



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.06.2014 Bulletin 2014/26

(51) Int Cl.:
A47C 1/026^(2006.01) A47C 1/032^(2006.01)

(21) Application number: **13193075.2**

(22) Date of filing: **15.11.2013**

(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

(72) Inventors:
 • **Vartdal, Leif**
7043 Trondheim (NO)
 • **Kvangraven, Halstein**
2550 Os i Østerdalen (NO)

(30) Priority: **19.12.2012 NO 20121538**

(74) Representative: **Langan, Hans et al**
Zacco Norway AS
Patent Department
Haakon VII's gt. 2
P.O. Box 2003 Vika
0125 Oslo (NO)

(71) Applicant: **Scandinavian Business Seating AS**
0369 Oslo (NO)

(54) **A tilt control device, in particular for a chair, and a method of operation**

(57) A tilt control device and an associated method for controlling relative movements (M) between a first chair member (5) and a second chair member (6) that are pivotally connected. The first member (5) comprises one receptacle (18) and the second member (6) comprises a guide (30), and the tilt control device further comprises a movable tilt locking member (16) configured for removably entering the guide (30) and the at least one receptacle (18). An operating member (7) is operably

connected to the locking member (16) via resilient actuating means (26, 27), that are configured and arranged to allow relative movement between the operating member and the locking member.

The operating member (7) and the locking member (16) are thus not directly connected, but the operating member controls the movements of the locking member via intermediate resilient elements, e.g. springs (26, 27).

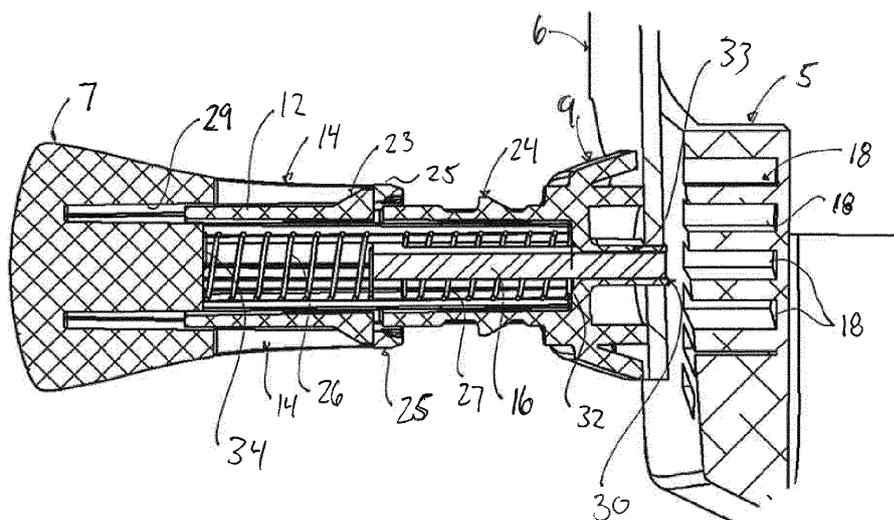


Figure 5a

Description

Field of the invention

[0001] The invention relates to tilt control mechanisms for chairs. More specifically, the invention concerns a tilt control device for controlling relative movements between a first member and a second member that are pivotally connected, as specified in the preamble of claim 1, and method of controlling relative movements as specified in the preamble of claim 7 and claim 8.

Background of the invention

[0002] Chairs with seats that may be tilted are well known, particularly within the field of office chairs. A tilting mechanism for an office chair typically includes two housing parts, one part attached to the seat and the other part attached to the chair pedestal. The housing parts are interconnected by an axle, allowing the seat to be pivoted, or tilted, with respect to the pedestal. A spring is arranged between the housing parts so as to dampen the pivoting movements, and is normally configured such that the neutral (equilibrium) state of the spring corresponds to a more or less horizontal seat position. A locking device provides a means for locking, or fixating, the housing parts with respect to one another at any given tilting angle. In use, the seat tilt angle is controlled by the user (shifting his or her weight on the seat), and the seat may be locked at the desired tilt angle. Known tilt locking mechanisms include frictional plates and locking pins.

[0003] When the user wants to change the tilt angle and thus release the tilt lock mechanism (e.g. retracting a locking pin from its receptacle), the preloaded spring will tend to move the seat back to the horizontal position. If the user at this instant has shifted his or her position on the chair, the sudden release of the tilt lock mechanism will cause an undesirable abrupt movement of the seat and the backrest.

[0004] The applicant has devised and embodied this invention to prevent or limit such abrupt movements.

Summary of the invention

[0005] The invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention.

[0006] It is therefore provided a tilt control device for controlling relative movements between a first member and a second member that are pivotally connected; the first member comprising at least one receptacle, and the second member comprising a guide; the tilt control device further comprising a movable tilt locking member configured for removably entering the guide and the at least one receptacle in order to selectively lock and unlock the first and second members with respect to one another, **characterized in that** an operating member is operably connected to the locking member via actuating means,

said actuating means being configured and arranged to allow relative movement between the operating member and the locking member, and wherein the operating member and the locking member are not directly connected, but the operating member controls the movement of the locking member via the actuating means.

[0007] In one embodiment, the actuating means comprise at least one resilient element. In one embodiment, the actuating means comprise a pair of springs arranged on opposite sides of an enlarged portion of the locking member in a manner such that when one spring is in compression and exerting a motive force on the locking member, the other spring is in tension or in a relaxed state, and vice versa.

[0008] In one embodiment, the first member is connected to a chair column and the second member is connected to a chair seat, and the locking member is arranged for reciprocal movement in a main body which is connected to the second member.

[0009] In one embodiment, a main body is connected to the second member and comprises a bore configured for slidably receiving the locking member, and the operating member is slidably arranged on the outside of the main body.

