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(54) **ANCHOR LINK INSTALLATION TOOL**

(57) The invention relates to an anchor link installation tool (12) for installing an anchor link (10), wherein the installation tool (12) includes

- an installation head (14) configured to hold an anchor link (10), wherein the installation head (14) includes a torque-bearing support surface (33) for supporting the anchor link (10) in a releasable manner in the installation head (14) during the installation of the anchor link (10) with the bolt end (11) belonging to the anchor link (10) sticking out, and
- a rod (16) comprising an upper end (18) and a lower end (20), attached at its upper end (18) to the installation head (14), for rotating the installation head (14).

The invention also relates to a method for installing an anchor link.

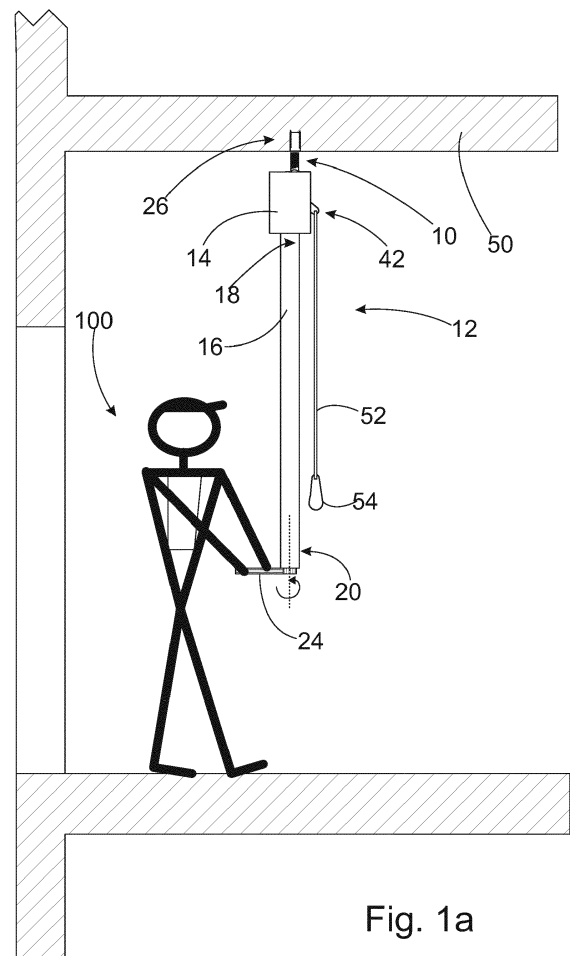


Fig. 1a

Description

[0001] The invention relates to an installation tool for installing an anchor link, wherein the installation tool includes

- an installation head configured to hold the anchor link, and
- a rod comprising an upper end and a lower end, attached at its upper end to the installation head, for rotating the installation head.

[0002] The invention also relates to a method for installing an anchor link.

[0003] When a new multistorey building is built using hollow-core slabs and the building is to include balconies, it is necessary after the assembly of the elements to go onto an empty balcony in order to build, among other things, the railings and any other balcony structures. In order to prevent a fall, the builder must be anchored with a safety harness so that the work can be performed safely. In the current method, the builder climbs up a ladder to attach an anchor link, to which a safety harness can be attached, to a threaded socket located in the ceiling. Climbing up a ladder on a balcony without railings is dangerous.

[0004] The publication JP 2015146852 A, which discloses an installation tool for attaching a harness attachment link while climbing a utility pole, is known from the prior art. However, this kind of installation tool is not suitable for attaching separate anchor links to an installation object, for example to a balcony ceiling, because the anchor link forms part of the installation tool in this publication.

[0005] It is an object of the invention to provide an anchor link installation tool and a method by means of which the safety of an anchor link installation is improved. The characteristic features of an installation tool according to the present invention are set out in the attached patent claim 1 and the characteristic features of the method are set out in the attached patent claim 15.

[0006] The object of an anchor link installation tool according to the invention can be achieved with an installation tool that includes an installation head configured to hold an anchor link with a bolt end belonging to the anchor link sticking out, wherein the installation head includes a torque-bearing support surface for supporting the anchor link in a releasable manner in the installation head during installation with the bolt end belonging to the anchor link sticking out. In addition, the installation tool includes a rod comprising an upper end and a lower end, attached at its upper end to the installation head, for rotating the installation head.

[0007] With the installation tool according to the invention, the installation of an anchor link in an installation object located above the user, for example in a threaded socket formed in an overhead balcony at the balcony construction site, can be performed safely while standing

on the balcony without the use of ladders or scaffolds. This significantly increases work safety and expedites work by eliminating the time required to set up ladders or scaffolds. The torque-bearing support surface of the installation head supports the installation link in the correct position, so that after rotating the installation link into place, the installation tool can be taken down while the installation link remains in place in the installation object. In other words, the anchor link only stays in place in the installation tool due to the lateral and vertical forces produced by gravity and the support surface. During rotation, the support surface transmits the torque required to turn the anchor link from the rod to the installation head and via the support surface to the anchor link.

[0008] In this connection, installing an anchor link in the installation head "with the bolt end sticking out" means that the bolt end of the anchor link extends so as to protrude from a recess and is essentially parallel to the rod, so that the anchor link can be directed into an installation object and installed by rotation with the installation tool.

[0009] According to an embodiment, the installation tool further includes a turning handle, which is attached to the rod, preferably to the lower end of the rod, for turning the rod and the installation head. The turning handle enables a large tightening torque when the anchor link is turned by means of the rod as opposed to when only the rod is turned.

[0010] Alternatively, the other end of the rod can include connection means, for example for connecting a screw driver to the rod in order to turn it.

[0011] Preferably, the installation head includes a recess for accommodating a linking part belonging to the anchor link in the installation head. The recess allows the anchor link to be held in place with the bolt end visible, so that the bolt end of the anchor link can be rotated into a threaded socket of the attachment object by means of the anchor tool.

[0012] It is understood that the anchor link is a separate component from the installation tool and is merely temporarily supported in the installation head of the installation tool during installation, preferably by gravity or by means of a frictional locking. On the other hand, the anchor link preferably includes a rigid closed linking part and a bolt end provided with a thread and attached to the linking part for attaching the anchor link to an installation object.

[0013] Preferably, the support surface of the installation head is formfitting in a direction transverse to the longitudinal direction of the installation tool in order to transmit the torque during the rotation of the rod from the rod through the installation head to the installation head and from there onwards via the support surface of the installation head to the anchor link.

[0014] Preferably, the recess is formed in the installation head on the side opposite the attachment of the rod.

[0015] Preferably, the recess is configured to correspond in width and in length to the linking part of the

anchor link, with a width of 50 - 90 mm, preferably 60 - 80 mm, and a length of 10 - 30 mm, preferably 15 - 24 mm, and a depth of 30 - 70 mm, preferably 35 - 55 mm. This allows the linking part of the anchor link to be fixed tightly in the installation head, which facilitates the alignment of the bolt end with the threaded socket and the insertion of the anchor link in the correct threads.

[0016] Preferably, the installation head includes a slot of a depth of the recess between the recess and the outer surface of the installation head for an attachment link to be attached to the anchor link, preferably for a carabiner. By means of the slot, the anchor link can be installed in its position while the attachment link is fixed in the anchor link, the attachment link remaining partially outside the installation head. It is thus not necessary to climb up separately to attach the carabiner to the anchor link, which would reduce safety.

