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(54) **Lightweight structured suitcase**

(57) A suitcase provided with two stiffening mouldings (2a,2b), bonded to two shells (1a,1b) respectively. The two mouldings (2a,2b) each have a seat (7a,7b) in which the terminal parts of the shells (1a,1b) can be inserted. The interface surfaces are subjected to pre-treatment with cold plasma so as to form an activated surface layer (9) upon them which encourages adhesion between the adhesive (3) placed between the mouldings (2a,2b) and the shells (1a,1b) in order to bond them firmly together. In this way structured suitcases can even be obtained with thin and therefore very light shells whose resistance to squashing and impacts is due to the mouldings which can be manufactured with the necessary robustness. A method for the production of such suitcases through the moulding of plastics materials is claimed.

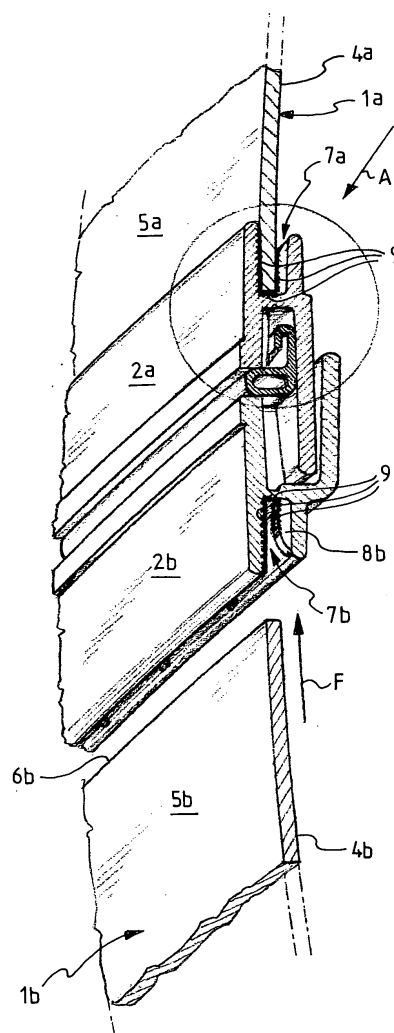


Fig- 3

Description

[0001] This invention relates to a lightweight structured suitcase, that is a suitcase according to the precharacterising clause of claim 1 and a method for its manufacture in accordance with the precharacterising clause of claim 8.

[0002] Suitcases of the known type are substantially subdivided into two major types: soft and rigid suitcases.

[0003] The context which requires the maximum performance from suitcases is that of air transport. Suitcases must in fact be at the same time lightweight, so as not to excessively reduce the maximum quantity of baggage which can be carried by a passenger, and strong, in order to adequately protect their load from the impacts which they inevitably incur during handling within airport equipment for the automatic distribution of baggage.

[0004] Soft suitcases, generally made of synthetic material or fabric, are lightweight and flexible but are easily torn and are unable to effectively protect the objects within them against impacts.

[0005] Rigid suitcases are generally provided with shells of rigid metal or polymer material and locks; these are the only ones capable of combining a high level of protection for the objects within them and high resistance to tearing.

[0006] Despite the fact that they are heavier and more bulky than other suitcases, they are preferred by those travelling by air, specifically because of their greater security.

[0007] The weight limits imposed on passengers by airlines are not however easily reconciled with the weight of rigid suitcases. It is therefore particularly important that the structure of the suitcase should be lightened in order to increase the weight available for the baggage which has to be carried.

[0008] Rigid suitcases are generally formed of two shells with corresponding integral stiffening mouldings about their perimeter which ensure the mechanical and structural properties necessary for normal use of the suitcase.

[0009] The connection between the various components of a suitcase, such as for example between the shells and the stiffening mouldings, is currently brought about for example through riveting, sewing or stapling.

[0010] Among the alternative methods to those mentioned above, adhesive bonding would appear to be particularly advantageous from the point of view of both weight and ease and speed of execution were it not for the difficulties encountered in carrying out bonding operations between plastics materials.

[0011] In view of the state of the art described, the object of this invention is to provide a suitcase which makes it possible for two components, such as for example a shell of polymer material and the corresponding moulding, to be joined together through adhesive bonding resulting in suitcase structures which are particularly light and at the same time very strong.