[0010] In one embodiment, the first member comprises a plurality of receptacles arranged at regular intervals.

[0011] It is also provided a method of allowing relative tilting movement between first and second members by means of the invented tilt control device, where the first member is connected to a chair column and the second member is connected to a chair seat, and the locking member initially is in place in the at least one receptacle in the first member and thereby preventing tilting movement between the first and second members, characterized by the steps of:

- a) causing movement between the first and second members, thereby causing the at least one receptacle to pinch and hold a stem portion of the locking member;
 - b) operating the operating member to activate at least one of the actuating means, whereby the tilt control device is pre-set to withdraw the stem portion from the at least one receptacle; and
 - c) causing the pinching force generated in step a) to cease;
- whereby the stem portion is withdrawn from the receptacle and relative tilting movement between the first and second members is allowed.

[0012] It is also provided a method of preventing relative tilting movement between first and second members by means of the invented tilt control device, where the first member is connected to a chair column and the second member is connected to a chair seat, and the locking member initially is retracted from the at least one of a plurality of receptacles in the first member and thereby allowing tilting movement between the first and second

members, characterized by the steps of:

- a) causing movement between the first and second members, thereby causing a misalignment between the at least one receptacle and the guide;
- b) operating the operating member to activate at least one of the actuating means, whereby the stem portion is urged towards the first member and abuts against the first member between adjacent receptacles, and the tilt control device thus is pre-set to lock; and
- c) causing movement between the first and second members in order to align a receptacle adjacent to the step portion with the guide;

whereby the stem portion is allowed to enter the receptacle and lock the first and second members with respect to one another.

[0013] In one embodiment of the above methods, said movements are caused by a user sitting on the chair seat and shifting his or her weight with respect to the chair column.

Brief description of the drawings

[0014] These and other characteristics of the invention will become clear from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings, wherein:

Figure 1 is a perspective view of a chair seat with a tilting assembly having an embodiment of the invented tilt control device;

Figure 2 is an external side view of the tilting assembly illustrated in figure 1;

Figure 3a is a plan view of section A-A in figure 2;

Figure 3b is a plan view of section B-B in figure 2;

Figure 4a is a perspective exploded view of the tilting assembly and the tilt control device;

Figure 4b is a perspective exploded view of the tilt control device;

Figure 4c is an enlarged view of the region labelled "C" in figure 4b;

Figures 5a-d are enlarged views of the region labelled "A" in figure 3a, illustrating the tilting assembly in the following states:

- figure 5a: locking bolt and knob retracted: tilting assembly is unlocked;
- figure 5b: locking bolt retracted, knob extended:

- tilting assembly is unlocked and pre-set to lock;
- figure 5c: locking bolt and knob extended: tilting assembly is locked;
- figure 5d: locking bolt extended, knob retracted: tilting assembly is locked and pre-set to unlock;

Figures 6a-d are enlarged views of the region labelled "B" in figure 3b, illustrating the tilting assembly in the following states:

- figure 6a: locking bolt and knob retracted: tilting assembly is unlocked;
- figure 6b: locking bolt retracted, knob extended: tilting assembly is unlocked and pre-set to lock;
- figure 6c: locking bolt and knob extended: tilting assembly is locked;
- figure 6d: locking bolt extended, knob retracted: tilting assembly is locked and pre-set to unlock;

Detailed description of a preferential embodiment

[0015] The following description will use terms such as "horizontal", "vertical", "lateral", "back and forth", "up and down", "upper", "lower", "inner", "outer", etc. These terms generally refer to the views and orientations as shown in the drawings and that are associated with a normal use of the chair. The terms are used for the reader's convenience only and shall not be limiting.

[0016] Figure 1 shows an embodiment of the tilt control device on tilting assembly 4 on an office chair having a seat 3 supported by a column 2. The column 2 is connected to a pedestal (not shown), in a manner which is commonly known in the art. The chair may also conveniently comprise a backrest (not shown).

[0017] The tilting assembly is of a type that is generally known in the art, having a lower housing part 5 which is connected to the column 2, and an upper housing part 6 which is connected to the seat 3. The housing parts 5,6 are pivotally connected by an axle (reference number 28 in figure 4a) via holes 8. Between the housing parts is arranged a spring (not shown) that serves to dampen the pivoting movements, and is configured such that the neutral (equilibrium) state of the spring corresponds to a more or less horizontal seat position. Such spring arrangements are generally known in the art and need therefore not be described further her.

[0018] Referring additionally to figures 2, 3a, 4a-c and 5a, the illustrated embodiment of the invented tilt control device comprises a main body 12 connected to the upper housing part 6 via a footing foundation 9 and bolts 10. In the illustrated embodiment, the main body 12 has a generally cylindrical shape and a trough-going axial bore 31 configured for slidably receiving a locking bolt 16. The bolt 16 has a stem portion 17 and a head portion 20 and an intermediate shoulder portion 19. The bore is open in both ends, and the inner end 33 (figure 3 a) is shaped to receive the stem portion but not the head portion. The stem portion 17 may thus slide partly through the inner

end 33 and guide opening 30 in the upper housing part 6.

[0019] An inner coil spring 27 is arranged around and coaxially with the stem portion 17. In the assembled state, in the bore of the main body 12, the inner spring 27 is arranged to abut against the shoulder portion 19 at one end, and the inner wall portion 32 at the other end.

[0020] A control knob 7 is slidably arranged on the outside of the main body 12. The knob 7 has an internal cavity and an annular groove 29 that is configured for accommodating a portion of the main body 12. In the assembled state, an outer coil spring 26 is arranged in the knob internal cavity, and abuts against the bolt head portion 20 at one end and the bottom of the knob cavity 34 at the other end.

