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(54) A seat with a layered structure, particularly for motor vehicles.

(57) At least one of the squab (2) and the backrest (3) of the seat has padding (5) with a layered structure having:
- a soft, resilient base layer (6),
- a relatively inelastic intermediate layer (7) with some degree of plastic memory, and -a soft upper layer (8).

FIG. 2

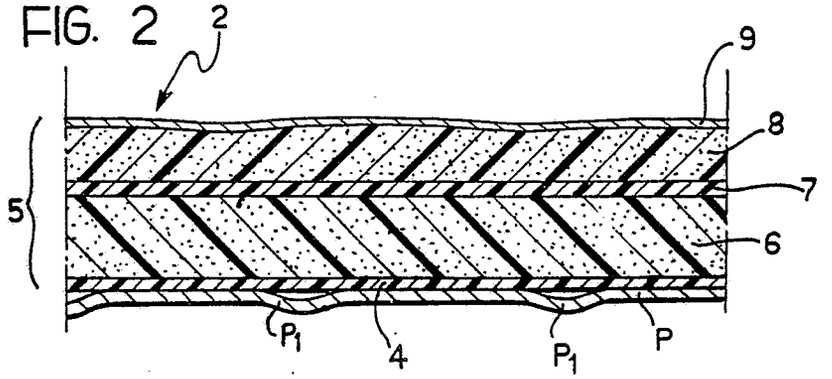
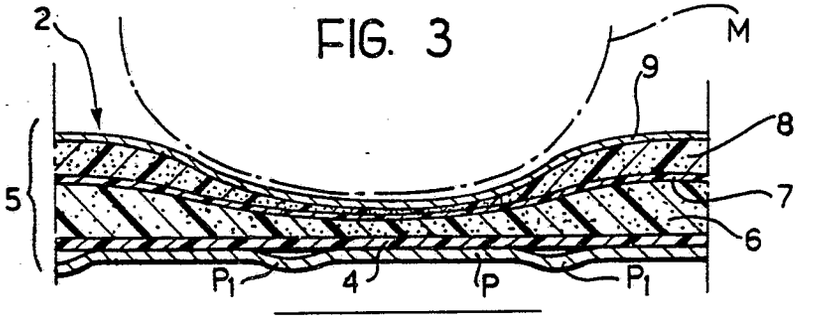


FIG. 3



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A seat with a layered structure, particularly for motor vehicles

The present invention relates to seats and has been developed with particular attention to its possible use in the manufacture of motor vehicle seats, particularly the rear (bench) seats of motor cars.

According to a solution adopted by practically all motor vehicle manufacturers, these seats are constituted essentially by a support framework (usually with associated means for varying the relative positions of the squab and the backrest and/or the position of the seat as a whole) on which a sprung structure covered in turn by a mass of padding (upholstery) is mounted.

The production of a seat structure of this kind involves quite considerable costs which are also due to the difficulty of completely automating the manufacturing process. In the specific case of rear seats for motor cars, it is also necessary to minimize their thickness and bulk (particularly as regards the squab) so that there can be a corresponding increase in the useful space available in the passenger compartment.

For some types of very cheap vehicles, in fact, very simple structures are used, such as, for example, metal frameworks which support bearing surfaces made of cloth; naturally, although they may be acceptable to some members of the public, solutions of this type do not generally constitute a good market alternative to more conventional solutions: indeed, the simplification of the structure leads to a reduction in the adjustability of the seat and/or in its comfort for driving or travelling.

The use of a layered structure has been suggested in the past in order to try to reach a compromise between the need to simplify the structure of the seat and the need to retain a good level of driving and travelling comfort, as well as the adjustability of the position of the seat.

For example, some motor cars (the Bluebird model of the Japanese company Nissan) have been fitted with a seat in which the squab is constituted by two layers of resilient synthetic material of different hardnesses, between which is an intermediate impregnation layer. The surface of the squab is defined by a soft layer so that the seat adapts itself to motorists of different sizes. The lower layer, which is more compact, acts essentially as a support structure. The upper soft layer is made thicker in the region on which the left femoral region of the driver rests in use, whilst the thickness of the lower layer is correspondingly reduced. The downward movement of the driver's femoral region is thus facilitated when he lowers the clutch pedal.

