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EUROPEAN PATENT APPLICATION

(21) Application number : **91306600.7**

(51) Int. Cl.⁵ : **E04H 3/12, A47C 1/16,
E04G 5/02**

(22) Date of filing : **19.07.91**

(30) Priority : **19.07.90 GB 9015885**

(43) Date of publication of application :
22.01.92 Bulletin 92/04

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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(54) **Improvements in seating and seating support structures.**

(57) A support structure for seating comprises a multiplicity of upright standards (12), a plurality of horizontal bearers (17) and bracing means (16) for bracing the structure, one or more of the standards (12) including a joint (20) such that the standards (12) can lie vertically whether standing on a horizontal or a non-horizontal surface. A seating assembly is provided with a multiplicity of seating units (25) secured to the horizontal bearers (17).

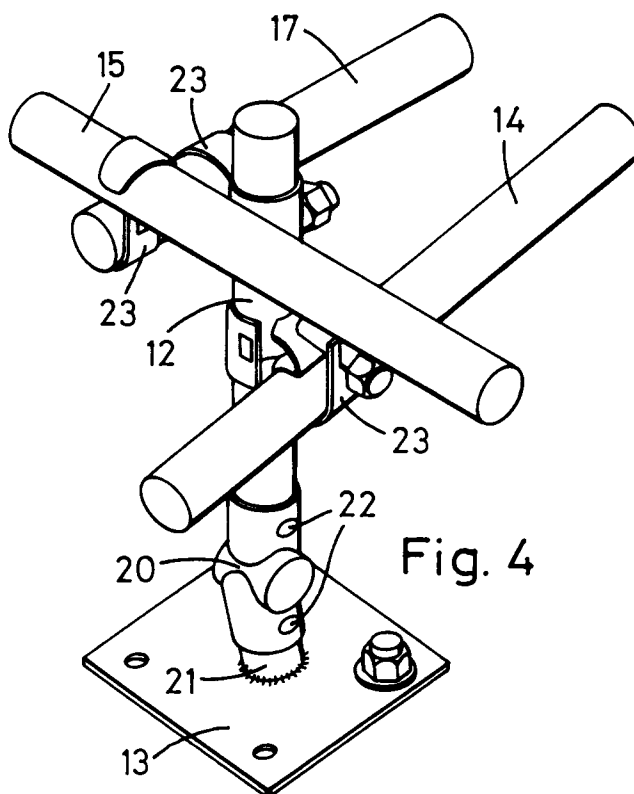


Fig. 4

The invention relates to seating, and to seating support structures.

With moves from spectators viewing sporting or other events standing on terraced structures to requirements that all spectators should be seated, substantial difficulties are posed to bodies such as football clubs who must now provide seating for all their spectators. Demolition of concrete terraces and replacement by seated stands will constitute a substantial expense to such bodies. This invention seeks to provide an alternative to outright structural replacement of terraces by seated stands.

According to the invention there is provided a support structure for seating, which structure comprises a multiplicity of upright standards, a plurality of horizontal bearers supported by the standards, and bracing means for bracing the structure, one or more of the standards including joint means such that said standards can lie vertically whether standing on a horizontal or a non-horizontal surface.

Preferably all the standards include joint means.

The joint means preferably comprises an elbow joint allowing movement about a single axis.

One or more horizontal bearers may include joint means to allow a change of seating line, in use.

The invention further provides a seating assembly comprising a support structure according to the invention and a multiplicity of seating units secured to the horizontal bearers.

The seating units are preferably secured to the horizontal bearers by fixings accessible only from beneath the seating units.

Each seating unit is preferably secured rotatably to a front horizontal bearer to allow tilting of the seating unit when the or each other fixing is released.

Each seating unit preferably includes a floor plate to provide a walkway, a back, and a seat mounted on the back. The seat is preferably rotatably mounted on the back to allow storage thereof when not in use.

The seating assembly may include one or more lateral walkways, and may include one or more stepped gangways. The stepped gangways may comprise step units secured together and to the support structure. The step units may be adjustably secured together.

The seating units preferably include drainage means for allowing liquid to drain towards the front. The floor plate preferably slopes down towards the front sufficiently to provide drainage flow.

By way of example, one embodiment of a seating support structure according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a general view of a support structure for seating and walkways;

Figure 2 is a sectional view along lines B-B in Figure 1 of a support for a seating unit;

Figure 3 is a sectional view along lines A-A in Figure 1 of a support for a step unit;

Figure 4 is a perspective view of a support standard;

Figure 5 is a side view of a standard hinge;

Figure 6 is a side view of an alternative support to a standard;

Figure 7 is an exploded view of a hinge in a bearer;

Figure 8 is a plan view of a seat/walkway unit;

Figure 9 is a sectional view along the lines A-A in Figure 8;

Figure 10 is a sectional view along the lines B-B in Figure 8;

Figure 11 is a diagrammatic view illustrating a corner seating plan;

Figure 12 is a sectional view of a horizontal gangway and balustrade unit;

Figure 13 is a sectional view showing a vertical stepped gangway;

Figure 14 is a sectional view along the lines D-D in Figure 13; and

Figure 15 is a sectional view showing a detail of securement of step units to form a vertical gangway.

Figure 1 shows a section of a terrace 10 for spectators at a stadium, or for viewing an area ahead of the terrace. The terrace 10 has a multiplicity of steps rising towards the back of the terrace so that spectators at the back of the terrace have an acceptable view of the area ahead of the terrace. The steps are of unequal length and the upwardly facing surfaces have a gentle slope towards the front to assist draining of surface water towards the front. This is a typical terrace of a stadium, such as a football stadium, and it will be appreciated that existing terraces will vary significantly stadium by stadium. Terraces are generally of concrete, but could be of other building materials.

The terrace 10 is structurally unaltered, but cleared of barriers or other crowd supports which are traditionally present. A support structure 11 is then assembled and secured to the terrace 10. As shown diagrammatically in Figure 1, the structure 11 consists essentially of standards 12 each with a base plate 13 secured to the terrace by a bolt, raking ties 14, horizontal bearers 15, diagonal bracing members 16 and horizontal bearer supports 17. All these structural members are tubular and of steel or other suitable structural material, and joined by clamps, for example scaffold clamps, as will be described later in more detail. As can be seen in Figure 1, different structural density of the support structure is possible, depending on the load to be borne. The structure of Figure 1 is mainly for seating support, but a denser structure can be seen in the direction of arrow 18 where a stepped gangway is required. Similarly, a horizontal gangway at 19 has a longer horizontal bearer support than does the seating area.

Figure 4 shows a standard 12 in more detail. The

base plate 13 is welded to the standard 12, and the standard 12 has a hinged elbow 20 to allow the base plate 13 to stand on a sloping surface but with the standard 12 vertical (see Figure 5). The elbow 20 is a female elbow engaged by a stub 21 adjacent the base plate 13, and by the standard 12, the stub 21 and the standard 12 being secured to the elbow 20 by rivets or bolts 22. Figure 4 shows in more detail standard bolted clamps 23 for holding the tubular members together.