[0021] The knob 7 comprises two grooves 14 (diametrically opposite each other) that each is configured for cooperating with a respective cam 24 and detent 23 on the main body 12. When the knob 7 is assembled onto the main body 12, the detent 23 serves as an outer limiter for the knob's reciprocal movement on the main body. Figure 5a shows the knob in this outer position: the knob collar 25 is abutting against the main body detent 23. The cam 24 is connected to the main body 12 via strip portions 21 (see figure 4c) such that the cam may flex elastically inwards. Thus, when the knob 7 is pushed to the position shown in figure 5b, the cam is momentarily depressed by the collar 25. The cam then serves to hold the knob in the position shown in figure 5b. When a user pulls back on the knob, to bring it to the position shown in figure 5a, the collar snaps back over the flexible cam.

[0022] The control knob 7 and the locking bolt 16 are thus not directly connected, but the control knob 7 controls the movements of the locking bolt 16 via intermediate resilient elements (springs 26, 27).

[0023] The lower housing part 5 comprises a number of receptacles 18, arranged at regular intervals in an arcuate configuration corresponding to the arcuate tilting movement M. Each receptacle 18 is configured for receiving a portion of the locking bolt stem portion 17. The upper housing part 6 and the lower housing part 5 may thus be interlocked at a plurality of tilt angles, by inserting the locking bolt 16 into any one of the receptacles 18 (as illustrated in e.g. figure 5c).

[0024] Figure 5a and figure 6a both illustrate the tilt control device in an "unactivated and unlocked" state: the knob 7 is pulled back to a position where the collar 25 abuts against the detent 23, and the locking bolt 16 is also retracted into the main body 12. The bolt is not engaging any of the receptacles 18, and the lower housing part 5 and the upper housing part 6 are free to move relative to one another (i.e. pivot about the axle 28, cf. figure 4a) In this state of the tilt control device, the outer spring 26 and the inner spring 27 are in a state of equilibrium.

[0025] Figure 5b and figure 6b both illustrate the tilt control device in an "activated and unlocked" state. The lower housing part 5 and the upper housing part 6 have moved with respect to one another so that the locking

bolt 16 is not aligned with any of the receptacles. The knob 7 has been pushed inwards, to a position where the collar 25 has moved across the cam 24, thereby compressing the outer spring 26 and thus urging the locking bolt 16 towards the lower housing part 5 where the free end of the stem portion 17 abuts against the lower housing part 5 between adjacent receptacles 18. The device is thus set to lock. In this state (illustrated in figures 5b and 6b), the housing parts 5, 6 may move slightly with respect to one another, but once the stem portion 17 is aligned with a receptacle 18, the stem will be urged (by the compressed outer spring 26) into that receptacle and lock the housing parts 5, 6 with respect to one another. This state is illustrated in figures 5c and 6c.

[0026] Figure 5c and figure 6c both illustrate the tilt control device in an "unactivated and locked" state: the knob 7 has been pushed inwards as described above with respect to figures 5b and 6b, and a forward portion of the stem 17 is arranged in a receptacle 18. The housing parts 5, 6 are thus locked with respect to one another. In this state of the tilt control device, the outer spring 26 has been somewhat extended (relaxed) and the inner spring 27 has been compressed, compared to the state of the springs illustrated in figures 5b, 6b .

[0027] If a user pulls back on the knob 7 when the housing parts 5, 6 are in a position as illustrated by figures 5c and 6c, the inner spring 27 will urge the bolt towards the knob and remove the stem portion 17 from the receptacle 18. The housing parts 5, 6 will again be free to pivot with respect to one another (i.e. as illustrated in figures 5a and 6a). Figure 5d and 6d both illustrate the tilt control device in an "activated and locked" state: a part of the stem 17 is still in the receptacle (as in figures 5c and 6c), but the housing parts 5, 6 have moved slightly with respect to one another (e.g. by the user shifting his or her weight on the chair seat), thereby causing the receptacle 18 to pinch and hold the stem portion 17. The knob 7 has been pulled outwards, and as the stem portion is being held (pinched) in place in the receptacle (in the locked state), the inner spring 27 is in the same state as illustrated in figures 5c and 6c. The outer spring 26 is allowed to expand, compared to the state illustrated in figures 5c and 6c. When the knob in this manner has been set to unlock the device, and the pinching force between the receptacle and the stem portion ceases, the compressed inner spring 27 will cause the locking bolt stem 17 to move out of the receptacle and thus allow the housing parts 5, 6 to pivot with respect to one another (see illustrated by figures 5a and 6a).

[0028] In use, the invented tilt control device thus ensures that the locking bolt stem 17 always enters the closest receptacle 18 when the device is set to lock (figure 5b and 6b). The invented tilt control device also ensures that the housing parts 5, 6 are not released (allowed to pivot) with respect to one another unless the user is sitting on the seat and relieving the pinching force as described above with reference to figures 5d and 6d.

[0029] It is obvious for the skilled person that modifi-

cations and/or additions can be made to the invented tilt control device, but these shall remain within the field and scope of the invention. For example, while the invention has been described with reference to coil springs 26, 27, it should be understood that any resilient element may be used. Although not illustrated, an embodiment using only one resilient element may be envisaged.

[0030] Also, while the invention has been described with reference to a seat tilting mechanism, it should be understood that the invention is equally applicable for a seatback tilting mechanism.

