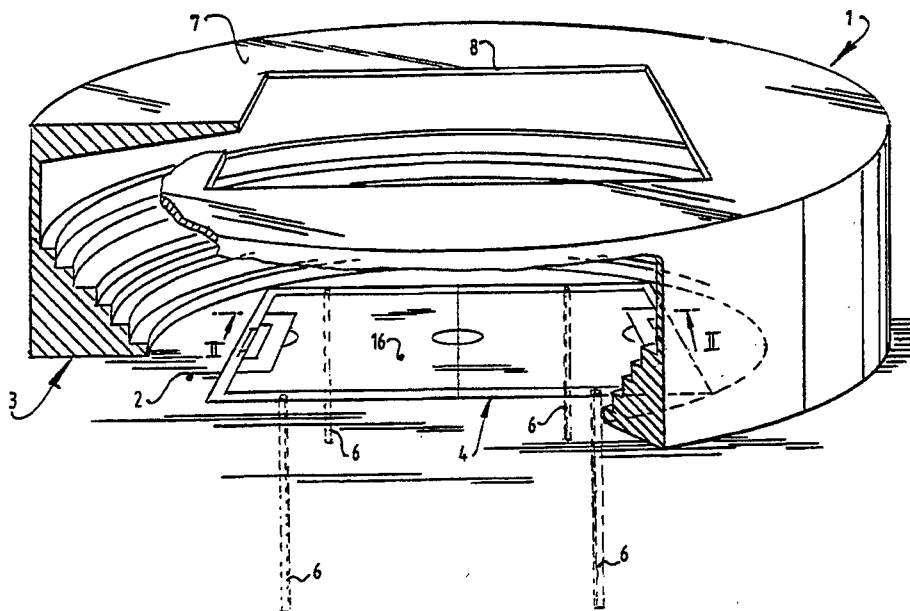




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : E04H 3/10, E04B 1/343</p>	<p>A1</p>	<p>(11) International Publication Number: WO 97/09497 (43) International Publication Date: 13 March 1997 (13.03.97)</p>
<p>(21) International Application Number: PCT/NL96/00351 (22) International Filing Date: 9 September 1996 (09.09.96) (30) Priority Data: 1001142 7 September 1995 (07.09.95) NL (71) Applicant (for all designated States except US): BALLAST NEDAM N.V. [NL/NL]; Laan van Kronenburg 2, NL-1183 AS Amstelveen (NL). (72) Inventor; and (75) Inventor/Applicant (for US only): HOEVERS, Arnold, Antoon, Maria [NL/NL]; Nieuweweg 2b, NL-3755 AC Eemnes (NL). (74) Agent: BARTELDs, Erik; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).</p>	<p>(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, HU, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. In English translation (filed in Dutch).</p>	

(54) Title: EVENT COMPLEX WITH VERTICAL DISPLACEABLE FLOOR PART



(57) Abstract

The invention relates to an event complex, comprising an event surface (2), which is surrounded by a stand (3) and on which is arranged a floor part (4) which is displaceable relative to the stand between a position of use and a stowed position. The floor part is displaceable in vertical direction and is located at a distance above the event surface in its stowed position. There, the floor part may form part of a roof (7) of the event complex. In such an event complex the event surface, which is cleared after the floor part, for instance a sports field is brought to its stowed position, may be used for events of different kinds. Furthermore, the space taken up by the event complex is minimized since the floor part is displaceable in vertical direction, which is especially advantageous in urban areas.

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Event complex with vertical displaceable floor part

The invention relates to an event complex provided with an event surface which is at least partially surrounded by a stand and on which is arranged at least one floor part which is displaceable in vertical direction relative to the stand between a position of use and a stowed position at a distance above the event surface. Such an event complex is known from WO-A-9015207 and can take for instance the form of a sports stadium, multi-purpose hall or the like.

Compared with event complexes wherein the floor part, which forms for instance a sports field, is fixed, an event complex with a displaceable floor part offers the advantage that through displacement of the floor part the event surface is freed for alternative uses. When the event complex is for instance a football stadium and the floor part therefore carries a turf field, the event surface located thereunder can be cleared by displacing the turf field in order to accommodate for instance a pop concert or an exhibition. The event complex can hereby be used for many different events, thus enabling economically responsible operation thereof.

In a number of known event complexes with displaceable floor part the floor part takes a slidable form. The floor part can herein slide for instance under a part of the stand. It is also possible for the floor to be formed by a plurality of separately displaceable parts which each support for instance half a playing field and can slide beneath stand parts located opposite each other. However, when the floor part forms a playing field of a natural material such as grass, as will be the case in football stadiums, it is important that the floor part be stowed in the open air. In the case of a slidable floor part this implies that the floor part must be carried beyond the periphery defined by the stands in

order to prevent deterioration of the grass. This has the drawback that a considerable area outside the periphery of the event complex must be kept clear of obstacles in order to allow the floor part to be placed there.

5 Therefore, an event complex with displaceable floor part has been proposed in the above-mentioned patent application WO-A-9015207 wherein this drawback does not occur. This is achieved according to this publication in that the floor part is displaceable in
10 vertical direction. This minimizes the space taken up by the event complex. This is of particular importance for event complexes situated in urban areas where the price of land is high and, moreover, buildings will often extend right up to the immediate vicinity of the event
15 complex. The floor part, which is displaceable through an intermediate position, in which it divides the complex into two halls located one above the other, to within an opening in the roof of the complex, is herein moved along four fixed columns located at its corners. These columns
20 are therefore visibly present in the complex at all times, and thus take away the view of possible important points of the field for large parts of the audience.

The invention therefore has for its object to provide an event complex of the type described above,
25 wherein this drawback does not occur. This is achieved according to the invention in that the floor part is supported by columns connected to the underside thereof and adjustable in height direction. As a result of the use of height adjustable columns arranged under the floor
30 part, these columns will be invisible at least when the floor part is in its position of use. Thus, the viewing pleasure of the audience is enhanced.