[0012] In accordance with this invention this object is achieved through a suitcase according to claim 1 and through a method according to claim 10.

[0013] The features and advantages of this invention will be obvious from the following detailed description of a practical embodiment provided by way of a non-restrictive example with reference to the appended drawings, in which:

- Figure 1 shows a suitcase in a semi-open configuration constructed in accordance with an embodiment of this invention,
- Figure 2 shows a partly exploded detail of a suitcase according to Figure 1,
- Figure 3 shows a disassembled detail in perspective cross-section of the shell/moulding assemblies of a suitcase illustrated in Figures 1 and 2,
- Figure 4 is a partly disassembled view of the detail in Figure 3 in the direction indicated by arrow A.

[0014] The suitcase illustrated in Figure 1 comprises two elements 1a, 2a, between which there is at least partly provided an adhesive material 3 which is capable of joining them firmly together through adhesive bonding.

[0015] Advantageously these two elements 1a, 2a are a shell 1a, preferably of polymer material, and a stiffening frame 2a, but obviously they may be any two components of the suitcase which must be firmly joined together.

[0016] For example, the adhesive bonding of any accessory or equipment such as for example a handle, a lock, a hinge or the frames therefor to the frame of the suitcase may be considered.

[0017] In a preferred embodiment at least one of the two elements 1a, 2a between which adhesive material 3 is placed to bond them together is made of preferably thermoplastic polymer material; suitable materials may for example be PC, PC/ABS, ABS, PP, HDPE.

[0018] Each of the two shells 1a, 1b, preferably manufactured through the moulding of thin sheets or by injection moulding may be regarded as being defined by a convex external surface 4a, 4b, which is generally visible from the outside, an inner surface 5a, 5b opposite thereto and a closed perimetral surface 6a, 6b.

[0019] At least one of shells 1a, 1b may be formed with a fabric which is incorporated into the plastics material used for moulding.

[0020] Figure 3 also shows a cross-section of stiffening frames 2a, 2b. These are advantageously made of polymer material, preferably by extrusion, and comprise a seat 7a, 7b capable of receiving the terminal part of shell 1a, 1b with which it has to be associated, for example inserted along the direction indicated by arrow F in Figures 2 and 3.

[0021] Seats 7a, 7b are preferably U-shaped, with the two sides of the U substantially parallel with each other. "Fins" 8a, 8b, which are substantially in the shape of a rectangular trapezium, with sloping sides forming a guide for shells 1a, 1b, are located along the seat at regular

intervals.

[0022] Preferably these fins 8a, 8b are located in such a way as to lie inside the suitcase when it is closed.

[0023] First and second elements 1a, 2a each comprise an interface surface, or that part of their surface which comes into contact with adhesive material 3 when the suitcase is assembled.

[0024] Adhesive material 3, which is advantageously silicone based, is then placed in contact with at least one part of the two interface surfaces, advantageously on a part such that it is located over the entire interface surface when the suitcase is assembled.

[0025] In the case where the two elements 1a, 2a are shell 1a and stiffening frame 2a, adhesive material 3 may be located within seat 7a close to the base of seat 7a. Advantageously adhesive material 3 may be located along the entire length of the base of seat 7a and/or over the entire surface of seat 7a which comes into contact with outer surface 4a of shell 1a. Pre-treatment of the surface parts of fins 8a which will come into contact with the inner surface 5a of shell 1a is also a possibility.

[0026] In order to obtain a better bond with adhesive 3 it is possible to pretreat at least part of the interface surfaces or, advantageously, the entire extent of one or both interface surfaces; for example, in the case in which shell 1a is bonded to stiffening frame 2a the entire bottom surface of seat 7a and at least that part of its sides which will be in contact with adhesive material 3 may be treated; with regard to the shell, peripheral surface 6a and/or that part of outer surfaces 4a and/or inner surfaces 5a which will be in contact with adhesive material 3 may be treated.

[0027] This pre-treatment comprises suitable activation, for example by plasma activation, preferably using cold plasma, of the part of the interface surface which is to be activated in such a way as to form an activated layer 9 thereupon, the depth of which is particularly shallow, at least such as not to diminish the mechanical properties of the underlying material.

[0028] This activated layer 9 has the property of being very much more adherent to adhesive material 3 than the material used for the elements which are to be bonded would otherwise be.

