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Method for making a skip body with a concave cross section

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METHOD FOR MAKING A SKIP BODY WITH A CONCAVE CROSS SECTION

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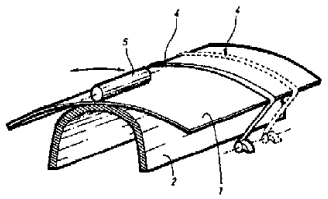
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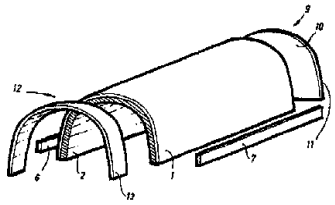
(54) Title: METHOD FOR MAKING A SKIP BODY WITH A CONCAVE CROSS SECTION

(54) Titre: PROCEDE DE FABRICATION D'UN CORPS DE BENNE A PROFIL CONCAVE

(57) Abstract

. A method for forming a one-piece skip body with a concave cross section from a large metal sheet (1) by imparting an approximate cross section to the sheet using shaping means (2) is disclosed. According to the method, the approximate cross section is maintained while a sealing plate (10) is secured to one end (9) and a stiffening reinforcement member (13) shaped according to the final cross section is attached to the other end (12). The longitudinal edges are stiffened then the most curved areas are mechanically treated and the shaping means (2) are released. The method is relevant to skip manufacturers and more generally to builders of utility vehicles.





(57) Abrégé

Le procédé permet de former d'une seule pièce un corps de benne à profil concave à partir d'un grand format (1) de tôle en imposant un profil voisin par des moyens de conformation (2), en solidarisant, tout en maintenant ce profil voisin, une plaque d'obturation (10) à l'une des extrémités (9) et à l'autre extrémité (12) un renfort (13) de rigidification conformé selon le profil définitif, puis après avoir rigidifié les bords longitudinaux, de procéder à un traitement mécanique des zones à forte incurvation et de lâcher la prise des moyens de conformation (2). Cette invention concerne les constructeurs de bennes et plus généralement les carrossiers de véhicules utilitaires.

ABSTRACT

A method for forming a one-piece skip body with a concave cross section from a large metal sheet (1) by imparting an approximate cross section to the sheet using shaping means (2) is disclosed.

According to the method, the approximate cross section is maintained while a sealing plate (10) is secured to one end (9) and a stiffening reinforcement member (13) shaped according to the final cross section is attached to the other end (12). the longitudinal edges are stiffened then the most curved areas are mechanically treated and the shaping means (2) are released.

The method is relevant to skip manufacturers and more generally to builders of utility vehicles.

Figure 2 and 4.

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METHOD FOR MAKING A SKIP BODY WITH A CONCAVE CROSS SECTION

The invention concerns a method for manufacturing a concave skip body, or more specifically, a skip body with a concave cross section and a continuous inwardly curved base from one large sheet of metal, thereby allowing unitary construction.

Concave skip bodies are presently shaped by bending.The concave shape of the transverse section results from performing a succession of longitudinal bending operations which impart a polygonal shape to the body.

This succession of creases is unsatisfactory for several reasons.

First, the interior structure of a shaped skip body which is in contact with the cargo should be as smooth as possible, with no bulging areas to attract residue which could adhere to the metal when freight is discharged and adversely affect wear over time. It is preferable for no residue to remain on the structure, since it could interact with the next shipment to be transported.

Furthermore, the utmost care is required when bending certain metals such as aluminum.

Moreover, other metals of interest, such as highly flexible steel known as HLE or THLE, will not maintain a definitive form unless they are bent into shape. The use of such metals is particularly exacting when shaping long objects that are hard to form of one piece, such as skip bodies. Large sheets of these metals have proven extremely difficult, if not impossible, to shape in any way other than by bending them on forms designed to interlock in the same way a skip body fits onto its complementary cradle receptor.

In addition, because of these complementary shapes, the creases in the skip body and in the cradle

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must be perfectly concentric. This technique requires the use of precise machinery that is very cumbersome.

Thus, the only choices remaining are to either use smaller dimensions or continue using the bending technique despite its many disadvantages.

However, the metals discussed above also have many qualities that make them preferable to conventional metals.

Practically speaking, because of its lower density, a vehicle using aluminum can carry a heavier load. For this reason many transport vehicles already use trailers, semi-trailers and skip bodies made primarily of aluminum.

These skip bodies are all conventionally designed and are generally rectangular in shape, with multiple reinforcing structures.

For other reasons, highly flexible steel is one of the preferred metals for constructing skip bodies.

While there is a serious risk that aluminum will fissure when creased, highly flexible steel is also very unsuitable for bending and is actually so resistant that it is impossible to bend using present methods.

However, both highly flexible steel known by the acronym HLE and very highly flexible steel known as THLE offer two advantages that make them very desirable for skip body construction:

- they are highly mechanically resistant to shocks and punctures, a quality which is particularly useful for skip bodies transporting heavy loads, minimizing the risk of damage when heavy freight is discharged and performing well in nearly any application;
- the steel is highly resistant to abrasion.

The high resistance of this metal provides greater weight while at the same time decreasing cost, since thinner metal can be used.

