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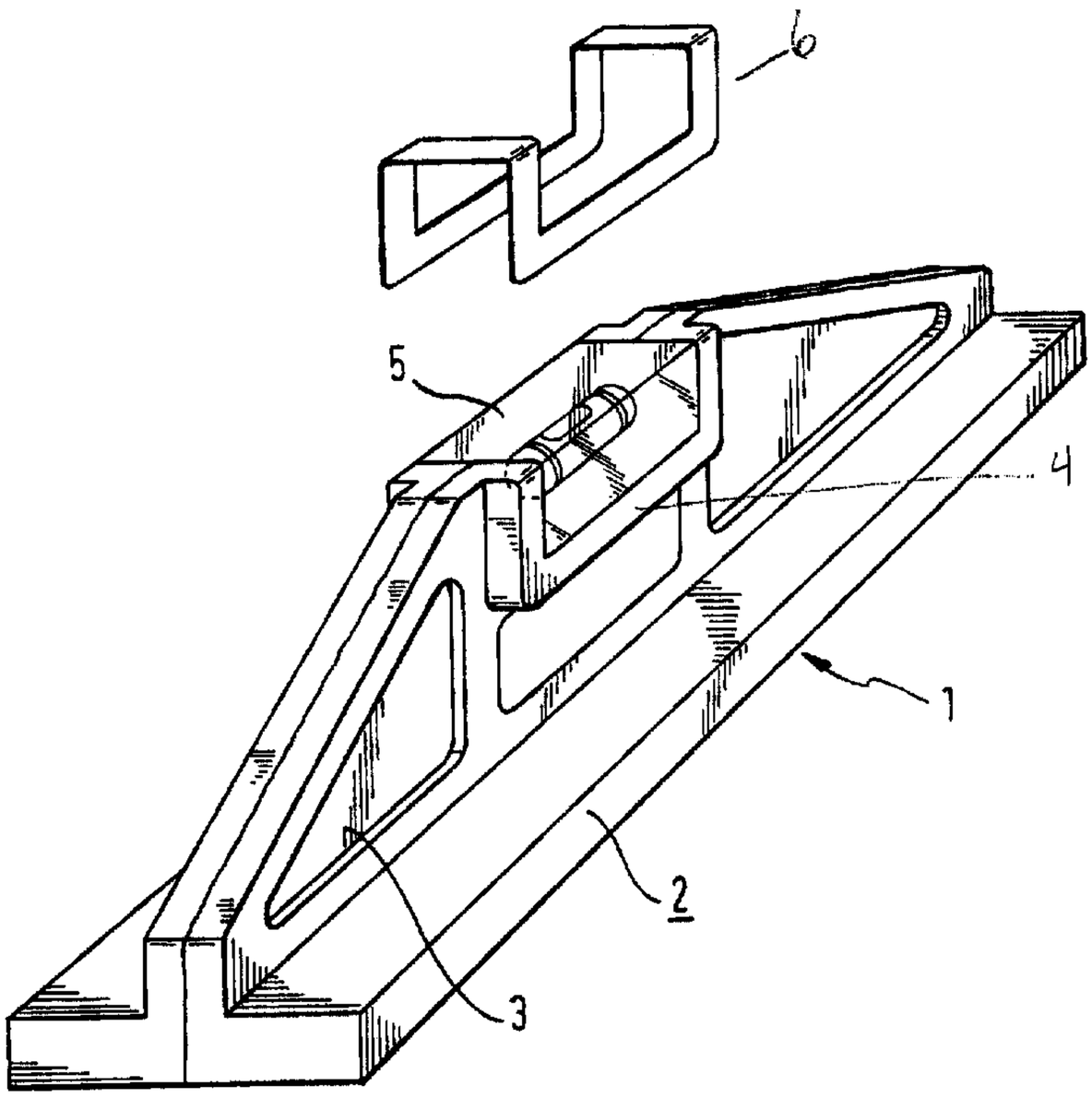
(54) Title: SPIRIT LEVEL AND MANUFACTURING PROCESS FOR PRODUCING IT



(57) Abrégé/Abstract:
The spirit level comprising a body is made up of a preferably T or I section with a housing in which an air unit is fixed. According to the invention, the body is produced in thermosetting resin and the air unit is integrated into the section.

ABSTRACT

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SPIRIT LEVEL AND MANUFACTURING PROCESS FOR PRODUCING IT

This invention concerns a spirit level and a manufacturing process for producing such a spirit level comprising a body with a recess in which at least one bubble block is fixed.