The object of the present invention is to produce a seat, preferably including a squab part and a backrest, in which, according to a known solution, the use of a layered structure is envisaged.

The main characteristic of the seat according to the invention, as better defined by the claims which follow, is the fact that the layered structure, which may be used only for the squab, only for the backrest, or for both these elements, includes at least one relatively inelastic layer with some degree of plastic memory.

The invention is based on the recognition of the fact that, according to experiments carried out by the Applicant, the solution in which an upper or outer soft, resilient layer is simply combined with a lower or base support layer which is also resilient but slightly harder (as in the case of the combination of two polyurethane layers) is intrinsically unsuitable for providing an ergonomically-effective solution: in fact, with this solution, it is impossible to reconcile the need to ensure driving or travelling comfort with the need to prevent the layered squab unit from being compressed (becoming, so to speak, "compacted") in the presence of very high stresses, such as those resulting from travelling over rough ground, until its function of mechanical insulation from the underlying rigid structure (the framework of the seat) is cancelled out, creating a situation (so-called "bumping") which is very disagreable for the driver.

In other words, a very soft lower layer provides good driving and travelling comfort, but shows a marked tendency to become deformed in the presence of high stresses. A harder lower layer, on the other hand, avoids the risk of deformation or "compaction" of the layered structure in the presence of a high stress, but is generally rather hard and uncomfortable under normal travelling conditions.

The above is also true as regards the lateral restraint of the body occupying the seat (either by the squab or the backrest): too firm a structure does not achieve any lateral restraint in practice. In order to achieve this effect, a softer resilient layer must be used which, however, has the disadvantages described above.

The main element of the solution according to the invention, however, is the presence of a relatively inelastic layer which has some degree of plastic memory.

In the present description and in the following claims, the term "relatively inelastic with some degree of plastic memory" is intended to define a layer of material which tends to retain its deformed shape to a certain extent following a mechanical stress and returns resiliently to its original undeformed shape only after the stress has ceased for a

certain period of time, for example several seconds.

As will better be described in the following detailed description of the invention, the use of materials, such as, for example, polyethylene foam (for example, the Dow Chemical product ETAFOAM) is particularly advantageous for the production of the layer.

In a layer approximately 0.5-1.5 cm thick and having the overall dimensions of the region supporting a person seated on a normal motor vehicle seat, this foam tends to return to its undeformed condition between about 0.1 and about 1 second after the deforming pressure has ceased, with preferred values around the upper end of this range.

Experiments show that, when the seat is occupied, an intermediate layer of this type tends to assume a bowl shape which adapts itself in a complementary manner to the body of the person occupying the seat, ensuring effective lateral restraint. This selection enables the soft, resilient base layer to be produced with characteristics which at any rate avoid the compacting compression of the layered structure as a result of a high stress. However, this does not give the person occupying the seat any sensation of excessive firmness or discomfort.

The invention will now be described, purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a general perspective view (partially cut away) of a seat according to the invention,

Figures 2 and 3 are two median cross-sections of the squab of Figure 1, taken on the line II-II of that Figure, which show the seat in question in the undeformed rest position and in the deformed position which it assumes under the weight of a seated person, respectively, and

Figure 4 is a further cross-section, substantially corresponding to Figure 2, reproduced on a slightly enlarged scale, showing a possible alternative embodiment of the invention.

In the drawings, a seat, generally indicated 1, is intended to be fitted in the passenger compartment of a motor vehicle, such as a motor car (not illustrated as a whole). More precisely, this is concerned with a rear (bench) seat fitted on a raised portion of the floor P of the passenger compartment of the motor car, provided with stiffening ribs P_1.

The seat 1 as a whole has a seat portion (or, in short, a "squab") 2 and a vertical portion or backrest 3 which extends upwards from the rear portion of the squab 2.

Naturally, the terms "front" and "rear", and "lower" and "upper" as used in this specification relate to the normal position of mounting of the seat 1 in the passenger compartment of the motor vehicle, with respect to the normal direction of travel of the latter.

Both the squab 2 and the backrest 3 (or possibly just one of them, preferably the squab 2) is constituted essentially by a structure or "body" 4 of rigid or semirigid material (for example, moulded plastics or metal) which is intended to rest on the floor P (or on a support structure projecting therefrom) and carries an applied mass of padding 5 with a layered structure.