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However, these same advantages precipitate manufacturing problems.

The flexible steel has a spring-like quality which not only resists precise formation into such a definitive, unnatural, shape, but also resists maintaining the curved shape.

The specific problem addressed here is how to achieve an industrial process for manufacturing skip bodies with a consistent inwardly curved, continuously convex shape, essentially semi-elliptical, with a certain degree of precision and using a reproducible operation.

The present invention relates to an industrial process for manufacturing a skip body from a single sheet of metal or several adjacent sheets seamed either longitudinally or transversely, manipulated and shaped as a single element.

More specifically, the invention relates to a a method of forming a skip body into a continuously curved, concave unit, without creasing it, from a large sheet of metal, characterized by the following steps:

- a large sheet of metal is prepared form one piece or several joined pieces;
- the single sheet of metal is curved inwardly using maintenance means into a cross section approximating the definitive shape desired for the ultimate shape of the body of the skip;
- a sealing plate is secured to one of the extremities of the skip body, the contours of which have the exact concave shape to be obtained, by gradually applying the edges of the opening of this end of the metal sheet against the cut edges of the sealing plate during the installation process;
- the opposed extremity of the skip body is stiffened by means of a stiffening member according to the definitive shape to be reached;
- the pressure of the maintenance means is relaxed and the skip body is disengaged, having assumed its definitive shape; and
- the stiffening of its longitudinal edges is performed either before or after the metal is curved inwardly.

The present invention makes it possible to fabricate a concave skip body that is continuously curved, with no creases, from a large sheet of any type of metal suitable for manufacturing skips, and more specifically from any of the preferred metals such as aluminium and highly flexible steel.

Other features and advantages of the invention will be apparent from the following description, provided as an example, and with reference to the drawings, wherein:

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- Figs. 1 through 5 are schematic illustrations of a first method of application to a convex form;
- Figs. 6 through 13 are schematic illustrations of a second variation using a concave form;
- Figs. 14 through 17 are schematic illustrations of a third method called the clamping method;
- Fig. 18 shows an example of mechanical treatment.

The invention features three methods of curving the metal: a first method in which it is applied to a form, a second method in which it is introduced into a form; and a third method in which it is clamped.

Method Using Application to a Form

This method consists of shifting and then applying the entire surface of a large sheet of metal 1 or a considerable portion thereof onto the lateral surface of a form or a counter-form 2 which approximates, with some slight differences, the concave shape of the skip body 3 to be produced (Figs. 1 through 5).

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The metal is applied to this counter-form using any suitable method of holding or applying it: straps 4, movable pressure wheels or rollers 5, cylinders, chains....

The edges or verge portions 6 or 7 may be formed either before or after the metal is passed along form 2.

If they are made first, they can be used as handles for holding it in place.

The verge portions can be made rigid either by the formation of one or more ribs, creases, or other deformations 8, or by mechanical, thermal, or chemical treatment.

While the metal is held in place on form 2, for example, by straps 4, one end is reinforced and the other end is sealed.

To do this, a rigid transverse wall or sealing plate 10 is soldered onto one of the extremities 9, generally the front extremity, which plate has a profile 11 that corresponds exactly to the shape of body 3 of the resulting skip. The extremity, when immobilized in this way, serves to make the length of the body rigid.

The other extremity 12 is then stiffened, which usually is used as a temporarily sealed opening and for discharging cargo when in the inclined unloading position.

Various reinforcement means are used to achieve this. They may consist of adding a reinforcement lining 13 to a predetermined longitudinal portion of the skip body, adding a compartment, or joining a reinforcing tube or other rigid element of adequate weight and thickness.

According to this method, there are some differences in shape between the form and the definitive profile.

It is preferable to pre-bend the form to a

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certain extent, that is, making it slightly more concave in the lower central portion to accommodate the elasticity of the steel and the its tendency to resume a flat exterior shape.

In this way, an allowance is made for ultimate deformations in the skip body.

Introduction Inside a Form:

According to this method, the sheet 1 of metal, having been produced by seaming or some other means, is held by its longitudinal edges using any floating or movable means to contact, for example, the edges or verge portions 6 or 7 which are preferably attached after the longitudinal edges have been attached (Figures 6 through 13).

As before, the edges of the verge portions may be made more rigid either by the formation of longitudinal ribs, creases, or other deformations, or by mechanical, thermal, or chemical treatment.

The metal is introduced inside the form, which has the concave portion facing upward. Next a specially shaped stamp or die 14 is used (shown by an arrow in the drawings) which causes the sheet 1 of metal to forcibly engage by means of the vertical pressure from the central longitudinal portion of the stamp onto the central longitudinal area 15 of the sheet of metal, while the longitudinal edges still remain vertical. While stamp 14 is being lowered, the longitudinal edges of the metal move toward each other until the sheet of metal is pressed tightly against the interior surface of form 2 and the exterior surface of the stamp (Figures 6 through 10).

The sheet of metal is compressed between these two shapes and assumes the concave shape of the form.

The sheet of metal may also be introduced by sliding it along the interior surface 16 of form 2

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(Figure 11) while pushing and/or pulling it downward by its two longitudinal edges. If necessary, it may be pushed down while constraining it against the interior lateral surface of the form.