Preferably, the columns are situated at a distance from the edges of the floor part. Thus, a
35 lightweight structure of the floor part is achieved, whereby the columns also may be constructed relatively lightweight and slender, and therefore constitute only limited obstacles.

Further preferred embodiments of the event complex according to the invention are described in the dependent claims.

5 The invention also relates to a displaceable floor part, displacing means and fixation means for use in an event complex as described above.

The invention is now elucidated on the basis of an embodiment, wherein reference is made to the annexed drawing, in which:

10 Fig. 1 shows a partly cut away perspective view of an event complex according to the invention;

Fig. 2 shows a sectional view of the floor part and the columns of the event complex according to the invention taken along the line II-II in fig. 1;

15 Fig. 3 shows a schematic top view of the floor part with columns of fig. 2;

Fig. 4 is a partly broken away perspective detail view of the underside of the floor part and a column;

20 Figs. 5 and 6 show schematic part-sections of the floor part with a column and its displacing means in the fully retracted, respectively fully extended position;

25 Figs. 7A-E show schematically the displacement of a column with the floor part resting thereon;

Figs. 8 and 9 are views corresponding to fig. 5 of alternative embodiments of the displacing means; and

Fig. 10 is a view corresponding to fig. 5 of an alternative embodiment of the column.

30 An event complex 1, for instance a football stadium, (fig. 1) is provided with an event surface 2 which, in the embodiment shown, is wholly enclosed by the stand 3. Arranged on an event surface is a floor part 4 which in the embodiment shown carries a football field
35 16. Floor part 4 is supported by columns 6 arranged in a ground 5 and is displaceable in vertical direction between the shown position of use and a stowed position in which the floor part 4 is situated at a distance above

the event surface 2. Because the columns 6 are situated below the floor part 4, they are not visible in the position of use of the floor part 4, so that the audience has an unrestricted view of the football field 16. In the shown embodiment the stands 3 are covered and a roof 7 is thus formed on the event complex 1 which is provided with an opening 8, the dimensions of which correspond precisely with the dimensions of the displaceable floor part 4. When floor part 4 therefore occupies its stowed position it precisely closes off the opening 8 in roof 7, whereby a completely closed event complex 1 is formed. The event surface 2 can then be used for other types of event such as for instance concerts, exhibitions and the like. Furthermore, the field 16 which is arranged on the floor part 4 is thus not covered at all in the stowed position, so that the field, if it is made from a natural material such as grass, remains in good condition.

In the illustrated embodiment the columns 6 are received adjustably in height direction in wells 19 which are arranged in the ground 5 and debouch in the event surface 2 (fig. 2). The floor part 4 can hereby be raised to its stowed position from its shown position of use, in which it is received in a recess 9 of the event surface 2, the upper surface thereby lying flush with the event surface. For this purpose means 13 are arranged in a widened part 12 of each well 10 for displacing the columns 6 in vertical direction. Also arranged in this same widened part 12 are means 14 which co-act with the displacing means 13 and which serve to fix the columns 6 in a determined position.

The floor part 4 is formed by a frame 15 on which is arranged a top layer, for instance in the form of a playing field 16. Frame 15 is formed by a plurality of longitudinal girders 17 and a plurality of transverse girders 18 connected thereto (fig. 2-4). Cross ties 19 are further arranged between the transverse girders 18, whereby a rigid floor part 4 is formed which does not exhibit any perceptible bending either in its position of

use or in its stowed position. The columns 6 are herein situated at a distance inside the peripheral edge 31 of floor part 4, thus leading to an optimum distribution of the loads in the floor part 4. As a result, the floor part 4 may be constructed relatively lightly, which in turn allows columns 6 to take a relative lightweight and thin form also. In this way they do not constitute much of an obstacle in the stowed position either. On the other hand, it is of course also conceivable to make use of columns which are arranged along the edge 31 of floor part 4.

The displacing means 13 comprise for each of the columns 6 at least one jack 23 for connecting thereto (fig. 5, 6). The fixation means 14 comprise in addition for each of the columns 6 at least one lower and upper fixation ring 22L respectively 22U, between which are arranged the jacks 23. Jacks 23 therein rest on the lower fixation ring 22L which in turn rests on the bottom of the widened part 12 of the well 10. These fixation rings 22L, 22U, which wholly enclose the column 6, are provided with openings 26, 27 in which can be placed fixing pins 28, 29. Columns 6 are each provided with openings 20, the dimensions of which correspond substantially with those of openings 26, 27 of fixation rings 22L, 22U, so that the fixing pins 28, 29 can be placed into these openings 20. Columns 6 are each arranged for displacement in their associated well 10 which is bounded by a well wall 21 arranged in the ground 5. During their displacement in the well 10 and the widened part 12 thereof the columns 6 are guided by schematically shown guide members 24, 25 respectively. The displacement of columns 6 herein takes place in stepwise manner, wherein the fixation means 14 are synchronized with the displacing means 13 such that during the displacement step they are held clear of columns 6 and are placed into engagement with the column 6 once again at the end of each step.

Displacement of the columns 6 proceeds as follows (fig. 7). When floor part 4 must be moved from a

particular position, in which it is fixed in that both fixation rings 22L and 22U are in engagement with the column 6 (fig. 7A), to another position, the lower fixation ring 22L is first disengaged from the columns 6.

5 For this purpose the fixing pins 29 are pulled out of the openings 20 in column 6 and the openings 27 of the lower fixation ring 22L (fig. 7B). The (for instance hydraulic) jacks 23 are then actuated, whereby their piston rod 30 moves upward, thus carrying upward the upper fixation
10 ring 22U. This fixation ring 22U is connected to column 6 by means of the fixing pins 28 which protrude through openings 26 and 20, whereby column 6 and floor part 4 are also carried upward.

