

(19) **DANMARK**



Patent- og
Varemærkestyrelsen

(10) **DK/EP 2425508 T3**

(12) **Oversættelse af
europæisk patentskrift**

-
- (51) Int.Cl.: **H 02 B 1/21 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2016-10-31**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-07-13**
- (86) Europæisk ansøgning nr.: **09779378.0**
- (86) Europæisk indleveringsdag: **2009-04-29**
- (87) Den europæiske ansøgnings publiceringsdag: **2012-03-07**
- (86) International ansøgning nr.: **EP2009055181**
- (87) Internationalt publikationsnr.: **WO2010124728**
- (84) Designerede stater: **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 SE SI SK TR**
- (73) Patenthaver: **ABB AB, Kopparbergsvägen 2, 721 83 Västerås, Sverige**
- (72) Opfinder: **NORD, Viktoria, Ryavägen 3, S-515 70 Rydboholm, Sverige**
SUNDMAN, Petter, Lerumsvägen 144, S-443 30 Lerum, Sverige
SÄÄW, Olle, Gärdesgatan 42, S-466 31 Sollebrunn, Sverige
LARSSON, Bertil, Krokanvägen 1, S-441 92 Alingsås, Sverige
EKMAN, Kristoffer, Skogskullegatan 16, 44146 Alingås, Sverige
- (74) Fuldmægtig i Danmark: **RWS Group, Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Bucks SL9 9FG, Storbritannien**
- (54) Benævnelse: **FORBINDELSESENHED OG SAMLESKINNEFORBINDELSE**
- (56) Fremdragne publikationer:
EP-A1- 0 040 180
EP-A1- 0 681 356
EP-A1- 0 713 018
DE-A1- 3 537 135
GB-A- 1 484 192

DESCRIPTION

FIELD OF THE INVENTION AND BACKGROUND ART

[0001] The present invention relates to a connection assembly according to the preamble of claim 1 and a bus bar connection according to the preamble of claim 9.

[0002] A bus bar in the field of electrical power distribution refers to strips of copper or aluminium that conduct electricity within switchboards, distribution boards, substations, or other electrical apparatuses. Bus bars may be connected to each other and/or to electrical apparatuses by bolted or clamped connections. An electrical apparatus is usually connected to a bus bar for several years and the electrical connection between the electrical apparatus and the bus bar has to be very good over the years of use. Therefore, it is of great importance that the assemblies for connecting the electrical apparatus to the bus bar are reliable over time, which also means that said connecting assemblies have to be correctly installed during mounting of the electrical apparatus to the bus bar.

[0003] A common feature of a bus bar is that it is provided with a T-shaped groove with an outwardly facing slot on the side of the bus bar to which an electrical apparatus is to be mounted. The groove has an inner width which is larger than the width of the slot. The electrical apparatus is usually mounted to the bus bar by means of a connection assembly. Such a connection assembly is configured to fit into the groove of the bus bar, which implies that it usually has at least one member which is T-shaped to fit into the T-shaped groove.

[0004] In GB 1484192 it is disclosed a connection assembly comprising a T-shaped bolt with an elongated head and a nut for connecting electrical apparatuses to bus bars. The T-shaped bolt is configured to be inserted into the groove of a bus bar when the long sides of the head of the bolt are parallel to the groove. The bolt is thereafter turned so as to lock the head in the T-shaped groove. Thereafter, an electrical apparatus is fastened to the bolt with the nut, and the connection assembly is tightened so as to push the electrical apparatus towards the bus bar.

[0005] DE 35 37 135 A1 discloses a connection assembly for attaching a device to a rail through a bolt and nut, further comprising frictional means.

SUMMARY OF THE INVENTION

[0006] The object of the present invention is to provide a new connection assembly for attaching an electrical apparatus to a bus bar.

[0007] This object is according to the invention obtained by providing a connection assembly having the features defined in claim 1.

[0008] The frictional means can of course be any frictional means providing increased friction between the thread of the bolt and the thread of the nut, for instance a spring, a plastic bushing, intentionally created defects in the thread of the bolt and/or the nut etc.