Figure 2 shows how seating/walkway units 25 sit on the structure 11. The horizontal bearers 15 are the uppermost structural members, being supported in the bearer supports 17 which are in turn supported in the standards 12 and raking ties, diagonal bracing ties 16 bracing the structure 11. Seating/walkway units 25 are then supported on and secured to the horizontal bearers 15 as will be described in more detail later.

Figure 3 shows how vertical gangway steps 26 are supported. The basic structure of standards 12, raking ties 14, horizontal bearer supports 17, horizontal bearers 15 and diagonal bracings 16 is similar to that previously described, but an additional standard 30 is provided for step support at regular intervals, the additional standards 30 being braced by horizontal bearings 31. The vertical gangway steps 26 are supported on and secured to the horizontal bearers 15.

Figure 6 shows an alternative standard arrangement 35 for use if a standard needs to be located at a terrace riser 36. Two base plates 37, 38 support elbowed stubs 39, 40 which are connected to provide a horizontal support for the standard 35.

In a stadium, it is often necessary to have a viewing area extending around a corner, and the horizontal bearers 15 can be jointed by an elbow 40 of the same configuration as the elbow 20 described in relation to the standards 12. Two such elbows 40 are indicated in Figure 1, where it can be seen how a corner is turned in the seating structure.

All the base plates 13, 37 and 38 are secured to the terrace 10 by expanding bolts.

Figures 8 to 10 show a seating/gangway unit 25 and how it is fixed to horizontal bearers 15 and to adjacent units 25.

Each unit 25 has a floor pan 42, a back 43 and side wings 44 which support a seat spindle 45, the seat spindle 45 supporting rotatably a seat 46. The back 43 has a stop 47 which acts as a rotation stop against a rear edge 48 of the seat 46, as can be seen in Figure 9, the rear edge 48 being provided by a mild steel plate cast into the seat 46.

The seats can be of any suitable material, for example a reinforced polymeric material or metal. Fire resistance is an important consideration in choosing a suitable material, but the simple shape allows ease of fabrication, moulding or forming.

Drain slots 49 are provided in the seat back 43, and the floor pan 42 is arranged to fall by 10mm (or

other suitable amount in alternative circumstances) from back to front by a rib 50 secured to the pan 42 underside.

The units 25 are secured to a pair of horizontal bearers 15 by a rotatable clamp 51 at the front and a bolt 52 or other fixing extending between plates 53 extending from the underside of the floor pan 42. The rotatable clamp 51 has a semi-cylindrical clamp member 54 which clamps around the front bearer 15 and is secured to the pan 42. When the rear fixing is released, the unit 25 can be tilted forward, as shown in chain lines in Figure 9, for inspection of the structure under the unit 25. It will be appreciated that the fixings of the units 25 are concealed, thereby preventing removal of the units 25, but, starting at the end of a row of units, it is relatively easy and convenient to release the rear fixings one by one, and tilt the units 25 forward for access to the structure beneath for inspection and maintenance.

For the most part, units 25 will be arranged in straight rows, with wings 44 of adjacent units 25 abutting one another to provide armrests for seat occupants. At a corner, however, the units 25 cannot abut, as shown in Figure 11. At a corner, units 25 are factory formed with extra floor and back widths bonded to the units 25 to fill the tapered gap between units. Cover panels 55 are provided on exposed wings 44 to provide the same armrest width.

Figure 12 shows a horizontal gangway/balustrade unit 60, supported on four horizontal bearers 15. As with the seating/gangway units 25, the units 60 can be of metal or mouldable material. The unit 60 has a floor pan 61, a front wall 62 and a rear wall 62', both walls 62 and 62' supporting handrails 63. The gangway/balustrade unit 60 is shown between two seating/gangway units 25 and drainage passageways are provided at 64 in the back wall 62' and at 65 in the front wall 62. The units 60 are secured to the horizontal bearers 15 by suitable clamps.

Figures 13 and 14 show how the vertical gangway steps 26 are supported on bearers 15 (see Figure 3 above). The steps 26 are formed of individual step units 70 bolted together at front and back. Each step unit 70 has a floor plate, a front riser 71 and a rear upstand 72, bolting taking place through adjacent risers 71 and upstands 72. A nose 73 is provided at the head of the floor plate 71. Covers 74 are provided for seating units 27 lying adjacent the steps 70 both to provide thickness for an armrest with the wing 44 of a unit 25 and to cover the gap between the steps 70 and the floor of the units 25. Figure 14 is a sectional view showing the thickness of the cover 74.

Figure 15 shows how the step units 70 can be adjusted for height, in that the rear upstand 72 is slotted so that bolt 74 which engages a hole in the riser 71 can slide in the slot. Two alternative positions of the step units 70 are shown in Figure 15. A metal channel 75 is moulded into the riser to aid clamping

of the riser 71 to the upstand 72, the channel 75 fitting over the upstand 72. Figure 15 also shows how the step unit is clamped to a horizontal bearer 15 by a clamp 76.

All gangways, floor portions and steps have a non-slip walking surface.

The seating system of this embodiment provides new seats and access ways which do not require the existing ground structures to be removed or worked upon to any extent beyond the removal of the existing crush barriers and gangway handrails.

This embodiment allows for any areas to be left as temporary standing areas for Emergency Services if these are required, or, in the event of a change of ruling which would re-introduce standing accommodation at football grounds, then the terrace can be restored to its former capacity in a very short time by virtue of the removal of the seating system in its entirety.

This embodiment allows erection upon a variety of slopes and stepped surfaces, and the loading the system imposes is low enough for no remedial work to be necessary on existing terracing.

This embodiment allows the existing geometry of the terraces to be utilised to its fullest extent including space behind corners.

The seating system whilst fixed securely to its supporting structure also incorporates the facility for each individual seat to be tilted forward for inspection purposes or for removal or replacement.

The individual seat fixings are all placed away from vision so that any opportunity to remove seats is removed, and the fitting pan and arm ledge provided to each seat are integrally made with the seat so as to prevent any temptation by unauthorised persons to remove them.

The system materials being entirely polymeric, in preferred form, and with concealed fixings allows the facility of each wash down by cleaning staff. The system will drain to the bottom end of the terrace and be collected to the surface water drainage system as existing or modified.

It will be appreciated that the foregoing description is by way of example only; alterations and modifications may be made within the scope of the invention.

Claims

1. A support structure for seating, which structure comprises a multiplicity of upright standards, a plurality of horizontal bearers supported by the standards, and bracing means for bracing the structure, one or more of the standards including joint means such that said standards can lie vertically whether standing on a horizontal or a non-horizontal surface.

2. A support structure as claimed in Claim 1 wherein all the standards include joint means.

3. A support structure as claimed in Claim 1 or Claim 2 wherein each joint means comprises an elbow joint allowing movement about a single axis.

4. A support structure as claimed in any one of Claims 1 to 3 wherein one or more horizontal bearers include joint means to allow a change of seating line, in use.