When the jacks 23 reach the end of their stroke
15 or when a new set of openings 20 of column 6 lie in register with the openings 27 of the lower fixation ring 22L, the pins 29 are placed once again through the openings 27 and the openings 20 of column 6 lying in register therewith, whereby the lower fixation ring is
20 likewise placed in engagement with column 6 (fig. 7C). The column 6 is now fixed in its position one step higher. The pins 28 can now be removed whereby the upper fixation ring 22U disengages from column 6 (fig. 7D), whereafter the piston rods 30 can be retracted into the
25 hydraulic jacks 23 until the upper fixation ring 22U lies in register with a set of openings 20 of column 6 which are in a lower position (fig. 7E), whereby a displacement step is completed. The pins 28 can now be placed once again into openings 26 and 20, whereby the starting
30 position of fig. 7A is restored and the above described operations can be repeated. Sliding of the fixing pins 28, 29 in and out of the openings 20, 26 and 27 and moving of the hydraulic jacks 23 herein takes place automatically under the control of an operating unit
35 arranged outside the well 10. Operation can herein take place manually or proceed in accordance with a pre-installed program.

In this manner the columns 6 and therewith the floor part 4 can be carried stepwise upward or downward. As a result of this stepwise displacement with intermediate locking it is possible to suffice with jacks having a comparatively short stroke, whereby the total costs of the event complex remain relatively limited.

Conversely, it is of course also possible to make use of jacks with a stroke length corresponding with the distance over which the floor part 4 has to be displaced between its position of use and its stowed position. Such a possibility is illustrated in fig. 8, wherein the underside 34 of the column 6 is constructed as a piston surface sealing the well 10, and pump means 32 are arranged in the widened part 12 of the well 10 and are connected via a conduit 36 to the space 35 at the bottom of the well 10 enclosed by the piston surface 34. A valve 33 is arranged in the conduit 36, whereby the column 6 may be fixated in a given position. When a pressure fluid 37 like water is pumped into the chamber 35 by means of the pumps 32, the column 6 may be raised. It is fixated by closing the valve 33. By way of extra safety, a mechanical fixation may further be applied, for instance by means of pins (not shown) to be pushed into the column 6.

Instead of hydraulic jacks, the displacing means 13 could also be embodied as winches 39, with which cables 38 connected to the underside 34 of the column 6 can be hauled in or paid out (fig. 9). In that way the columns 6 and thus the floor part 4 may also be raised and lowered. By way of fixation a cable brake may be envisaged, complemented if necessary by a mechanical fixation by means of pins to be pushed into the column 6.

In case insufficient room is available under the event surface 2 for striking wells 10 to a depth which corresponds to the desired height of displacement of the floor part 4, telescopically extendable columns 6 may be used (fig. 10). These may be placed on the event surface 2 or in shallow wells 10. The columns 6 in that

case consist of mutually fitting telescopic parts 40, which are mutually slidable, and which may be fixated with respect to each other in one or more extended positions. For extending and collapsing the columns 6
5 small jacks 23 may once again be used.

Claims

1. Event complex (1) provided with an event surface (2) which is at least partially surrounded by a stand (3) and on which is arranged at least one floor part (4) which is displaceable in vertical direction relative to the stand (3) between a position of use and a stowed position at a distance above the event surface, **characterized in that** the floor part (4) is supported by columns (6) connected to the underside thereof and adjustable in height direction.

2. Event complex (1) as claimed in claim 1, **characterized in that** the columns (6) are arranged at a distance from the edges (31) of the floor part (4).

3. Event complex (1) as claimed in claim 1 or 2, **characterized in that** the columns (6) are received for adjustment in height direction in wells (10) extending under the event surface (2).

4. Event complex (1) as claimed in any one of the preceding claims, **characterized in that** the columns (6) are telescopically extendable.

5. Event complex (1) as claimed any one of the preceding claims, comprising means (13) arranged close to the event surface (2) for displacing the columns (6) in vertical direction, **characterized in that** the displacing means (13) for each of the columns (6) comprise at least one jack (23) for connecting thereto.

6. Event complex (1) as claimed in claim 5, comprising means (14) co-acting with the displacing means (13) for fixing the columns (6) in a determined position, **characterized in that** the displacing means (13) are adapted to displace the columns (6) in stepwise manner and the fixation means (14) are synchronized with the displacing means (13) such that during a displacement step they are held clear of the columns (6) and are placed in engagement therewith at the end of each step.

7. Event complex (1) as claimed in claim 6, **characterized in that** the fixation means (14) for each of

the columns (6) comprise at least one lower and one upper fixation member (22L, 22U), between which is arranged the at least one jack (23) and the fixation members (22L, 22U) can be placed in alternating engagement with the associated column (6).

5
8. Event complex (1) as claimed in claim 5, **characterized in that** the jack (23) is formed by a chamber (35) arranged under the column (6) for filling with a pressure fluid and pump means (32) connected thereto.

10
9. Event complex (1) as claimed in claim 8, comprising means (14) co-acting with the displacing means (13) for fixing the columns (6) in a determined position, **characterized in that** the fixation means (14) are formed by a valve (33) arranged between the pump means (32) and the chamber (35).

15
10. Displaceable floor part (4) evidently intended for use in an event complex (1) as claimed in any of the foregoing claims.

20
11. Displacing means (13) evidently intended for use in an event complex (1) as claimed in any of the claims 5-9.

25
12. Fixation means (14) evidently intended for use in an event complex (1) as claimed in claims 6, 7 or 9.