[0009] The connection assembly defined above can be used for mounting an electrical apparatus to a bus bar, wherein the bus bar typically has a longitudinal groove with a slot configured for receiving the bolt of the connection assembly, the slot having a smaller width than the inner width of the groove. The connection assembly is connected to the bus bar by insertion of the head of the bolt into the groove of the bus bar through the slot which provides an entrance to the groove. The nut is thereafter turned in a rotational direction which normally screws the nut onto the bolt (typically clock-wise), but since the head of the bolt is allowed to rotate essentially freely in the groove, i.e. not hindered by walls in the groove, the frictional means provides enough friction between the bolt and the nut for the bolt to rotate with the nut. Thus, the bolt is rotated with the nut until parts of the short sides of the head come into engagement with opposite walls in the groove. When the turning of the nut is continued in the same direction the nut is screwed onto the bolt and the surface of the head of the bolt facing the nut is pressed towards flanges defining the slot of the groove of the bus bar. The electrical apparatus to be mounted is thereby pressed towards the bus bar. The connection assembly is tightened until the connection assembly is secured to the bus bar with a predefined torque, e.g. 15 Nm. In the prior art, as described in for instance GB 1484192, the head of the bolt needs to be turned into place in the groove of the bus bar before the nut is screwed onto the bolt. By using the connection assembly according to the present invention the turning of the

head of the bolt into its place and the tightening of the connection assembly is performed by the same manoeuvre, i.e. turning of the nut in one and the same rotational direction.

[0010] According to an embodiment of the invention the frictional means comprises a spring, at one end abutting against the nut on the side of the nut facing the head of the bolt, and at the other end abutting against the head of the bolt on the side of the head facing the nut, which spring is a pressure spring configured to press the nut and the bolt in opposite directions so as to create friction between the thread of the nut and the thread of the bolt. The pressure provided by the pressure spring gives rise to a very homogenous friction between the thread of the nut and the thread of the bolt, i.e. the friction is not significantly changed over time and after use which can be the case with other types of frictional means.

[0011] According to another embodiment of the invention the frictional means comprises a plastic bushing between the nut and the bolt, which plastic bushing is configured to engage with the thread of the nut and/or the thread of the bolt so as to create friction between them. By using a plastic bushing the frictional means can be provided in a cost effective way.

[0012] After or during the mounting of the connection assembly to a bus bar, the turning of the head of the bolt can be controlled by inspecting the position of the indicator mark. If the head for some reason is not completely turned, the surface of the head facing the nut can be pressed towards the lips obliquely during tightening, which after some time may result in loss in the torque applied during the mounting of the connection assembly. It is very important that the applied torque is preserved during the life-time of the connection assembly; otherwise the electrical connection between the bus bar and the electrical apparatus mounted to the bus bar can fail or deteriorate.

[0013] According to another embodiment of the invention the indicator mark is a notch. If a visual inspection of the indicator mark shows that the bolt has not been correctly turned in position, a screw driver, preferably an insulated screw driver, can be inserted into the through hole of the nut and engage with the notch, whereupon the bolt can be turned into correct position by means of the screw driver.

[0014] According to another embodiment of the invention the nut is a socket head nut provided with a socket hole, which together with the threaded hole of the nut forms said through hole. A socket head nut can be turned even if the nut is closely surrounded by objects. An ordinary hexagonal nut has to be grasped from its periphery by a wrench or a similar tool, which means that there must be enough space in the proximity to the nut to allow a wrench to grasp the nut. This is not the case if the nut is a socket head nut. The through hole allows for visual inspection of the turned position of the bolt as discussed above. The protrusions also improve the electrical connection between the bus bar and the electrical apparatus, by engaging the lips from the inside of the groove.

[0015] According to another embodiment of the invention the head of the bolt on the surface facing the nut, along the short sides of the head, has protrusions for providing friction between the head of the bolt and the inside of the groove in a bus bar when the connection assembly is in use. The protrusions can ensure that the connection assembly does not slide in the bus bar by having its edges engaging with the inside of the groove when the connection assembly is in use.

