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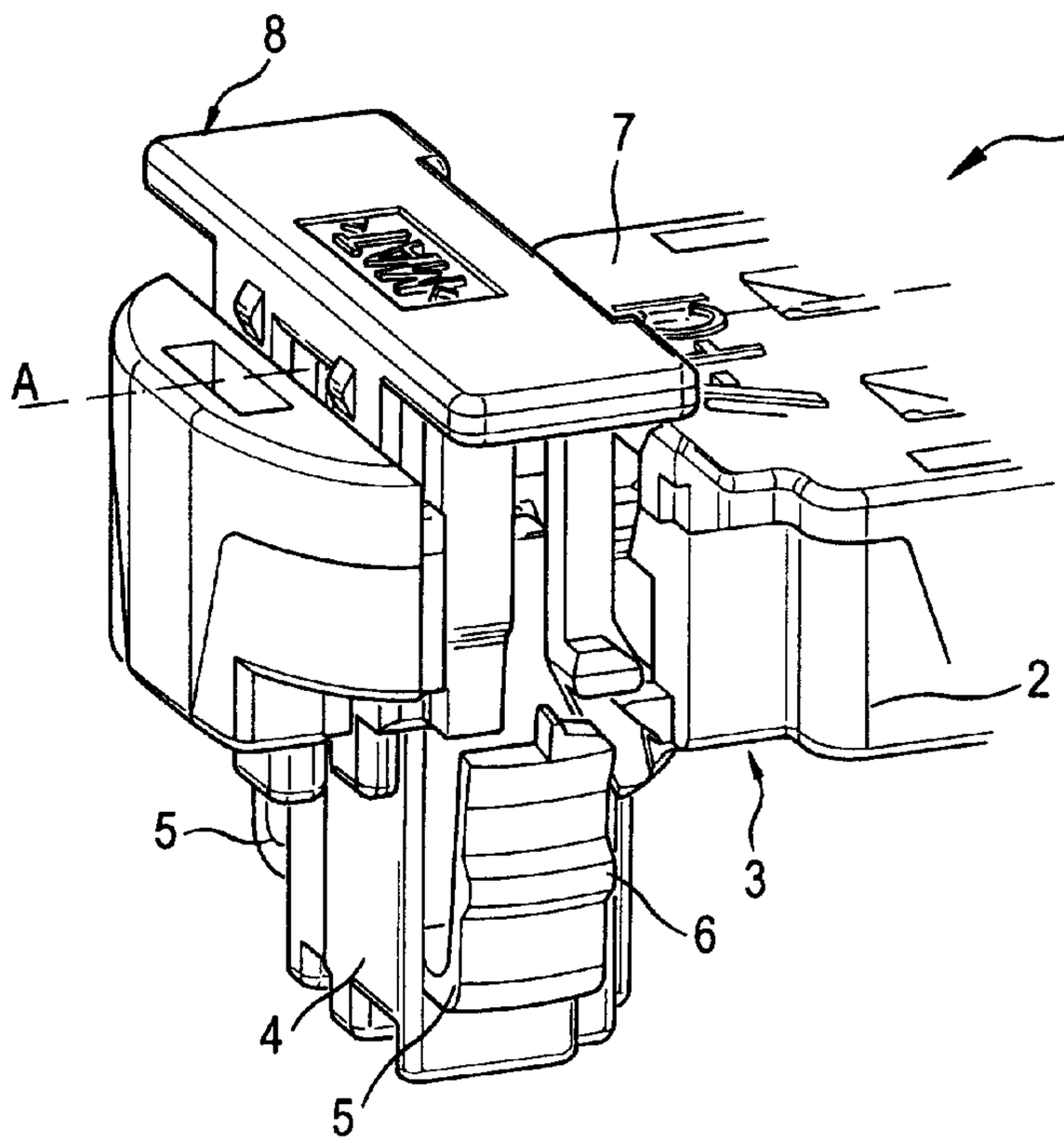
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(54) Titre : FICHE DE CONNEXION AVEC DISPOSITIF DE VERROUILLAGE SECONDAIRE
(54) Title: A PLUG CONNECTOR WITH A SECONDARY LOCKING DEVICE



(57) Abrégé/Abstract:
The invention concerns a plug connector (1) with a secondary locking device (8) with legs (10), which fix the locking arms (5) of the plug connector (1) in their final locked position in a socket (16). The secondary locking device (8) also has a spring arm (12) with a step (13), which is supported on a locking projection (15) formed on the housing (2) of the plug connector (1), which holds the secondary locking device (8) in a pre-locked position, where the step (13) is only lifted from the locking projection (15) during the insertion of the plug connector (1) into the socket (16). Thereafter, the secondary locking device (8) can be locked into the final locked position.

Abstract

A plug connector with a secondary locking device

The invention concerns a plug connector (1) with a secondary locking device (8) with legs (10), which fix the locking arms (5) of the plug connector (1) in their final locked position in a socket (16). The secondary locking device (8) also has a spring arm (12) with a step (13), which is supported on a locking projection (15) formed on the housing (2) of the plug connector (1), which holds the secondary locking device (8) in a pre-locked position, where the step (13) is only lifted from the locking projection (15) during the insertion of the plug connector (1) into the socket (16). Thereafter, the secondary locking device (8) can be locked into the final locked position.

Plug connector with secondary locking device

The present invention concerns a plug connector with a secondary locking device according to the characterising portion of Patent Claim 1. Such a plug connector is familiar from EP 1 006 621 A2.

Plug connectors of this type find particular application as airbag restraint systems in automotive vehicles and are used for the connection of these airbag restraint systems to an ignition base. The ignition bases are located on, for example, the collapsible ring of the steering wheel or elsewhere, where the flat construction of the plug connector is important for reasons of space.
It is a further essential requirement placed on such plug connectors that the insertion connection between the plug connector and the socket should not in any circumstances become loosened. It is the task of the secondary locking device to ensure that a plug and a socket shall not become loosened unintentionally.

