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(54) CONNECTOR HOUSING FOR AN ELECTRIC CONNECTOR

(57) Connector housing (1) for an electric connector comprising:
a top wall (3), and
a flexible locking arm (2) longitudinally extending along the top wall (3), the locking arm (2) having an inner surface (8) opposite an outer surface (9) of the top wall (3), the locking arm (2) being connected to the top wall (3) by a transition portion (10) having a transition surface (11) merging into the inner surface (8) of the locking arm (2) and
into the outer surface (9) of the top wall (3),
characterized in
that a slot (12) is disposed in the transition surface (11).

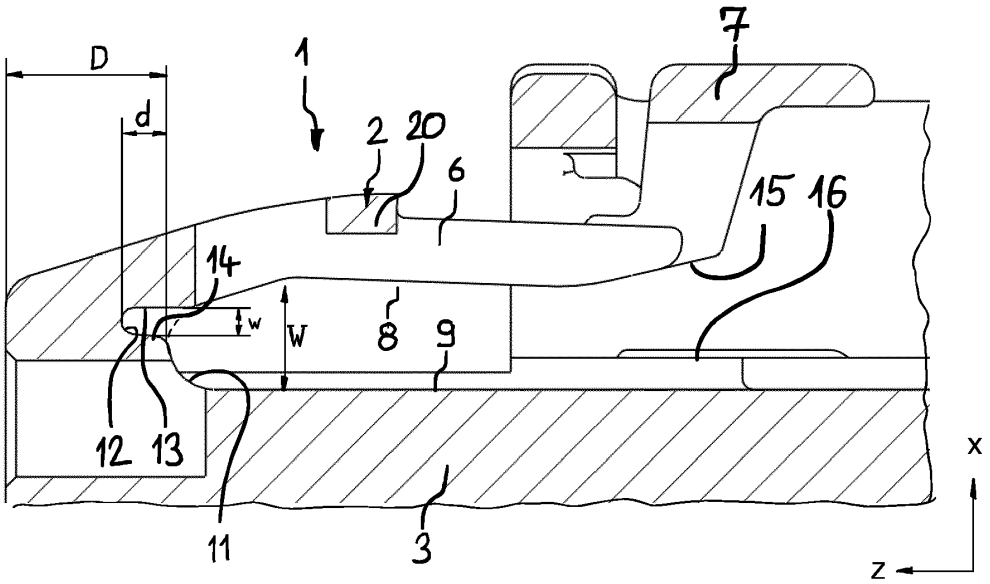

FIG. 3

EP 4 336 672 A1

Description

[0001] The invention refers to a connector housing for an electric connector comprising a top wall, and a flexible locking arm longitudinally extending along the top wall, for instance along the longitudinal extension of the connector housing, the locking arm having an inner surface opposite an outer surface of the top wall, the locking arm being connected to the top wall by a transition portion having a transition surface merging into the inner surface of the locking arm and into the outer surface of the top wall.

[0002] Such a connector is described in EP 2 772 993 A1. A connector assembly comprises a first connector housing having an open end, an inner cavity and a locking protrusion extending from an upper wall into the inner cavity. The connector further includes a second connector housing having a top wall and a flexible lock arm extending along the top wall. The second connector housing and the lock arm are sized to be received in the inner cavity of the first connector housing. The lock arm has a locking aperture for receiving the locking protrusion when the second connector housing is fully inserted in the first connector housing. The lock arm further has a free end terminating in a release tab, which remains outside the first connector housing when the second connector housing is fully inserted in the first connector housing. The release tab is in a raised position when the locking protrusion on the first connector housing is in the locking aperture on the lock arm. The release tab is capable of being depressed so as to move the lock arm downwardly and disengage the locking aperture from the locking protrusion. An assurance element is adapted to be inserted between the top wall and lock arm to a preset position and adapted to be fully inserted between the top wall and lock arm to a fully locked set position. The assurance element includes a seat adapted to be positioned under the release tab to prevent the release tab from being depressed so as to disengage the locking aperture from the locking protrusion when the second connector housing is fully inserted in the first connector housing and the assurance element is fully inserted between the top wall and lock arm.

