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(54) **Improvements in or relating to panel connections**

(57) Two construction panels 10 have edges 12. Each edge 12 has a recess 14. That is, the recess 14 is open at the edge 12. The recess 14 receives, in use, an end of a connection arrangement indicated generally at 16. Each panel 10 further comprises an aperture extending from a face of the panel 10 to the recess 14 to receive, in use, a fixing pin 22 which retains the connection ar-

rangement 16 in the recess 14. The connection arrangement 16 may include a turnbuckle arrangement formed by threaded members 36 each threaded to a common connector member 38 and each having an eye 42 to receive one of the fixings 22. Turning the common member 38 allows the threaded members 36 to be moved together or apart.

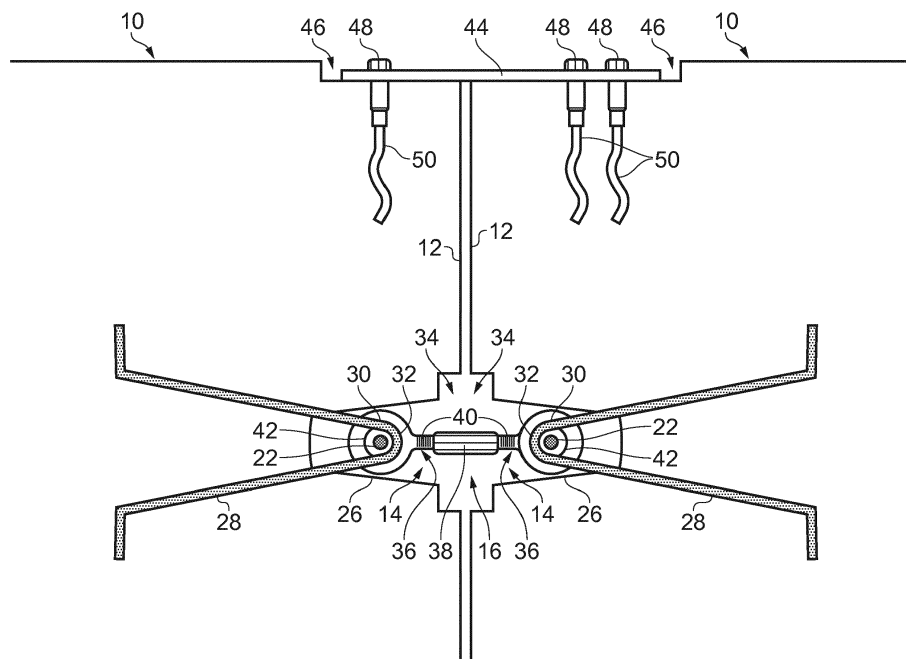


FIG. 1

Description

[0001] The present invention concerns improvements in or relating to panel connections.

[0002] Some building techniques make use of prefabricated panels which are assembled at the construction site in order to form a building or other structure. Typically, panels are secured together in an edge-to-edge relationship. Panels are vulnerable to becoming misaligned until they have been fixed in position and may even represent a danger to personnel in the event that they are dislodged and fall over. It is therefore desirable for any fixing arrangements to be capable of installation quickly, in order to minimise these risks, and securely.

[0003] Examples of the present invention provide a construction panel having an edge which is a panel side edge, in use, and a recess in the panel side edge, wherein the recess receives, in use, an end of a connection arrangement, and wherein the panel further comprises an aperture extending from a face of the panel to the recess to receive, in use, a fixing to retain the connection arrangement in the recess.

[0004] The panel edge may be rebated to provide access from a face of the panel to a connection arrangement received in the recess.

[0005] The aperture may extend from the panel face in a direction generally perpendicular to the plane of the panel.

[0006] The panel may comprise a socket member at the edge and defining the recess and/or the aperture. The panel may be made of settable material, the socket member serving as a former for the recess and/or the aperture prior to the panel material setting. The panel may further comprise reinforcing members within the body of the panel. The reinforcing members may include a purchase portion positioned between the edge of the panel and a fixing in the aperture, to provide a mechanical purchase for the fixing.

[0007] The panel may further comprise a connection arrangement for receipt, in use, in the panel edge recess, and a fixing for receipt, in use, in the aperture to engage the connection arrangement to retain the connection arrangement in the recess.

