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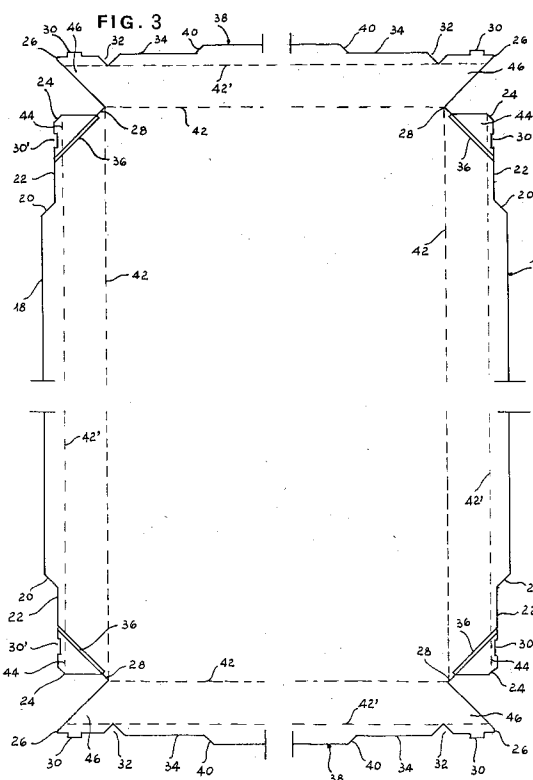
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(54) **Metal sheet shaped to achieve polygonal articles with weldless edges at the vertices and manufacturing method for said article.**

(57) Polygonal metal sheet articles such as a support sink are achieved by a succession of bends of a rectangular metal sheet provided with internal bend lines (42) and external bend lines (42') and having the following configuration of each vertex:

- the end portions (34,22) of the sides are lowered;
- each lowered end portion (22) of each major side (18) is provided with a U-shaped recess (30') and has the triangular end (44) lowered or recessed by a depth corresponding to the thickness of the metal sheet;
- Each lowered end portion (34) of each minor side (38) is provided with a V-shaped cavity (32) and a U-shaped projection (30) and terminates with a triangular appendage (26).

In manufacturing the triangular appendage (46) is bent on the edge (48') of the adjacent side and is arranged in the lowered triangular portion (44) and, subsequently, the projection (30) is bent back and constrained in the recess (30').



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The present invention relates to a metal sheet shaped to achieve polygonal articles with weldless edges at the vertices and method for manufacturing said articles from said metal sheet.

More specifically, The present invention relates to the provision of metal support sinks such as for example stainless steel wherein the bands constituting the edge are bent in a U and constrained together permanently at the vertices without welding.

As is known, modular kitchens, formed by the assemblage of a plurality of containing furniture items and household appliances having generally standardized dimensions include a metal sink provided with one or two tanks.

The sink, aligned with the cooking surface and the top formed by the containing furniture items, is in general achieved in stainless steel or enamelled iron and has peripherally a U-bent edge of a height usually between 20mm and 40mm.

Said sink is made from a metal sheet subjected to operations of (i) drawing for achievement of the tank or tanks, (ii) shearing of the peripheral development, and (iii) bending of the edge. The sheet is taken from a metal strip whose exposed surface has been previously covered with a thin film of plastic material; said film has the purpose during drawing, shearing and bending of protecting the sheet so that the surface finish of the metal, bright or satin-finished, is not damaged. The protective film is removed from the finished article only upon installation thereof and, therefore, protects it even during storage and transportation.

In known sinks, after bending of the edge which creates the U section, the peripheral band which constitutes the height of the edge is formed from four strips not constrained together at the vertices and brought together generally at 90° mutually. Connection of said strips, to complete forming of the edge of the sink and stiffen it, is generally performed by welding. This operation has various drawbacks. Indeed, the protective film covering the sink on the exposed front must be removed at the vertices of the edge to allow welding. Removal of said film, although it involves limited portions of the metal sheet, results in a serious drawback in that the film cannot be restored after the welding operations. The corners of the sink therefore are without protection and the bright or satin-finished surfaces can undergo deterioration during storage, packaging or installation of the sink.