[0017] Preferably, the recess is dimensioned to correspond to the outer dimensions of the linking part of the anchor link so that a contact is formed between the anchor link and the installation head, the friction of which holds the anchor link in place relative to the installation head during installation.

[0018] To enhance the friction, the inner surface of the recess can be coated, for example, with a rubber surface or the like.

[0019] According to one embodiment, the slot includes a wide section that is wide in a depth direction of the slot for a locking link belonging to the bolt end of the anchor link as well as a narrow section that is narrower in width than the wide section for an attachment link. This is particularly important in cases where the anchor link is of a type in which the bolt end is attached by a bearing to the linking part in order to allow the rotation of the link after installation. In this case, the bolt end must be locked relative to the linking part so that when the anchor link is rotated, the bolt end does not rotate freely relative to the linking part, which would make it impossible to attach the anchor link by rotation. In cases where the bolt end is attached in a fixed manner to the linking part of the anchor link, a corresponding larger section in the slot is not necessary.

[0020] Preferably, the installation tool further includes a ratchet member for connecting the turning handle to the rod. By means of the ratchet member, the rotation of the rod is quick and can also be performed in tight spaces, such as close to a wall.

[0021] Preferably, the turning handle can be a ratchet wrench comprising a ratchet member, which is attached to the rod with, for example, a H-inch anvil. Alternatively, the turning handle can be realized by forming a fixed turning handle on the rod or, according to yet a further option, by forming an opening in the rod through which, for example, a screwdriver can be fitted to act as a turning handle.

[0022] Preferably, the rod is adjustable lengthwise. By means of its lengthwise adjustability, it is easy for a user to adjust the length of the rod to suit their personal ergo-

nomics.

[0023] According to one embodiment, the rod is telescopic. A telescopic rod is readily adjustable.

[0024] According to another embodiment, the rod includes two parts that are to be placed so as to overlap each other, each comprising a series of holes, and a locking pin, through which holes the parts can be locked together by means of the locking pin so as to form a desired length of the rod.

[0025] A length of the installation tool from the installation head to the lower end of the rod can be 1 - 2 m, preferably 1.2 - 1.7 m. The installation tool is thereby particularly suitable for attaching anchor links to an installation object located above the user, such as a hollow-core slab of an overhead balcony, while the user stands on the floor without the use of ladders or platforms.

[0026] According to one embodiment, the recess is formed directly in the material forming the installation head. In this case, the structure of the installation head is particularly strong and durable.

[0027] In the embodiment set out in the foregoing, the installation tool can include a series of different installation heads for anchor links of different sizes and quick-attachment means for attaching a selected installation head to the rod in a detachable manner. The same installation tool can thus be used to install anchor links of different sizes.

[0028] According to another embodiment, the recess is formed in a separate insert that is detachably attachable to a cavity belonging to the installation head, and the installation tool includes a series of inserts that are suitable for anchor links of different sizes. In this case, the installation head itself can be the same when installing anchor links of different sizes while the insert to be attached to the installation head varies according to the size of the anchor link. In such an embodiment, the inserts could be made of a material that is less expensive than the installation head, the installation head preferably being made of anodized aluminium while the insert can be made of, for example, 3D or injection-moulded plastic. The installation head can be manufactured by machining aluminium.

[0029] With the anchor link installation tool according to the invention, it is possible to attach an anchor link manually from the floor using the rod.

[0030] Preferably, a wall thickness of the structure surrounding the recess of the installation head is 6 - 10 mm. The installation head is thereby strong enough to withstand the stresses acting on it.

[0031] Preferably, the installation head is made of anodized aluminium. This is a lightweight and durable material for forming an installation head.

[0032] The object of a method according to the invention can be achieved with a method for installing an anchor link in an overhead installation object, preferably in a threaded socket belonging to a ceiling or an intermediate floor, wherein in the method any of the embodiments of the installation tool according to the invention

mentioned in the foregoing is used as the installation tool, the anchor link is supported by gravity or by a frictional locking in the installation head of the installation tool, and the anchor link is rotated by means of a rod of the anchoring tool while the user stands on the floor. It is thus possible in the method according to the invention to attach an anchor link to an elevated installation object while the user stands on the floor without climbing onto ladders or other platforms.

[0033] Preferably, the installation object is a ceiling or intermediate floor. These are generally located at a height above the user that a direct installation of an anchor link in the same by reaching up from the floor is not possible.

[0034] The invention is illustrated in the following in detail with reference to the attached drawings illustrating embodiments of the invention, wherein

Figures 1a - 1c schematically show steps of an installation of an anchor link using an installation tool according to the invention in a sectional side view,
 Figure 2a shows an installation head of an installation tool according to the invention and an anchor link placed inside the same in a cross-sectional side view,
 Figure 2b shows, from a direction orthogonal to Figure 2a, the installation head of an installation tool according to the invention and an anchor link placed inside the same,
 Figure 3a shows an installation head of an installation tool according to the invention on its own in an axonometric view obliquely from below,
 Figure 3b shows an installation head of an installation tool according to the invention on its own in an axonometric view obliquely from above,
 Figure 3c shows an installation head of an installation tool according to the invention on its own in an axonometric view directly from the side and obliquely from above,
 Figure 3d shows an installation head of an installation tool according to the invention on its own in an axonometric view from above.

[0035] Figures 1a - 1c show the attachment of an anchor link 10 to a balcony or comparable ceiling on a construction site by means of an installation tool 12 according to the invention in steps. It is understood in this connection that the installation tool according to the invention can also be utilised in other use environments in which it is necessary to attach an anchor link to an overhead structure from a lower plane. On the other hand, the in-

stallation tool according to the invention can also be used in situations in which maintenance or other work that requires climbing a ladder is carried out subsequently on a completed balcony provided with railings. In this case, it is advisable for a user to attach him- or herself to a harness to prevent a fall over the balcony railing so that an installation tool according to the invention is necessary. An example of such work to be performed later on can be, for example, the glazing of the balcony.

[0036] The basic parts of an installation tool 12 according to the invention include an installation head 14 for an anchor link 10, a rod 16 connected at its upper end 18 to a lower part 22 of the installation head 14 and a turning handle 24 connected to a lower end 20 of the rod 16. Both the rod and the turning handle can be connected to the anchoring head in a detachable manner or can be, in the simplest design, permanently attached.

[0037] When the installation tool 12 according to the invention is used, the installation of the anchor link 10 starts with the placement of the anchor link 10 in the installation head 14 as shown in Figures 2a and 2b. The installation head 14 includes a recess 28 that is dimensioned to correspond in width, depth and length to the anchor link 10 to be used, so that the linking part 13 forming the anchor link 10 remains substantially inside the recess 28 and the bolt end 11 attached in a fixed manner or by a bearing to the linking part 13 remains visible outside the installation head 14. More specifically, the recess 28 is preferably dimensioned so as to be so tight that the anchor link 10 is incapable of rotation, while the bolt end 11 is preferably oriented parallel to the longitudinal direction of the rod 16. The inner surface of the recess 28 forms a support surface 33, which supports the linking part of the anchor link 10 during installation.