While maintaining this pressure, both extremities of the partially completed skip body are sealed and closed or reinforced in the same way as before.

The sheet of steel may also be introduced into the form by pressing the two edges or the two verge portions toward the longitudinal edges of the form.

In that case, the metal is stiffened either immediately or after shaping along its longitudinal edges with verge portions 6 or 7 or suitable longitudinal stiffening deformations.

An advantage of this method is that it shapes the skip body in its normal usage position, eliminating the need to turn it over when the operation is complete.

Clamping Method:

With this method shown in Figs. 14 through 17, no form is used. A large sheet 1 of metal is used, or a sheet of metal of the required dimensions is made by joining several smaller sheets.

In this case, the upper extremities of skip body 3 are next stiffened either by attaching edges or verge portions 6 or 7 or by longitudinal deformation of the sheet to provide rigidity.

As before, the verge sections may also be longitudinally reinforced either by forming ribs, creases, or other longitudinal deformations, or by mechanical, thermal, or chemical treatment.

The length of the sheet of metal is then clamped by an exterior clamping means 17, such as straps or similar means.

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Clamping means that the two lateral edges are pushed toward each other up to a certain point.

Next, sealing plate 10 is placed at one of the extremities 9 and used to form the definitive shape.

The plate has previously been cut to the identical shape of the finished product.

Next, the clamping means are either tightened or released locally to form the shape of the open end around profile edge 11 of sealing plate 10 and its edges are gradually soldered to the corresponding edges of the extremity 9 of skip body 3.

The other extremity 12 is reinforced using a preform in a manner similar to the method using a shaping form.

When the other extremity has been stiffened, clamping means 17 are released.

In this instance, the upper extremities of the skip body are then stiffened by attaching verge sections 6 or 7 or by stiffening it longitudinally.

Mechanical Treatment:

A variation of the method is to treat the most broadly curved portions of the sides 18 of skip body 3 with a pressurized spray of metal particles, gravel or other hard particles from nozzles 19, using a granulating or hammering procedure along the length of the skip body to improve its shape and maintain its form (Figure 18).

This mechanical effect has the advantage of relaxing the surface material, that is, stretching the fibers of the exterior metal skin and thus neutralizing its tendency to resume its initial flat shape. It also offers the advantage of providing anti-corrosion protection under pressure.

This mechanical treatment can take place from the outside while the metal is still inside the form,

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which would have openings for this purpose, for example, a perforated structure or one with open sections separated by curved elements such as arches 20 shown in Figure 18.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of forming a skip body form a large sheet of metal with a continuously curved, concave cross-section without creasing it, characterized by the following steps:

- a large sheet of metal is prepared from one piece or several joined pieces;
- the single sheet of metal is curved inwardly using maintenance means into a cross-section approximating the definitive shape desired for the ultimate shape of the body of the skip;
- a sealing plate is secured to one of the extremities of the skip body, the contours of which have the exact concave shape to be obtained, by gradually applying the edges of the opening of this end of the metal sheet against the cut edges of the sealing plate during the installation process;
- the opposed extremity of the skip body is stiffened by means of a stiffening member according to the definitive shape to be reached;
- the pressure of the maintenance means is relaxed and the skip body is disengaged, having assumed its definitive shape;
- the stiffening of its longitudinal edges is performed either before or after the metal is curved inwardly.

2. A method of forming a skip body according to claim 1, characterized by securing the sealing plate to the extremity of the skip body after the stiffening of the other extremity of the sheet by means of a stiffening member according to the definitive shape to be reached.

3. A method of forming a skip body according to claim 1, characterized in that verge portions are secured to the sheet of metal before the metal is curved.

4. A method of forming a skip body according to claim 1, characterized in that verge portions are secured to the sheet of metal after the metal is curved.

5. A method of forming a skip body according to the preceding claim, characterized in that verge portions are secured to the sheet of metal after the stiffening of the other extremity of the sheet by means of the stiffening member.

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6. A method of forming a skip body according to any one of the claims 1, 2 or 3, characterized by using a form which has been pre-molded into the ultimate shape of the skip body.

7. A method of forming a skip body according to any one of the claims 1, 2, 3 or 6, characterized in that the sheet of metal is curved inward by applying it to the exterior surface of a convex form.

8. A method of forming a skip body according to any one of the claims 1, 2, 3 or 6, characterized in that the sheet of metal is curved inwardly by introducing it inside the concave interior of a concave form, placing it in contact with this surface and maintaining it in contact.

9. A method of forming a skip body according to claim 8, characterized in that the sheet of metal is placed in contact with the interior concave surface of the concave form by sliding it along said interior surface.

10. A method of forming a skip body according to claim 8, characterized in that the sheet of metal is placed in contact with the concave interior surface of the concave form by pushing the central portion down.

11. A method of forming a skip body according to claim 8, characterized in that the sheet of metal is placed in contact with the interior concave surface of the concave form by pressing together the longitudinal edges or the two verge portions down towards the longitudinal edges of the form.

12. A method of forming a skip body according to any one of the preceding claims, characterized in that the metal is released by applying mechanical treatment to its most curved areas.

