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(71) Applicant: **Bengoa Saez De Cortazar, Domingo**
01002 Vitoria-Gasteiz,
Alava (ES)

(72) Inventor: **Bengoa Saez De Cortazar, Domingo**
01002 Vitoria-Gasteiz,
Alava (ES)

(74) Representative: **Pons Ariño, Angel**
Glorieta Ruben Dario 4
28010 Madrid (ES)

(54) SEMI-PREFABRICATED BUILDING AND ASSOCIATED CONSTRUCTION METHOD

(57) The invention can be used for the simple, quick construction of prefabricated buildings. The building comprises a floor (2), walls (1) and a roof (3), all of which are prefabricated. The walls (1) and roof (3) are semi-rigidly connected by first bars (7) and the roof (3) includes openings (6) for securing lifting means (4) comprising hydraulic jacks (4) formed by a casing (8) secured to the floor (2) and pistons (9) that can move in relation to the casing (8). The synchronised actuation of the jacks (4) allows the walls (1) to be lowered and moved in relation to the floor (2) by means of the first bars (7), with the roof (3) and walls (1) being lifted simultaneously. The walls (1) are connected to one another and to the roof (3) by means of concrete that is poured into first (19) and second (21, 22) moulds secured at the corners of the walls (1) and the roof (3).

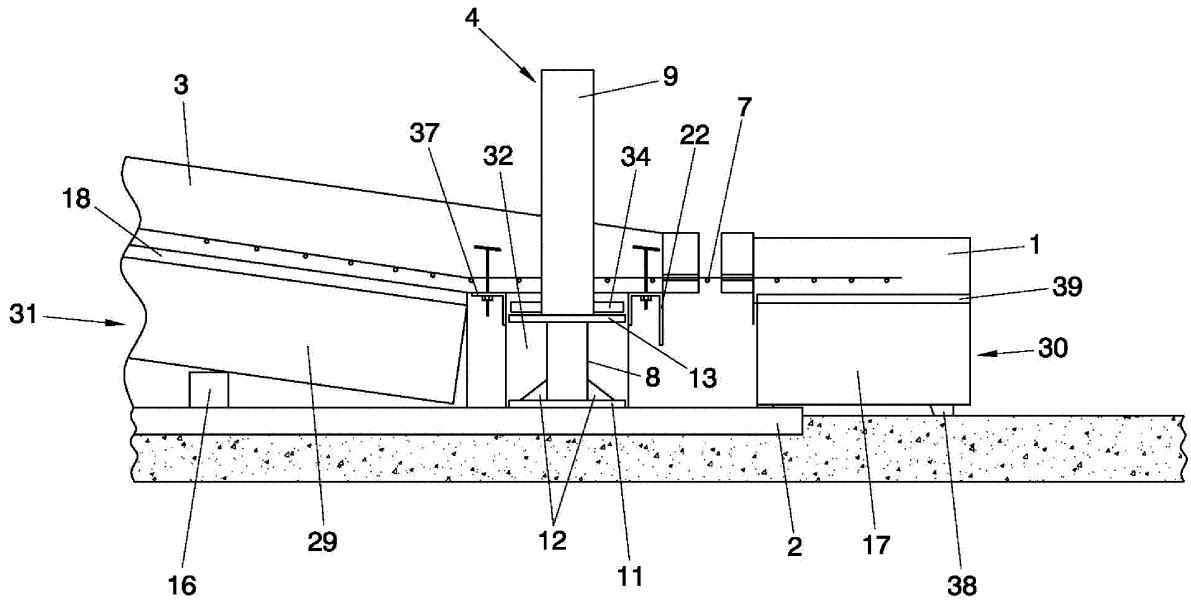

FIG. 3

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Description

OBJECT OF THE INVENTION

[0001] The present invention can be included within the technical field of building construction, more specifically in the construction of buildings of reduced size, such as detached homes, small warehouses or industrial premises and workshops, starting from prefabricated concrete slabs. The object of the invention relates to a semi-prefabricated building of quick construction and its production process.

BACKGROUND OF THE INVENTION

[0002] Patent of invention P200600168 relates to a system for the construction of a semi-prefabricated building. Said system comprises a floor, a roof and outer walls, all composed of reinforced concrete slabs, where the outer walls comprise spaces for windows and, where applicable, doors.