[0038] As shown in Figures 2a and 2b, an attachment link 40, which is preferably a carabiner, has already been attached to the anchor link 10 to be arranged in the installation head 14 prior to the installation of the anchor link 10. The attachment link 40 is substantially perpendicular to the linking part 13 of the anchor link 10. A slot 30 that forms an opening to the outside of the installation head 14 is formed in the recess 28, through which slot 30 the attachment link 40 extends to the outside of the installation head 14. An extension of the slot 30 is also provided in the form of a groove 48, which can be seen better in Figures 3b - 3d, which provides more room for the attachment link 40 outside of the form of the anchor link 10. A mooring line or cable 52 has preferably already been attached to the attachment link 40 prior to installation, the mooring line or cable 52 extending down to the plane of the turning handle 24 of the installation tool 12 as shown in Figure 1a, to which the user 100 can attach him- or herself after the attachment of the anchor link 10.

[0039] When the anchor link 10 has been securely placed in the installation head 14 of the installation tool 12, the anchor link 10 can be raised as shown in Figure 1a by means of the installation tool 12 into the installation object, which is a threaded socket 26 in a hollow-core

slab 50 of an overhead balcony in Figure 1a. The threaded socket is a mating thread already connected to the hollow-core slab during its manufacture to which the anchor link can be fastened. When the installation tool 12 is used, the anchor link 10 can be attached manually from the floor using the rod 16 without a ladder or other means that require climbing.

[0040] The user 100 starts to turn the installation head 16 by means of the rod 16 or with the rod 16 using the turning handle 24, so that the threads of the bolt end 11 of the anchor link 10 are placed in alignment with the mating threads of the threaded socket 26, and continues to turn the installation tool 12 until the anchor link 10 is fully screwed into the threaded socket as shown in Figure 1b. During rotation, the support surface 33 of the installation head 14 provides torque support to the anchor link 10 and enables the transmission of force from the installation tool 12 to the anchor link 10. A final locking torque of the anchor link 10 is achieved by means of the turning handle 24 by rotating the rod 16 and the installation head 14. The turning handle can also include an indicator of the correct tightening torque, for example a dial and pointer known from a torque wrench.

[0041] As shown in Figure 1c, the user 100 pulls the installation tool downwards off the anchor link 10, which remains in place. Finally, the user 100 attaches his or her harness to the mooring line or cable 52 by means of a separate, further attachment link 54 and, for example, an intermediary line or cable 60. The user can now move freely on a, e.g. railingless, balcony without fear of falling. Two users can be attached to the same anchor link, each preferably by their own mooring line or cable.

[0042] As shown in Figure 2b, the slot 30 located between the outer surface of the installation head 14 and the recess 28 is advantageously configured so as to have three sections of different widths. The section with the greatest width or wide section 42 is intended to receive a locking link 44 of a bolt end 11 belonging to any anchor link 10, the purpose of the locking link 44 being to hold the bolt end 11 in position relative to the linking part 13 when the bolt end 11 is rotatably attached by a bearing to the linking part 13. When the linking part 13 is locked in the recess 28 of the installation head 14, the bolt end 11 must also be locked relative to the linking part 13 so that the torque can be transmitted to the bolt end 11 via the linking part 13. To this end, a rotation of the bolt end 11 relative to the linking part 13 is prevented by inserting the locking link 44, which is permanently attached to the bolt end 11, into the wide section 42 of the slot 30, where it is unable to rotate.

[0043] The width of the slot 30 at the next section or narrow section 46 of the slot 30 is configured to correspond in width to the locking sleeve 64 or locking element of the attachment link 40 as shown in Figures 2b and 3b - 3d. The slot can further include a third section, not shown in the figures, which is narrower in width than the aforementioned sections and which receives a part of the attachment link outside the locking sleeve, the width of

which is smaller than that of the locking sleeve. The entire attachment link is thus solidly supported by means of the slot as well as in part by means of a groove into which part of the attachment link extends.

[0044] The recess 28 can be dimensioned so as to have a width of 50 - 90 mm, preferably 60 - 80 mm, corresponding to the width of the anchor link in the direction of the plane of the opening located in the middle of the linking part. The length of the recess in the direction of a line running orthogonally through the anchor link can be 10 - 30 mm, preferably 15 - 24 mm. The depth of the recess in the direction of the longitudinal orientation of the rod can be 30 - 70 mm, preferably 35 - 55 mm. Preferably, the recess is dimensioned so that a friction forms between the anchor link and the installation head that holds the anchor link in place relative to the installation head. To enhance the friction, the inner surface of the recess can be coated, for example, with a rubber surface or the like.

[0045] As shown in Figures 2a, 2b and 3b - 3d, the recess 28 in the installation head 14 can be a cavity worked, e.g. machined, directly into the installation head 14. Alternatively, the installation head can also be a casting with a corresponding recess. A cavity 66 as shown in Figure 3a is also formed in the installation head 14 for a spindle 62 of the rod 16, which is visible in Figure 2a. In this case, the cavity 66 and the spindle 62 form quick-attachment means 34 for attaching the rod 16 to the installation head 14.

[0046] Alternatively, to a recess to be worked or formed directly in the installation head, it is conceivable that only a rectangular prism-shaped recess is formed in the installation head, into which an insert dimensioned specifically for the anchor link is placed, which comprises a recess and a slot adapted to the anchor link. The recess formed in the insert in the installation head would be open on the side of the slot so that the attachment link can extend outside the installation head. The insert can be, for example, a piece that is machined from plastic or 3D printed. Preferably, there are a plurality of inserts corresponding to different anchor links.

[0047] The turning handle preferably comprises a ratchet member and the turning handle is pivoted back and forth during installation, whereby the rod and the installation head rotate in a chosen direction according to the setting of the ratchet wrench.

[0048] The installation head is preferably made of anodized aluminium. In contrast to Figures 3a - 3d, the outer shape of the installation head is preferably rendered as light as the recess allows so as to minimize the weight of the installation head. However, the wall thickness should be 6 - 10 mm at all points. The weight of the installation head can be, for example, 300 g when made of anodized aluminium. The rod can also be made of aluminium. The low weight of the installation head is an advantage, making it is easy to use the installation tool. A weight of the installation tool can be influenced by the selection of the material as well as by a reduction of the

number of parts of the installation tool.

[0049] The installation head of one embodiment can be realized so that, instead of a recess, the installation head includes a first transverse, with respect to the rod, support member configured to be placed inside the linking part of the anchor link and two second transverse support members configured to be placed on either side of the bolt end of the anchor link in order to support the anchor link in a vertical position during installation. In this type of embodiment, the anchor link is removed by moving the installation head laterally relative to the anchor link after installation.

Claims

1. An anchor link installation tool (12) for installing an anchor link (10), wherein the installation tool (12) includes

- a installation head (14) configured to hold an anchor link (10), and
- a rod (16) comprising an upper end (18) and a lower end (20), attached at its upper end (18) to the installation head (14), for rotating the installation head (14),

characterized in that the installation head (14) includes a torque-bearing support surface (33) for supporting the anchor link (10) in a releasable manner in the installation head (14) during installation of the anchor link (10) with a bolt end (11) belonging to the anchor link (10) sticking out.

2. The installation tool according to claim 1, **characterized in that** the installation tool (10) further includes a turning handle (24), which is attached to the rod (16), preferably to the lower end (20) of the rod (16), for turning the installation head (14) with the rod (16).

3. The installation tool according to claim 1 or 2, **characterized in that** the installation head (14) includes a recess (28), which forms the support surface (33), for accommodating a linking part belonging to the anchor link (10) in the installation head (14).

