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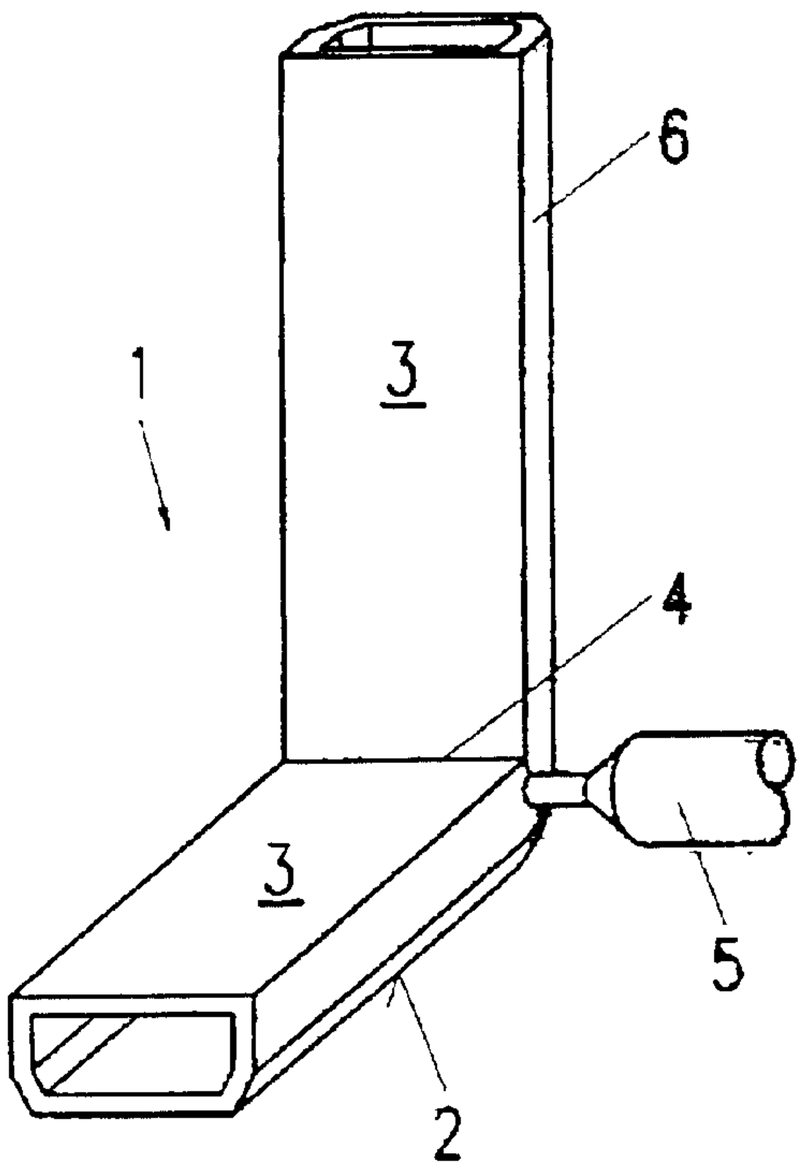
(54) Titre : PROCEDE DE PRODUCTION DE BARRES PROFILEES CREUSES COUDEES
(54) Title: METHOD FOR PRODUCING BENT HOLLOW PROFILE STRIPS



(57) Abrégé/Abstract:
The invention relates to a method for producing plastic, bent, hollow profile strips. According to said method, the hollow section is filled with plastic on both sides of the bend point during bending, in order to reinforce this area. The process comprises the following steps: fixing a plastic strip (1) in a bending device; heating the bend point; bending the strip, and inserting plastic (7) into the bent area on both sides of this area. The invention hereby provides a means of producing stable plastic frames with reinforced corners for use as spacers in multi-pane insulating glazing.

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Abstract of the Disclosure

The invention relates to a method for producing plastic, bent, hollow profile strips. According to said method, the hollow section is filled with plastic on both sides of the bend point during bending, in order to reinforce this area. The process comprises the following steps: fixing a plastic strip (1) in a bending device; heating the bend point; bending the strip, and inserting plastic (7) into the bent area on both sides of this area. The invention hereby provides a means of producing stable plastic frames with reinforced corners for use as spacers in multi-pane insulating glazing.