[0003] Said patent P200600168 discloses the raising of the outer walls and later the raising of the roof. The outer walls are raised by folding, using raising elements comprising a fixed part fixed to the floor and a moving part displaceable with respect to the fixed part, and disposed in the spaces of the windows of the outer walls, to which spaces is fixed said moving part by means of anchoring elements. The raising means is also used subsequently for raising the roof, since the roof slab comprises a plurality of openings, coinciding with the positions of said raising means, where the moving part of the raising means is fastened to said openings by means of said anchoring elements.

[0004] Later, the walls, once raised, are joined together through two metal frames in the form of a square, one of said frames located in the inner face of each wall and the other frame located in the outer face, being fixed together and to the corresponding walls, between which the concrete is later poured in mass.

[0005] The outer walls and the roof additionally have lugs perpendicular to the joining edges of said outer walls and roof, where the lugs have curved ends. A mould disposed between the upper part of the walls and the roof allows the pouring of mass concrete, which on hardening provides, in collaboration with the lugs a secure joint between the side walls and the roof.

[0006] The aim is to describe a system for the construction of a semi-prefabricated building that allows the simultaneous raising of the walls and the roof.

DESCRIPTION OF THE INVENTION

[0007] The present invention resolves the technical problem posed providing a semi-prefabricated building equipped with walls, floor and roof, of simplified construction and quicker than those known, as well as of a process for the construction of said building, that allows the simultaneous raising of the walls and the roof by means of the production by moulding in situ of said walls and roof, where the walls and the roof are joined from the in situ production process, as explained below.

[0008] Once the previous preparatory work has been performed such as, for example, if necessary, compacting of the ground with stone, the floor is placed on the ground. Preferably, the floor is a concrete slab, preferably of reinforced concrete and produced in situ, preferably by moulding, where said moulding may comprise the in situ manufacturing of a floor mould, the assembly of said floor mould, and subsequent filling with mass concrete, setting and curing of said concrete.

[0009] Then, a plurality of raising means is disposed on the floor, comprising a fixed part and a moving part, where the fixed part is disposed on the floor and the moving part can move with respect to the fixed part.

[0010] Next, the side walls and roof are moulded in situ on the floor, placing roof moulds (adapted to provide a certain inclination to the roof) and wall moulds.

[0011] Preferably, due to simplicity in the construction, the roof moulds comprise first tubes by way of support disposed longitudinally in parallel on first wedges that give them a certain inclination, as well as comprising first boards disposed on the first tubes, forming a receptacle whereon the concrete has to be poured. Similarly, wall moulds comprise second tubes by way of support disposed longitudinally on the floor, with possible aid of second wedges if it is necessary to bridge a difference in level between the floor of the building and the ground, as well as comprising second boards disposed on the first tubes, forming a receptacle whereon the concrete has to be poured. The raising means must substantially coincide with the corners of the roof. The side walls incorporate spaces for at least one door in total, as well as for windows, where applicable. The tubes and the wedges must be able to exit the spaces of the doors and windows.

[0012] The walls are moulded by disposing the wall moulds around the roof mould. During the wall and roof moulding process, connection means is introduced in the adjacent ends of said walls and said roof, to connect, after setting the concrete, said walls and said roof, by a semi-rigid joint between each one of the walls and the roof, maintaining a separation between said walls and said roof.

[0013] It is necessary to make a connection to the roof of the moving parts of the raising means, to later jointly raise the roof and the walls by synchronized activation of the raising means. For the case that the raising means comprises hydraulic jacks, to perform said connection beams are preferably placed in parallel to the sides of the roof and substantially at the ends of said sides. Said beams comprise strips that protrude from their ends. Likewise, the moving casings of the raising means are fixed in their lower part to different second discs, which before the raising are disposed under the strips of the beams present in each corner of the roof.

[0014] Next, the roof is raised by synchronized activation of the raising means. The semi-rigid joints established between the walls and the roof through the connection means allow, together with the weight of the walls, that, as the roof is raised, the walls are incorporated, by folding and displacement with respect to the lower edge of said walls, from an initial position wherein the walls and the roof rest on the floor until a final position, where the raising of the roof is such that the walls are disposed in a substantially vertical position. After the raising, the roof and wall moulds remain on the floor.