[0029] This treatment therefore makes it possible to use polymer materials such as those indicated above when manufacturing bonded suitcases, for which adhesive bonding was hitherto unthinkable, thus achieving an appreciable saving in weight.

[0030] In fact in accordance with the invention structured suitcases can even be obtained with thin and therefore very light shells whose resistance to squashing and impacts is mainly due to the frames which can be manufactured with the necessary robustness without having an overall disadvantage on the weight of the suitcase.

[0031] Frames 2a and 2b may be used to support means for rotatably joining two parts of the suitcase together as indicated diagrammatically by 10 in Figure 1.

[0032] Obviously in order to satisfy contingent and specific requirements a person skilled in the art could apply

many modifications and variants to the configurations described above, all of which are however included within the scope of protection of the invention as defined by the following claims.

Claims

1. Suitcase comprising a first element (1a) manufactured from a first polymer material and a second element (2a) manufactured from a second polymer material bonded thereto
characterised in that it comprises
adhesive material (3) located at least partly between the said first element (1a) and the said second element (2a), the said adhesive material (3) being capable of joining the said first element (1a) and the said second element (2a) together by adhesive bonding.
2. Suitcase according to claim 1, in which at least one of the said first (1a) and second (2a) element comprises an activated surface layer (9) placed in contact with the said adhesive material (3), the said activated surface (9) having surface properties which are different from those of the material on which it is formed.
3. Suitcase according to claim 2, in which the said activated surface layer (9) is obtained by plasma activation of the surface of the said first (1a) and said second (2a) element on which it is produced.
4. Suitcase according to any one of the preceding claims, in which the said first and second polymer materials are selected from the group comprising PC, PC/ABS, ABS, PP, HDPE.
5. Suitcase according to claim 4, in which at least one of the said first and second polymer materials is polypropylene.
6. Suitcase according to claim 5, in which both the said first polymer material and the said second polymer material are polypropylene.
7. Suitcase according to any one of the preceding claims, in which the said first element (1a) is a shell and the said second element (2a) is a stiffening moulding.
8. Suitcase according to any one of the preceding claims in which the polymer material of at least one of the said shells (1a, 1b) incorporates a fabric.
9. Suitcase according to claim 9, comprising two stiffening frames, each bonded to two shells through the intermediary of the said adhesive material, the said two shells being rotatably joined together.

10. Method for producing a suitcase according to any one of claims 1 to 9
characterised in that
the said first element (1a) is bonded to the said second element (2a) through the intermediary of adhesive material (3). 5
11. Method according to claim 10, in which before the said first element (1a) is bonded to the said second element (2a) at least part of the interface surfaces which come in contact with the said adhesive material (3) is subjected to plasma activation treatment in order to form an activated surface layer (9) thereupon which is capable of increasing adhesion between the said adhesive material (3) and the said activated interface surface. 10 15
12. Method according to claim 11 in which the said plasma activation treatment is a cold plasma activation treatment. 20