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23444-396

METHOD FOR PRODUCING BENT HOLLOW PROFILE STRIPS

The present invention refers to a method for producing bent hollow profile strips for use as plastic spacers for a multi-pane insulating glazing.

Such a manufacturing method is known from EP-A-0 103 111, where a connecting body of an adhesive material connects two hollow profiles while an adhesive of this kind can also be used in order to reinforce corners. These connections replace socket connections and are intended for metal profiles.

In many applications of hollow profile strips, more particularly if they are used for the manufacture of spacer frames for multi-pane insulating glazings, it is important that the outwardly facing surface of the frame is tight, and it has therefore been attempted to produce the frames by bending a strip instead of assembling individual strips.

In the manufacture of frames from metal profiles, mostly of aluminum, a method for producing a spacer frame is e.g. known from EP-A-003 715, where the inwardly facing wall section of the profile bar is cut transversally to its longitudinal extension before being bent. The purpose of this incision is to prevent upsets at the corner when the bar is bent.

WO-93/20319 discloses a method for producing spacer frames where the frame is filled with a granular drying agent prior

to bending, the drying agent being previously mixed with a compressible granulate. Subsequently, the metallic profile frame is bent. In the process, the bend points may be weakened especially in the case of thin-walled strips.

While spacer frames of metal have been known for quite a long time, and bending methods for the same have therefore been well studied, further difficulties are encountered in the manufacture of spacer frames of plastic materials since bending hollow profile strips without upsetting and especially also without weakening them e.g. by sawed or punched cuts in the inner edge of the frame is very problematic.

On the background of this prior art and of the described problems, it is the object of the present invention to provide a method for producing bent hollow profile strips from plastic materials in which the resulting frame offers a sufficient stability for the intended purposes at the bend points and conserves the required shape. In particular, it is also an object of the present invention to provide a method which allows to form frames from spacers of thermoplastic materials for a multi-pane insulating glazing according to DE-A-195 33 685 whose corners fulfill the requirements with respect to stability and dimensional accuracy, and which comprise clean and acute angles in a further development of the invention. These objects are attained by the methods defined in the independent claims.

The invention is explained in more detail hereinafter with reference to a drawing of an exemplary embodiment where the figures show different steps of the process of the invention

for reinforcing a bend point and for bending a hollow profile strip which may subsequently form a frame.

In accordance with this invention, there is provided method for producing bent hollow profile strips, in which a reinforcing mass is introduced into a hollow section on both sides of a bend point in order to reinforce bent areas, characterized by the steps of: - chucking a plastic material strip (1) in a bending device; - heating the bend point; - bending the plastic material strip; - introducing a plastic material (7) into the hollow section of the strip at the bend point and on both sides of the bent area in order to reinforce it.

In accordance with another aspect of this invention, there is provided a multi-pane insulating glazing having a spacer frame of a thermoplastic material, characterized in that the spacer frame has a profile adaptable to the periphery of glass panes, and which is bent to be adapted to the size of the glass panes and which is reinforced in bent areas by the introduction of plastic inside the bent area in order to reinforce it.

FIG. 1 shows a perspective view of a profile strip;

FIG. 2 shows the strip of FIG. 1 with an incision;

FIG. 3 shows the bent profile strip with a schematically illustrated injection nozzle applied thereto; and

FIG. 4 shows a longitudinal cross-section of the finished bent strip with the reinforced corner.

FIG. 1 shows a hollow profile strip 1, which is simplified and schematically illustrated for better

understanding, but which may be shaped and designed according to the above-mentioned application DE-A-195 33 685 and may e.g. consist of a glass-fiber reinforced plastic material, and whose external side 2 may be provided with a bonded metal foil. The strip may also be of metal. Hereinafter, hollow profile strip 1 will briefly be referred to as strip 1.

Such a strip 1 can be supplied automatically from a shelf of a bending device to the milling and cutting installation of the automatic bending device, where it is automatically connected by means of a longitudinal connector to the remainder of the preceding strip to form an endless strip, if necessary. While metering the required strip length for the frame to be produced, the strip is stopped at the first bend point by the electronic control. Subsequently, the strip is fed to a cutting and milling installation where an

incision 4 is made in the internal side 3 of the strip while observing a defined cutting depth.

