(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 910 142 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.11.2021 Bulletin 2021/46

(51) Int Cl.:
E05D 11/10 *(2006.01)* ***E05D 5/14*** *(2006.01)*

(21) Application number: **21173726.7**

(22) Date of filing: **13.05.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **13.05.2020 IT 202000010885**

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(54) **HINGE CONNECTION FOR A PANEL FOR A WORK VEHICLE**

(57) Hinge connection (5) for a panel (4) of a vehicle (1) comprising a male element (7) and a female element (8), the male element (7) defining a protrusion (9) configured to cooperate at contact with a housing (11) defined in the female element (8) to allow a relative rotation between the female element (8) and the male element (7) about an axis (A), the hinge connection (5) further comprising locking means (12) configured to lock the relative position between male and female elements (7, 8) when a predetermined relative rotation between the latter has been reached.

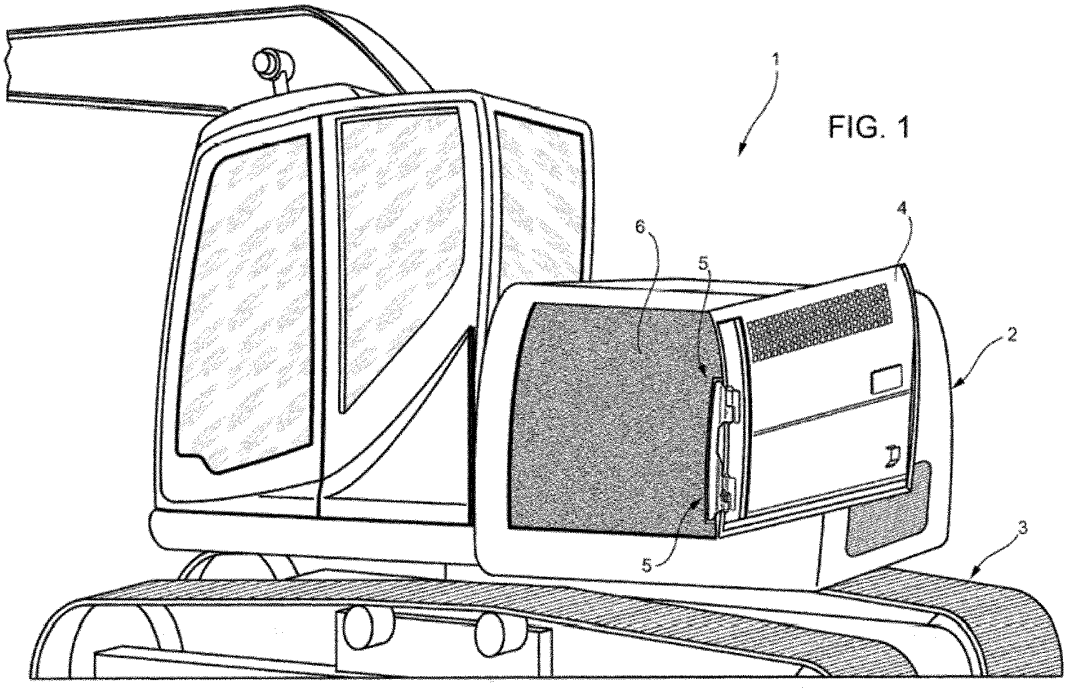

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention concerns a hinge connection for a work vehicle, in particular a hinge connection for a panel of a work vehicle such as an earth-moving machine.

BACKGROUND OF THE INVENTION

[0002] All vehicle are equipped with doors or panels that are openable. In particular, heavy vehicle such as earth moving machinery or agricultural machinery are equipped with doors and/or panels that are generally openable, to access the inside of the machinery to allow operations such as maintenance, service, parts replacement and general inspection.

[0003] Such panels are in general equipped by hinges that are installed to the panels in various way. The openable panels should have a wide angle, in order to facilitate the access to the operation area by a professional operator, allowing to do operations on the machine in an easy and smooth way.

[0004] However, such large opening angle is extremely sensitive to the vehicle side wind; indeed, the wider will be the opening angle, the stronger will be the sensitivity of the panel to the side wind.

[0005] In a very common situation, a service man is operating in a vehicle compartment; consequently, the panel is completely opened to allow to the service man the operation easier. In such configuration, a sudden wind would impart a force on the panel that will hurt the service man. Considering the dimensions of such panels and the force they may acquire, the service man is potentially in danger.

[0006] Therefore, in order to guarantee that the operation is safe, it is known to equip the door with systems that avoid the accidental closure of such panels.

[0007] However, the addition of several parts to prevent the accidental rotation and closure of the door provide in some case a certain amount of complexity to the design with the risk of increasing the product cost but also the possibility to have the breakage of parts because of the vibration under which the machine is subjected.

[0008] Therefore, the need is felt to provide a safe way to allow the opening of the panels of a vehicle so that they can allow a wide opening while avoiding sudden closure due to the wind.

[0009] An aim of the present invention is to satisfy the above mentioned needs in a cost effective and optimized way.

SUMMARY OF THE INVENTION

[0010] The aforementioned aim is reached by a hinge connection for a panel for a vehicle and a vehicle as claimed in the appended set of claims.

BRIEF DESCRIPTION OF DRAWINGS

[0011] For a better understanding of the present invention, a preferred embodiment is described in the following, by way of a non-limiting example, with reference to the attached drawings wherein:

- Figure 1 is a perspective view of a portion of a work vehicle comprising a hinge connection according to the present invention;
- Figure 2A is a perspective view of a hinge connection according to the present invention in a first operation condition;
- Figure 2B is a perspective view of a hinge connection according to the present invention in a second operation condition;
- Figures 3A to 3C are respective perspective exploded views of a hinge connection according to the present invention in different exploded configurations;
- Figure 4 is a section view about a longitudinal plane of a hinge connection according to the present invention in a first operation configuration;
- Figure 5 is a longitudinal section view of a hinge connection according to the present invention in a second operation configuration;
- Figure 6 is a transversal section view about plane VI-VI of figure 4 of the hinge connection of the present invention; and
- Figure 7 is a transversal section view about plane VII-VII of figure 4 of the hinge connection of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Figure 1 discloses a vehicle 1, in the present embodiment a work vehicle such as a scraper. Although the invention will be described with respect to such vehicle it is clear that it is not limited thereto.