4. The installation tool according to any of claims 1 - 3, **characterized in that** the recess (28) is configured to correspond in width and in length to the linking part (13) of the anchor link (10), with a width of 50 - 90 mm, preferably 60 - 80 mm, and a length of 10 - 30 mm, preferably 15 - 24 mm, and a depth of 30 - 70 mm, preferably 35 - 55 mm.

5. The installation tool according to claim 3 or 4, **characterized in that** the installation head (14) includes a slot (30) of a depth of the recess (28) between the recess (28) and the outer surface of the installation

head (14) for an attachment link (40) to be attached to the anchor link (10), preferably for a carabiner.

6. The installation tool according to claim 5, **characterized in that** the slot (30) includes a wide section (42) that is wide in a depth direction of the slot (30) for a locking link (44) belonging to the bolt end (11) of the anchor link (10) and a narrow section (46) that is narrower in width than the wide section (42) for the attachment link (40).

7. The installation tool according to any of claims 2 - 6, **characterized in that** the recess (28) is dimensioned to correspond to the outer dimensions of the linking part (13) of the anchor link (10) so that a contact is formed between the anchor link (10) and the installation head, friction of the which holds the anchor link (10) in place relative to the installation head (14) during installation.

8. The installation tool according to any of claims 1 - 7, **characterized in that** the installation tool (12) further includes a ratchet member for connecting the turning handle (24) to the rod (16).

9. The installation tool according to any of claims 1 - 8, **characterized in that** a length of the installation tool from the installation head (14) to the lower end (20) of the rod (16) is 1 - 2 m, preferably 1.2 - 1.7 m.

10. The installation tool according to any of claims 3 - 9, **characterized in that** the recess (28) is formed directly in the material forming the installation head (14).

11. The installation tool according to any of claims 1 - 10, **characterized in that** the installation tool (12) includes a series of different installation heads (14) for anchor links (10) of different sizes and quick-attachment means (34) for attaching a selected installation head (14) to the rod (16) in a detachable manner.

12. The installation tool according to any of claims 3 - 9, **characterized in that** the recess (28) is formed in a separate insert that is detachably attachable to a cavity belonging to the installation head (14), and the installation tool includes a series of inserts that are suitable for anchor links (10) of different sizes.

13. The installation tool according to any of claims 1 - 12, **characterized in that** a wall thickness of the structure surrounding the recess of the installation head (14) is 6 - 10 mm.

14. The installation tool according to any of claims 1 - 13, **characterized in that** the installation head (14) is made of anodized carbon.

15. A method for installing an anchor link (10) in an overhead installation object, preferably in a threaded socket (26) belonging to a ceiling or an intermediate floor, wherein in the method an anchor link (10) is rotated into the threaded socket (26) by means of an installation tool (12), **characterized in that** an installation tool (12) according to any of claims 1 - 14 is used as the installation tool (12), the anchor link (10) is supported by gravity or by a frictional locking in the installation head (14) of the installation tool (12) and the anchor link is rotated by means of a rod of the anchor tool (12) while the user stands on the floor.

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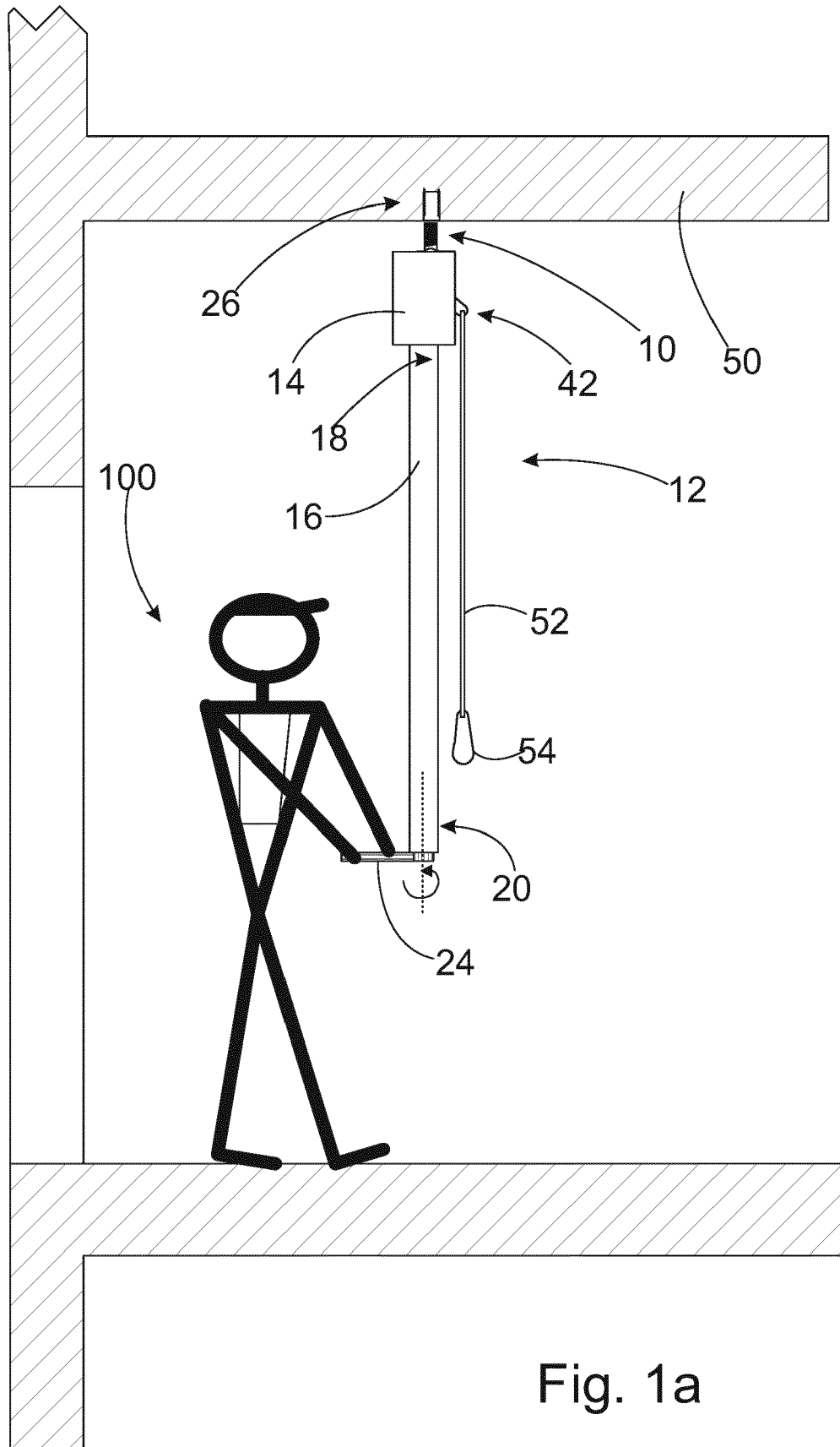
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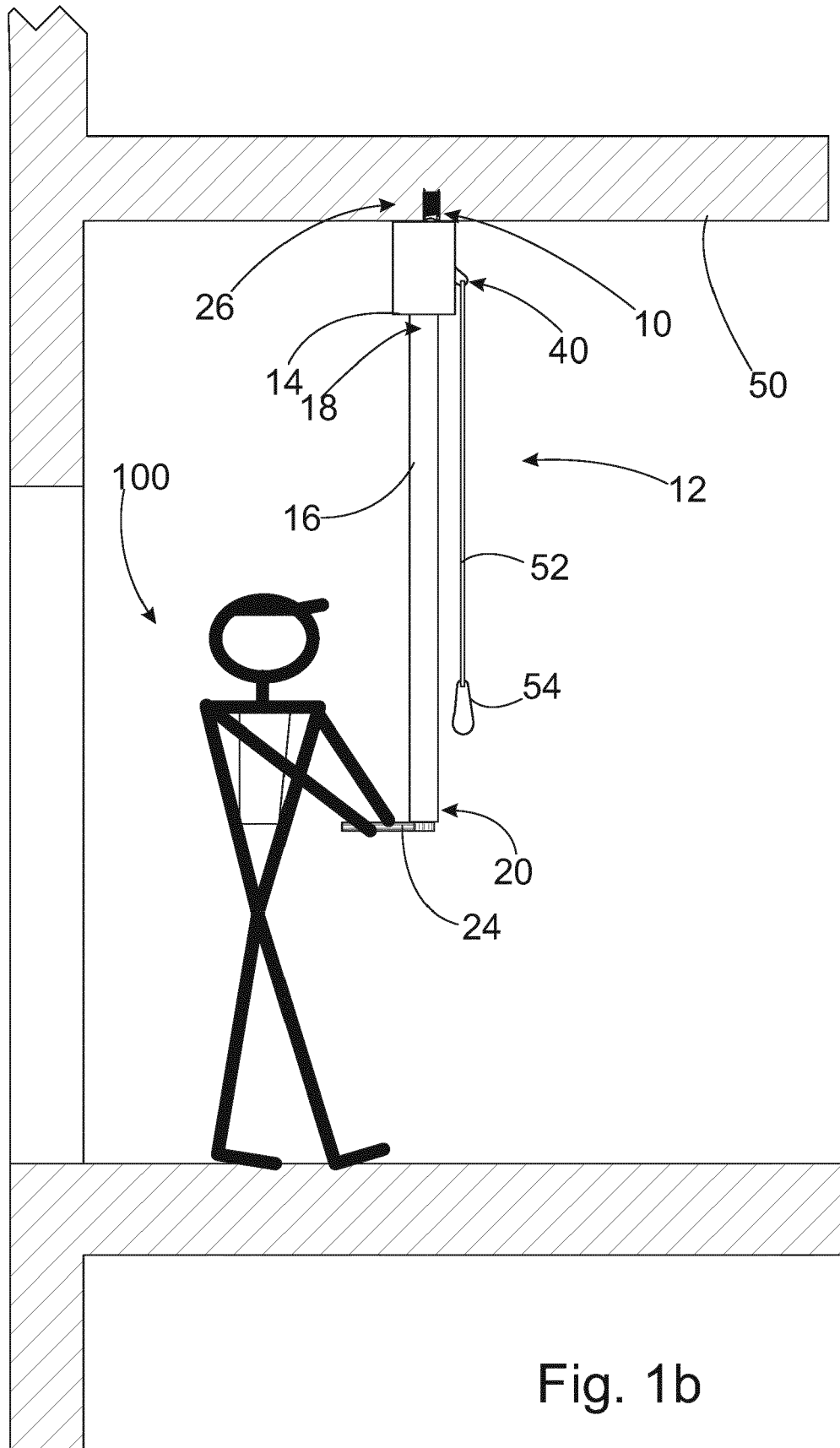


