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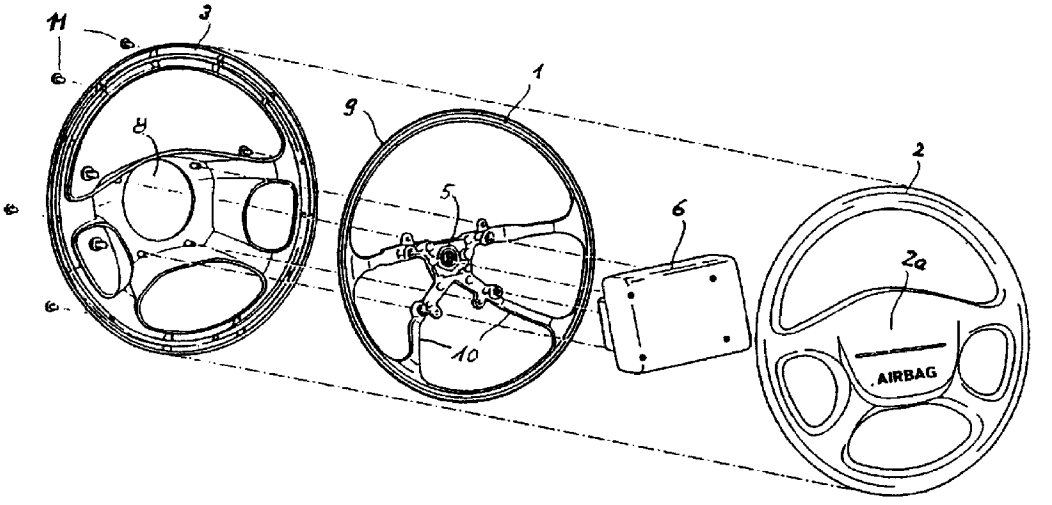
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(54) **VOLANT A COUSSIN GONFLABLE INTEGRE**
(54) **STEERING WHEEL WITH BUILT-IN AIRBAG**



(57) La présente invention vise un volant à coussin gonflable intégré pour véhicules motorisés. Un couvercle pour la portion centrale du coussin gonflable est formé d'une seule pièce à l'aide d'un revêtement primaire dont le rebord extérieur est contigu aux rayons et à la jante du volant. Le volant et toutes les pièces accessoires forment une structure finie pouvant être raccordée à la colonne de direction pendant l'assemblage final. Le volant est composé d'une ossature (1) et d'un revêtement primaire à deux coquilles (2,3), l'ossature de volant (1) comportant un moyeu (5) se fixant sur la colonne de direction (4), un module pour coussin gonflable (6) qui se fixe sur l'ossature du volant (1). Le revêtement primaire comprend une coquille supérieure (2) munie d'un élément servant à recouvrir le coussin gonflable (2a) et une coquille inférieure (3) présentant une ouverture centrale (8) dans la région du moyeu (5). La coquille supérieure (2) et la coquille inférieure (3) sont reliées l'une à l'autre le long d'une surface de séparation.

(57) For a steering wheel for motor vehicles with an integrated airbag, a covering for the central airbag region being formed in one piece with a sheathing which adjoins on the outside for the steering-wheel spokes and the steering-wheel rim, and the steering wheel inclusive of all accessory parts forming a finished structural unit which can be connected to the steering column during final assembly, it is provided that the steering wheel comprises a steering-wheel skeleton (1) and a two-shell sheathing (2, 3), - the steering-wheel skeleton (1) having a hub region (5) to be fastened to the steering column (4), - an airbag module (6) being fastened to the steering-wheel skeleton (1), - the sheathing comprising an upper shell (2) with airbag covering (2a) and a lower shell (3) with a central opening (8) in the hub region (5) and - the upper shell (2) and lower shell (3) being connected to each other along a parting surface.

Abstract

For a steering wheel for motor vehicles with an integrated airbag, a covering for the central airbag region being formed in one piece with a sheathing which adjoins on the outside for the steering-wheel spokes and the steering-wheel rim, and the steering wheel inclusive of all accessory parts forming a finished structural unit which can be connected to the steering column during final assembly, it is provided that the steering wheel comprises a steering-wheel skeleton (1) and a two-shell sheathing (2, 3),

- the steering-wheel skeleton (1) having a hub region (5) to be fastened to the steering column (4),
- an airbag module (6) being fastened to the steering-wheel skeleton (1),
- the sheathing comprising an upper shell (2) with airbag covering (2a) and a lower shell (3) with a central opening (8) in the hub region (5) and
- the upper shell (2) and lower shell (3) being connected to each other along a parting surface.

Steering wheel with built-in airbag

Description

The invention relates to a steering wheel for motor vehicles with an integrated airbag, a covering for the central airbag region being formed in one piece with a sheathing which adjoins on the outside for the steering-wheel spokes and the steering-wheel rim, and the steering wheel inclusive of all accessory parts forming a finished structural unit which can be connected to the steering column during final assembly.