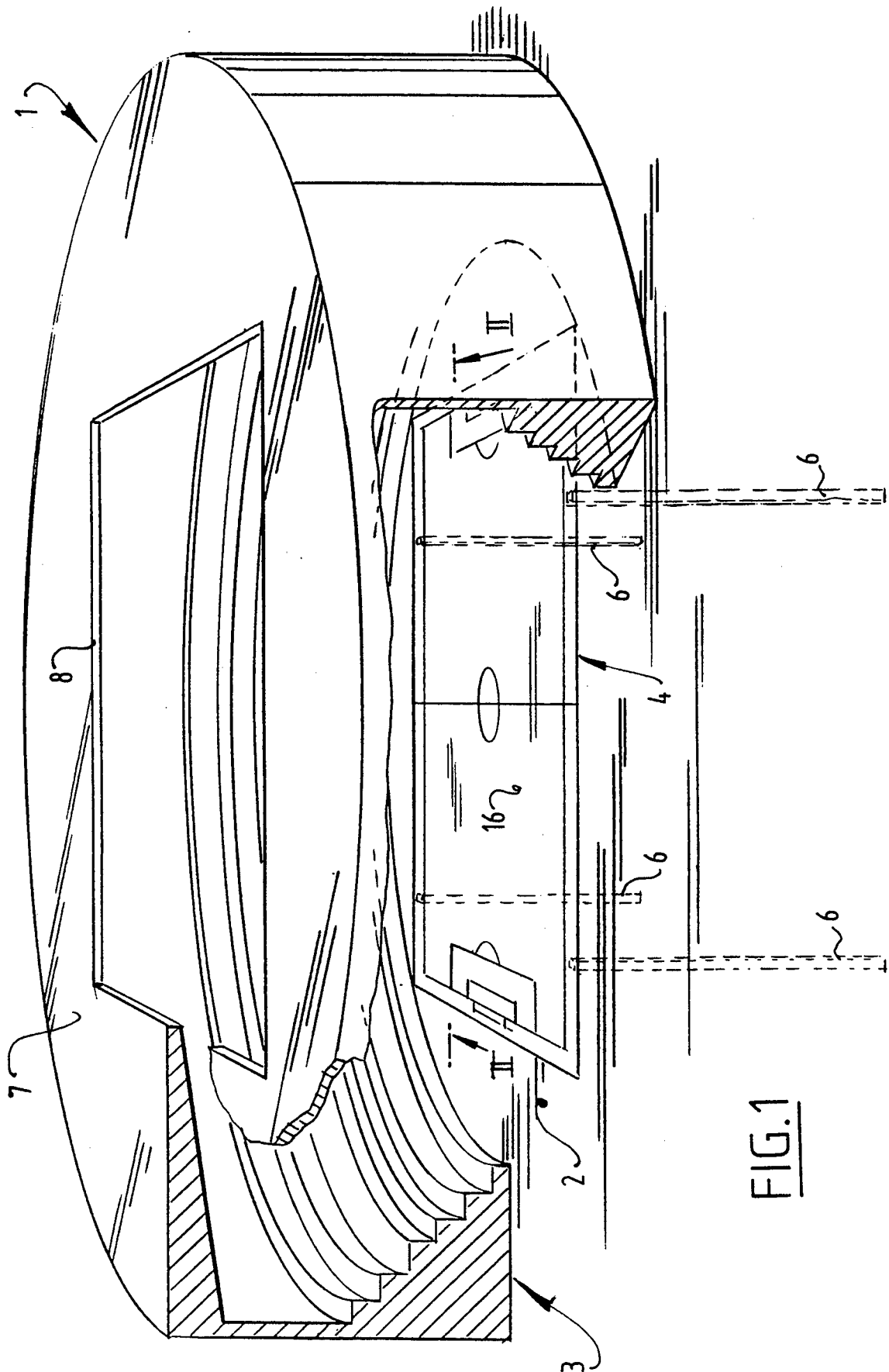
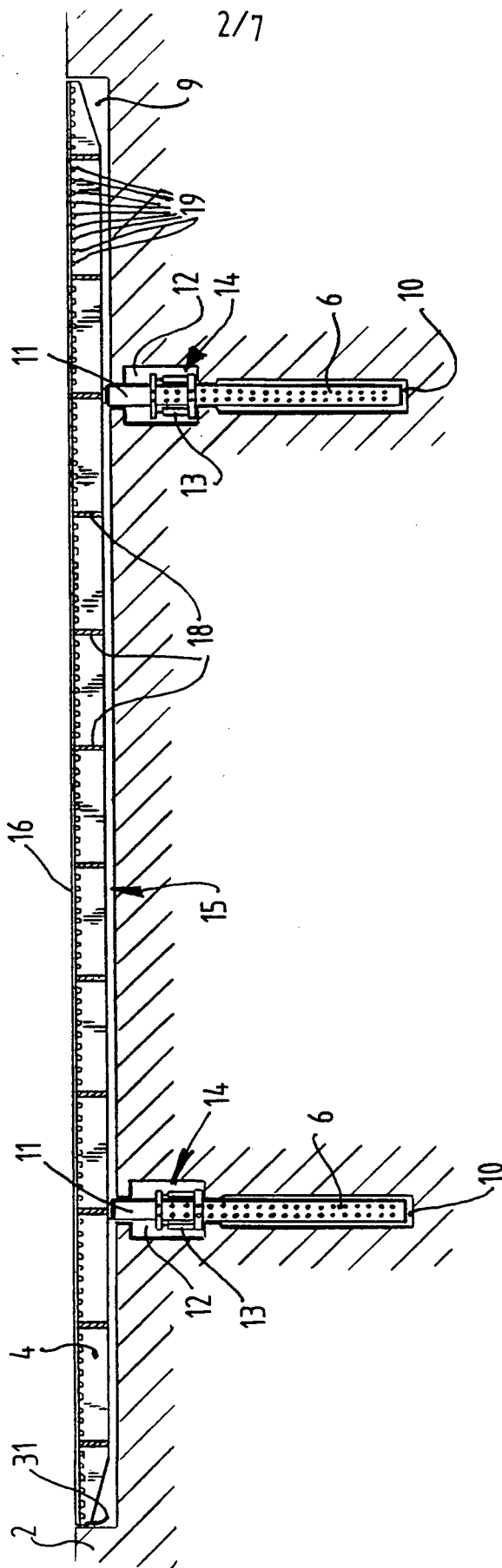


