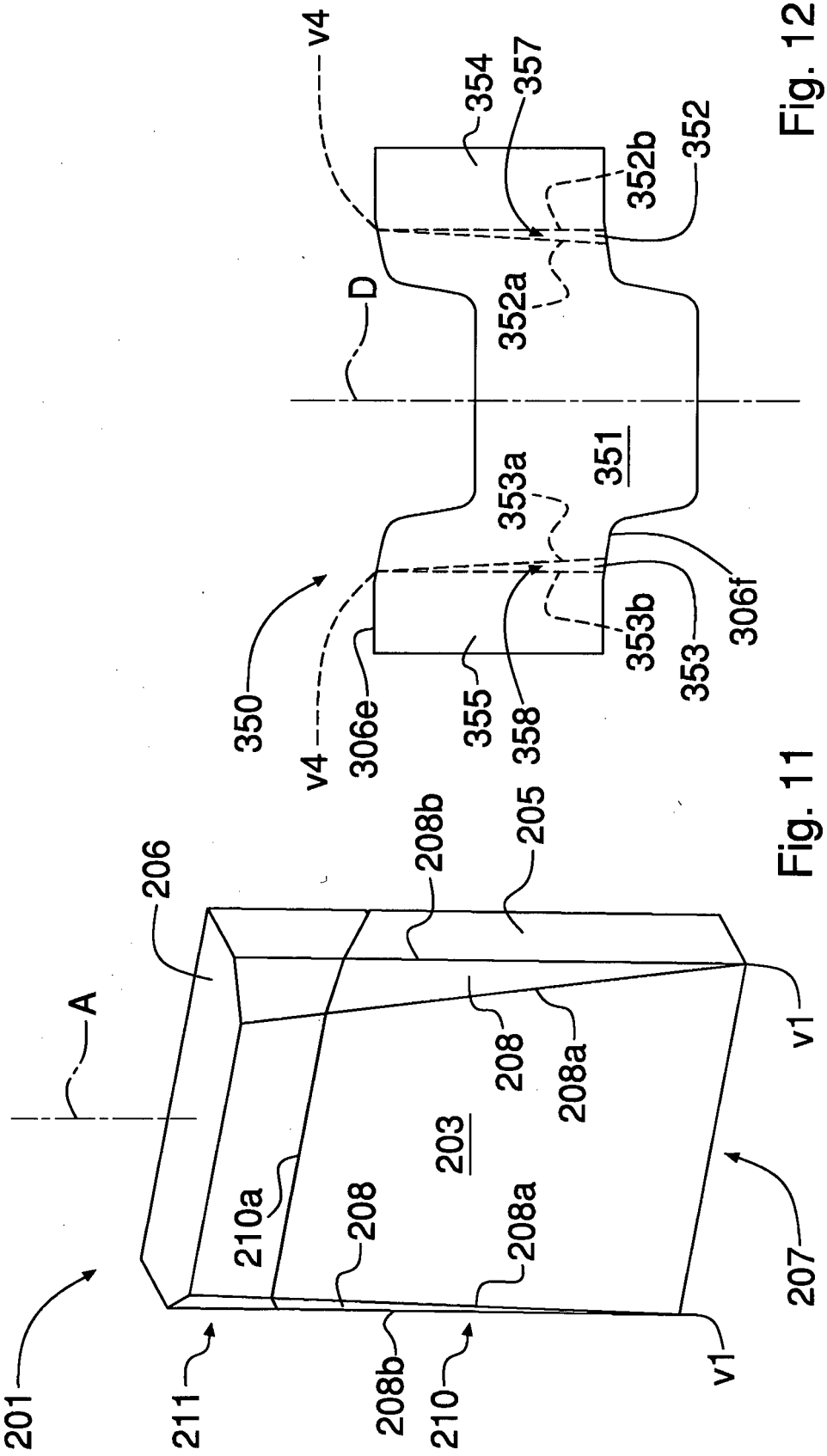

v4
354
357
352b
352
D
352a
351
353a
306f
353b
353
350
306e
355
358
v4
205
208b
206
A
v1
208
208a
203
210a
208
208a
207
201
211
208b
210
v1