[0013] Vehicle 1 defines, as known, a body 2 configured to be carried on a carriage 3 movable with respect to the ground. Such body 2 may comprise a panel 4 carried by the body 2 thanks to an hinge connection 5 according to the present invention. In particular, the panel is connected to the body 2 thanks to an upper and a lower hinge connections 5.

[0014] The at least one hinge connection 5 allows the panel 4 to assume a first operational position, closed, into which it isolate an inner space 6 defined by vehicle's body 2 (not shown) and a second operational position, opened, into which it allows the communication with the environment of such inner space 6 (as shown in figure 1).

[0015] As depicted in figures 2A, 2B the hinge connec-

tion comprises essentially a first, male, element 7 and a second, female, element 8 configured to cooperate in a rotatably free manner, as per se known, about a rotation axis A.

[0016] Indeed, for sake of clarity, male element 7 can define a protrusion 9 configured to cooperate at contact with a respective seat 11 realized in the female element 8. The protrusion 9 defines a shape coupling with the shape of the seat 11, e.g. a cylindrical protrusion 9 and seat 11.

[0017] According to the proposed embodiment, both the male and female elements 7, 8 each defines a coupling portion 7a, 8a each configured to define, respectively, the protrusion 9 and the housing 11 and a fixing portion 7b, 8b.

[0018] In particular, the coupling portion 7a,8a have each a substantially cylindrical shape while the fixing portion 7b, 8b have a flanged shape extending radially from the respective coupling portion 7a, 8a, preferably tangentially with respect to these latter. More preferably, the coupling portions 7a, 8a and the fixing portions 7b, 8b are realized as one piece.

[0019] The fixing portions 7b, 8b are configured to be connected to, respectively, the body 2 of vehicle 1 and the panel 4 so that relative movement between first and second element 7, 8 corresponds to a relative movement of panel 4 about axis A with respect to body 2. For sake of example, the fixing portions 7b, 8b may be fixed to the panel 4 via threaded elements (not shown). In order to ensure a vertical support to panel 4, preferably, both male elements 7 are both positioned vertically lower with respect to female elements 8.

[0020] According to the present invention, the hinge connection 5 comprises locking means 12 integrated in the hinge connection 5 itself and configured to lock the relative rotation of male and female elements 7, 8 when they reach a predefined angular distance. Such predefined angular distance is the relative rotational angle between the male and female elements 7, 8 corresponding to the second operational position of the panel 4.

[0021] In particular, the locking means 12 comprises a cam coupling between a cam 14 and a guide define in one between the male and female elements 7, 8 and elastic means 16 configured to maintain the cam coupling against the one between the male and female elements 7, 8 defining such guide 15.

[0022] In particular, in the proposed example, the cam 14 insist on a guide 15 defined by the female element 8 and the elastic means 16 are interposed between the male element 7 and the cam 14 and exert a force against the female element 8.

[0023] According to the disclosed embodiment, the cam 14 comprises an annular element 14a housed about the protrusion 9, in particular defining an inner diameter configured to cooperate at contact with the external surface of the protrusion 9 and an outer diameter having the same dimension of the coupling portions 7a, 8a of the male and female element 7, 8. Accordingly, the annular element 14a is axially comprised between the male and female elements 7, 8.

[0024] Cam 14 further comprises a protrusion 14b from an edge of the female annular element 14a, preferably parallel to axis A and a flanged portion 14c extending radially from annular portion 14a, preferably on the opposite side of the protrusion 14b. The flanged portion 14c furthermore defines a grip portion 17 on its axial surfaces, e.g. thanks to a plurality of grooves realized on such axial surfaces.

[0025] The guide 15 essentially defines at least a slot 18. In the described example, it comprises only a slot 18 realized in a predefined angular position, i.e. in a specific angular position about axis A with respect to a "zero" position corresponding to the opening of inner space 6 configured to be closed by cover 4.

[0026] The slot 18 is made by a recess starting from the edge of the central portion 8a of the female element 8 faced to the cam 14. Such slot 18 is opened on such edge and has a shape configured to match with the shape of the protrusion 14b defined by cam 14.

[0027] Advantageously, the cam 14 is carried by protrusion 9 thanks to a mechanical coupling, in particular a prismatic coupling, configured to allow only the vertical movement of the cam 14 on the protrusion 9 about axis A.

[0028] Preferably, the protrusion 9 is divided into two different portions, a base portion 9a and a terminal portion 9b. The base portion 9a extends from the coupling portion 7a and the terminal portion 9b extends from the base portion so that the coupling portion 7a has a greater diameter than the base portion 9a which has, in turn, an outer diameter greater than the terminal portion 9b.

[0029] The housing 11 has a diameter configured to cooperate at contact only with terminal portion 9b so that the base portion 9a defines a vertical stop position on the coupling between male and female members 7, 8.

[0030] The base portion 9a has a substantially cylindrical cross-section except for a flat surface 9c realized secant the substantially cylindrical cross-section of the base portion 9a. The annular portion 14a of the cam 14 defines an inner shape configured to cooperate at contact with the base portion 9a, i.e. comprises a flat surface configured to cooperate with the flat surface 9c of the base portion 9a. Accordingly, it is clear that the cam 14 can slide along axis A on the base portion 9a but cannot rotate about axis A on this latter because of the anti-rotation effect of flat surfaces coupling as defined above.

[0031] Preferably, elastic means 16 comprises a coil spring 19 radially housed about axis A, in particular about base portion 9a of protrusion 9. Coil spring 19 is configured to define a force that maintains the cam 14 against female element 8.

[0032] Advantageously, both male element 7 and cam element 14 defined respective annular seat 20 for housing terminal portions of coil spring 19.

[0033] The operation of the above described hinge connection 5 according to the present invention is the following.

[0034] Making reference to figures 2A and 4, in such condition the panel 4 is in its opened, i.e. the second operational position. In such configuration, the protrusion 14b is inserted in slot 18; accordingly, such coupling avoids any possible rotation between the male and female elements 7, 8 that are therefore rotationally locked together.

[0035] When the user wants to close the panel 4, i.e. wants to pass from the second to the first operational position, the user can exert a force F on the flanged portion 14c of the cam 14, thereby forcing in compression the elastic means 16. The presence of the surface 9c avoids any rotational movement of the cam 14 about base portion 9a of the protrusion 9 and the force F is all directed to force in compression the elastic means 16, thereby allowing the sliding of cam 14 on the base portion 9a. Accordingly, the protrusion 14b disengage from slot 18 and the panel 4 can be closed since the female element 8 is again free to rotate with respect to the male element 7. Once rotated for a sufficient angle to avoid a further coupling of the protrusion 14b with slot 18, the cam 14 will be in contact with the lower edge of the coupling portion 8a of the female element 8. The force of elastic means 16 will maintain in contact the protrusion14b with slot 18 in a way sufficient to guarantee its sliding which can be useful to dampen the movement of panel 4.