5. A seating assembly comprising a support structure as claimed in any one of Claims 1 to 4 and a multiplicity of seating units secured to the horizontal bearers.

6. A seating assembly as claimed in Claim 5 wherein the seating units are secured to the horizontal bearers by fixings accessible only from beneath the seating units.

7. A seating assembly as claimed in Claim 5 or Claim 6 wherein each seating unit is secured rotatably to a front horizontal bearer to allow tilting of the seating unit when the or each other fixing is released.

8. A seating assembly as claimed in any one of Claims 5 to 7 wherein each seating unit includes a floor plate to provide a walkway, a back, and a seat mounted on the back.

9. A seating assembly as claimed in Claim 8 wherein the seat is rotatably mounted on the back to allow storage thereof when not in use.

10. A seating assembly as claimed in any one of Claims 5 to 9 including one or more lateral walkways.

11. A seating assembly as claimed in any one of Claims 5 to 10 comprising one or more stepped gangways.

12. A seating assembly as claimed in Claim 11 wherein the stepped gangways comprise step units secured together and to the support structure.

13. A seating assembly as claimed in any one of Claims 5 to 12 wherein the seating units include drainage means for allowing liquid to drain towards the front.

14. A seating assembly as claimed in Claim 13 wherein the floor plate slopes down towards the front sufficiently to provide drainage flow.

