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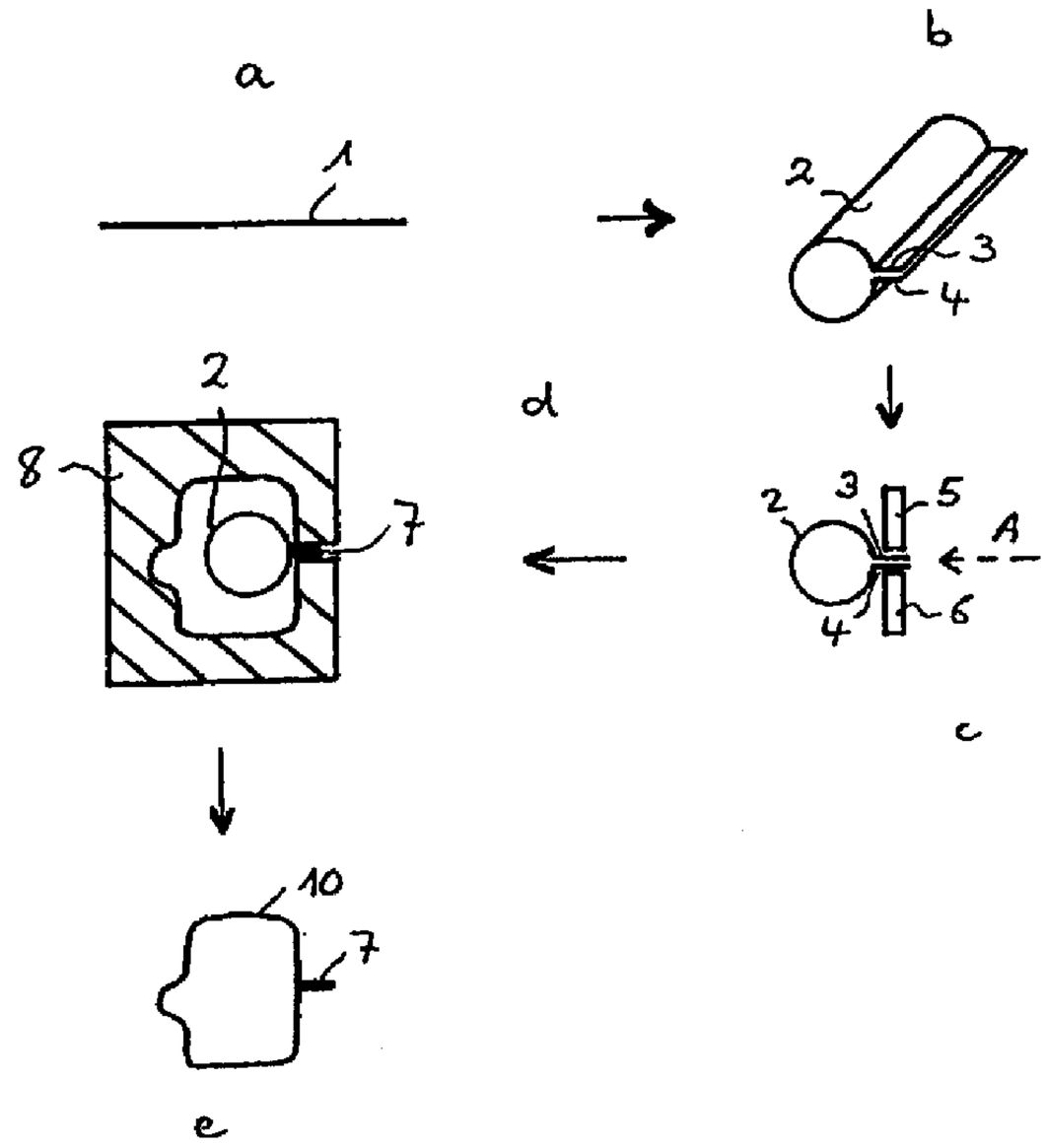
(54) **PROCEDE POUR LA FABRICATION D'UNE PIECE MOULEE, AINSI QUE PIECE MOULEE AINSI FABRIQUEE**

(54) **METHOD FOR PRODUCING A MOLDED PART AND A MOLDED PART PRODUCED ACCORDING TO SAID METHOD**



(57) L'invention concerne un procédé pour la fabrication d'une pièce moulée (10), dans lequel un corps tubulaire (2) est d'abord pourvu d'un bord soudé (7). Ce corps (2) est ensuite façonné dans un moule (8), avec blocage du bord (7), par formage sous haute pression interne pour former la pièce moulée ou le corps moulé (10). On obtient ainsi, simplement, des corps moulés pourvus d'un bords de fixation permettant l'assemblage du corps moulé avec d'autres pièces.