Fig. 12

Fig. 11

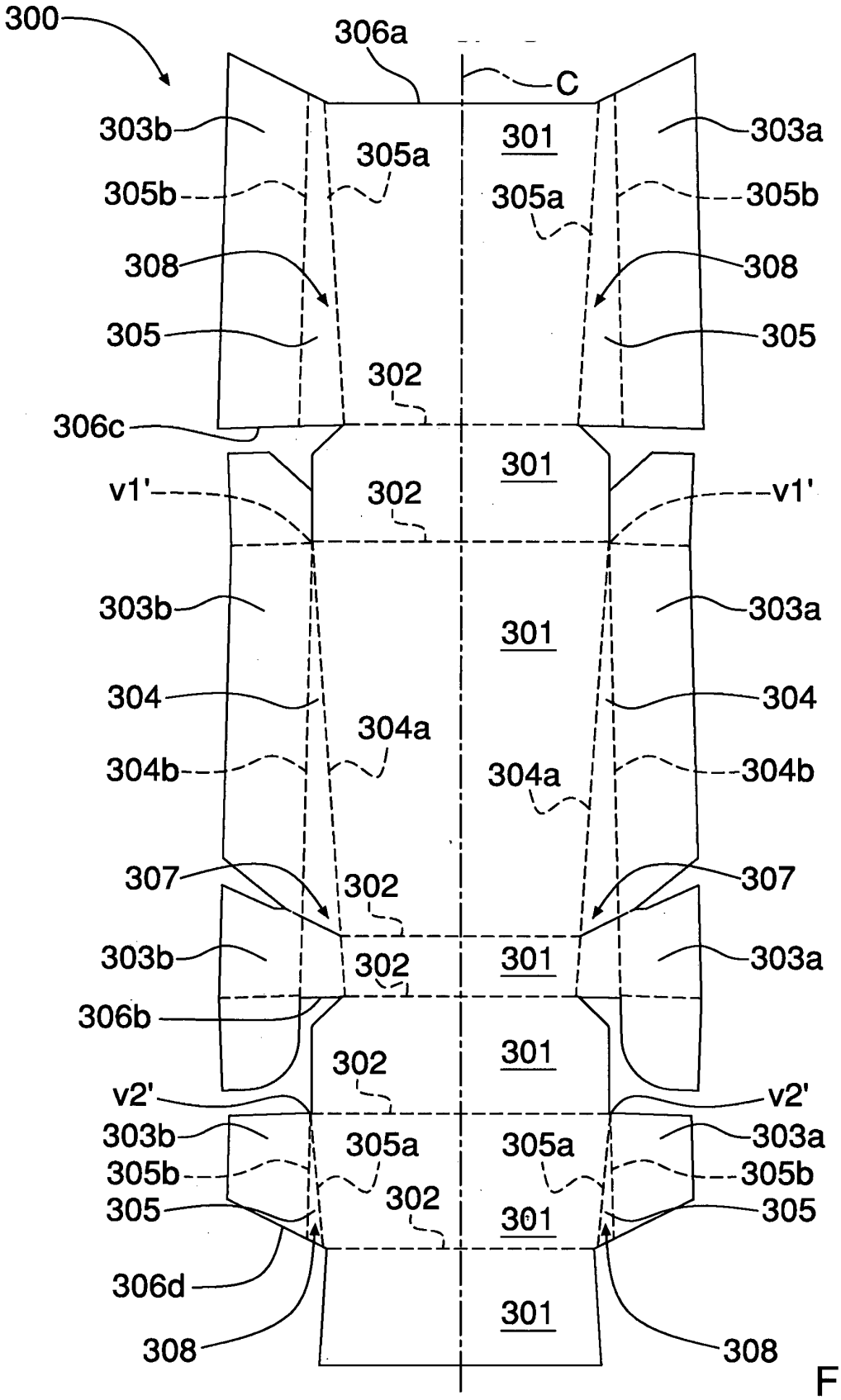

300
306a
C
303b
303a
301
305a
305b
305a
305b
308
308
305
305
302
306c
301
v1'
302
v1'
303b
303a
301
304
304
304a
304b
304a
304b
307
302
307
303b
302
301
303a
306b
301
302
v2'
v2'
303b
305a
305a
303a
305b
305b
302
305
301
305
306d
301
308
308