FIG. 2



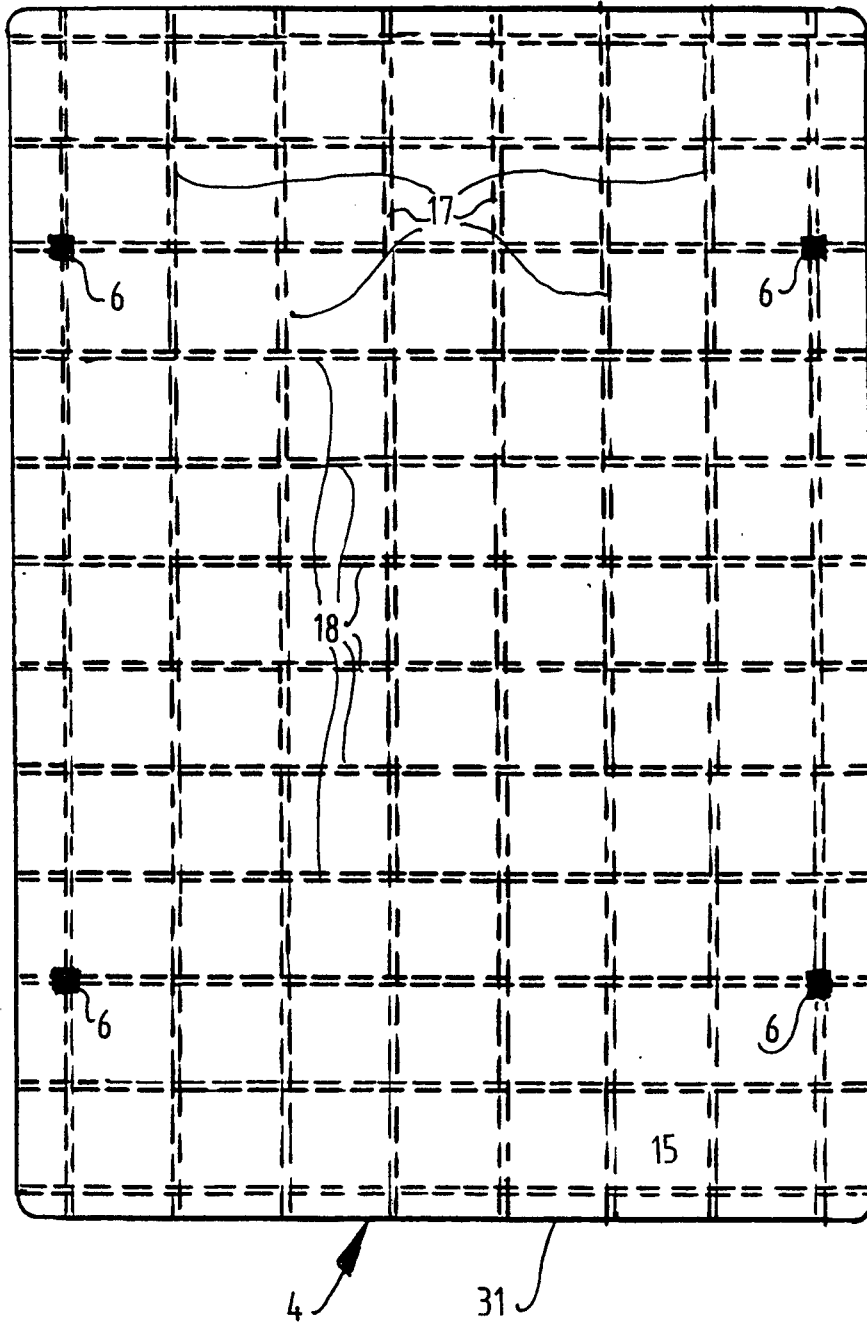


FIG. 3

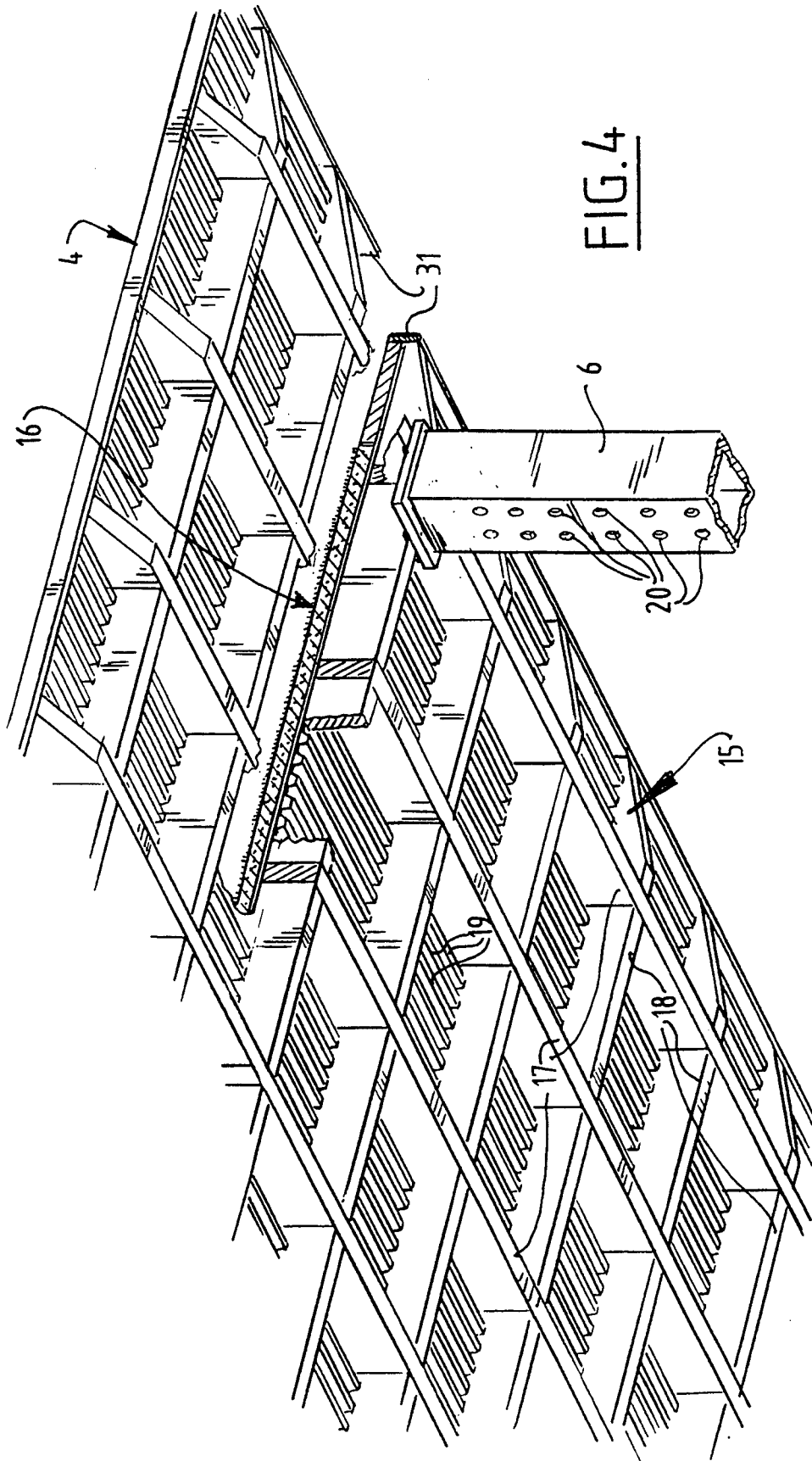


FIG. 4

5/7

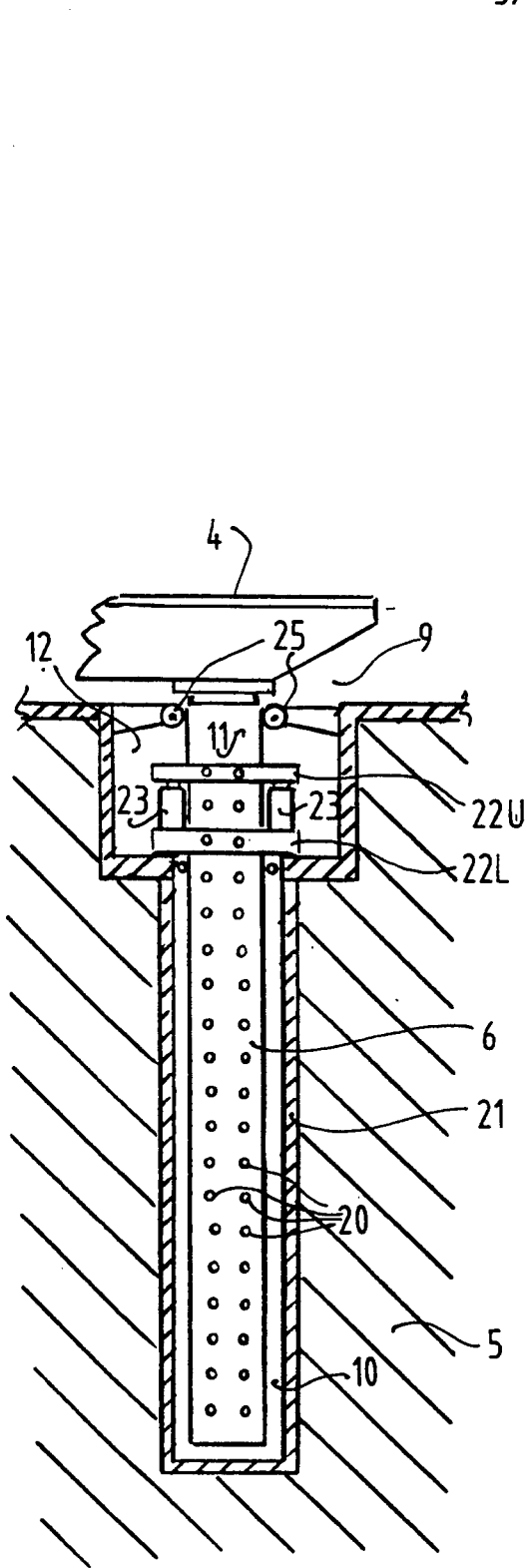