[0003] It specific applications it might be possible that during the movement of the assurance element from the preset position to the fully locked position, when the second connector housing is not inserted in the first connector housing, the lock arm is being damaged or breaks at a transition portion at the root of the lock arm due to high stresses in the lock arm material. The same might occur in some applications during bending the lock arm for releasing the lock arm.

[0004] The object of the invention is to increase the lifetime of a connector as described above.

[0005] The object is achieved with a connector housing for an electric connector comprising a top wall, and a flexible locking arm longitudinally extending along the top wall, for instance along the longitudinal extension of the connector housing, the locking arm having an inner surface opposite an outer surface of the top wall, the locking arm being connected to the top wall by a transition portion having a transition surface merging into the inner surface of the locking arm and into the outer surface of the top wall, wherein a slot is disposed in the transition surface.

[0006] The slot in the transition surface of the transition portion results in an increased locking arm elasticity, while avoiding high stresses in the locking arm material. Even if high forces exceeding a threshold value are applied to the connector assurance element the elasticity of the locking arm assures that stresses in the locking arm material do not exceed a material strength limits hence avoiding damages.

[0007] When, for instance, the locking arm is pressed downwardly towards the top wall high stresses occur at the root, respectively at the transition portion, of the locking arm. In particular, if the locking arm has a locking aperture according to the above-described connector of the prior art high stresses occur at the root-side end of the locking aperture. These stresses are avoided by the increased elasticity of the locking arm due to the slot in the transition surface.

[0008] If the second connector housing is not inserted in the first connector housing a connector assurance element, that might be provided, should only be moveable from the preset position to the set position when a very high force is applied to it. This avoids an unintentionally movement of the connector assurance element form the preset position to the set position before the second connector housing is inserted in the first connector housing. However, even if such high forces are applied to the connector assurance element a damage or breakage of the locking arm is avoided.

[0009] In an embodiment of the invention, the transition surface is concavely curved. It is, however, also conceivable that the transition surface is straight or made of several areas of flat sections.

[0010] The slot might extend over the entire width of the locking arm so as to maximize the elasticity of the locking arm.

[0011] The slot can extend parallel to the top wall wherein minor deviations due to manufacturing tolerances or inclined surfaces of the slot for manufacturing purposes should be included.

[0012] In an embodiment of the invention, the slot has a depth being up to half the thickness of the transition portion of the locking arm, preferably up to a third the thickness of the transition portion of the locking arm.

[0013] A width of the slot can be up to half a largest distance between the inner surface of the locking arm and the upper surface of the upper wall, preferably up to a third of the largest distance between the inner surface of the locking arm and the upper surface of the upper wall.

[0014] The slot is limited by two side surfaces that can be arranged parallel to each other and orientated in the longitudinal direction of the slot and the depth direction of the slot. Parallel means that minor deviations are in-

cluded such as an opening angle for removing the connector housing from a mold or removing a core of a mold during the manufacturing process.

[0015] In an embodiment of the invention, the transition portion is an integral part of the locking arm, wherein the transition portion of the locking arm is integrally connected to the top wall.

[0016] The locking arm may have a bending stop surface opposite the top wall configured to come into contact with the top wall when the locking arm is depressed downwardly towards the top wall. The bending stop surface might be on a stop protrusion in the locking arm. This avoids that the locking arm is depressed too far which would lead to high material stresses potentially resulting in a damage of the locking arm.

[0017] The top wall might be provided with a bending stopper opposite the locking arm configured to come into contact with the locking arm when the locking arm is depressed downwardly towards the top wall. If the locking arm has a stop surface as describe before the bending stopper is arranged such that the stop surface comes into contact with the bending stopper. The bending stopper might be a protrusion projecting from an upper surface of the top wall towards the locking arm. This avoids that the locking arm is depressed too far which would lead to high material stresses potentially resulting in a damage of the locking arm.

[0018] These and other features and advantages of the invention will become apparent upon further reading of the specification in light of the accompanying drawings.