(57) The invention relates to a molded part (10) which is configured by initially forming a tubular body (2) with a soldered flange (7). Subsequently, the body (2) is shaped in a mold (8) by securing the flange (7) under high internal pressure to shape the form part or the preform (10). Thus, preforms with a secured flange that can be used to connect said preforms to other parts can be easily obtained

PCT

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(54) Title: METHOD FOR PRODUCING A MOLDED PART AND A MOLDED PART PRODUCED ACCORDING TO SAID METHOD

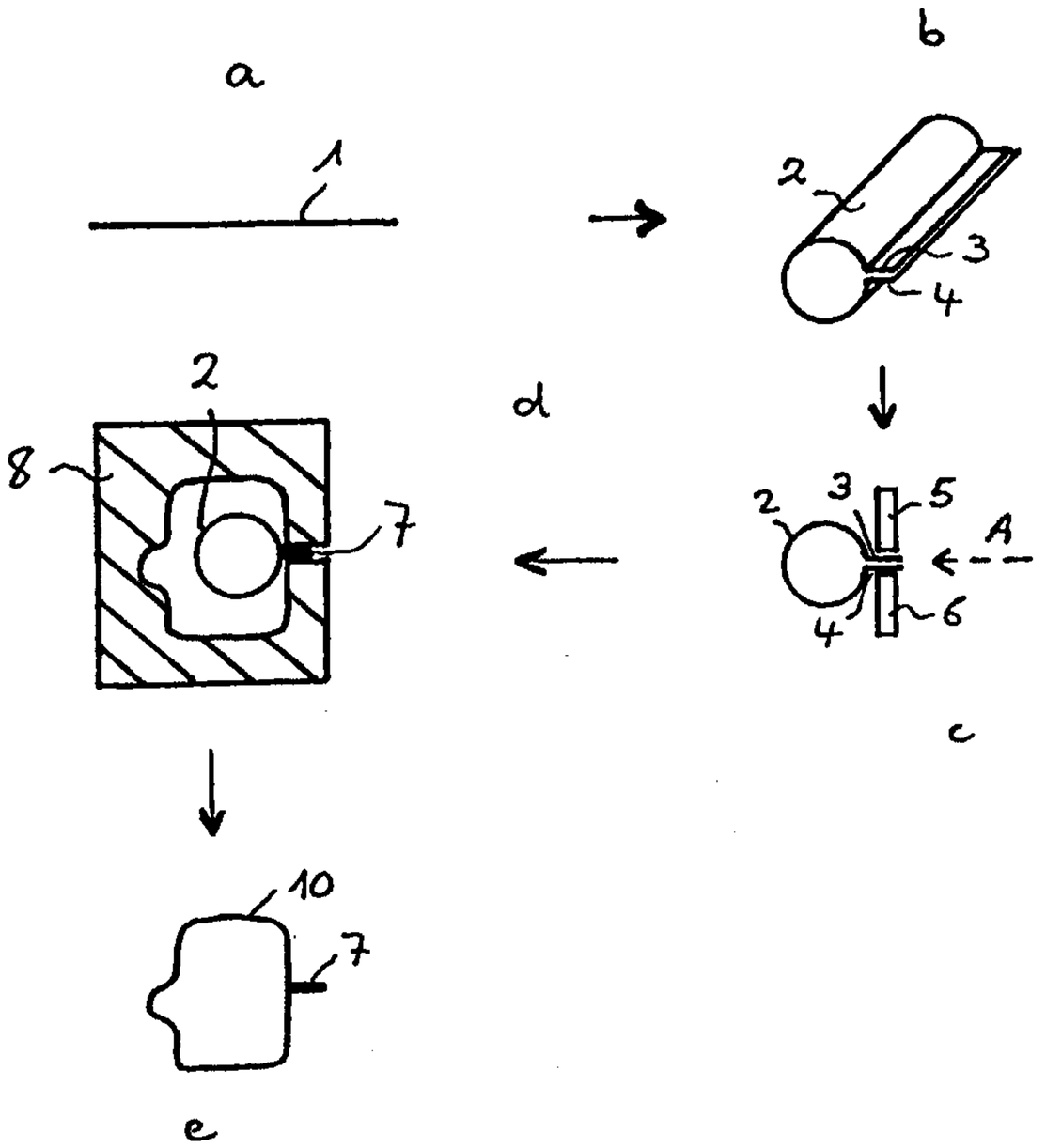
(54) Bezeichnung: VERFAHREN ZUR HERSTELLUNG EINES FORMTEILES SOWIE NACH DIESEM HERGESTELLTES FORMTEIL