[0036] When the user wants to open the panel 4, i.e. wants to pass from the first to the second operational position, it is only necessary to open the panel, thereby moving female element 8 with respect to male element 7. Accordingly, the protrusion 14b will slide on the lower edge of the central portion 8a till reaching seat 18 into which will automatically insert thanks to the presence of the force of the elastic means 16. In this way, the male and female elements 7, 8 are again locked together against rotation, thereby avoiding any sudden closure of the panel.

[0037] In view of the foregoing, the advantages of a hinge connection 5 according to the invention are apparent.

[0038] The proposed hinge connection 5 is simple, integrated into the hinge connection itself and automatically locked when the predetermined angle/angles is/are reached.

[0039] Indeed, the proposed hinge connection 5 foresees few and economic components that does not change the cost of production or the encumbrances of the existing hinge connections.

[0040] Since the system is automatically locking, the user cannot forget to secure the panel 4 and, moreover, the unlocking is simple and quick.

[0041] The proposed system can be applied to any existing vehicle 1 and the existing hinge connections can be modified in an economic manner to apply the features of the hinge connection according to the invention.

[0042] It is clear that modifications can be made to the described hinge connection 5 which do not extend beyond the scope of protection defined by the claims.

[0043] For example, the proposed shapes of male and female elements 7, 8, of the cam 14, the guide 15 or protrusion 9 can be varied while maintaining the same purpose.

[0044] Furthermore, the respective positioning and coupling of male and female elements 7, 8 with respect to panel 4 and vehicle 1 or to cam 14 and guide 15 or to elastic means 16 may be varied to assume the possible non described alternatives, omitted for sake of brevity.

[0045] It is furthermore clear that the guide 15 can be realized separated by said male or female elements 7, 8 such as the cam 14 can be integrated in said male or female elements 7, 8.

Claims

1. Hinge connection (5) for a panel (4) of a vehicle (1) said hinge connection (5) comprising a male element (7) configured to be connected to one between said panel (4) and said vehicle (1) and a female element (8) configured to be connected to the other between said panel (4) and said vehicle (1), said male element (7) defining a protrusion (9) configured to cooperate at contact with a housing (11) defined in said female element (8) to allow a relative rotation between said female element (8) and said male element (7) about an axis (A),
said hinge connection (5) further comprising locking means (12) configured to lock the relative position between male and female elements (7, 8) when a predetermined relative rotation between the latter has been reached.

2. Hinge connection according to claim 1, wherein said locking means (12) comprise a cam coupling between said male and female elements (7, 8).

3. Hinge connection according to claim 2, wherein said cam coupling is realized about said protrusion (9) and axially comprised between said male and female elements (7, 8).

4. Hinge connection according to claim 2 or 3, wherein said cam coupling comprises a cam (14) configured to cooperate at contact with a guide (15), said guide (15) being realized in one between said male and female elements (7, 8).

5. Hinge connection according to claim 4, wherein said cam (14) is a separated element with respect to said male and female elements (7, 8).

6. Hinge connection according to claim 4 or 5, further comprising elastic means configured to maintain said cam (14) against said guide (15).

7. Hinge connection according to any of claims 4 to 6,

wherein said guide (15) comprises at least a seat (18) realized in a predefined angular position with respect to said axis (A) .

8. Hinge connection according to any of claims 4 to 7, wherein said cam (14) comprises an annular element (14a) arranged to surround said protrusion (9), a protrusion (14b) configured to cooperate with said guide (15) and a flanged portion (14c) defining grip portion (17).

9. Hinge connection according to any of claims 4 to 8, wherein said protrusion (9) comprises a base portion (9a) configured to be coupled with said cam (14) to allow only a translational motion along said axis (A) and a terminal portion (9b) extending from said base portion (9a) parallel to said axis (A) and configured to cooperate at contact with said housing (11).

10. Hinge connection according to claim 9, wherein the coupling between said base portion (9a) and said cam (14) is a prismatic coupling.

11. Hinge connection according to any of claims 6 to 10, wherein said elastic means (16) comprises a coil spring (19) arranged to surround said protrusion (9).