Figure 1 is a perspective view of the connector housing according to the invention with a connector assurance element;

Figure 2 is a longitudinal sectional view of the connector according to Figure 1;

Figure 3 is an enlarged view of the locking arm of the connector according to Figure 2; and

Figure 4 is an enlarged perspective view of the locking arm of the connector according to Figure 3.

[0019] With reference to Figures 1 and 2 of the drawings, an exemplary connector housing 1 in accordance with the present invention is shown. The connector housing 1 is configured to be inserted into a receptacle of a counter-connector housing (not shown) in a mating direction parallel to a longitudinal axis Z. The connector housing 1 has a flexible cantilevered locking arm 2 joined to a top wall 3 of the connector housing 1. The locking arm 2 extends along the top wall 3 substantially parallel to the longitudinal axis Z. The locking arm 2 is arranged near or at a front side 4 of the connector housing 1, with which the connector housing 1 is inserted into the counter-connector housing, and extends towards a rear side 5 of the connector housing 1. The locking arm 2 is provided for securing the connector housing 1 within the counter-connector housing by way of locking engagement with a locking protrusion on the counter-connector housing. In the shown embodiment, the locking arm 2 has a locking aperture 6 for receiving the locking protrusion when the connector housing 1 is fully inserted in the counter-connector housing.

[0020] During inserting the connector housing 1 into the counter-connector housing, the locking arm 2 is being deflected downwardly in direction of a height axis X, perpendicular to the longitudinal axis Z, towards the top wall 3. As the downwardly-deflected locking arm 2 passes the locking protrusion of the counter-connector housing, the locking arm 2 snaps over the locking protrusion, which is then received in the locking aperture 6 of the locking arm 2 supporting the connector housing 1 within the receptacle of the counter-connector housing against unmating.

[0021] For releasing the connector housing 1 from the counter-connector, housing the locking arm 2 terminates at a free end into a finger-operable release tab 7. When the connector housing 1 is in a fully inserted condition the release tab 7 is still accessible from the outside of the counter-connector housing. The release tab 7 can be manually depressed so that the locking arm 2 is being deflected downwardly in direction of the height axis X. As a result, the locking protrusion is released from the locking aperture 6 and the connector housing 1 can be removed from the receptacle of the counter-connector housing.

[0022] The locking arm 2 has an inner surface 8 opposite an outer surface 9 of the top wall 3. Further, the locking arm 2 is joined to the top wall 3 by a transition portion 10, which is in the disclosed embodiment an integral part of the locking arm 2 and integrally joined to the top wall 3. The transition portion 10 has a transition surface 11 merging into the inner surface 8 of the locking arm 2 and into the outer surface 9 of the top wall 3. In the transition surface 11 a slot 12 is provided for increasing the elasticity of the locking arm 2 during a downward deflection.

[0023] The slot 12 can best be seen in Figure 3. The dashed line indicates the course of the transition surface 11 if no slot 12 were provided. In this case, i.e. without a slot 12, in specific applications it might be possible that during deflecting the locking arm 2 downwardly towards the top wall, the locking arm 2 may be damaged in the area of the transition portion 10 at the root of the locking arm 2 due to high stresses in the material. This is avoided by the slot 12 that increases the elasticity of the locking arm 2 in the area of the transition portion 10.

[0024] According to the disclosed embodiment, the transition surface 11 is concavely curved. It is, however, also conceivable that the transition surface 11 is straight or made of several areas of flat sections.

[0025] The slot 12 extends over the entire width of the locking arm 2 substantially parallel to a width axis Y, which is arranged perpendicular to the longitudinal axis Z and the height axis X.

[0026] In a direction parallel to the longitudinal axis Z, the slot 12 extends at least substantially parallel to the top wall 3 wherein minor deviations due to manufacturing tolerances or inclined surfaces of the slot 12 for manufacturing purposes are considered parallel.

[0027] The slot 12 has a depth d viewed in direction of the longitudinal axis Z that is up to half of the thickness D of the transition portion 10 of the locking arm 2, preferably up to a third of the thickness D of the transition portion 10 of the locking arm 2.

[0028] A width w of the slot 12 can be up to half a largest distance W nearest to the slot 12 between the inner surface 8 of the locking arm 2 and the upper surface 9 the upper wall 3, preferably up to a third of the largest distance W.

