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(54) Title: METHOD FOR PRODUCING AN OBJECT AND CONNECTING ARRANGEMENT THEREFOR

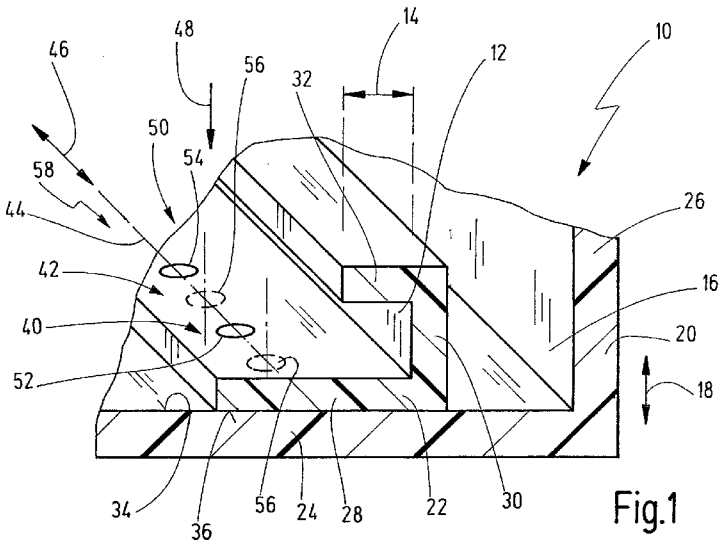

Fig.1

(57) Abstract: Method for producing an object (10) of complex form, having the steps of: providing a first component (20) and providing a second component (22), positioning the first and the second component (20, 22) one above the other so that a connecting surface (34) of the first component (20) is in contact with a connecting surface (36) of the second component (22), and connecting the first component (20) and the second component (22). In this case, the first and the second component (20, 22) are connected together at least two connecting points (40, 42), wherein a tolerance-compensating device (50) which provides tolerance compensation in a direction parallel to the connecting surfaces (34, 36) is provided.

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Method for producing an object and connecting arrangement therefor

[0001] The present invention relates to a method for producing an object of complex form, having the steps of providing a first component and a second component, positioning the first and the second component one above the other so that a connecting surface of the first component is in contact with a connecting surface of the second component, and connecting the first component and the second component.

[0002] Furthermore, the present invention relates to a connecting arrangement for producing a connection between a first and a second component.

[0003] Objects of complex form are to be understood here to be objects which have undercuts or recesses in at least two directions which lie at an angle of greater than 0° with respect to one another. Metal objects of this kind can often only be produced, for example in metal-cutting processes, by being re-clamped in a tool.

When such complex objects are produced from plastics materials, it is regularly necessary to provide injection moulds having complex slide arrangements, thereby increasing the production costs. It is therefore known to produce the object of complex form by connecting at least a first and a second component together, wherein these components each separately have much less complex forms and therefore can each be produced much more cost-effectively.

[0004] Such connections can be formed substantially in a punctiform, linear or planar manner. The materials of the components can be identical or different. Furthermore, when the object produced in this manner is used as intended, it is possible for the components to be subjected to different loads, in particular external loads.

[0005] Against this background, it is an object of the invention to specify an improved method for producing an object of complex form and also a connecting arrangement.

[0006] This object is achieved firstly by a method for producing an object of complex form of the type mentioned at the beginning, wherein the first and the second component are connected together at at least two connecting points and wherein a tolerance-compensating device which provides tolerance compensation in a direction parallel to the connecting surfaces is provided.

[0007] Furthermore, the above object is achieved by a connecting arrangement which is produced in particular in accordance with such a method.

[0008] The production method according to the invention is based on the fact that the first and the second component are connected together at a number of connecting points. The provision of a tolerance-compensating device makes it possible to absorb or to compensate stresses which arise for example in the case of different heating of the components. Such different heating can arise for example in

that the components are produced from different materials. However, such different heating can also depend on the intended use of the object, if for example one side is exposed to a heat source (for example the sun) and the other side is not.

[0009] The absorption or compensation of such stresses can considerably increase the durability of the connection produced between the first and the second component.

[0010] The object of complex form can be for example a vehicle body component, such as a door element or the like, for example.

[0011] The object is thus achieved in its entirety.

[0012] In the method according to the invention, it is particularly advantageous for the components to be produced from plastics material, wherein the provision of the components includes the integration of a plurality of thermally conductive auxiliary connecting elements into the first component and/or into the second component, and wherein the connecting of the first and the second component includes the simultaneous or successive heating of the auxiliary connecting elements in order to produce in each case a thermoplastic welded connection between the first and the second component at the plurality of connecting points formed thereby.

[0013] In this embodiment, two plastics components can be connected together in a simple manner to produce a plastics object of complex form. The integration of auxiliary connecting elements can take place for example during an injection-moulding production process for the respective component. Further, it is in this case possible to produce the thermoplastic welded connections when the connecting point is accessible from only one side, i.e. for example when one of the two components is accessible only from the side. As a result, the production process can be considerably simplified.

[0014] It is particularly advantageous in this case if the auxiliary connecting elements are heated inductively from one side.

[0015] In general, inductive heating from two sides is also possible. Further, other kinds of heating, for example by applying electric current or the like, are also possible.

[0016] However, inductive heating has the advantage that the auxiliary connecting elements integrated preferably inside the first and/or the second component can be heated without contact having to be made with them.

[0017] It is furthermore advantageous if a recess is provided in at least one of the components in a region between two connecting points, said recess being designed to provide tolerance compensation in a direction parallel to the connecting surfaces.

[0018] In this embodiment, the tolerance-compensating device can be formed in a comparatively simple manner, specifically by the provision of recesses between connecting points. Different expansions of the components can be absorbed via these recesses.

[0019] In this case, it is particularly advantageous if two recesses are provided in at least one of the components in the region of at least one connecting point, said recesses being arranged on opposite sides of the one connecting point in a connecting line that connects the connecting points, in order to provide tolerance compensation in a direction parallel to the connecting surfaces and/or parallel to the connecting line.

[0020] In this embodiment, a recess is provided on each side of a connecting point so that stresses that arise, in particular in a direction parallel to the connecting line, can be absorbed efficiently.

[0021] Furthermore, according to a further embodiment, it is preferred for the connecting of the first and the second component to include the fastening on the first component of at least one connecting element which protrudes with respect to the connecting surface of the first component, wherein the second component has a recess through which the connecting element passes when the components are positioned one on top of the other, and having the step of connecting said components together, once they have been positioned one on top of the other, by attaching a clip element to the connecting element.

[0022] This embodiment is regarded as a separate invention, regardless of the provision of a tolerance-compensating device and regardless of whether the components are connected together at one or more connecting points.

[0023] However, in a suitable configuration of the connecting element on the one hand and of the recess on the other, this type of connection, too, can provide tolerance compensation in a direction parallel to the connecting surfaces. Furthermore, in this configuration, depending on the configuration of the components, of the connecting element and of the clip element, tolerance compensation in a direction transverse to the connecting surfaces can also take place.