Of course, incision 4 can also be made by the saw blade, which can be used for this purpose by adjusting its cutting depth. The incision is made at every bend point of the strip. The shape and the depth of the incision essentially depend on the angle to be bent, the V-shaped incision which is schematically shown in FIG. 2 being intended for a 90° bend. After the last bend milling, the strip is sawed off by the saw blade at the required length.

The bending operation is effected in the subsequently described steps. First, the strip is transported to the first bending position in the bending tool of the bending device, and when the bend point is attained, it is chucked in a clamping device in front and after the bend point. Then, the wall of the strip is preheated at the bend point, where e.g. a first hot-air nozzle (not shown) is pointed at the bend point from below and a second hot-air nozzle (not shown) is pointed at the bend point directly through incision 4 in the strip. After the desired and adjustable preheating time, the hot air is turned off, and the nozzles are swung out of the bending area.

After the heating operation, the clamping jaws are displaced to the bending position, and then the bending jaw of the bending tool is displaced to the desired angular position, which may be equal to or different from 90°. At the start of the bending operation, a heated injection nozzle 5 is pushed through a transversal wall 6 at the bend point of the strip. As soon as the required bending angle is attained, while the nozzle has punctured the strip wall, the injection

of a thermoplastic material 7, e.g. as known under the abbreviations SAN, ABS, and possibly glass-fiber reinforced, is started. The injected quantity of the material can be regulated automatically. The injecting position, resp. the injecting angle are chosen such that the plastic reinforcing mass is regularly distributed inside the profile on both sides of the corner.

At the beginning of the injection, the injection nozzle is retracted a distance which corresponds to the wall thickness so that the hole produced in the strip due to the injection is automatically filled with plastic material. In the case of a metallic strip, an already existing drilling hole having served for the removal of drying agent grains may be used for the injection, for example.

In analogy to an injection molding tool, the clamping unit is cooled. After the cooling time, the bending tool returns to the initial position, and the strip is transported to the next bending corner. This procedure is repeated until the frame is finished.

In the implementation of the method of the invention, it is not essential whether the drying agent grains are filled in before or after bending the frame. If the grains have been filled in beforehand, they must be able to yield during the injection of the reinforcing mass, or they are evacuated.

As previously mentioned, the injection of the corner reinforcement can be advantageous for all hollow profile strips, however especially if thermoplastic materials with or without reinforcing materials are used. Also, especially in the case of hollow profile strips of plastic materials,

the incision on the inner side of the bend point offers further advantages.

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CLAIMS:

1. Method for producing bent hollow profile strips, in which a reinforcing mass is introduced into a hollow section on both sides of a bend point in order to reinforce bent areas, characterized by the steps of:

- chucking a plastic material strip (1) in a bending device;

- heating the bend point;

- bending the plastic material strip;

- introducing a plastic material (7) into the hollow section of the strip at the bend point and on both sides of the bent area in order to reinforce it.

2. Method according to claim 1, characterized in that a thermoplastic material with fiber reinforcement is introduced into the bent area.

3. Method according to claim 1, characterized in that a thermoplastic material without fiber reinforcement is introduced into the bent area.

4. Method according to any one of claims 1 to 3, characterized in that the reinforcing plastic material (7) is introduced by means of an injection nozzle (5), the nozzle melting through the strip wall (6) at the bend point, and the resulting hole being closed again when the plastic material has been introduced.

5. Method according to any one of claims 1 to 4, characterized in that the inwardly facing side (3) is provided with an incision (4) at the bend point prior to the bending operation.

6. A spacer frame for a multi-pane insulating glazing produced according to any one of claims 1 to 5, characterized in that the frame (1) consists of a thermoplastic material, of a glass-fiber reinforced plastic material, and an outwardly facing side (2) of the frame is provided with a bonded metal foil.

7. A multi-pane insulating glazing having a spacer frame for a thermoplastic material, characterized in that the spacer frame has a profile adaptable to the periphery of glass panes, and which is bent to be adapted to the size of the glass panes and which is reinforced in bent areas by the introduction of plastic inside the bent area in order to reinforce it.

8. A multi-pane insulating glazing according to claim 7 wherein the plastic which is introduced contains fiber reinforcement.

9. A multi-pane insulating glazing according to claim 7 or claim 8 characterized in that the plastic is introduced into the bent area by means of an injection nozzle and the resulting hole from the injection nozzle being closed when the plastic has been introduced.