Both EP-A-0 632 534 and WO 97/41623 describe a plug connector of a flat construction for connection to the ignition base of an airbag, where a secondary locking device prevents the loosening of the plug connector from the ignition base. The secondary locking devices can be unintentionally placed into the final locked position before the connector „halves“ are joined to one another, which prevents assembly.

A plug connector with a secondary locking device is also familiar from DE-C-197 28 448, where the secondary locking device is secured on the plug connector with locking legs, in order to prevent possible detachment. By means of introducing the secondary locking device into the appropriate socket, the locking legs prevent the locking arms of the plug connector from becoming loosened from the final locked position. If the secondary locking device of such a plug connector is placed in the pre-locked position, it can nevertheless happen that during transport or handling of the first connector parts, the secondary locking device becomes loosened from its pre-locked position and pressed into its final locked position, before the introduction of the plug connector into the

socket has taken place. Through the locking legs which have been inserted, it is no longer possible to introduce the plug connector into the socket, that is to say, into the ignition device, since the locking legs with their locking projections are wider than the slots into which they are to be inserted and consequently, an effort is needed to loosen the secondary locking device manually.

EP 1 006 621 A2 describes a plug connector with a secondary locking device, where the secondary locking device can only be pressed into its final position through a part of the socket through a part of the socket the opening of a tong-shaped spring arm arrangement. Owing to the fact that the secondary locking device and the spring arms lie on different levels with respect to the longitudinal axis of the plug connector, the locking clamp can tilt both during the assembly of the locking clamp on a connector part and during the introduction of the plug connector into the socket, which can adversely affect the assembly of the plug connector parts.

It is the task of the present invention to develop a plug connector of the type described earlier in such a way that the unintentional pressing of the secondary locking device into its final locked position is impossible before the two plug connector „halves“ have been joined together, without adversely affecting the joining process itself.

This task is solved according to the patent Claims. The features of preferred embodiments of the invention are characterised in the subsidiary Claims.

In a preferred embodiment, the spring arm has on its insertion end a projection, through which during the insertion of the plug connector into the socket, the spring arm is deflected in such a way that the step of the spring arm is lifted from the locking projection and the secondary locking device is released. By means of this form of the spring arm, the latter is bent during the process of insertion of the plug connector into its socket when the projection reaches the socket, whereby the step is loosened from the locking projection. Preferably, the locking projection is wedge-

shaped where, during the introduction of the plug connector into its socket, the wedge-shaped section reaches a face of the socket opposite the plug connector. As the introduction of the plug connector into its socket proceeds, the spring arm is introduced into an opening of the socket, which may, for example, be the opening into which the insertion face of the plug connector is inserted.

In a preferred embodiment of the present invention, the free ends of the legs are supported on the free end of the locking arms during the introduction of the secondary locking device into the plug connector, whereby the introduction of the secondary locking device into the final locked position is prevented, until the locking arms snap into the recesses provided for the locking of the plug connector into its socket, whereby the locking arms vacate the insertion path of the legs and the secondary locking device becomes lockable into the final locked position. This invention-related geometry also prevents the secondary locking device from being able to be placed in its final locked position. Only when the locking shoulders of the locking arms are locked into the recesses provided for that purpose in the socket, are the pre-tensioned locking arms pressed outwards and only then an insertion of the secondary locking device becomes possible. This leads to two conditions for the insertion of the secondary locking device into its final locked position. Firstly, the shoulder of the spring arm must be lifted from the locking projection formed on the housing of the plug connector and secondly, the plug connector must have become finally locked into the socket, until an insertion of the secondary locking device becomes possible. This makes it easy for the operative to ascertain from the outside, whether the plug connector and the socket are correctly joined. If the secondary locking device can be brought into its final locked position, then the joining of the plug connector and its socket has been successful.

In a preferred embodiment of the present invention, the locking arms are formed on an insertion face on the underside of the housing, whereby the free ends of the locking arms are bent against the direction of insertion. In this way, it is possible for the rear face of the locking arms is able to reach the lower end of the leg, whereby the insertion of the secondary

locking device is prevented until the locking arms have vacated the insertion path by swinging outwards, when a complete joining of the two plug connector portions has taken place.

Below, the invention is explained more fully by means of the description of an embodiment example, where

Fig. 1 is a diagonal view of the plug connector with a secondary locking device in its pre-locked position, in a preferred embodiment.

Fig. 2 is a perspective view of the secondary locking device

Fig. 3 is the plug connector during the process of its introduction into the socket

Fig. 4 is a lateral view after the joining of the plug connector and the socket with the secondary locking device almost fully inserted

Fig. 5 is a detailed cross-sectional view of the plug connector in the socket after joining and

Fig. 6 is a detailed cross-sectional view of a second embodiment

Fig. 1 is a perspective view of the plug connector 1 with a housing 2, which has on the housing side 3 an insertion face 4, on whose opposite ends are formed locking arms 5. The locking arms 5 have locking shoulders 6, which snap into recesses, which are provided for that purpose, during the introduction of the plug connector 1 into a socket (not shown). A secondary locking device 8 can be inserted into the upper face 7

As can be seen in Fig. 2, the said secondary locking device has a horizontal plate 9 on whose underside extend a leg 10 (locking leg) and a second leg 11 and a spring arm 12. The spring arm 12 has a step 13 and a projection 14, where the projection is wedge-shaped and is located on

the insertion side of the spring arm. The secondary locking device is inserted through openings, provided for that purpose, from the upper face 7 of the plug connector 1 into the latter. The secondary locking device 8 also has locking shoulders 20, 21, by means of which the secondary locking device 8 can be locked into the pre-locked or final locked position in the housing 2 of the plug connector. In the embodiment shown, the leg 10 and the spring arm 12 are separate, but can nevertheless still be combined in a single leg, which then assumes the functions of both a plug and a spring.