Fig. 13

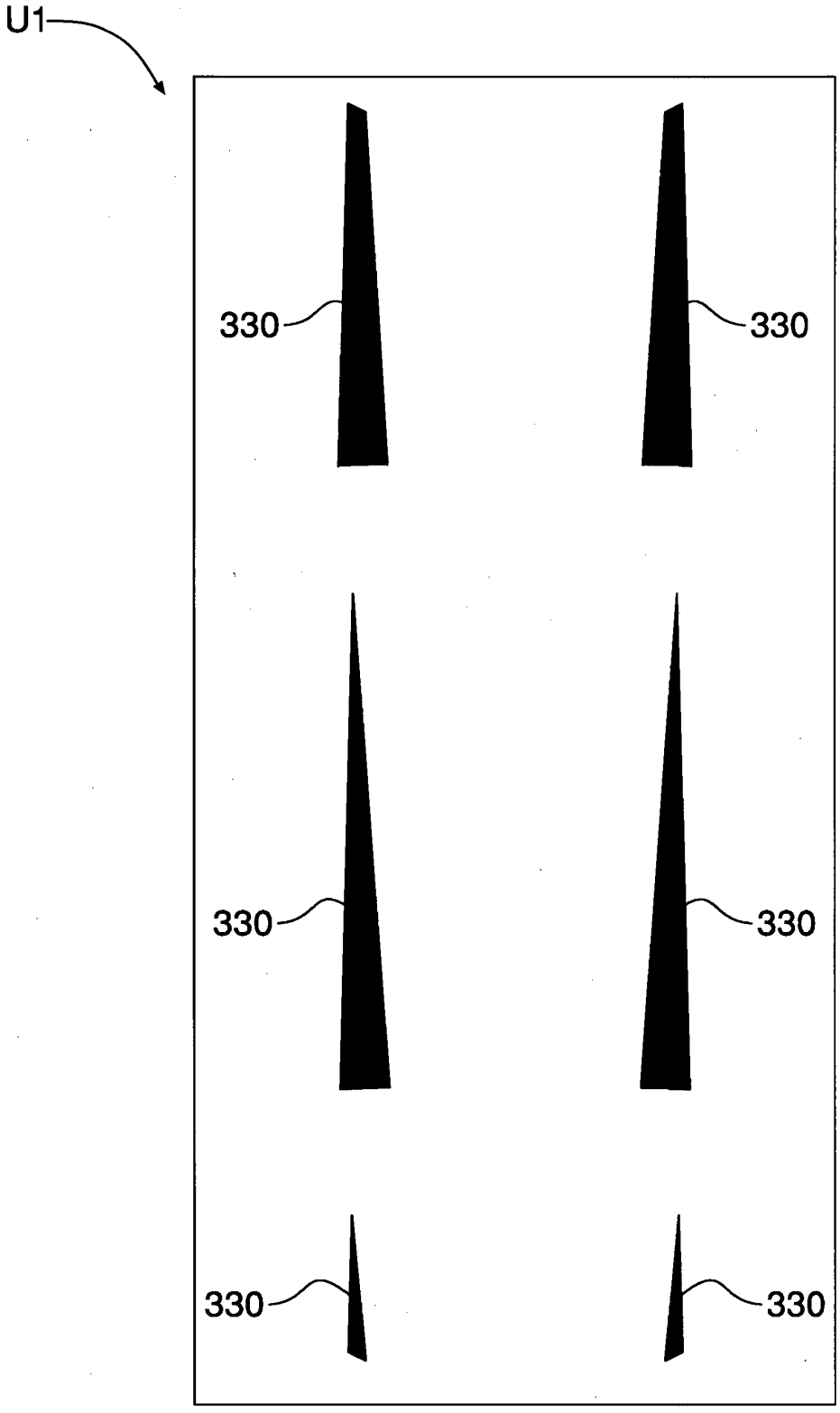


Fig. 14

