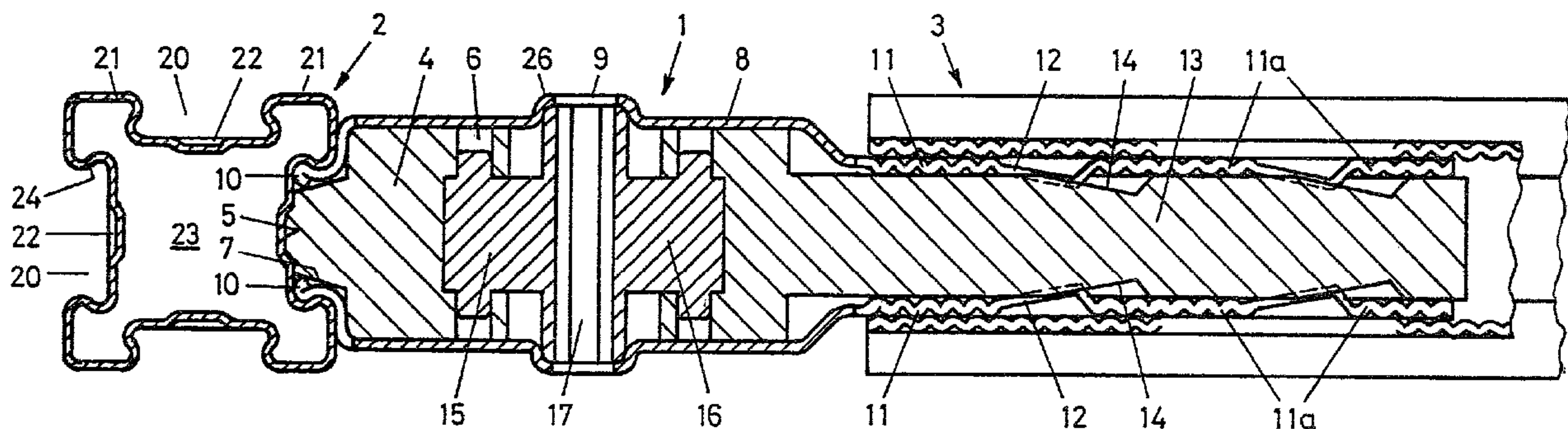




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(54) Titre : CONNEXION DE DEUX BARRES EN SECTIONS, BARRES EN SECTIONS D'UN SYSTEME D'APPUI, SYSTEME D'APPUI D'APPAREIL SANITAIRE ET PROCEDE DE FABRICATION D'UN SYSTEME D'APPUI
(54) Title: CONNECTION OF TWO SECTIONAL BARS, SECTIONAL BARS FOR A SUPPORT SYSTEM AND SUPPORT SYSTEM FOR SANITARY APPARATUS, AS WELL AS A PROCESS FOR CONSTRUCTING SUCH A SUPPORT SYSTEM



(57) Abrégé/Abstract:

The connection has a connection piece (1), which has two displaceable wedges (4, 13) in a bearing housing (8). These wedges (4, 13) can be displaced in the bearing housing (8) independently of one another by means of a guide bearing (15, 16). In the working position, the wedge (4) extends into a dovetailed longitudinal groove (20) of a sectional bar (2). The front side (5) of the wedge (4) is profiled and engages a correspondingly profiled wall (22) of the sectional bar (2) in a positive-locking manner. The wedge (4) spreads two clamping tongues of the bearing housing (8) against the flanks of the longitudinal groove (20). By pivoting the guide bearing (15), the wedge (4) can be retracted, and the connection can be separated. A second wedge (13) is inserted axially into the interior space of a second profiled piece (3). This wedge (13) spreads two brackets (11) of the bearing housing (8). Both sectional bars (2, 3) have the same design and may be cut off to any desired length. No further processing of the sectional bars (2, 3) is necessary.



ABSTRACT OF THE DISCLOSURE

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The connection has a connection piece (1), which has two displaceable wedges (4, 13) in a bearing housing (8). These wedges (4, 13) can be displaced in the bearing housing (8) independently of one another by means of a guide bearing (15, 16). In the working position, the wedge (4) extends into a dovetailed longitudinal groove (20) of a sectional bar (2). The front side (5) of the wedge (4) is profiled and engages a correspondingly profiled wall (22) of the sectional bar (2) in a positive-locking manner. The wedge (4) spreads two clamping tongues of the bearing housing (8) against the flanks of the longitudinal groove (20). By pivoting the guide bearing (15), the wedge (4) can be retracted, and the connection can be separated. A second wedge (13) is inserted axially into the interior space of a second profiled piece (3). This wedge (13) spreads two brackets (11) of the bearing housing (8). Both sectional bars (2, 3) have the same design and may be cut off to any desired length. No further processing of the sectional bars (2, 3) is necessary.

Docket # 23,460

**CONNECTION OF TWO SECTIONAL BARS,
SECTIONAL BARS FOR A SUPPORT SYSTEM AND
SUPPORT SYSTEM FOR SANITARY APPARATUS, AS WELL AS A
PROCESS FOR CONSTRUCTING SUCH A SUPPORT SYSTEM**

FIELD OF THE INVENTION

The present invention pertains especially to a connection according to claim 1. The present invention also pertains to sectional bars that are particularly suitable for such connection, to a support system for sanitary apparatus, as well as to a process for constructing such a support system.

BACKGROUND OF THE INVENTION

A connection of sectional bars on a support system for sanitary apparatus according to the introductory part of claim 1

has become known from German Patent No. DE-A-34,10,499. The sectional bars are bars slotted at one end, which are connected by brackets which are clamped with screws extending into the slots.

A connection on a support system for sanitary apparatus, which has a connection part consisting of two plate-shaped parts and extending into U-shaped profiled rails at two ends, has been known from DE-A-35,28,334. Similar connections and support systems have been known from Registered German Utility Patents Nos. DE-GMS-76,02,215, 76,26,246, and 80,00,819.

Thus, numerous connections for support systems for installing sanitary apparatus have been known. They all share the common feature of enabling simple and yet stable installation even of relatively heavy sanitary apparatus and of the pipelines and the like which are needed for them. Such support systems have the shortcoming that they must be exactly adapted, usually individually and to the actual installation location. Nevertheless, simple and clear inventory management as well as low-cost construction and installation shall be possible.

SUMMARY AND OBJECTS OF THE INVENTION

Thus, the basic task of the present invention is to provide a connection of the above-described class which is particularly suitable for a support system for the installation of sanitary apparatus and permits simple inventory management and installation. This task is accomplished by the present invention according to claim 1. Particularly suitable sectional bars, a support system, as well as a process for constructing such a support system will

be characterized in the further independent claims.

One essential aspect of the present invention is considered to be the fact that the sectional bars have identical cross section and can be connected in all four directions in space. It is also essential that a rectangular frame can be prepared, in which all sectional bars and all connection pieces are arranged in one plane; consequently, contrary to, e.g., the connection according to the aforementioned DE-A-34,10,499, in which the bracket and the sectional bars are located in two different planes. As a result, the symmetry of the connection and of a sanitary apparatus constructed from it is substantially increased. In the case of three-dimensional arrangement of the sectional bars, the connection according to the present invention permits uniform and simple connection and consequently better possibility for planning. Pre-assembly by the installer or at the factory is substantially simpler than before. Since only one sectional bar is provided, inventory management is simpler. The uniform type of connection also makes it possible to reduce the installation time at the installation site and consequently also to reduce the costs.

Further advantageous characteristics will become apparent from the other claims and the following specification, as well as the drawing. Exemplary embodiments of the present invention will be explained in greater detail below on the basis of the drawing.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and

specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which a preferred embodiment of the invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 shows a section through the device according to the present invention with two sectional bars arranged in a T-shaped pattern;

Figure 2 shows a section along the line II-II in Figure 1;

Figure 3 shows a section along the line III-III in Figure 1;

Figure 4 shows a section along the line IV-IV in Figure 1;

Figure 5 shows a section along the line V-V in Figure 1;

Figure 6 shows a section through a device according to a variant of the present invention, wherein two sectional bars extending in parallel to one another can be detachably connected;

Figure 7 shows a partial section through another variant of a device according to the present invention;

Figure 8 shows a view of the front side of the connection part shown in Figure 7;

Figure 9 shows a section along the line IX-IX in Figure 7;

Figure 10 shows a section along the line X-X in Figure 7;

Figure 11 shows a section according to Figure 10, but prior to rotation of the connection piece;

Figures 12a through 12e show schematically a sequence of installation during the construction of a support system according to the present invention;

Figures 13a through 13b shown schematically a support system for a toilet bowl and a wash stand;

Figure 14 shows a cross section through a sectional bar fastened to a building body;

Figure 15 shows a cross section through a sectional bar with a gypsum board fastened to it; and

Figure 16 shows schematically a support system according to the present invention with a cover.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The device shown in Figures 1 through 5 has a connection piece 1 which connects a hollow sectional bar 2 to a sectional bar extending at right angles to it. Said two sectional bars 2 and 3 are of identical design and are made of, e.g., metal. As is shown by the cross section of said sectional bar 2 represented in Figure 3, said sectional bar 2 has four identical longitudinal dovetailed grooves 20 that extend over the entire length of said sectional bar. Said grooves 20 have a wall 22 of wave-like cross section at their bottoms. As is shown in the left-hand part of Figure 1, said wall 22 is internally and externally profiled. Said walls 22 preferably also extend over the entire length of said sectional bar 2. The flanks of said grooves 20 are formed by two flanges 21 of approximately heart-shaped cross section. As can be seen, said sectional bar 2 has a rotationally symmetric cross section. This is also true of said sectional bar 3.

Said connection piece 1 has a bearing housing 8 which is made of, e.g., sheet metal and consists of two overlapping parts 8a and

8b (Figure 4). Two wedges 4 and 13, which are displaceable in the longitudinal direction of said bearing housing 8 with two guide bearings 15 and 16 that can be actuated independently of one another, are inserted into said bearing housing 8. Said guide bearings 15 and 16 are rotatably mounted in projections 26 of said bearing housing 8 and have hexagonal openings 17, into which an Allen wrench can be inserted through openings 9 of said bearing housing. Said guide bearings 15 and 16 extend, with a cam 18 and 19, respectively, into a respective recess 27 or 28 of the corresponding wedge. On pivoting said guide bearing 15 or 16, said respective cams 18 and 19 slide along a control surface 6 and 29, respectively, and displace said respective wedge 4 and 13 so that it will be pulled into said bearing housing 8 or displaced to the outside in the opposite direction.

At one end, said wedge 4 has two symmetric wedge surfaces 7 which cooperate with two clamping tongues 10 arranged on said bearing housing 8, so that said clamping tongues 10 are clamped against inclined internal surfaces 24 of said sectional bar 2. As a result, frictional connection of said connection piece 1 with said sectional bar 2 is guaranteed. When said wedge 4 is retracted into a position, not shown here, by pivoting said guide bearing 15, said clamping tongues 10 are freed, and said connection piece 1 can be pulled off from said sectional bar 2.

Said wedge 4 has, on its front side, a profiling 5, which corresponds to the profiling of said wall 22. In the working position of said wedge 4 shown in the drawing, said profiling 5 of said wedge 4 engages the outer profiling of said wall 22. In this

position, said wedge 4 is prevented from yielding due to the position shown of said guide bearing 15. The engagement of said wedge 4 with said wall 22 effectively prevents said connection piece 1 from being displaced in the longitudinal direction of said sectional bar 2.

Said wedge 13 can be displaced analogously to the right or left in said bearing housing 8 with said guide bearing 16. To do so, a corresponding Allen wrench is inserted into said hexagonal opening 17. Said wedge 13 cooperates with two brackets 11 which are pushed axially into the interior space 23 of said sectional bar 3. In the position shown, said wedge 13 spreads apart said two brackets 11 and presses them on the inside against opposite walls 22 of said sectional bar 3. To spread said brackets 11, wedge surfaces 12 and 14 are provided at said brackets 11 and at said wedge 13. Said brackets 11 have a plurality of walls 11a with wave-like longitudinal section, which are profiled like said walls 22, at least on the outside. Thus, when said brackets 11 are spread, said walls 11a are in a positive-locking connection with said walls 22 of said sectional bar 3. If said wedge 13 is displaced to the left by a pivoting movement of said guide bearing 16, said connection piece 1 can be pulled out of said sectional bar, and said brackets 11 are able to yield toward the wedge.

The connections of said connection piece 1 with said sectional bar 2 and with said sectional bar 3 can thus be established and detached independently of one another. To displace said connection piece 1 along said sectional bar 2, said wedge 4 in said bearing housing 8 need only be retracted, after which the positive-locking

and frictional connections are detached. When said wedge 4 is retracted, said connection piece 1 can be displaced in said longitudinal groove 20 over any amount in the longitudinal direction of said sectional bar 2, and the connection can be re-established at any point by pushing said wedge 4 forward. In order for said brackets 11 to be able to be pushed more or less deep into said sectional bar 3, the distance between said two sectional bars can be adjusted to a limited extent. A design in which said two wedges 4 and 13 are adjusted jointly is also conceivable.