As shown in Fig. 3, the step 13 formed at right angles to the direction of insertion, reaches during the insertion of the secondary locking device 8, reaches the locking projection 15 formed on the plug connector housing 2. Preferably, a further locking projection 15 which supports a further step 13 of the second spring arm 12 of the secondary locking device, is located in an axially symmetrical manner to the symmetry axis A of the plug connector 1, on the opposite face which is not shown. During the insertion of the plug connector 1 into the socket 16, the spring arm 12 is deflected so that the said spring arm 12 bends, whereby the step 13 is lifted from the locking projection 15. Through the insertion of the plug connector 1 into the socket 16, the locking arms are pressed together. The legs 10 of the secondary locking device 8 rest with their lower end on a face 17, which is located vertically to the direction of insertion at the free ends of the locking arms. This supported position of the legs 10 on the locking arms 5, also prevents the insertion of the secondary locking device 8 into its final locked position. Through a wedge-shaped crest 22, the step 13 also rests on the locking arm 5, until the latter swigs outwards.

Fig. 4 shows the plug connector 1 and the socket 16 in a joined position. Through the complete insertion of the plug connector 1 into the socket 16, the locking shoulders 6 of the locking arms 5 are pressed into recesses 18 (see Fig. 3). The pre-tensioned locking arms move outwards, the legs 10 are no longer supported on the face 17, so that the secondary locking device 8 can be locked into its final locked position by means of the application of a force to the horizontal plate 9. After the insertion of

the legs 10, the locking shoulders 6 are firmly ensconced in the recesses 18 and the loosening of the plug connector is no longer possible. As can be seen, the spring arm 12 is bent, since the projection 14 through being supported on the socket 16, bends the spring arm 12.

Fig. 5 is an enlargement showing how the locking shoulders 6 of the locking arms 5 snap into the recesses 18 through the complete insertion of the plug connector 1 into the socket 16, so that the path of the legs 10 is vacated. The secondary locking device can now be pressed into the final locked position in the plug connector 1. During this process, a guiding leg 19 (see Fig. 2) guides the movement of the secondary locking device. During the complete insertion of the secondary locking device, the further leg 11 shown in Fig. 2 releases a short circuit bar (not shown), which short-circuits two contact pins (not shown) of the socket.

Fig. 6 shows a detailed cross-section of a second embodiment of the plug connector according to the invention. In this embodiment, the locking arm in substantially parallel with the free end extending from the plug connector housing, on which a locking projection 6 is arranged for locking into a corresponding slot 18 in the socket 16. Into the slit between the plug connector housing 2 and the side of the locking arm 5 directed to the central longitudinal axis, can be inserted a leg 10 of a secondary locking device 8. The second embodiment is characterised by the particular forms of the said leg 10 and the slot. The leg 10 has at its free end 100 on the side opposite the central longitudinal axis of the secondary locking device, in its radial thickness, an offset Δx. The radial slot thickness between the plug connector housing 2 and the locking arm 5 is seen unreduced in the direction of insertion of the secondary locking device 8 as far as the height of the top 110 of the leg 10 in pre-locked position. In its continuing course, the radial slot thickness is reduced in size by approximately the amount of the size of the offset as far as the final locking depth of the secondary locking device on the side of the offset. The leg 10 is held in the pre-locked position by the pressure of the step 13 on the locking projection 15 (see Fig. 3). During the process of insertion of the plug connector into the corresponding socket 16, the step is lifted from the locking projection. During a short travel of the insertion

process, this creates the possibility of an error, whereby, by pressure on the clamp 9 of the secondary locking device 8, a premature insertion of the secondary locking device becomes possible, without the locking projection 6 already having been locked into the corresponding slot 18 in the socket 16. This makes impossible a normal insertion of the plug connector 1 into the socket 16. In order to prevent this from happening, the thickness reduction of the front end of the leg 10 and the shoulder 130 on the level of the free end 110, causes the locking arm 5 to bend the front end of the leg 10 during the process of insertion, during the sliding of the tip of the locking projection 6 on the upper inner edge of the socket 16, so far in the direction of the central longitudinal axis of the plug connector 1, that the free end 110 of the leg 10 comes to lie opposite the shoulder 130. In this way, it is impossible to displace the secondary locking device 8 into its final locked position during this phase of the process of insertion of the plug connector 1 into the socket 16. Only after the locking projection 6 has become locked into the slot 18 of the socket 16, does the locking arm 5 vacate the slot to the extent of enabling the secondary locking device 8 to be pushed out of the pre-locked position into the final locked position.

In order to facilitate the insertion of the plug connector 1 into the socket 16, the plug connector housing 2 is conical tapered at one insertion end in the direction of insertion and forms in front of the free end of the locking arms, circular segment-shaped aprons (120), opposite the outer edge 121 of which only its locking projections radially extend.

The plug connector according to the invention ensures that with the secondary locking device in the final locked position, the connection between the plug connector and the socket is secure. An insertion of the secondary locking device into the final locked position prevented by means of two supporting points, firstly through the support of the step 13 on the locking projection 15 and secondly by the support of the leg 10 on the face 17 at the rear end of the locking arms 5. Only when both these points of support have been vacated and which only happens when the plug connector 1 has been completely inserted into the socket 16, is the insertion of the secondary locking device 8 possible. An insertion of the

plug connector 1 into the socket is possible, either through pressure on the upper face 7 of the housing 2, or through pushing the plug connector 1 into the socket and subsequent pressure on the secondary locking device or only through pressure on the secondary locking device.

Claims

1 A plug connector (1) with a secondary locking device (8) which has a leg (10), where at least one leg fixes a locking arm (5) of the plug connector (1) in the final locked position in a socket (16), where at least one of the legs (10) has a locking arm (12) with a step (13) which is supported on a locking projection (15) formed on the housing (2) of the plug connector (1) and which holds the secondary locking device (8) in a pre-locked position and where the secondary locking device (8) can be locked into the final locked position, characterised by the fact that the secondary locking device (8) has two spring arms (12), each with a step (13) and a projection (14) which is arranged symmetrically to the longitudinal axis of the plug connector (1), where during the process of insertion of the plug connector (1) into the socket (16), the spring arms (12) are deflected by the locking projections in such a way that the step (13) of the spring arms (12) is lifted from the locking projections (15) and the secondary locking device (8) is released.