[0024] In this embodiment, the components can be connected together in a relatively simple manner, even when they are produced from different materials.

[0025] It is particularly preferred for the first component and the connecting element to be produced from the same material. In the case of metal, the first component and the connecting element can then for example be welded or adhesively bonded together.

[0026] However, it is particularly preferred for the first component and the connecting element to be produced from plastics material.

[0027] In this case, it is advantageous if a thermally conductive auxiliary connecting element is integrated into the connecting element and/or into the first component, wherein the connecting of the first component and the connecting element includes the heating of the auxiliary connecting element in order to produce a thermoplastic welded connection between the first component and the connecting element.

[0028] As described above, the production of the thermoplastic welded connection can take place for example in that the auxiliary connecting element is heated inductively, for example from one side.

[0029] Generally, it is advantageous in the production of thermoplastic welded connections of the type described above if the respective welded connection is produced immediately after a process for producing the first component and/or the second component and/or the connecting element, such that the respective component or element still has a temperature greater than an ambient temperature.

[0030] In this embodiment, a kind of residual heat can consequently be used, so that a thermoplastic welded connection can be carried out more quickly or more effectively.

[0031] In the case of the connecting arrangement according to the invention, it is particularly advantageous if said connecting arrangement has a connecting element which has a flange portion, into which a thermally conductive auxiliary connecting element is integrated, and which has a hollow-cylindrical shank portion which extends from the flange portion and on the outer periphery of which a radially protruding head portion is formed.

[0032] In this embodiment, the head portion can serve for example to fasten a clip element.

[0033] On account of the measure whereby the shank portion is formed in a hollow-cylindrical manner, it is possible to heat the auxiliary connecting element integrated into the flange portion by introducing an energy source into the hollow-cylindrical shank portion. Furthermore, the cavity can have a function in the fastening of a clip element on the connecting element.

[0034] Consequently, it is advantageous if the connecting arrangement includes a clip element which has a base portion and a U-shaped shoulder portion which are connected via an edge portion such that a head receptacle for a head portion of a connecting element is formed between the base portion and the shoulder portion.

[0035] In this embodiment, the clip element can be formed such that it can be pushed onto the connecting element in a direction transverse to a joining axis and/or substantially parallel to the connecting surfaces.

[0036] The respective connection can thus be produced by means of a simple assembly step.

[0037] It is particularly advantageous in this case if a latching tongue is formed on the base portion and projects with respect to the base portion in the direction of the shoulder portion.

[0038] The clip element can be connected easily to the connecting element in a latching manner by means of such a latching tongue.

[0039] It is particularly advantageous in this case if the latching tongue engages in the process in a hollow portion of the shank portion of the connecting element.

[0040] In this embodiment, the head portion, which is provided on the outer periphery of the shank portion and is accommodated in the head receptacle, can serve as a means for securing in a direction parallel to a joining axis. The latching tongue can in this case serve as a securing means to prevent the clip element from being unintentionally pulled off the connecting element.

[0041] Furthermore, it is advantageous if the shoulder portion has on its outer side remote from the base portion at least one clamping elevation for fastening a component in a clamping manner.

[0042] The provision of such a clamping elevation makes it possible to produce the component and/or the clip element and/or the connecting element with much greater tolerances. On account of the fact that the clamping elevation can fasten the second component arranged between the clip element and the first component in a clamping manner, the components can be fixed securely together.

[0043] According to a further advantageous embodiment, the clip element has at least one resilient tongue, which can be elastically deflected counter to a pushing-on direction in which the clip element can be pushed on to a connecting element.

[0044] In this embodiment, it is possible for the resilient tongue to butt against an abutment in an end position on the connecting element and thus to be able to provide even better fixing of the individual elements of the connecting arrangement.

[0045] The above-described auxiliary connecting element can preferably be in the form of a perforated sheet and is preferably in the form of a circular perforated sheet. Instead of a single heatable element, such as a perforated sheet, it is possible also to introduce metal particles as auxiliary connecting element into the respective component.

[0046] The connection between the components and/or between a component and a connecting element can be produced in an automated manner, for example by means of a robot. In this case, the connecting elements can likewise be supplied automatically.

[0047] It is furthermore also conceivable for the clip elements to be assembled on connecting elements in an automated manner. Thermoplastic welding using auxiliary connecting elements can take place with access being available from one side. In contrast to so-called fakir welding, damage to the component during the joining process can in this case be avoided. It is also not necessary for a tool for heating an auxiliary connecting element to have to have a contour identical to a surface contour of the component and/or connecting element. Thermoplastic welding can also be carried out by means of a tool having few disruptive contours, for example no heating plates as in hot-plate welding.

[0048] Furthermore, no high pressures are necessary, as is the case for example in vibration welding.

[0049] Since thermoplastic welding according to the invention is carried out preferably by a uniformly heated auxiliary connecting element, geometric tolerances of the components to be connected can be compensated. The auxiliary connecting element can be adapted to the magnetic field of an inductive heating tool (inductor) in order that the heating is carried out as uniformly as possible.

[0050] The mass of the auxiliary connecting element can be relatively low, so that the amount of energy to be introduced can be reduced.

[0051] As a result of the lower energy input, distortion phenomena can be reduced, and thus in particular influencing of the opposite side in the case of visible parts.

[0052] In the case of thermoformed parts (thermoforming following prior heating of parts), a welding system can be inserted directly into a tool and joining can be carried out at the same time as the forming or during a cooling process within the tool.

[0053] The components can be positioned in a manner independent of dimensions associated with the tool. All that is required is a sufficiently planar surface in order to connect the components together.

[0054] It may be advantageous in the complete integration of the auxiliary connecting elements for a positioning feature to be attached to at least one component to be joined and/or to the joining system, in order to minimize tolerances.

[0055] The tolerance-compensating device can also be realized by configuring the connecting zones in an appropriate manner. Tolerance compensation can in this case be two- or three-dimensional.

[0056] The components can be connected preferably without additional adhesive and/or connecting frame. It is also possible to attach fastening elements to pressure-sensitive components such as sandwich materials (roof liners, honeycomb sandwich structures, hollow bodies, blow-moulded parts).

[0057] It goes without saying that the abovementioned features and those still to be explained below can be used not only in the combination stated in each case but also in other combinations or on their own, without departing from the scope of the present invention.

[0058] Exemplary embodiments of the invention are explained in more detail in the following description and illustrated in the drawing, in which:

Figure 1 shows a schematic illustration in the form of a perspective sectional view of a first embodiment of an object of complex form produced according to the invention;

Figure 2 shows a plan view of a connecting arrangement for the object in Figure 1;

Figure 3 shows a sectional view along the line III-III;

Figure 4 shows a side view of an embodiment of a connecting element for a connecting arrangement according to the invention;

Figure 5 shows a longitudinal sectional view through an embodiment of a connecting arrangement according to the invention having the connecting element in Figure 4;

Figure 6 shows a perspective view from below of a clip element of the connecting arrangement in Figure 5;

Figure 7 shows a perspective view from above of the clip element in Figure 6;

Figure 8 shows a view from above of the clip element in Figures 6 and 7;

Figure 9 shows a sectional view along the line IX-IX in Figure 8;

Figure 10 shows a sectional view along the line X-X in Figure 8; and

Figure 11 shows a longitudinal sectional view through an object of complex form produced according to the invention, having a connecting arrangement according to the invention.