(57) Abstract

The invention relates to a molded part (10) which is configured by initially forming a tubular body (2) with a soldered flange (7). Subsequently, the body (2) is shaped in a mold (8) by securing the flange (7) under high internal pressure to shape the form part or the preform (10). Thus, preforms with a secured flange that can be used to connect said preforms to other parts can be easily obtained

(57) Zusammenfassung

Ein Formteil (10) wird dadurch gebildet, dass zunächst ein rohrförmiger Körper (2) mit einem verschweissten Flansch (7) gebildet wird. Nachfolgend wird der Körper (2) in einer Form (8) unter Festhaltung des Flansches (7) durch Innenhochdruckumformung zum Formteil bzw. Formkörper (10) verformt. Es entstehen auf einfache Weise Formkörper mit einem Befestigungsflansch zur Verbindung des Formkörpers mit anderen Teilen.



METHOD FOR PRODUCING A MOLDED PART AND A MOLDED PART PRODUCED ACCORDING TO SAID METHOD

The invention relates to a method for the production of a formed sheet-metal component which is formed by internal high-pressure forming. The invention also relates to a formed component produced according to the method.

It is known to shape components by internal high-pressure forming of butt-welded tubular preforms which are cut from corresponding bar stock to the length required. From EP-A-0620056 it is also known to weld together a number of such butt-welded tubular preforms of different diameter and thickness into a single tube which is then formed into a tubular component by internal high-pressure forming.

Extended formed components made from tubular preforms may especially be used as components in motor vehicle construction. Here, these components usually have to be joined to other components, eg. by further welding or by bonding. For certain purposes, it is then necessary for one component to be provided with at least one attachment flange. At least one operation is required to add such a flange to the said components, which is a disadvantage in terms of cost, so that, in this case, several components formed by deep-drawing or pressing are usually welded together in a conventional manner into one formed component.

From EP-A-0589370 it is known to provide two essentially flat metal sheets with a conduit for introducing the fluid for the internal high-pressure forming, and to weld the sheets together at their edges; the result is a formed body with a surrounding flange, which is not desired in many applications in motor vehicle construction. DE-C 900085 likewise discloses the internal high-pressure forming of two essentially flat metal sheets which have been both welded together and which have a chamber in the middle formed from two domes for the introduction of the pressure fluid. This also produces a formed body with a surrounding flange. similarly, DE-A 3418691 shows the forming of two or four flat metal sheets which are joined together at their edges. US-A-5070717 shows a flangeless butt-welded tube being formed in such a way that a flange is produced in the forming process. In this way it is possible to produce an extended formed body with a flange on one side only, but additional cutting and welding operations are necessary to obtain a flange form with a straight end face.

Therefore, the problem which the invention seeks to solve is to provide a method which produces by internal high-pressure forming a component which can easily be produced and joined to other components, in particular an elongate component with a flange on one side only, or with two flanges on opposite sides of the component.

This problem is solved by the characterising features of claim 1.

By first of all forming, by rounding, a tubular body with an outwardly directed flange, production is facilitated, since the flange serves as a welding flange which can be welded by conventional low-cost methods at a high rate of production. In the completed formed component, this existing flange serves as an attachment point for other components, which makes the use of such a formed component advantageous in many applications in comparison with conventional bodies formed by internal high-pressure forming.

In an alternative solution according to claim 1, two half-rounded metal sheets each provided with two projecting flat tongues are first of all joined to form one essentially tubular body with two flanges.

Another object of the invention is to provide a component formed by internal high-pressure forming which can be easily joined to other components. This problem is solved by a formed component according to claim 9.