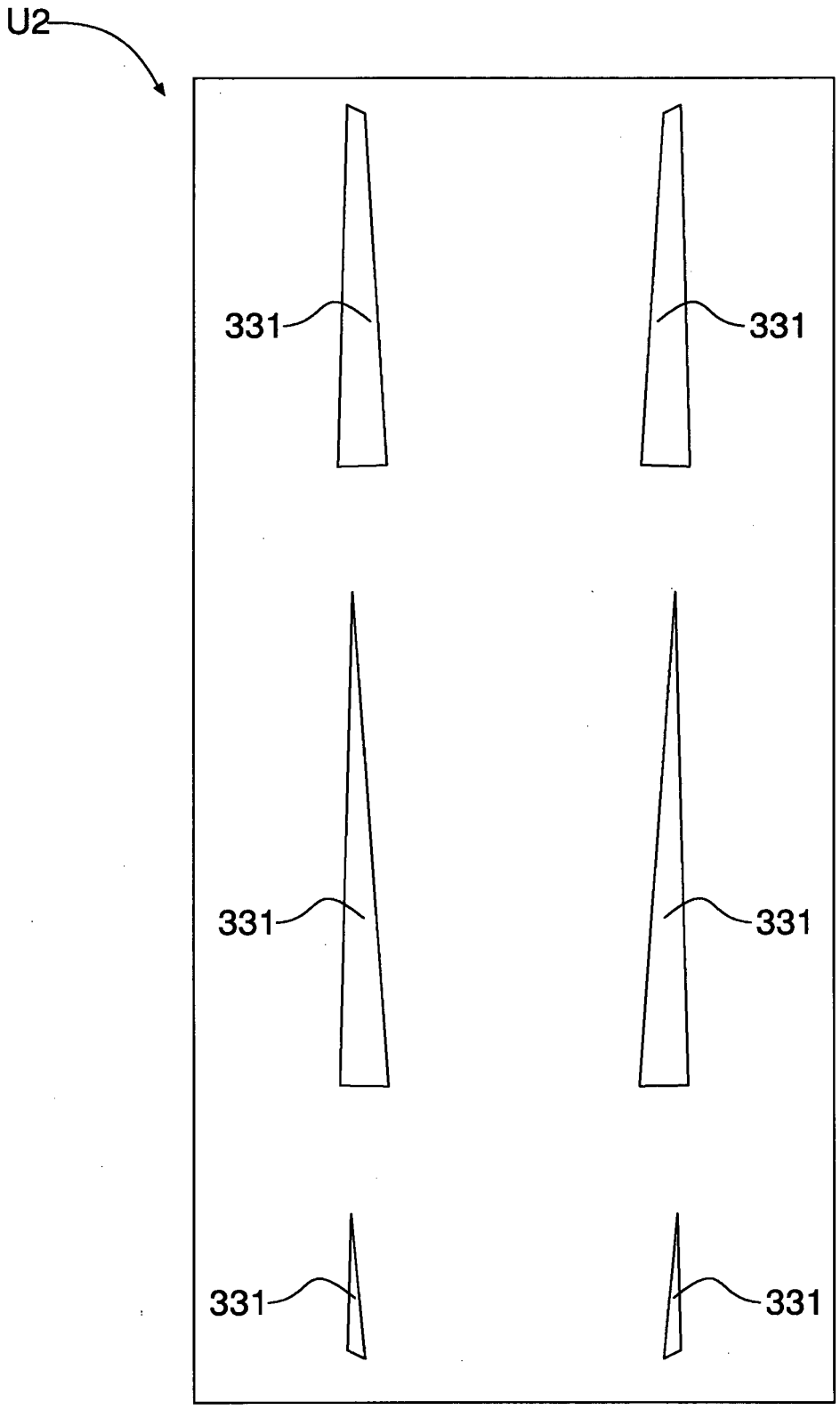


Fig. 15

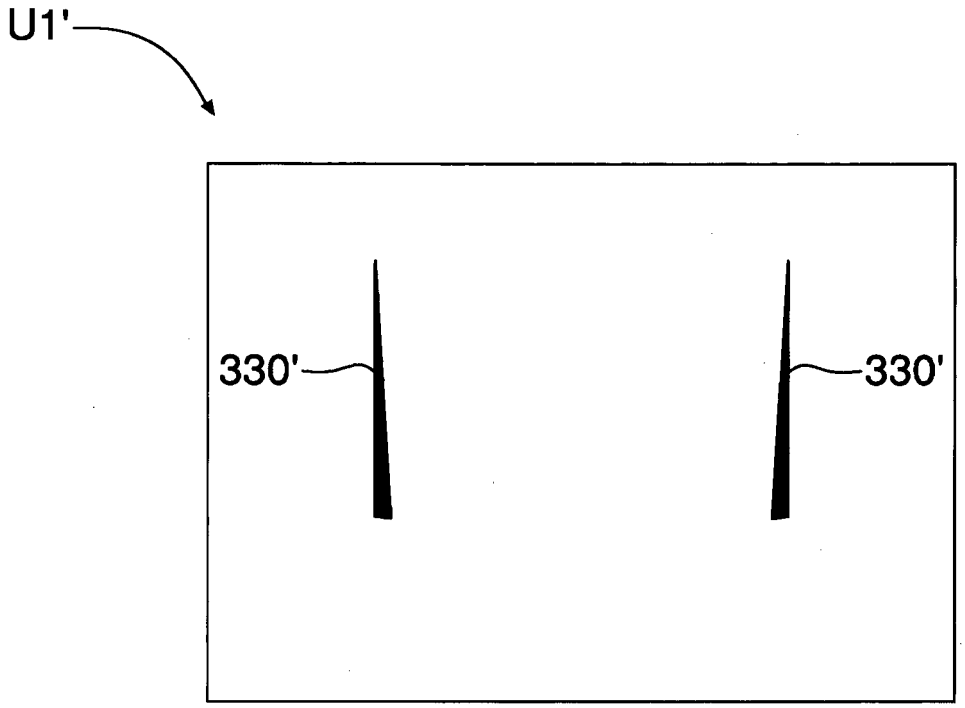