2 A plug connector (1) according to Claim 1, characterised by the fact that the projection (14) is wedge-shaped and reaches a face of the socket (16) during the insertion of the plug connector (1) into the socket (16).

3 A plug connector (1) according to one of the Claims 1 and 2, characterised by the fact that during the insertion of the locking device (8) into the plug connector (1), the free ends of the leg (10) are supported on the free ends of the locking arms (5) and prevent an insertion of the secondary locking device (8) into the final locked position, until the locking arms (5) snap into the recesses (18) which are provided for that purpose, in order to lock the plug connector (1) into the socket (16), whereby the locking arms (5)

clear the way for the legs (10) and the secondary locking device (8) can be locked into its final locked position.

4 A plug connector (1) according to one of the Claims 1 to 3, characterised by the fact that the locking arms (5) are formed on insertion face (4) formed on the underside of the housing (2), where the free ends of the locking arms (5) are bent towards the direction of insertion.

5 A plug connector (1) according to one of the Claims from 1 to 4, characterised by the fact that the secondary locking device (8) has a further leg (11), where, on the secondary locking device (8) being locked into the final locked position, releases a short-circuit bar and a short-circuit forms between two end contacts of the socket (16).

6 A plug connector (1) according to one of the preceding Claims, characterised by the fact that at least one of the legs (10) has an offset Δx of its radial thickness at its free end (100) on the side facing the central longitudinal axis of the secondary locking device, where the radial slot width between the plug connector (1) and the locking arm (5) seen in the direction of insertion of the secondary locking device (8) up to the height of the tip (110) of the leg (10) is not reduced in the pre-locked position and is subsequently reduced by the amount of the offset up to the final locked position on the side of offset.

7 A plug connector (1) according to Claim 6, characterised by the fact that the free ends of the locking arms (5) are arranged in the direction of insertion.

8 A plug connector (1) according to Claim 7, characterised by the fact that the plug connector housing (2) tapers conical at its insertion end and has circular segment-shaped aprons (120) arranged in front of the free ends of the locking arms, opposite the outer edge

(121) of which only the locking projections of the locking arms radially project.

9 A plug connector (1) according to one the Claims from 6 to 8, characterised by the fact that the front edges of the locking projections (6) lie so far in the direction of insertion from the front edge of the locking projection of the spring arm (5), that during the process of insertion of the locking projection (6) of the locking arm (5) into a corresponding slot (18) in the socket (16), the locking projection (14) on the spring arm (12) is pushed away by the step (13) on the plug connector housing (2), in order to release the secondary locking device for locking into the final locked position.

10 A plug connector according to one of the Claims from 6 to 8, characterised by the fact that the radially and internally lying side of the free end of the locking arms, elastically presses the top end of the legs (10) against the inner wall of the slot between the housing (2) and the locking arm during the process of insertion, so that the front faces (110) lie opposite a step (130) which is formed by the taper of the slot, so that until the locking of the locking arm (5), a pressing in of the secondary locking device (8) is prevented.