A spirit level is a precision instrument, the manufacturing and adjustment of which must be handled with great care. The body of a modern spirit level is often an aluminum section. This section can be a hollow or I- or T-shaped section. Aluminum has the advantage of being rigid enough to ensure the necessary precision, but it is quite expensive and requires a surface treatment for its protection or colouring.

Plastic sections have been suggested as an alternative to an aluminum spirit level body, but plastic materials that lend themselves to low-cost manufacturing cannot give a spirit level base the required rigidity. That is the reason why composite spirit levels have been developed having a core and a base plate in the form of an aluminum section over which a plastic structure is molded to accommodate the air element and manipulate the spirit level. In that case, the plastic structure includes a cut-out where the air element is housed. Adjustment of the exact orientation of the air element against the base plate is achieved by

screws. In the case of a perfect alignment, the air element is glued to the plastic structure.

This manufacturing process is long and tedious but the saving of aluminum compensates for the high manufacturing cost.

For this reason, the object of the invention is to create a spirit level of the type described above as well as to attain a simple and inexpensive manufacturing process that ensures the required precision and a low manufacturing cost.

The subclaims describe preferred embodiments of the invention.

According to the invention, the thermosetting resin of the spirit level can be coloured. Thus, even when it is prone to scratches, the section continues to have a clean appearance.

Necessary handling during the manufacturing process are limited to a minimum.

Other features and advantages of the invention can be seen more clearly in the following description, given only as an example but not restricted hereto, as well as the attached drawing in which

Fig. 1 is a perspective view of an embodiment of the spirit level and of the invention, and

Fig. 2 is a perspective view of the injection mold for manufacturing a spirit level according to the invention.

The spirit level 1 shown in Fig. 1 is mainly composed of three parts: the base plate 2, the core of the body 3 and the air element 5. The base plate 2 forms one piece, called section, with the core of the body 3. The section has a

cut-out showing a housing 4 for the air element 5. This housing 4 is located exactly in the middle of the body's core to improve the contact between the lateral faces and the bottom of the air element 5. The section is enlarged in the cut-out area so as to have the width of the air element 5.

Starting at element 5 positioned above the centre of the base plate 1, the core 3 of the sectional body is chamfered toward the ends of the spirit level.

The body of the spirit level shown in Fig. 1 is cast in a mold for casting by injection as shown in Fig. 2. The material to be cast is a polyester resin loaded with glass particles. These glass particles may either be long fibres or relatively short fibres or even glass marbles. The section of the glass particles' shape depends on the requirements placed on the spirit level or the ease of the manufacturing process.

The glass particles integrated in the resin give the thermosetting resin its required rigidity.

The thermosetting resin can be loaded with glass balls on the outside faces of the injected piece and loaded with core fibres.

Another essential feature of the invention is that the air element is permanently fixed to the spirit level's section during cooling of the resin in the injection mold. Therefore, further adjustment is unnecessary.

As shown in Fig. 2, the injection mold 6 used to manufacture the spirit level 1 of the invention is composed of three parts: one base part 7, or alternatively two parts, and two lateral parts 8,9, that close up over the first one.

The injection mold 7 is schematically drawn to illustrate some essential features of the invention. These are the means for fixing an air element to one of the inside faces of at least one of the lateral parts 8,9 of the injection mold 7. The air element 5 is then set by these fixing means 10, i.e. by a set of small pins put in openings in at least one of the lateral parts of the injection mold 7 at the level of the lateral faces 8,9 and the base of the air unit 5. These externally removable pins are taken out of the mold before the resin is completely hardened. The injection mold 7 is partially cooled around the air element housing area so that injected resin temperatures do not rise to a point that could be destructive for the material forming the air element unit. This material is often transparent, shock resistant plastic, for example Altuglas (registered trade-mark). The material to be cast is injected when the mold is not yet completely closed. This method presents the following advantages:

The risk of cavities forming inside the material to be cast is reduced because the material repels the air contained in the partially open injection mold 7. Moreover, since the injection mold 7 is completely closed after the injection of the resin, burrs form. Burrs of a predetermined shape can be easily polished with a planing tool.

After the cooling of the thermosetting resin, the spirit level 1 is removed from the injection mold 7. The air element 5 is well joined to the section. To improve the visual appearance of the spirit level 1 and hide contact areas between the lateral faces or the base of the air

element and the housing 4 in the section's core 3, it is possible to provide a frame 11 for the air element 5 with a case that still shows the central parts of the top surface and the lateral surfaces of the air element 5.

Since the air element 5 is carefully inserted into the injection mold 7, the adjustment of the spirit level 1 is no longer necessary and because it is joined to the section, a disturbance is no longer possible. The air elements 5 are completely immobilized and foolproof. The manufacturing process is very simple which leads to very low costs. The thermosetting resin ensures the required sturdiness and costs much less than aluminum.