Another drawback is the fact that after welding the sink must be subjected to another polishing operation at the corners to give the edge of the sink a finish as uniform as possible with the remaining parts.

The object of the present invention is to overcome the above shortcomings.

More specifically, the object of the present invention is to provide a sink of stainless steel, iron or other metallic material in which the bands forming the edge are constrained together at the vertices without welding or polishing and, hence, without removal of the protective film covering the sink on the surface.

Another object of the present invention is to provide a shaped metal sheet which would allow provision of a sink the strips of which forming the edge are constrained together at the vertices by bending and weldless fixing.

Still another object of the present invention is to provide a procedure for bending back and constraining without welding the bands forming the edge of sinks of stainless steel, iron or other material at the vertices.

In accordance with the present invention these and other objects are achieved by subjecting to simple bending operations a metal sheet of rectangular shape comprising four vertices, two opposing minor sides and two opposing major sides and provided along the entire edge with two equidistant bending lines, parallel at the edges of the metal sheet of which one more inward and one more outward, corresponding to the two corners of a U-shaped edge, wherein each vertex has the following configuration:

- a) each terminal portion of the major and minor sides of the metal sheet, which form each vertex, is lowered and filleted at the corresponding central portion preferably by a bevelled length;
- b) each lowered terminal portion of the major side of the metal sheet is provided with a U-shaped recess and is cut, for a length which extends substantially to the most inward bending line, along a plane parallel to the minor side of the metal sheet and moved toward the centre of the metal sheet from the most inward bend;
- c) each lowered terminal portion of the minor side of the metal sheet is provided with a V-shaped cavity having its vertex on the outermost bending line and a U-shaped projection, each lowered terminal portion being cut at the free end for a length which extends to the innermost bending line along an oblique plane passing through the diagonal which unites the vertex of the metal sheet with that of the innermost bending line so as to form a triangular appendage;
- d) the free end of the major side is preferably bevelled at the vertex and its terminal part, for a triangular extension substantially equal to the terminal triangular appendage of the minor side, is recessed or lowered by a thickness equal to that of the metal sheet; and
- e) the U-shaped projection of the minor side corresponds to the U-shaped recess or cavity of the major side when the sides are bent along

the two bending lines and the triangular appendage of the minor side is bent on the lowered triangular terminal portion of the major side.

Preferably the U-shaped projection of the minor side has a height greater than that of the U-shaped recess of the major side.

For manufacture of the article, as for example a sink with U-bent edges without welding at the vertices, the shaped metal sheet described above is subjected to a series of successive and simple bending operations performed manually or automatically by means of a device provided with bending means or movable dies.

First, the metal sheet described above is bent along the edges at the two internal and external bending lines. After this first bending operation, the metal sheet has its edges bent U-shaped and brought near the vertices while the terminal triangular appendages of each minor side project from the bent edge of the major side of each vertex.

There is then performed a second bending operation of said triangular appendages until they contact the surface of the recessed triangular terminal portion of the corresponding major side. The portion of each appendage which exceeds the height of the edge is subsequently bent inward of the edge and, finally, each U-shaped projection of the minor side is bent toward the plane of the metal sheet and hooked in the corresponding and mating U-shaped recess of the major side.