Embodiments of the invention will now be described in detail by way of example, with reference to the drawings, in which:

Figs. 1a-1e show schematically the steps in the production of a formed component produced in accordance with the invention;

Fig. 2 shows in profile a formed component according to the invention, used as a roof edge section for a motor vehicle;

Fig. 3 shows in profile a formed component

according to the invention, used as a door sill section for a motor vehicle;

Fig. 4 shows in profile a formed component according to the invention, used as a door post for a motor vehicle;

Fig. 5 shows in profile a formed component according to the invention, used as a hinge bracket or lock bracket for a motor vehicle; and

Fig. 6 shows a further embodiment of the formed component according to the invention prior to internal high-pressure forming.

Figs. 1a-1e show schematically a sequence of process steps in the production of a formed component or body according to the invention. In Fig. 1a, 1 denotes a sheet-metal blank from which the body will be formed. This blank 1 may be homogeneous, eg. a wholly steel or aluminium blank consisting of a single piece of the requisite size and with uniform thickness, as illustrated in Fig. 1a. The blank may, however, consist of two or more sheet-metal portions joined together by welding, so that the blank 1 has portions of different thickness and/or with other dissimilarities of material characteristics or properties, which impart to the subsequent formed component local differences in characteristics or properties. Such blanks consisting of portions joined together (so-called tailored blanks) are known, and are used eg. in motor vehicle construction, where they are formed into components in a known manner. The "tailored blank" can be assembled in any

desired direction and using any desired welding processes.

As shown in Fig. 1b the blank is formed into an essentially cylindrical tube 2, two margins 3 and 4 of the blank being formed into tongues projecting from the tubular part 2, these tongues together constituting a flange 7 projecting from the tube. The forming of the blank 1 into the tubular part 2 may be performed on a rounding machine in a conventional manner, with unrounded margins 3,4 forming the tongues.

Fabrication of the tubular body 2 continues with the welding together of the tongues 3,4 to constitute the flange 7 (Fig. 1c). This may be performed eg. by lap seam welding with welding rollers 5 and 6, a wire electrode being provided in a known manner at each of the welding rollers 5,6. This has the advantage that coated metal blanks, eg. tinned or galvanised blanks, can be welded without any problem, as the wire electrode is continuously replenished from a spool. Alternatively the flange 7 may be welded eg. by edgewise laser welding, as illustrated in Fig. 1c by the additional arrow A symbolically representing the laser beam impinging on the tongues 3,4. Both roller seam welding and laser beam welding allow lengthy flanges 7 to be continuously welded at a high rate of feed and with high weld quality. It is also possible to employ laser welding in which the flange is through-welded from above or below. Alternatively the margins may be joined together edgewise by other known welding processes such as MIG, MAG, plasma or oxyacetylene welding. Electron-beam welding is

also possible. By employing these processes, practically all kinds of sheet metal including, in particular, coated sheet-metal blanks, can be welded with high quality. The welded body 2 has an essentially tubular form with open ends and with a sealingly welded flange 7.

In a next step (Fig. 1d) the body 2 thus formed is placed in a mould 8 for internal high-pressure forming. The inner surface of this mould has a configuration which corresponds to the shape of the formed body to be produced. The mould also has means for closing off the open ends of the tubular body 2 and means for introducing - usually via the end - a fluid at high pressure. The fluid for forming may also be introduced through an orifice or nozzle within the cylindrical portion of the preform. The process of internal high-pressure forming is known in itself and the corresponding devices for carrying out this process are likewise known and available on the market, and will therefore not be described in further detail here. In the present case, however, the mould 8 is configured so that the flange 7 can be clamped in the mould by the mould itself or by additional means, so that the flange 7 is impinged on both faces, over as nearly as possible its entire length, and preferably its full width, during the internal high-pressure forming process, so that the weld seam of the flange is not subjected to opening or peeling forces due to the pressure exerted in the interior of the body 2.

Fig. 1e shows the resulting formed body 10, which

has the desired shape imparted by internal high-pressure forming, and is provided with a flange 7 which can be used for attaching the body 10 to another component.

Fig. 2 shows as an example a formed body 11 which has been produced by the steps 1a to 1e described above, used as a roof edge section for a car roof 15. Fig. 2 shows this application in schematic and highly simplified form. It will be seen that the formed body 11 is attached to the roof 15 by its flange 7, eg. by a laser-welded joint (seam 16). Of course, other known attachment techniques (such as spot welding or bonding) might be employed.