13. A method of forming a skip body according to the receding claim, characterized in that mechanical treatment occurs after the verge portions have been secured.

14. A method of forming a skip body according to either claim 12 or 13, characterized in that the mechanical treatment consists of a spray of grains or solid particles of hard material.

15. A method of forming a skip body according to any one of the preceding claims, characterized in that a longitudinal deformation is used to stiffen the

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longitudinal deformation is used to stiffen the longitudinal edges of the sheets of metal.

16. A method of forming a skip body according to any one of the preceding claims, characterized in that the longitudinal edges of the sheet of metal are stiffened by mechanical, thermal, or chemical treatment.

17. A method of forming a skip body substantially as described herein with reference to the accompanying drawings.

Dated this twentieth day of September 1999

LOHR INDUSTRIE
Patent Attorneys for the Applicant:

F B RICE & CO

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FIG.1

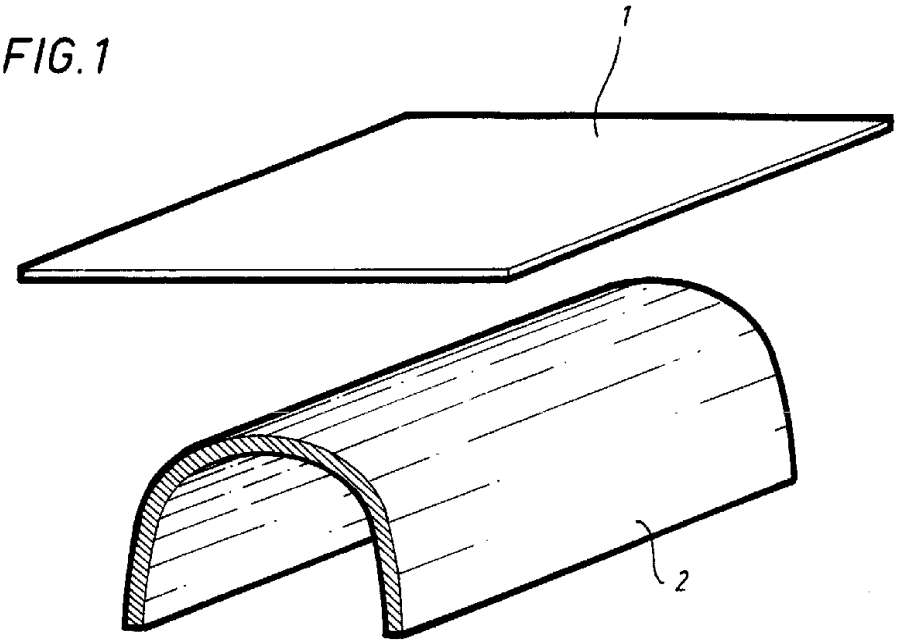


FIG.2