The construction characteristics of the shaped metal sheet which is the object of the present invention and the manufacturing process for the articles with U-bent edges without welding at the vertices, also the object of the present invention, can be better understood from the following detailed description wherein reference is made to the figures of the annexed drawings representing a preferred embodiment given by way of nonlimiting example and with particular reference to a sink and in which:

FIG. 1 shows a schematic view of a longitudinal cross section of the sink achieved with shaped metal sheet and by the procedure of the present invention,

FIG. 2 shows a schematic view of a vertex of the metal sheet for formation of the sink,

FIG. 3 shows a schematic view of the metal sheet shaped for formation of the sink,

FIG. 4 shows a schematic view of a vertex of the finished weldless sink,

FIG. 5 shows a schematic view of the minor side at a vertex of the edge of the sink after the first bending for formation of the edges,

FIG. 6 shows a schematic bottom view, and

FIGS. 7 and 8 show schematically two cross sections of the sink along a plane passing through line A-A of FIG. 6 and represent the

bending and hooking phases of the end segment.

With particular reference to the figures the sink (10) of the present invention comprises a single tank (12) and, laterally, a top (14) inclined toward the mouth of said tank. The sink (10) is delimited peripherally by a U-bent edge in which the front (16) constitutes the height of the edge and has a height preferably between 20mm and 40mm. Said sink (10) is made from a metal sheet, preferably stainless steel, whose development is diagrammed in FIGS. 2 and 3 in partial and whole form respectively. The metal sheet, of a thickness preferably between 0.5mm and 1.2mm, has a rectangular form with two opposed major sides (18) and two opposed minor sides (38) and four vertices (26) all having a conformation as described below.

The metal sheet has two bending lines, one more inward (42) and one more outward (42'), equidistant from each other and parallel with the sides of the metal sheet. The distance between the two bending lines is equal to the height (16) of the sink while the internal line (42) defines the sink top. These two lines (42,42') correspond to the two corners of the U-shaped edge (48).

The terminal portions (22) of each major side (18) of the metal sheet are lowered and filleted to the remaining central portion preferably by a bevelled length (20) having preferably an inclination of 45°. Each lowered terminal portion (22) of each major side (18) is provided with a U-shaped recess (30') and cut for a length extending substantially to the innermost bending line (42) along a plane parallel with the minor side (38) and moved toward the centre of the metal sheet from the innermost bending line (42).

The terminal portions (34) of each minor side (38) of the metal sheet are also lowered and filleted to the remaining central portion, preferably by a bevelled length (40) having preferably an inclination of 45°.

Each lowered portion (34) of each minor side (38) is provided with a V-shaped cavity (32) having its vertex corresponding to the outer bending line (42') and a U-shaped projection (30) nearer the vertex. Said U-shaped projection (30) has a height greater than the depth of the U-shaped recess (30') of the major side (18) and a width preferably less than that of said U-shaped recess (30'). Each lowered portion (34) is cut at the free end for a length extending to the inner bending line (42) along an oblique plane passing through the diagonal which unites the vertex of the metal sheet (26) with the vertex (28) of the inner bending line (42). Each free end of each minor side (38) of the metal sheet thus assumes the form of a triangular appendage (46) provided on the outer side of the U-shaped projection.

The vertex (24) of each lowered terminal portion (22) of each major side (18) is preferably bevelled. The triangular terminal part (44) of said lowered portion (22) of the major side (18) is lowered or recessed along a line (36) passing through the vertex (28) and symmetrical to the straight line which unites the vertices (26) and (28) for a depth equal to the thickness of the metallic sheet.

The lowering of the triangular terminal part (44) is achieved preferably by pressing. Said triangular terminal portion (44) of the major side (18) and the triangular appendage (46) of the minor side (38) are substantially equal and overlap each other during bending to form the vertices of the sink. After bending, the U-shaped projection (30) corresponds to the U-shaped recess (30') and the fixing of said triangular appendage (46) to the edge of the major side (18) is provided by the U-shaped projection (30) which is bent and hooked in the U-shaped recess (30') of the major side.

With reference to FIGS. 5-8 there is now described a preferred method for achievement of a support sink (10) with weldless edge at the corners.

First, the metal sheet is bent along the bending lines (42,42') so as to form along the major side (18) and minor side (38) a U-shaped edge (48) having a height (16) corresponding to the distance between the two bending lines (42,42').