Figure 6 shows another design of the device according to the present invention, in which two sectional bars 2 and 3 extending in parallel to one another are connected to a connection piece 50. In this design, two identical wedges 4, which are designed as explained above and are actuated individually with a respective guide bearing 15 or 16, are arranged in a bearing housing 25. Said bearing housing 25 has clamping jaws, not shown here, which correspond to said clamping jaws 10 of the design explained in the introduction. Said sectional bars 2 and 3 may be of fully identical design in this case as well, in which case more than two wedges 4 for connecting more than two sectional bars are arranged in one bearing housing.

To connect two sectional bars, these are cut to the desired length at one end or the other. No further treatment of the sectional bars is necessary. Said two sectional bars may be connected to said connection piece 1 in a T-shaped arrangement or to said connection piece 50 in a parallel arrangement in relation

to one another. The only tool needed for this is an Allen wrench, with which the two wedges are brought into a retracted position. After said clamping tongues 10 and said brackets 11 have been inserted into a groove 20 or into said interior space 23, said respective wedges 4 and 13 are moved in the outward direction to the positions shown. Said connection piece 1 or 50 is then firmly connected to said two sectional bars. Since said wedge 4 is in contact with said wall 22 over a relatively broad area, it is ensured that said connection piece 1 or 50 will be aligned exactly vertically to said profiled piece 2 and that this alignment will be maintained even under the effect of relatively strong forces. It is, of course, also possible to arrange a plurality of connection pieces 1 or 50 on one profiled piece 2. It is thus possible to prepare three-dimensional frames with high load-bearing capacity in a simple manner. Such frames are particularly suitable for the installation of sanitary apparatus.

Figures 7 through 11 show a device according to the present invention, which has a connection piece 30 that can be fully made of plastic at a particularly low cost. Said connection piece 30 has a shaft 31, which is hollow and has a square cross section. The four edges of said shaft 31 have a wave-shaped profile 32, which extends essentially over the entire shaft 31 and has a design corresponding to the profiling of said wall 22 of said sectional bars 2 and 3.

A collar 33 with a shoulder 34 as well as a head 35 are made in one piece with said shaft 30. Figure 8 shows the front view of said collar 33 and said head 35, and figure 9 shows the

longitudinal section of said collar 33 and said head 35. The front side of said head 35 is provided with a wave-shaped profiling 36, which also has a design corresponding to the profiling of said wall 22. Next to said profiling 36, two laterally projecting wings 37 are made in one piece with said head 35; these extend behind a dovetailed groove 20 in the assembled state, as is shown in Figure 9. Said wings 37 extend at right angles to the grooves of said profiling 36 and are provided with rounded areas 38 in a rotationally symmetric arrangement at the transition to the lateral surfaces 39. The distance between said two lateral surfaces 39 is equal to the smallest width of said dovetailed groove 20. If said lateral surfaces 39 are aligned in parallel to said dovetailed groove 20, said head 35 can still be inserted into or removed from said groove 20 at right angles to said sectional bar 2. However, if said head 35 thus inserted is rotated through 45° around the longitudinal axis of said connection piece 30, said wings 37 are caused to engage said internal surfaces 24 of said sectional bar 2 in the zone of said rounded areas 38, and said head 35 is thus clamped in said groove 20. Simultaneously with this rotary movement of said connection piece 30, said profiling 36 of said head 35 is aligned with and caused to engage said profiling 22 of said sectional bar 2. A cavity 40 behind said profiling 36 permits walls of said head 35 to yield elastically during the establishment of the connection. If the connection between said connection piece 30 and said sectional bar 2 has been established, said profiling 36 and 22 are also enmeshed with one another, and detachably

clamped with said groove 20 by means of said wings 37. To detach the connection, said connection piece 30 is rotated through 45° in the opposite direction, namely, in the direction in which said rounded areas 38 come into contact with and finally move away from said internal surfaces 24. The enmeshing of said profiled pieces 36 and 22 is now also abolished, and said connection piece 30 can be displaced in the longitudinal direction of said groove 20 or can be lifted out of it. If the connection has been joined, the engagement of said two profiled pieces 36 and 22 prevents said connection piece 30 from being displaced in the longitudinal direction of said sectional bar 2 under load in this case as well. Despite the high stability, the connection can be established or separated only by rotation through 45° . At the same time, a connection with another sectional bar 3 can be established or detached, as will be explained in greater detail below.

To connect said connection piece 30 to said sectional bar 3, said shaft 31 is rotated, as is shown in Figure 11, to said sectional bar 3, and pushed in this alignment into the cavity of said sectional bar 3. Said profilings 32 are now freely displaceable in the expanded edges 41 of said sectional bar 3. If said shaft 31 is now rotated through 45° into the position shown in Figure 10, said profilings 32 are caused to engage said profilings 22 of said sectional bar 3. Said connection piece 30 and said sectional bar 3 are then snapped in in the longitudinal direction, and can no longer be displaced in this direction. The connection can be separated at any time by a rotation through 45°

in this case as well.

When connecting said two sectional bars 2 and 3 to said connection piece 30, both said bars 2 and 3 are simultaneously connected to said connection piece 30 by a rotation through 45° . In contrast to this, when connecting said connection pieces 1 or 50, said two sectional bars may be connected to said connection piece independently of one another. In contrast, said connection piece 30 may be manufactured from plastic by injection molding at a very low cost, and consequently it is also corrosion-resistant and lightweight.

A support system for sanitary apparatus, fittings, pipe parts, and pipelines and its installation will be explained on the basis of Figures 12 through 16. The sanitary apparatus are, e.g., a toilet, a bidet, a wash stand, or a urinal. These are connected to drain pipes 41 and flexible connection lines 42, as well as corresponding branch pipes, which are represented only schematically here. As is clearly apparent from Figures 12c through 12d, all the vertically extending line parts are arranged on the side, and the branch pipes extend from these essentially horizontally to said support frames 43 and 44 for the sanitary apparatus, not shown here.

When installing the support system, a floor sectional bar 2a, two vertical sectional bars 2b, and one ceiling sectional bar 2c are connected, according to Figure 12a, to a rectangular, frame-like system part A, preferably using the sectional bars and connections described farther above. The frame shown in Figure

12a forms a reference frame for the further construction of the support system.

According to Figure 14, the floor, vertical, and ceiling sectional bars 2a, 2b, and 2c are fastened to the building with angle plates 50. To do so, said angle plate 50 has two slotted holes 51, through which a suitable screw 52 or a stud bolt of a sliding block 54, which is fixed with a nut 55, is passed for fastening.

Pipes and lines 41 extending vertically on the side are now fastened to said system part A, and further, horizontally extending sectional bars 2c are fastened, and transverse sectional bars 2d are fastened to the latter [sectional bars 2c]. However, it is advantageous in some cases to install said sectional bars 2c before the pipes and lines. Depending on the sanitary apparatus to be connected, connection members 40 and flexible lines 40a with vertically extending sectional bars 2e are fastened to said system part A.

Relatively short transverse sectional bars 2d are now arranged on said system part A, and the support profile is complemented with another system part B and horizontally extending connection lines and pipes to form the arrangement shown in Figure 12c.

Finally, said support frames 43 and 44, which may be pre-assembled, are put in place, and covered with gypsum boards 45 on one side or both sides of the support system, using self-tapping screws 49. Said boards 45 are now provided with corresponding openings 47 and 48 for, e.g., operating plates and pipe connections. In the case of coverage on both sides according to

Figure 12e, the support system may form a complete inner wall. However, the support system may also be prepared as a support system leaning against a massive building wall. In the case of this design, only a system part B, which is fastened to the building wall with transverse sectional bars 2d, is needed.

Said sectional bars 2a, 2b, 2c, 2d, and 2e have the same cross section profile and are connected to one another with the same connection pieces and preferably the above-described connection pieces 1, 30, and 50.

Using the known DLS (distance least square) calculation program and the exact dimensions of the construction location, the components, especially the length of said sectional bars, and their positions can be optimally calculated. The material consumption and the installation work can thus be optimized by computation, and consequently very rapidly and accurately. This permits highly efficient custom-made manufacture in the plant. The installer will receive a project-specific, assembled building kit with extensively pre-assembled components. The installer may, of course, also cut the sectional bars to the required lengths.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. Connection of two sectional bars (2, 3) of essentially identical cross section, especially on a support system for sanitary apparatus, each of which has a longitudinal groove (20) that is accessible from the outside, with a connection piece (1, 30, 50), which is fixed in the longitudinal grooves (20) by clamping and detachably connects the two sectional bars (2, 3), which are arranged approximately at right angles to one another, characterized in that the sectional bars (2, 3) have longitudinal grooves (20) of essentially square cross section, and one end of the connection piece (1, 30, 50) is inserted in the longitudinal direction into a longitudinal canal (23) of one sectional bar (3), which [longitudinal canal (23)] is arranged between the longitudinal grooves (20) and is detachably fixed in it by clamping, and the other end of the connection piece (1, 30, 50) is inserted into a longitudinal groove (20) of the other sectional bar (2) and is detachably fixed in it by clamping.

2. Connection in accordance with claim 1, characterized in that at its other end, the connection piece (1) has two clamping tongues (10) which extend laterally behind a dovetailed groove (20).

3. Connection in accordance with claim 1 or 2, characterized in that the other end of the connection piece (1, 30, 50) has a

projection (4, 35) which engages the sectional bar (2) in the longitudinal groove (20) in a positive- locking manner.

4. Connection in accordance with claim 3, characterized in that the projection (4) is a wedge that is displaceable in a bearing housing (8) and is arranged between two clamping tongues (10) that can be spread apart.

5. Connection in accordance with one of the claims 1 through 4, characterized in that the sectional bars (2) have profiled surfaces (5) in the longitudinal grooves (20).

6. Connection in accordance with one of the claims 1 through 5, characterized in that the connection piece (1, 50) has two wedges (4, 13), which can be adjusted individually or jointly and can be caused to engage a sectional bar (2, 3) each.

7. Connection in accordance with one of the claims 1 through 6, characterized in that the connection piece (1) has two profiled brackets (11) that can be spread apart by means of a displaceable wedge (13).

8. Connection in accordance with claim 7, characterized in that the brackets (11) have wedge surfaces (12) which cooperate with corresponding wedge surfaces (14) of the wedge (13) to spread apart the brackets (11).

9. Connection in accordance with claim 7 or 8, characterized in that the brackets (11) are arranged on a bearing housing (8).

10. Connection in accordance with one of the claims 7 through 9, characterized in that the brackets (11) have an approximately U-shaped cross section and partially surround the wedge (13).

11. Connection in accordance with claim 1, characterized in that the connection piece (30) has a head (35) with laterally projecting wings (37) and a front-side profiling (36), which [head] is fixed in a dovetailed groove (20) of a part (2, 3) to be connected by rotation.

12. Sectional bars for a support system for installing sanitary apparatus, fittings, pipe parts, and lines, wherein these have a longitudinal groove (20) that is accessible from the outside for connecting these bars (2, 3), characterized in that the sectional bars (2, 3) are sheet metal sections with a cross section bent in a square shape which are, e.g., welded at the edges, which are recessed in each side to form the longitudinal grooves (20).

13. Sectional bars in accordance with claim 12, characterized in that the longitudinal grooves (20) are designed as dovetailed grooves.

14. Sectional bars in accordance with claim 12 or 13, characterized in that in the longitudinal grooves (20), they have

profilings extending at right angles to the longitudinal direction of the bars.

15. Sectional bars in accordance with one of the claims 12 through 14, characterized in that the longitudinal edges are designed as flanges (21) of heart-like cross section that are open toward the inside.

16. Support system for sanitary apparatus, fittings, pipe parts and lines, with horizontal and vertical sectional bars (2, 3), which are arranged in a frame-like manner and are detachably connected to one another by connection pieces (1, 30, 50), characterized in that the sectional bars (2, 3) are of approximately square cross section and can be connected at each of the four sides, and that the horizontal and vertical sectional bars (2, 3) and the connection pieces (1, 30, 50) of at least one frame-like system part (A, B) are arranged in one plane.

17. Support system in accordance with claim 16, characterized in that two system parts (A, B) arranged in parallel to one another are connected to one another by transverse bars (2d).

18. Support system in accordance with claim 17, characterized in that the transverse bars (2d) are also sectional bars which have the same cross section as the other sectional bars and are also connected in the same manner.

19. Support system in accordance with one of the claims 16 through 18, characterized in that the connection pieces (1, 30, 50) connects two sectional bars (2, 3) arranged at right angles to one another by clamping, wherein one end each of the connection pieces (1, 30, 50) is inserted into a longitudinal canal (23) of one sectional bar (3), and the other end is inserted into a longitudinal groove (20) of the other sectional bar (2), which is accessible from the outside, and is detachably fixed in it by clamping.