[0059] Figures 1 to 3 show a first embodiment of an object of complex form which has the general designation 10.

[0060] The object 10 has an undercut 12 in an undercut direction 14. Furthermore, the object 10 has a depression 16 in a depression direction 18, which runs transversely to the undercut direction 14.

[0061] In order to produce the object 10, a first component 20 and a second component 22 have been connected together. The first component 20 has, for example, the undercut 12. As a result, the first component 20 can be produced in a comparatively easy manner. The second component 22 may itself have the depression 16. In the present case, the depression 16 is formed by the first component 20 and the second component 22.

[0062] The first component 20 has a bottom plate 24 and a wall plate 26 that extends transversely thereto. The second component 22 has a bottom panel 22 and a wall panel 30 that extends transversely thereto. A top panel 32 also extends from the wall panel 30, with the undercut 12 being formed between the top panel 32 and the bottom panel 28.

[0063] The first component 20 has a first connecting surface 34, which is formed on the bottom plate 24. The second component 22 has a second connecting surface 36, which is formed on that side of the bottom panel 28 that faces away from the top panel 32.

[0064] In order to connect the components 20, 22, the two connecting surfaces 34, 36 have been positioned one on top of the other. Furthermore, the first and the second component 20, 22 have been connected together at a plurality of connecting points. In this case, a first connecting point 40 and a second connecting point 42 are illustrated by way of example in Figure 1.

[0065] The connecting points 40, 42 are arranged along a virtual connecting line 44 which has a connecting line direction 46. The connecting line direction 46 can be oriented for example transversely both to the undercut direction 14 and to the depression direction 18.

[0066] In order to produce the connecting points 40, 42, the first component 20 and the second component 22 have been connected together in a joining direction, with the joining direction being shown at 48 and running transversely to the connecting line direction 46 and preferably transversely to the undercut direction 14 and/or the depression direction 18. The connecting of the components 20, 22 in a punctiform manner along the connecting line 44 can lead to stresses in the event of different heating of the first component 20 and the second component 22. In order to avoid or at least to reduce these stresses, provision is made of a tolerance-compensating device 50. In the present case, the tolerance-compensating device 50 is formed by a plurality of recesses, which preferably lie on the connecting line 44, specifically with in each case preferably one or more recesses being provided between the respective connecting points 40, 42. In the present case, a first recess 52 and a second recess 54 are illustrated. The recesses can for example be formed in the second component 22.

[0067] A side of the first component 20 which faces away from the second component 22 (for example that surface of the bottom plate 24 that is opposite the first connecting surface 34) can be in the form of a visible surface. Therefore, it is preferred for there to be at least no continuous recess in the first component 20.

[0068] Furthermore, the connecting points 40, 42 are produced such that a tool for producing the connecting points 40, 42 is only applied from one side, specifically from the side of the second component 22. This makes it possible to avoid a tool having to act in the region of the visible surface.

[0069] Preferably, the connecting points 40, 42 are also produced such that no abutment need to be applied from the side of the visible surface.

[0070] The connecting points 40, 42 can be produced depending on the material of the components 20, 22, for example by bonding locations or the like. However, it is particularly preferred for the components 20, 22 each to be produced from a thermoplastic and for the connecting points 40, 42 to be produced using auxiliary connecting elements. The auxiliary connecting elements 56 are each formed by thermally conductive elements. These may be metal particles, which are inserted in the material of one of the components. Preferably, the auxiliary connecting elements 56 are small metal plates or metal sheets. These are formed in a preferably circular manner and can be in the form of annular elements, as is shown in Figure 3, for example. These annular elements may furthermore be provided with holes in order for example to achieve a firmer connection to the component into which the auxiliary connecting element is integrated.

[0071] In the illustration in Figures 1 to 3, the components 20, 22 are in the form of thermoplastic components which are produced, for example, in an injection-moulding process. Since the components 20, 22 are each elements of relatively simple form, these components can be produced in comparatively simple injection moulds (for example without a slide).

[0072] In the embodiment of Figures 1 to 3, auxiliary connecting elements 56 are each integrated into the second component 22 at the connecting points. In Figure 3, the auxiliary connecting elements 56 are each integrated such that they terminate flush with the second connecting surface 36. However, Figure 3 also shows one auxiliary connecting element 56' which is integrated completely into the second component 22 such that it cannot be seen from the outside.

[0073] Figure 3 further shows that it is possible to provide positioning aids 57 on that surface of the second component 22 which is opposite the second

connecting surface 36, at the locations at which auxiliary connecting elements 56 are integrated into the second component 22, it being possible, for example, for said positioning aids 57 to consist of a circular imprint or a circular impression or the like.

[0074] The object 10 is produced in that the connecting surfaces 34, 36 are positioned one on top of the other. Subsequently, a tool for heating an auxiliary connecting element 56 is applied to that surface of the second component 22 that is opposite the second connecting surface 36 (for example at the location of the positioning aids 57). Then, the auxiliary connecting element 56 located thereunder is heated, for example by induction. As a result, the thermoplastic material of the second component 22 and the adjacent thermoplastic material of the first component 20 starts to melt such that the melts are joined together and in this way a punctiform thermoplastic welded connection between the first and the second component 20, 22 is produced. This manner of producing a connecting point can be carried out in succession for the individual connecting points 40, 42, etc., or it can be carried out simultaneously when a suitable tool is provided. Furthermore, it is preferred for the connection to be produced shortly after, for example, the second component 22 has been produced (in an injection-moulding process or the like). In this variant, residual heat of the second component 22 (and/or of the first component 20) can be used in order to allow a lower energy input for producing the welded connection.

[0075] When the first and the second component 20, 22 have been connected together in this manner, a connecting arrangement 58 is formed by the plurality of connecting points.

[0076] Figures 4 to 11 illustrate a further embodiment of a connecting arrangement 58' according to the invention.

[0077] The connecting arrangement 58' shown in these figures (see for example Figures 5 and 11) contains a connecting element 60, as is illustrated in

Figure 4, for each connecting point. The connecting element 60 has a flange portion 62 which can be formed for example as a flat, cylindrical portion. From the flange portion 62 there extends a shank portion 66 having a smaller diameter than the flange portion 62. Formed at a top end of the shank portion 66 is a head portion 64 having in turn a larger diameter than the shank portion and preferably a larger diameter than the flange portion 62. The shank portion 66 and the head portion 64 are in the form of hollow portions such that an approximately cylindrical cavity 70 is formed in the connecting element 60, with the cavity 70 being in the form of a blind cavity which is closed by the flange portion 62 and is open on the opposite side of the connecting element 60, as is illustrated in Figure 5.