[0008] The connection arrangement may comprise a turnbuckle having first and second threaded members threaded to a common connector member, so that rotation of the common connector member causes the threaded members to move together or apart. One of the threaded members may be an eye-bolt having an eye in the recess and engaged by the fixing. The fixing may be an elongate member.

[0009] Examples of the present invention also provide a construction panel connection arrangement comprising a construction panel according to any of the preceding definitions, a connection arrangement received in the panel edge recess, and a fixing received in the aperture and engaging the connection arrangement to retain the connection arrangement in the recess.

[0010] The connection arrangement may comprise a turnbuckle having first and second threaded members threaded to a common connector member, so that rotation of the common connector member causes the threaded members to move together or apart. One of the threaded members may be an eye-bolt having an eye in the recess and engaged by the fixing. The fixing may be an elongate member.

[0011] Examples of the present invention will now be described in more detail, by way of example only, and with reference to the accompanying drawings, in which:

Fig. 1 is an elevation in section of two construction panels in accordance with the present invention and connected by means of a panel connection arrangement in accordance with the present invention;

Fig. 2 is a plan in section through the arrangement of Fig. 1, at the section line 2-2;

Fig. 3 is an external elevation view of the arrangement of Fig. 1; and

Figs. 4 and 5 are a plan in section and an external elevation view of an arrangement for securing a panel to a final structure.

Overview

[0012] Figs. 1 to 3 illustrate two construction panels 10, each of which has an edge 12. The edges 12 are connected, as will be described. Each edge 12 has a recess 14. That is, the recess 14 is open at the edge 12. The recess 14 receives, in use, an end of a connection arrangement indicated generally at 16. Each panel 10 further comprises an aperture 18 (Figs. 2 and 3) extending from a face 20 of the panel 10 to the recess 14 to receive, in use, a fixing 22 which retains the connection arrangement 16 in the recess 14.

Panel Construction

[0013] The main bodies of the panels 10 are formed of a settable material such as concrete or another cementitious material. The panels 10 may therefore be cast by setting the material in a mould. Prior to introducing the settable material into the mould, a socket member 26 is positioned in the mould to serve as a former. The socket member 26 may be made of a plastics material, for example. The socket member 26 serves as a former for the recess 14. In this example, the socket member 26 also serves as a former for the aperture 18. That is, when the settable material is cast, the main body of the panel 10 is provided, but the presence of the socket member 26 prevents settable material entering the recess 14 or the aperture 18, which therefore both remain as voids. The socket member 26 remains cast into the panel 10, once the settable material has set.

[0014] The recess 14 extends inboard of the panel 10, from the edge 12. In this example, the aperture 18 extends from the face 20 in a direction generally perpendicular to the plane of the panel 10, to open into the recess 14.

[0015] In this example, each panel 10 also includes at least one reinforcing member 28. At least two are preferred, to help prevent twisting when the connection is under load. Each reinforcing member may be in the form of a length of reinforcing bar or rebar. In this example, the reinforcing member 28 has a purchase portion 30 in the form of a generally U-shaped loop. The reinforcing members 28 also have feet 31 which anchor the member 28 in the body of the panel 10. The extremity 32 of the U-shaped purchase portion 30 lies between the edge 12 and the position at which the fixing 22 is received in the aperture 18, in order to provide a mechanical purchase for the fixing 22, as will be described.

[0016] The edge 12 of each panel 10 is also rebated at 34 to provide access from the face 20 to the connection arrangement 16 when received in the recesses 14, as will be described.

Construction of the Connection Arrangement

[0017] The connection arrangement 16 includes a turnbuckle arrangement in this example, formed by threaded members 36 which are each threaded to a common connector member 38. The threaded members 36 are threaded in opposite senses. That is, one has a right handed thread and the other has a left handed thread. The connector member 38 has complementary threads. Consequently, if the threaded members 36 are prevented from turning, any rotation of the common connection member 38 will cause the threaded members 36 to be moved together or apart.

[0018] In this example, the threaded members 36 are eye-bolts having a threaded shank 40 threaded into the connection member 38 and an eye 42 which, in use, lies in the vicinity of the aperture 18. That is, the eye-bolts 36 can be positioned within the recesses 14 so that the eyes of the eye-bolts 36 are aligned with the apertures 18.