[0016] Other advantages and advantageous features of the invention will appear from the dependent claims and the subsequent description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] With reference to the appended drawings, below follows a specific description of embodiments of the invention cited as examples.

[0018] In the drawings:

Fig 1
shows a fuse box attached to bus bars,

Fig 2a
shows in a perspective view a connection assembly according to an embodiment of the invention,

Fig 2b
shows in an exploded view a connection assembly according to another embodiment of the invention,

Fig 3
shows in a top view a bolt of a connection assembly according to the invention,

Fig 4

shows in a cross-sectional view a nut of a connection assembly according to the invention,

Fig 5

shows in perspective and partial sectional view a connection assembly according to the invention connecting an electrical apparatus to a bus bar, and

Figs 6a-d

show in cross-section how a connection assembly according to the invention is used for connecting an electrical apparatus to a bus bar.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0019] Explained herein are connection assemblies according to embodiments of the invention. The invention may, however, be embodied in many different forms and should not be construed as being limited to the exemplary embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to those skilled in the art.

[0020] In Fig 1 it is shown an electrical apparatus 1 in the form of a fuse box attached to bus bars 2 with grooves 10 accessible via slots 11. The electrical apparatus 1 is connected to a bus bar 2 by means of a connection assembly according to the invention (which not can be seen in Fig 1) inserted in the groove 10 through the slot 11 and said connection assembly can be accessed for instance through a connecting hole 3 in the electrical apparatus by a tool 19.

[0021] In Figs 2a-b it is shown a connection assembly 5 according to two different embodiments of the invention. The connection assembly 5 comprises a bolt 6, which also is shown in Fig 3 in a top-view of one embodiment of said bolt, and a nut 7, which also is shown in Fig 4 in a cross-sectional view of one embodiment of the nut 7. The bolt 6 has a head 8 and a shaft 9, which shaft 9 is provided with an external thread 22 and configured to be screwed into the nut 7. The shaft 9 extends essentially from the centre of the head 8 of the bolt 6. The head 8, as seen in a plane perpendicular to the longitudinal axis of the shaft 9, has an elongated shape so as to allow the head 8 to be introduced into the groove 10 of the bus bar through the slot 11. The width of the head 8 is smaller than the width of the slot 11 and the length of the head 8 is larger than the width of the slot 11. The nut 7 is provided with an internal thread 21 configured to be in engagement with the external thread 22 of the shaft 9 of the bolt 6. Frictional means are provided between the bolt 6 and the nut 7. The frictional means can of course be any frictional means providing increased friction between the shaft 9 of the bolt 6 and the nut 7, for instance a spring, a plastic bushing, intentionally created defects in the thread of the bolt and/or the nut etc.

[0022] In Fig 2b it is shown frictional means comprising a spring 12, which at one end is to abut against the nut 7 on the side of the nut facing the head 8 of the bolt 6, and at the other end is to abut against the head 8 of the bolt 6 on the side of the head 8 facing the nut 7. The spring 12 is a pressure spring configured to press the nut 7 and the bolt 6 in opposite directions so as to create friction between the thread of the nut 7 and the thread of the bolt 6. As shown in Fig 4 the frictional means can alternatively comprise a plastic bushing 13 attached to the nut 7, which plastic bushing 13 is configured to engage with the thread of the bolt 6 so as to create friction between the nut 7 and the thread of the bolt 6. Of course a plastic bushing can be attached to the bolt instead and configured to engage with the thread of the nut 7 so as to create friction between the thread of the nut 7 and the bolt 6.