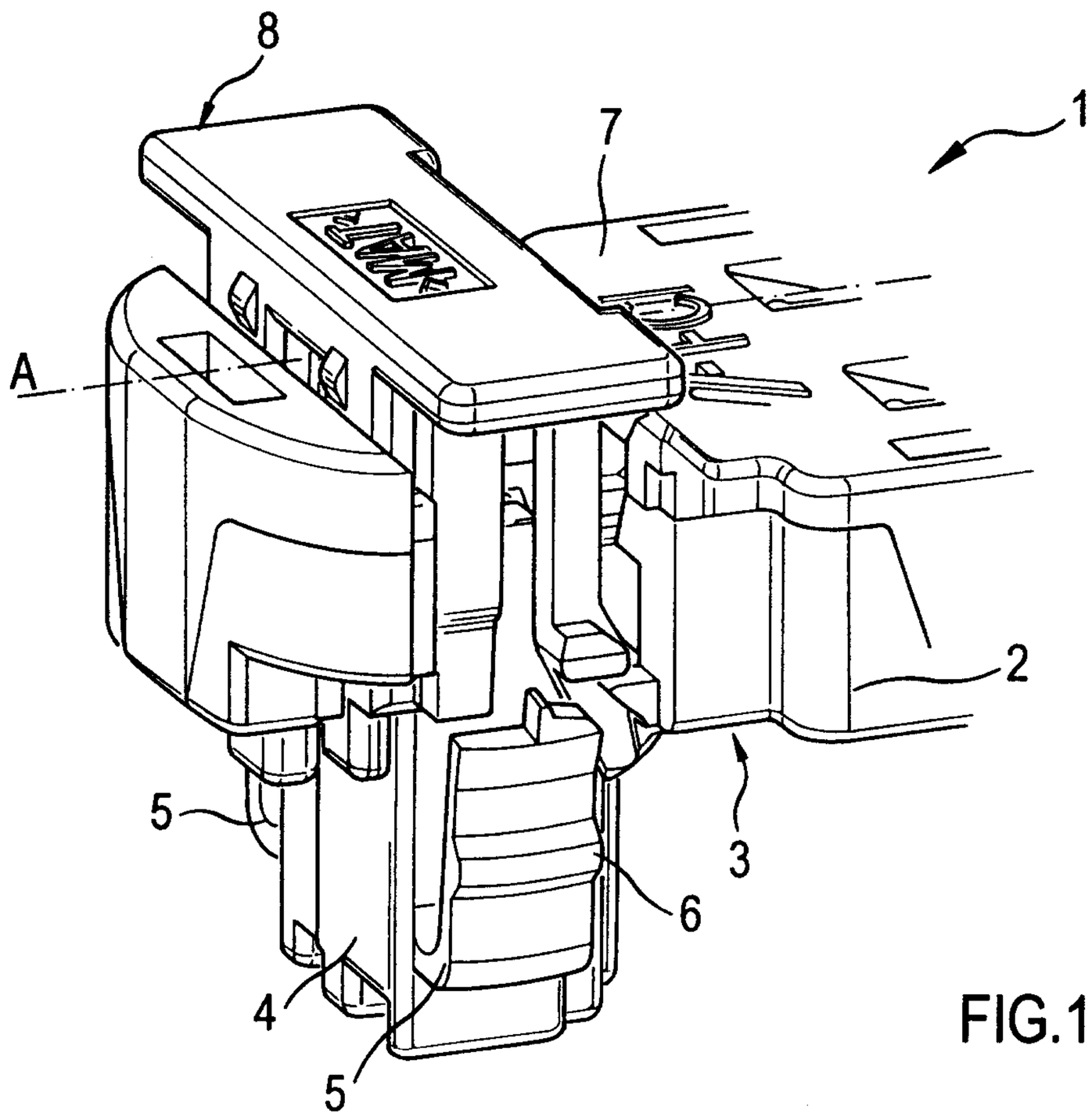


FIG.1

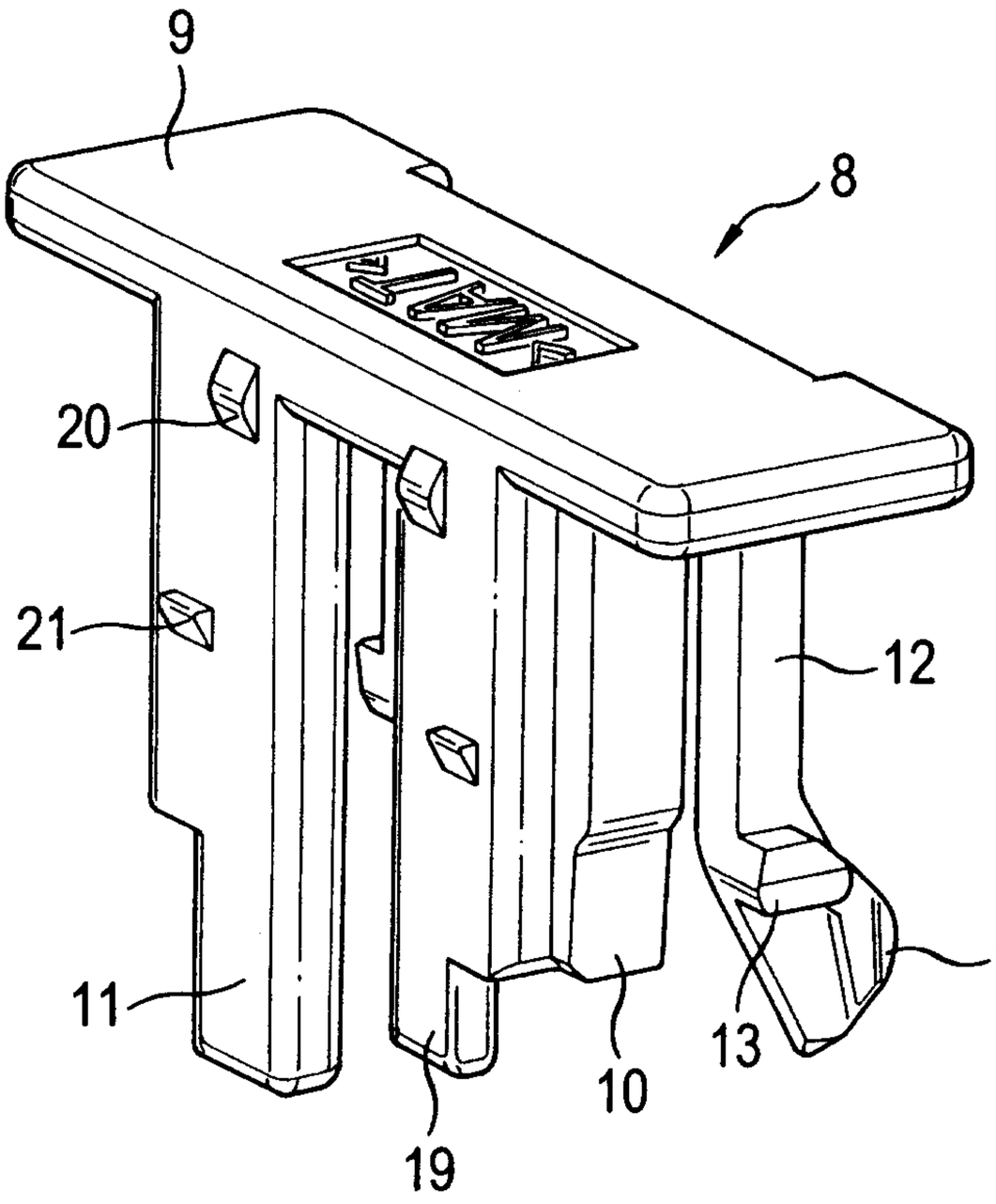


FIG.2