20. Support system in accordance with one of the claims 16 through 19, characterized in that a support frame (43, 44) [consisting] of sectional bars (2, 3) and connection pieces (1, 30, 50) is provided, which is arranged in the plane of a frame-like system part (B), wherein the sectional bars (2, 3) and connection pieces (1, 30, 50) are of the same design as those of the rest of the system.

21. Process for preparing a support system in accordance with claim 16, characterized in that the sectional bars (2, 3) are installed from back to front and that the floor sectional bars (2a), vertical sectional bars (2b), and ceiling sectional bars (2c) are connected to form a reference frame.

22. Process in accordance with claim 21, characterized in that with the exception of the vertical sectional bars (2b) and the

sectional bars of a support frame (43, 44) for sanitary apparatus, essentially all the sectional bars (2a, 2c, 2d) are oriented horizontally.

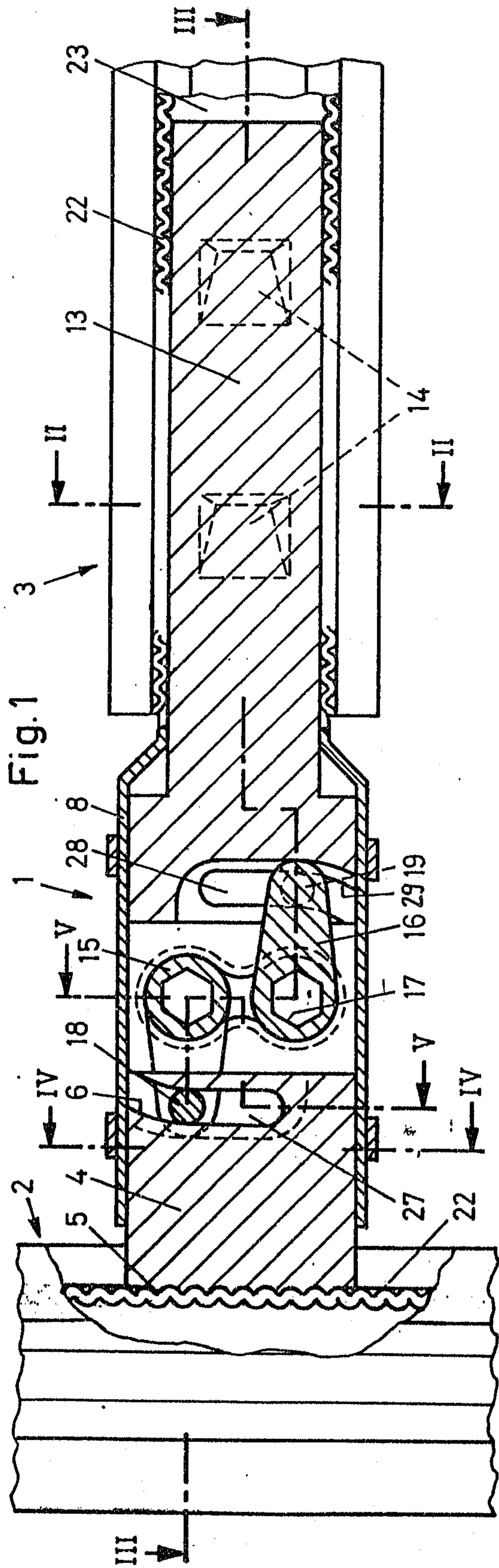


Fig. 1

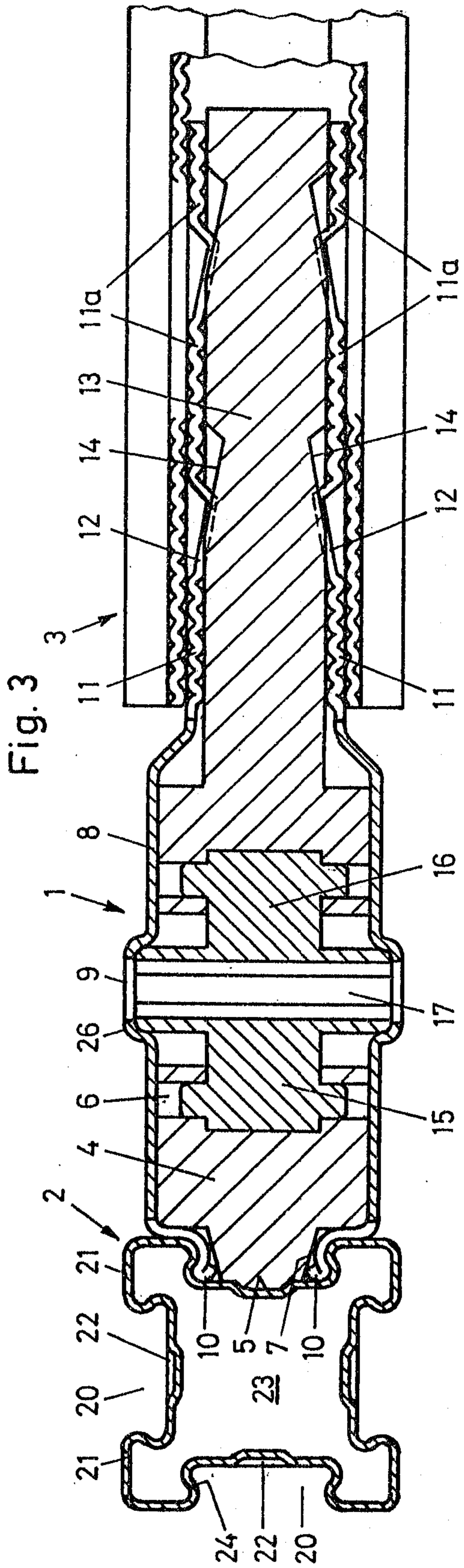


Fig. 3

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Fig. 2

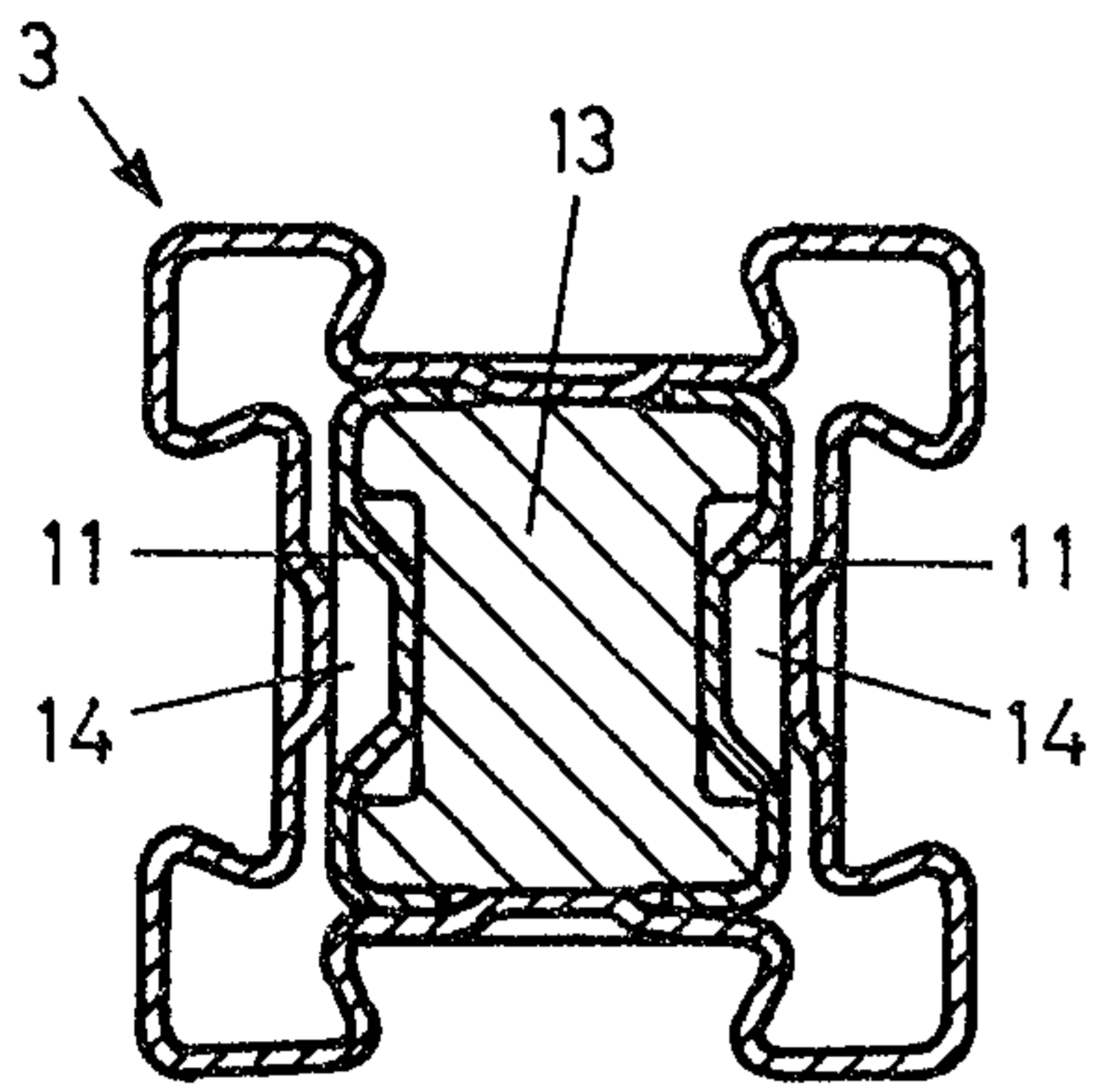


Fig. 4

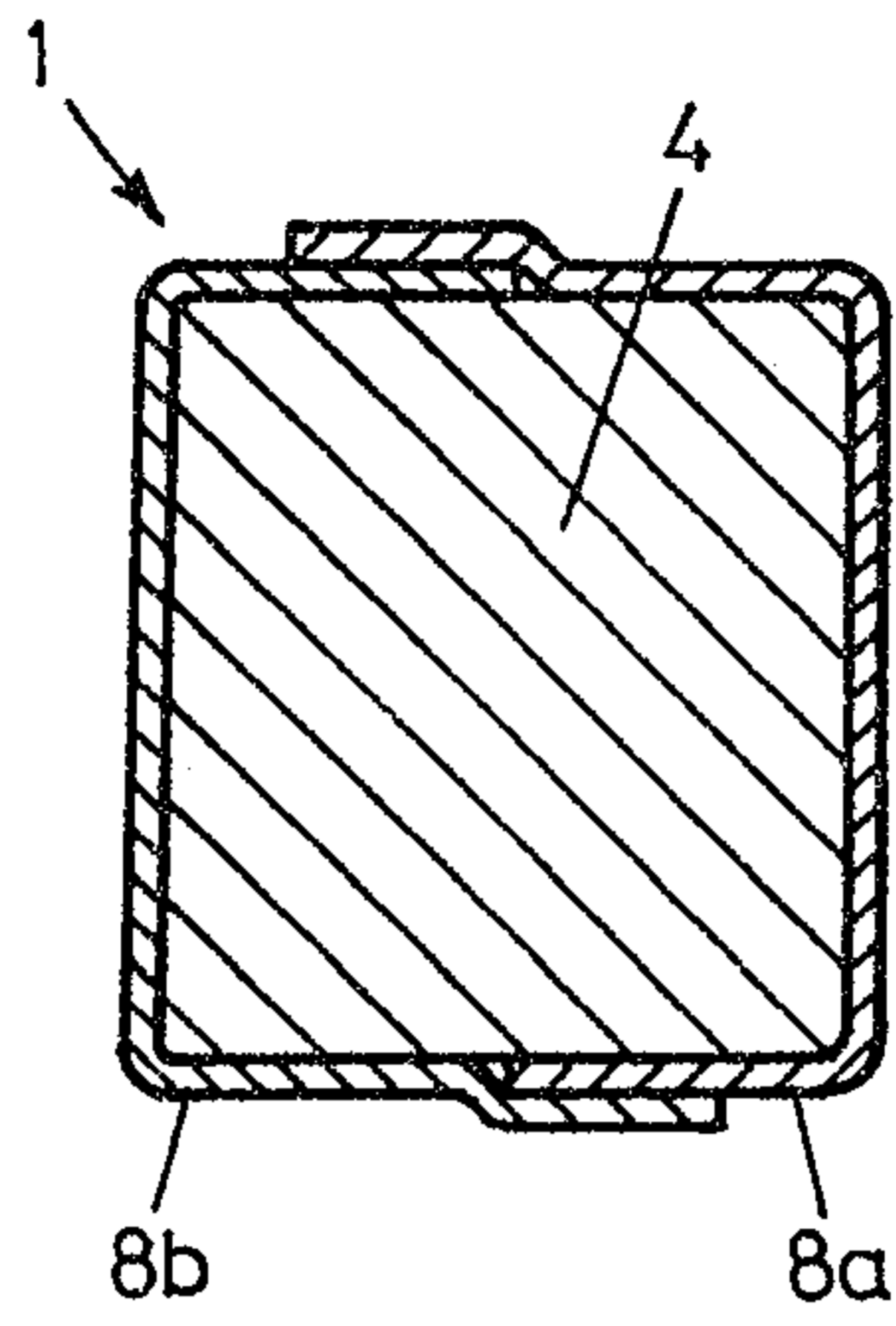


Fig. 5

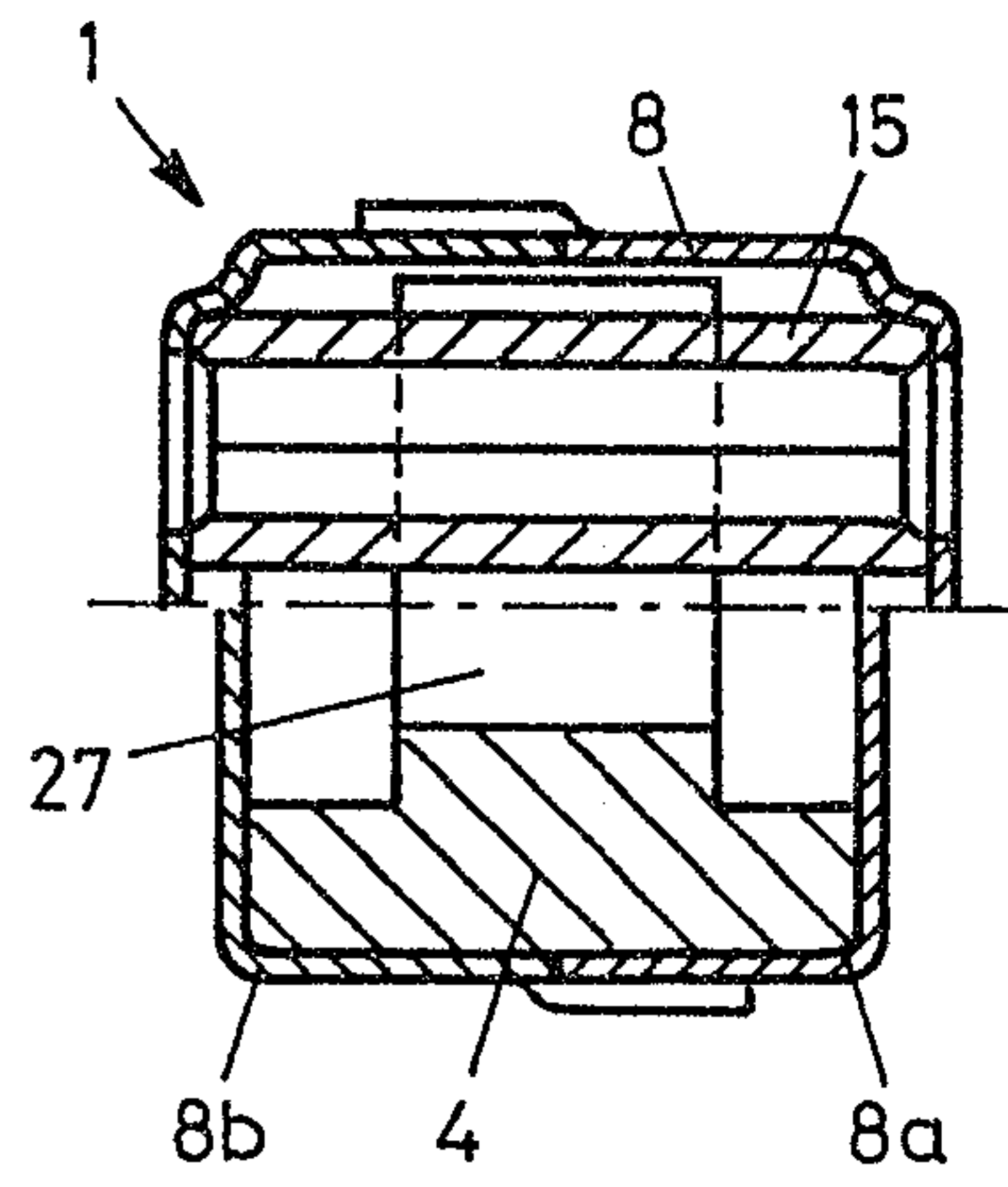
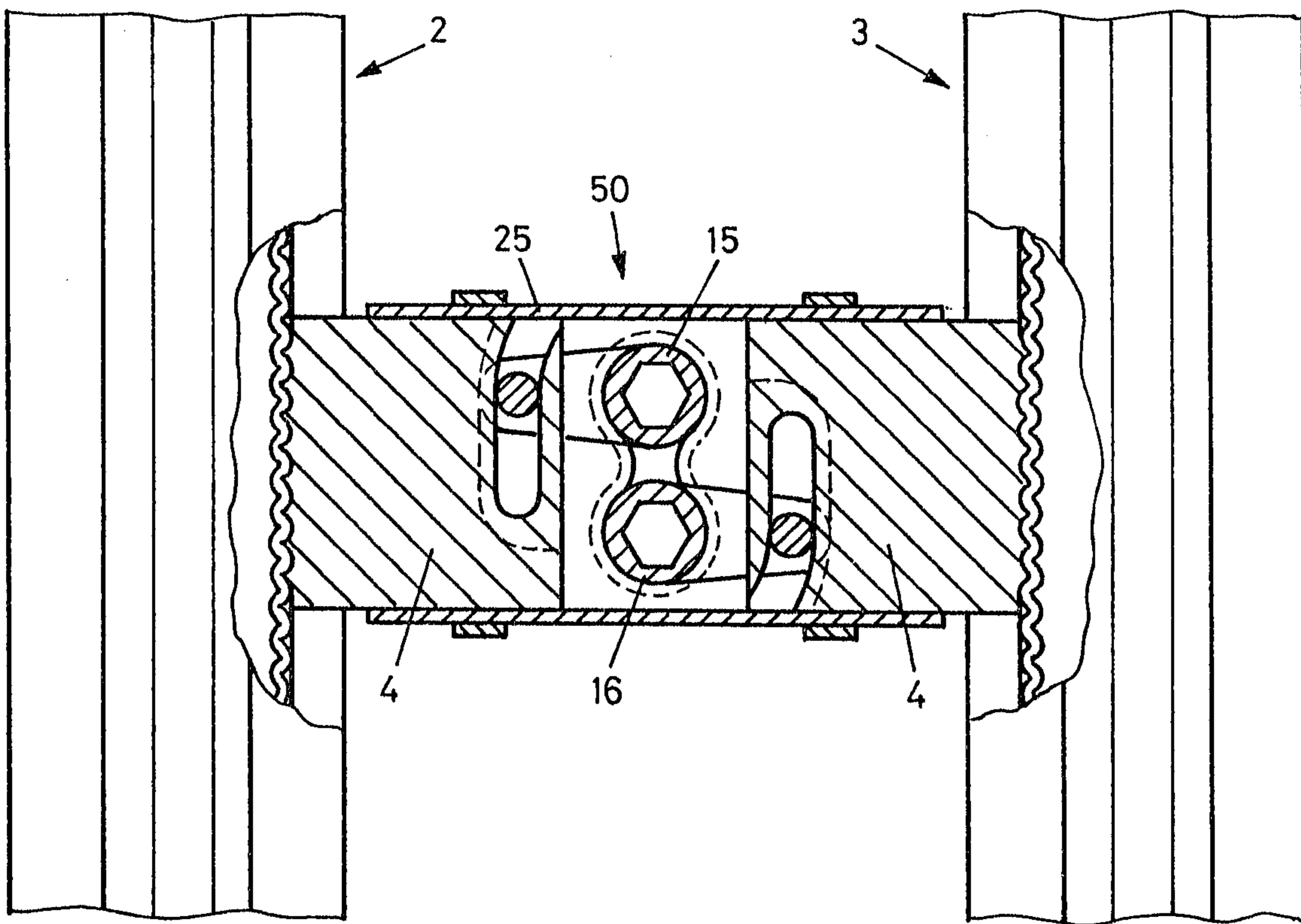