Proceeding from the base region (in contact with the body 4) towards the upper region (that is, the "outer" region intended to face the body of the person occupying the seat) one can identify in the layered mass 5:

- a soft, resilient lower or base layer 6,
- a relatively inelastic intermediate layer 7 with some degree of plastic memory, and
- a soft upper or "outer" layer 8.

With regard to the meaning of the term "relatively inelastic with some degree of plastic memory" in relation to the intermediate layer 7, reference should be made to the terminological statement made in the introduction to the present description.

As far as the selection of the materials which form the three layers 6, 7 and 8 (which are not shown to scale in Figures 2 and 3 for clarity of illustration) is concerned, various possibilities can be proposed on the basis of experimental findings.

For example, a material such as the expanded polyurethane foam sold under the trade name PURFOAM (produced by Padana Plastici) may be used for the production of the base layer 6.

The selection of a thickness of the order of from approximately 5 to approximately 7.1 cm has proved particularly effective for the layer 6.

With regard to the intermediate layer 7, however, it has proved possible to use the polyethylene foam sold under the trade name ETAFOAM (produced by Dow Chemical).

This material has a generally elastoplastic behaviour which means that it tends to retain the deformed condition assumed as a result of a stress and return to its original undeformed condition only after the stress has ceased for a certain period of time. In the embodiments which have proved most effective up to now, this period has a duration of from about 0.1 to about 1 second, preferably around the upper end of this range. For the layer 7 made of this material, the selection of a thickness within the range of about 0.5 to about 1.5 cm has proved particularly effective, at least for the region supporting a person seated on a normal motor vehicle seat.

Finally, as far the soft upper layer 8 is concerned, it is possible, for example, to use a ma-

terial substantially identical to the material constituting the layer 6, preferably with a selected thickness of the order of from about 1 to about 1.5 cm which brings the overall thickness of the layered mass 5 to a value of the order of 6-10 cm.

The top or outer layer 8 may be covered by a protective layer 9 made, for example, from fabric (possibly padded), synthetic material (for example, vinyl leather or the like) or even from a layer of natural leather.

As a possible alternative, the protective layer 9 may be constituted by an upper portion of the layer 8 (which, as has been seen, is usually a foamed or sponge material) which has been subjected - according to known criteria -to a condensation treatment intended to provide it with a more compact structure suitable for carrying out the function of a protective layer.

A comparison of Figures 2 and 3 shows that the upper or outer layer 8 is almost completely deformed by a person M occupying the seat, so that it lies on the intermediate layer 7. The latter consequently assumes a general bowl shape which is adapted in a complementary manner to the anthropometric characteristics of the person M, so as to achieve the required restraint. This all occurs without causing the complete deformation of the base layer 6 which therefore retains its capacity for further deformation as a result of incidental stresses such as those resulting from bumps, etc...

The above description of the squab 2 can supply equally well to the backrest 3, in which the base layer 6 and the outer layer 8 are situated behind and in front of the intermediate layer 7, respectively.

The alternative embodiment shown in Figure 4 provides for tee use of an additional fabric layer 10, which is fairly rigid, applied (for instance by glueing) on the upper or the lower surface of the intermediate layer 7.

As already seen, under the action of the weight of the person occupying the seat, the intermediate layer 7 is flexed and the load is distributed over a larger surface than that represented by the body structures contacting the squab.

The fabric layer 10 is useful in obtaining a still larger surface, involving a larger portion of the squab in the springing action.

Thus, the insertion of the fabric layer 10, which is by itself substantially unextendible, ensures the following advantages:

- a wider distribution of the load on the squab surface;
- minimum weight increase;
- reduced costs and, in any case, costs which are lower than possible alternatives;
- synergism (i.e. mutual increase) of the desired effect, in contact between the plastic layer 7 and the fabric layer 10; and
- no appreciable increase in thickness.

If the fabric layer 10 is applied (as shown in Figure 4) under the plastic layer 7, then this latter operates under compression stress.

If, on the contrary, the fabric 10 is applied over the plastic layer 7, then this latter operates under traction stress.

Both solutions are viable since, as demonstrated by the tests effected, adhesion between the plastic layer 7 and the fabric 10 is extremely effective also when using traditional adhesives used for glueing different layers of foamed materials.