[0078] Integrated into the flange portion 62 is an auxiliary connecting element 56, which, as in the previous embodiment, can be formed by metal particles, but preferably by a sheet metal element such as a circular annular sheet metal element, for example, which is produced from a material that can be inductively heated.

[0079] As is illustrated in Figure 5, the connecting element 60 is joined to a first connecting surface 34 of a first component 20, specifically preferably again by means of a thermoplastic welding method. The first component 20 and the connecting element 60 are in this case each preferably produced from a thermoplastic.

[0080] Figure 5 shows that an axial recess 72 can be provided radially inside the auxiliary connecting element 56 on a connecting side of the flange portion 62. This recess 72 may be advantageous for producing a connection between the first component 20 and the connecting element 60, as is described for example in the document WO 2010/057599 A1. The flange portion 62 of the connecting element 60 can in this case be formed in a similar or identical manner to the flange portion of a connecting element shown in said document. In this regard, reference is made to the

disclosure of said document and the disclosure content thereof is intended to this extent also to be subject matter of the present application.

[0081] The connecting arrangement 58' shown in Figure 5 also contains a clip element 74. The clip element 74 is shown in detail in Figures 6 to 10 and has a base portion 76 and a shoulder portion 78 that is spaced apart axially therefrom. The shoulder portion 78 is formed in the shape of a U and forms on its inside a shank receptacle 79 for the shank portion 66. The base portion 76 and the U-shaped shoulder portion 78 are connected together by an edge portion 80 which is U-shaped in plan view. Formed in the U-shaped region between the shoulder portion 78 and the base portion 76 is a head receptacle 81 for accommodating the head portion 64 of the connecting element 60.

[0082] Formed approximately centrally on the base portion 76 is a latching tongue 82.

[0083] In order to connect the clip element 74 to the connecting element 60, the clip element 74 is pushed in a pushing-on direction 86 onto the head portion 64 of the connecting element 60, wherein the pushing-on direction 86 runs transversely, in particular perpendicularly, to the joining direction 48 or to a longitudinal axis of the connecting arrangement 58'.

[0084] Figure 5 shows that, after pushing on, the head portion 64 is accommodated in the head receptacle 81, with the base portion 76 resting on the top side of the head portion 64 and with the shoulder portion 78 engaging behind the head portion 64 on its underside. Furthermore, the latching tongue 82 extends into the region of the head receptacle 84 and is provided with a ramp portion 84. The ramp portion 84 is formed such that, when the clip element 74 is pushed on, the latching tongue 82 is deflected with respect to the plane of the base portion 76, specifically under the influence of the head portion 64. As soon as the clip element 74 has been pushed far enough onto the head portion 64, until the head portion 64

butts against a rear end, in the pushing-on direction 86, of the edge portion 80 (on the left in Figure 5), the latching tongue 82 snaps back into its starting position and in this case engages behind an inner wall of the cavity 70, as is shown in Figure 5. In this way, the clip portion is fastened to the connecting element 60 both in the axial direction (parallel to 48) and in the radial direction (parallel to the pushing-on direction 86).

[0085] Provided in this case between an underside of the clip element 74 and the first connecting surface 34 is a clearance 85, which is preferably larger than the height of the flange portion 62. A second component 22 can be accommodated within the space defined by this clearance 85, with the second component for this purpose preferably having a recess for accommodating the flange portion 62.

[0086] Formed on the base portion 76 are two resilient tongues 88, as are shown in particular in Figure 7 and Figure 8. The resilient tongues 88 are designed to be deflected in the radial direction, for example by butting against a wall panel 30 of the second component 22, as is illustrated in Figure 1.

[0087] The resilient tongues 88 may for example serve to support the clip element 74 in the radial direction such that the latching tongue 82 always rests in abutment against a wall of the cavity 70 and as a result accidental springing up of the latching tongue 82 can be avoided.

[0088] Furthermore, it can be seen in particular in Figure 6, Figure 9 and Figure 10 that the clip element 74 has on its underside, i.e. on that side of the shoulder portion 78 that faces away from the base portion 76, at least one clamping elevation 92. Provided in the present case are two clamping elevations 92, which are formed substantially in a rib-like manner and extend in a direction parallel to the pushing-on direction 86. The clamping elevations 92 are in this case formed such that they first of all rise in a conical manner counter to the pushing-on direction 86.

During pushing on, the second component 22, which is accommodated within the clearance 85, is clamped in and fixed by the clamping elevations 92.

[0089] Figure 11 further shows that the second component 22 has a recess 94, which has a diameter larger than the outside diameter of the flange portion 62.

[0090] In this way, tolerance compensation in a direction parallel to the connecting surfaces 34, 36 can be achieved. On account of the clamping elevations 92, tolerance compensation in a direction substantially transverse thereto can be achieved.

Patent claims

1. Method for producing an object (10) of complex form, having the steps of:

- providing a first component (20) and providing a second component (22),

- positioning the first and the second component (20, 22) one above the other so that a connecting surface (34) of the first component (20) is in contact with a connecting surface (36) of the second component (22), and

- connecting the first component (20) and the second component (22),

characterized in that

the first and the second component (20, 22) are connected together at at least two connecting points (40, 42), wherein a tolerance-compensating device (50) which provides tolerance compensation in a direction parallel to the connecting surfaces (34, 36) is provided.

2. Method according to Claim 1, characterized in that the components (20, 22) are produced from plastics material, wherein the provision of the components (20, 22) includes the integration of a plurality of thermally conductive connecting elements (56) into the first component and/or into the second component (22), and wherein the connecting of the first and the second component (20, 22) includes the simultaneous or successive heating of the connecting elements (56) in order to produce in each case a thermoplastic welded connection between the first and the second component (20, 22) at the plurality of connecting points (40, 42).

3. Method according to Claim 2, characterized in that the connecting elements (56) are heated inductively from one side.

4. Method according to Claim 2 or 3, characterized in that a recess (52) is provided in at least one of the components (22) in a region between two connecting points (40, 42), said recess (52) being designed to provide tolerance compensation in a direction parallel to the connecting surfaces (34, 36).

5. Method according to Claim 4, wherein two recesses (52, 54) are provided in at least one of the components (22) in the region of at least one connecting point (42), said recesses (52, 54) being arranged on opposite sides of the one connecting point (42) in a connecting line (44) that connects the connecting points (40, 42), in order to provide tolerance compensation in a direction parallel to the connecting surfaces (34, 36) and/or parallel to the connecting line (44).

6. Method according to one of Claims 1-5 or according to the preamble of Claim 1, characterized in that the connecting of the first and the second component (20, 22) includes the fastening on the first component (20) of at least one connecting element (60) which protrudes with respect to the connecting surface (34) of the first component (20), wherein the second component (22) has a recess (94) through which the connecting element (60) passes when the components (20, 22) are positioned one on top of the other, and having the step of connecting said components (20, 22) together, once they have been positioned one on top of the other, by attaching a clip element (74) to the connecting element (60).