Claims

1. A tilt control device for controlling relative movements (M) between a first member (5) and a second member (6) that are pivotally connected; the first member (5) comprising at least one receptacle (18), and the second member (6) comprising a guide (30); the tilt control device further comprising a movable tilt locking member (16) configured for removably entering the guide (30) and the at least one receptacle (18) in order to selectively lock and unlock the first and second members with respect to one another, **characterized in that** an operating member (7) is operably connected to the locking member (16) via actuating means (26, 27), said actuating means being configured and arranged to allow relative movement between the operating member and the locking member, and wherein the operating member (7) and the locking member (16) are not directly connected, but the operating member (7) controls the movement of the locking member (16) via the actuating means (26, 27).
2. The tilt control device of claim 1, wherein the actuating means comprise at least one resilient element.
3. The tilt control device of claim 1 or claim 2, wherein the actuating means comprise a pair of springs (26, 27) arranged on opposite sides of an enlarged portion (20) of the locking member (16) in a manner such that when one spring (26) is in compression and exerting a motive force on the locking member, the other spring (27) is in tension or in a relaxed state, and vice versa.
4. The tilt control device of any one of the preceding claims, wherein the first member (5) is connected to a chair column (2) and the second member (6) is connected to a chair seat (3), and the locking member (16) is arranged for reciprocal movement in a main body (12) which is connected to the second member (6).
5. The tilt control device of any one of the preceding claims, further comprising a main body (12) which is connected to the second member (6) and comprises a bore (31) configured for slidably receiving the locking member (16), and wherein the operating member (7) is slidably arranged on the outside of the main body (12).
6. The tilt control device of any one of the preceding claims, wherein the first member (5) comprises a plurality of receptacles (18) arranged at regular intervals.
7. A method of allowing relative tilting movement between first and second members (5, 6) by means of the tilt control device of any one of claims 1-6, where the first member (5) is connected to a chair column and the second member (6) is connected to a chair seat, and the locking member (16) initially is in place in the at least one receptacle (18) in the first member (5) and thereby preventing tilting movement between the first and second members (5, 6), **characterized by the steps of:**
 - a) causing movement between the first and second members (5, 6), thereby causing the at least one receptacle (18) to pinch and hold a stem portion (17) of the locking member;
 - b) operating the operating member (7) to activate at least one of the actuating means (26, 27), whereby the tilt control device is pre-set to withdraw the stem portion (17) from the at least one receptacle (18); and
 - c) causing the pinching force generated in step a) to cease;
 whereby the stem portion is withdrawn from the receptacle and relative tilting movement between the first and second members (5, 6) is allowed.
8. A method of preventing relative tilting movement between first and second members (5, 6) by means of the tilt control device of any one of claims 1-6, where the first member (5) is connected to a chair column and the second member (6) is connected to a chair seat, and the locking member (16) initially is retracted from the at least one of a plurality of receptacles (18) in the first member (5) and thereby allowing tilting movement between the first and second members (5, 6), **characterized by the steps of:**
 - a) causing movement between the first and second members (5, 6), thereby causing a misalignment between the at least one receptacle (18) and the guide (30);
 - b) operating the operating member (7) to activate at least one of the actuating means (26, 27), whereby the stem portion (17) is urged towards the first member (5) and abuts against the first member (5) between adjacent recepta-

cles (18), and the tilt control device thus is pre-set to lock; and

c) causing movement between the first and second members (5, 6) in order to align a receptacle (18) adjacent to the step portion (17) with the guide; 5

whereby the stem portion is allowed to enter the receptacle and lock the first and second members (5, 6) with respect to one another. 10

9. The method of claim 7 or claim 8, wherein said movements are caused by a user sitting on the chair seat and shifting his or her weight with respect to the chair column. 15