Claims

1. A seat (1) including a mass of padding (5) with a layered structure, characterised in that the layered structure includes at least one relatively inelastic layer (7) with some degree of plastic memory (as defined above).

2. A seat (1) according to Claim 1, characterised in that the layered structure comprises:
- a soft, resilient base layer (6),
- a relatively inelastic intermediate layer (7) with some degree of plastic memory, and
- a soft outer layer (8).

3. A seat according to Claim 2, characterised in that the layered structure also includes an upper protective layer (9) arranged to cover the outer layer (8).

4. A seat according to Claim 3, characterised in that the protective layer (9) is made of a material selected from the group consisting of: fabric, plastics material and natural leather.

5. A seat according to Claim 3, characterised in that the protective layer (9) is made from the same material as the soft outer layer (8).

6. A seat according to any one of Claims 1 to 5, characterised in that only the squab (2) includes the at least one relatively inelastic layer (7) with some degree of plastic memory layered (6 to 8).

7. A seat according to any one of Claims 1 to 5, characterised in that both the squab (2) and the backrest (3) include at least one relatively inelastic layer (7) with some degree of plastic memory.

8. A seat according to any one of the preceding claims, characterised in that the at least one relatively inelastic layer (7) with some degree of plastic memory resumes its undeformed condition between about 0.1 and about 1 second after the deforming stress has ceased, and preferably around the upper end of this range.

9. A seat according to any one of Claims 1, 2 and 8, characterised in that the at least one relatively inelastic layer (7) with some degree of plastic memory is made substantially of polyethylene

foam.

10. A seat according to any one of Claims 1, 2, 8 and 9, characterised in that the at least one relatively inelastic layer (7) with some degree of plastic memory has thickness of between about 0.5 and 1.5 cm.

11. A seat according to Claim 2, characterised in that at least one of the base layer (6) and the outer layer (8) is made substantially of polyurethane foam.

12. A seat according to Claim 2 or Claim 11, characterised in that the base layer (6) has a thickness of between about 5 and about 7.1 cm.

13. A seat according to any one of Claims 2, 11 and 12, characterised in that the outer layer (8) has a thickness of a between about 1 and about 1.5 cm.

14. A seat according to Claim 2, characterised in that it also includes a substantially unextendible additional layer (10) applied in contact with said intermediate layer (7).

15. A seat according to Claim 14, characterised in that said additional layer (10) is comprised of fabric.

16. A seat according to Claim 14 or Claim 15, characterised in that said additional layer (10) is applied in an adhesive relationship to said intermediate layer (7).

17. A seat according to any of Claims 14 to 16, characterised in that said additional layer (10) is applied under said intermediate layer (7).