The invention is not limited to the embodiments described above and a person skilled in the art will be able to modify it without going beyond the scope of the invention, in particular with respect to the number of base plates.

WE CLAIM:

1. A spirit level comprising a body with a recess in which at least one air element is fixed,
characterised in that the body is made from a thermosetting resin having a glass particle filler to give the thermosetting resin its required rigidity and comprising specifically predetermined burrs only on the top parts of the level.

2. A spirit level according to claim 1, characterised in that the thermosetting resin is a polyester resin having a glass particle filler.

3. A spirit level according to claim 1 or 2, characterised in that the thermosetting resin has a glass fibre filler.

4. A spirit level according to claim 1 or 2, characterised in that the thermosetting resin has a glass ball filler.

5. A spirit level according to claim 1 or 2, characterised in that the thermosetting resin has glass ball filler on the outer surface of the injection molding and a fibre filler in its core.

6. A spirit level according to any one of the preceding claims, characterised in that an air element is partially covered by a frame having a window at a level of a bubble and masking an edge of the air element and of the profile.

7. A spirit level according to any one of the preceding claims, characterised in that the thermosetting resin is dyed in its mass.

8. A spirit level according to claim 1, characterised in that the body has the form of a T-profile.

9. A spirit level according to claim 1, characterised in that the body has the form of an I-profile.

10. A manufacturing process for producing the spirit level according to any one of the preceding claims, by injection of a thermosetting material having glass particle filler, characterised in that the air element is fixed by means of withdrawable pins to a part of an injection mold and in that the injection mold brought to a melting temperature of the material is partially cooled in a zone of the air element location.

11. A process for the production of the spirit level of claim 1, characterised by use of a mold in three or four parts, one or two partially forming a base plate and

the other two closing above the base plate to form a top part of a profile with insertion of the air element.

12. A process for the production of the spirit level of claim 9, characterised in that complete closure of an injection mold is effected only after the injection mold has been filled with the thermosetting resin containing a filler, resulting in formation of specifically predetermined flashes only on top parts of the level.