After this U-shaped bending, the metal sheet has at each vertex a projecting segment corresponding to the triangular appendage (46). As may be seen in detail from an examination of FIG. 5, said appendage (46) has a length equal to the distance between the V-shaped cavity and the vertex (26) and a height slightly greater than the edge (48). Said appendage (46) forms an extension along each minor side (38) for each band of the edge (48) and constitutes the means of constraining the corners of the sink.

Drawing near and constraining each of said triangular appendages (46) to the surface of the edge (48') of the corresponding adjacent major side (18) are performed by successive bending operations. Said bends are preferably performed with equipment made up of movable dies.

The first bending consists of bending to 90° at the vertex of the triangular appendage (46) which draws near the band of the adjacent edge (48'). Following this first bending, performed in the direction indicated by the arrow "x" in FIG. 6, the appendage (46) which initially extends from the edge band (48) aligns with the adjacent edge band (48') arranging itself in the lowered terminal portion (44) of the major side (18).

The second bending consists of bending toward the interior of the edge (48') the part of the triangular appendage (46) which exceeds the height of the edge. The operation consisting of

flattening said portion which overlaps the lowered part of the U-bent edge is illustrated in FIG. 7 wherein the arrow "y" indicates the direction of bending.

The third bending consists of bending downward in the direction of the plane of the metal sheet of the projection (30) which projects from the triangular appendage (46). Said projection (30) is bent in the direction of the arrow "z" in FIG. 8 and is arranged in the recess (30') of the edge (48) bent like the letter U, achieving permanent hooking of said appendage (46) to the adjacent band of the edge (48') of the sink.

After completion of the bending operations the sink has four bands constituting the edge permanently constrained together without any requirement for welding at the vertices. Said configuration is illustrated in FIG. 4 in which the exposed front portion of the edge (48) develops without a break. The triangular appendage (46) is perfectly aligned and constrained to the adjacent band of the edge (48') and to the lower part of said edge.

As may be seen from the above the many advantages of the present invention are evident.

The article does not require welding on the corners for permanent connection of the bands constituting the edge. To form it therefore, it is not necessary to remove the protective film at the vertices. The latter are permanently constrained by successive bending operations on the triangular appendage (46) which, depending on specific requirements, can project either on the major sides or on the minor sides of the metal sheet.

Although the invention has been described in conjunction with a specific embodiment it is evident that many alternatives and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, the invention is intended to embrace all of the alternatives and variations that fall within the spirit and scope of the appended claims.

For example, the triangular appendages (46) which are bent back along the edges of the article can have a different configuration and/or extension from that proposed by way of example and be constrained to the lower part of the U-bent edge of the article by rivetting or equivalent holding systems.

It is also intended that the metal sheet, although proposed in particular for the achievement of stainless steel sinks with rectangular plan and 90° corners, could be used for the creation of articles of another type and form such as for example metallic cooking tops, doors or frames of appliances or furniture, with edge optionally bent back in an angle other than 90°.