Fig. 6



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Fig. 7

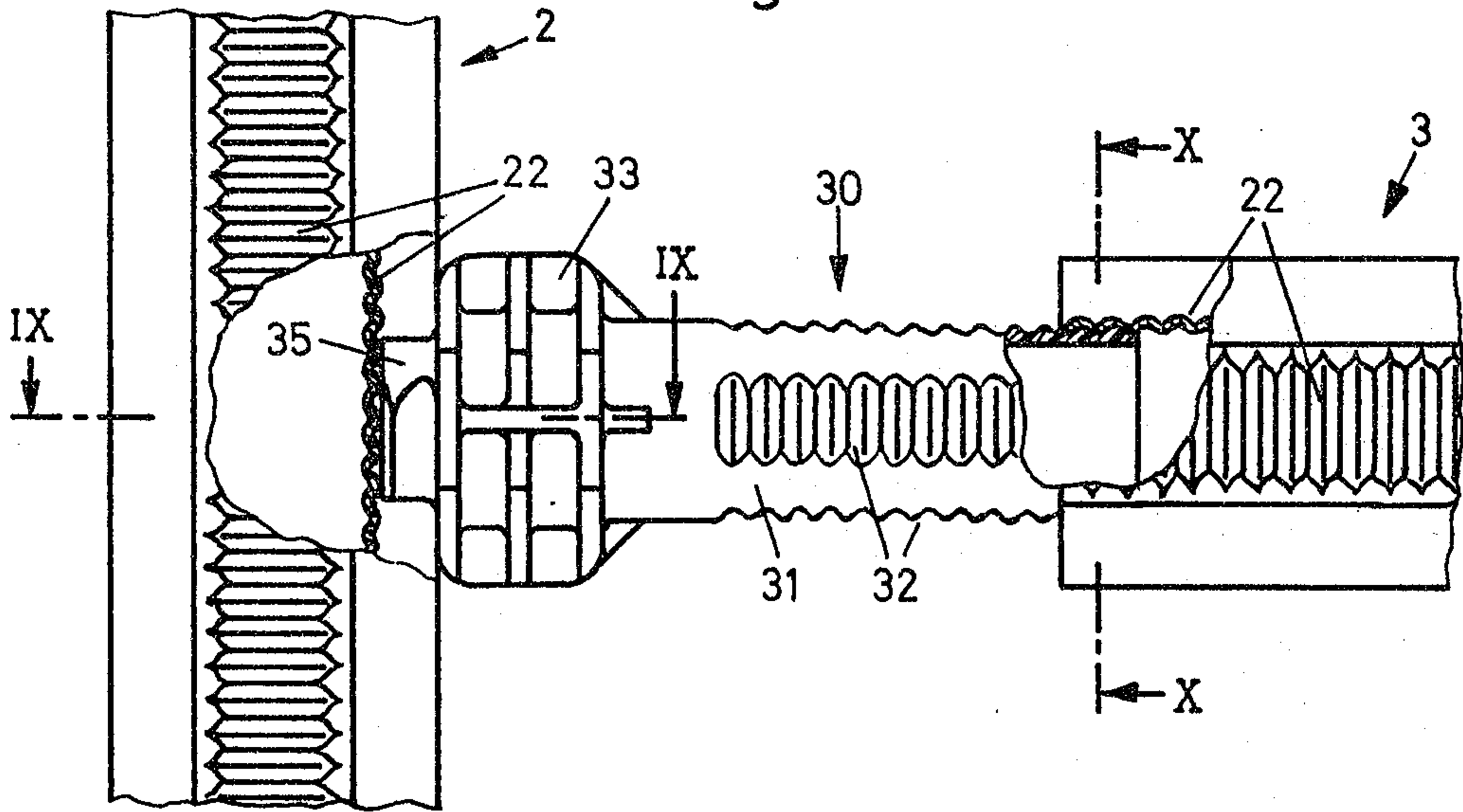


Fig. 9

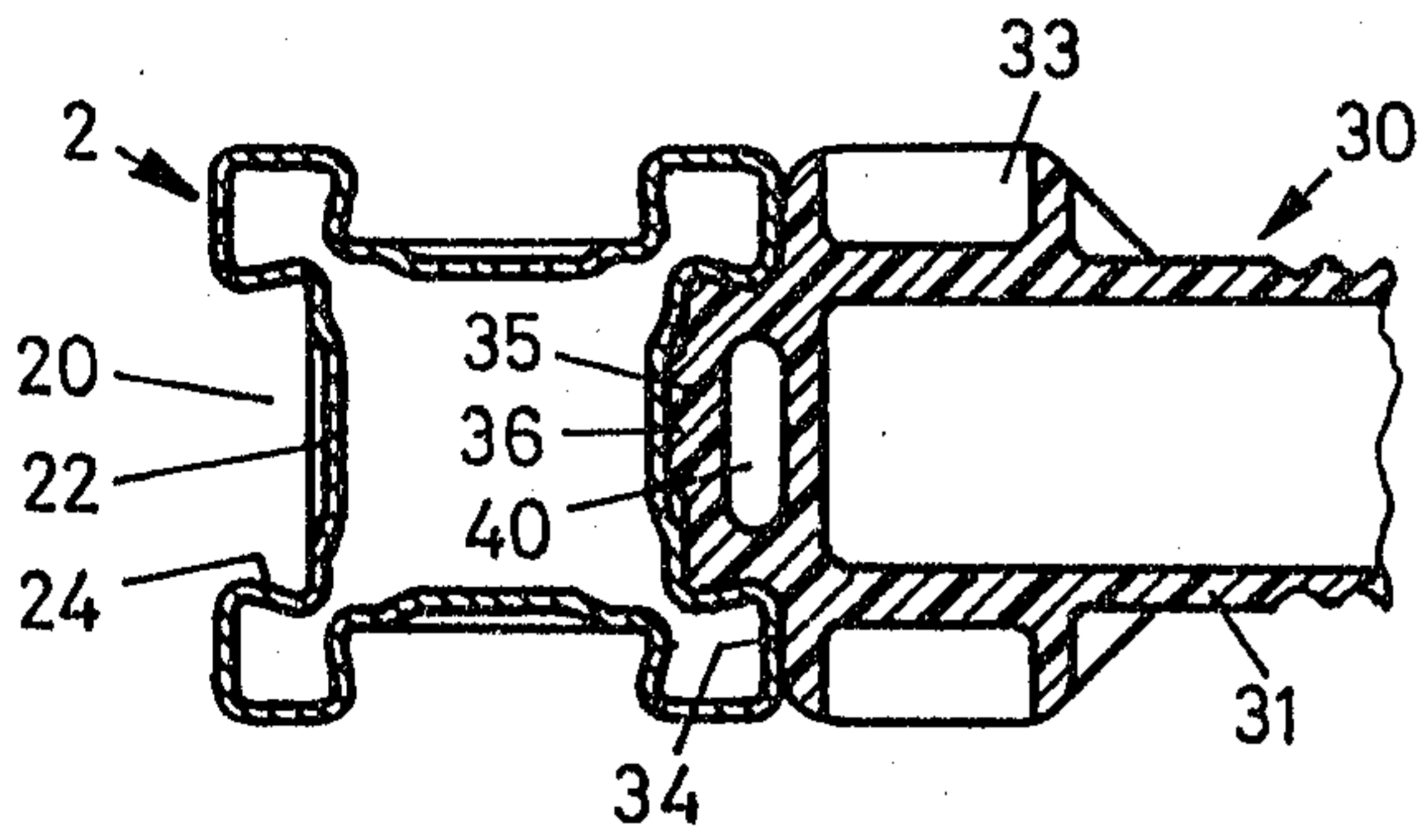


Fig. 8

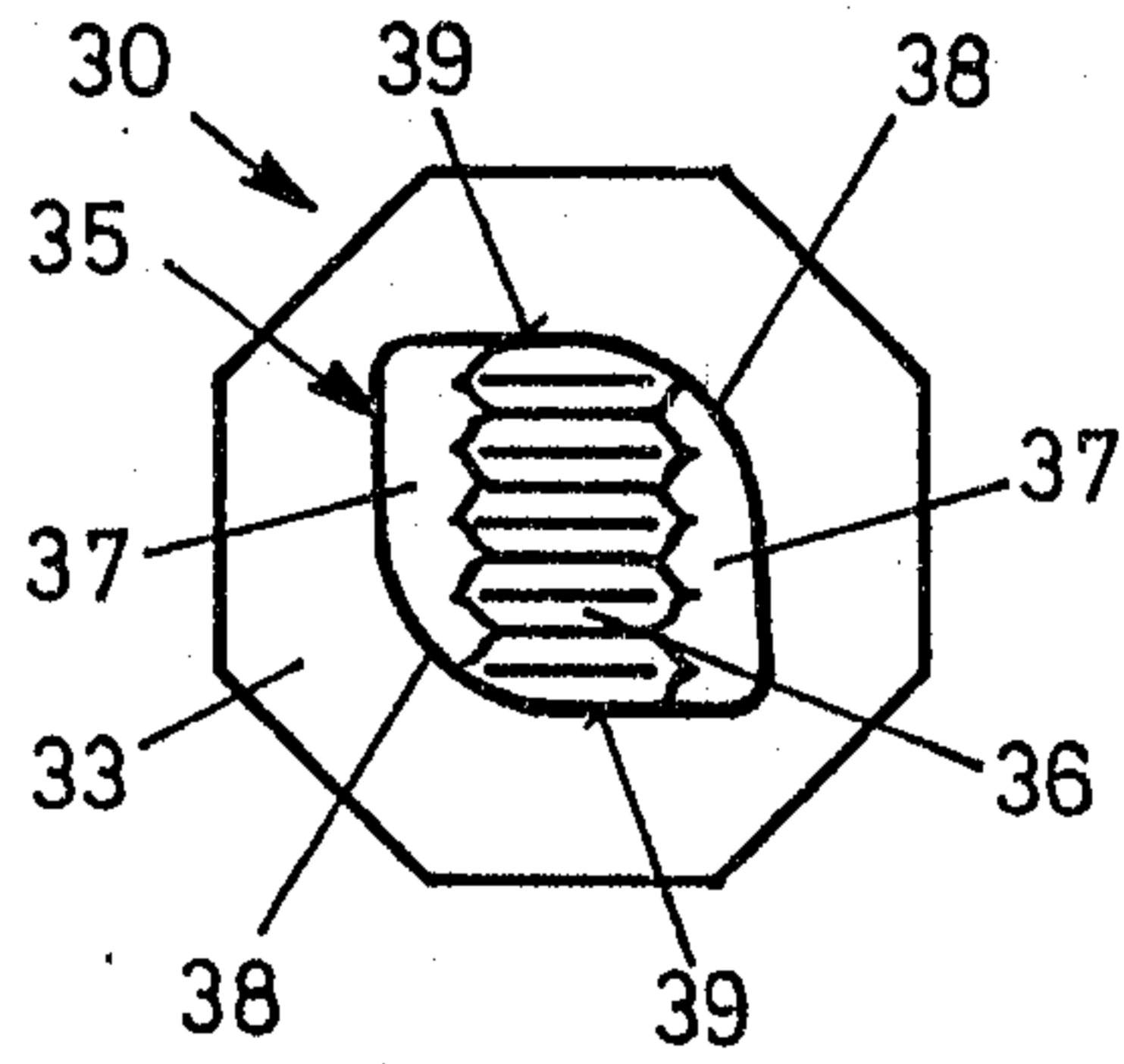


Fig. 11

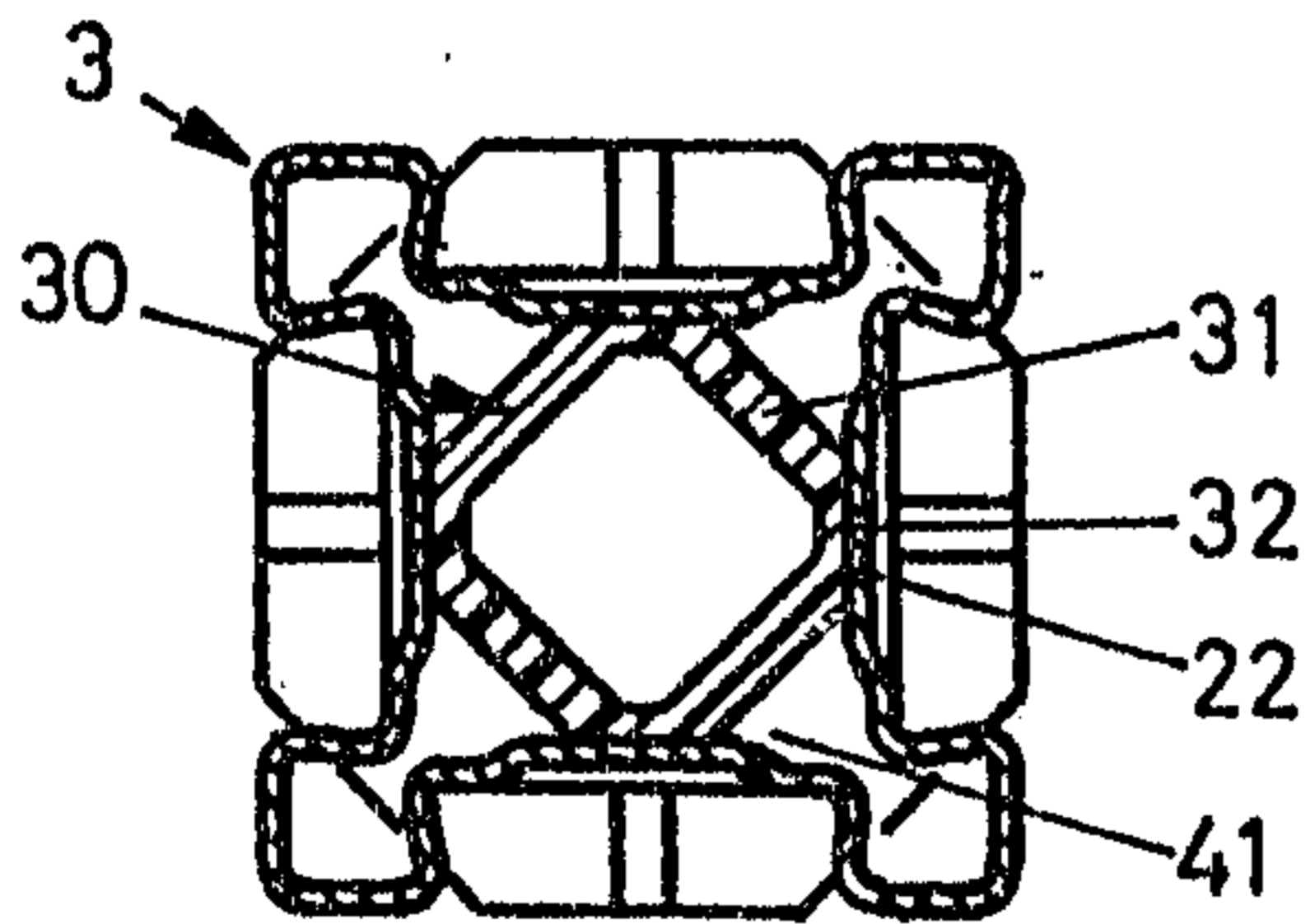
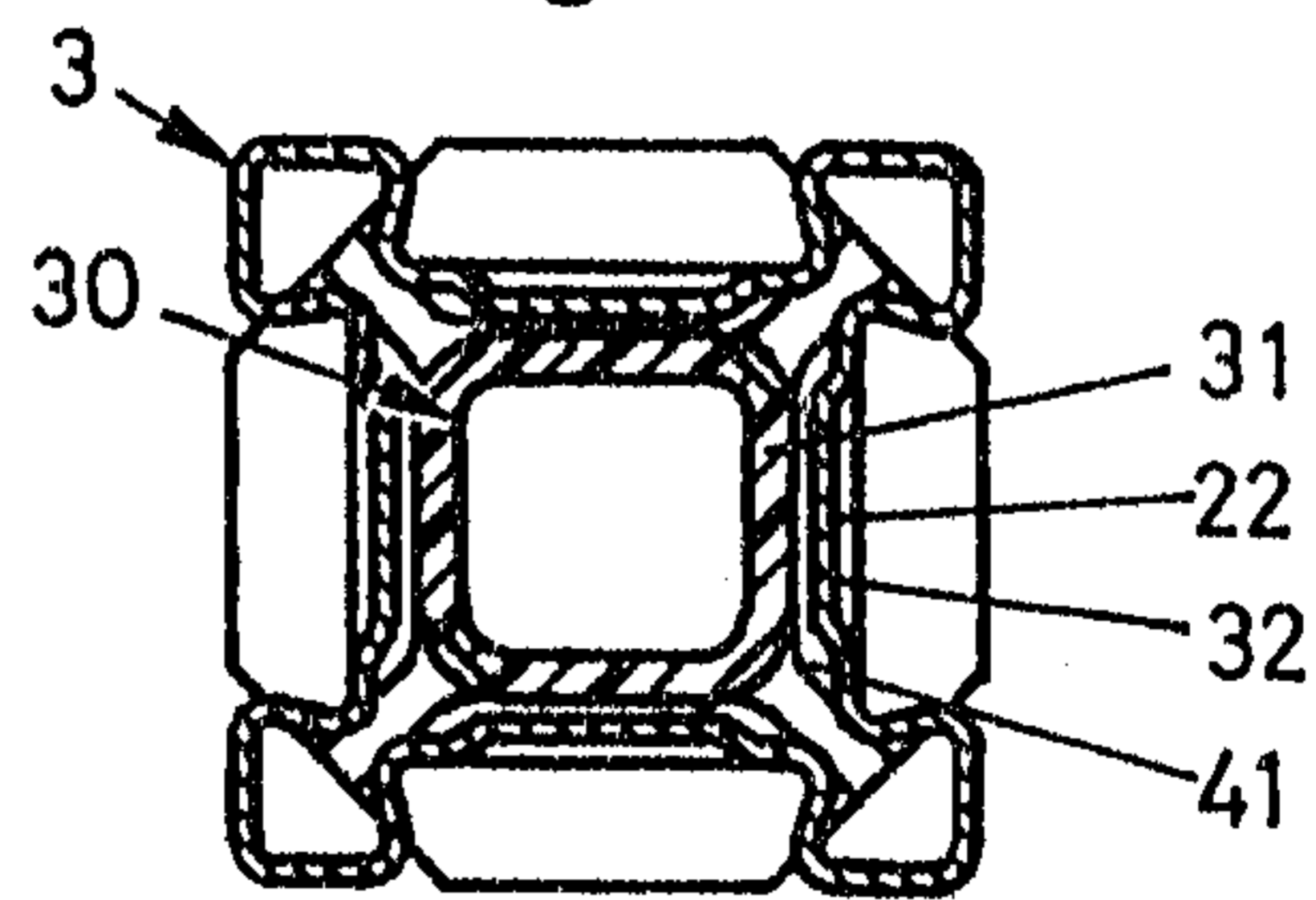