Fig. 16

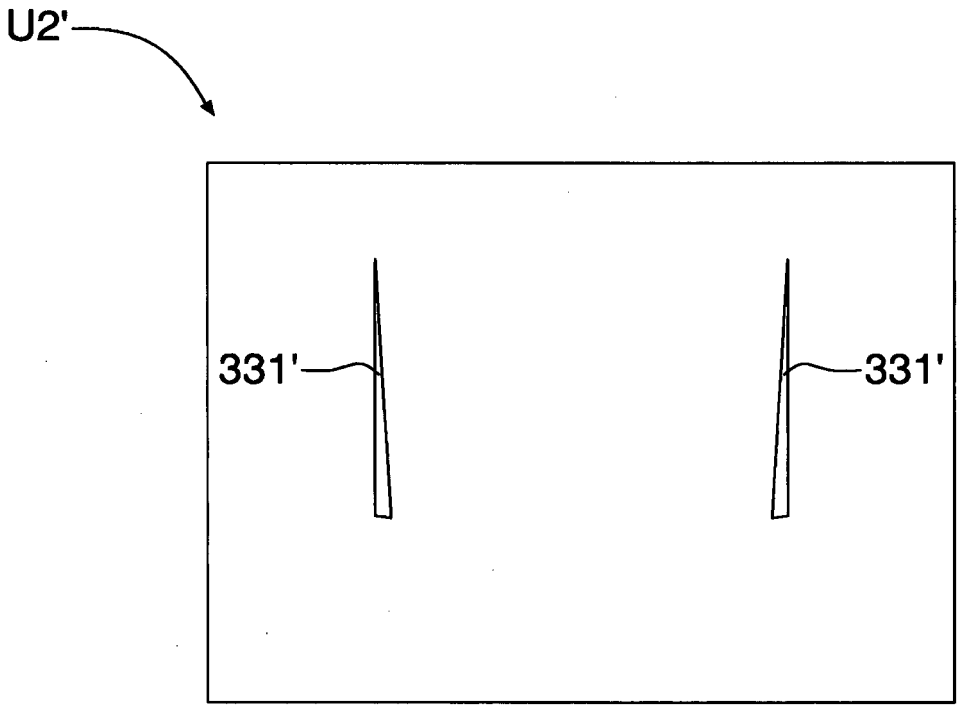


Fig. 17