[0019] Each fixing 22 is in the form of an elongate bar of suitable strength, in this example. In use, each fixing 22 is introduced through the aperture 18 into the recess 14. When the eye-bolts 36 are aligned with the aperture 18, as described above, this causes the fixing 22 to extend through the eye of the eye-bolt 36.

Connection of Panel Edges

[0020] The mechanisms described above can be used as a construction panel connection arrangement in the following manner.

[0021] First, one of the panels 10 is placed in its intended position and secured in position. This leaves the edge 12 exposed. The second panel 10 is then introduced alongside the first panel so that the edges 12 are

opposed to each other and initially spaced apart, and so that the recesses 14 are aligned.

[0022] While there is still sufficient space between the edges 12 to do so, the turnbuckle 16 is introduced between the edges 12, so that one of the eye-bolts 36 extends into the recess 14 of one of the panels 10 and the other eye-bolt extends into the recess 14 of the other panel 10. The panels 10 can then be brought together until the edges 12 are in abutment. It may be desirable to provide a flexible or resilient seal strip 43 (Fig. 2) between the edges 12. Prior to introduction of the turnbuckle 16, the length of the turnbuckle is set so that once the edges 12 have been brought together, each eye-bolt 36 will have its eye generally in alignment with the corresponding aperture 18. This allows the fixing 22 to be introduced through the aperture 18 (see Fig. 3, particularly), thus penetrating the eye of the eye-bolt 36. This also places each fixing 22 in the extremity 32 of the U-shaped purchase portion 30 of the corresponding reinforcing members 28. In consequence, the fixing 22 serves as a locking pin which prevents the eye-bolt 36 being withdrawn from the recess 14, through the edge 12, because the eye of the eye-bolt 36 is penetrated by the fixing 22. In addition, the fixing 22 can bear on the extremity 32 of the purchase portion 30, so that forces exerted on the fixing 22 are transferred to the reinforcing member 28 and can thus be dissipated through the panel 10.

[0023] Having introduced the turnbuckle 16 between the panels 10 and secured it in position by means of the fixings 22, the connection member 38 can then be accessed from the panel faces 20, through the rebates 34 (Fig. 3), for example by means of a spanner, wrench, or other suitable tool. This allows the connection member 38 to be turned. The eye-bolts 36 are held against turning, by the fixings 22. Thus the eye-bolts 36 are pulled together and therefore the panel edges 12 are also pulled together, until they are locked adequately securely into position. This process can also be used to compress any seal material provided between the edges 12.

[0024] The fixings 22 may be covered after installation. For example, a cap of plastic or other material may be fitted over them to close the aperture 18 for cosmetic reasons and/or to keep the aperture 18 clean.

Other Optional Arrangements

[0025] Corners of the panels 10 may be further secured together by using a connecting plate 44 set into further rebates 46 and secured in position by further bolts 48, which may engage anchors 50 set in the body 24 of the panel 10. The connecting plate 44 bridges the gap between the panels.

Concluding Comments

[0026] The arrangements described above provide a connection between adjacent panels 10, each provided with a recess 14 and an aperture 18. That is, the arrange-

ment described above is generally symmetrical about the border between the panels 10. In an alternative arrangement, (Figs. 4 and 5) one of the eye-bolts 36 can be replaced by a fixed, threaded member 52 such as a socket embedded in a fixed structure 54 adjacent the panel 10. The socket 52 is secured in the structure 54 by an anchor 56. The connection member 38 can then be threaded to the fixed socket 52 by a short length of threaded bar 58 to form a turnbuckle, prior to the panel 10 being offered to its final position and thereafter, the arrangements for keeping the turnbuckle in the panel edge by means of a fixing 22, and for tightening the turnbuckle 16, will be as described above. Connecting plates 44 can also be used.

[0027] A connection of the type described above can be assembled and disassembled easily, at any time. The turnbuckle and fixings can be reused in another suitable panel and can be replaced with alternative strength arrangements, if required.

[0028] It is also envisaged that a connection can be created quickly in order to provide some initial security of connection sufficient to prevent panels falling or being dislodged. All that is required is to introduce the turnbuckle into each panel edge and to hold it in place by means of a fixing 22. At this point, the connection will be complete, but not fully tightened to pull the edges together or to compress any joint or seal strip provided between the panels. This can be completed as a subsequent step, knowing that the panels are held in position against falling or being dislodged, and therefore that they do not represent a danger to personnel. The process of assembling and tightening the connection does not require skilled labour.