Fig. 10



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Fig. 12a

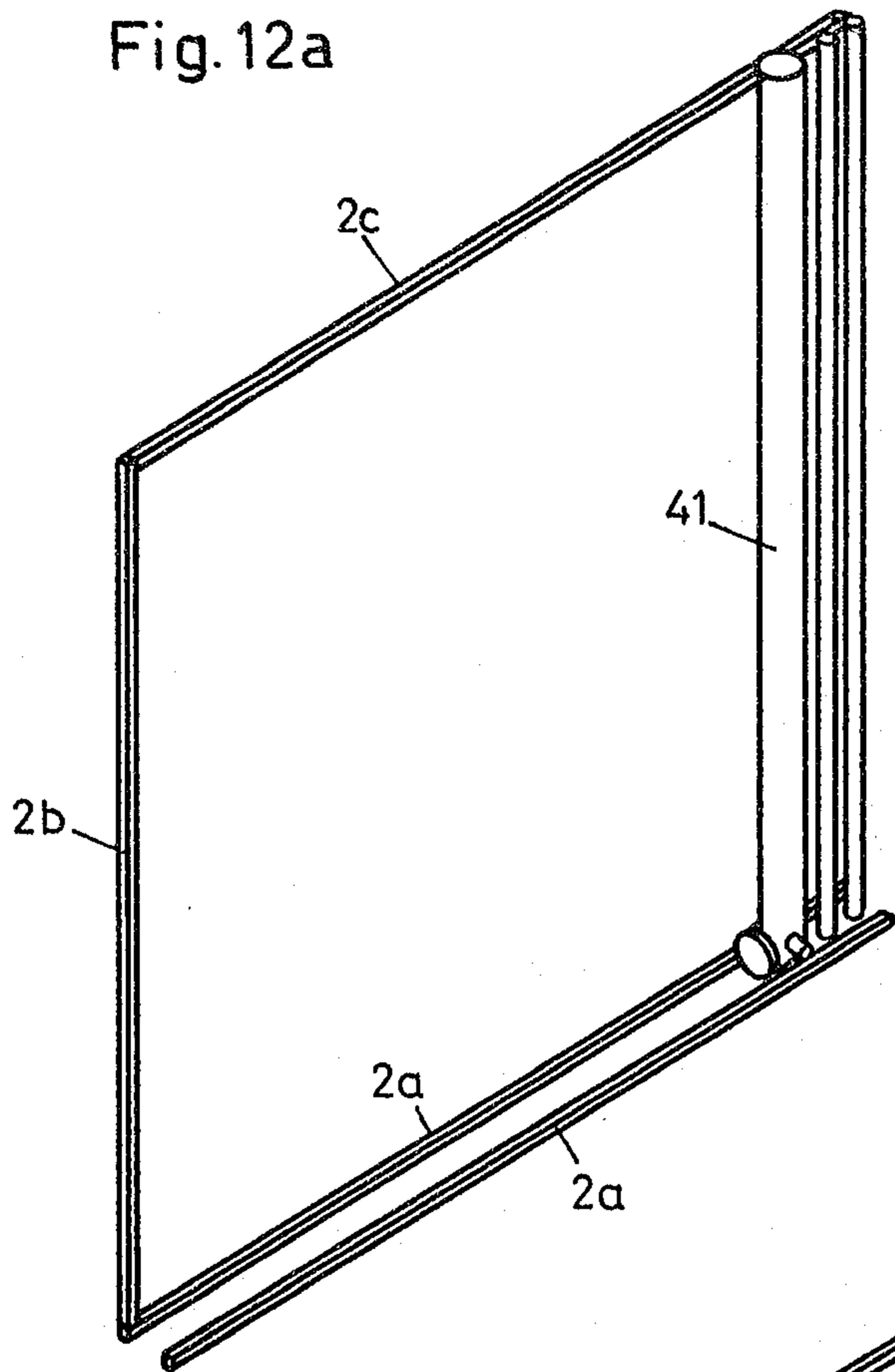
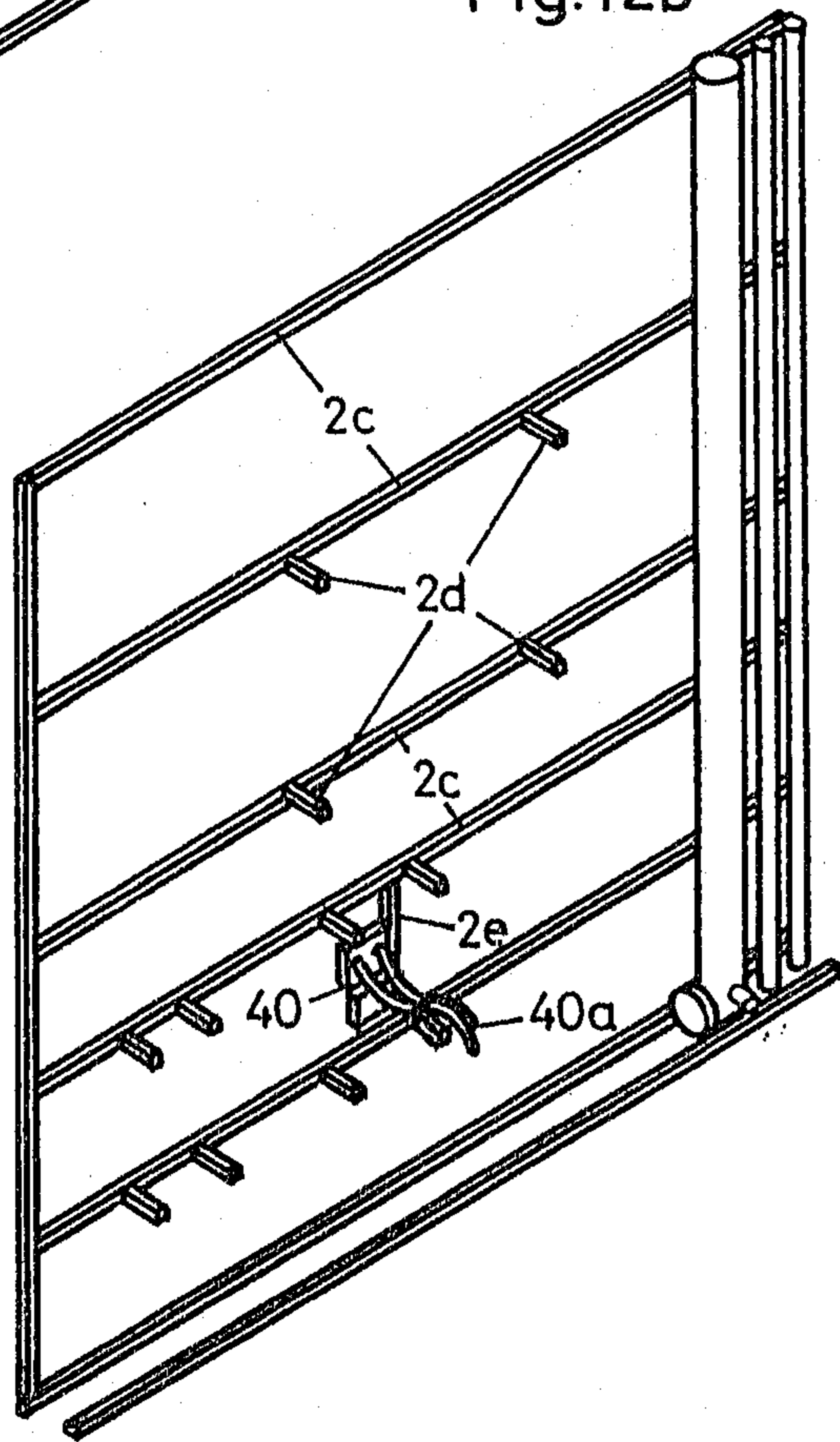