Since the introduction of the airbag, such steering wheels have been realized in the widest variety of embodiments. Understandably, the widespread technique for producing steering wheels was initially taken as a basis, this technique comprising providing the metal skeleton of the steering wheel, at least on the steering-wheel rim, with a sheathing of foamed plastic which either, as a so-called integral foam, inherently has an impermeable outer layer with good feel, or else is sheathed in leather or a leather-like plastic layer. The central region of the steering wheel, receiving the airbag module, was then also designed in a similar way, many proposals having been disclosed concerning the cover cap for the airbag and

attempting to meet the to some extent conflicting requirements in a way which is functionally satisfactory and favorable in terms of production technology.

International competition means that automobile manufacturers are increasingly demanding from suppliers complete components, which on the one hand require little assembly work but on the other hand are becoming ever more complicated, because they have to perform an ever greater number of functions. Steering wheels are equipped with all possible switches and buttons to enable the driver to actuate all the operating functions of the radio, the various vehicle lighting systems, the automatic window openers, etc., without having to take a hand off the steering wheel. All these switches and buttons must be taken into consideration during the design of the steering wheel and its sheathing and must be configured in such a way that on the one hand they have the required freedom of movement but on the other hand they are integrated in a way which is satisfactory with respect to appearance and feel.

In the case of a first known example (EP 0648 661 A1), it is provided that a central steering-wheel part with hub, spoke stubs, airbag and other functional parts is first of all connected to the steering column, that then the rear covering is fastened to this steering-wheel part and that, finally, the peripheral

steering-wheel part with the steering-wheel rim, outer spoke stubs and covering for the airbag module is fastened to the central steering-wheel part, overlapping ends of the spoke stubs, which are connected to one another by means of screws inserted at the rear, being provided. Alternatively, the central steering-wheel part and the rear covering may also first of all be connected and then fitted onto the steering column. During this operation and during possible disassembly of the steering wheel, the fastening means can be reached with a tool through an opening in the rear covering.

It is regarded as disadvantageous in the case of both embodiments that a relatively great assembly effort is required and that the two steering-wheel parts, which in their final form are expediently screwed to each other for transportation and storage, first have to be taken apart again for assembly.

In the case of another embodiment (ES-U-9303374), it is provided that a central hub part with an airbag module fastened to it, but without a special rear plastic covering, is connected to the steering column and that the steering wheel, assembled in one piece with inner ring, spokes, steering-wheel rim and sheathing, and integrated covering for the airbag module, is then connected to the hub part by means of screws which are to be inserted at the rear. Objections here are the excessive amount of final

assembly and the effort involved during possible disassembly.

The same also applies to the third and fourth embodiments (WO 95/23712A1 and EP 0691245A1), in which again a hub part with airbag module and a one-piece steering wheel with inner ring, spokes, steering-wheel rim, sheathing and integrated covering for the airbag module is provided and the only differences are in the fastening means for connecting the steering wheel and steering column. In all cases, although the part of the steering wheel to be grasped by the driver is designed relatively favorably in terms of production technology, this is not true of the fastening part, which is decisive for final assembly, with the result that - as far as we know - none of the known versions has so far gone into series production. This may be due not least to the fact that the fastening part has been left behind in development technology in favor of simple production of the steering-wheel parts relevant to feel.

The invention is based on the object of further developing the generic steering wheel in such a way that the production standard achieved can be maintained, that the assembly of the various parts for various additional functions on the steering wheel can be made simple and variable and that, in particular, the entire steering wheel can be transported, stored and assembled on the steering column in the simplest

possible way, and if need be also disassembled again, as a single component.

To achieve this object, it is provided according to the invention that the steering wheel comprises a steering-wheel skeleton and a two-shell sheathing,

- the steering-wheel skeleton having a hub region to be fastened to the steering column,
- an airbag module being fastened to the steering-wheel skeleton,
- the sheathing comprising an upper shell with airbag covering and a lower shell with a central opening in the hub region and
- the upper shell and lower shell being connected to each other along a parting surface.

The invention is based on the idea that considerable degrees of freedom are gained with regard to the arrangement and assembly of the airbag module and of the other functional parts to be fitted to the steering wheel if a substantially three-part steering-wheel form is provided, the metal skeleton serving as a carrier for all the components to be assembled and the upper and lower shells, to be produced from plastic, enclosing the steering wheel and all the components fastened to it in a sandwich-like manner. In this way, a finished steering wheel which just has to be fitted onto the steering column and fastened with the union nut in final assembly can be created, without having to

dispense with the customary serration with taper between steering-wheel hub and steering column. A simple plug connection also suffices here for the electrical part.

The design according to the invention has the further advantage that the metal steering-wheel skeleton, with the components fastened to it, some of which are sensitive to heat, no longer has to be placed into an injection mold and that the upper and lower shells can each be produced on their own as independent components. This gains degrees of freedom for the plastics to be used, with the result that different plastics and shells made up of different plastic components can also be realized more easily. Instead of foaming, a mechanical fastening between the shells and the steering-wheel skeleton is provided, which brings with it further degrees of freedom in the design of the shapes of the shells. Finally, in the connection of the shells to each other and to the steering-wheel skeleton, it is possible to have recourse to all common types of connection and to select the most favorable for the respective case.