[0029] The strength of the connection formed in the manner described above will depend on various factors, such as the tension capacity of the turnbuckle components (the eye bolts 36 and the common connection member 38) and the sheer strength of the fixing 22. The load capacity of the connection can therefore be changed by modifying the sizes and/or material properties of these components.

[0030] Many variations and modifications can be made to the apparatus described above, without departing from the scope of the present invention. In particular, many different shapes, sizes and relative shapes and sizes for the various components can be used. The turnbuckle has been described as having two eye-bolts with threaded shanks, threaded to a common connection member, but alternatively, the common connection member could have two threaded shanks extending in opposite directions for connection with internally threaded collars on threaded members 36. Arrangements other than turnbuckles could be envisaged for location within the recesses 14. Other arrangements could be used for providing purchase for the fixings 22 and/or for transferring forces from the fixings to the panel or its reinforcing members.

[0031] Whilst endeavouring in the foregoing specifica-

tion to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. A construction panel having an edge which is a panel side edge, in use, and a recess in the panel side edge, wherein the recess receives, in use, an end of a connection arrangement, and wherein the panel further comprises an aperture extending from a face of the panel to the recess to receive, in use, a fixing to retain the connection arrangement in the recess.
2. A panel according to claim 1, wherein the panel edge is rebated to provide access from a face of the panel to a connection arrangement received in the recess.
3. A panel according to claim 1 or 2, wherein the aperture extends from the panel face in a direction generally perpendicular to the plane of the panel.
4. A panel according to any preceding claim, comprising a socket member at the edge and defining the recess and/or the aperture.
5. A panel according to claim 4, wherein the panel is made of settable material, the socket member serving as a former for the recess and/or the aperture prior to the panel material setting.
6. A panel according to any preceding claim and further comprising reinforcing members within the body of the panel.
7. A panel according to claim 6, wherein the reinforcing members include a purchase portion positioned between the edge of the panel and a fixing in the aperture, to provide a mechanical purchase for the fixing.
8. A panel according to any preceding claim, further comprising a connection arrangement for receipt, in use, in the panel edge recess, and a fixing for receipt, in use, in the aperture to engage the connection arrangement to retain the connection arrangement in the recess.
9. A panel according to claim 8, wherein the connection arrangement comprises a turnbuckle having first and second threaded members threaded to a common connector member, so that rotation of the common connector member causes the threaded members to move together or apart.