7. Method according to Claim 6, characterized in that the first component (20) and the connecting element (60) are produced from plastics material.

8. Method according to Claim 7, characterized in that a thermally conductive connecting element (56) is integrated into the connecting element (60) and/or into the first component (20), wherein the connecting of the first component (20) and the connecting element (60) includes the heating of the connecting element (60) in order to produce a thermoplastic welded connection between the first component (20) and the connecting element (60).

9. Method according to Claim 2 or according to Claim 8, characterized in that the welded connection is produced immediately after a process for producing the first and/or the second component (20, 22) and/or the connecting element (60), so that the first and/or the second component (20, 22) and/or the connecting element (60) still has a temperature greater than an ambient temperature.

10. Connecting arrangement for connecting a first and a second component (20, 22), produced in particular by means of a method according to one of Claims 1-9.

11. Connecting arrangement according to Claim 10, having a connecting element (60) which has a flange portion (62), into which a thermally conductive auxiliary connecting element (56) is integrated, and which has a hollow-cylindrical shank portion (66) which extends from the flange portion (62) and on the outer periphery of which a radially protruding head portion (64) is formed.

12. Connecting arrangement according to Claim 10 or 11, having a clip element (74) which has a base portion (76) and a U-shaped shoulder portion (78) which are connected via an edge portion (80) such that a head receptacle (81) for a head portion (64) of a connecting element (60) is formed between the base portion (76) and the shoulder portion (78).

13. Connecting arrangement according to Claim 12, wherein a latching tongue (82) is formed on the base portion (76) and projects with respect to the base portion (76) in the direction of the shoulder portion (78).

14. Connecting arrangement according to Claim 11 and according to Claim 13, wherein the latching tongue (82) engages in a hollow portion (70) of the shank portion (66) of the connecting element (60).

15. Connecting arrangement according to one of Claims 12-14, wherein the shoulder portion (78) has on its outer side remote from the base portion (76) at least one clamping elevation (92) for fastening a component (22) in a clamping manner.

16. Connecting arrangement according to one of Claims 12-15, wherein the clip element (74) has at least one resilient tongue (88), which can be elastically deflected counter to a pushing-on direction (86) in which the clip element (74) can be pushed on to a connecting element (60).