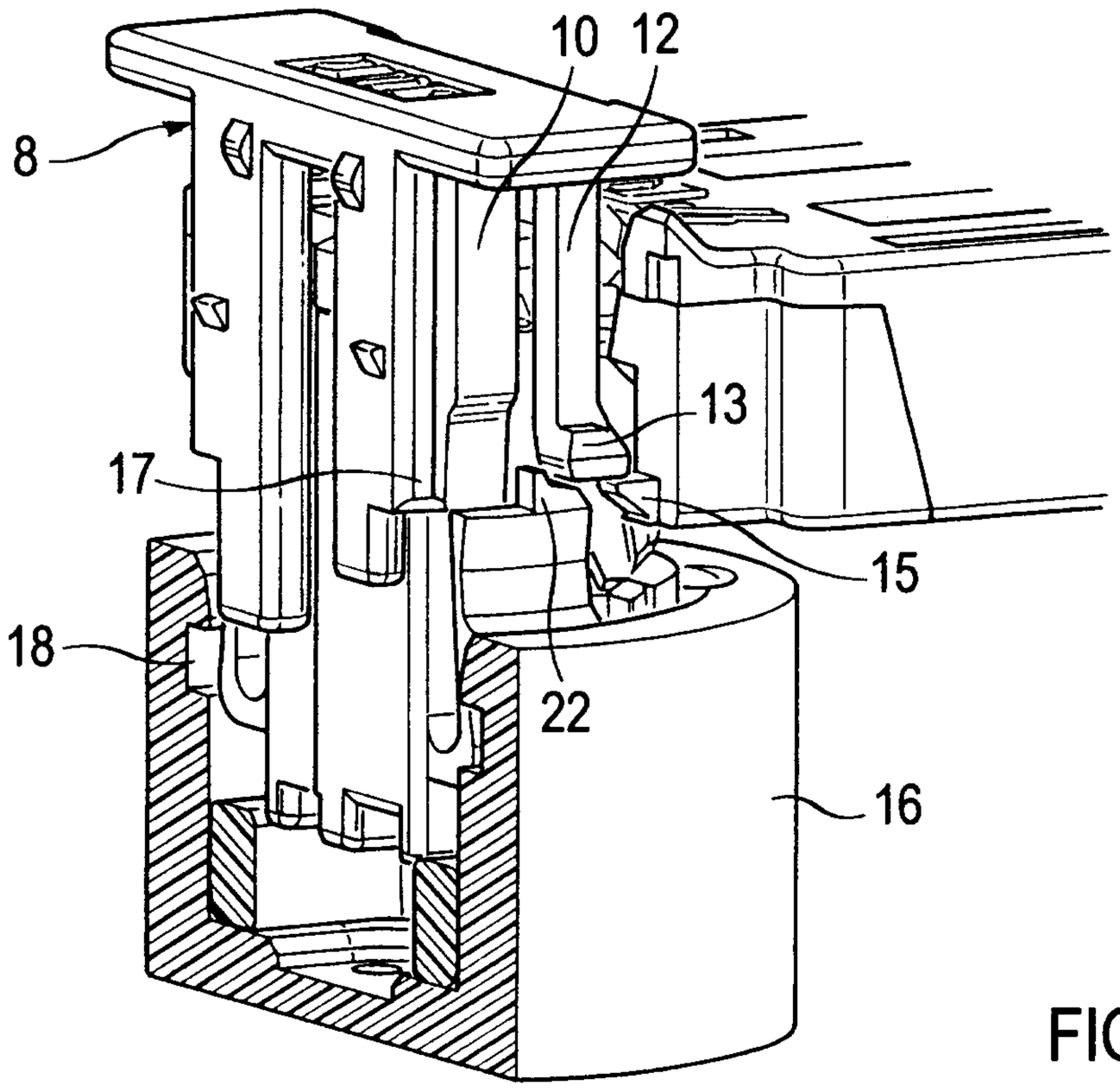


FIG.3

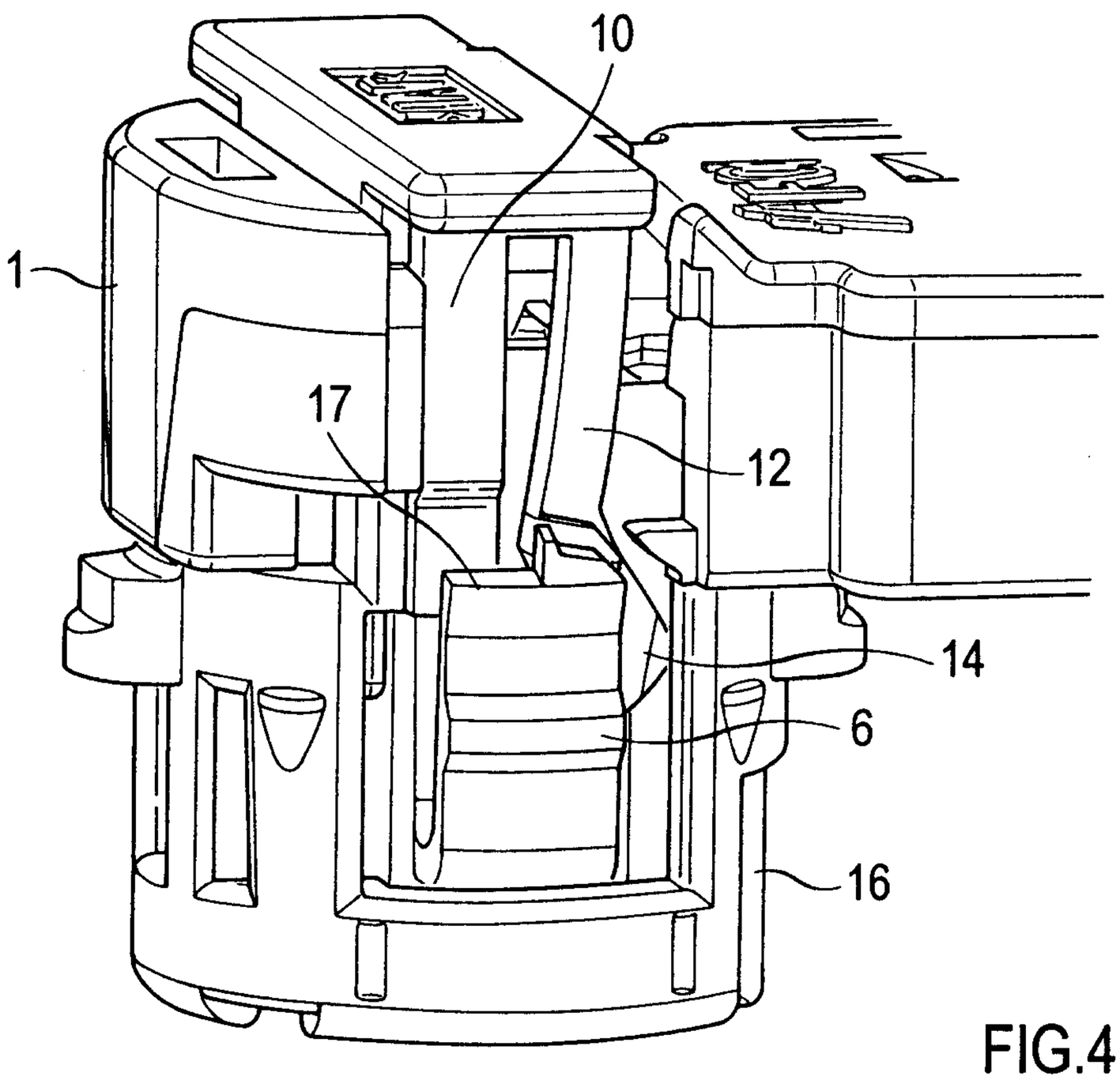


FIG.4