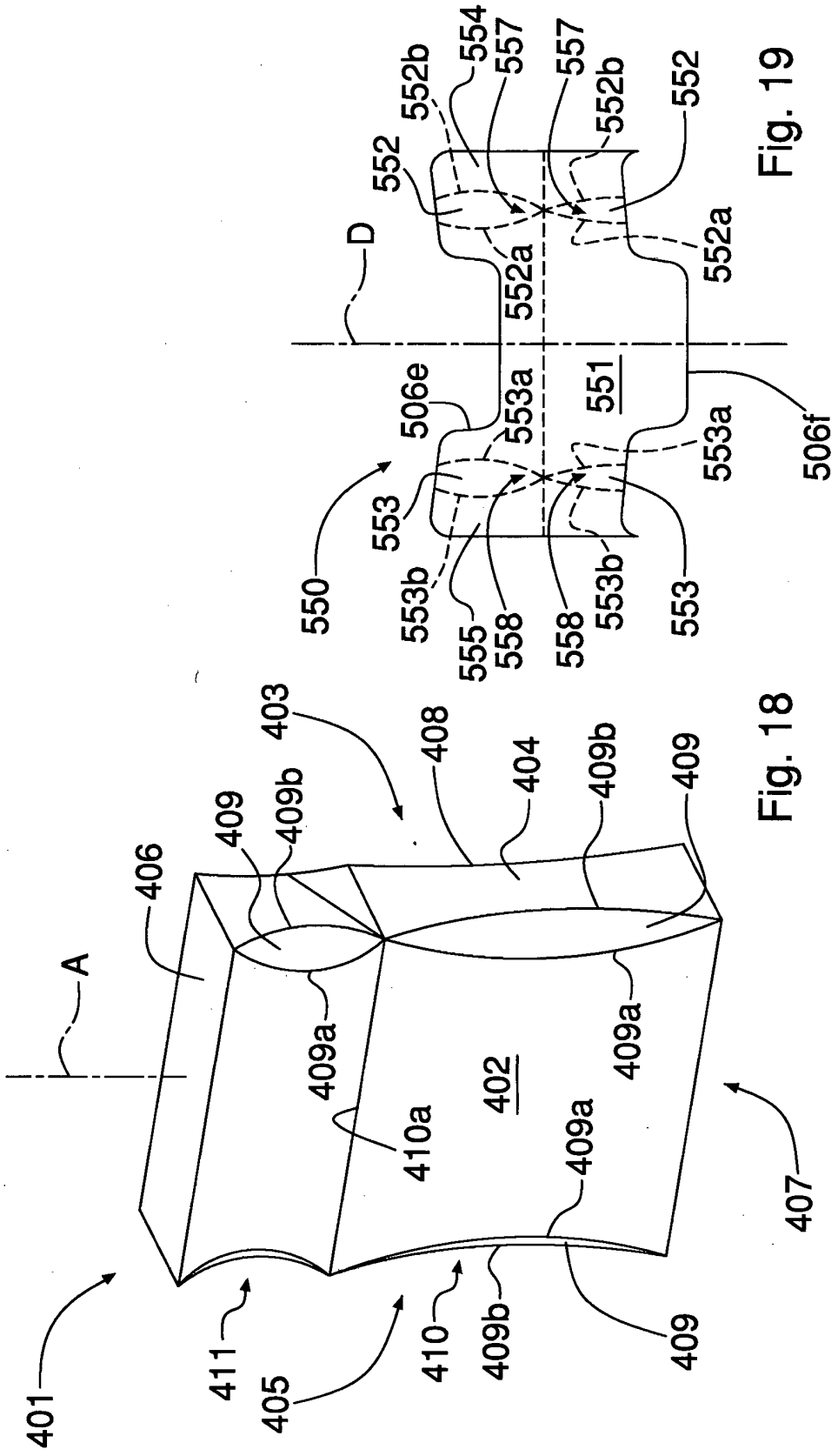
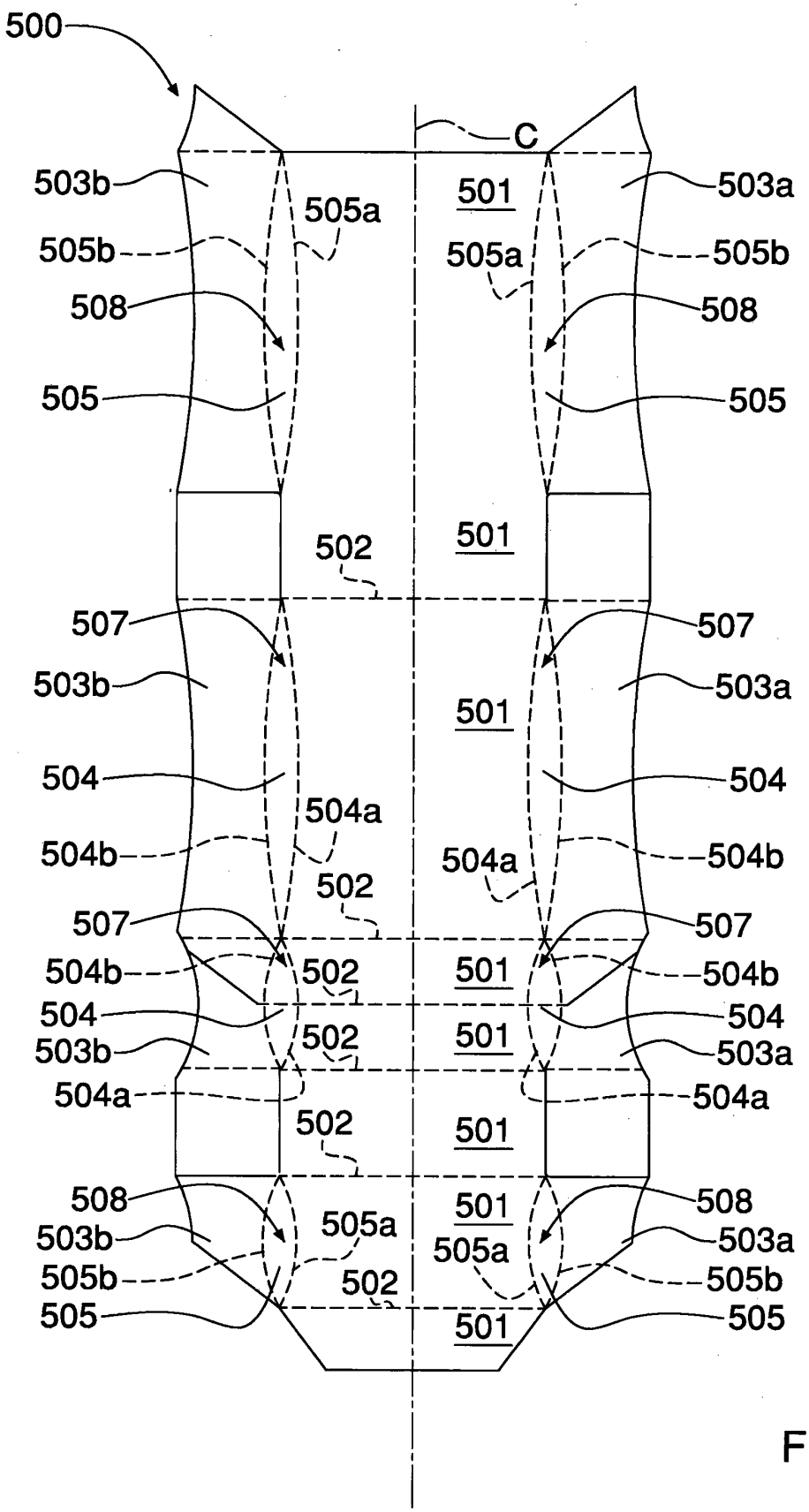