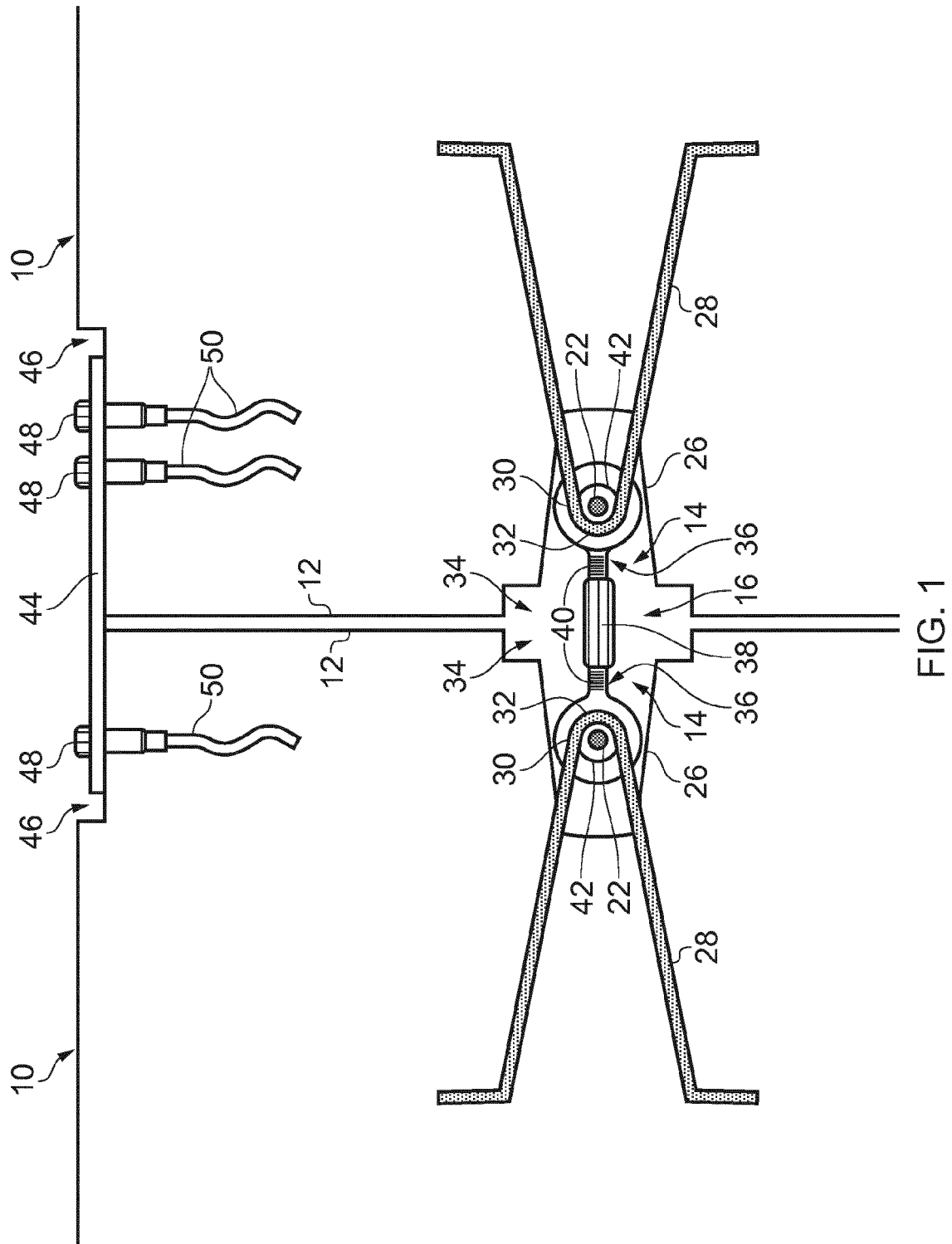
10. A panel according to claim 9, wherein one of the threaded members is an eye-bolt having an eye in the recess and engaged by the fixing.
11. A panel according to any preceding claim, wherein the fixing is an elongate member. 5
12. A panel substantially as described above, with reference to the accompanying drawings. 10
13. A construction panel connection arrangement comprising a construction panel according to any of claims 1 to 12, a connection arrangement received in the panel edge recess, and a fixing received in the aperture and engaging the connection arrangement to retain the connection arrangement in the recess. 15
14. An arrangement according to claim 13, wherein the connection arrangement comprises a turnbuckle having first and second threaded members threaded to a common connector member, so that rotation of the common connector member causes the threaded members to move together or apart. 20
15. An arrangement according to claim 14, wherein one of the threaded members is an eye-bolt having an eye in the recess and engaged by the fixing. 25
16. An arrangement according to any of claims 13 to 15, wherein the fixing is an elongate member. 30
17. Any novel subject matter or combination including novel subject matter disclosed herein, whether or not within the scope of or relating to the same invention as any of the preceding claims. 35