10

15

20

25

30

35

40

45

50

55

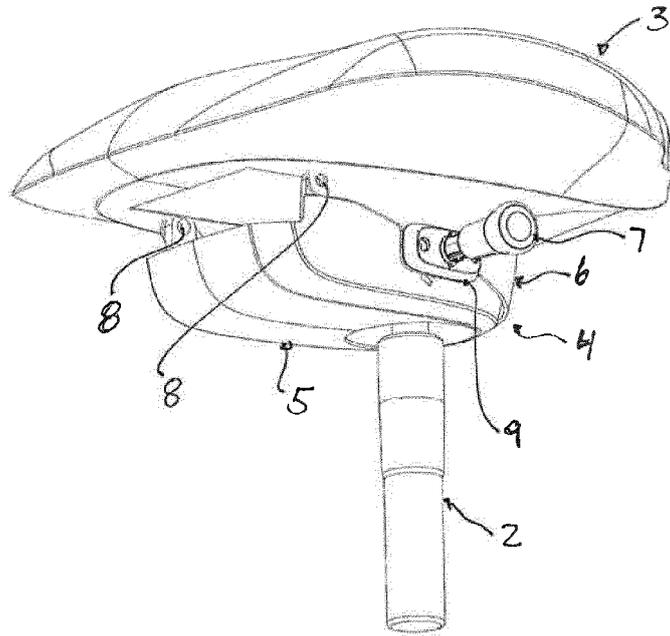


Figure 1

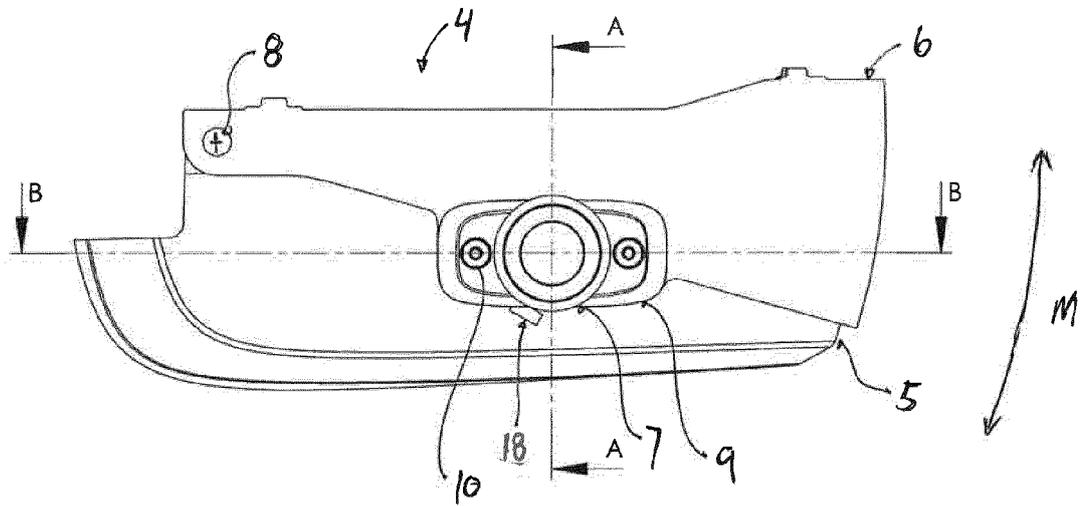


Figure 2

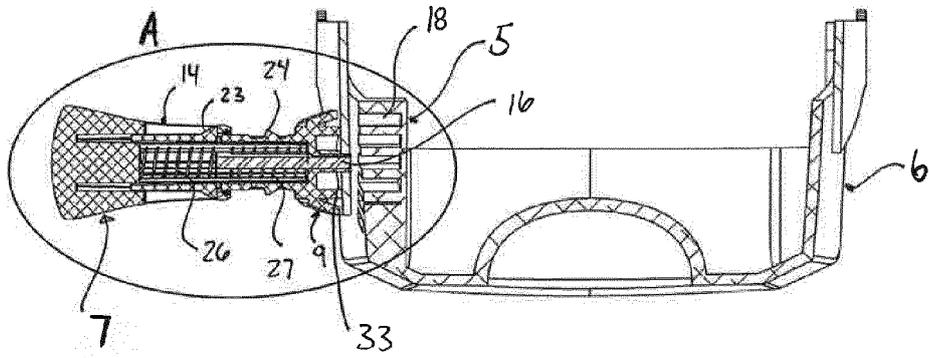


Figure 3a

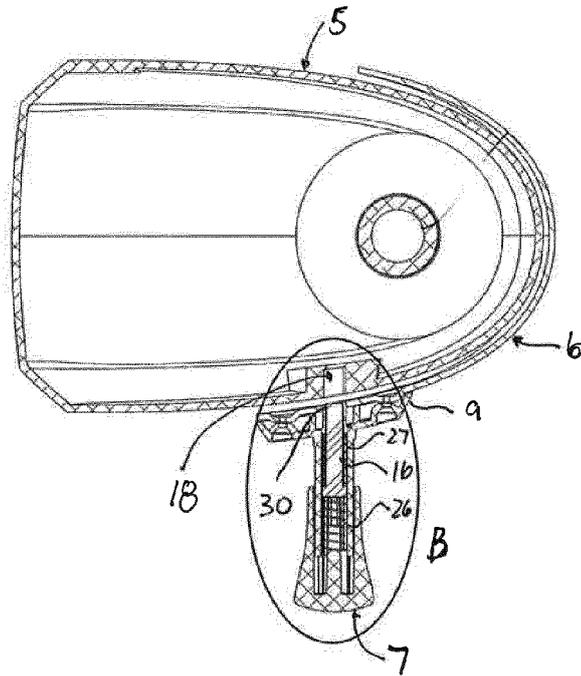


Figure 3b

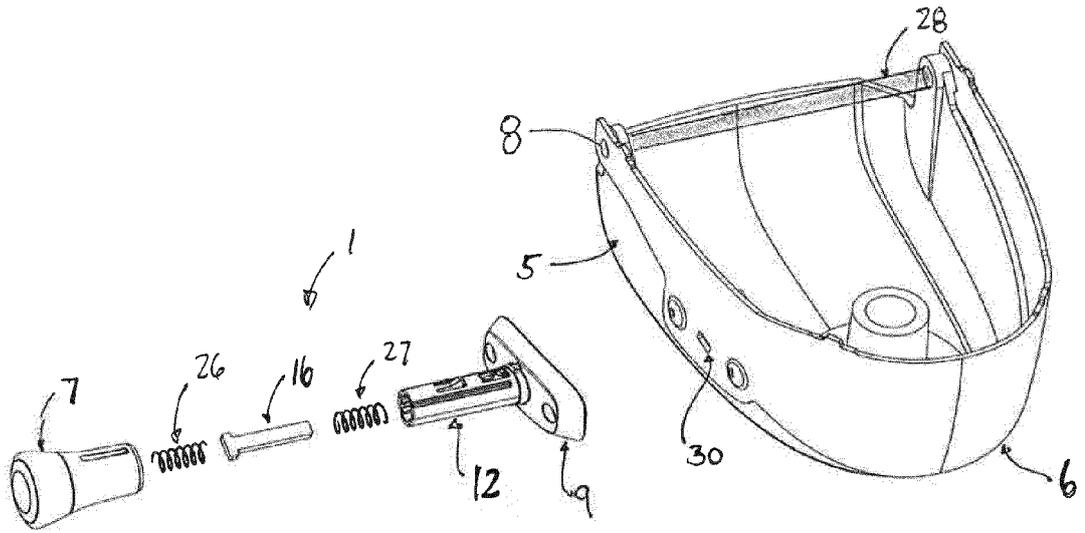


Figure 4a

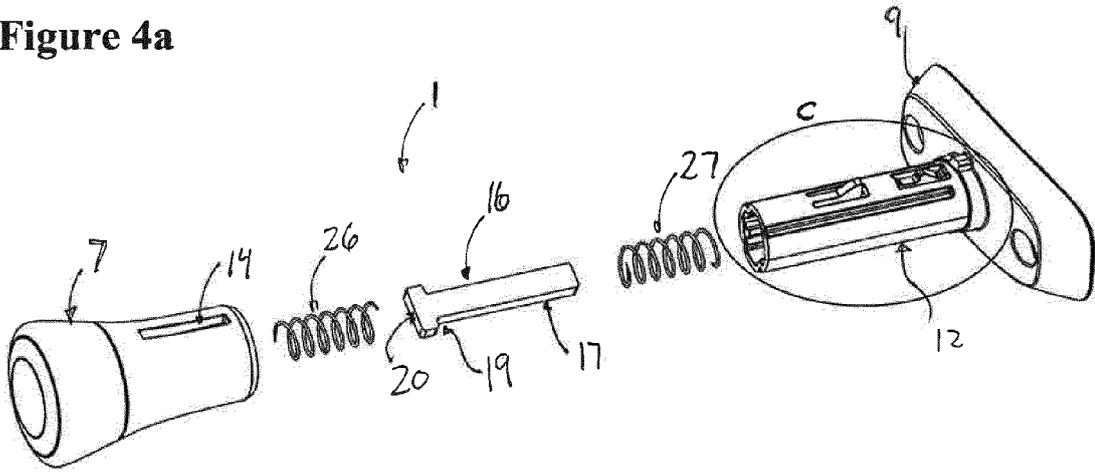


Figure 4b

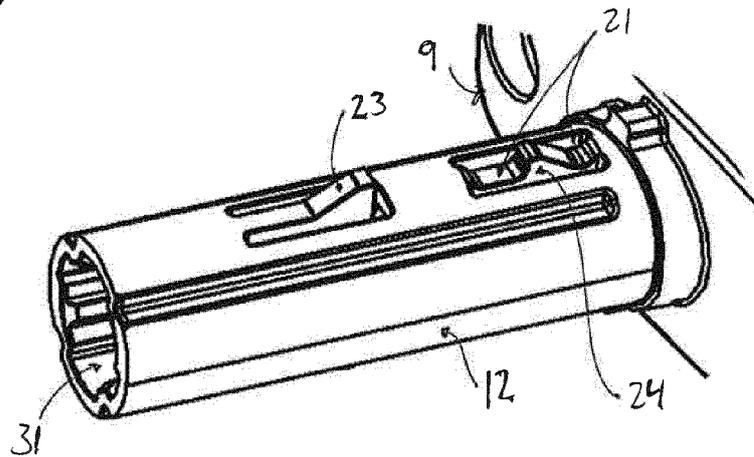


Figure 4c

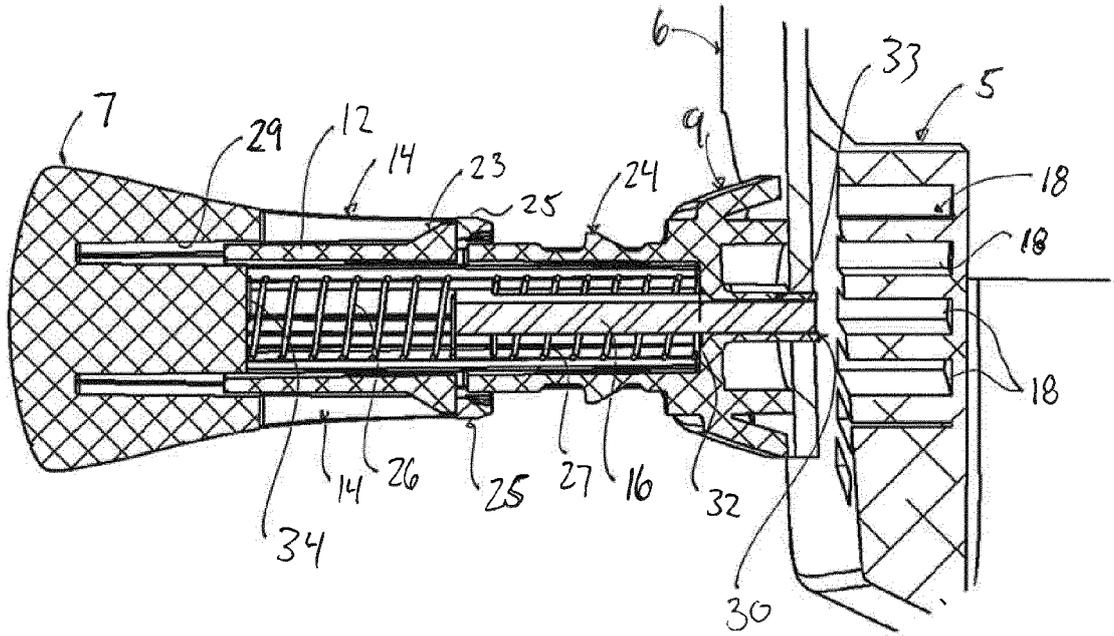


Figure 5a

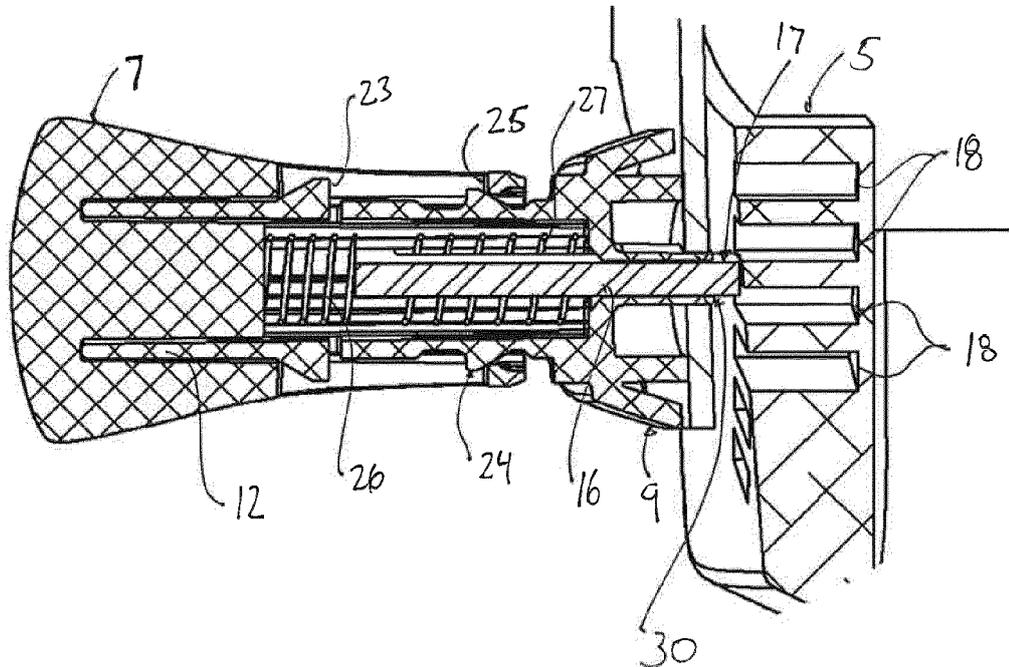


Figure 5b

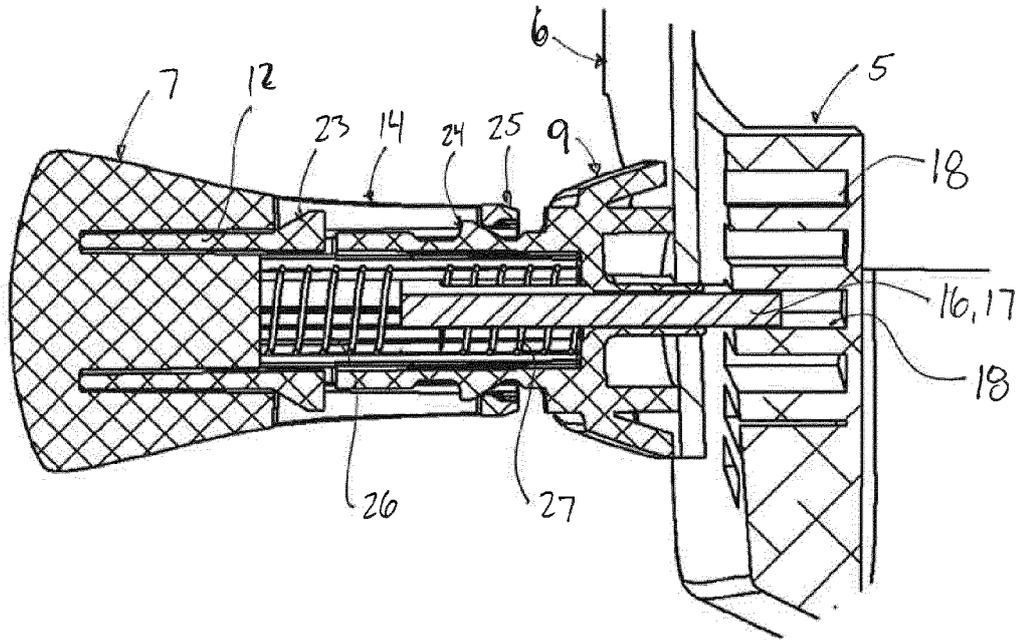


Figure 5c

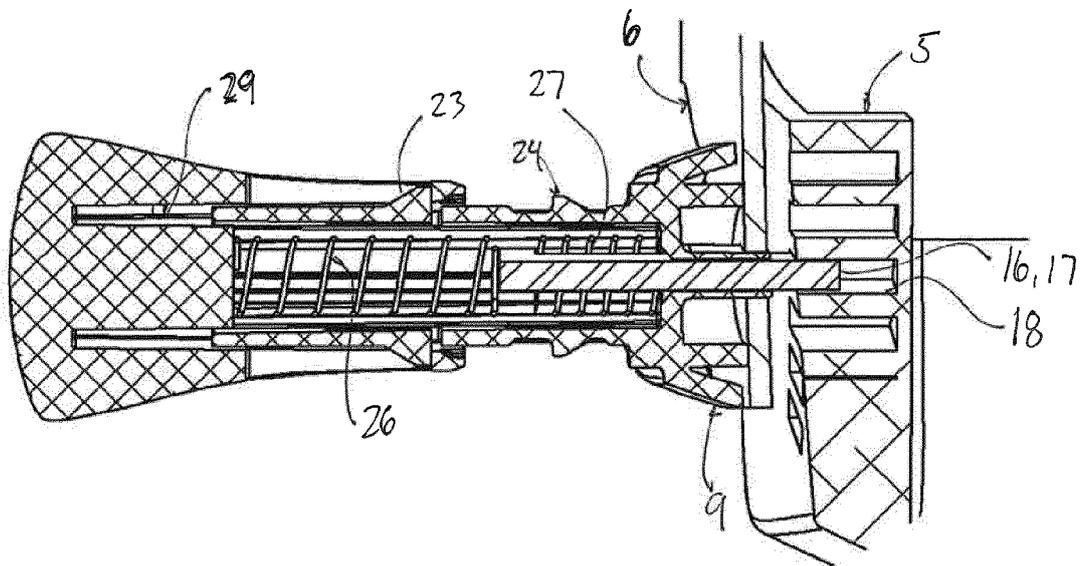