Advantageous refinements and modifications of the idea of the invention are described in subclaims 2 to 22. Further details and advantages are explained in more detail with reference to the exemplary embodiments represented in Figures 1 to 7, in which:

Figure 1 shows an exploded drawing of an embodiment of the invention

Figure 2 shows an assembled embodiment in elevation and two sections

Figure 3 shows in an enlarged representation a section through an embodiment of the steering-wheel rim

Figure 4 shows in an enlarged representation a section through another embodiment of the steering-wheel rim

Figure 5 shows a third embodiment as a section through a spoke and steering-wheel rim

Figure 6 shows a fourth embodiment as a section through the steering-wheel rim

Figure 7 shows a further embodiment as a section through a spoke and steering-wheel rim.

In the case of the exemplary embodiment according to Figure 1, the steering wheel comprises a steering-wheel skeleton 1 with a hub region 5, spokes 10 and steering-wheel rim 9, an airbag module, an upper shell 2 with airbag covering 2a and a lower shell 3 with a central opening 8. The steering-wheel skeleton 1 takes the form of a die casting and is configured for fastening the airbag module 6. Also provided are screws 11, to allow the lower shell 3 and upper shell 2 to be connected to each other. In this arrangement, the steering-wheel skeleton can be held and clamped in just by a corresponding form-fitting type of design between the two shells or else be additionally fixed in

relation to the shells by means of through-bores for the screws 11.

In the present case, four spokes 10, extending in a funnel-shaped manner from the steering-wheel rim 9 to the hub region 5, are provided, and in both shells 2, 3 there are accordingly provided four spoke-like regions, which in the assembled state enclose the spokes 10 of the steering-wheel skeleton 1 and consequently form at the same time four grip-through openings, through which the driver can grasp the steering-wheel rim 9. The parting plane between lower and upper shells 2,3 lies exclusively in the plane of the steering-wheel rim 9, i.e. the wall regions of the lower shell are drawn up on both sides of the spokes 10 to the height of the steering-wheel rim 9. Since the lower shell 3 is consequently of a funnel-shaped overall design and undertakes the sheathing of the steering-wheel skeleton 1 in the regions extending out of the plane of the steering-wheel rim 9 in the direction of the steering column 4, the upper shell 2 may be of a relatively flat configuration and the parting surface may be arranged at the height of the steering-wheel rim.

Figure 2 shows an assembled steering wheel with the basic configuration according to Figure 1, Figure 2a showing a plan view and Figures 2b and 2c showing two sections running perpendicular to each other and to the plane of the drawing of Figure 2a.

Fastened on the steering-wheel skeleton 1 with hub region 5, spokes 10 and steering-wheel rim 9 is an airbag module 6. The steering-wheel skeleton 1 is sheathed by lower and upper shells 3, 2, the lower shell having a central opening 8 and the upper shell 2 comprising the airbag covering 2a. The hub region 5 is provided in a known way with a serration and a taper and is fitted on the corresponding part of the steering column. The axial bracing takes place by means of a union nut 7, which is supported on a peripheral stop on the steering-wheel column 4 and is screwed up on a thread formed on the outside of the hub region 5.

This type of fastening, combined with the two-shell sheathing 2, 3 according to the invention of the steering-wheel skeleton 1, allows the steering wheel as a whole to be configured as a one-part component which is easy to handle during transportation and storage and requires no special protective measures. The one-part steering wheel can go straight into final assembly and is very easy to fasten. Consequently, a steering wheel which can be equipped with all the currently customary and planned additional functions and at the same time is extremely easy to handle and (dis)assemble is obtained.

Figure 3 shows as a section through the steering-wheel rim 9 a first possible way in which the lower shell 3 and upper shell 2 can be connected to each other. In the region of the steering-wheel rim 9,

the steering-wheel skeleton 1 is of a U-shaped design in cross section, with a base region 16c and two slightly outwardly diverging legs 16a, 16b, and has a series of through-holes 9a. The two shells 2 and 3 are made up of a number of plastic components, according to the different hatching, and can thus be adapted optimally to the different requirements regarding strength and to the demands with respect to appearance and feel. They are matched in a form-fitting manner to each other in the parting surface, like a tongue-and-groove joint, and are connected to each other by means of screws 11. In this arrangement, the upper shell 2 bears against the steering-wheel rim 9 in certain regions and has corresponding bores for the screws 11. The lower shell 3 engages by a cross-sectionally trapezoidal part 17 in the cross-sectionally U-shaped steering-wheel rim 9. It has clearances 18, in which the screw heads 11a may be countersunk and which may, if appropriate, be covered by a subsequently applied layer of plastic. They may, however, also remain open, since, being on the underside of the steering wheel, they are not obtrusive visually or in terms of feel.

In the case of the embodiment according to Figure 4, the steering-wheel skeleton 1 is again of a U-shaped design, with slightly diverging legs, in the region of the steering-wheel rim 9. In this case, the lower shell 3 and upper shell 2 are, however, connected to each other in a form-fitting manner by means of a

snap connection 20, an elastically deformable body 20a ensuring that the snap connection 20 is permanently under tensile stress.

Figure 5 shows a section through a spoke 10 and through the steering-wheel rim 9. The lower shell 3 and upper shell 2 bear against the steering-wheel skeleton only in certain regions, via webs, and are held together by means of a flexible ring 12 of approximately semicircular cross section, it being ensured by recesses 13 and 14 that, on the outside, the ring 12 terminates flush with the inwardly adjoining regions of the two shells 2, 3.