Claims

1. Shaped metal sheet for achieving polygonal manufactured articles and in particular a support sink with edges bent back in a U shape and constrained at the vertices without welding and said sheet metal having a rectangular form comprising four vertices (26) and two opposed major sides (18) and two opposed minor sides (38) and provided along the entire edge with two equidistant bending lines (42,42') parallel to the edges of the metal sheet and of which a more inward one (42) and a more outward one (42') corresponding to the two corners of a U-shaped edge (48) and characterized in that each vertex has the following configuration:
 - a) each terminal portion (22,34) of the major (18) and minor (38) sides of the metal sheet, which together form each vertex (26), is lowered and filleted to the corresponding central portion preferably by a bevelled part (20,40);
 - b) each lowered terminal portion (22) of each major side (18) of the metal sheet is provided with a U-shaped recess (30') and is cut, for a length which extends substantially to the most inward bending line (42), along a plane parallel to the minor side (38) of the metal sheet and moved toward the centre of the metal sheet from the most inward bend (42);
 - c) each lowered terminal portion (34) of the minor side (38) of the metal sheet is provided with a V-shaped cavity (32) having its vertex on the outermost bending line (42') and a U-shaped projection (30), each lowered terminal portion (34) being cut at the free end for a length extending to the innermost bending line (42) along an oblique plane passing through the diagonal which unites the vertex (26) of the metal sheet with that (28) of the innermost bending line (42) so as to form a triangular appendage (46);
 - d) the free end of the major side (18) is preferably bevelled at the vertex (24) and its terminal part (44), for a triangular extension substantially equal to the terminal triangular appendage (46) of the minor side (38), is recessed or lowered by a thickness equal to that of the metal sheet; and
 - e) the U-shaped projection (30) of the minor side (38) corresponds to the U-shaped recess (30') of the major side (18) when the sides are bent along the two bending lines (42,42') and the triangular appendage (46) of the minor side (38) is bent on the lowered triangular terminal portion (44) of the major side (18).
2. Metal sheet in accordance with claim 1 wherein the U-shaped projection (30) has a height greater than the depth of the U-shaped recess (30') and a width less than that of said U-shaped recess (30').
3. Metal sheet in accordance with claim 1 or 2 wherein the triangular terminal part (44) of the major side (18) is lowered or recessed along a line (36) passing through the vertex (28) of the internal bending line (42) and symmetrical to the oblique line which unites the vertex (26) of the metal sheet with that of the internal bending line (42).
4. Metal support sink provided with a U-shaped edge achievable by bending of the metal sheet of the above claims and in which the edge (48) of the minor side (38) has at each end a triangular appendage (46) bent back and arranged in the lowered terminal part (44) of the edge (48') of the major side (18) and constrained to said edge (48') by bending of the projection (30) in the corresponding recess (30').
5. Support sink in accordance with claim 4 characterized in that said triangular appendage (46) is aligned with the edge (48,48') and the lower strip of said U-bent edge.
6. Support sink in accordance with claim 4 or 5 characterized in that the triangular appendage (46) is bent back inward of the edge (48') for a length corresponding to the part which exceeds the height of the edge.
7. Procedure for the formation of manufactured articles with bent back edges and in particular flush-mounted stainless steel sinks comprising a first bend at each vertex of the triangular appendage (46) arranged at the end of the edge (48) until it draws near the band of the adjacent edge, a second bend of said appendage inward of the edge (48') by the part which exceeds the height of the edge and a third bend in the direction of the sink top of the projection (30) projecting from said triangular appendage (46) until it hooks to the lower strip of the U-bent edge.