Figure 5d

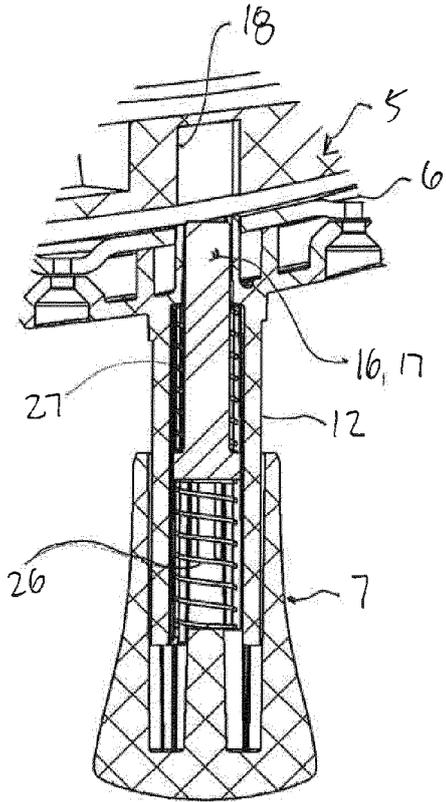


Figure 6a

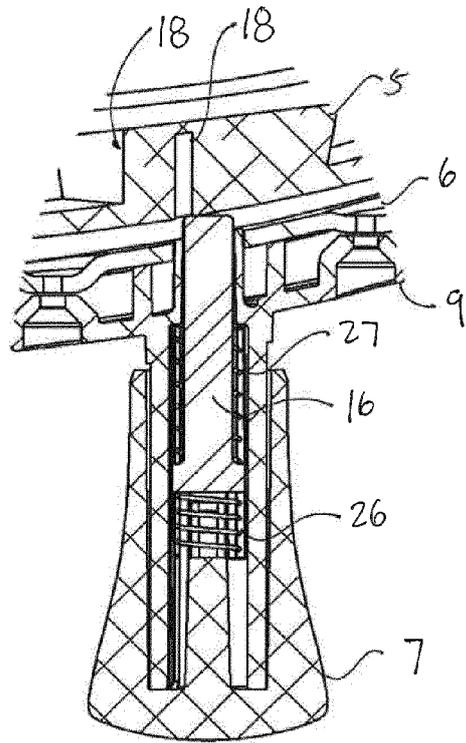


Figure 6b

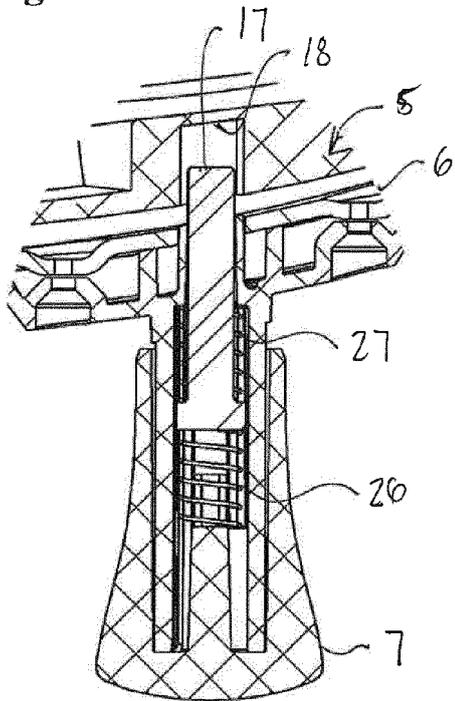


Figure 6c

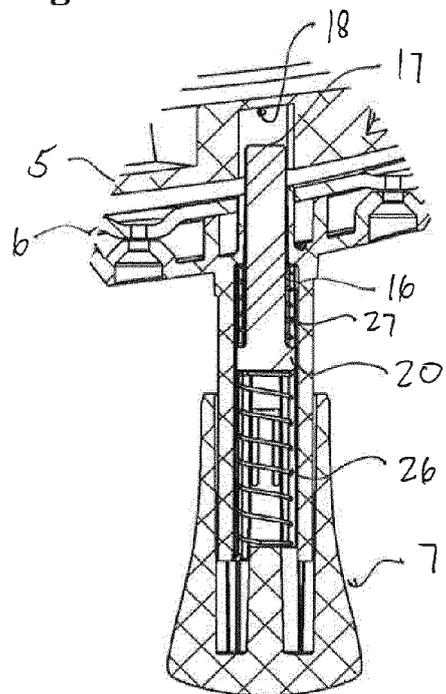


Figure 6d



EUROPEAN SEARCH REPORT

Application Number
EP 13 19 3075

5

10

15

20

25

30

35

40

45

50

55

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	US 6 213 552 B1 (MIOTTO BENIAMINO) 10 April 2001 (2001-04-10) * abstract; figures 8-10 * * column 6, line 57 - column 7, line 49 * -----	1-9	INV. A47C1/026 A47C1/032