Fig. 3 shows a further formed body 12 produced in accordance with the invention. This body - likewise shown only in simplified form - is used as a door sill section for a motor vehicle. 17 denotes a part of the vehicle floor to which the formed body 12 is attached by the flange 7, eg. by spot welding or laser welding.

Fig. 4 shows schematically an end view of a formed body 13 according to the invention, which can be used as a door post (B-pillar) of a motor vehicle.

Fig. 5 shows a further formed body 14 fitted as a formed section in the hinge or lock region of a car engine bonnet or boot lid. The formed body 14 is attached by the flange 7 to the bent-over end 21 of the outer skin 19 of the bonnet or lid. The inner skin is fitted to the outer skin on interposed rubber mountings, and stiffeners 22 are provided.

Fig. 6 shows a tubular body 25 made up of two

half-round formed blanks 26 and 27. Each blank has two projecting margins or tongues which are paired to provide flanges 28 and 29. These are welded as described above with reference to the flange 7 of Fig. 1. The body 25 is also formed by internal high-pressure forming, the two flanges 28 and 29 being gripped over as nearly as possible their entire area. After forming, a formed body 30 with two flanges 28 and 29 results.

Of course, the method according to the invention can be used for producing a large number of formed components for other applications besides motor vehicle construction, such as eg. railcar building or aircraft construction.

CLAIMS

1. Method for the production of a formed sheet-metal component (10-14) characterised in that an essentially tubular body (2) is formed by rounding a sheet-metal blank (1), with an outwardly directed flange (7) formed from unrounded margins (3,4) of the blank from the body, or in that an essentially tubular body (25) is formed by half-rounding two sheet metal blanks (26,27) and has two flanges (28,29) on opposite sides, formed from unrounded margins of the blanks, in that the flange (7) or flanges (28,29) are welded, and in that the body is transformed into the formed component (10-14) by internal high-pressure forming.

2. Method according to claim 1, characterised in that the flange (7;28,29) is welded by roller seam welding with or without wire electrode.

3. Method according to claim 1 or claim 2, characterised in that the flange is welded by laser welding or electron beam welding.

4. Method according to claim 1, characterised in that the flange is welded by gas fusion welding or electric arc welding.

5. Method according to any one of claims 1 to 4, characterised in that the flange is clamped during the

internal high-pressure forming, in particular by the mould (8) for the internal high-pressure forming.

6. Method according to any one of claims 1 to 5, characterised in that each blank (1) is composed of at least two sheet-metal blanks which are assembled together by welding before rounding takes place.

7. Formed component (10-14) of sheet metal, produced by internal high-pressure forming of an essentially tubular body, characterised in that it is an elongate formed component with a flange (7) on one side, or with two separate flanges on opposite sides.

8. Formed component according to claim 7, characterised in that it is a roof edge section (11) for motor vehicle construction.

9. Formed component according to claim 7, characterised in that it is a door sill section (12) for motor vehicle construction.

10. Formed component according to claim 7, characterised in that it is a pillar (13) for motor vehicle construction.

11. Formed component according to claim 7, characterised in that it is a hinge bracket or lock bracket

(14) for motor vehicle construction.

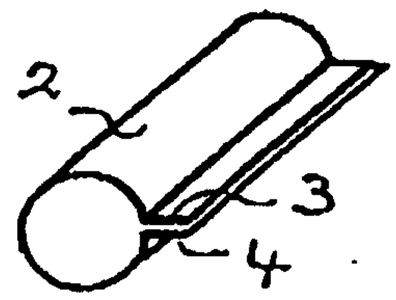
12. Formed component according to claim 7, characterised in that it is a longitudinal beam or transverse beam for motor vehicle construction.