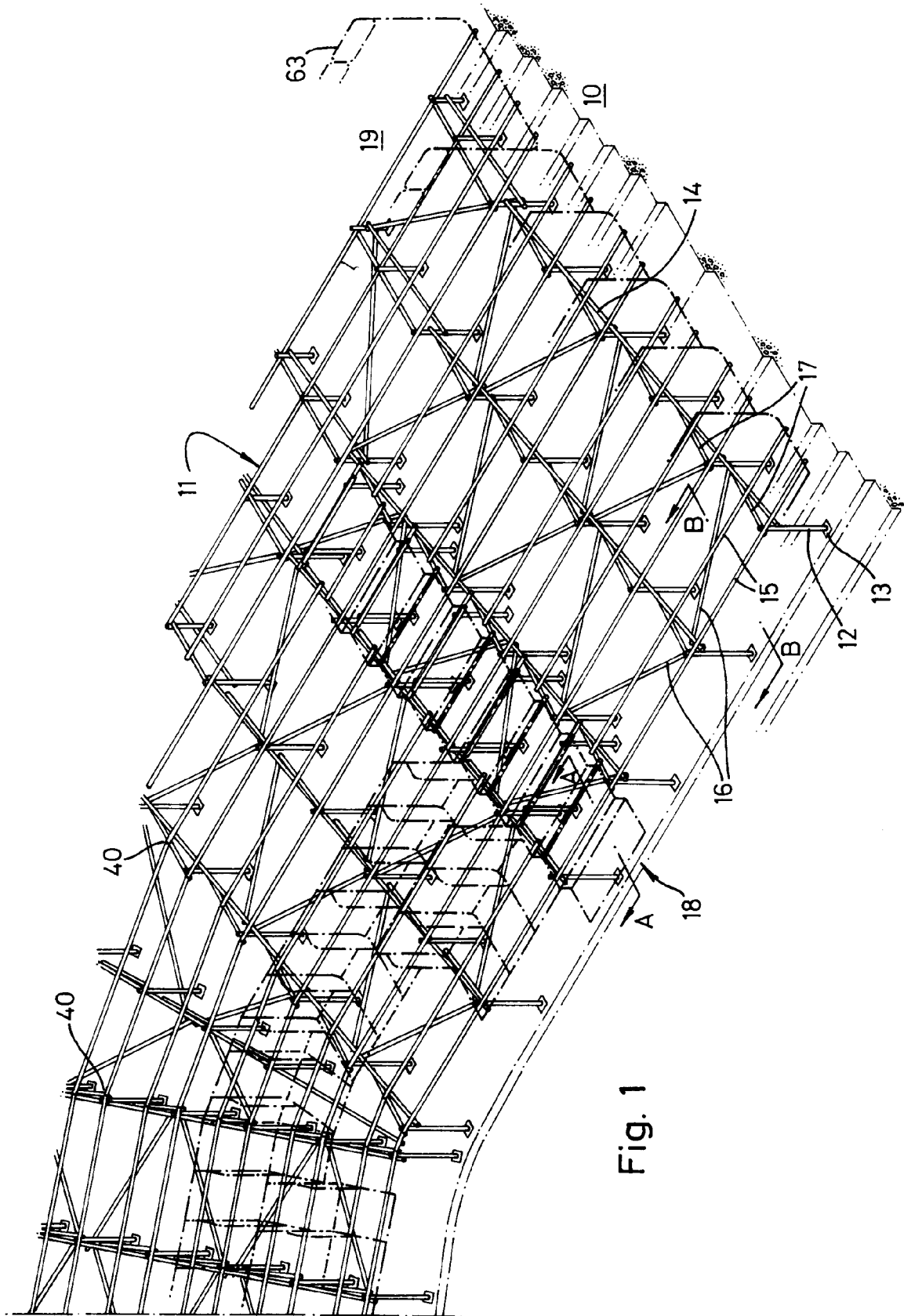
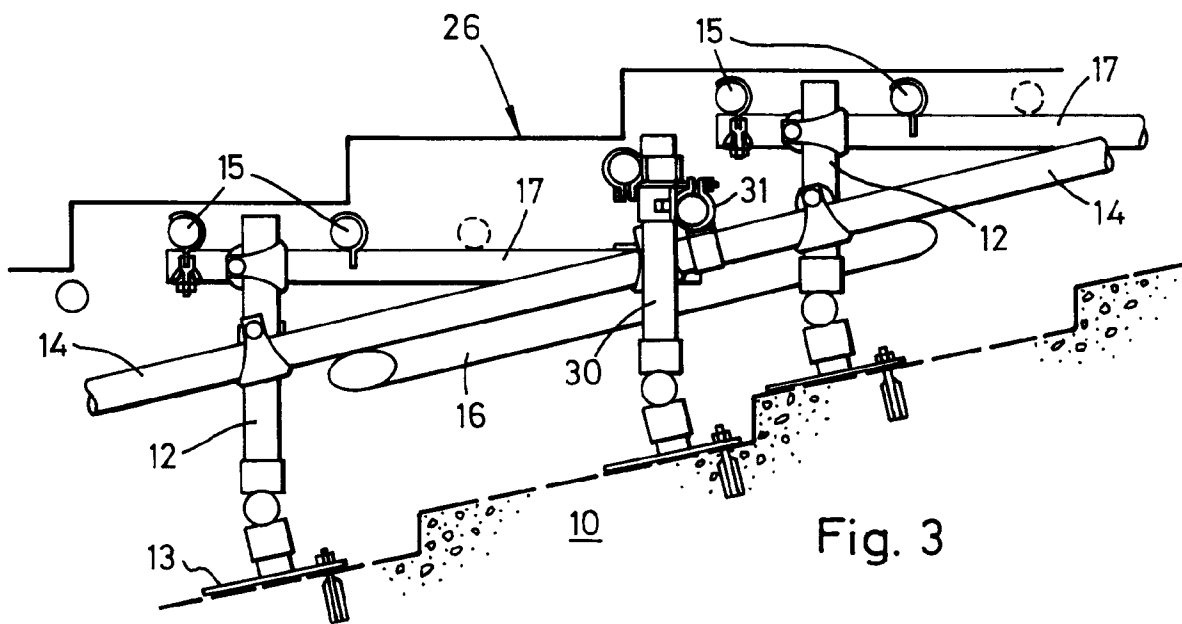
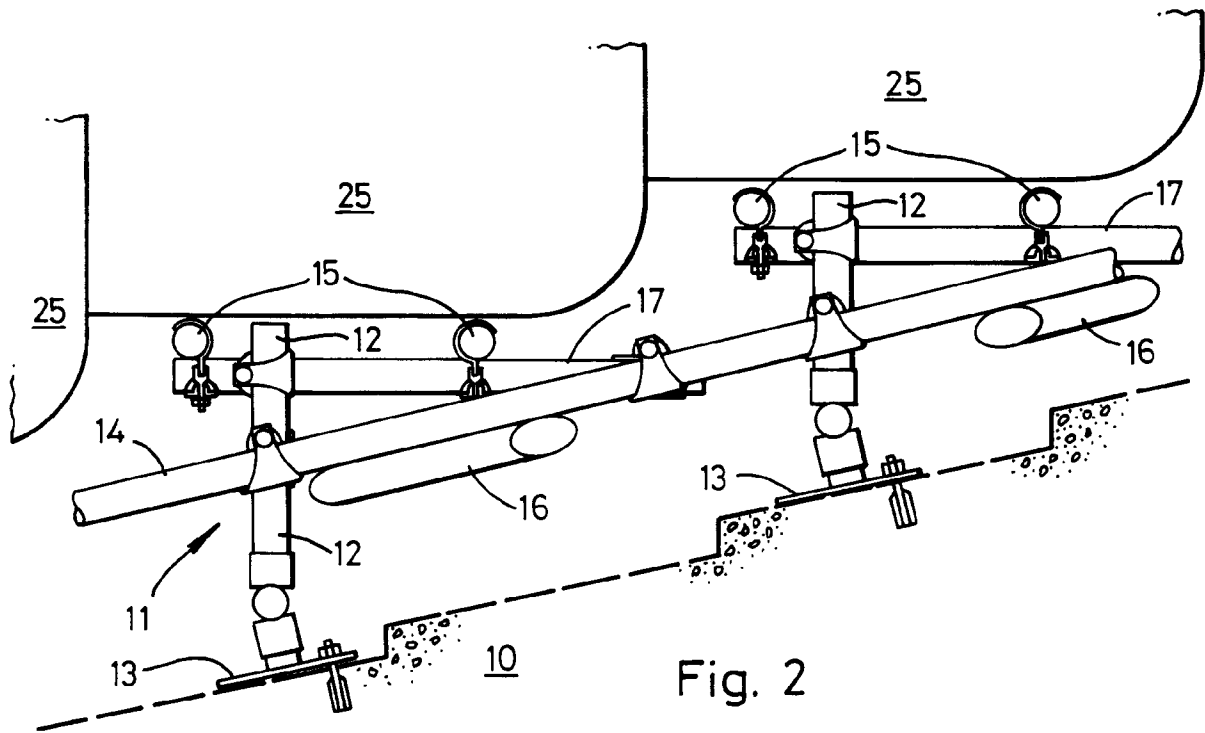
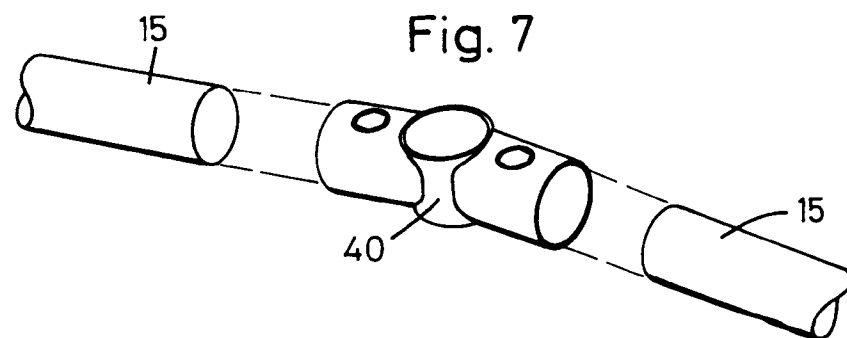