[0023] The nut 7 has a through hole 14 and the bolt 6 has an indicator mark 15 on the surface of the free end of the shaft 9. The indicator mark can of course be any suitable mark but in Fig 2b and Fig 3 the indicator mark 15 constitutes a notch. The indicator mark 15 indicates the turning position of the bolt 6, and is visible through said through hole 14 of the nut 7 when the thread of the nut 7 is in engagement with the thread 22 of the shaft 9 of the bolt 6. The through hole 14 of the nut 7 extends in the axial direction of the nut 7 and the thread 21 of the nut 7 is formed in this through hole 14. The nut 7 can be a socket head nut wherein the socket hole together with the threaded hole of the nut forms the through hole 14 of the nut 7. If the indicator mark 15 constitutes a notch a screw driver can be engaged in the notch for turning the bolt 6 if the bolt 6 for some reason is not turned correctly into its position.

[0024] The head 8 of the bolt 6 can have protrusions 16 on the surface facing the nut 7, along the short sides of the head 8, for providing friction between the head 8 of the bolt 6 and the inside of the groove 10 in a bus bar 2 when the connection assembly 5 is in use. The protrusions can be of any shape, for instance conical or pyramidal. In Figs 2a-b and Fig 3 the protrusions are

embodied with a wedge-shape.

[0025] In Fig 5 it is shown how a connection assembly 5 according to the invention is used for the attachment of an electrical apparatus 1 to a bus bar 2. Electrical connection between the bus bar 2 and the electrical apparatus 1 is provided by contact flanges 17 of the bus bar 2 and contact members 18 of the electrical apparatus 1. The contact flanges 17 are normally an integrated part of the bus bar 2 and are also defining the slot 11 for entering the groove 10 of the bus bar 2. When an electrical apparatus 1 is attached to a bus bar 2 the contact members 18 are pressed against the outer sides of the contact flanges 17 of the bus bar 2 with a predetermined force. The connection assembly 5 provides this force by having the head 8 of the bolt 6 abutting the inner sides of the contact flanges 17, and the surface of the nut 7 facing the head 8 of the bolt 6 abutting the contact members 18, or parts in contact with the contact members 18, so as to press the contact flanges 17 and the contact members 18 towards each other when the connection assembly 5 is tightened.

[0026] The use of a connection assembly 5 according to the invention for attaching an electrical apparatus 1 to a bus bar 2 is shown in Figs 6a-d.

[0027] In Fig 6a it is shown that the connection assembly 5 is premounted in the electrical apparatus 1 with the nut 7 abutting against the electrical apparatus 1. The head 8 of the bolt 6 is inserted into the groove 10 of the bus bar 2 through the slot 11 defined by the contact flanges 17 with the longitudinal axis of the head 8 extending along the slot 11.

[0028] In Fig 6b it is shown how the head 8 has been inserted into the groove 10 and that the contact flanges 17 of the bus bar 2 are abutting the contact members 18 of the electrical apparatus 1.

[0029] In Fig 6c it is shown how the head 8 of the bolt 6 of the connection assembly 5 is turned into its locking position. A tool 19 is used for engagement with and turning of the nut 7. Since there is frictional means, here in the form of a spring 12, provided between the nut 7 and the bolt 6, the bolt is turning with the nut 7 when said nut 7 is turned. The bolt 6 is turned with the nut 7 until parts of the short sides of the head come into engagement with opposite walls 20 in the groove 10. The nut 7 is turned in a direction which normally would screw the nut 7 onto the bolt 6, typically clock-wise, and the tool 19 is here depicted as an Allen key for engaging in a nut with a socket head, but if the nut has other engagement means the tool can of course be any tool suitable for turning the nut 7.

[0030] Upon further turning of the nut 7, using the tool 19, the bolt is prevented by said opposite walls 20 to turn with the nut 7. In Fig 6d it is shown how further turning of the nut 7 screws the nut 7 onto the bolt 6, whereby the bolt 6 is moving towards the nut 7, and hence moving towards the electrical apparatus 1. The head 8 of the bolt 6 abuts the contact flanges 17 from inside the groove 10 and since the nut 7 of the connection assembly 5 abuts the electric apparatus 1 so as to press the contact members 18 towards the bus bar 2, further turning of the nut 7 will press the contact flanges 17 and the contact members 18 towards each other. The turning can be continued until a predefined torque is reached, preferably between 1-30 Nm, most preferred 15 nm.