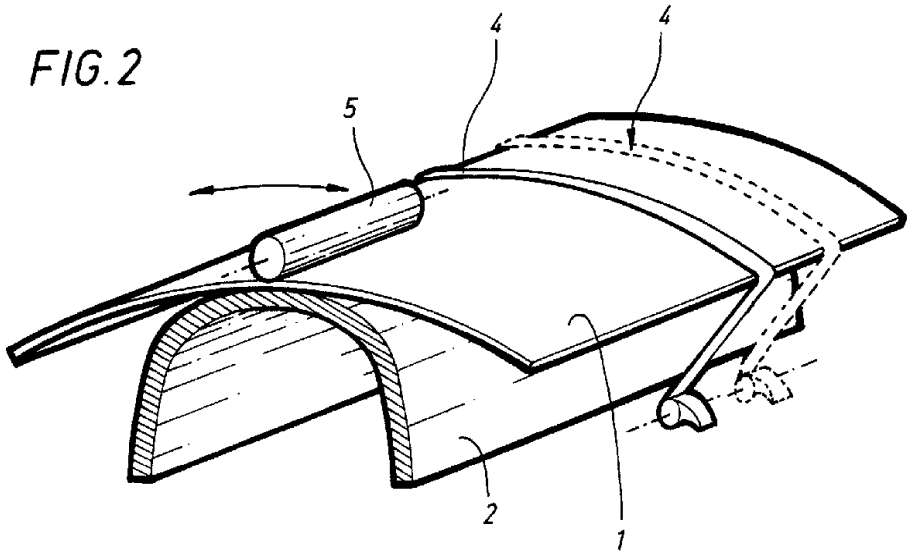


FIG.3

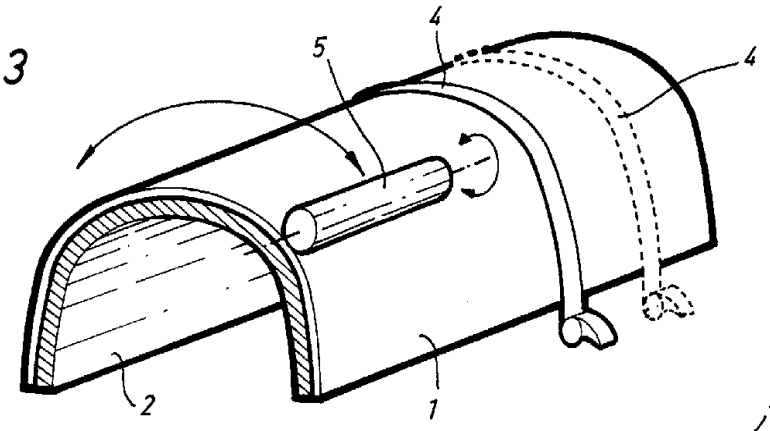


FIG.4

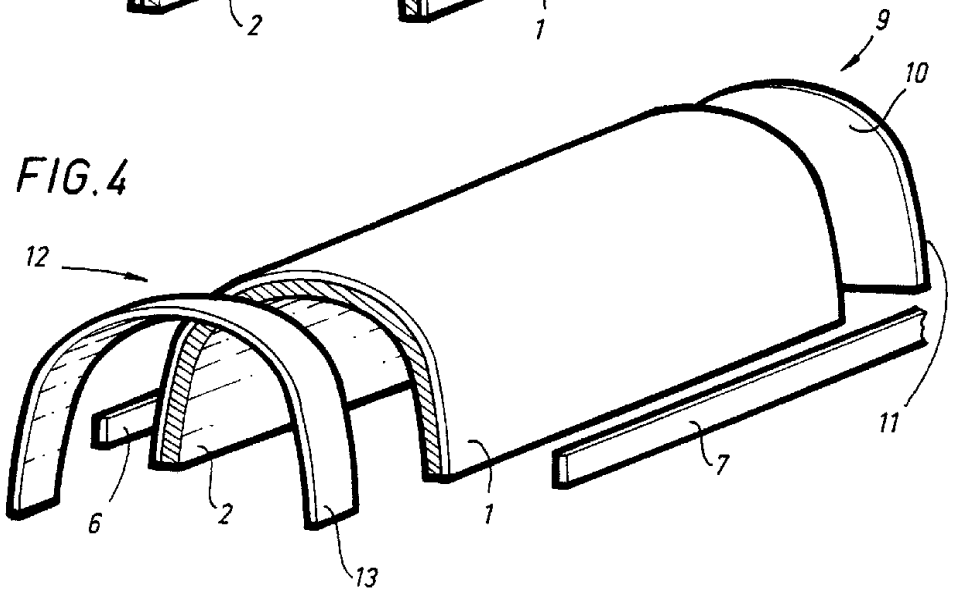


FIG.5

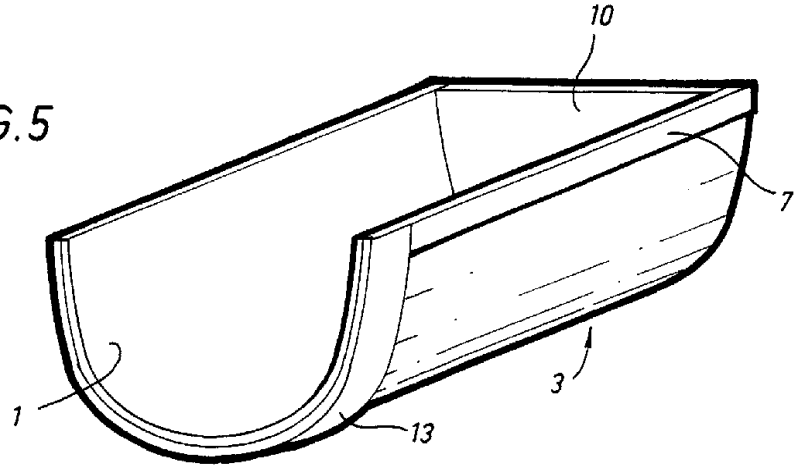


FIG.6

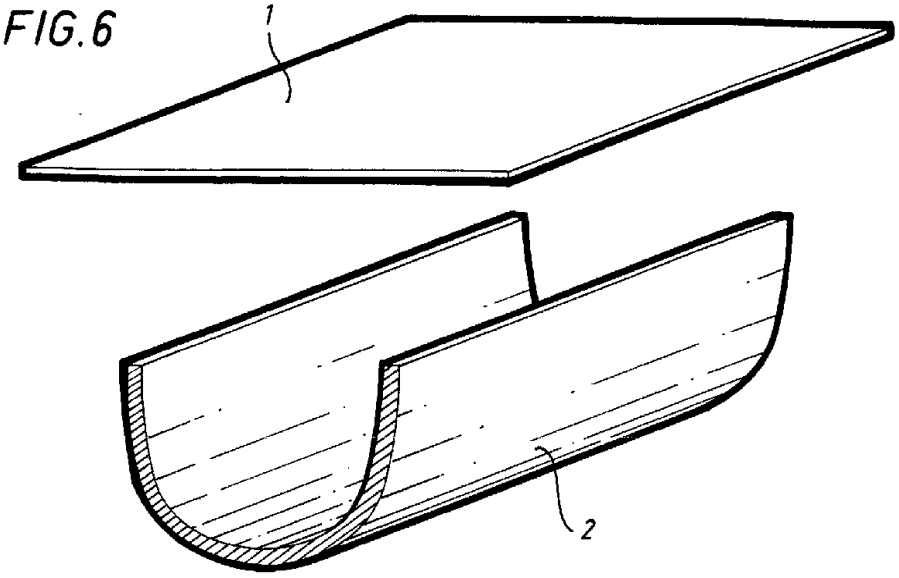


FIG.7

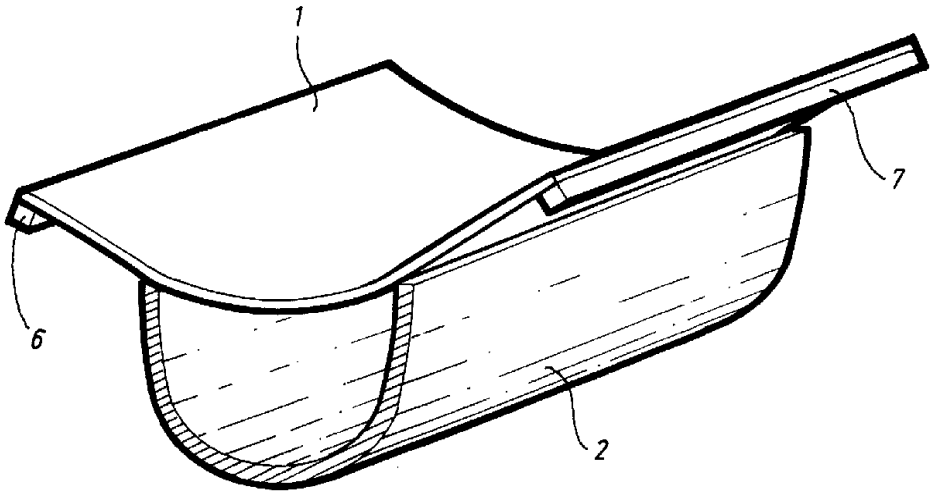


FIG.8

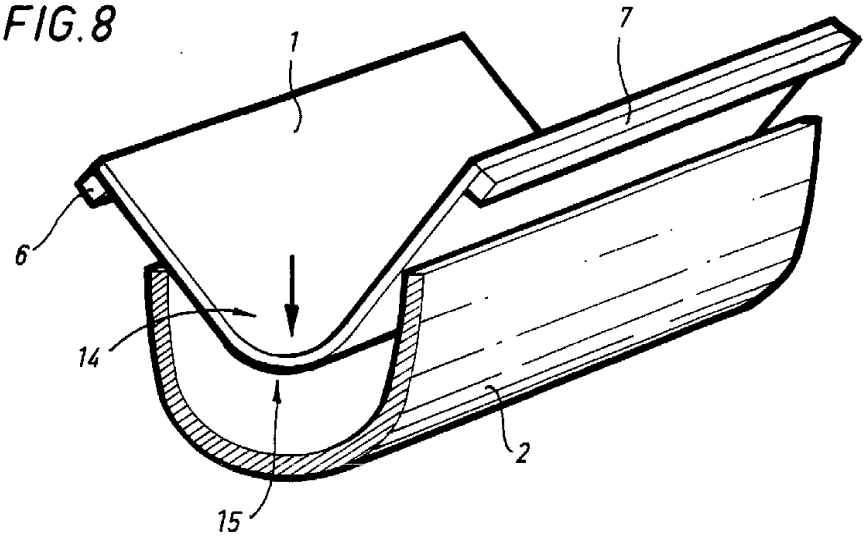


FIG.9

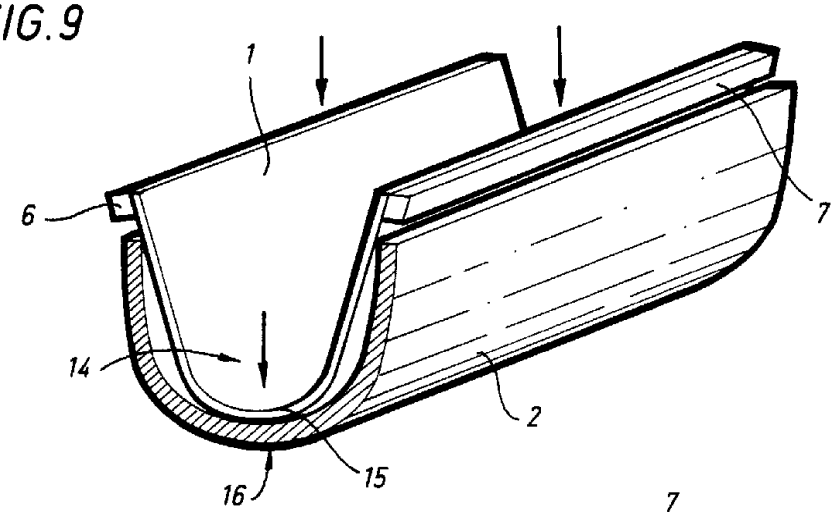


FIG.10