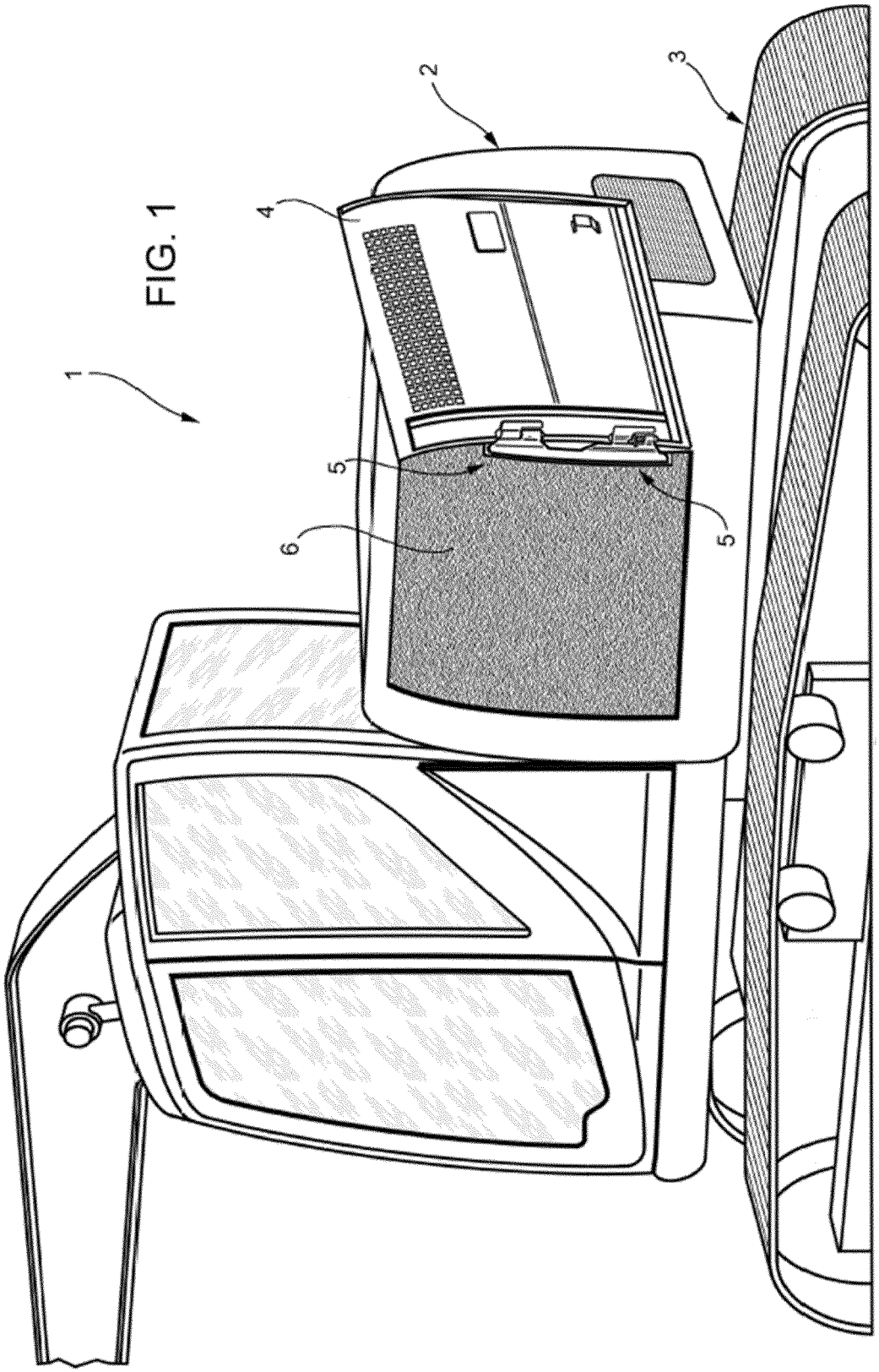
12. Hinge connection according to any of claims 9 to 10, wherein said elastic means (16) comprises a coil spring (19) arranged to surround said base portion (9a) of said protrusion (9) .

13. Hinge connection according to any of claims 4 to 12, wherein said cam (14) is carried by the one between said male and female elements (7, 8) coupled to said panel (4).

14. Hinge connection according to any of the preceding claims, wherein each between said male and female elements (7, 8) comprises a coupling portion (7a, 8a) defining respectively said protrusion (9) and said housing (11) and a fixing portion (7b, 8b) configured to allow the coupling of said male and female elements (7, 8) to respectively said vehicle (1) and said panel (4).

15. Vehicle (1) comprising a panel (4) configured to assume at least a first closed position and a second opened position to allow the access to an inner space (6) of said vehicle, said panel (4) being coupled to said vehicle (1) by at least one hinge connection (5) according to any of the preceding claims.