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PATENT AGENTS

FIG. 1

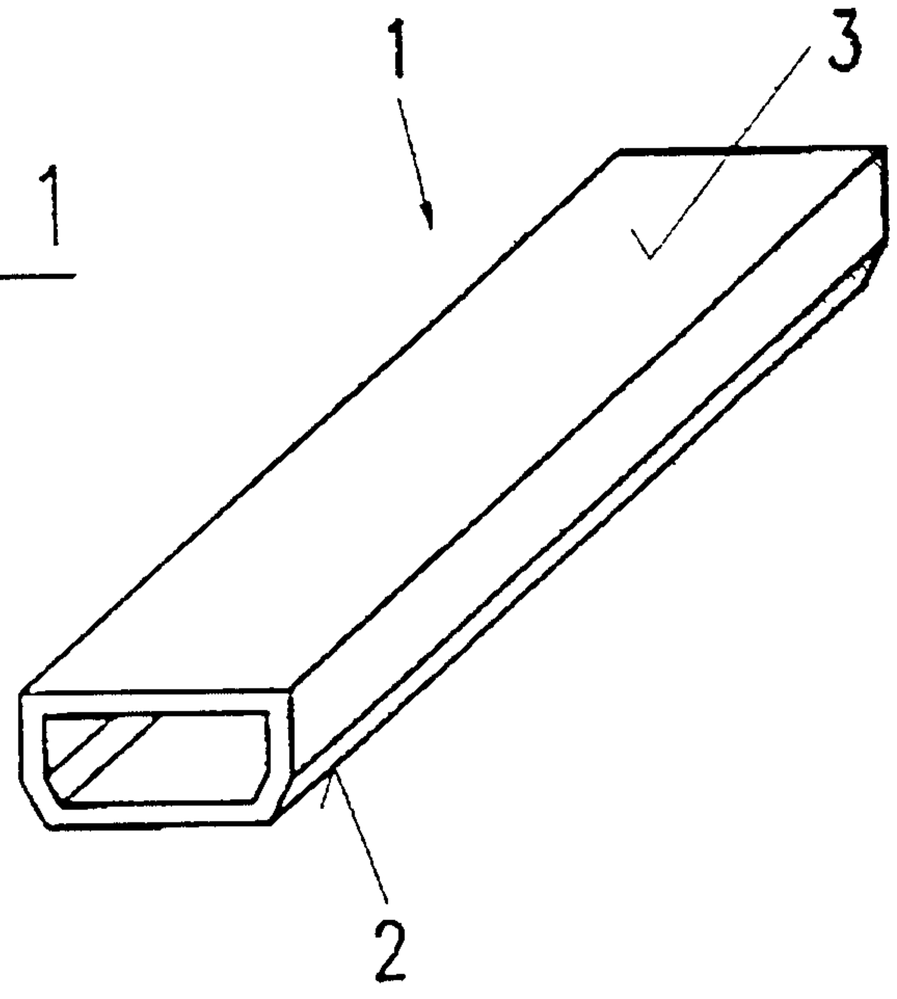


FIG. 2

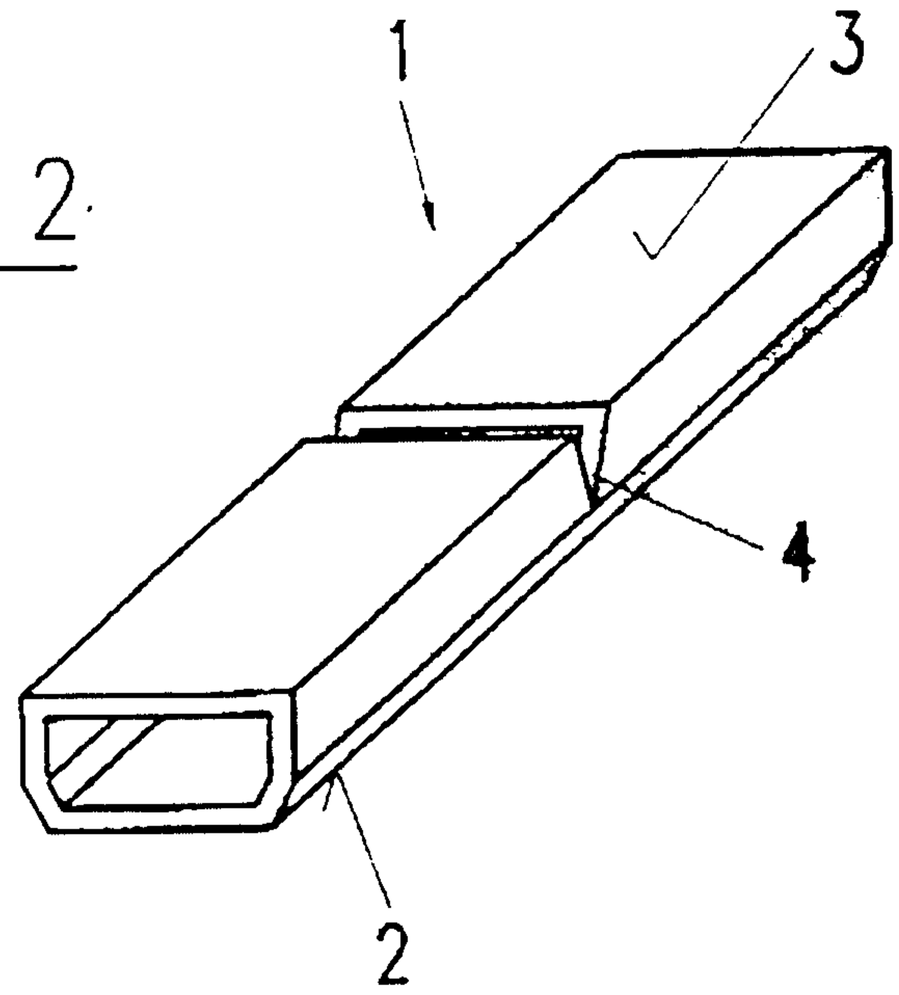


FIG. 3