FIG. 1

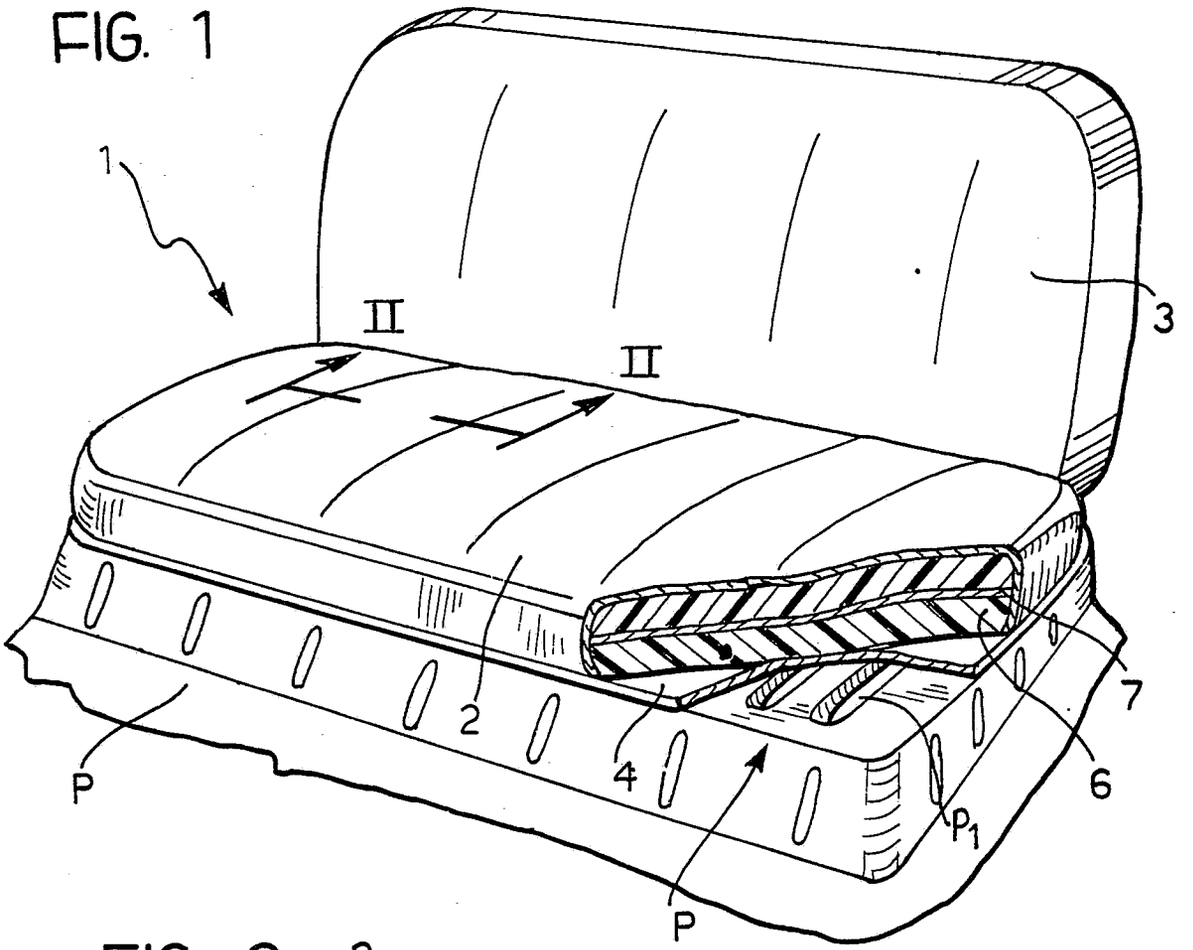


FIG. 2

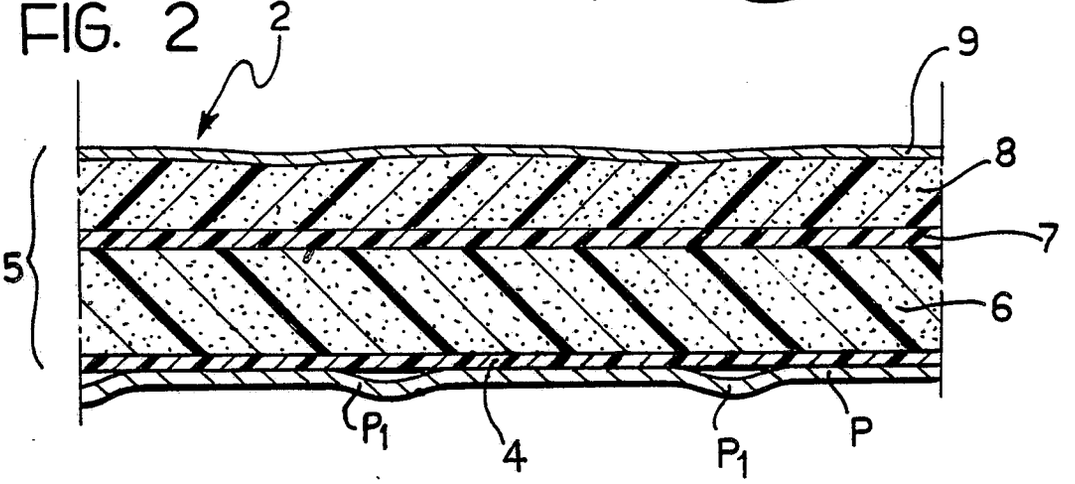


FIG. 3

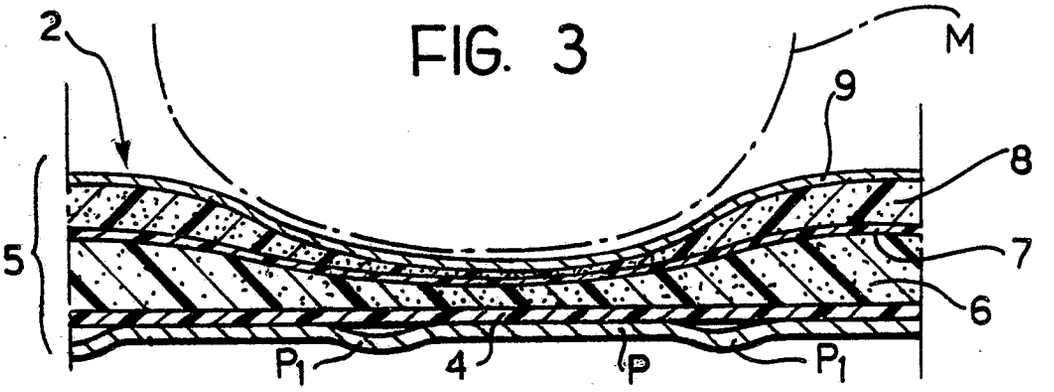
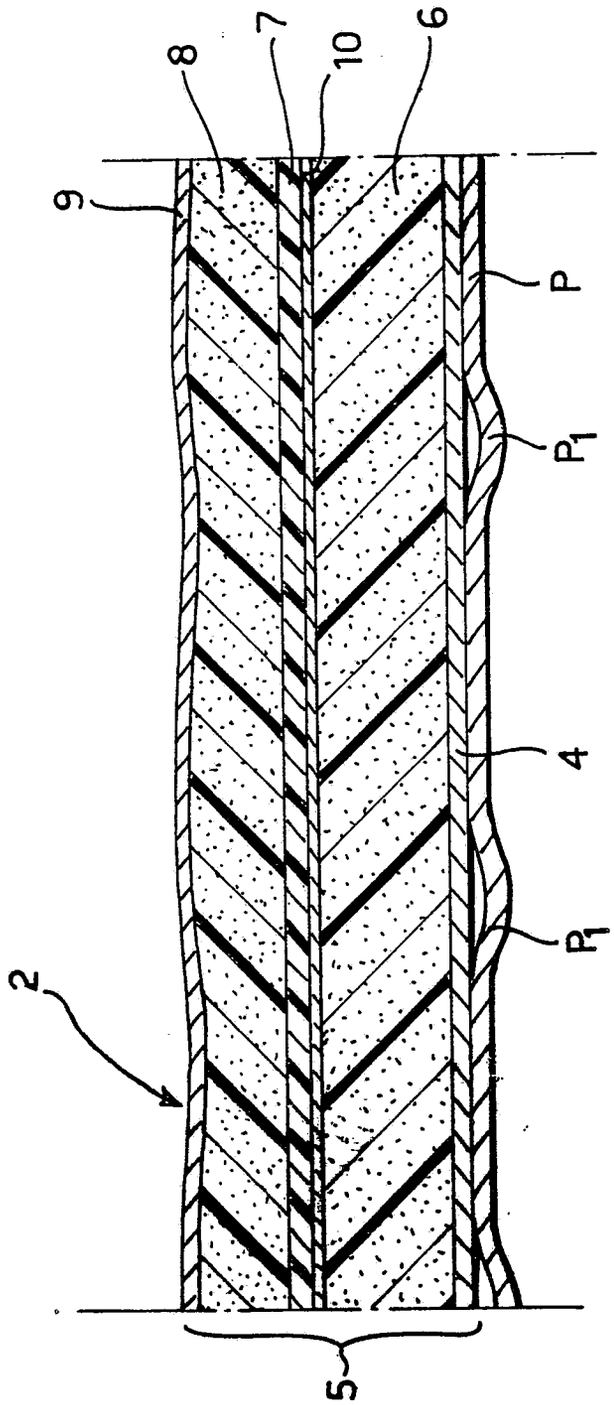


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number

EP 89 83 0387

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)
X A	US-A-3 833 259 (PERSHING) * Column 3, lines 16-55; figures *	1-4,6,9,11 8	A 47 C 7/18
A	US-A-3 047 888 (SHECTER) * Column 2, lines 35-53; column 4, lines 39-46; figures *	1,2,11	
A	US-A-3 118 153 (HOOD) * Column 2, lines 11-53; figures *	1,2,11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 47 C
B 60 N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-11-1989	HORVATH R.C.

CATEGORY OF CITED DOCUMENTS

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