Fig. 12b



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Fig. 12c

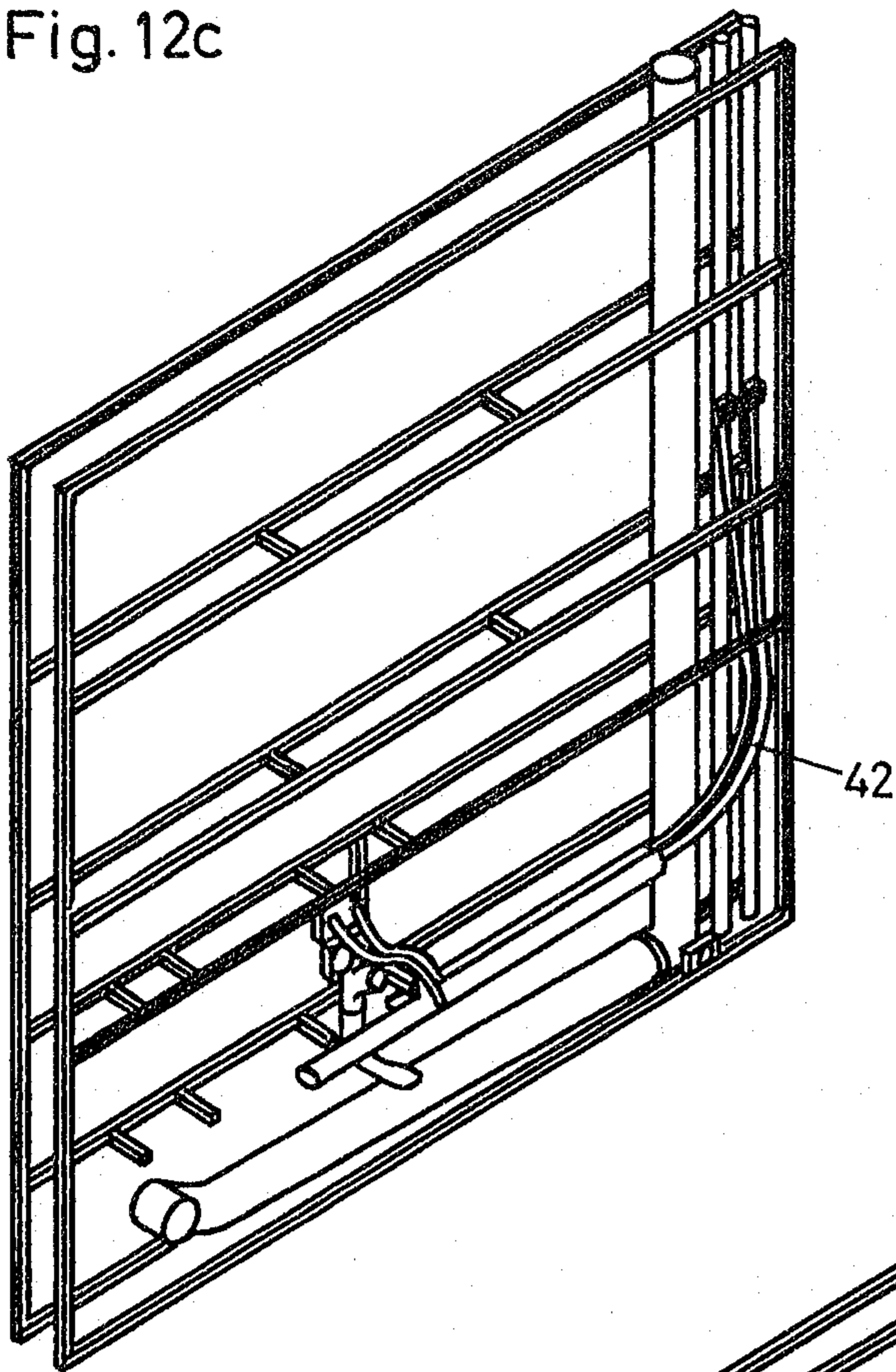
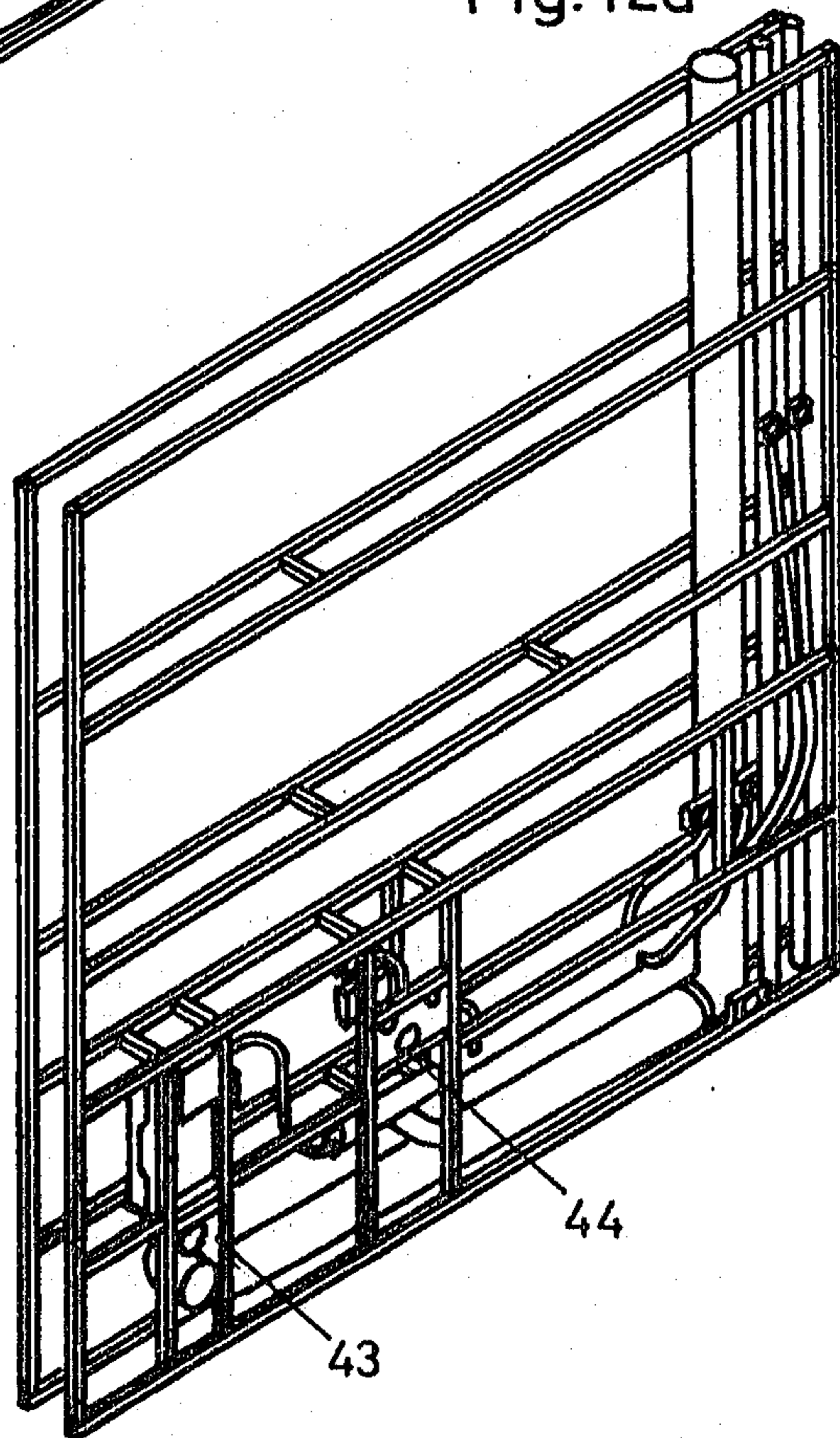
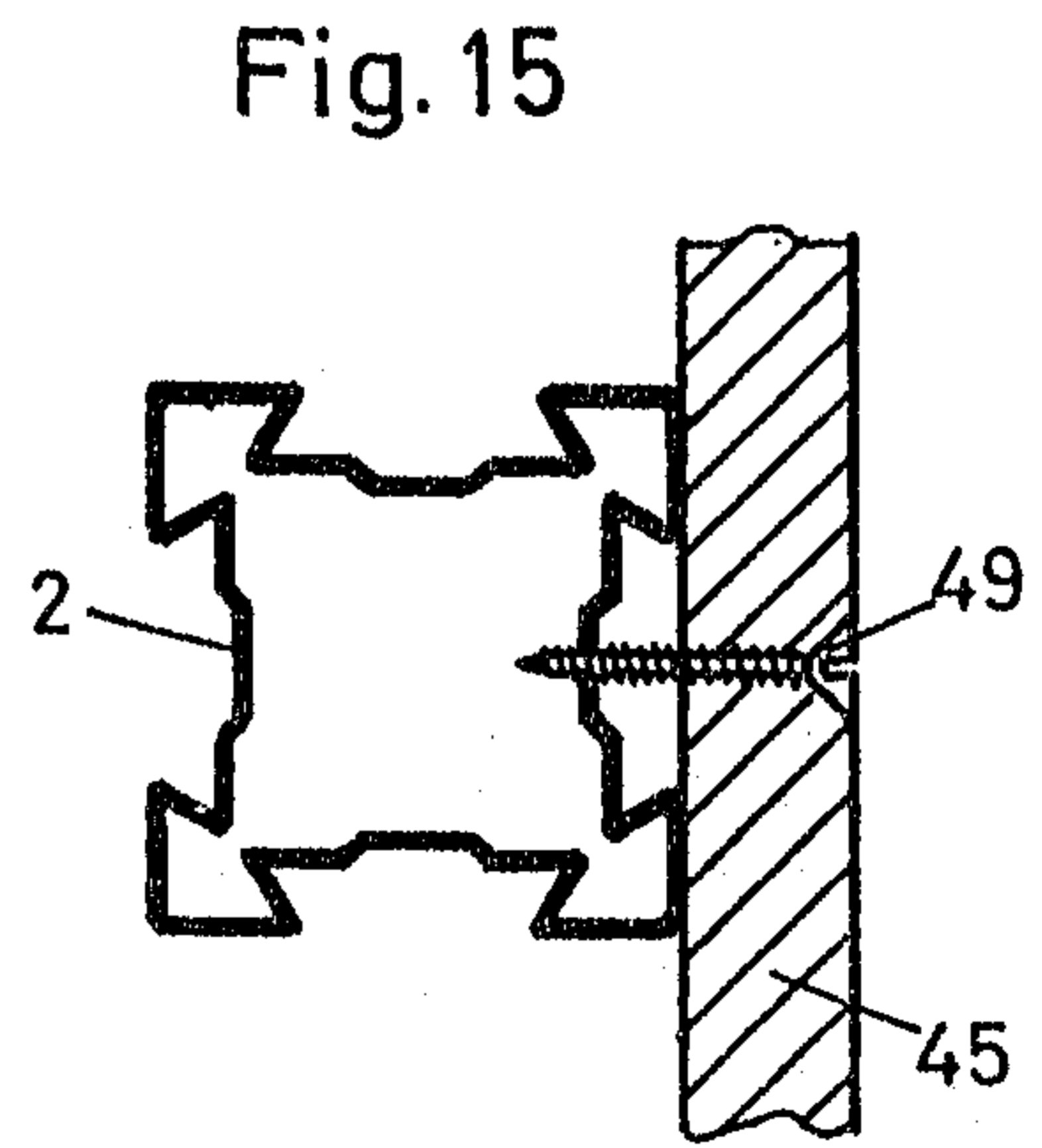
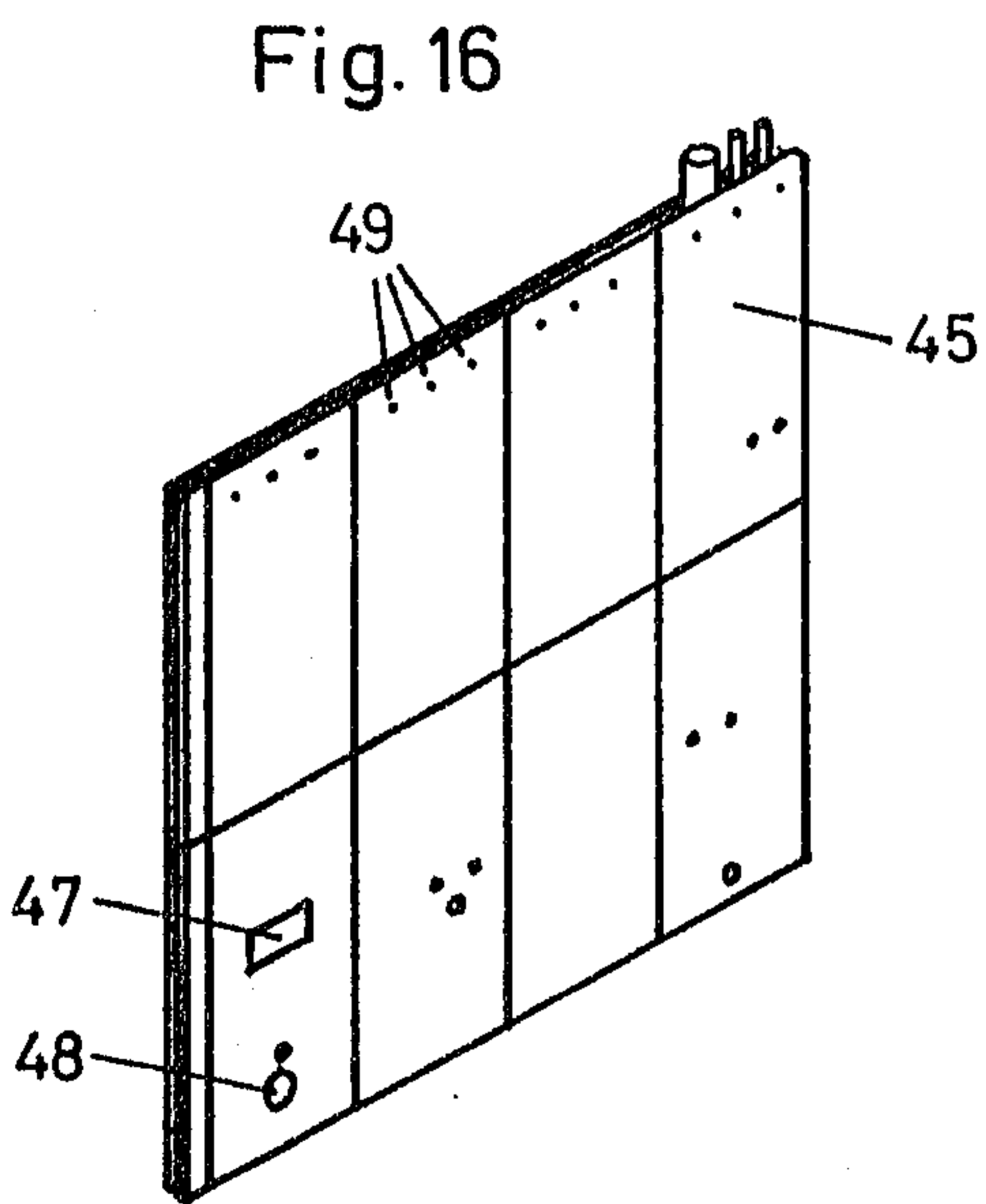