[0029] The slot 12 is limited by two side surfaces 13, 14 that are arranged parallel to each other and orientated in a plane parallel to the width axis Y, which is the longitudinal direction of the slot 12, and the longitudinal axis Z, which is the depth direction of the slot 12. Parallel means that minor deviations are included such as an opening angle for removing the connector housing 1 from a mold or removing a core of a mold during the manufacturing process.

[0030] As can best be seen in Figure 4, the locking arm 2 has a bending stop surface 15 opposite the top wall 3 configured to come into contact with the top wall 3 when the locking arm 2 is depressed downwardly towards the top wall 3. This avoids that the locking arm 2 is depressed too far, which would lead to high material stresses potentially resulting in a damage of the locking arm 2.

[0031] Additionally, the top wall 3 is provided with a bending stopper 16 opposite the locking arm 2 configured to come into contact with the locking arm 2 when the locking arm 2 is depressed downwardly towards the top wall 3. The bending stopper 16 may be provided additionally to the bending stop surface 15 or alternatively.

[0032] If the locking arm 2 has a bending stop surface 15 as describe before the bending stopper 16 is arranged such that the bending stop surface 15 comes into contact with the bending stopper 16. The bending stopper 16 is provided as a protrusion projecting from an upper surface 9 of the top wall 3 towards the locking arm 2.

[0033] The connector housing 1 can include a connector position assurance element 17, as shown in Figures 1 and 2. The connector position assurance element 17 is slidably mounted on the connector housing 1 for movement along an axis parallel to the longitudinal axis Z between a preset position, which is shown in the Figures 1 and 2, and a set position, in which the connector position assurance element 17 is moved further to the right as shown in Figures 1 and 2. The connector position assurance element 17 is movable from the preset position to the set position only when the connector housing 1 is in the fully engaged position relative to the counter-connector housing to thereby inhibit uncoupling of the connector housing 1 and the counter-connector housing.

[0034] The connector position assurance element 17 has a flexible arm 18 with a pawl 19 that abuts a rearward edge of a bridge portion 20 of the locking arm 2. The bridge portion 20 separates the rearward locking aperture 6 from a forward aperture 21. When pushing the connector position assurance element 17 in a forwardly direction the connector position assurance element 17 cannot proceed further forward under the locking arm 2 due to the abutment of the pawl 19 against the bridge portion 20. At this point it is difficult (without significant force) to push the connector position assurance element 17 further. The connector position assurance element 17 is now in a "preset" position on the connector housing 1.

[0035] With reference to Figure 1, the connector housing 1 is configured to house a first set of conductive terminals (not shown) in respective cavities 22. The counter-connector housing is configured to house a second set of conductive terminals (not shown) that can be electrically coupled to the first set of conductive terminals when the connector housing 1 and the counter-connector housing are engaged in the fully engaged position.

[0036] To electrically mate the first set of terminals with the second set of terminals, the connector housing 1 is inserted into the counter-connector housing. Resistance is encountered when the locking protrusion of the counter-connector housing passes over the forward aperture 21 of the locking arm 2 and abuts the bridge portion 20. Additional force is needed to push the bridge portion 20 forwardly under the locking protrusion, with the motion preferably aided by rounded leading edges on the locking protrusion and beveled, ramp-like leading portions of the bridge portion 20. The locking protrusion, as it slides over the bridge portion 20, deflects the locking arm 2 of the connector housing 1 and the flexible arm 18 of the connector position assurance element 17 downwardly towards the top wall 3. As the downwardly deflected bridge portion 20 passes forwardly beyond the locking protrusion, the locking protrusion contacts the pawl 19 and forces the pawl 19 and the flexible arm 18 of the connector position assurance element 17 downward. Finally, the locking protrusion snaps into the rearward locking aperture 6 on the locking arm 2 as the locking arm 2 snap upwardly.

[0037] At this point, the connector housing 1 and the first set of terminals are completely inserted in and fully mated to the counter-connector housing and the second set of terminals. Only in this fully inserted "pre-lock" position, with the locking protrusion forcing the pawl 19 out of the rearward locking aperture 6, and locking arm 2 in the normal up position, can the connector housing 1 be inserted further under the locking arm 2.