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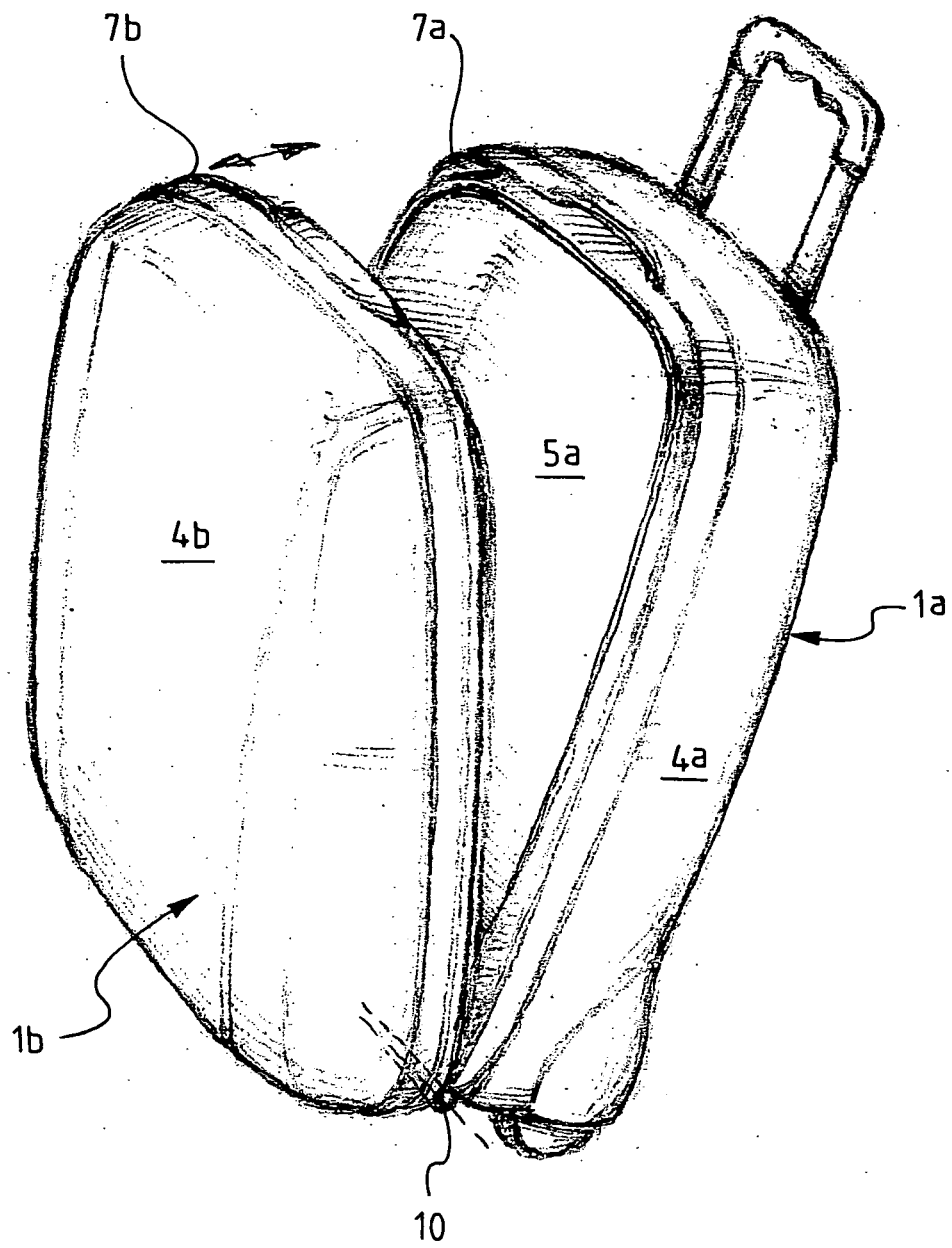