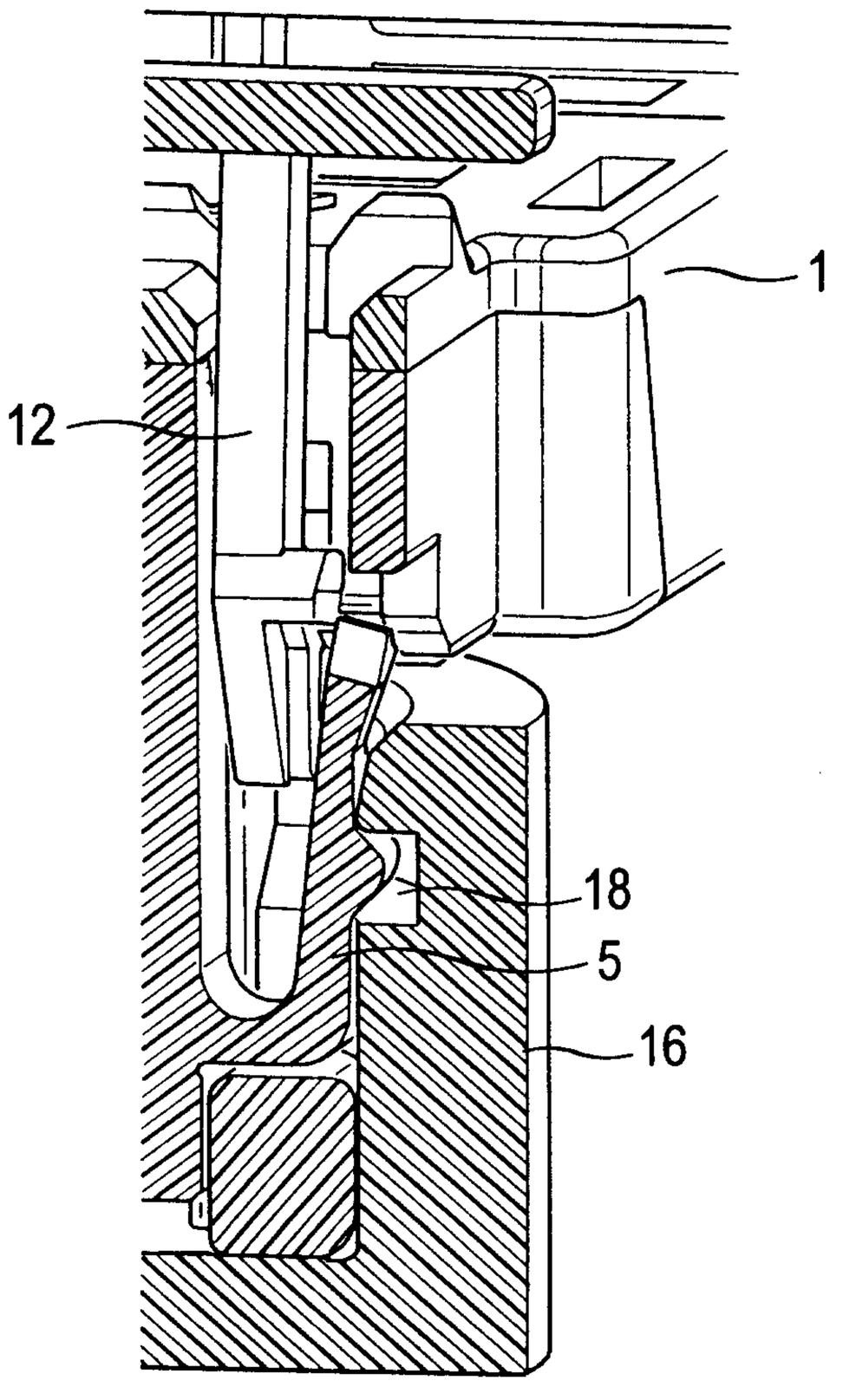


FIG.5

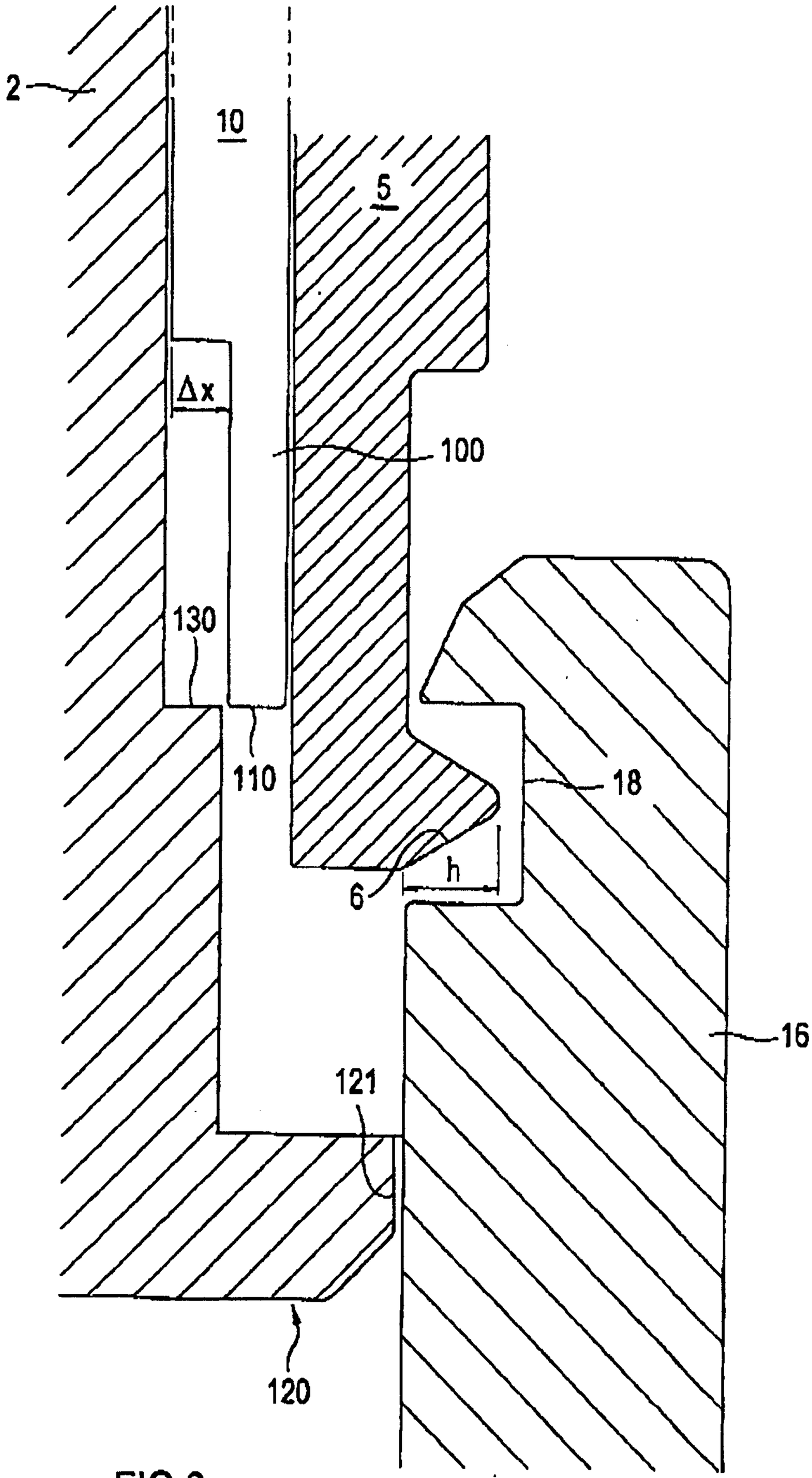