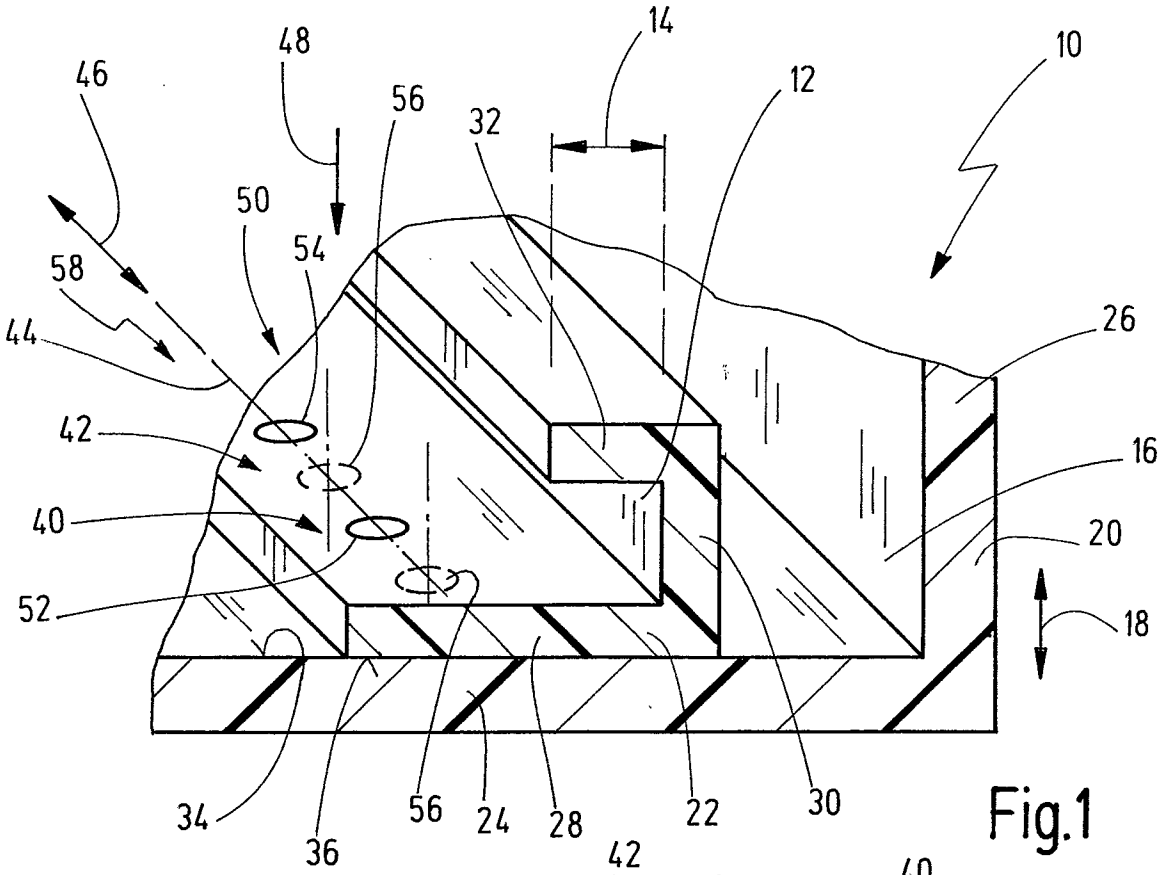

Fig.1

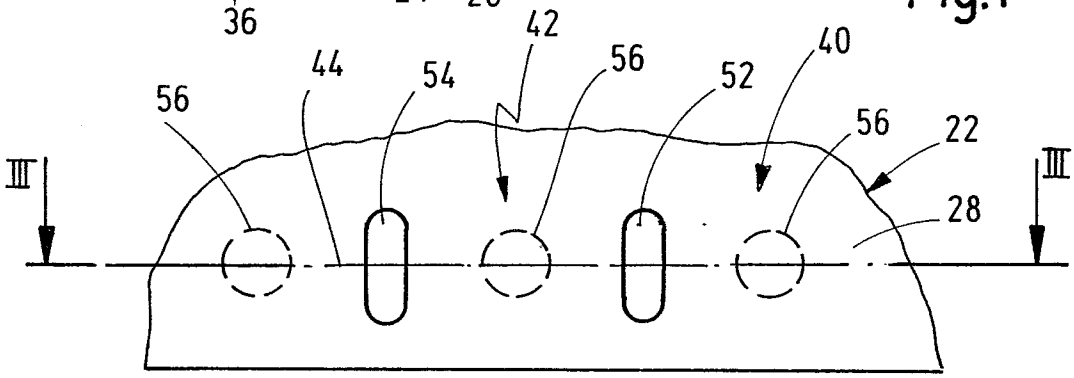

Fig.2

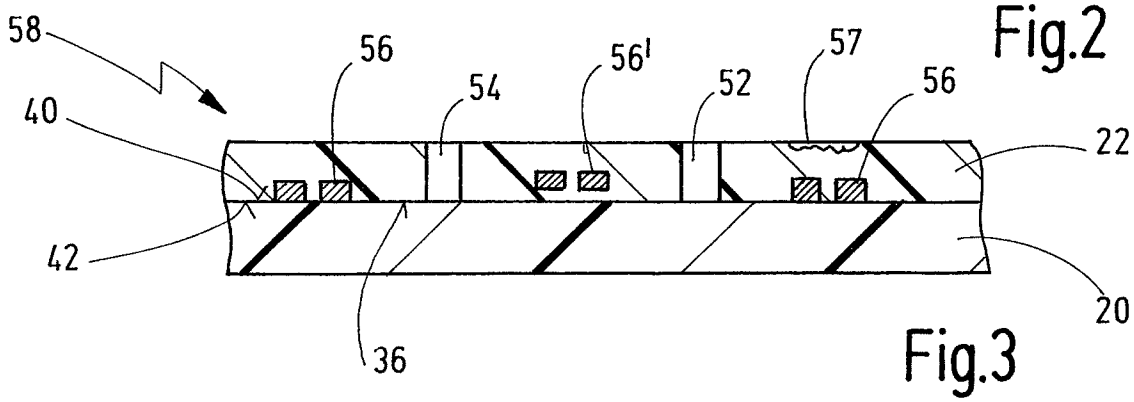

Fig.3

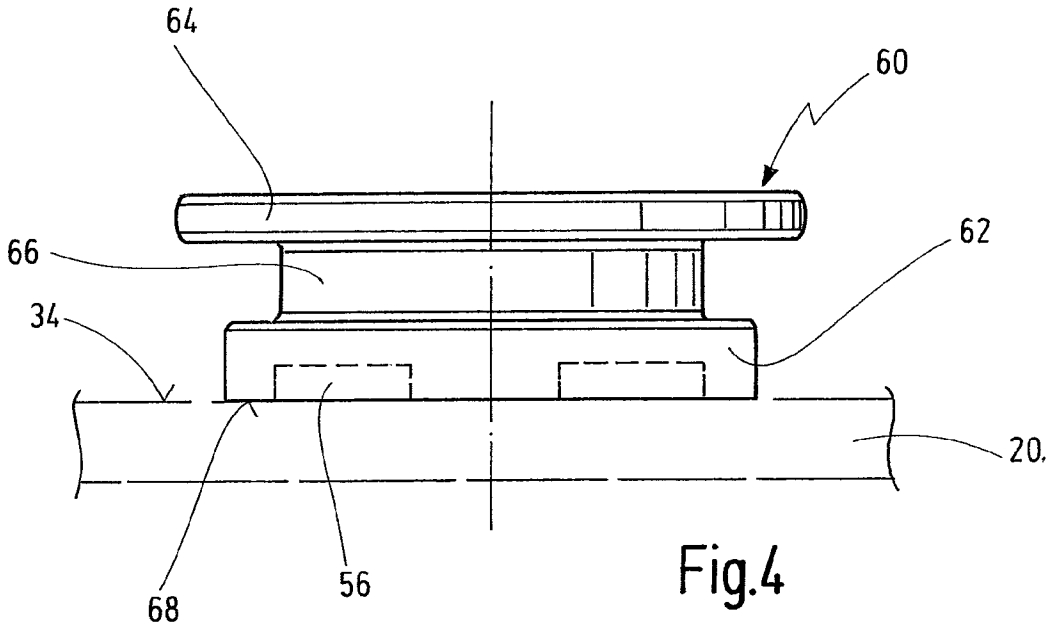
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Fig.4

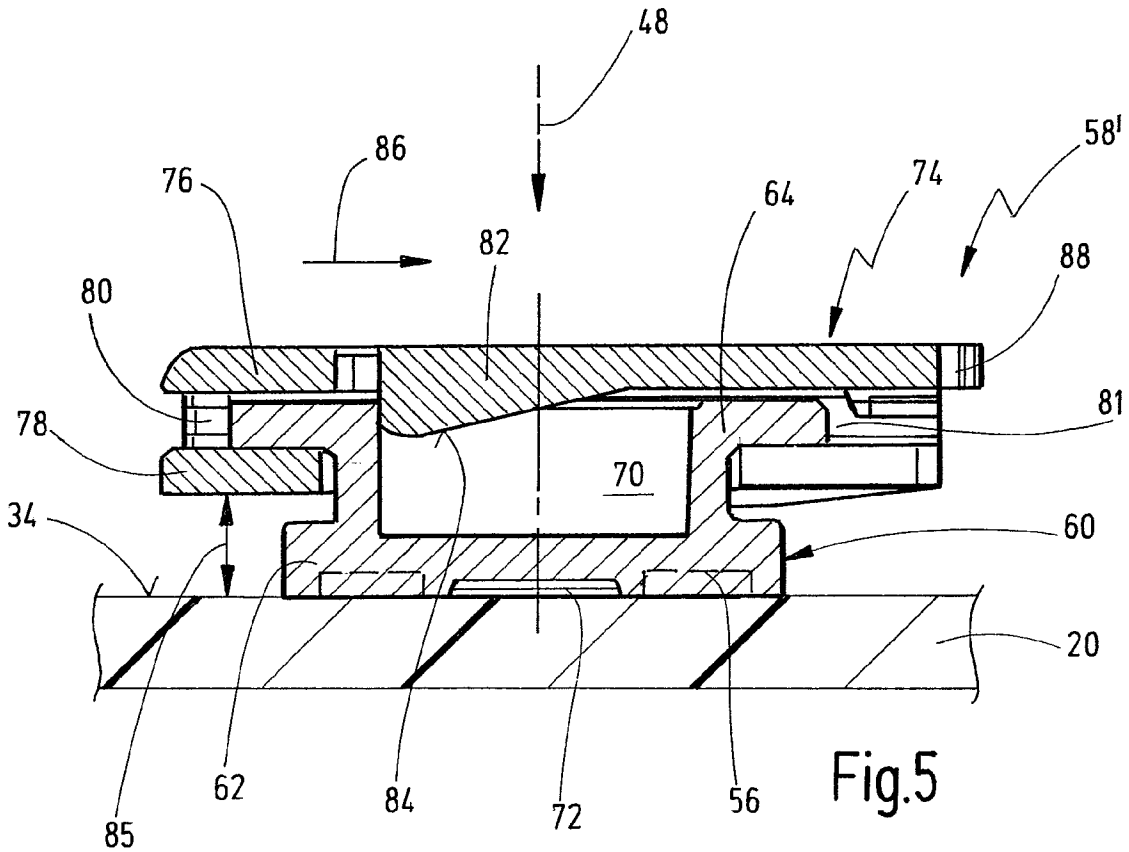
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Fig.5