Figure 6 shows an embodiment in which the upper shell 2 and lower shell 3 are surrounded, at least in the region of the steering-wheel rim 9, by a covering layer 15 of leather or the like in each case. The borders 15a, 15b of the covering layers 15 are turned inward in the region of the parting surfaces and clamped in between the two shells 2, 3. Provided between the shells 2, 3 is a form-fitting tongue-and-groove joint, which is held together by screws (not shown).

Figure 7 shows an embodiment in which the steering-wheel skeleton is completely embedded in the lower shell 3 in the region of the spokes 10 and of the steering-wheel rim 9. The upper shell 2 is connected by means of tongue-and-groove joint 19 and screws 11 to

the lower shell 3, the screw heads 11a again being countersunk in clearances 18.

Further modifications and types of fastening are within the scope of the basic idea of the invention, providing a one-part steering wheel suitable for final assembly in which the steering-wheel skeleton is embedded with all the functional parts between plastic parts in the form of half shells.

Patent claims

1. Steering wheel for motor vehicles with an integrated airbag, a covering for the central airbag region being formed in one piece with a sheathing which adjoins on the outside for the steering-wheel spokes and the steering-wheel rim, and the steering wheel inclusive of all accessory parts forming a finished structural unit which can be connected to the steering column during final assembly, characterized in that the steering wheel comprises a steering-wheel skeleton (1) and a two-shell sheathing (2, 3),

- the steering-wheel skeleton (1) having a hub region (5) to be fastened to the steering column (4),
- an airbag module (6) being fastened to the steering-wheel skeleton (1),
- the sheathing comprising an upper shell (2) with airbag covering (2a) and a lower shell (3) with a central opening (8) in the hub region (5) and
- the upper shell (2) and lower shell (3) being connected to each other along a parting surface.

2. Steering wheel according to claim 1, characterized in that the steering-wheel skeleton (1) consists of a metal material.

3. Steering wheel according to claim 2, characterized in that the steering-wheel skeleton (1) comprises a one-piece die casting.

4. Steering wheel according to claim 3, characterized in that the die casting consists of an AL or MG [sic] alloy.

5. Steering wheel according to one of claims 1 - 4, characterized in that the sheathing (2, 3) consists of plastic.

6. Steering wheel according to claim 5, characterized in that the upper shell (2) and/or lower shell (3) comprise a plastic injection molding.

7. Steering wheel according to claim 6, characterized in that the upper shell (2) and/or lower shell (3) consist of rigid foam with a closed surface, at least on the outside.

8. Steering wheel according to claim 6, characterized in that the upper shell (2) and/or lower shell (3) have a two- or multi-shell structure with different plastic components.

9. Steering wheel according to one of claims 1 - 8, characterized in that the parting surface between the upper shell (2) and the lower shell (3) has a first planar part in the region of the steering-wheel rim (9), a second planar part, parallel to the first, in the region of the steering-wheel hub (5) and, between the first and second parts, a third funnel-shaped part in the region of the spokes (10).

10. Steering wheel according to claim 9, characterized in that the upper shell (2) and lower shell (3) are matched to each other in a form-fitting

manner along the parting surface and, at least in certain regions, to the steering-wheel skeleton (1).

11. Steering wheel according to claim 10, characterized in that the upper shell (2) and lower shell (3) are matched to each other along the parting surface in the manner of a tongue-and-groove joint (19).

12. Steering wheel according to one of claims 10 or 11, characterized in that the upper shell (2) and lower shell (3) are connected to each other, and to the steering-wheel skeleton (1), by screws or rivets (11) arranged substantially perpendicular to the parting surface.

13. Steering wheel according to claim 9, characterized in that screws or rivets (11) extend through clearances (12 [sic]) in the steering-wheel rim (9) and engage in the mating shell.

14. Steering wheel according to claim 9, characterized in that the upper shell (2) and lower shell (3) are connected to each other along the parting surface by a snap connection (20).

15. Steering wheel according to claim 9, characterized in that the upper shell (2) and lower shell (3) are held together by means of a flexible ring (12) arranged on the outer side of the steering-wheel rim (9).

16. Steering wheel according to claim 15, characterized in that the upper shell (2) and lower

shell (3) have recesses (13, 14) matched to the flexible ring (12) and in that the flexible ring (12) terminates with its surface flush with the adjoining regions of the upper shell (2) and lower shell (3).

17. Steering wheel according to claim 9, characterized in that the upper shell (2) and lower shell (3) are provided with a covering layer (15) of leather.

18. Steering wheel according to claim 17, characterized in that the borders (15a, 15b) of the covering layer (15) are angled inwards in the parting surface and are clamped in between the upper shell (2) and lower shell (3).

19. Steering wheel according to claim 9, characterized in that the steering-wheel rim (9) is of a U-shaped design in cross section, with side legs (16a, 16b) diverging in the direction of the lower shell (3), and in that the lower shell (3) engages by a cross-sectionally trapezoidal part (17) in the U-shaped cross section of the steering-wheel rim (9).