[0031] As can be seen in Fig 5 the turning of the bolt 6 can, during the attachment or after the attachment, be inspected by inspecting the indicator mark 15 through the through hole 14 of the nut 7. If the turning is not correct, the head 8 of the bolt 6 is not properly positioned inside the groove 10 of the bus bar 2. The connection assembly 5 can then be loosened somewhat and if the indicator mark 15 is a notch, a screw driver, preferably an insulated screw driver, can be used to turn the bolt 6, and thus the head 8 of the bolt 6 into a correct position. The screw driver is brought into engagement with the notch through the through hole 14 of the nut 7.

[0032] The invention is of course not in any way limited to the embodiments described above. On the contrary, several possibilities to modifications thereof should be apparent to a person skilled in the art without departing from the basic idea of the invention as defined in the appended claims.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- GB1484192A [0004] [0009]
- DE3537135A1 [0005]

Patentkrav

1. Forbindelsesenhed (5) til fastgørelse af et elektrisk apparat (1) til en samleskinne (2), hvilken forbindelsesenhed
5 (5) omfatter en bolt (6) og en møtrik (7), idet møtrikken (7) er konfigureret til at skubbe det elektriske apparat (1) mod samleskinnen (2), når forbindelsesenheden (5) er i brug, hvor boltens (6) har et hoved (8) og et skaft (9), hvilket skaft (9) er forsynet med et gevind (22) og er konfigureret til at blive
10 skruet ind i møtrikken (7), idet skaftet (9) i det væsentlige strækker sig ud fra midten af boltens (6) hoved (8), hvor hovedet (8), når det ses i et plan vinkelret på skaftets (9) længdeakse, har en aflang form for at gøre det muligt for hovedet (8) at blive indført i en rille (10) i en samleskinne
15 (2) gennem en slids (11) med hovedets (8) længdeakse, der strækker sig ud langs slidsen (11) og derefter drejes, således at det kommer i indgreb med modstående vægge (20) i rillen (10), hvor et friktionsmiddel tilvejebringes mellem boltens (6) og møtrikken (7), idet friktionsmidlet er konfigureret til at
20 fremskaffe tilstrækkelig friktion mellem boltens (6) og møtrikken (7) til, at boltens (6) roterer med møtrikken (7), når møtrikken (7) drejes, hvis boltens (6) hoved (9) af omgivelserne får lov til at rotere i det væsentlige frit, kendetegnet ved, at møtrikken (7) har et gennemgående hul
25 (14), samt ved, at boltens (6) har et indikatormærke (15) på overfladen af den frie ende af skaftet (9), hvilket indikatormærke (15) angiver drejehøjden af boltens (6), idet indikatormærket (15) er synligt gennem det gennemgående hul (14) i møtrikken (7), når møtrikkens (7) gevind (21) er i
30 indgreb med gevindet (22) på boltens (6) skaft (9).

2. Forbindelsesenheden (5) ifølge krav 1, kendetegnet ved, at friktionsmidlet omfatter en fjeder (12), som i den ene ende sidder i anslag mod møtrikken (7) på den side af møtrikken,
35 der vender mod boltens (6) hoved (9), og i den anden ende støder op mod boltens (6) hoved (9) på den side af hovedet (9), der vender mod møtrikken (7), hvilken fjeder (12) er en trykfjeder, der er konfigureret til at trykke på møtrikken (7)

og boltens (6) i modsatte retninger for således at skabe friktion mellem møtrikkens (7) gevind (21) og boltens (6) gevind (22).

5 3. Forbindelsesenhed (5) ifølge krav 1, kendetegnet ved, at friktionsmidlet omfatter en indsats af plastic (13) mellem møtrikken (7) og boltens (6), hvilken indsats af plastic (13) er konfigureret til at tilkobles møtrikkens (7) gevind (21) og/eller boltens (6) gevind (22).