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Fig. 1

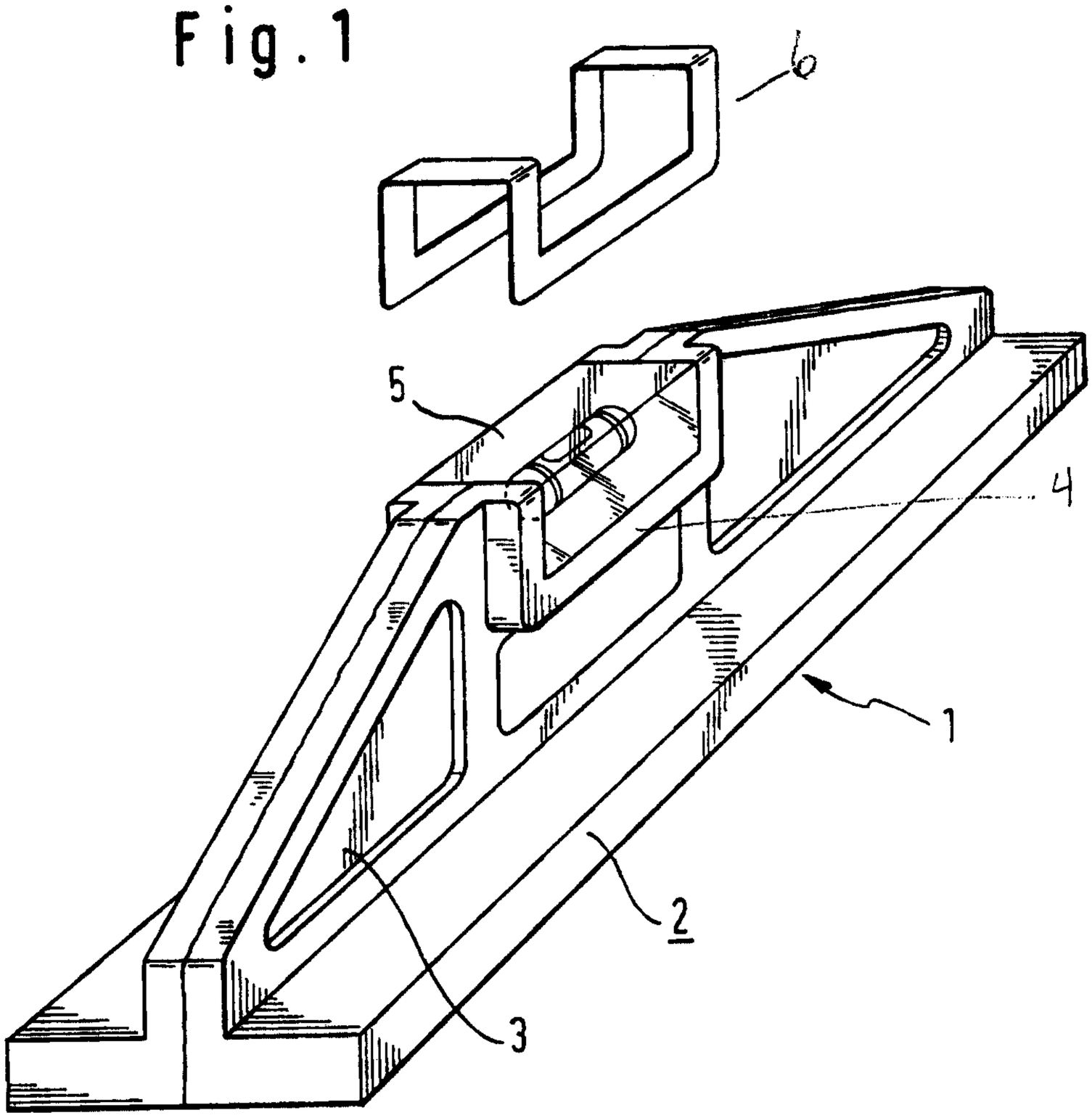
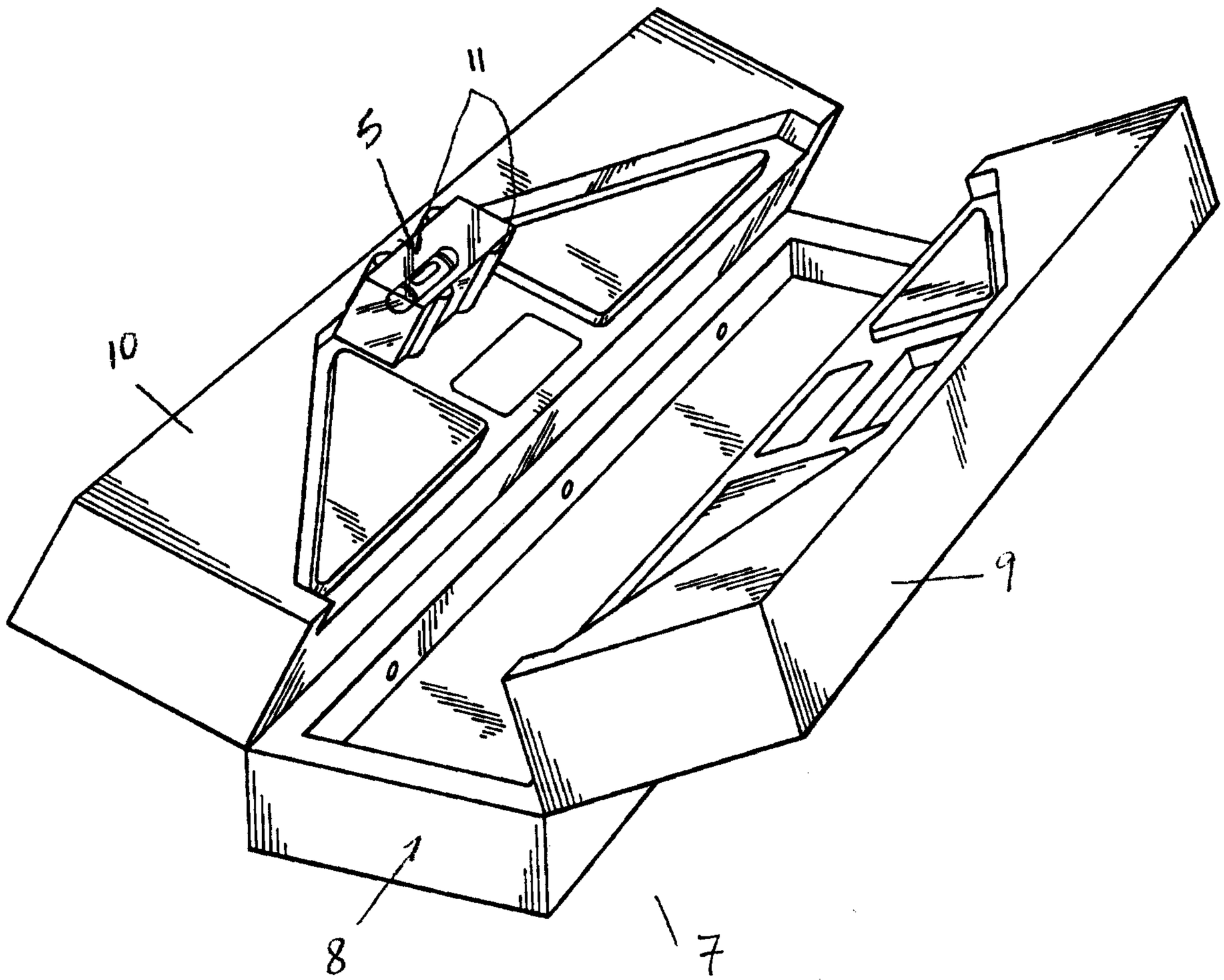