AMENDED SHEET

WO 98/24569 PCT/CH97/00351

Fig. 1a

Fig. 1b



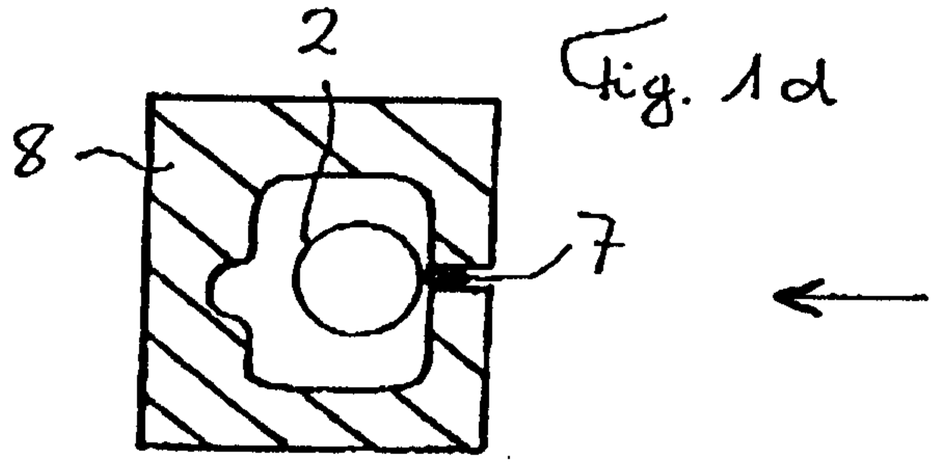


Fig. 1d

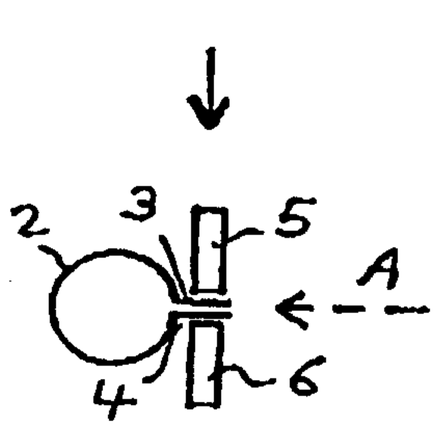


Fig. 1c

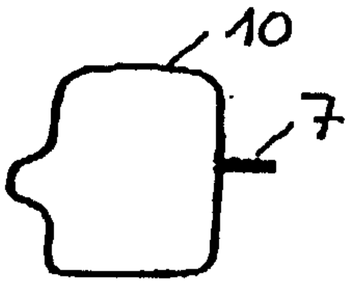