10

4. Forbindelsesenhed (5) ifølge et af kravene 1 til 3, kendetegnet ved, at indikatormærket (15) er et hak.

15 5. Forbindelsesenhed (5) ifølge et af kravene 1 til 4, kendetegnet ved, at møtrikken (7) er en møtrik, hvis hoved er forsynet med et hul, der sammen med gevindhullet i møtrikken (7) danner det gennemgående hul (14).

20 6. Forbindelsesenhed (5) ifølge et af de foregående krav, kendetegnet ved, at boltens (6) hoved (8) på den overflade, der vender mod møtrikken (7), langs de korte sider af hovedet (8) har fremspring (16) for at fremskaffe friktion mellem boltens (6) hoved (8) og indersiden af rillen (10) i en samleskinne (2), når forbindelsesenheden (5) er i brug.

25

7. Anvendelse af en forbindelsesenhed (5) ifølge et af kravene 1 til 6 til fastgørelse af et elektrisk apparat (1) til en samleskinne (2).

30 8. Samleskinneforbindelse, der omfatter en forbindelsesenhed (5) og en samleskinne (2), hvor samleskinnen (2) har en langsgående rille (10) med en slids (11), der er konfigureret til at modtage forbindelsesenheden (5), idet slidsen (11) har en mindre bredde end den indre bredde af rillen (10),
35 kendetegnet ved, at forbindelsesenheden (5) er en forbindelsesenhed (5) ifølge et af kravene 1 til 6.

9. Anvendelse af en samleskinneforbindelse ifølge krav 8,

kendetegnet ved, at forbindelsesenheden (5) forbindes til samleskinnen (2) ved at:

- 5 a) indføre boltens (6) hoved (8) i rillen (10) i samleskinnen (2) gennem slidsen (11) med hovedets (8) længdeakse, der strækker sig ud langs slidsen (11)
- b) dreje møtrikken (7) i en retning, som normalt skrues den ind i boltens (6), typisk med uret, hvorved boltens (6) drejer med møtrikken (7), indtil dele af de korte sider af hovedet (8) kommer i indgreb med modsatte vægge (20) i rillen (10)
- 10 c) fortsætte med at dreje møtrikken (7) i samme retning som i b), indtil forbindelsesenheden (5) fastgøres til samleskinnen (2) med et forud bestemt drejningsmoment.