[0038] The connector position assurance element 17 is now pushed forwardly. A base portion 23 of the connector position assurance element 17 slides under the release tab 7 of the locking arm 2. The pawl 19 simultaneously snaps up into the forward aperture 21 of the locking arm 2. The connector position assurance element 17 is now in its "set" position.

[0039] In the "set" position, the connector position as-

surance element 17 reinforces the locking connection between the connector housing 1 and the counter-connector housing. The base portion 23 of the connector position assurance element 17 prevents the release tab 7 of the locking arm 2 from being pushed downward and releasing the locked connector housing 1 and counter-connector housing.

Reference Numerals

[0040]

1	connector housing
2	locking arm
3	top wall
4	front side
5	rear side
6	locking aperture
7	release tab
8	inner surface
9	outer surface
10	transition portion
11	transition surface
12	slot
13	side surface
14	side surface
15	bending stop surface
16	bending stopper
17	connector position assurance element
18	arm
19	pawl
20	bridge portion
21	forward aperture
22	cavity
23	base portion

d	depth of the slot
D	thickness of the transition portion
w	width of slot
W	largest distance between inner surface and upper surface
X	height axis
Y	width axis
Z	longitudinal axis

Claims

1. Connector housing (1) for an electric connector comprising:

a top wall (3), and
a flexible locking arm (2) longitudinally extending along the top wall (3), the locking arm (2) having an inner surface (8) opposite an outer surface (9) of the top wall (3), the locking arm (2) being connected to the top wall (3) by a transition portion (10) having a transition surface (11) merging into the inner surface (8) of the locking arm (2) and into the outer surface (9) of the top wall (3),
characterized in
that a slot (12) is disposed in the transition surface (11).

2. Connector housing (1) according to claims 1,
characterized in
that the transition surface (11) is concavely curved.

3. Connector housing (1) according to claims 1 or 2,
characterized in
that the slot (12) extends over the entire width of the locking arm (2).

4. Connector housing (1) according to one of claims 1 to 3,
characterized in
that the slot (12) extends parallel to the top wall (3).

5. Connector housing (1) according to one of claims 1 to 4,
characterized in
that the slot (12) has a depth (d) being up to half the thickness (D) of the transition portion (10) of the locking arm (2), preferably up to a third the thickness (D) of the transition portion (10) of the locking arm (2).

6. Connector housing (1) according to one of claims 1 to 5,
characterized in
that the slot (12) has a width (w) being up to half a largest distance (W) between the inner surface (8) of the locking arm (2) and the outer surface (9) of the upper wall (3).

7. Connector housing (1) according to one of claims 1 to 6,
characterized in
that the slot (12) is limited by two side surfaces (13, 14) arranged parallel to each other and orientated in the longitudinal direction and the depth direction of the slot (12).

8. Connector housing (1) according to one of claims 1 to 7,
characterized in
that the transition portion (10) is an integral part of the locking arm (2) and that the transition portion (10) of the locking arm (2) is integrally connected to the top wall (3).

9. Connector housing (1) according to one of claims 1 to 8,
characterized in
that the locking arm (2) has a bending stop surface (15) opposite the top wall (3) configured to come into

contact with the top wall (3) when the locking arm (2) is depressed downwardly towards the top wall (3).

10. Connector housing (1) according to one of claims 1 to 9,
characterized in
that the top wall (3) is provided with a bending stopper (16) opposite the locking arm (2) configured to come into contact with the locking arm (2) when the locking arm (2) is depressed downwardly towards the top wall (3).