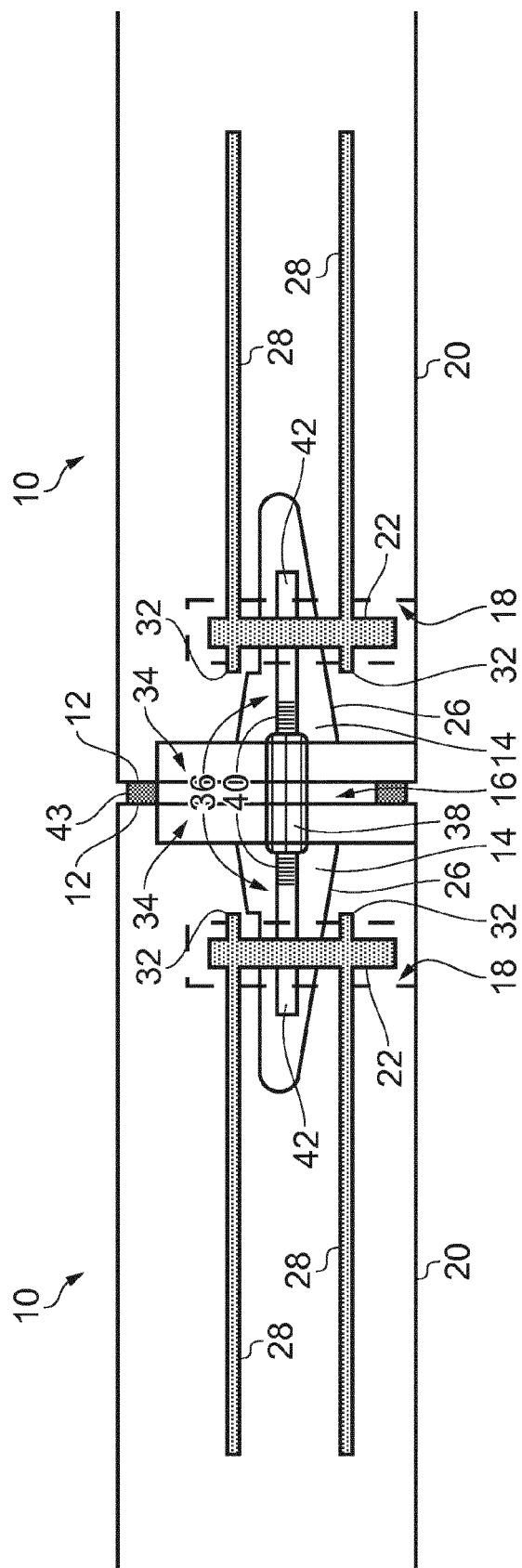
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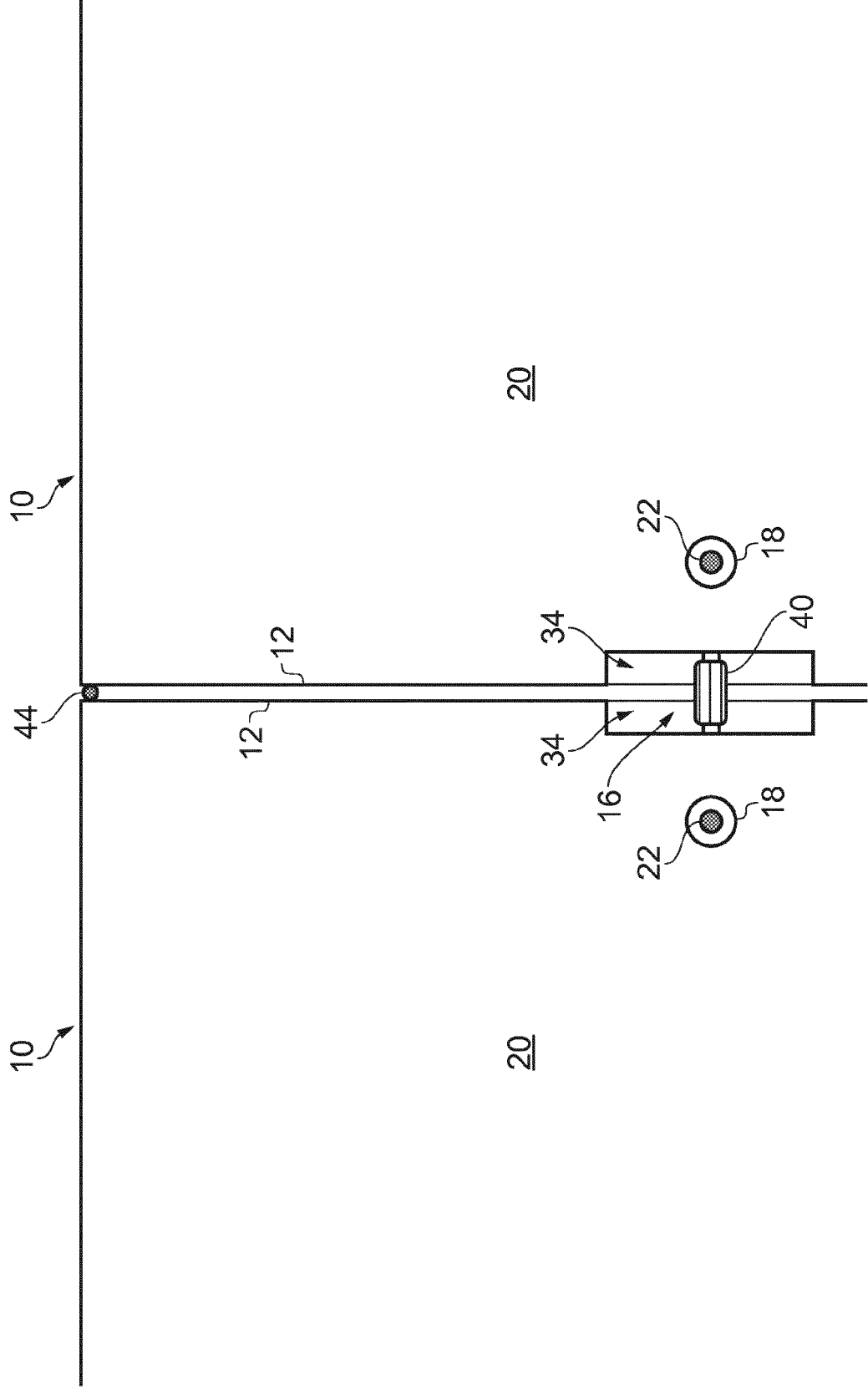