FIG. 1

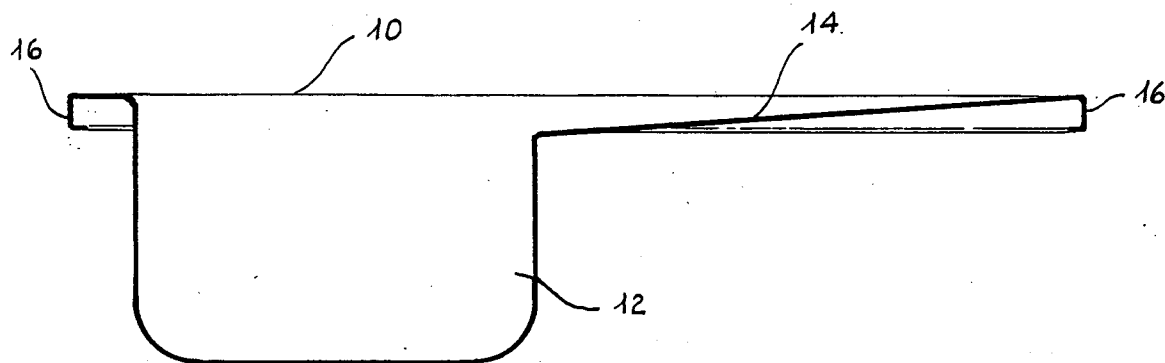


FIG. 2

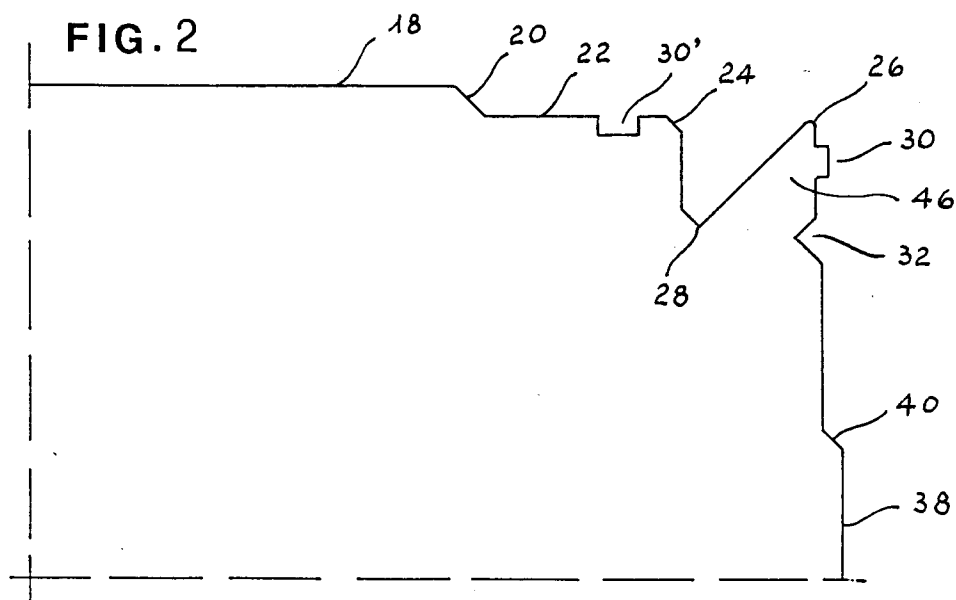
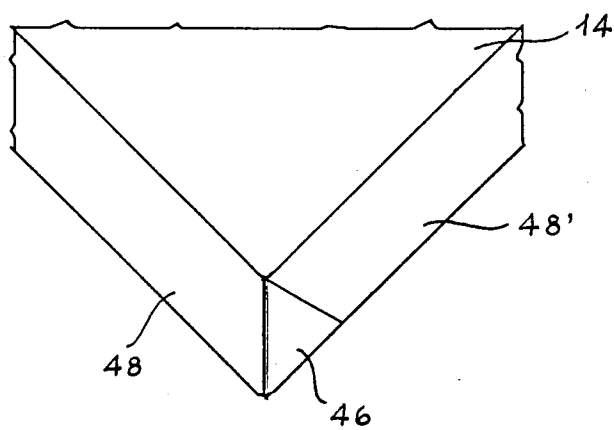
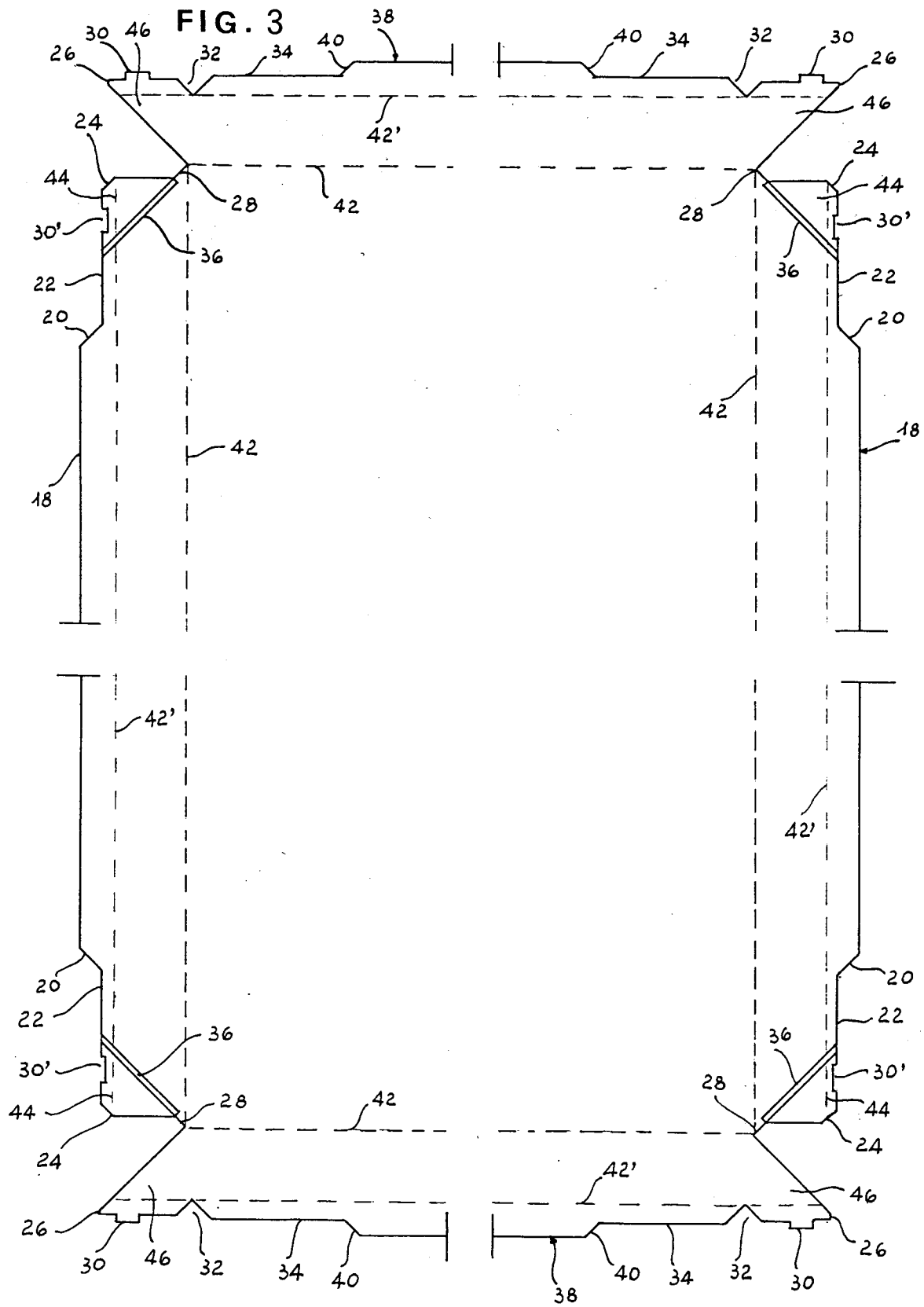
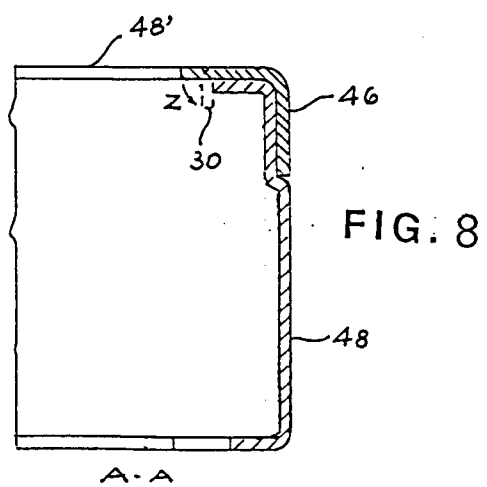
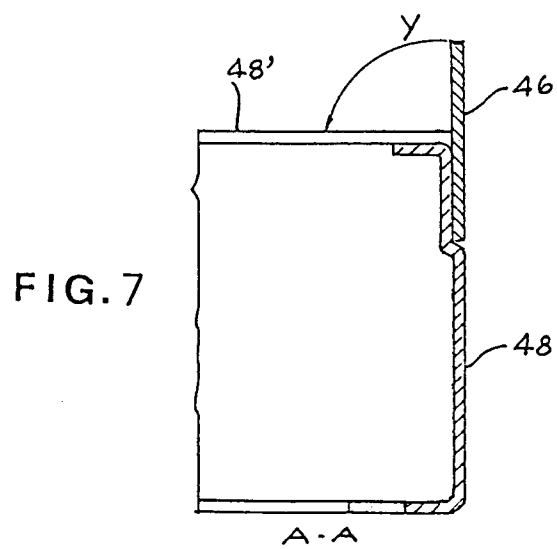