Fig. 1b

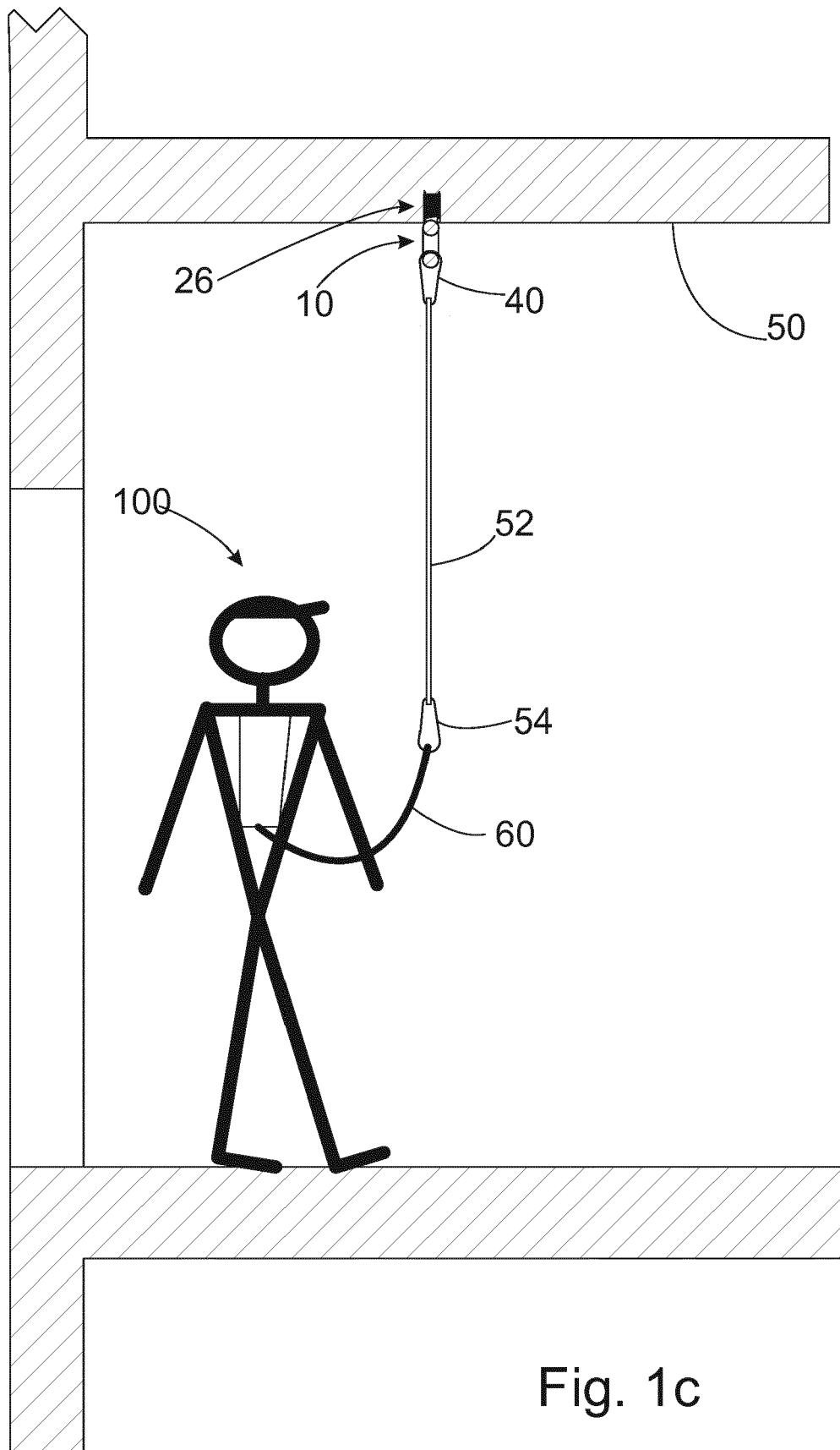