FIG. 1



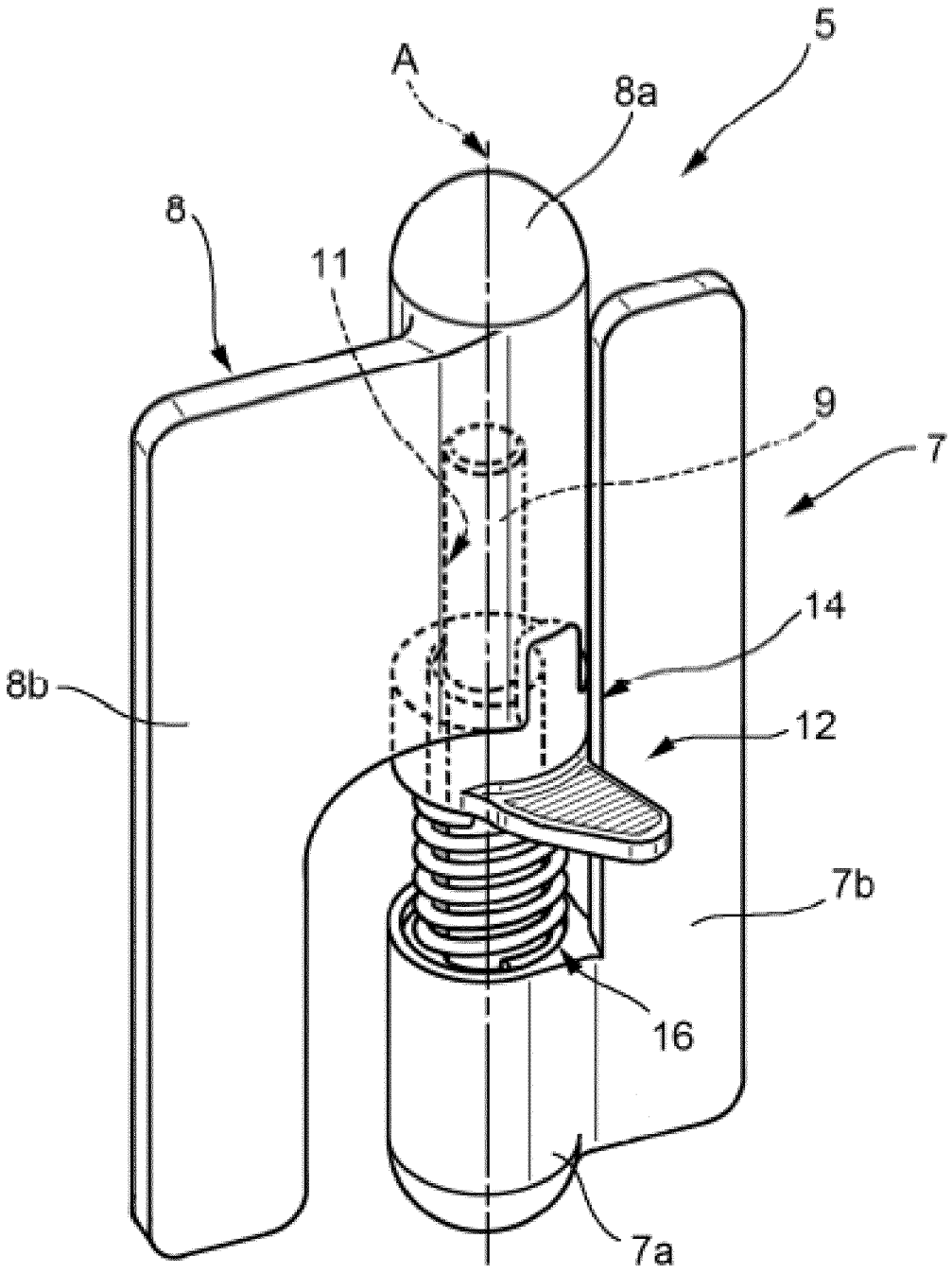


FIG. 2A

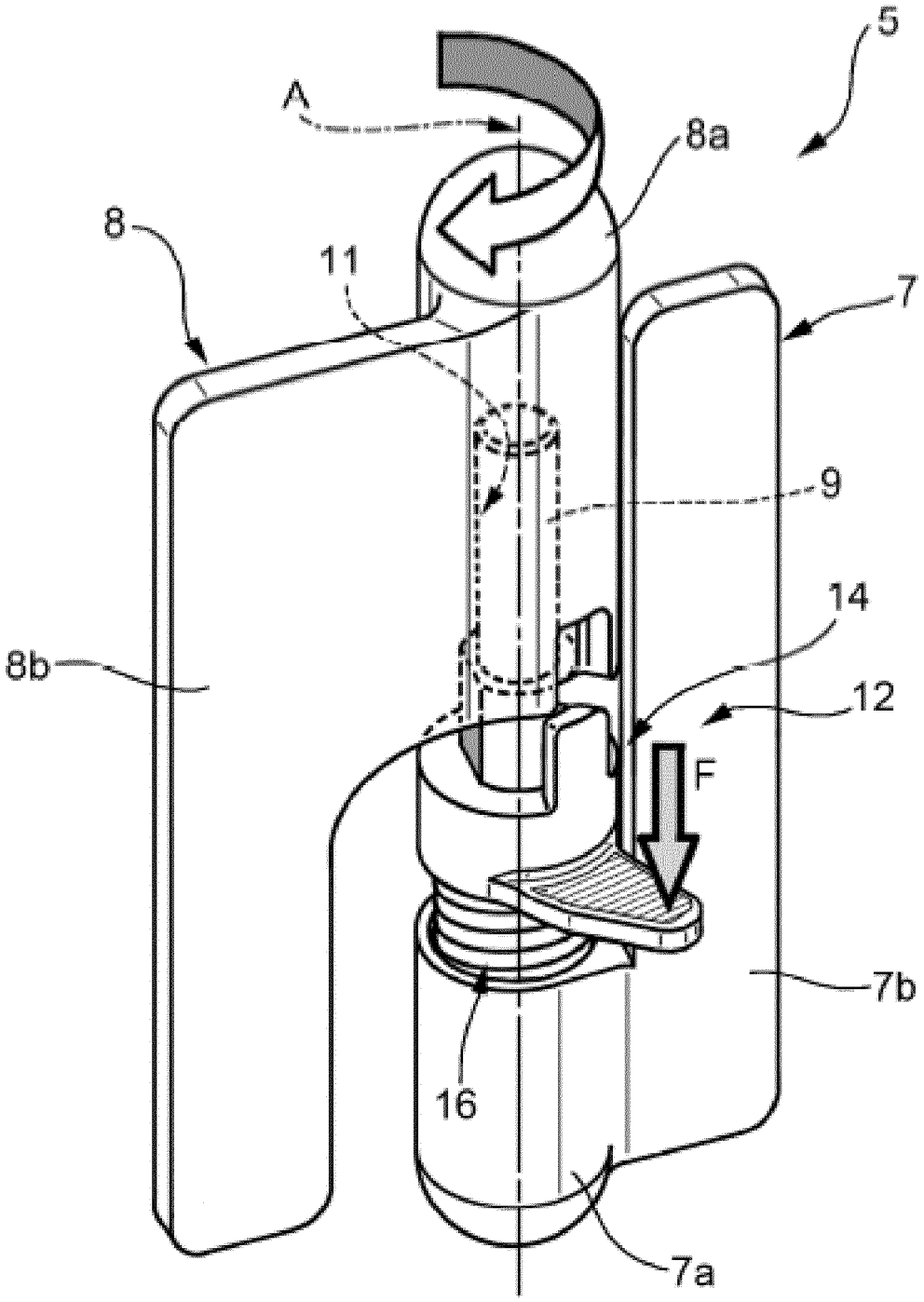


FIG. 2B

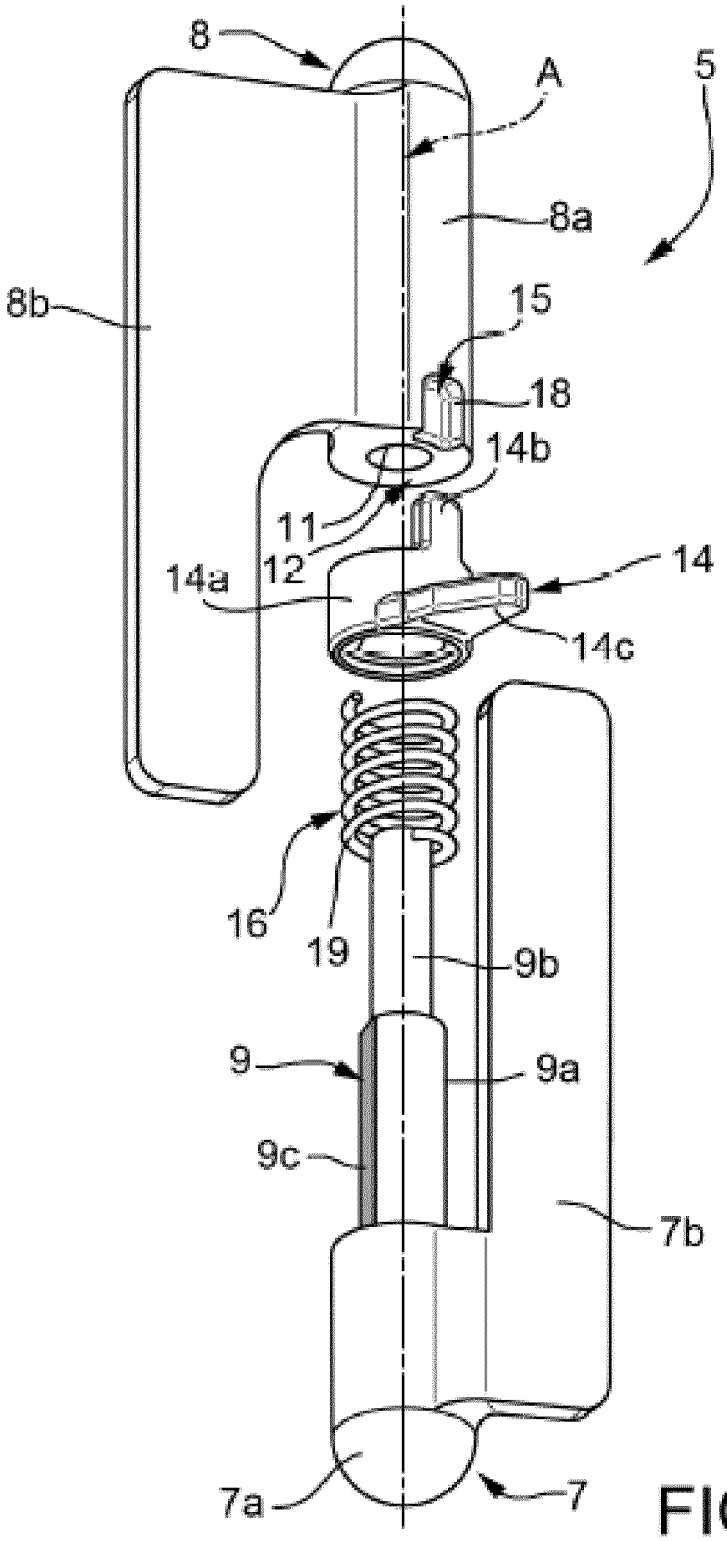


FIG. 3A

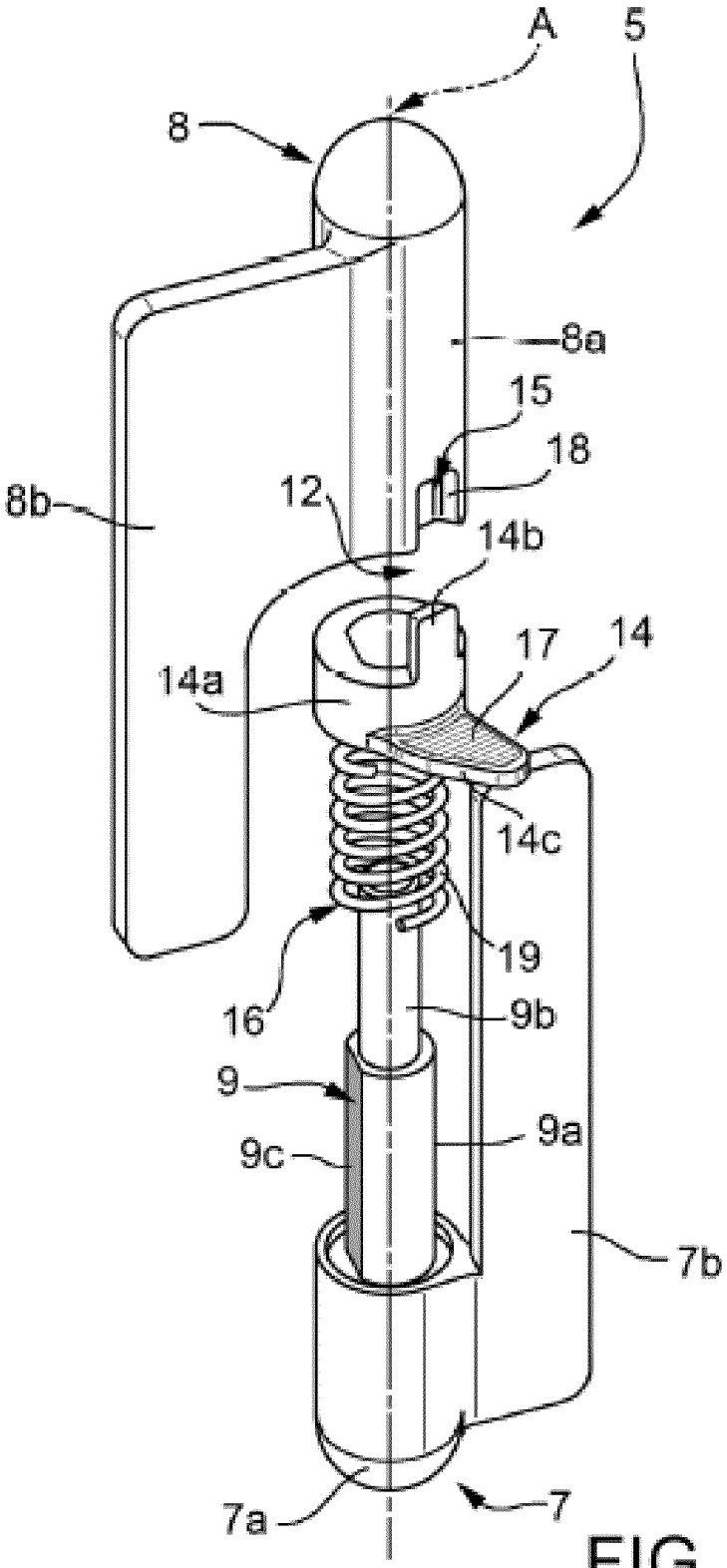


FIG. 3B

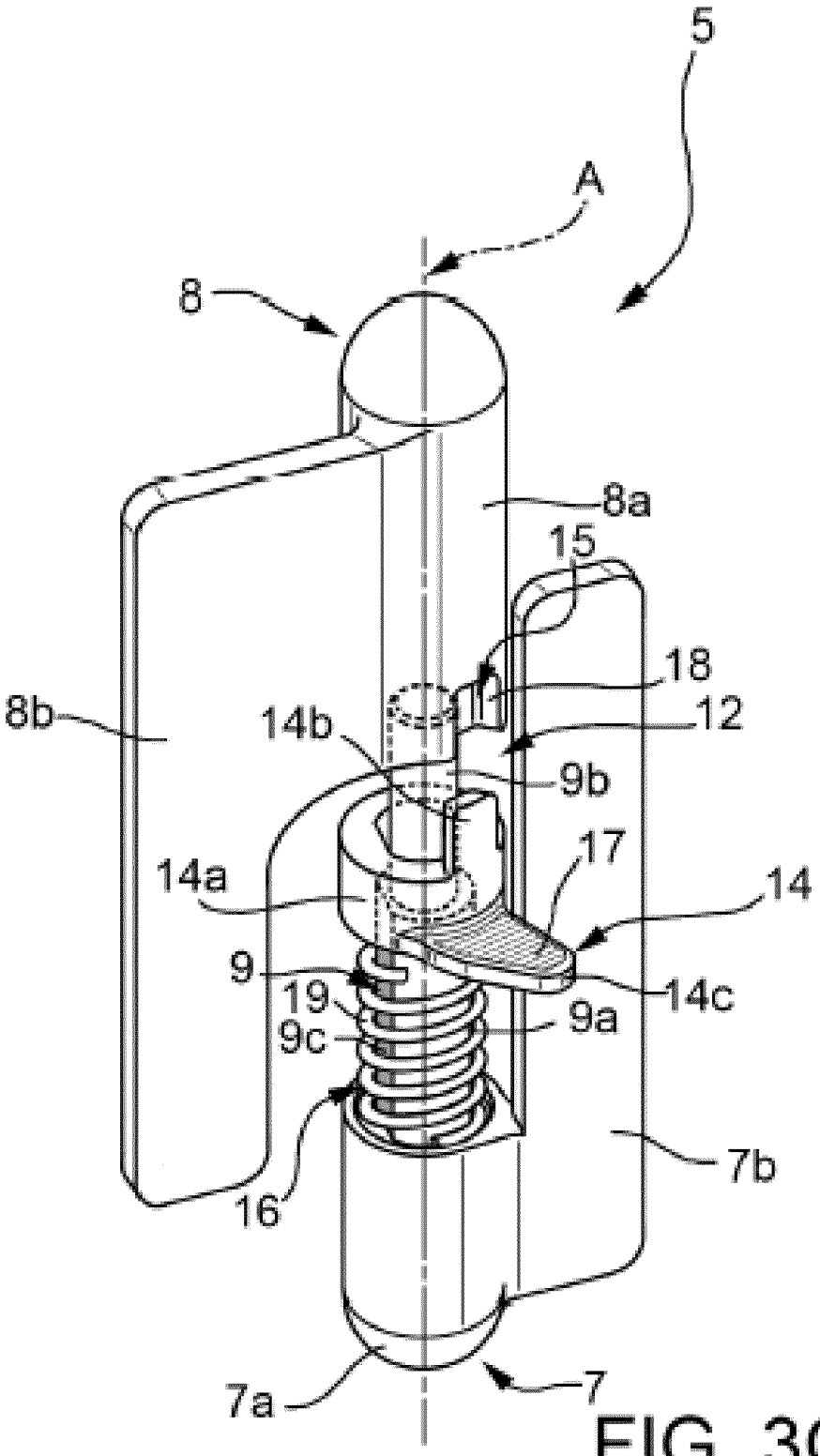


FIG. 3C

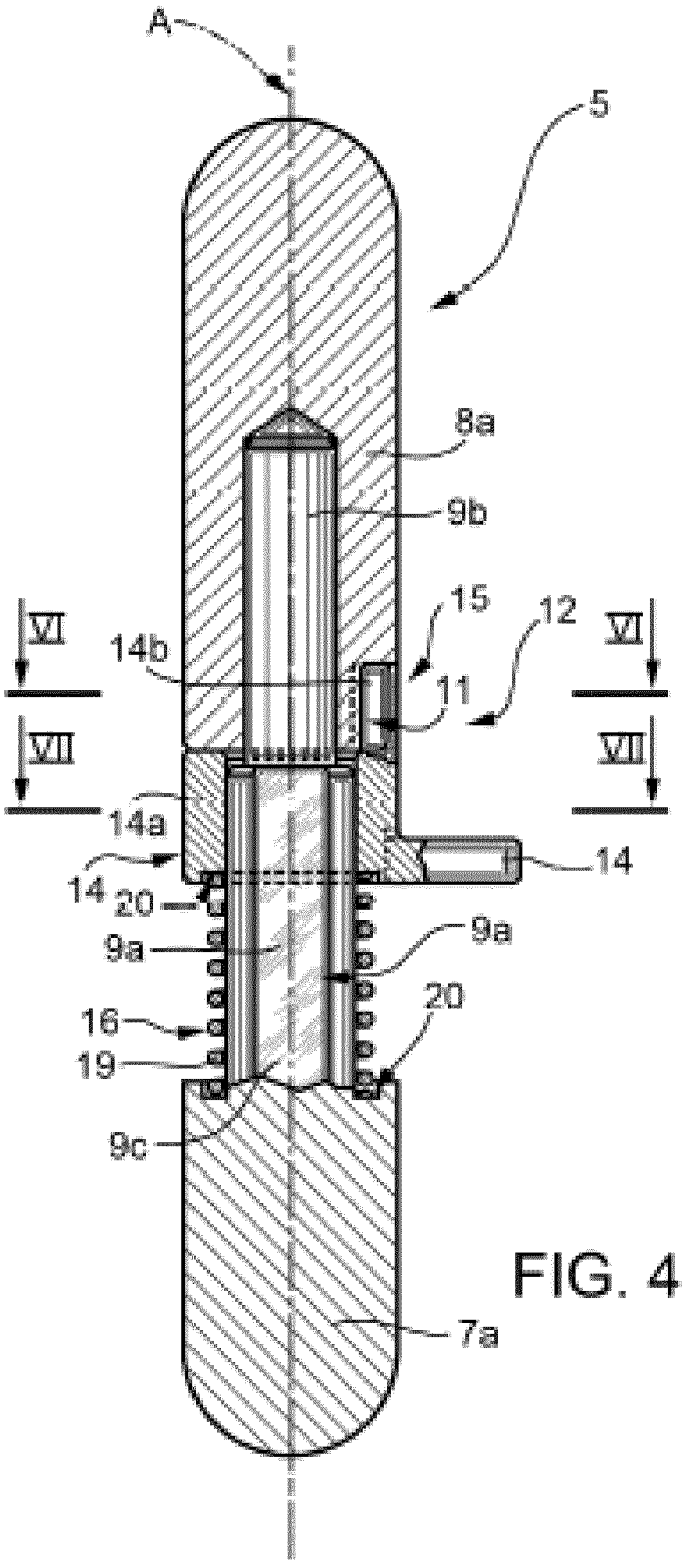


FIG. 4