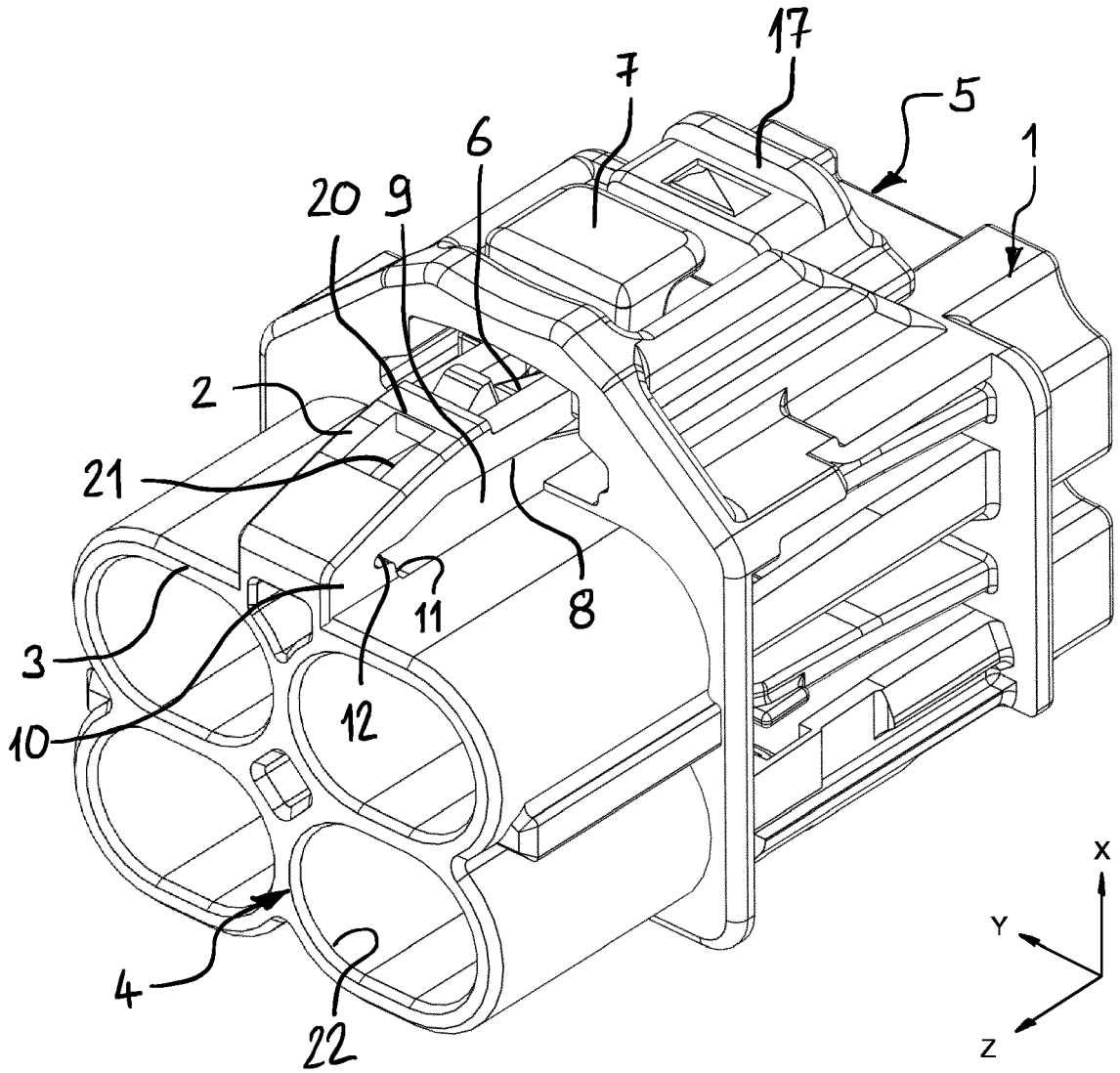

FIG. 1

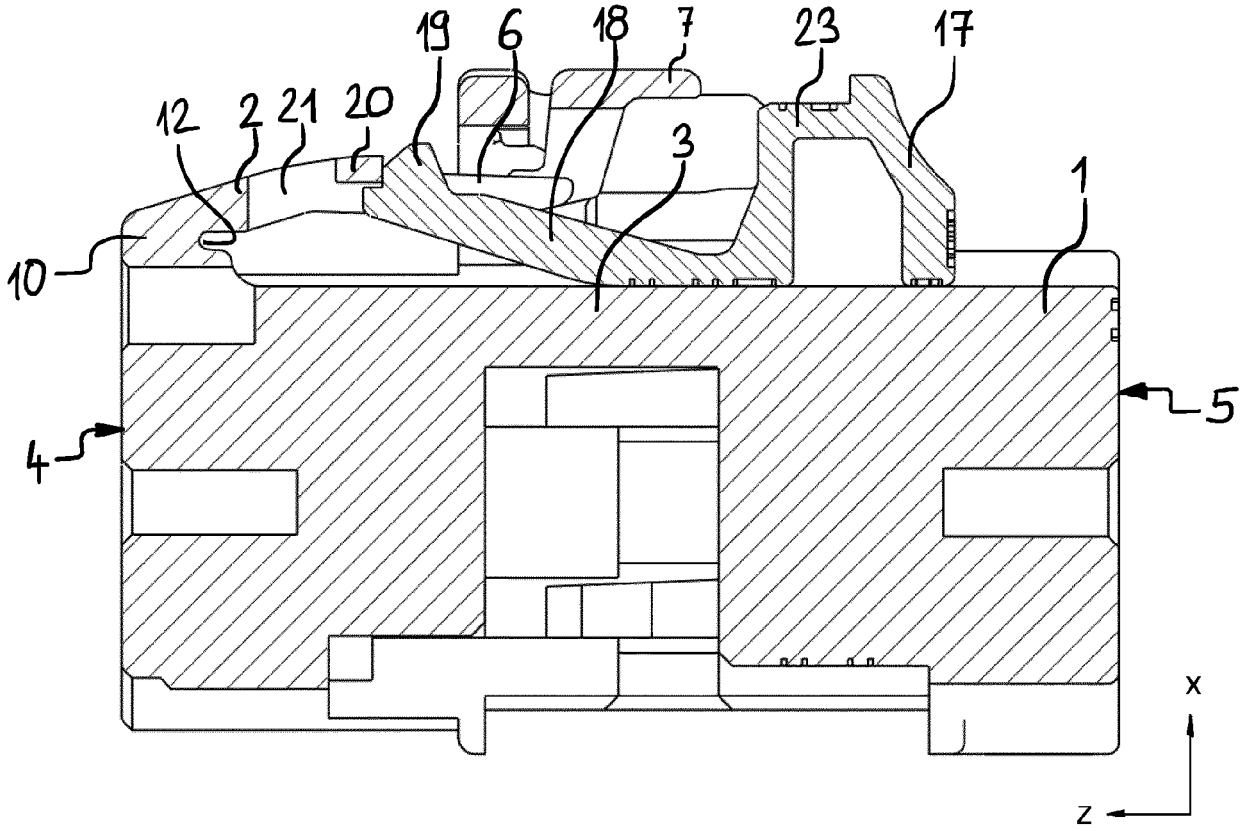
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