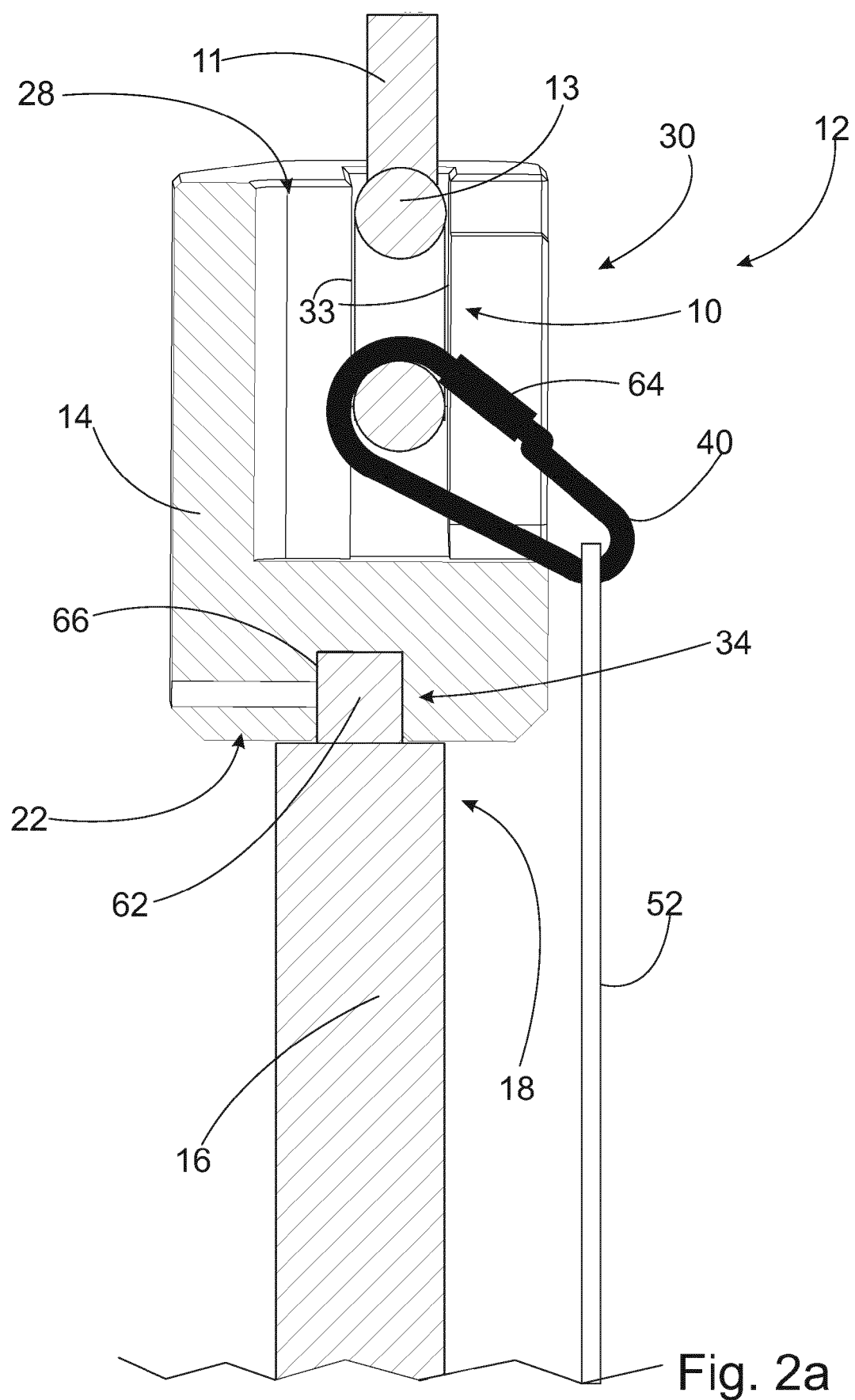
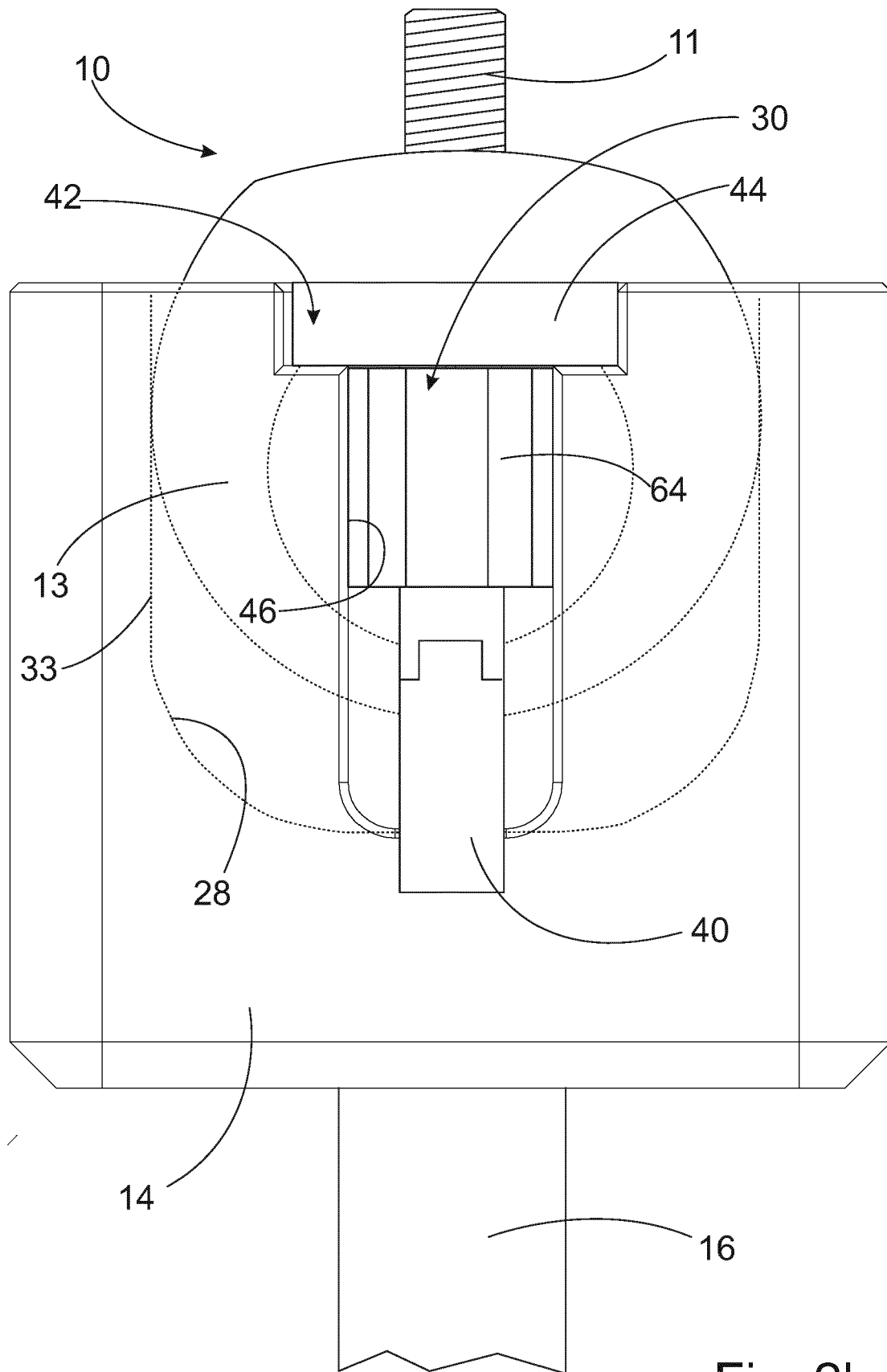