Fig. 1e

Fig. 2

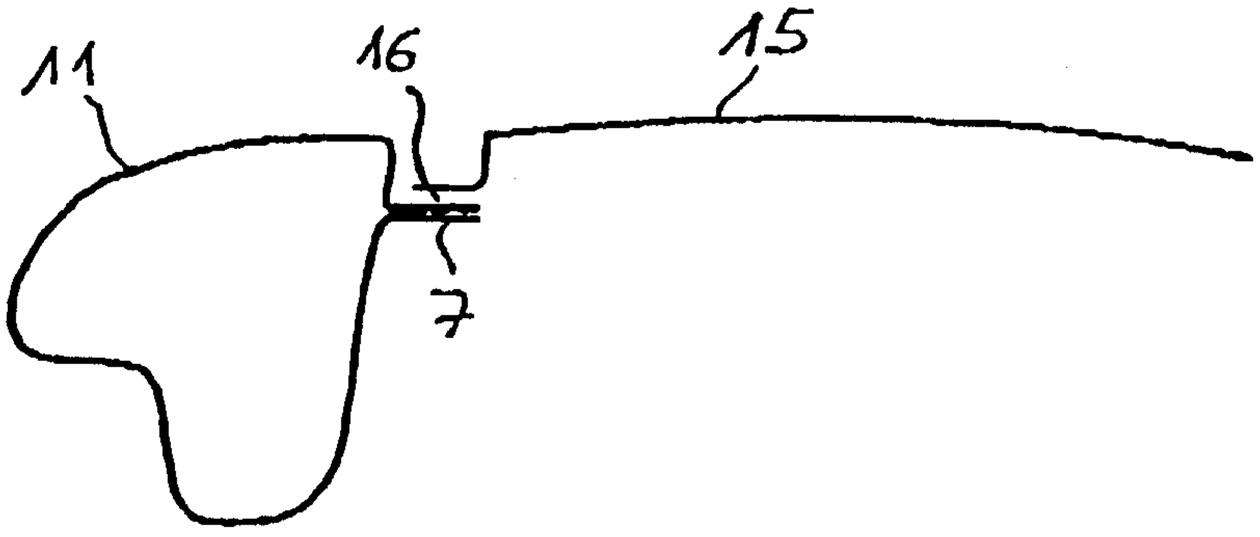


Fig. 3

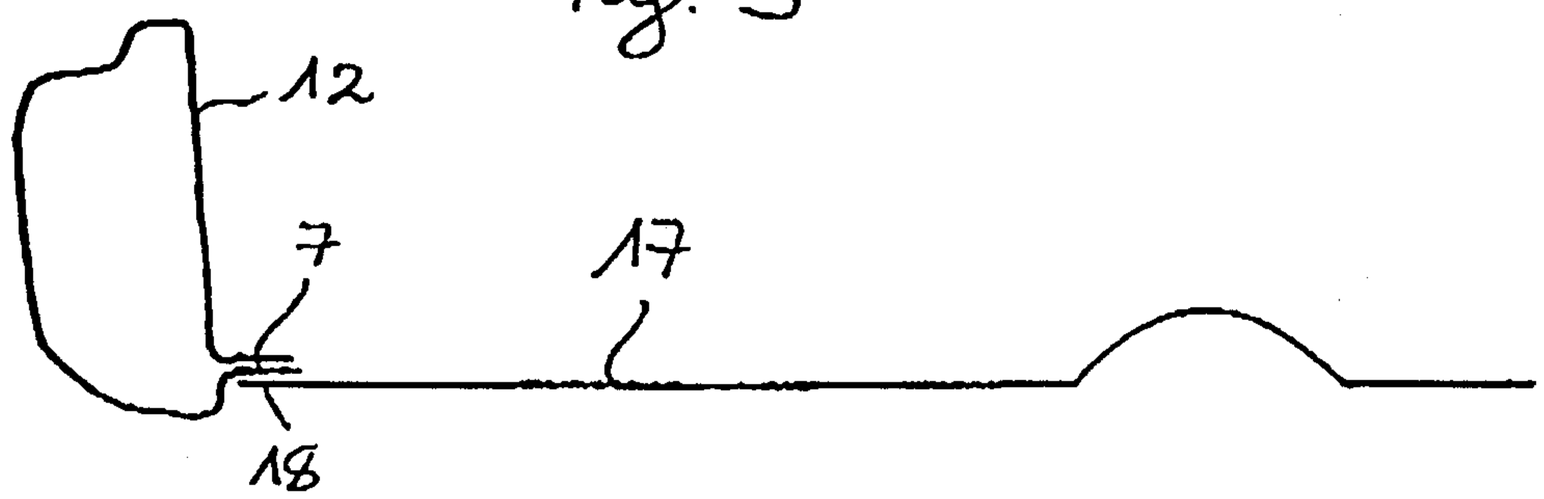


Fig. 5

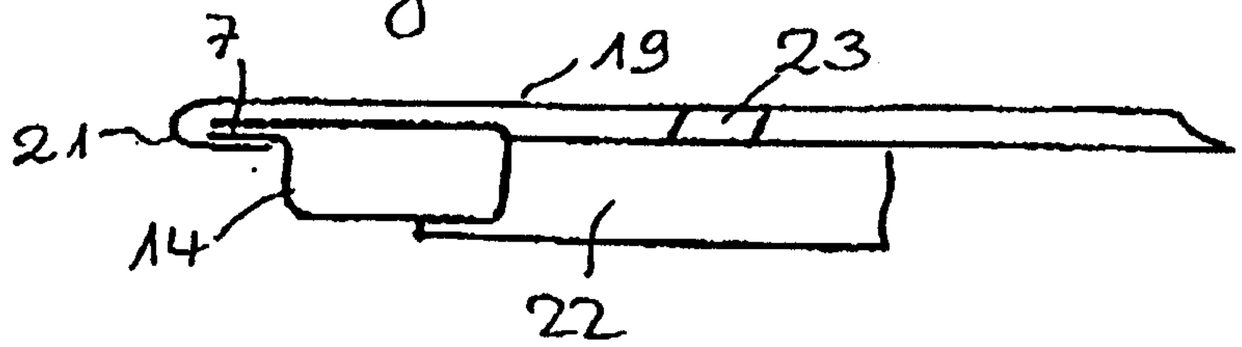


Fig. 4

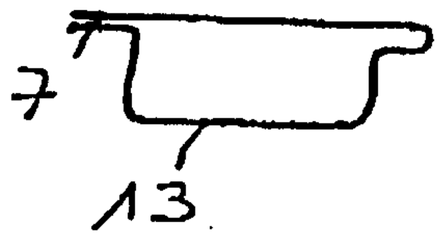


Fig. 6