Fig- 1

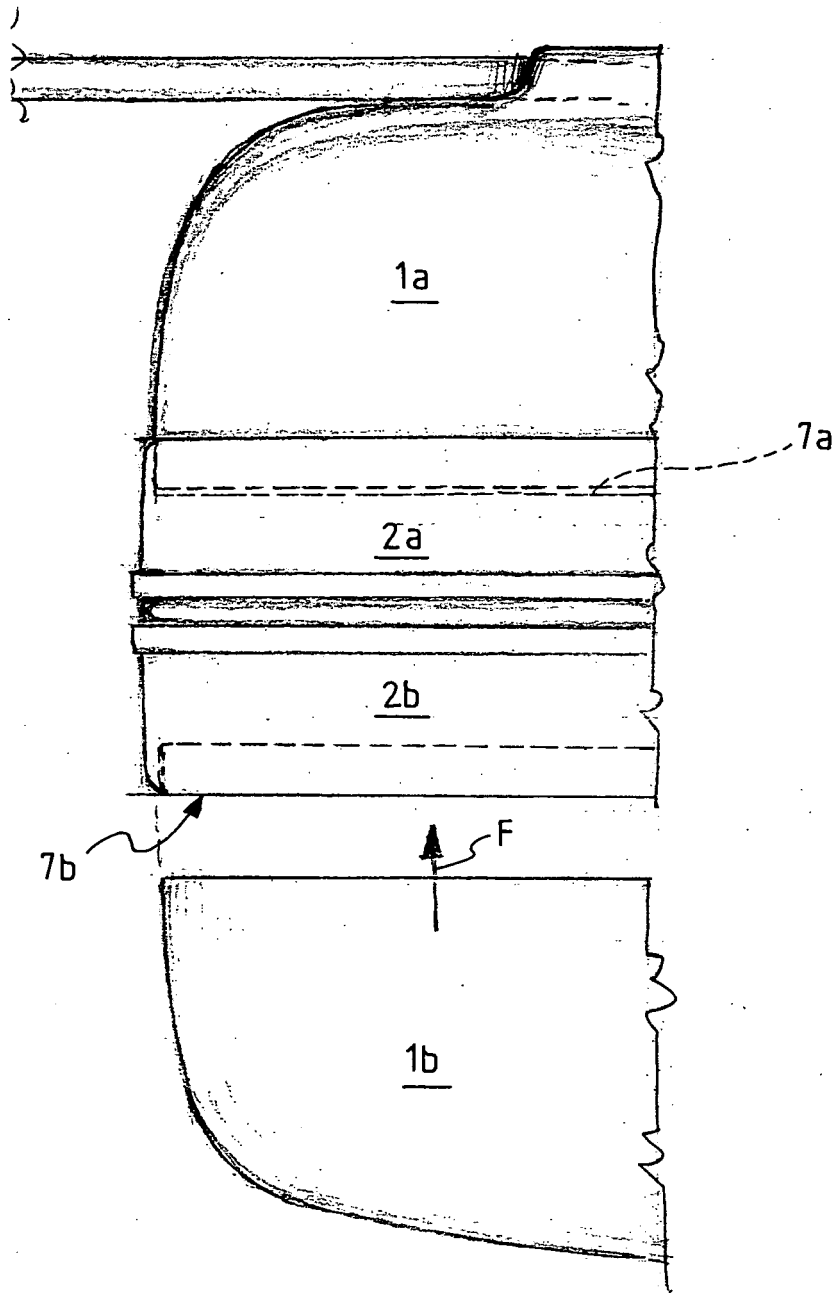


Fig- 2

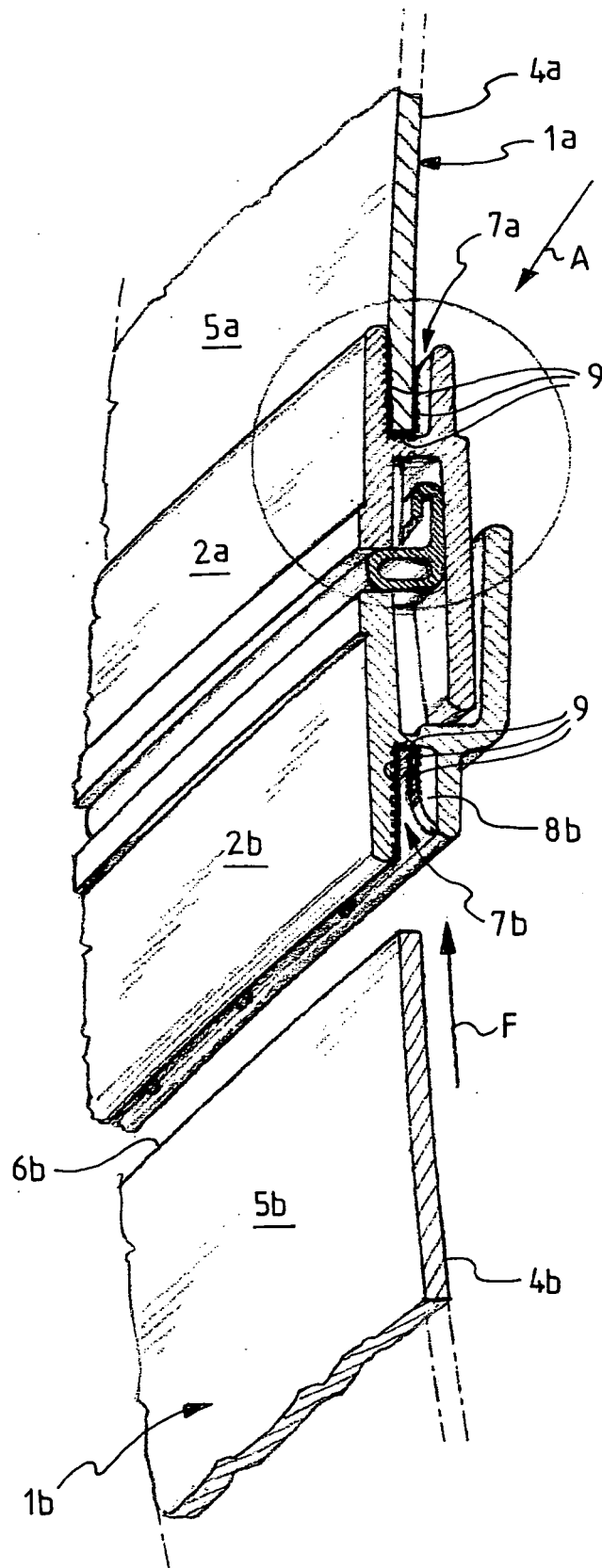


Fig- 3

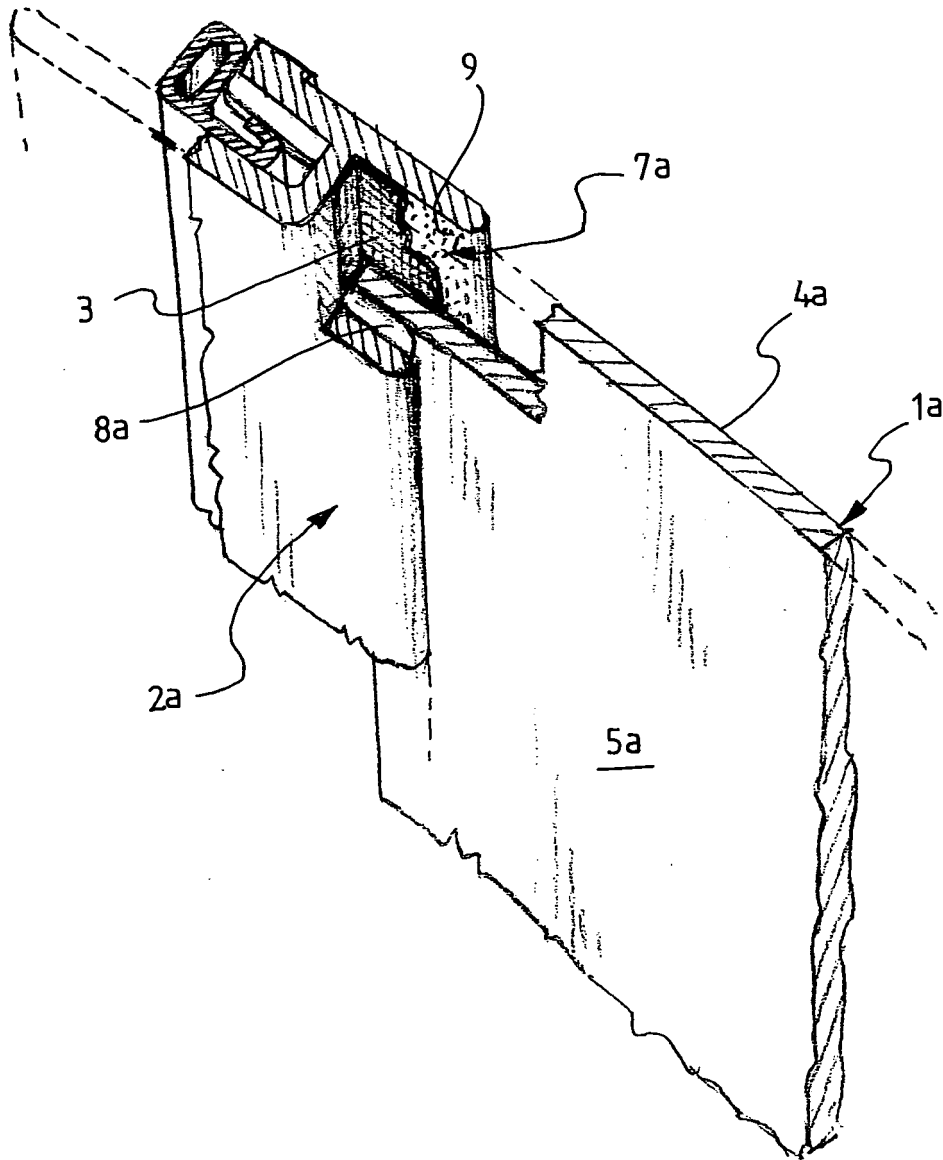


Fig- 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5409

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 November 2006	Examiner Dindorf, Jochen
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-11-2006

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