FIG. 2

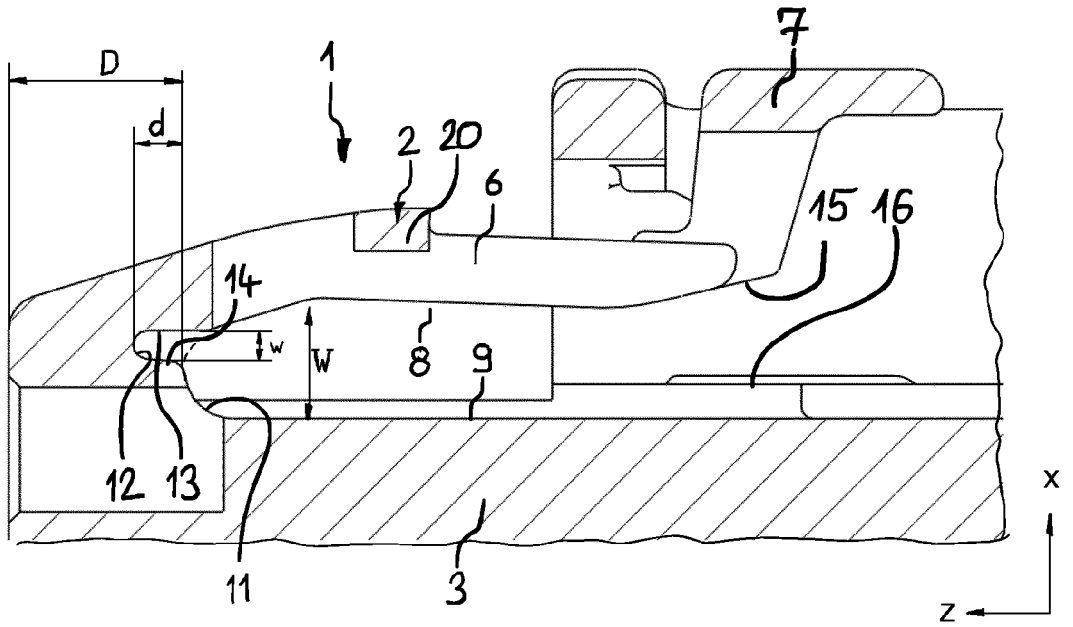
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FIG. 3