20. Steering wheel according to claim 19, characterized in that the heads (11a) of the screws or rivets (11) according to claims 12 and 13 are arranged in clearances (18) of the cross-sectionally trapezoidal part (17) of the lower shell (3) and in that the screws or rivets (11) extend through the base (16c) of the U-shaped cross section of the steering-wheel rim (9).

21. Steering wheel according to claim 1, but with the proviso that the steering-wheel skeleton (1) is formed into the lower shell (3) in the region of the spokes (10) and of the steering-wheel rim (9) and in that the upper shell (2) according to one of claims 10 - 19 is matched in a form-fitting manner to the lower shell (3) and is connected to it.

22. Steering wheel according to one of claims 1 - 21, characterized in that the connection of the "steering wheel" structural unit with the steering column (4) takes place by means of a union nut (7).

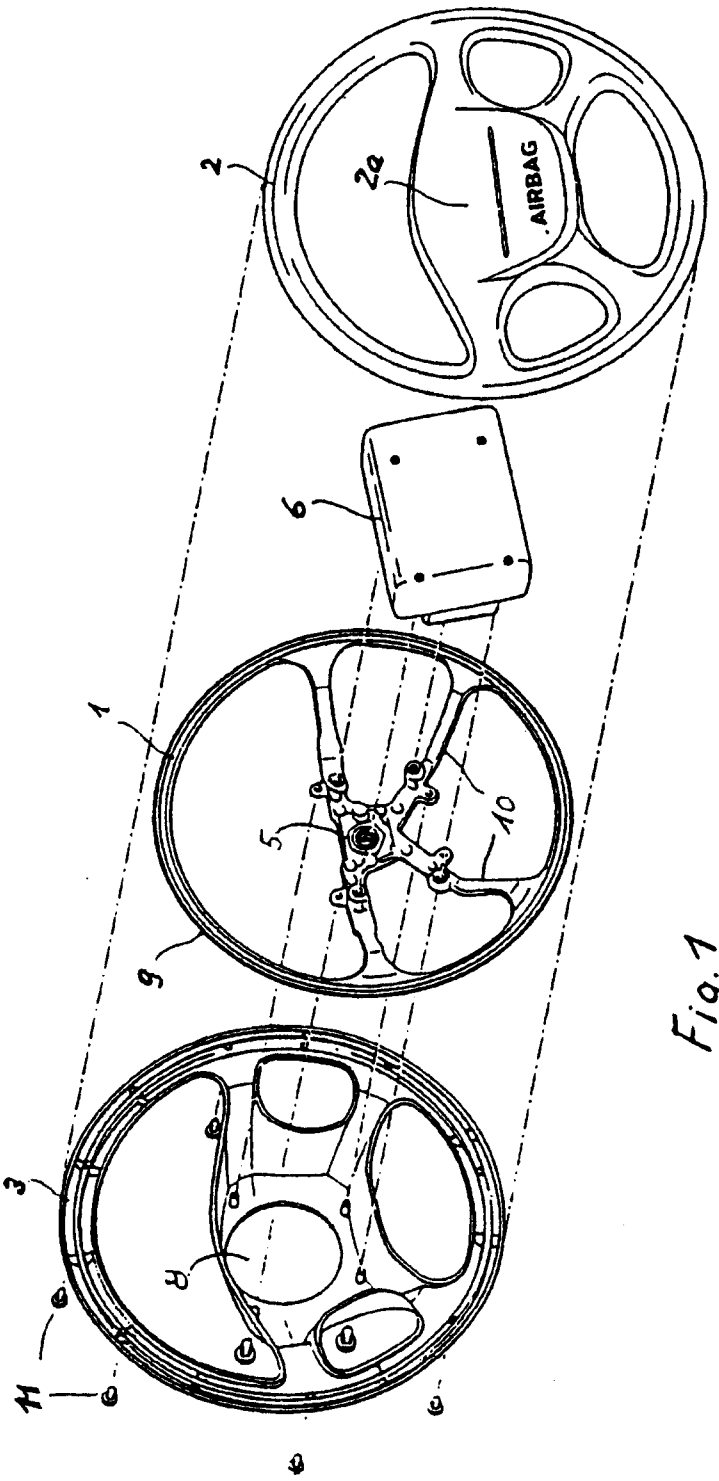


Fig.1

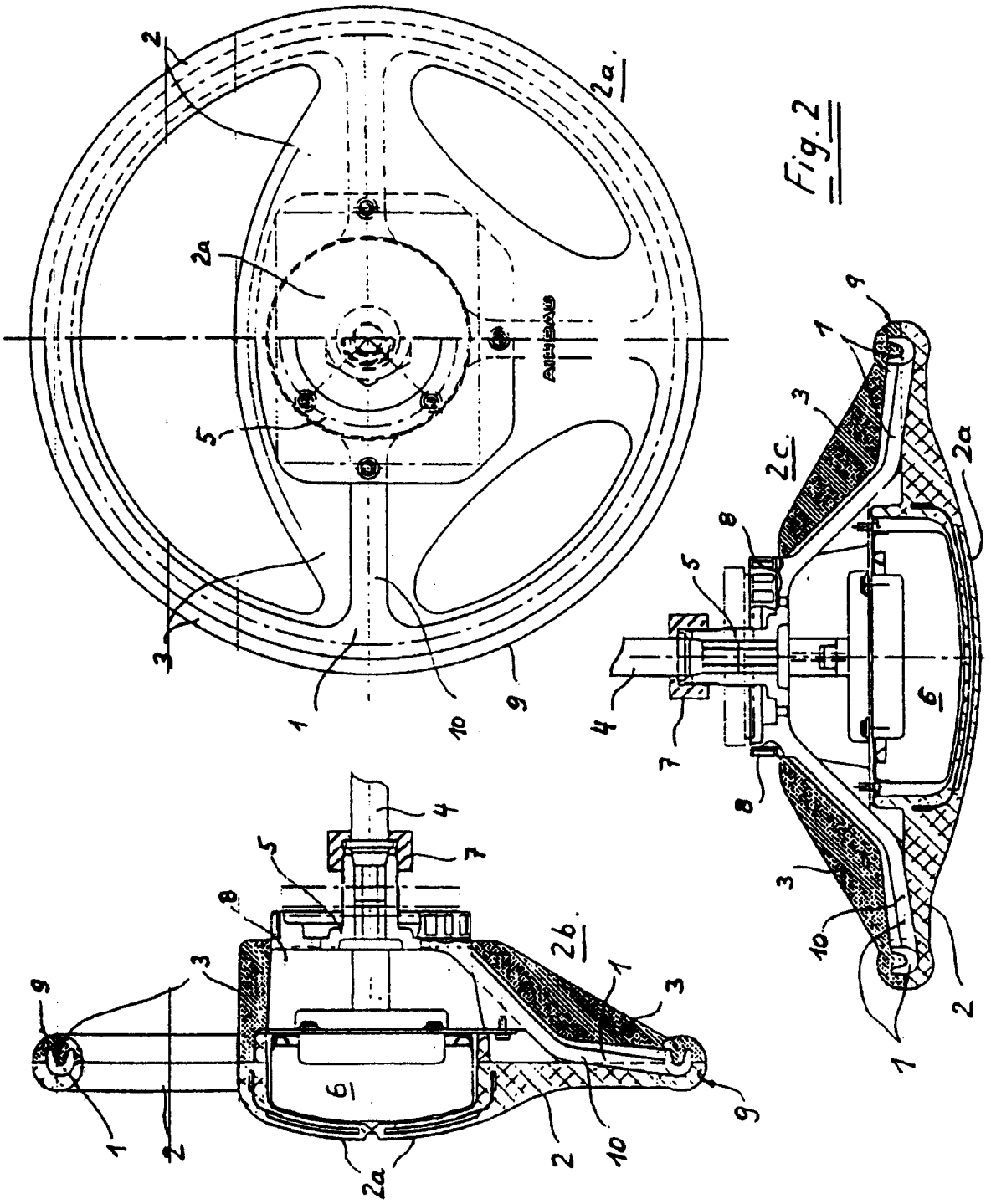