FIG. 5

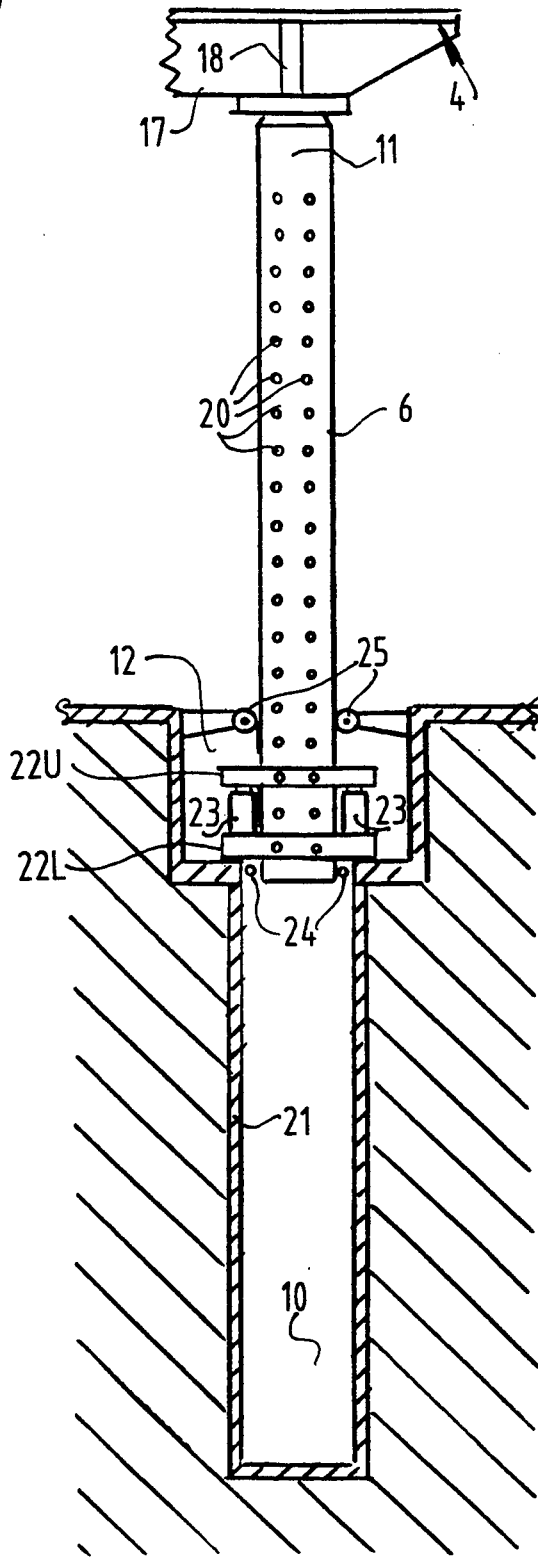
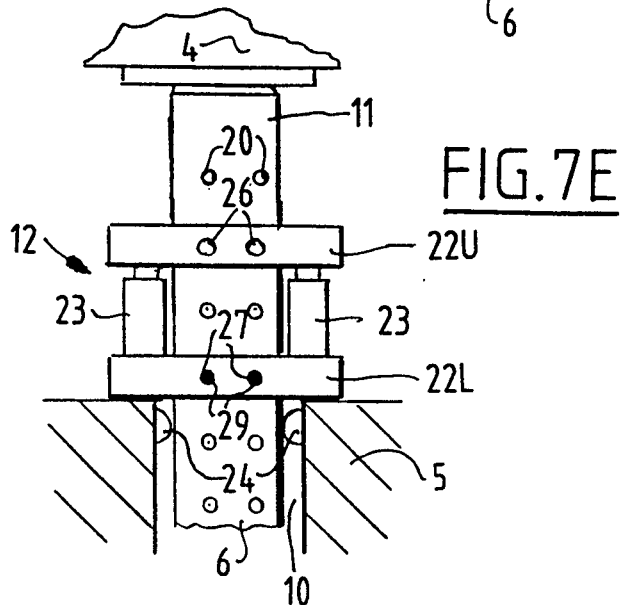
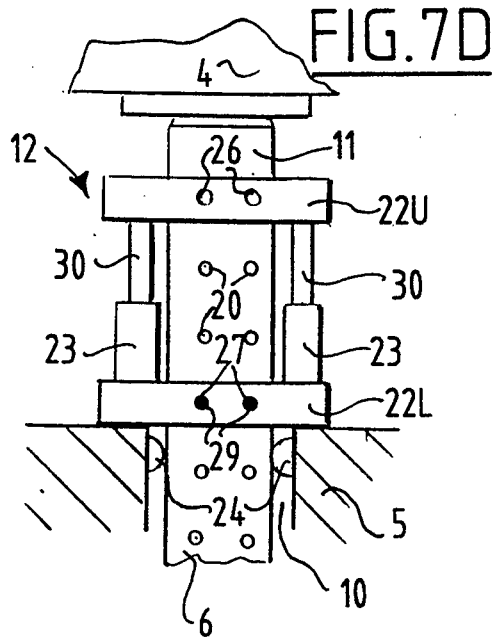