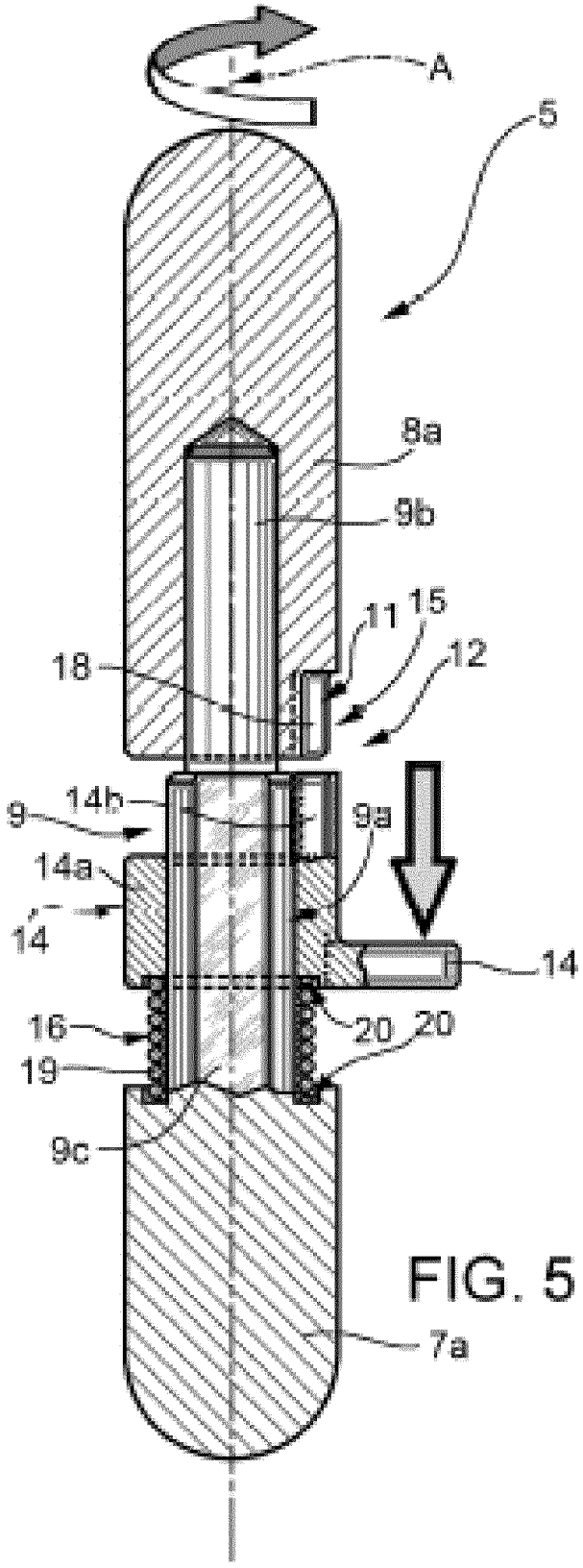


FIG. 5

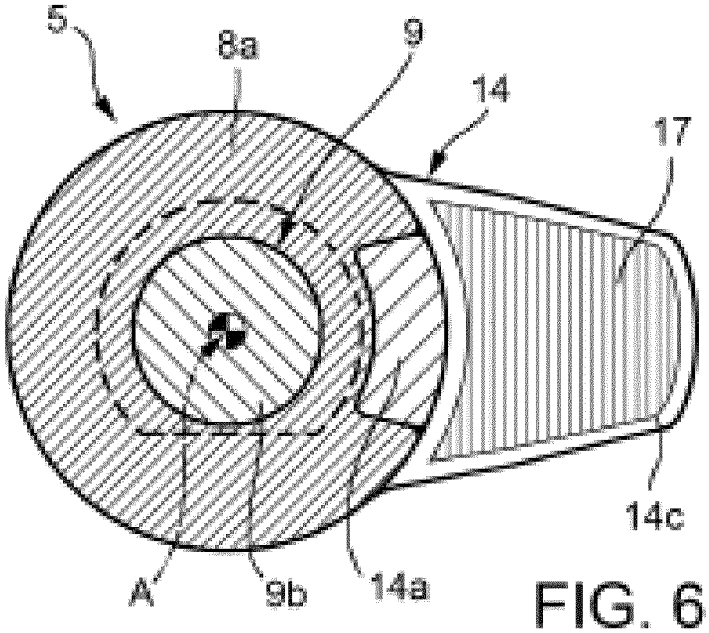


FIG. 6

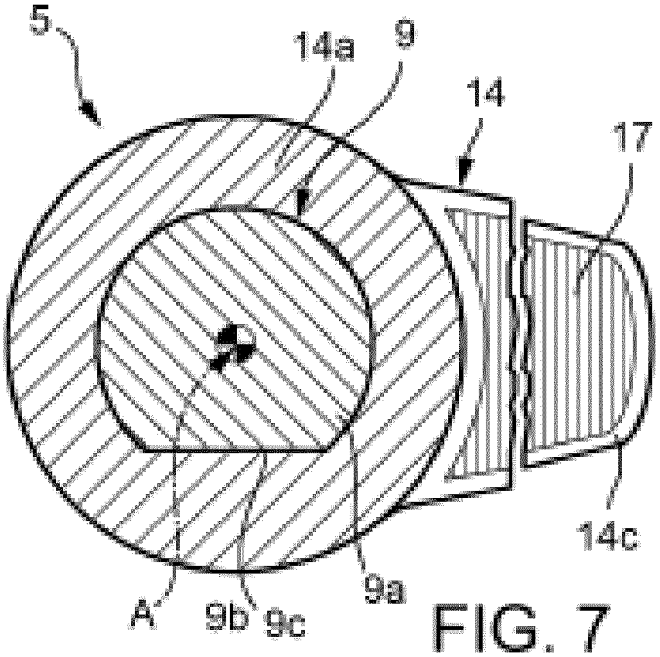


FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 3726

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 508 865 C (ALBERT BRUGGER; JOSEF FRITZ) 20 October 1930 (1930-10-20) * page 1, column 2, lines 57-85; figures *	1-4,6,7, 11,13,14	INV. E05D11/10 E05D5/14
X	US 8 556 330 B2 (LAZAREVICH ROBERT R [US]; KLEINHOFFER RICHARD M [US] ET AL.) 15 October 2013 (2013-10-15) * column 3, line 33 - column 4, line 65; figures *	1-7,9-15	
X	US 2 362 923 A (PARDOE NORMAN H) 14 November 1944 (1944-11-14) * the whole document *	1-15	
A	US 1 076 568 A (FURUYA MOTOICHI [US]) 21 October 1913 (1913-10-21) * figures *	8	

TECHNICAL FIELDS SEARCHED (IPC)
E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 September 2021	Witasse-Moreau, C

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06-09-2021

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