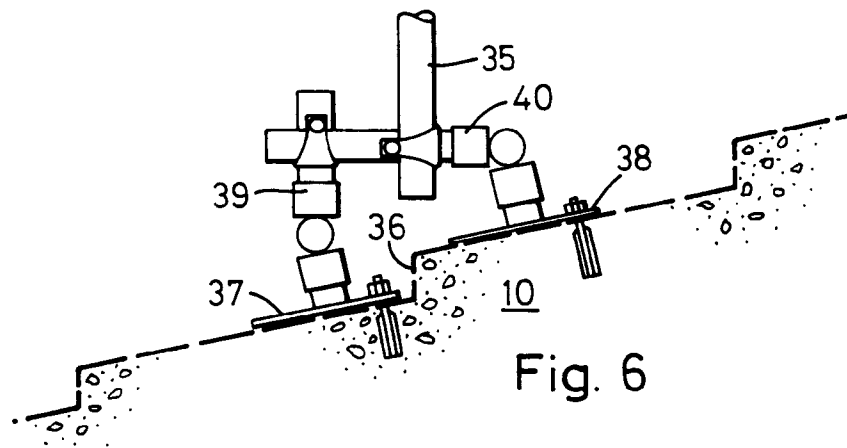
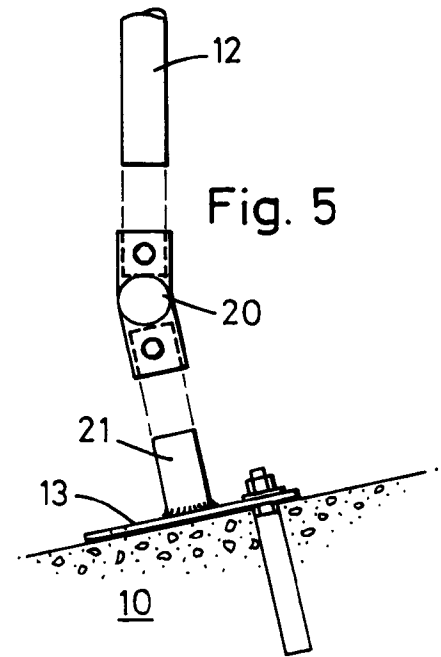
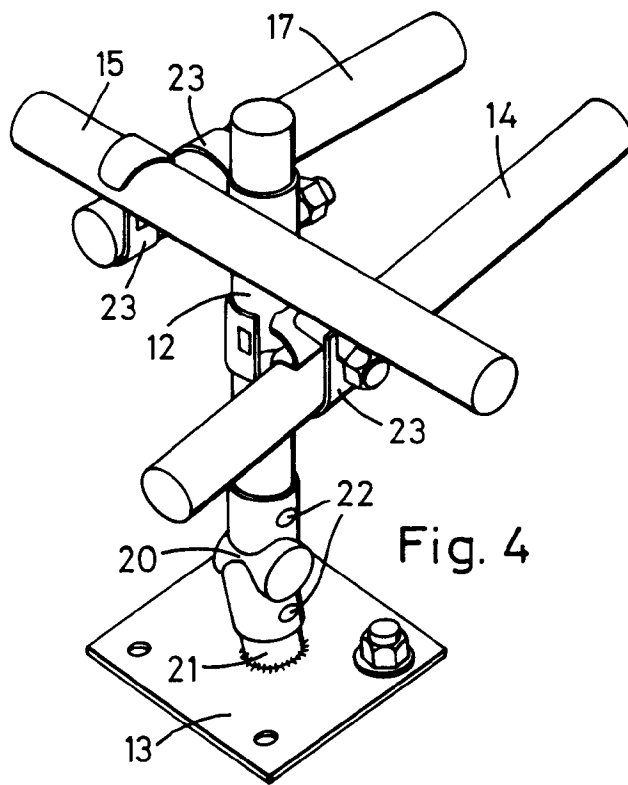