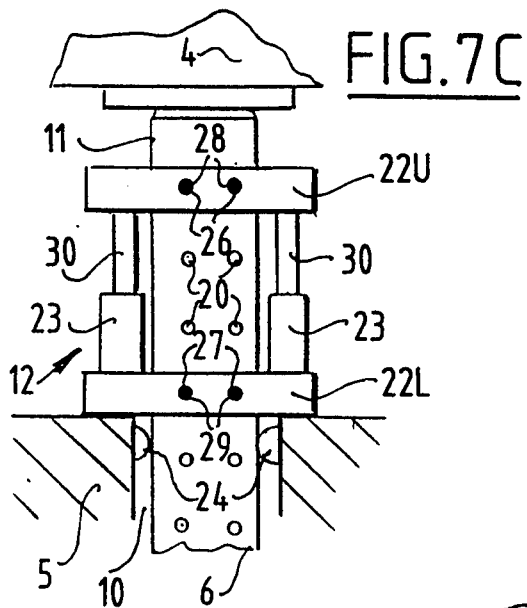
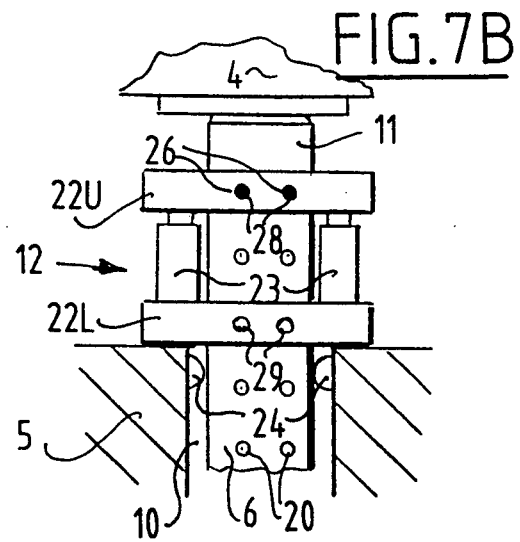
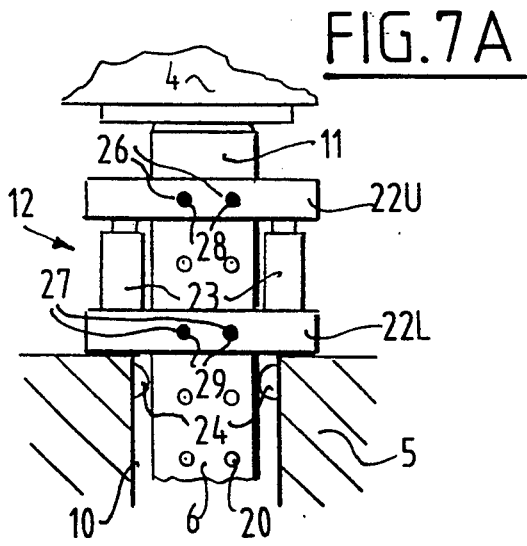