Fig. 1c





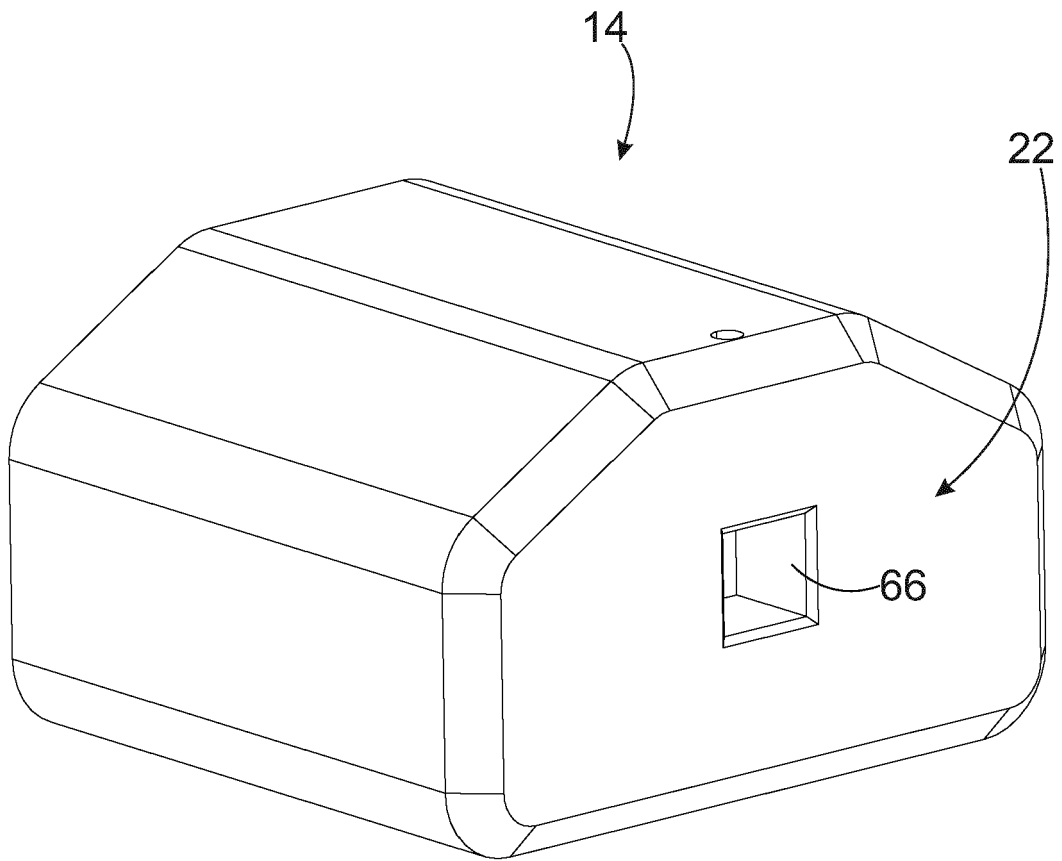


Fig. 3a

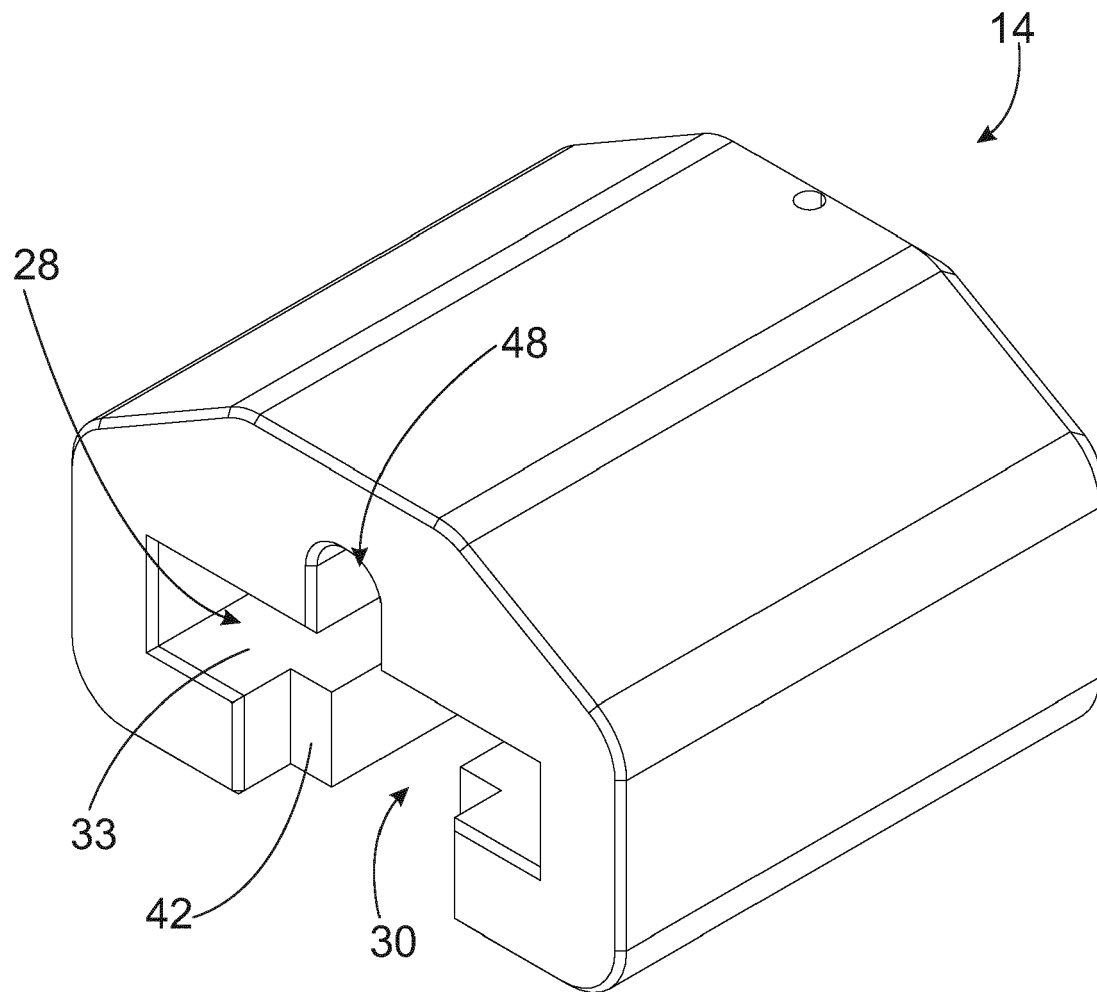


Fig. 3b

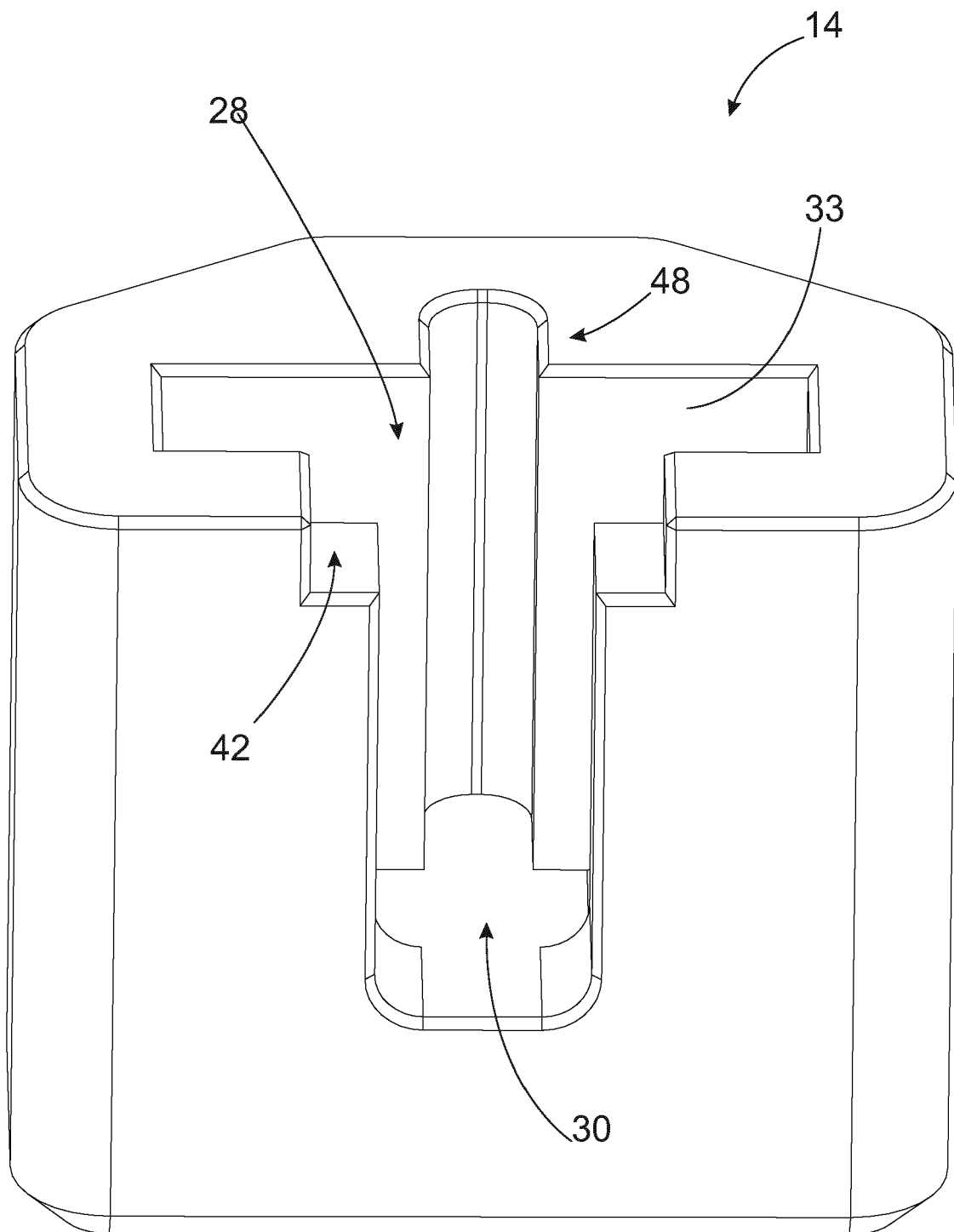


Fig. 3c

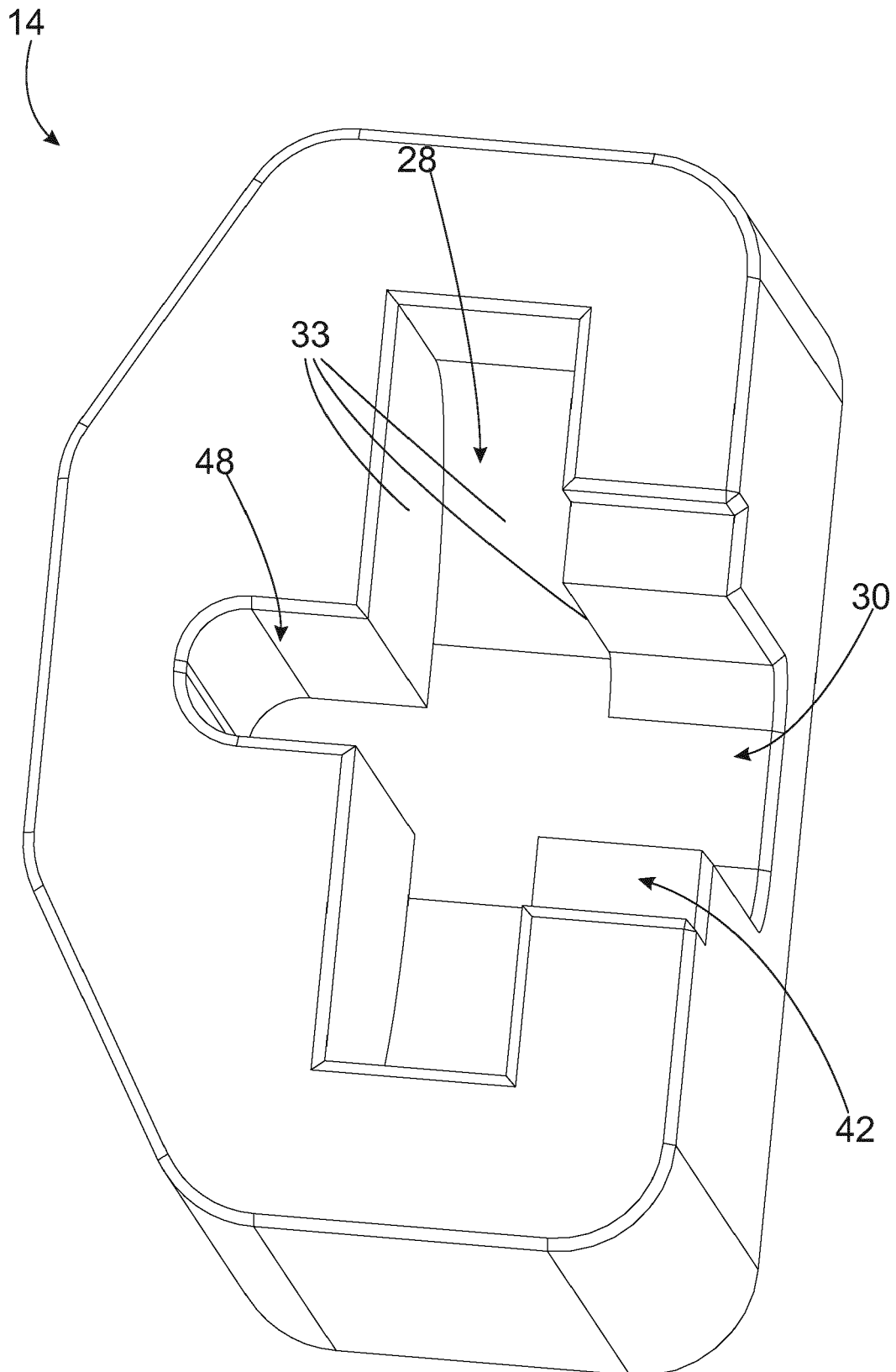


Fig. 3d



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 3314

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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 2014/318324 A1 (BUCHNER DAVID J [US] ET AL) 30 October 2014 (2014-10-30) * paragraph [0002] * * paragraph [0007] * * paragraphs [0022] - [0027] * * paragraphs [0053] - [0055] * * paragraph [0059] * * figures 1a-11 * -----	1-15	INV. A62B35/00 B25B31/00
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