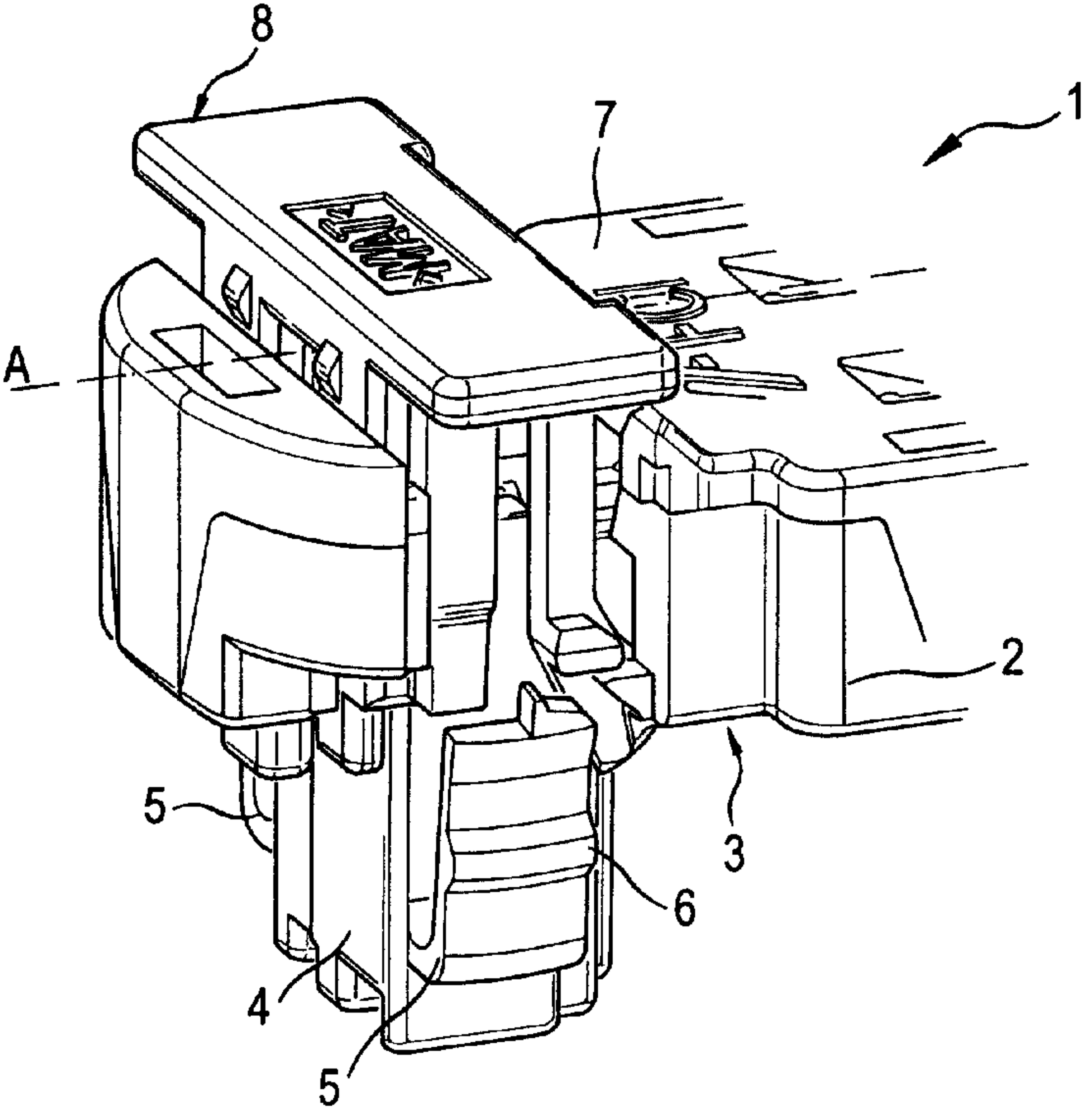


FIG.6


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