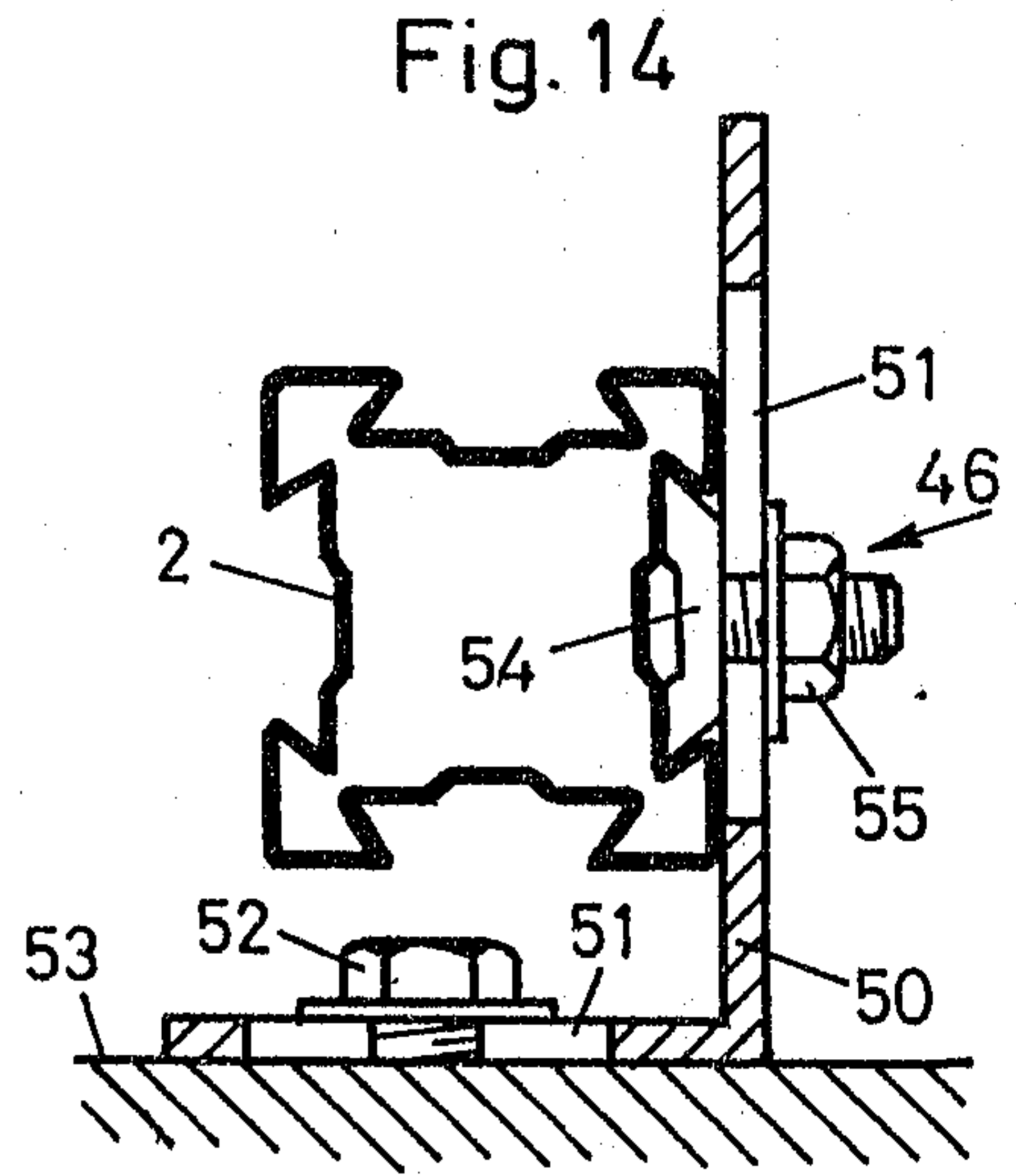
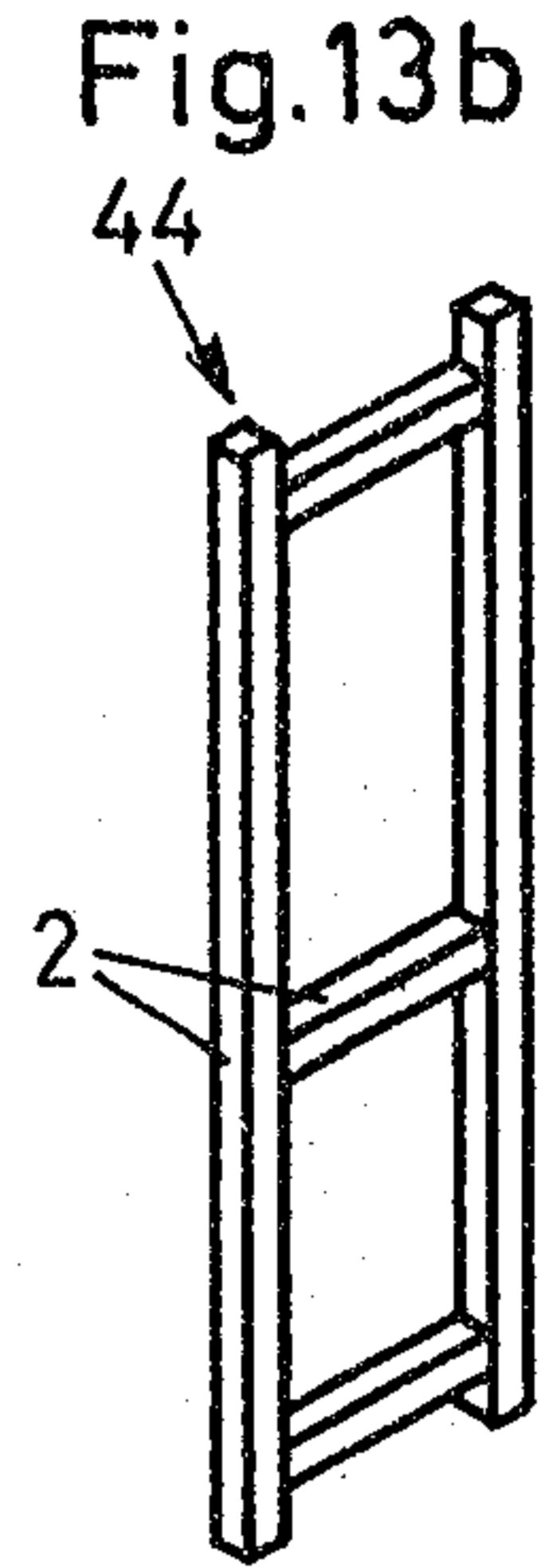
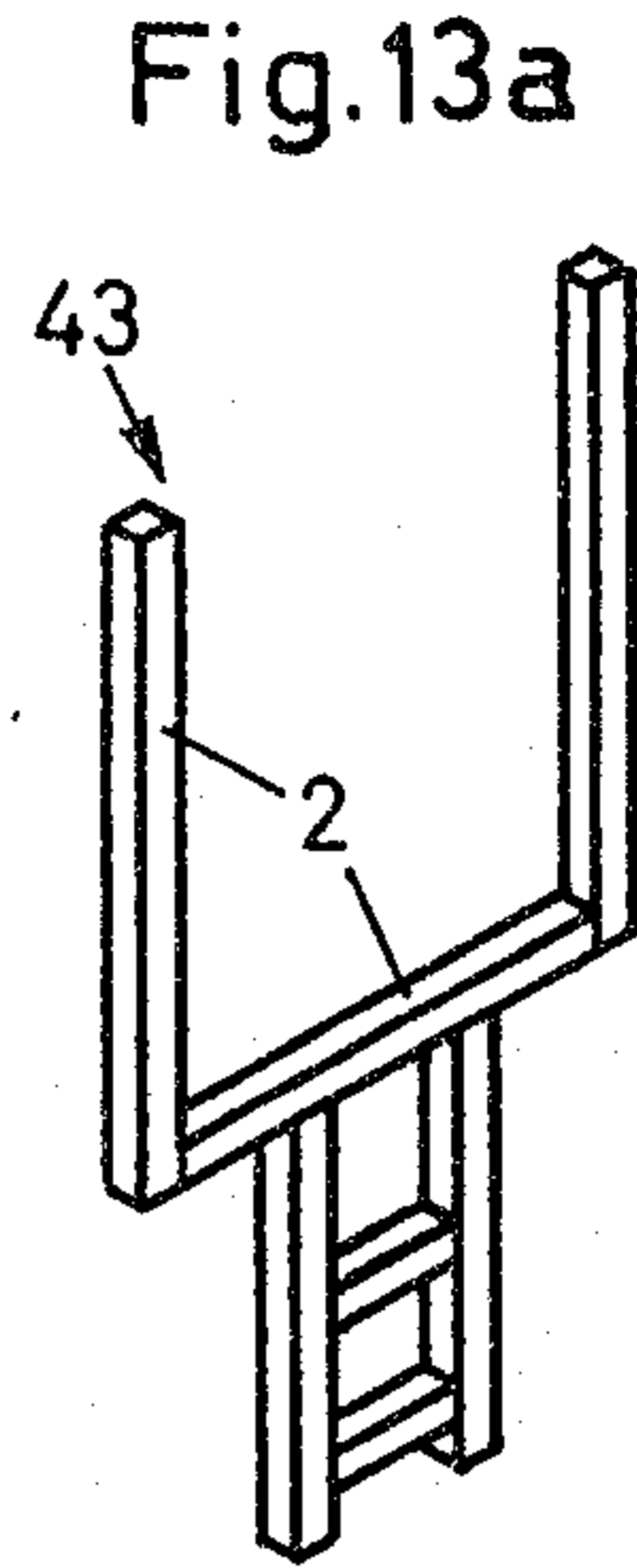
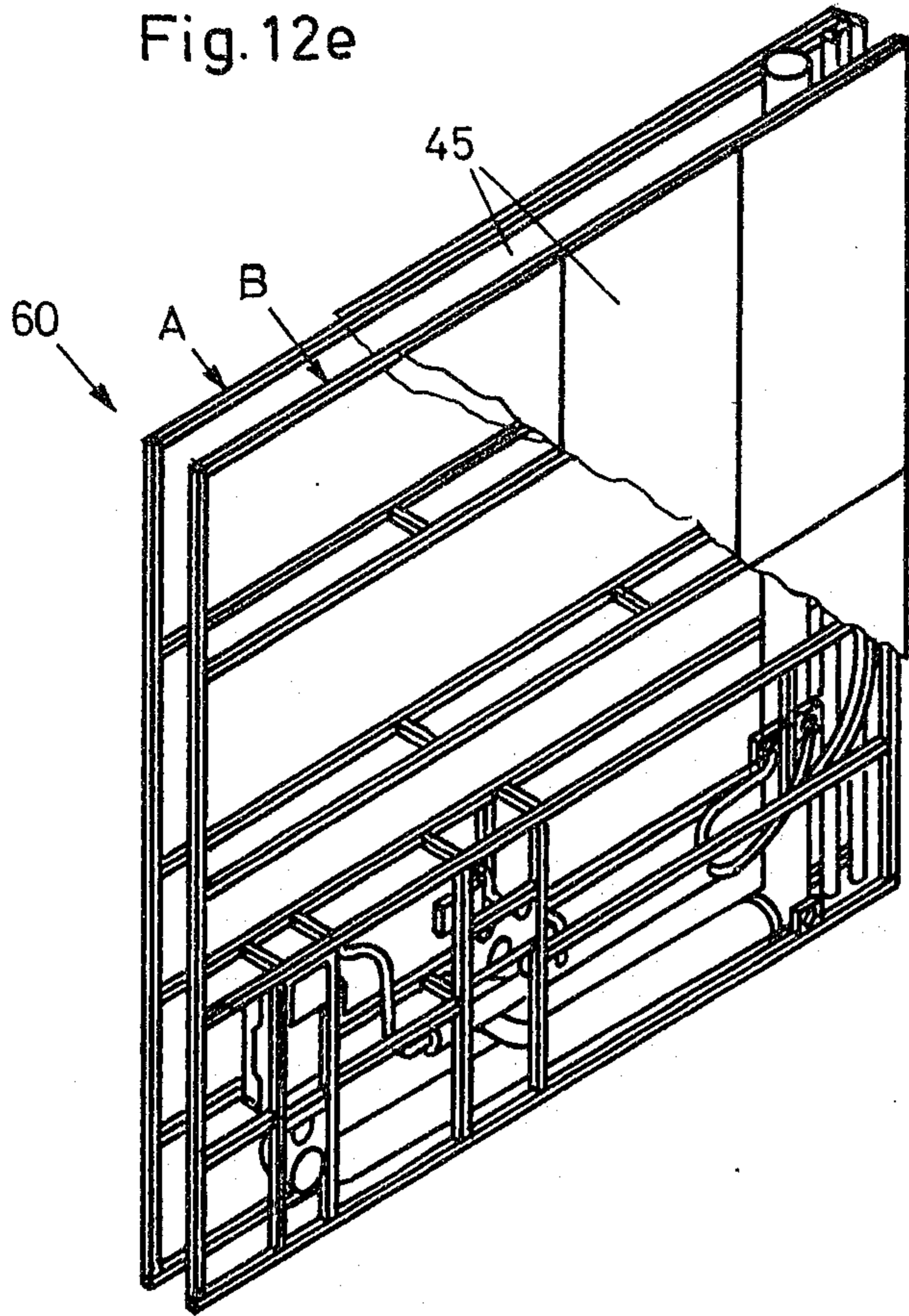


Fig. 12d



by Rogers, Bereskin & Farr



by Rogers, Bereskin & Parr