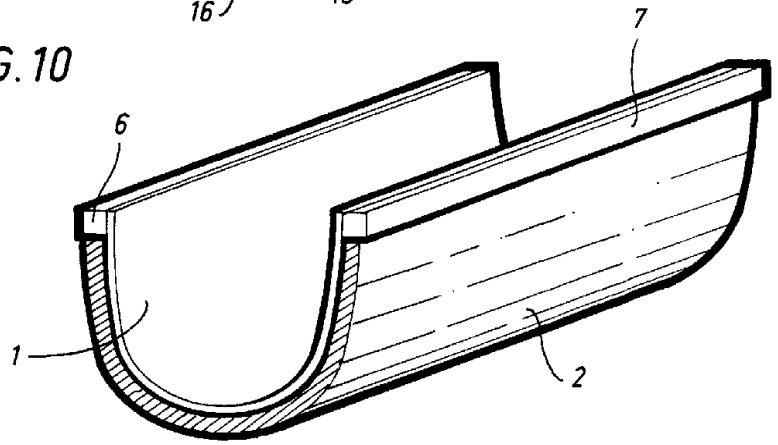


FIG. 11

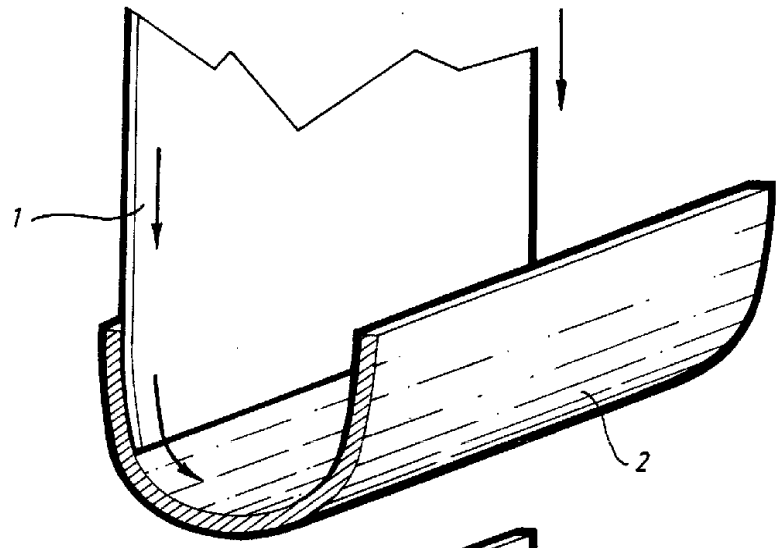


FIG. 12

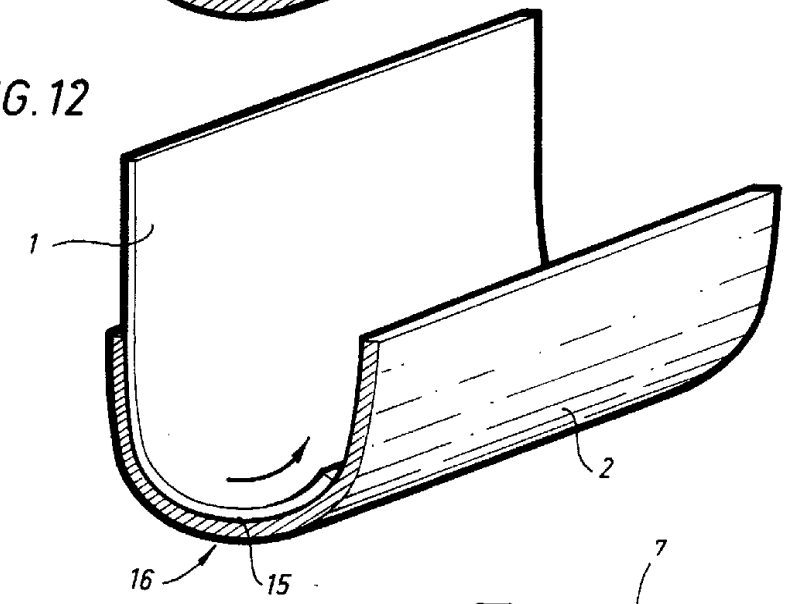


FIG. 13

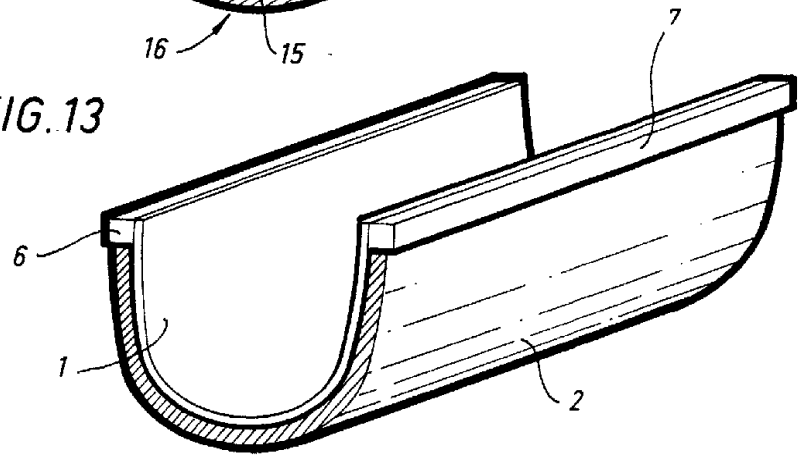


FIG. 14

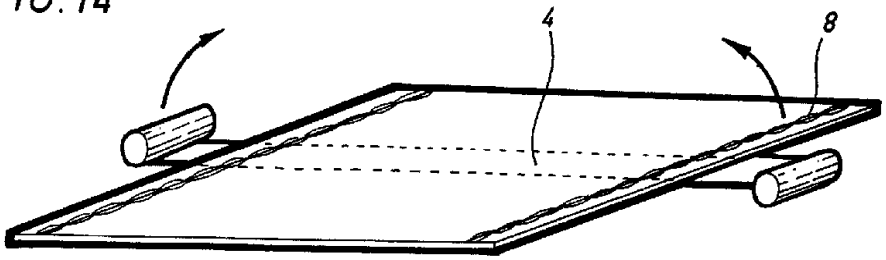


FIG. 15

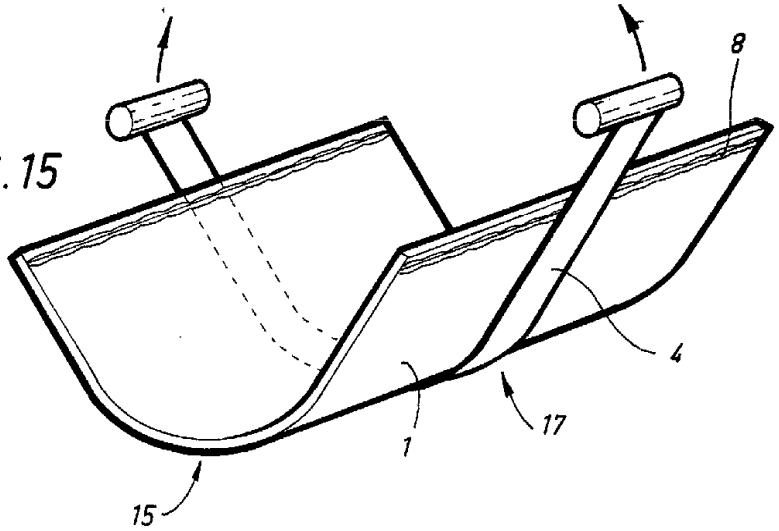


FIG. 16

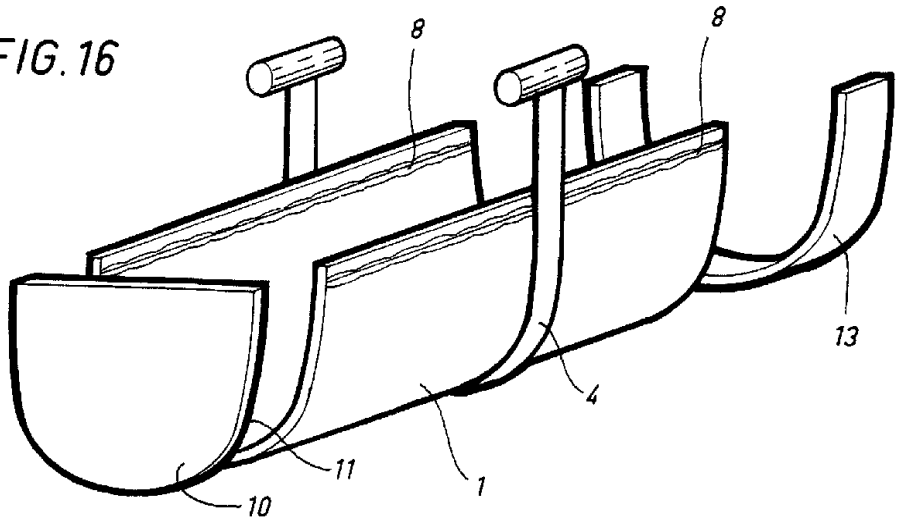


FIG. 17

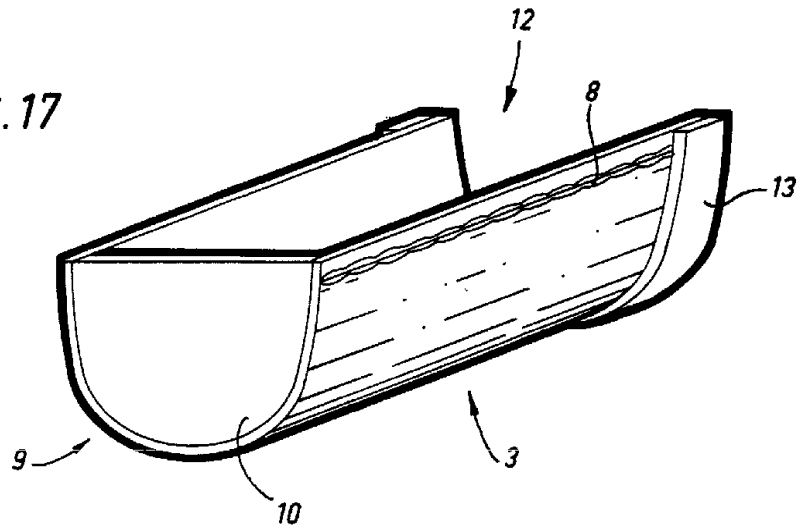


FIG. 18