FIG. 3

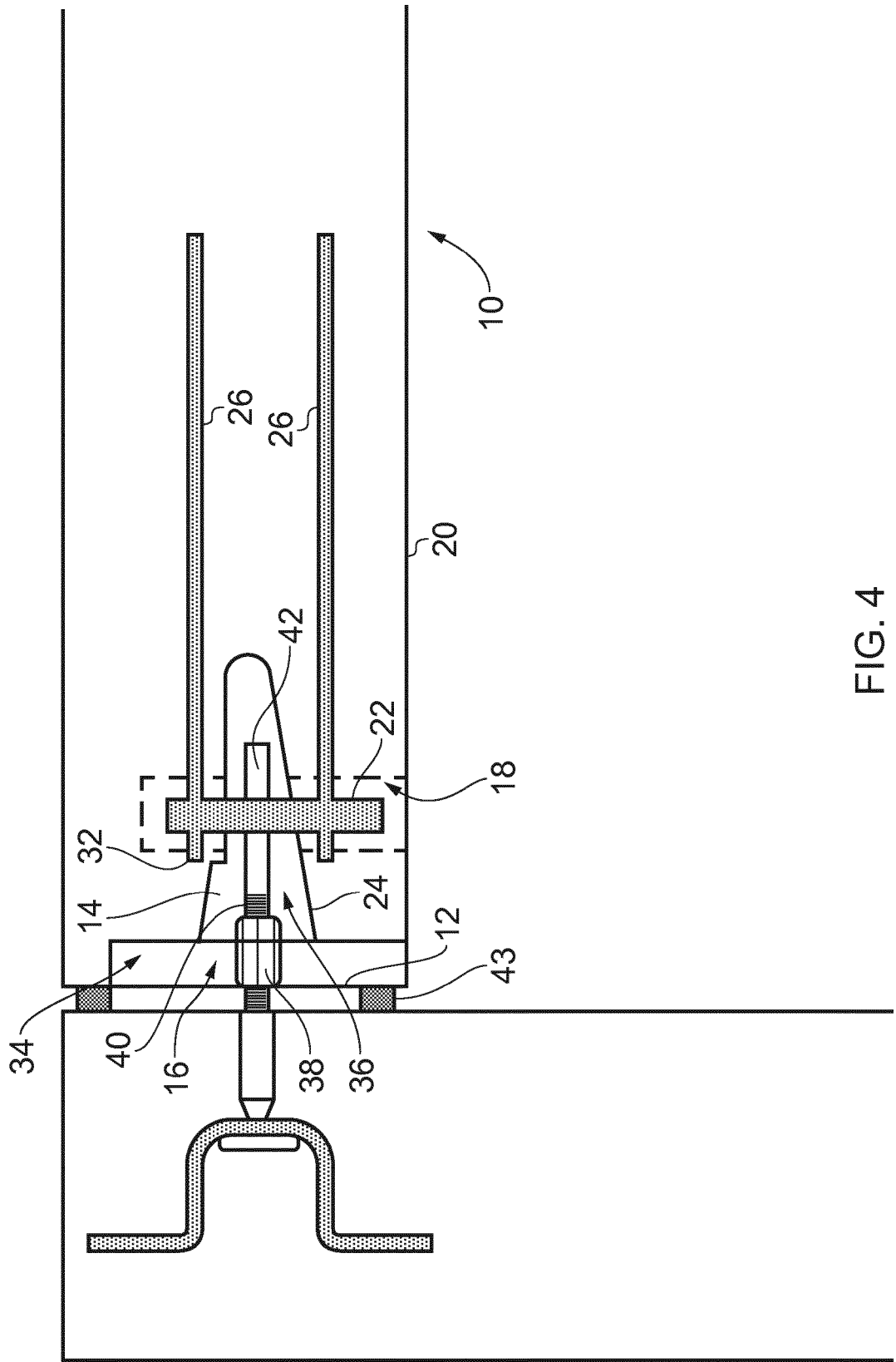


FIG. 4

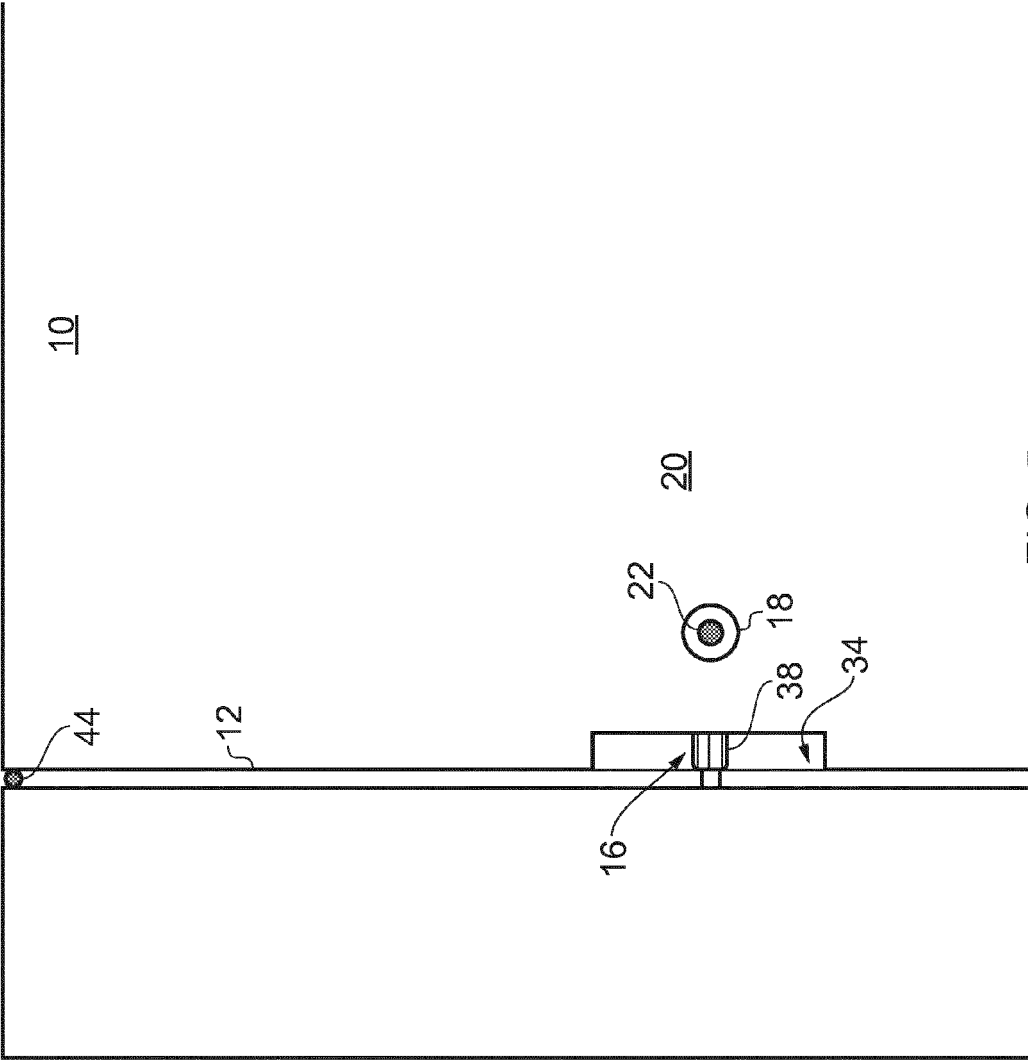


FIG. 5



EUROPEAN SEARCH REPORT

 Application Number
EP 14 17 2630

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 October 2014	Examiner Zuurveld, Gerben
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			

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

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