Fig. 1





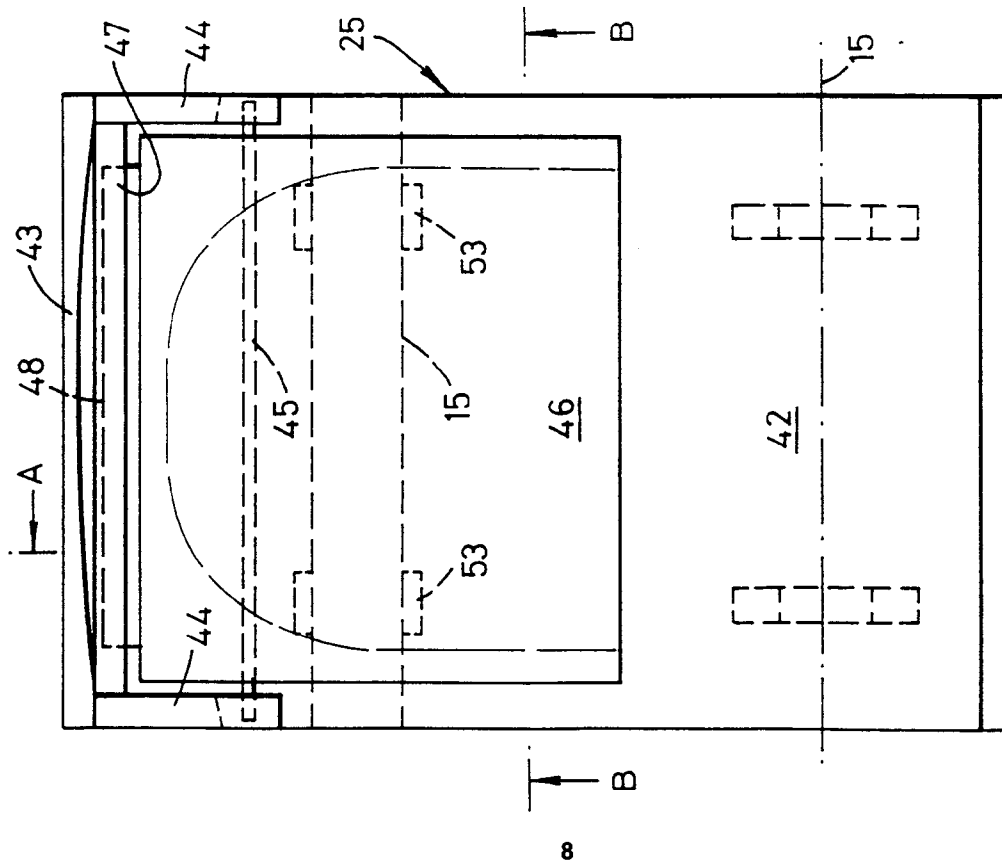


Fig. 8

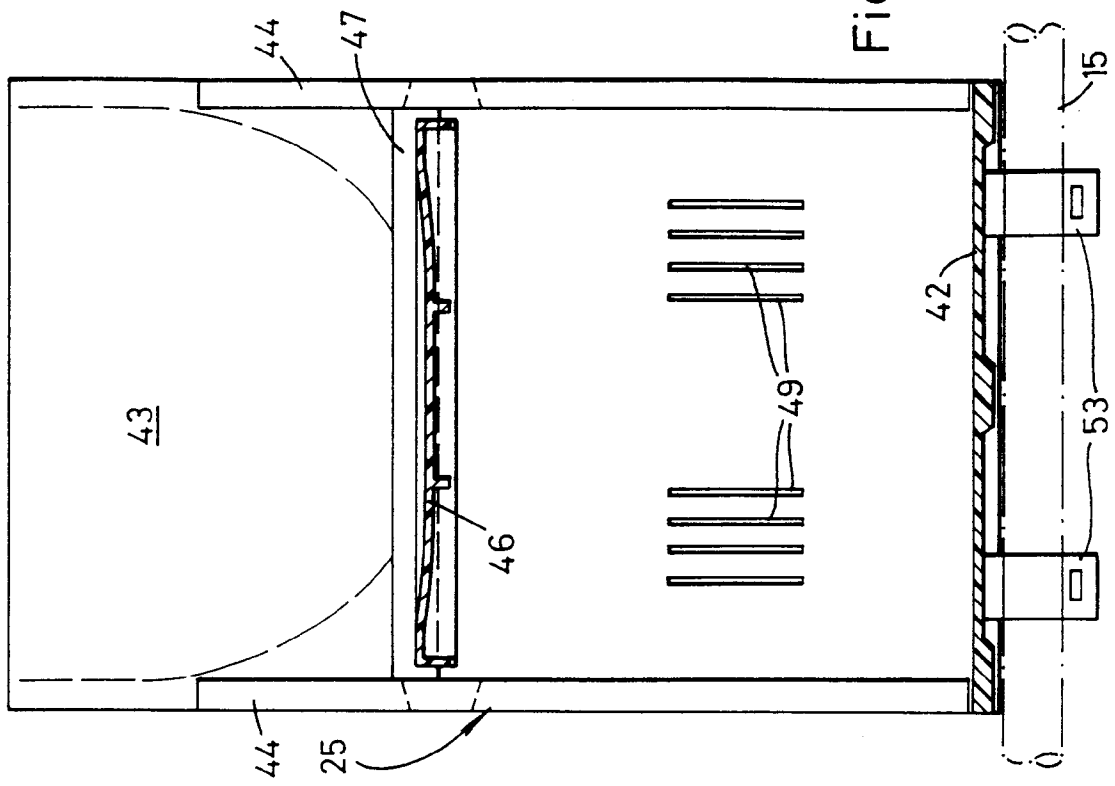


Fig. 10

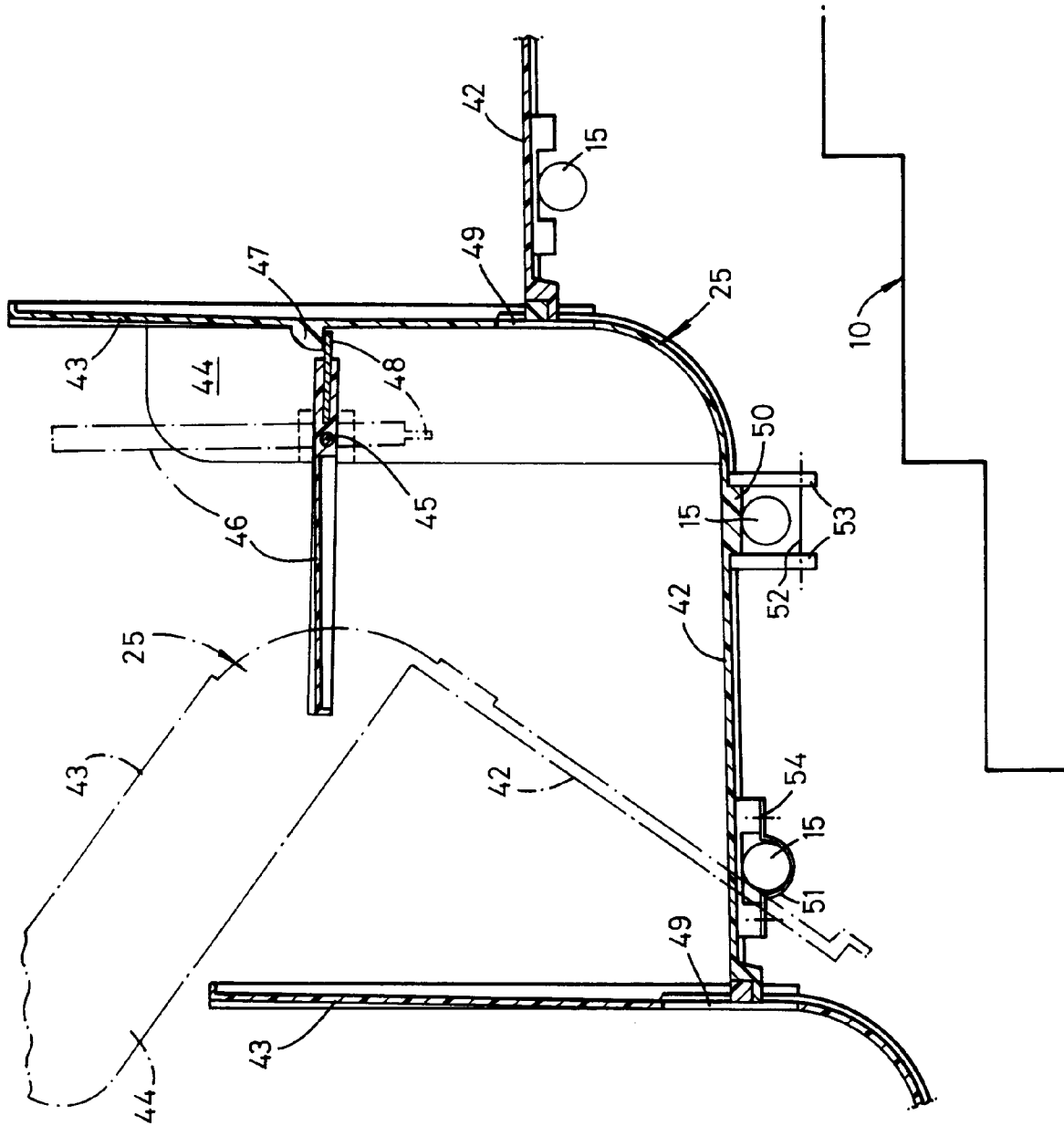


Fig. 9

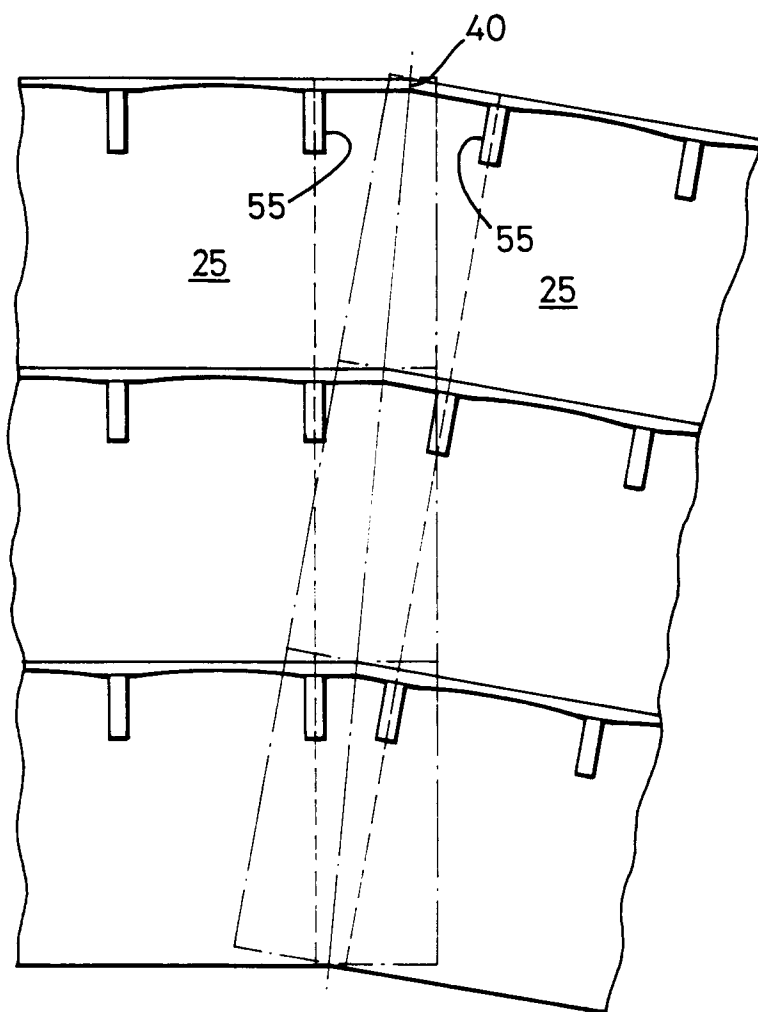


Fig. 11

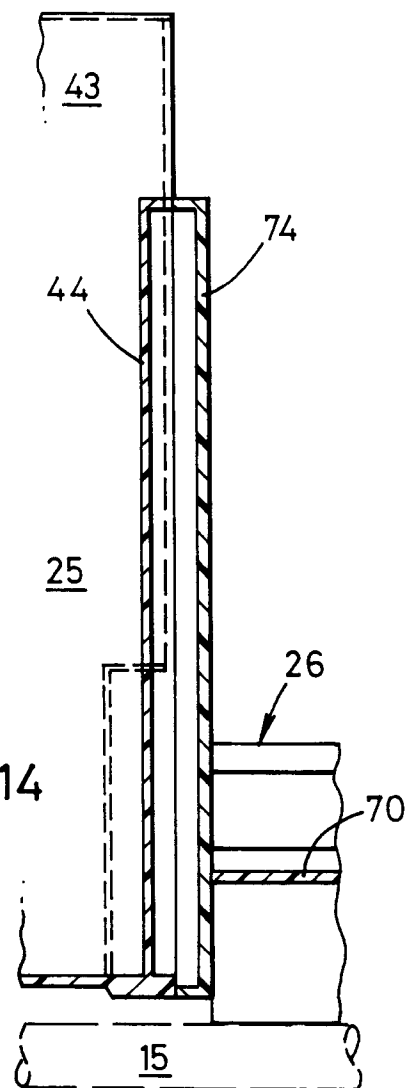


Fig. 14

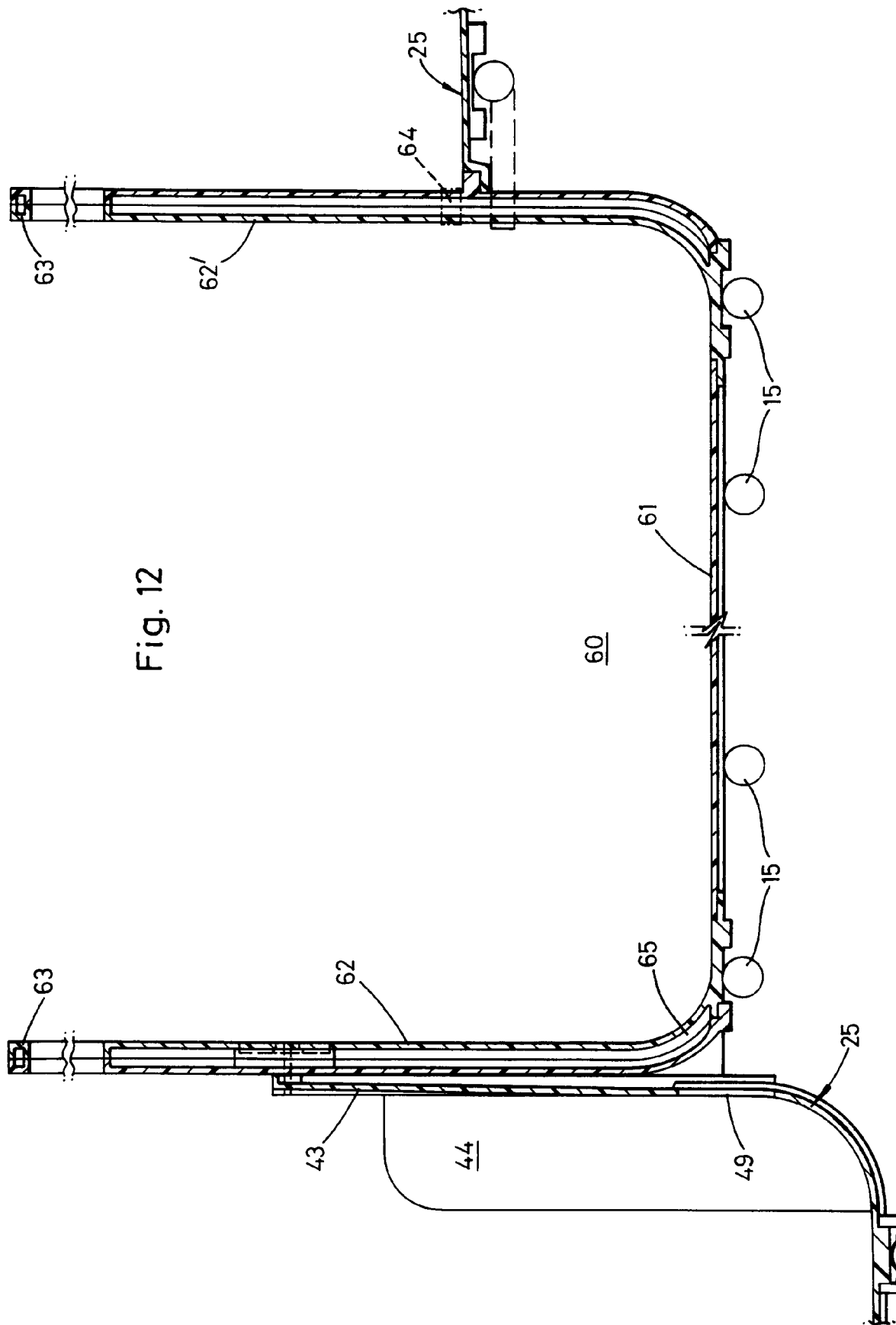
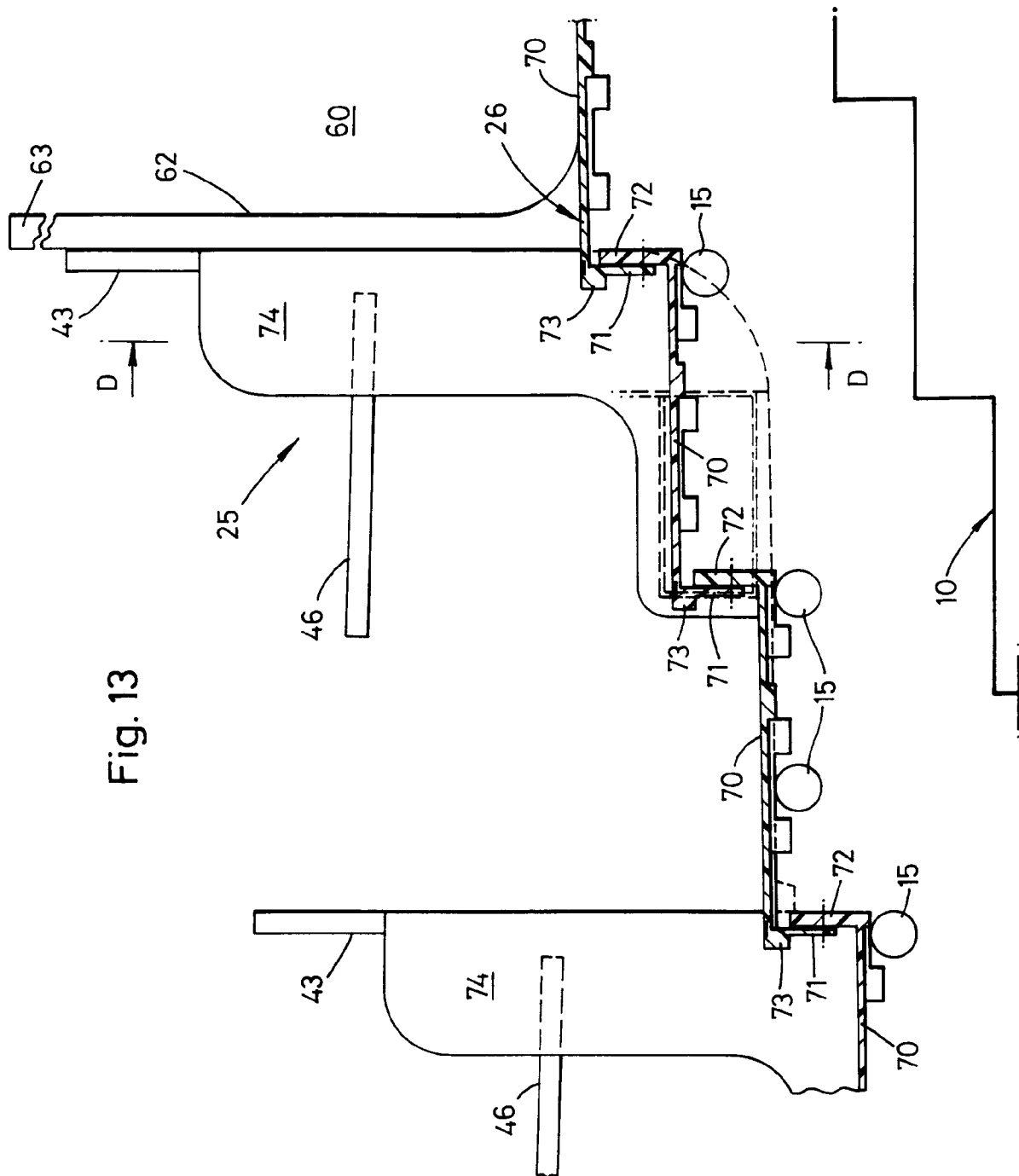
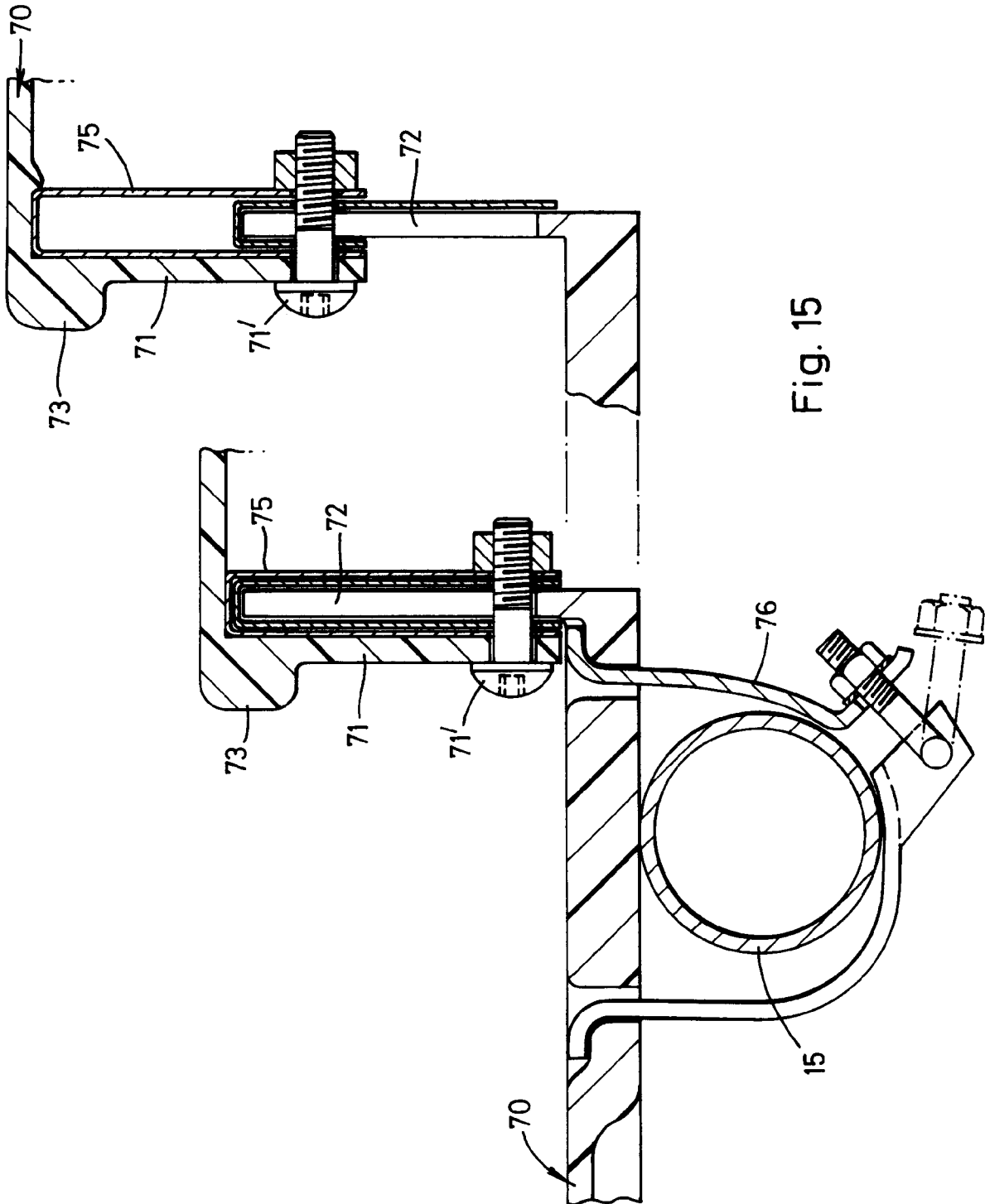


Fig. 12







European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 6600

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	WO-A-8 303 438 (STALLNINGSGRUPPEN I GÖTEBORG) * page 1, line 30 - page 2, line 11 * * page 4, line 29 - page 5, line 21 * * page 8, line 3 - line 9; figures 5,6 * ---	1-3, 4	E04H3/12 A47C1/16 E04G5/02
Y	GB-A-424 200 (MARSHALL) * page 2, line 81 - line 105; figure 1 * ---	1-3, 4	
A	EP-A-0 072 265 (MAYEN) * page 6, line 30 - page 7, line 33; figure 9 * ---	1,5,7-9	
A	WO-A-8 606 433 (SIT DOWN) * page 7, line 6 - page 8, line 13; figures 1,2,6,10,15 * ---	1,4,6, 11-13	
A	EP-A-0 367 900 (HANSAL) * column 3, line 10 - line 14 * * column 3, line 35 - line 50; figure 1 * ---	6,13	
A	US-A-4 790 594 (TEMOS) * column 3, line 31 - line 37; figure 2 * -----	14	TECHNICAL FIELDS SEARCHED (Int. Cl.5) E04H E04G A47C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 OCTOBER 1991	Examiner BELLINGACCI F.
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 I : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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