DRAWINGS

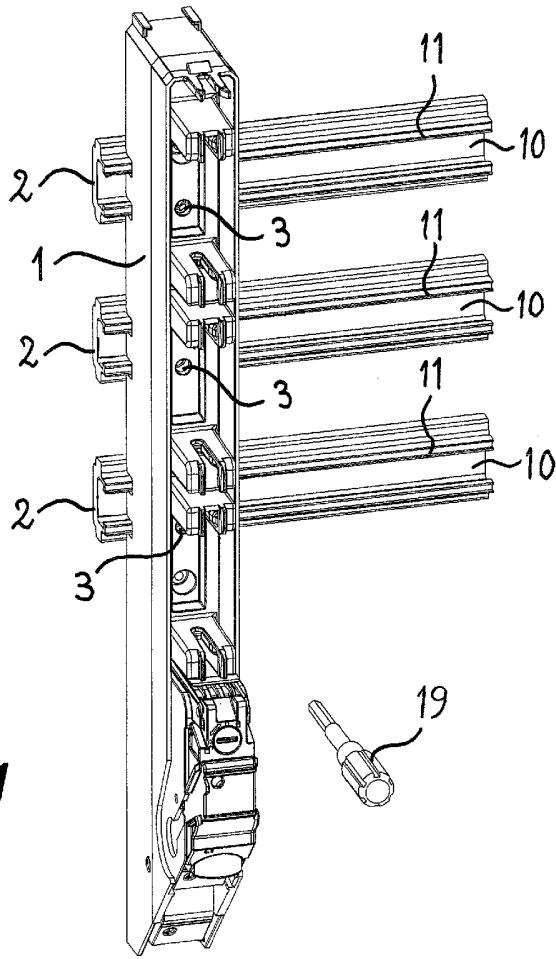
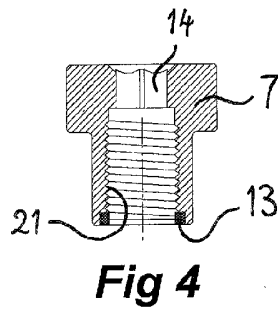
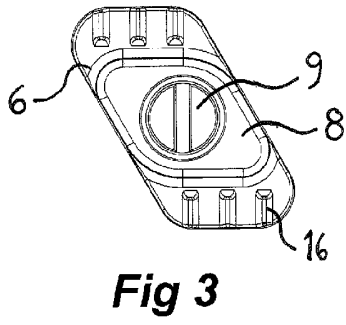
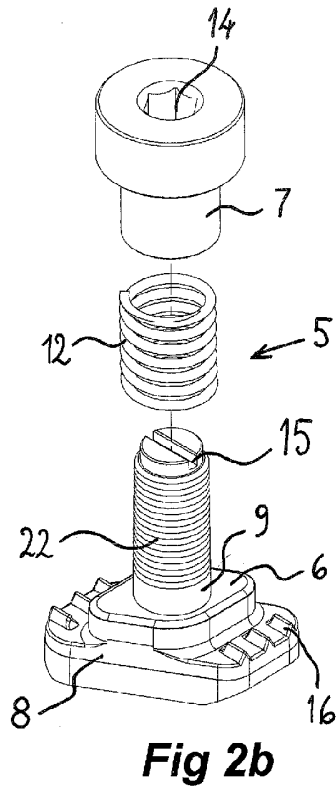
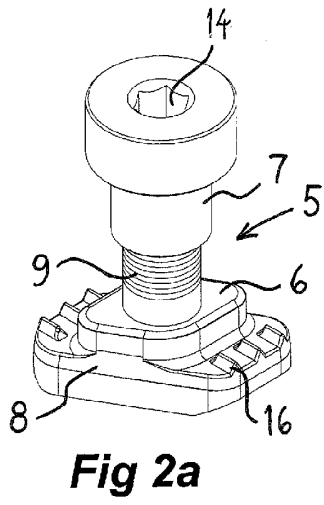


Fig 1



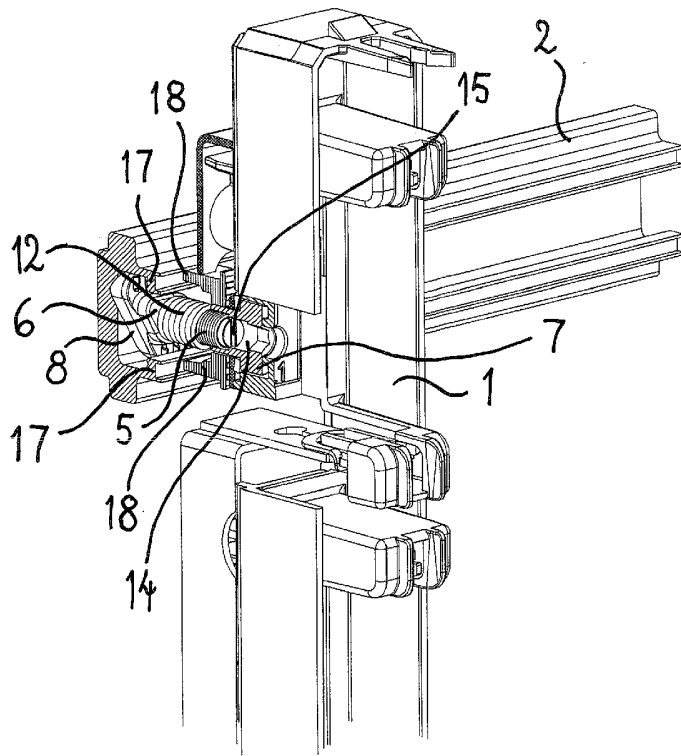


Fig 5