FIG. 6



7/7

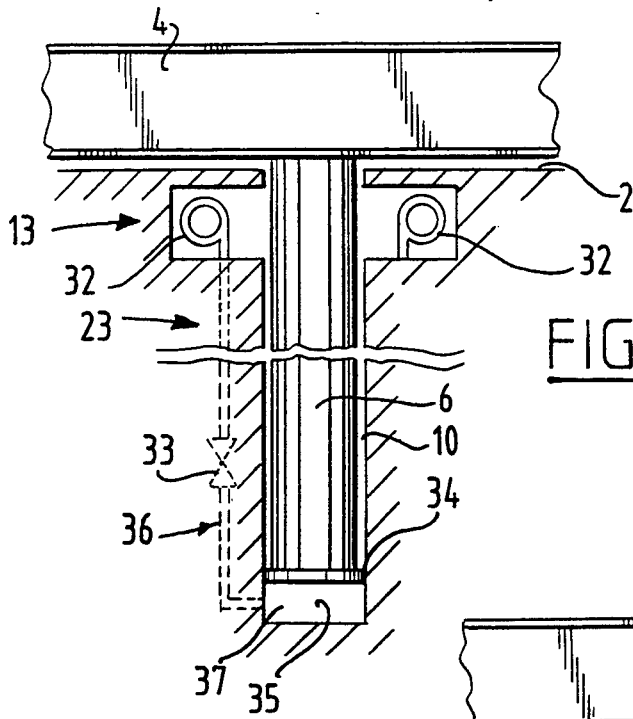


FIG. 8

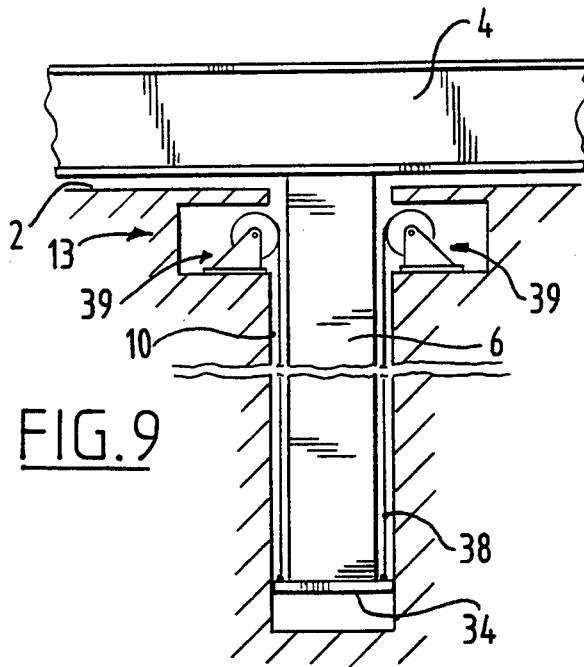


FIG. 9

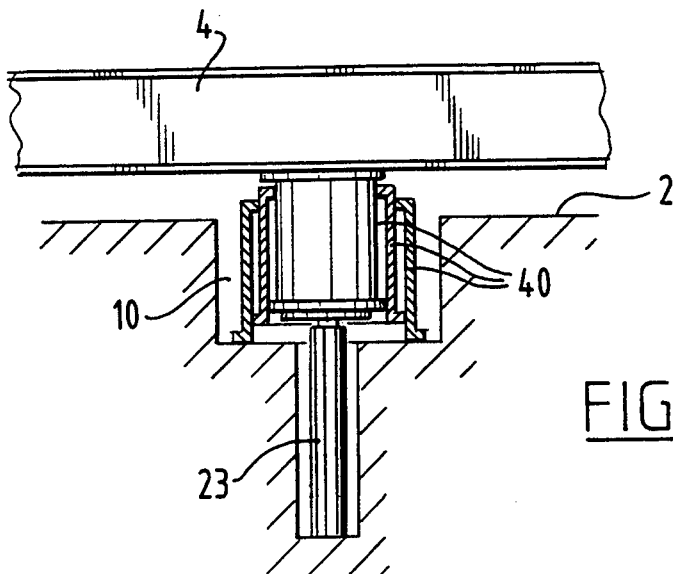


FIG. 10

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/NL 96/00351

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E04H3/10 E04B1/343

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E04H E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A A	<p>WO,A,90 15207 (CAMPBELL DAVID M) 13 December 1990 see the whole document ---</p> <p>DE,A,27 46 636 (ZILLER ALFRED H FA) 19 April 1979 see page 6, paragraph 2; figure 2 -----</p>	<p>1,5,10, 11 2,6-8,12</p> <p>6,7,9</p>

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

12 December 1996

Date of mailing of the international search report

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NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+ 31-70) 340-3016

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Vrugt, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9015207	13-12-90	US-A- 5103600	14-04-92
		EP-A- 0474784	18-03-92
		JP-T- 5503330	03-06-93
DE-A-2746636	19-04-79	NONE	