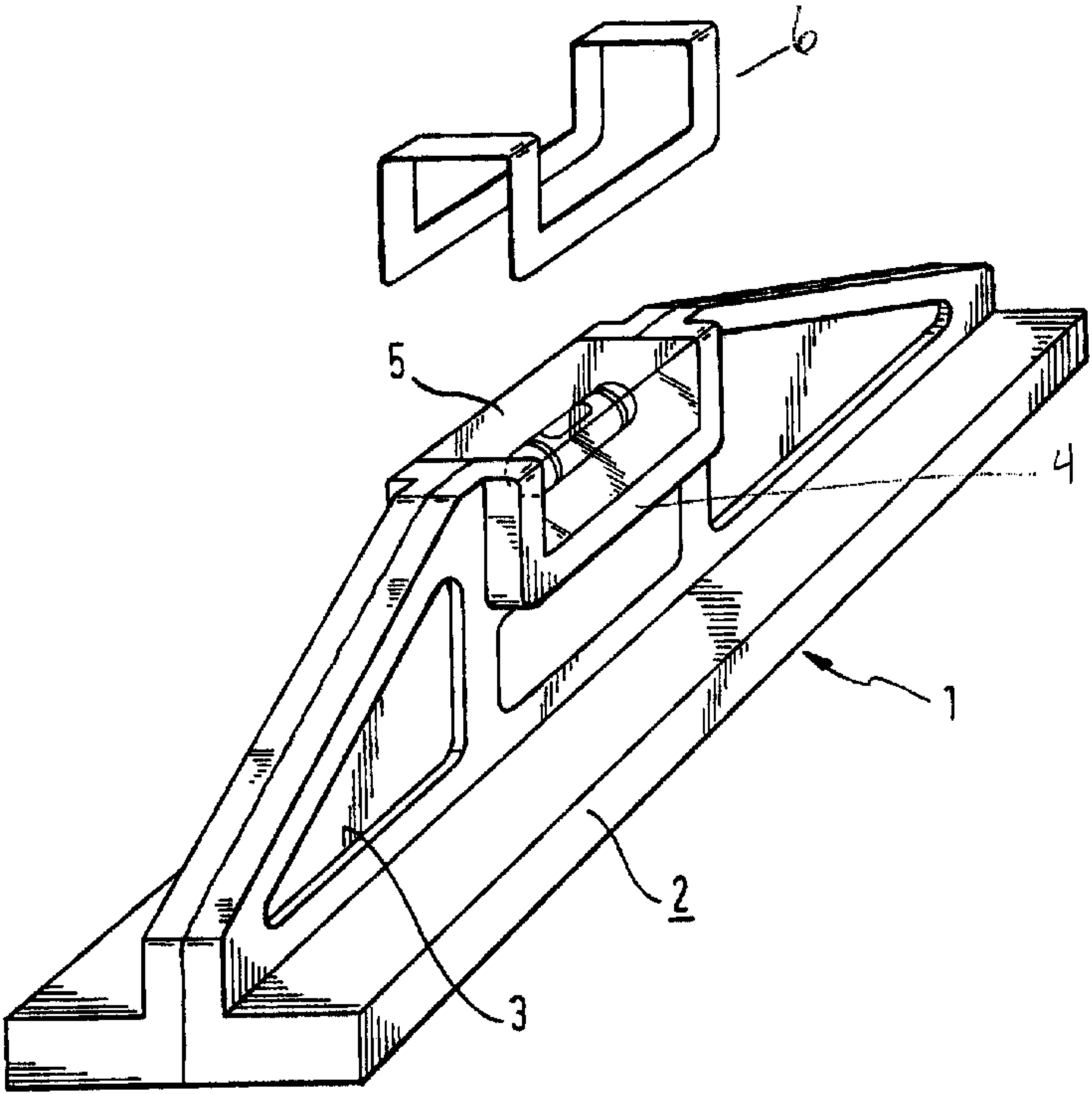


Fig. 2

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