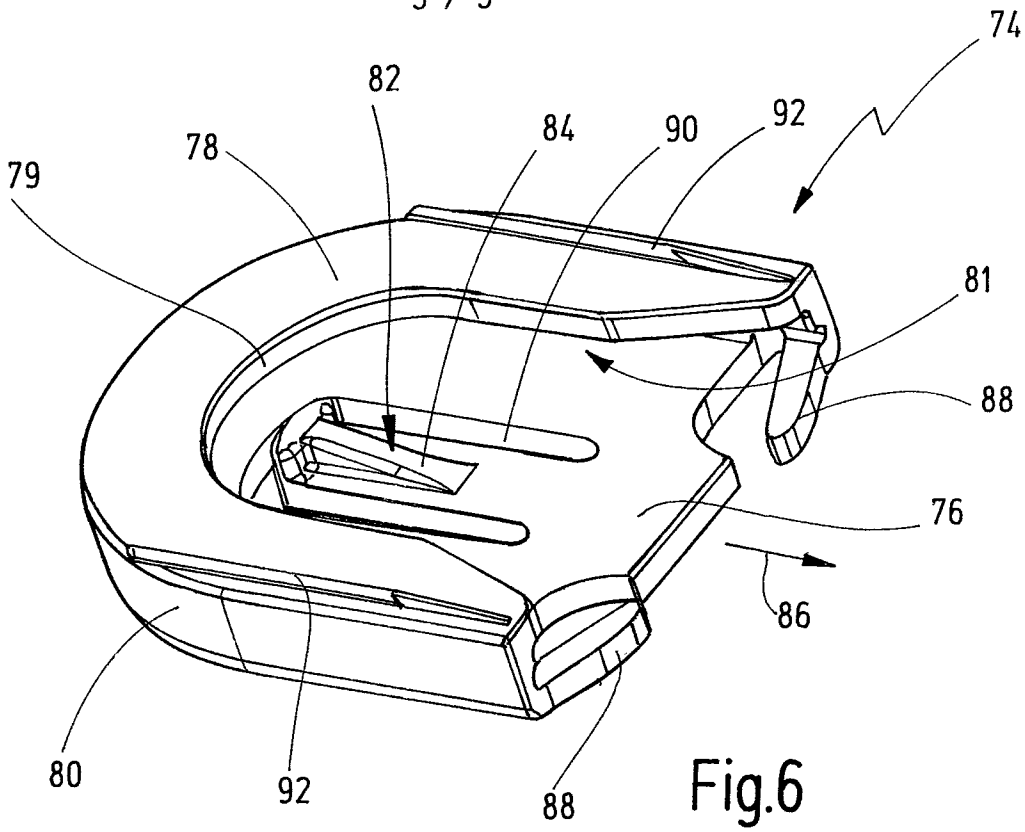

Fig.6

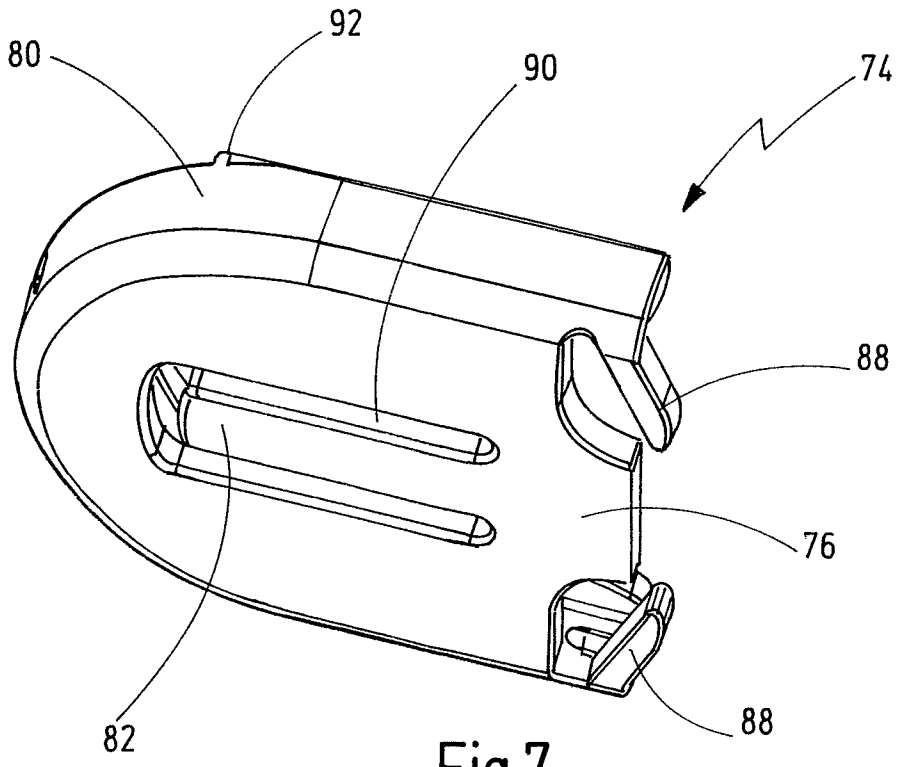

Fig.7

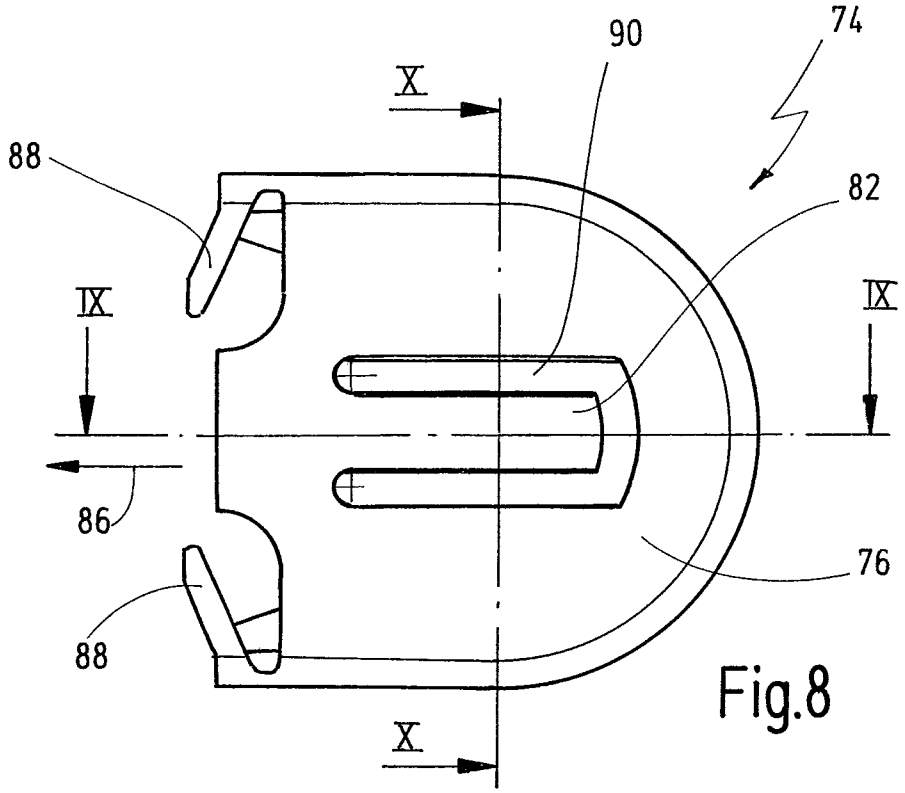

Fig.8