X	EP 0 902 634 B1 (IMARC SRL) 5 April 2000 (2000-04-05) * abstract; figures 2,3 * * column 4, paragraph 26 - column 5, paragraph 30 * -----	1-4,6-9	
X	US 2010/187883 A1 (CHEN YUNG-HUA) 29 July 2010 (2010-07-29) * abstract; figures 7-10 * * page 2, paragraph 42 - page 3, paragraph 44 * -----	1-4,6-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 January 2014	Examiner Tempels, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

1

EPO FORM 1503 03/82 (P04/C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 13 19 3075

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-01-2014

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6213552	B1	10-04-2001	AU 1413499 A	02-08-1999
			CA 2319498 A1	22-07-1999
			DE 69819368 D1	04-12-2003
			EP 1047319 A1	02-11-2000
			IT T0980034 A1	16-07-1999
			US 6213552 B1	10-04-2001
			WO 9935939 A1	22-07-1999

EP 0902634	B1	05-04-2000	AU 711574 B2	14-10-1999
			AU 1304797 A	01-08-1997
			CN 1207023 A	03-02-1999
			DE 69607655 D1	11-05-2000
			DE 69607655 T2	23-11-2000
			EP 0902634 A1	24-03-1999
			ES 2146925 T3	16-08-2000
			IT VE960001 U1	08-07-1997
			PL 327685 A1	21-12-1998
			US 6074008 A	13-06-2000
			WO 9724955 A1	17-07-1997

US 2010187883	A1	29-07-2010	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82