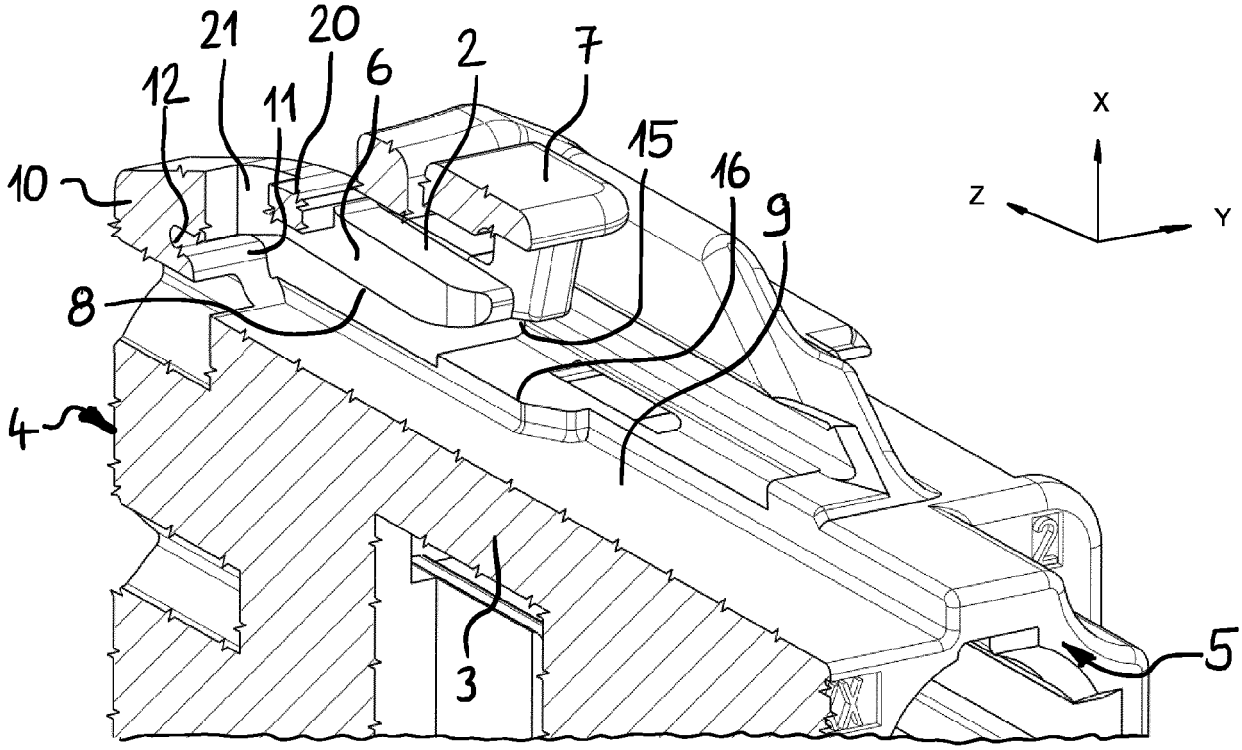

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 4171

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 January 2023	Gomes Sirenkov E M.

CATEGORY OF CITED DOCUMENTS

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