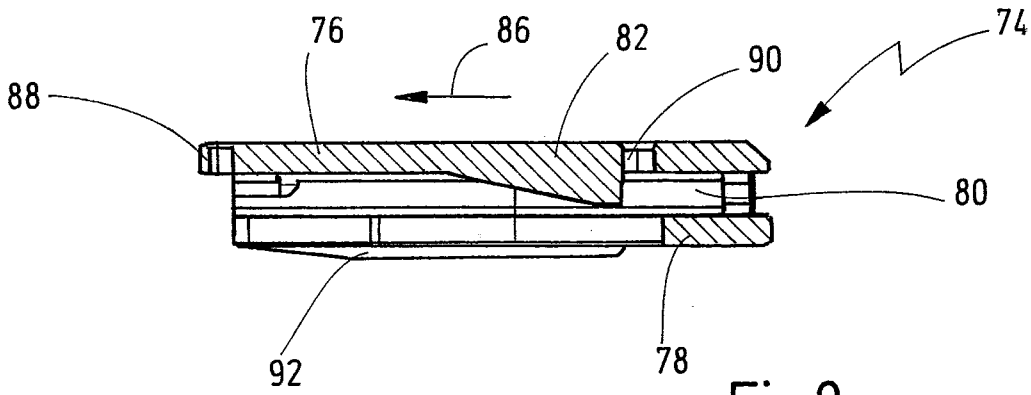

Fig.9

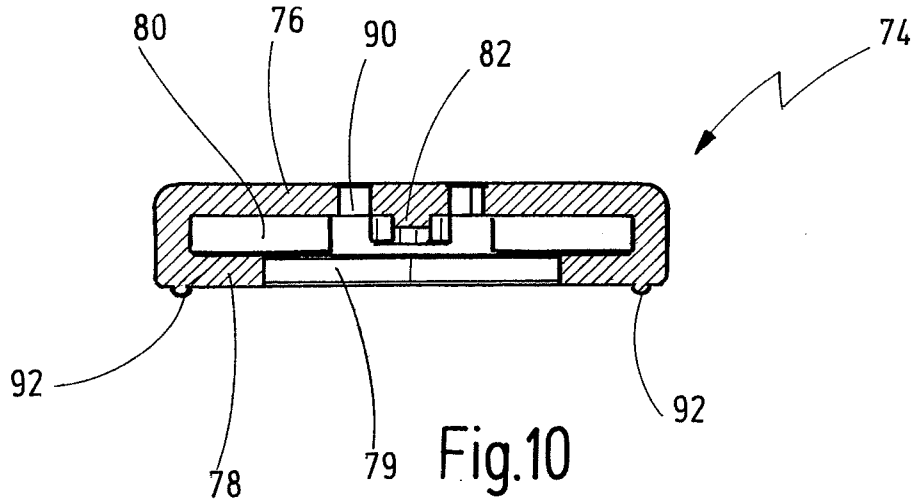

Fig.10

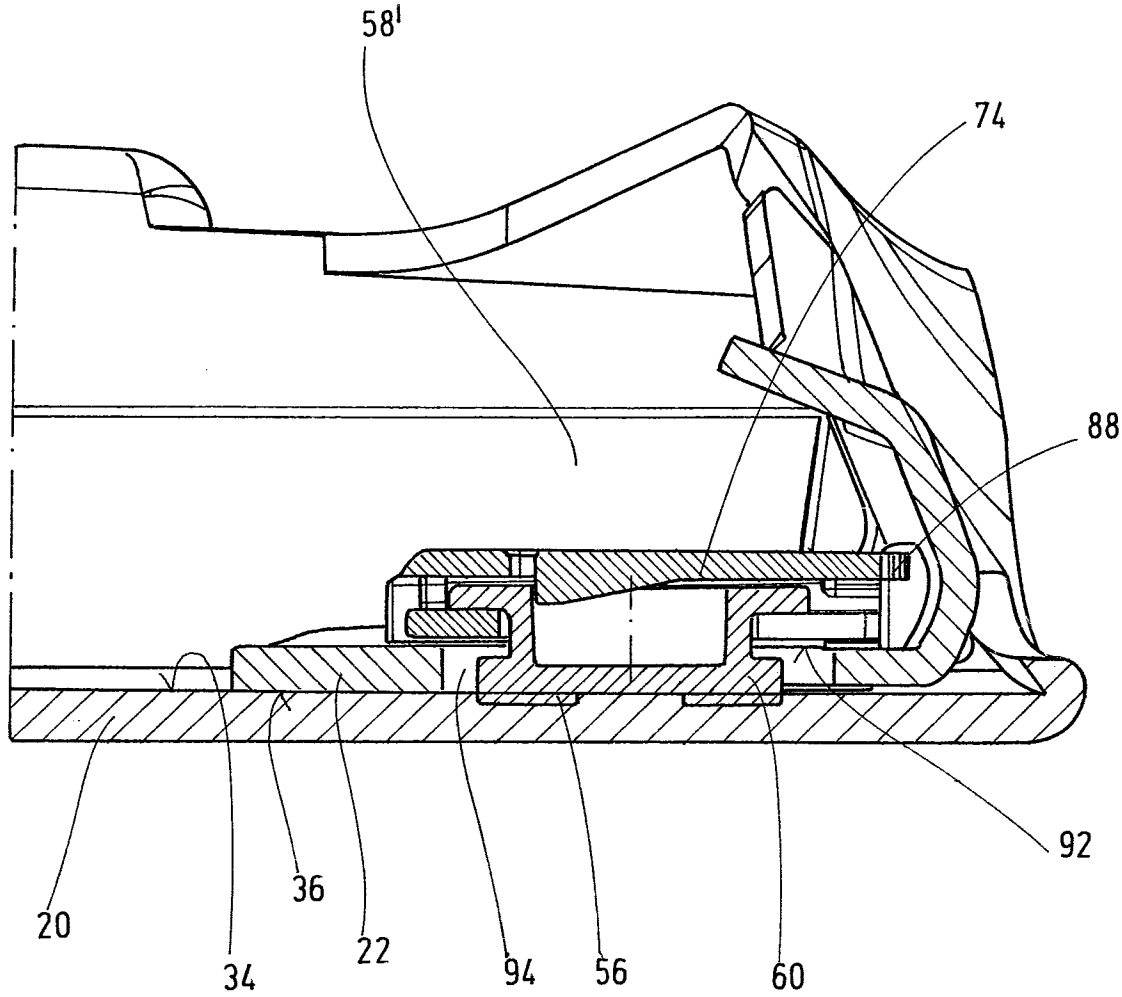

Fig.11