401
411
405
410
409b
409
407
A
406
409
409b
403
408
404
409b
409
409a
410a
402
409a
409a
409
D
552b
554
557
557
552b
552
552
552a
552a
506e
553a
551
553a
506f
553
553b
555
558
558
553b
553
550

Fig. 18

Fig. 19


500
C
503b
505a
501
503a
505b
505a
505b
508
508
505
505
502
501
507
507
503b
503a
501
504
504
504a
504b
504a
504b
502
507
507
504b
502
501
504b
504
504
502
501
503b
503a
504a
504a
502
501
508
501
508
503b
505a
505a
503a
505b
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505b
505
501
505

Fig. 20

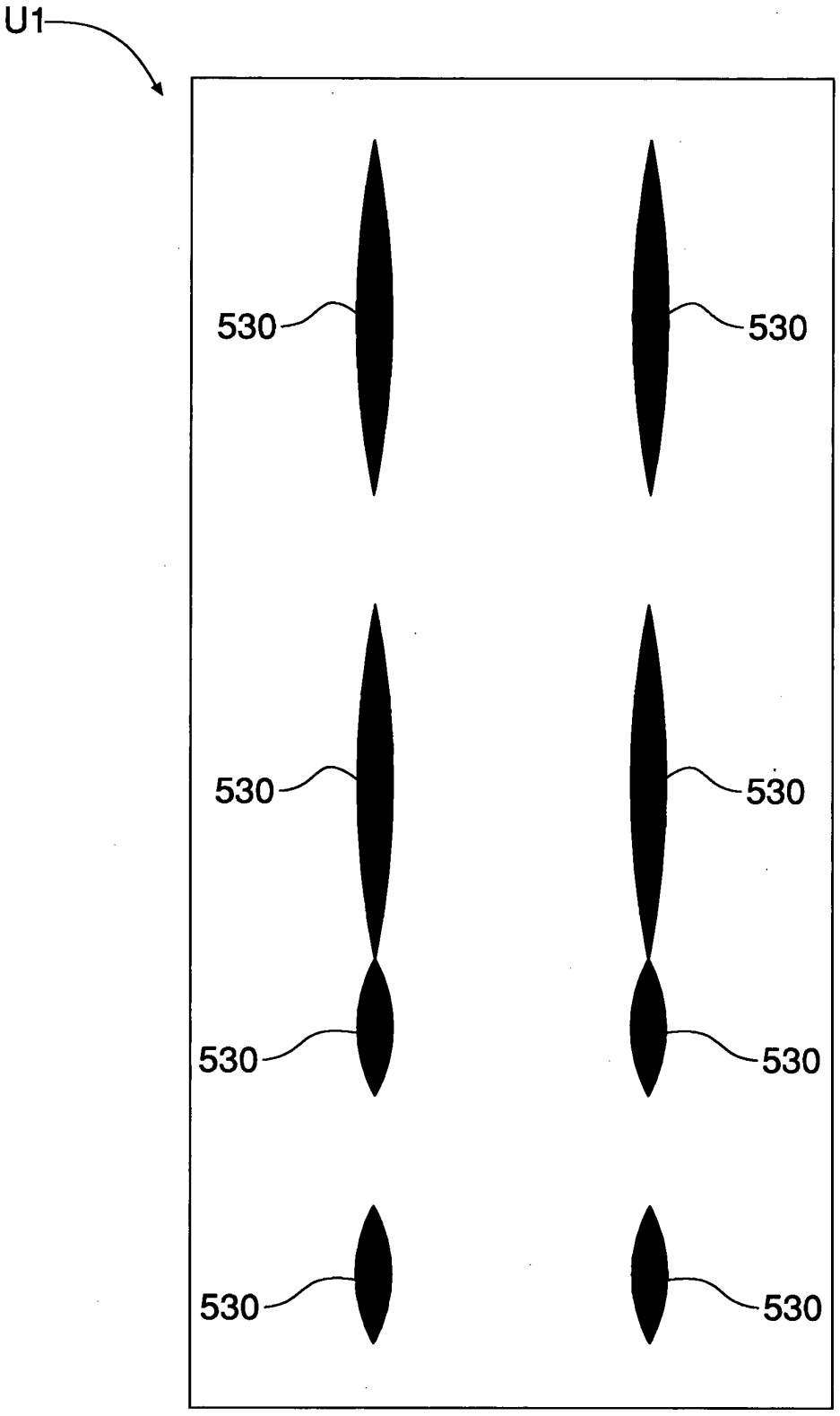

Fig. 21

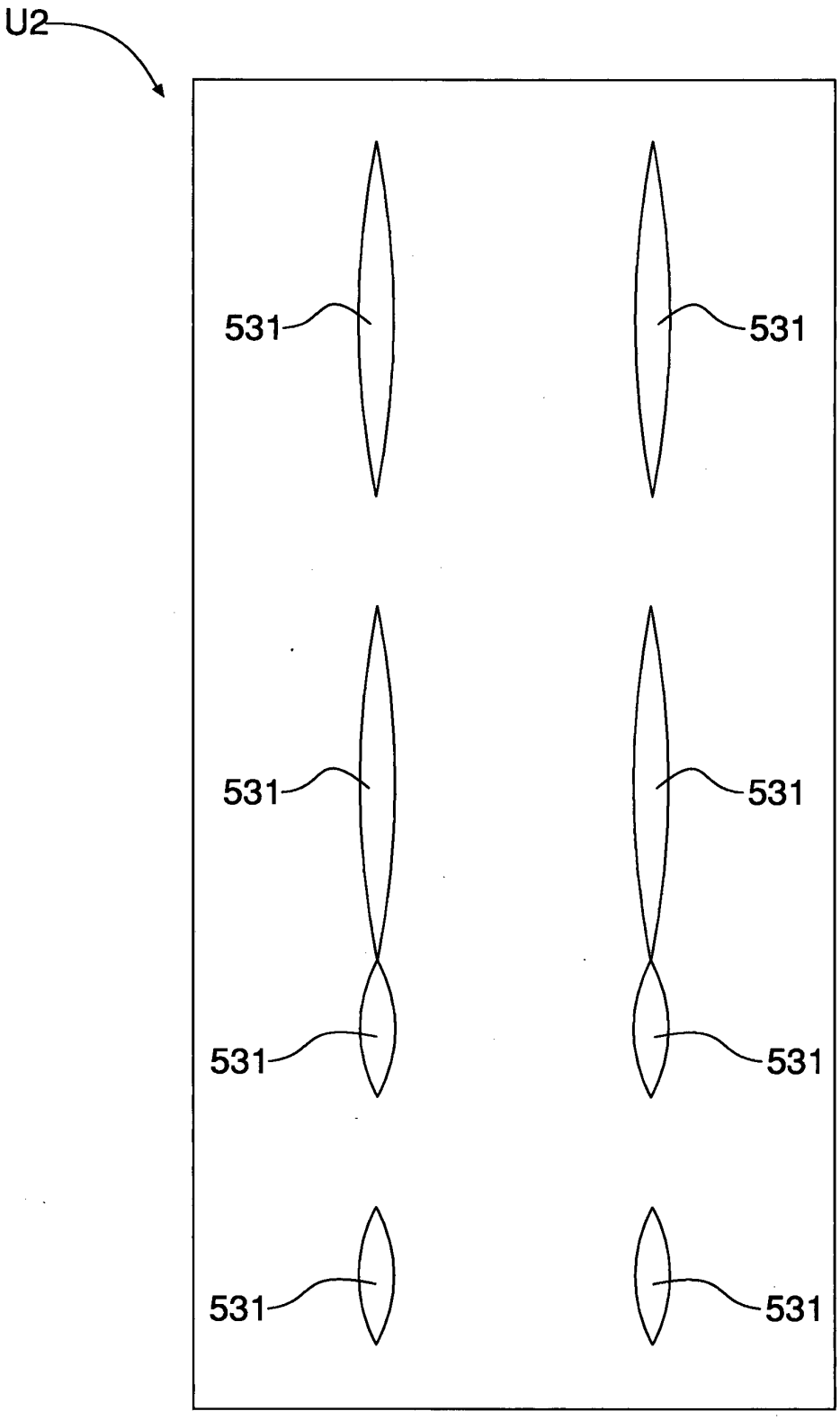

Fig. 22

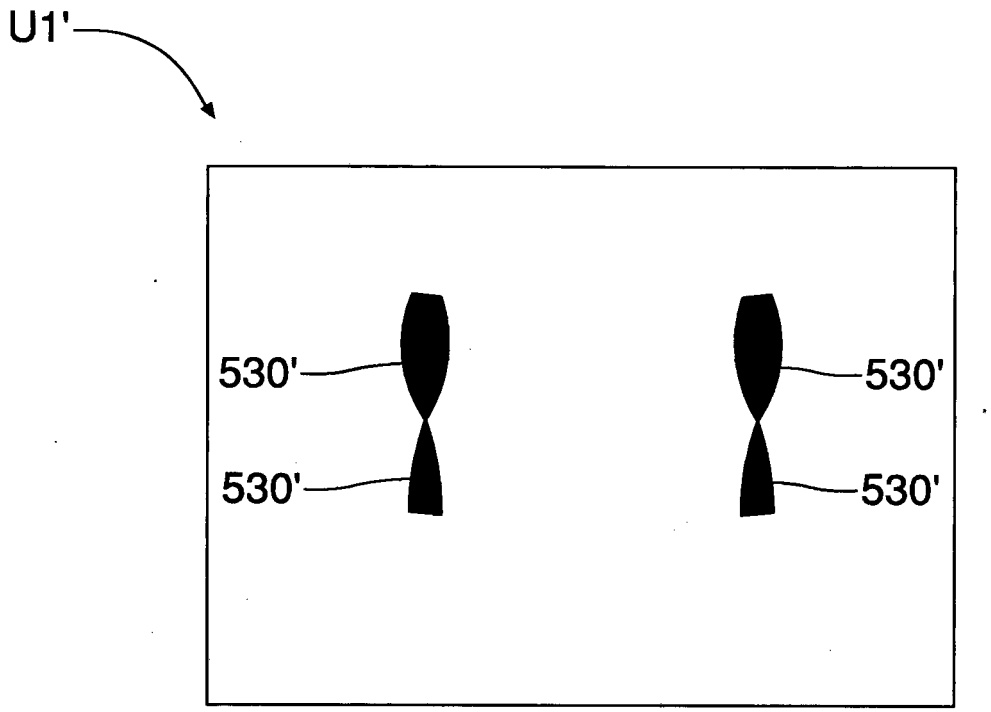

Fig. 23

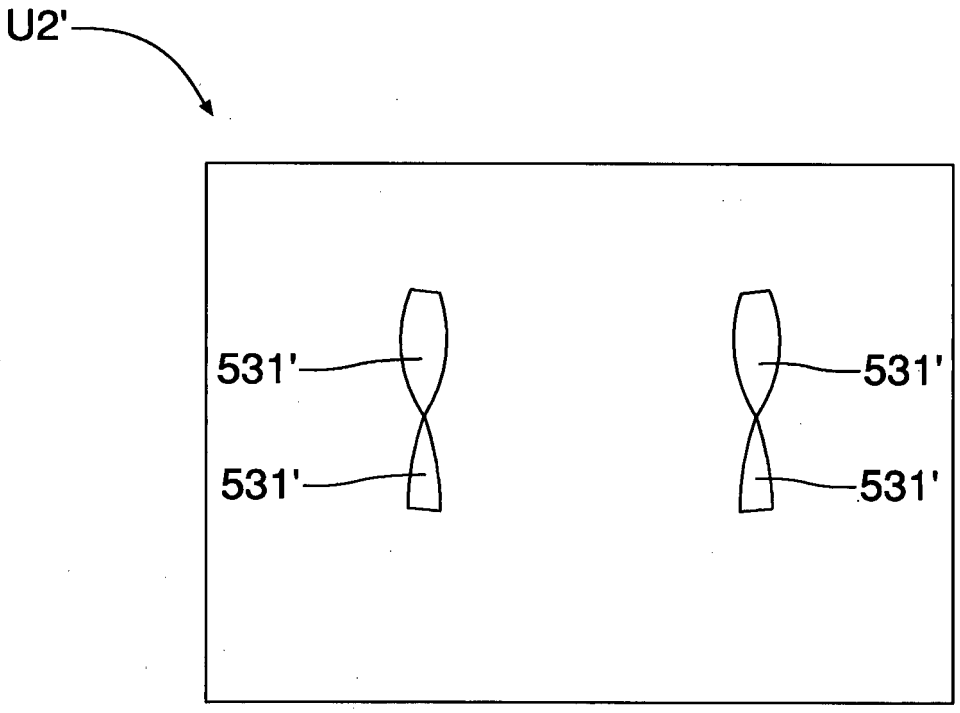

Fig. 24

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- WO 2012007302 A **[0013]**