Fig. 2

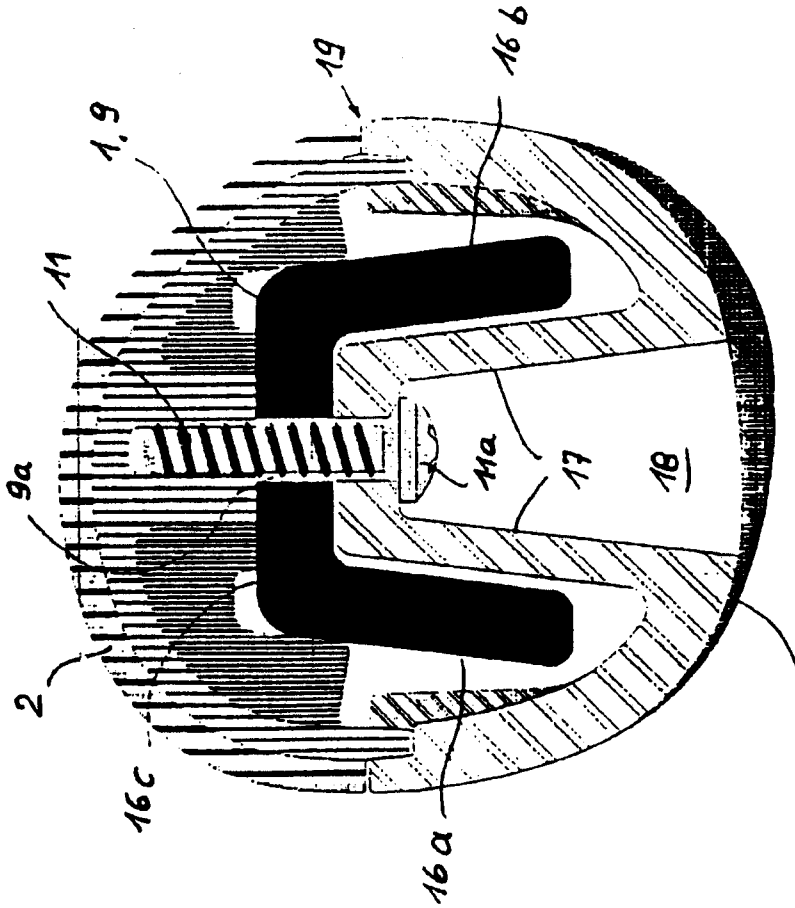


Fig.3

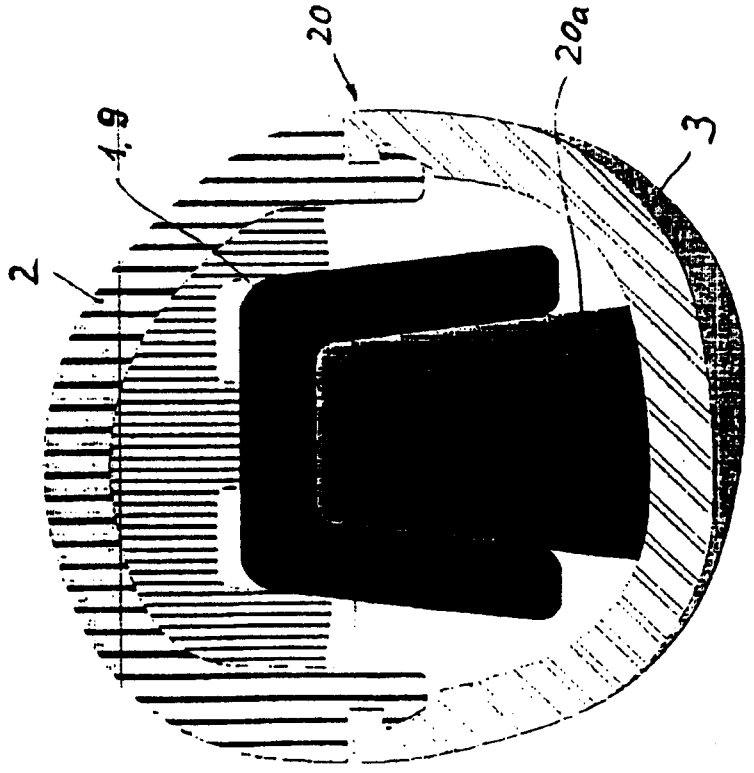


Fig.4

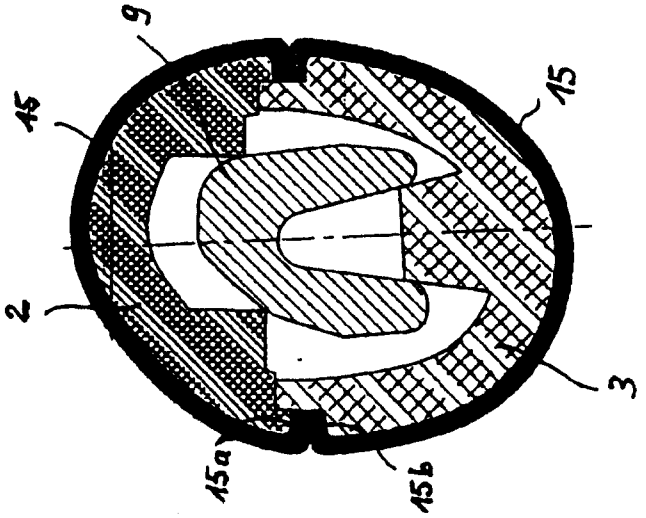


Fig.6

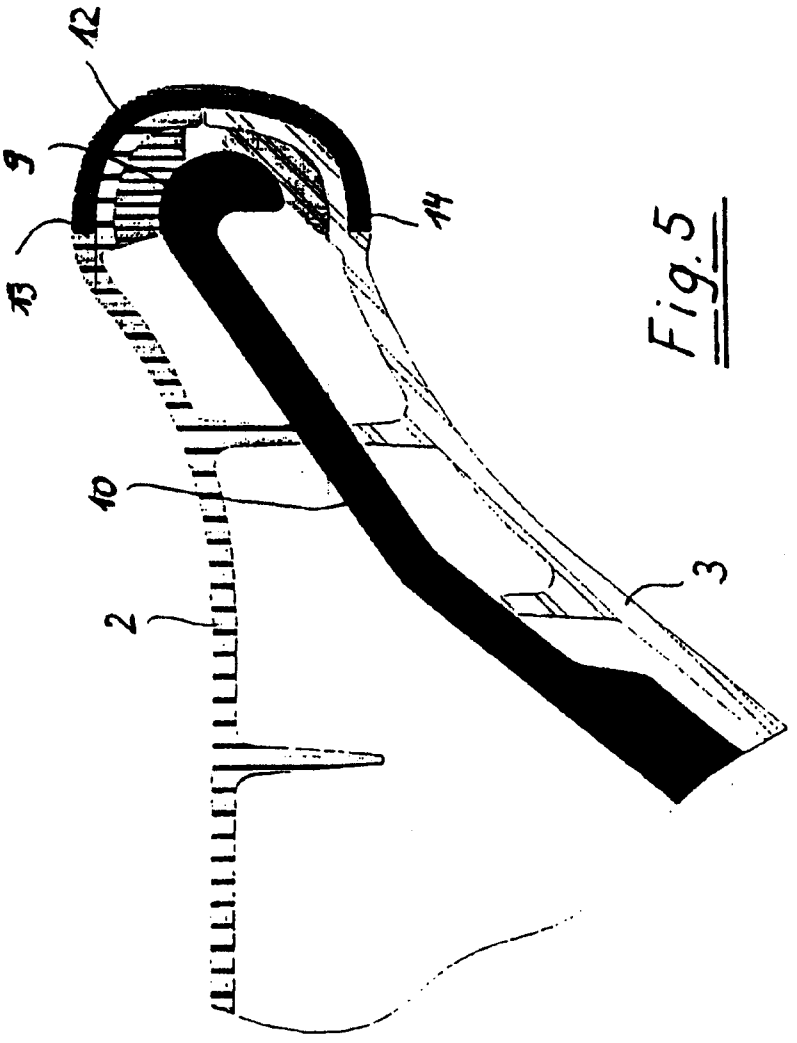


Fig.5

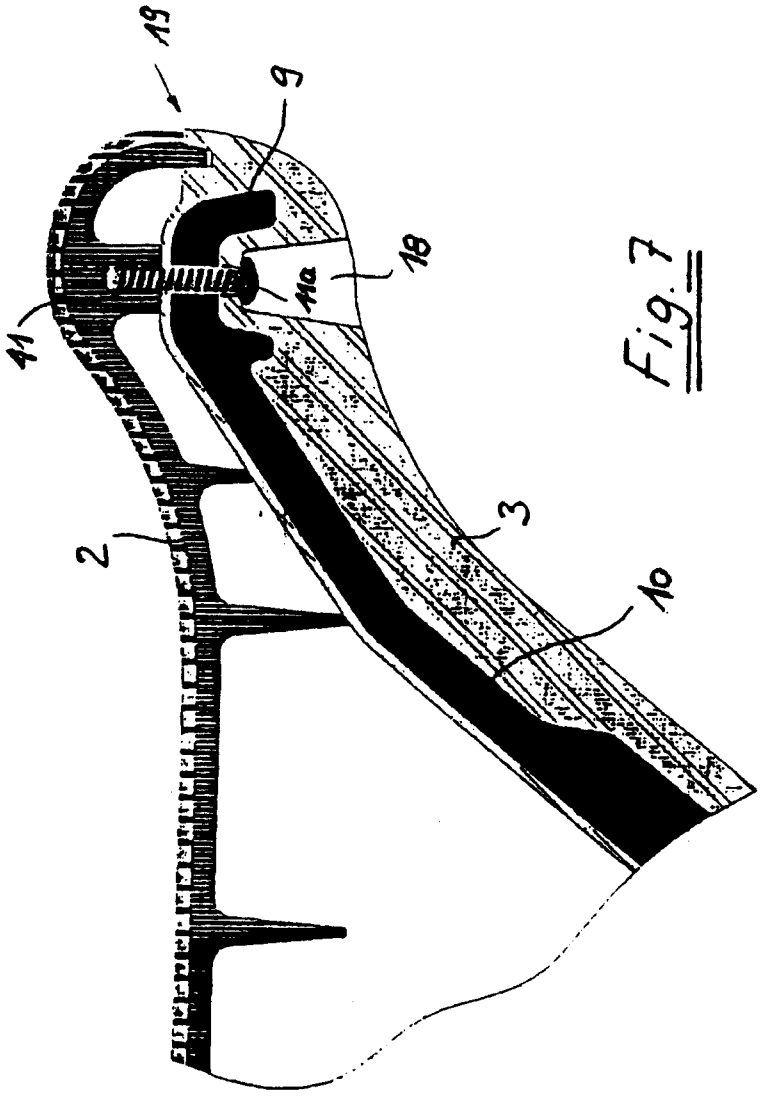
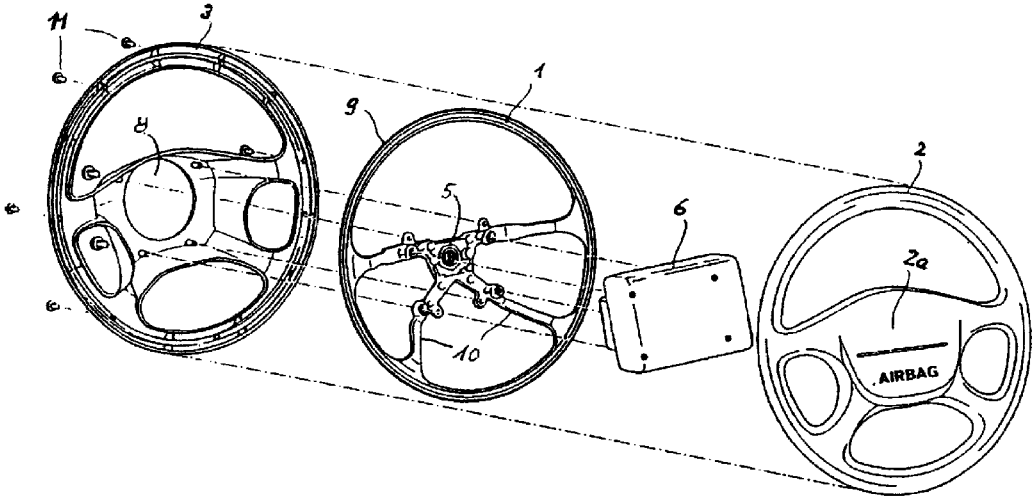


Fig. 7


11
3
1
9
4
5
6
2
2a
10
AIRBAG