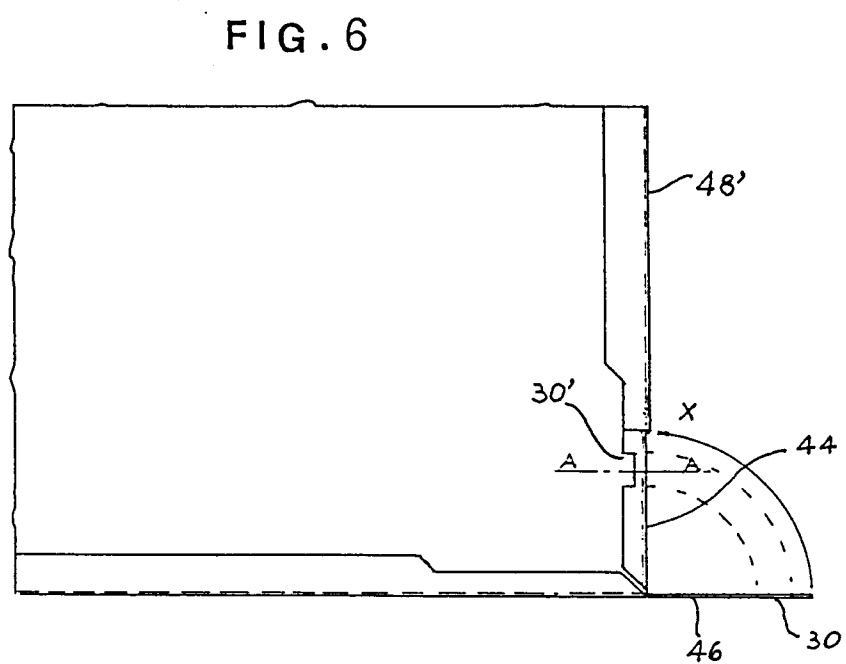
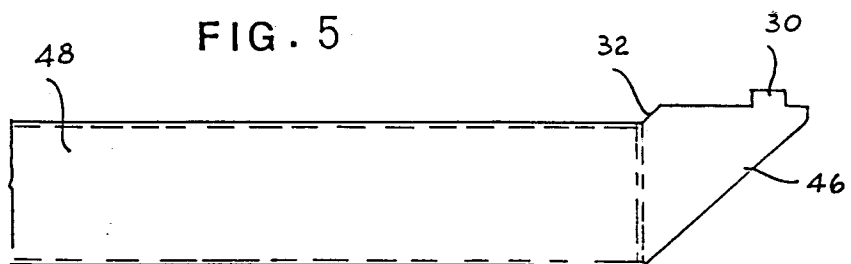


FIG. 4









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EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0407

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 159 199 (LIBAUD) * figures 4-9 * -----	1, 4, 7	B21D19/08 B21D51/52 E03C1/182
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B21D E03C B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 MARCH 1993	Examiner RIS M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	