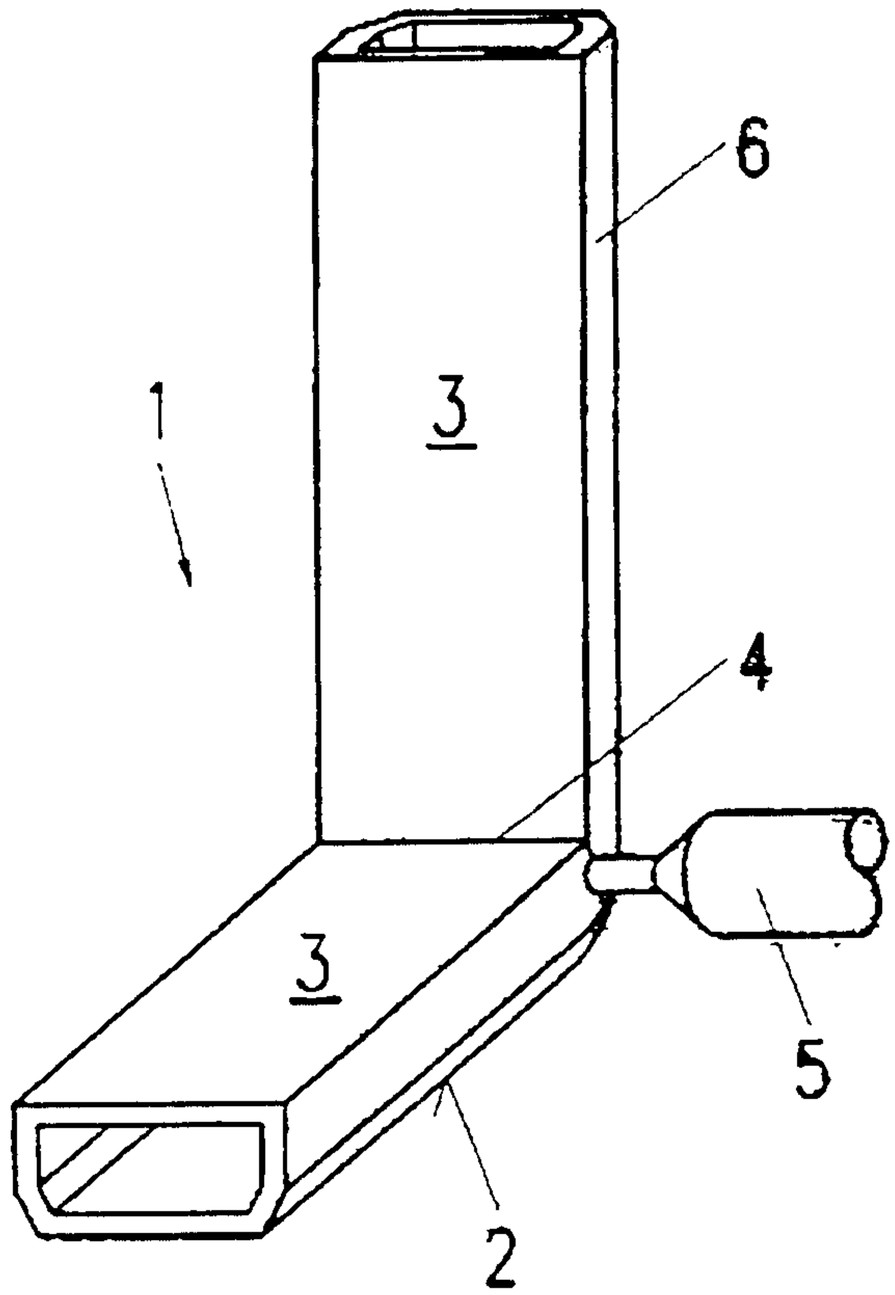
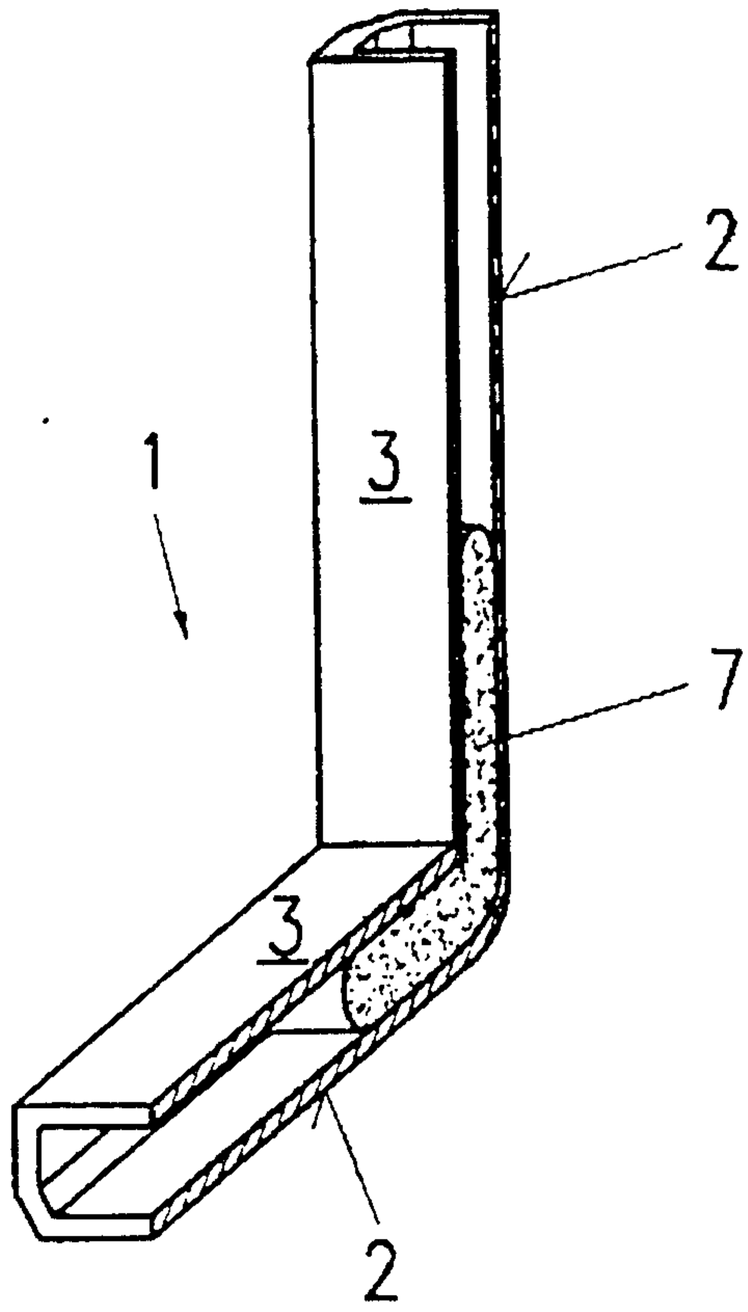
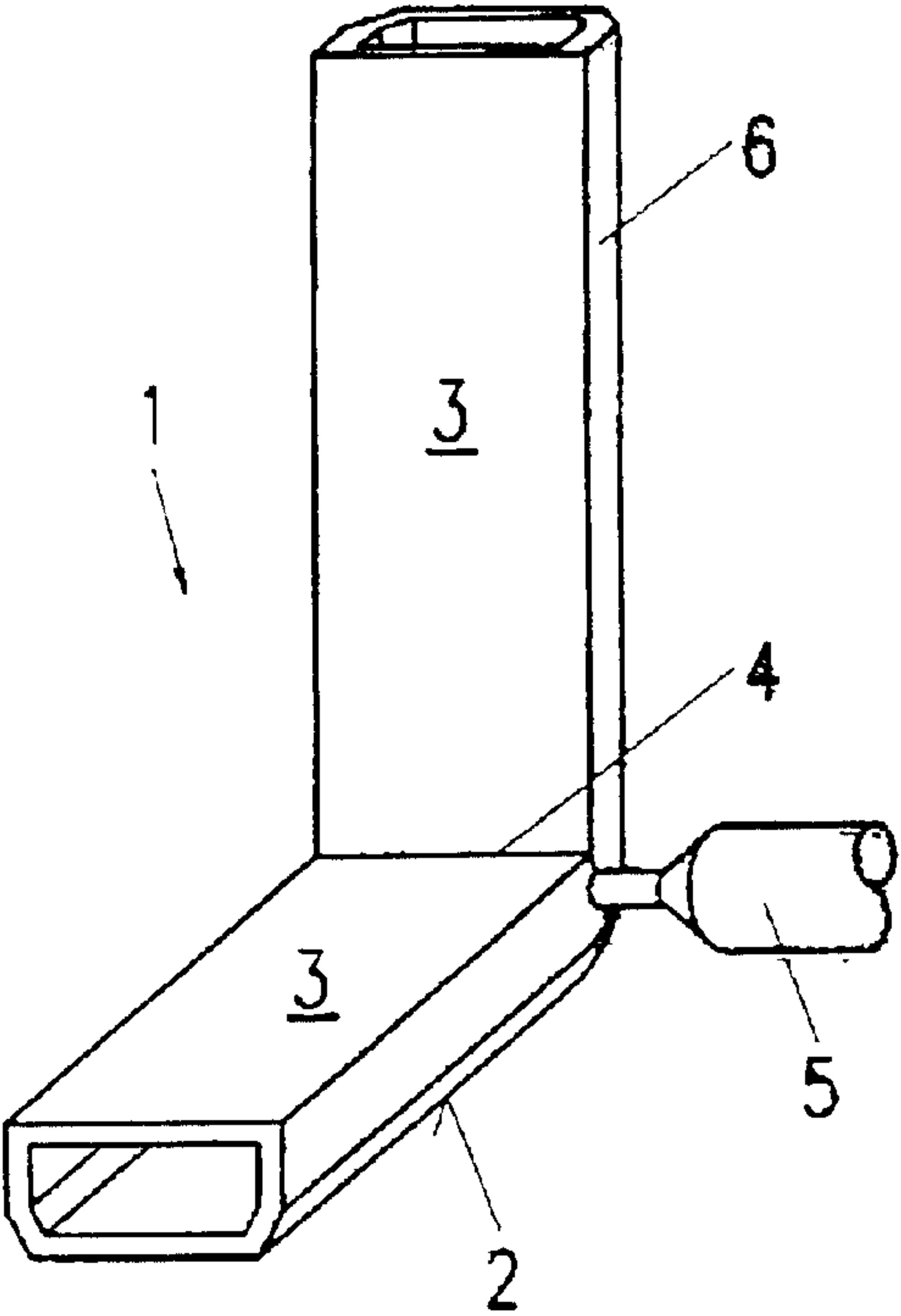


FIG. 4

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