[0015] Afterwards, the walls are plumbed and fastened by conventional means and the walls are joined together, fixing in the inner part and in the outer part of the corners of the walls different first moulds in the form of a square and proceeding with the poured of concrete inside said first moulds. Preferably, the side edges of the walls may incorporate from their moulding second framework bars which provide greater rigidity between said walls. Next, the walls are joined to the roof, for which purpose there are different second moulds in the corners of the walls with the roof. Preferably, the second moulds comprise inner second moulds in the form of an angle or square and outer second moulds in the form of a receptacle. Even more preferably, the inner second moulds are U-shaped welded to the beams.

[0016] Finally, the raising means is retracted and removed, together with the beams, as well as, if they had not already been removed, the removal and evacuation of the first moulds, the second moulds, the wall moulds and the roof moulds.

DESCRIPTION OF THE DRAWINGS

[0017] To complement the description being made and in order to aid towards a better understanding of the characteristics of the invention, in accordance with a preferred example of practical embodiment thereof, a set of drawings is attached wherein, with illustrative and non-limiting character, the following has been represented:

Figure 1.- Shows a plan view of the arrangement of the floor, the walls and the roof at some point previous to the filling of the moulds and to the raising of the roof and the walls.

Figure 2.- Shows a view of the initial position prior to the raising, where neither the moulds nor the beams have been represented.

Figure 3.- Shows an enlarged detail of the walls and the roof, where the beams, the cylinders, the moulds and also the wedge of the walls are represented.

Figure 4.- Shows a plan detail of the support of the strips on the discs after raising.

Figure 5.- Shows, according to detail A of figure 2, an enlarged view of the raising means.

Figure 6.- Shows a view of the raising of the roof in a more raised second intermediate position.

Figure 7.- Shows an elevation view of the roof in a totally raised final position with the walls in vertical position.

Figure 8.- Shows the disposal of the raising means with respect to the beam and the roof during the raising.

Figure 9.- Shows a perspective view of the first moulds fixed to the walls for joining said walls.

Figure 10.- Shows an enlarged detail of the roof, the walls, the second joining moulds of the walls to the roof, the beams and the flanges.

PREFERRED EMBODIMENT OF THE INVENTION

[0018] The invention presents a semi-prefabricated building, equipped with walls (1), floor (2) and roof (3), and a process for the construction of said building, which allows the simultaneous raising of the walls (1) and the roof (3) using raising means (4).

[0019] Figure 1 shows the floor (2) whereon the walls (1) and the roof (3) are moulded, placing wall moulds (30) and roof moulds (31), as observed in figure 3. The roof moulds (31) comprise first tubes (29) disposed longitudinally in parallel on first wedges (16) which provide the first tubes (29) with the inclination necessary to define the roof (3). On the first tubes (29), first boards (18) are disposed that form a receptacle whereon the concrete is poured. The wall moulds (30) comprise second tubes (29) disposed longitudinally in horizontal on the floor, aided by second wedges (38). On the second tubes (17) are disposed second boards (39), which form a receptacle whereon the concrete has to be poured. The walls (1) incorporate spaces (5) for doors and windows, where applicable. The tubes (29, 17) and the wedges (16, 38) are of a size such that they can be removed from the building through the spaces (5) of the door and/or the windows.

[0020] Again in figure 1, the walls (1) are moulded disposing the wall moulds (30) around the roof mould (31). During the wall (1) and roof (3) moulding process, first corrugated bars (7) are introduced, by way of connection means (7), at the adjacent ends of said walls (1) and said roof (3), to connect, after setting the concrete, said walls (1) and said roof (3), by a semi-rigid joint between each one of the walls (1) and the roof (3).

[0021] Before moulding of the walls (1) and the roof (3), hydraulic jacks (4) are disposed close to the corners of the roof (see figures 1 and 3), by way of raising means (4), comprising a piston (8) disposed on the floor (2) by way of fixed part (8), and a moving casing (9), by way of moving part (9), actuated hydraulically to longitudinally move along the outside of the piston (8). As observed in figure 5, to improve the stability of the raising means (4), a first disc (11) is disposed on the floor (2) solidly joined to the pistons (8), as well as (first) reinforcing brackets (12) between the first disc (11) and the piston (8), to avoid an excessive deformation or, even, a sinking, of the floor (2).

[0022] Figures 2, 6 and 7 show schematic arrange-

ments of the construction according to, respectively, a first initial position with the walls horizontal, a second intermediate position and a third final position with the walls vertical and the construction completely raised.

[0023] Next, as shown in figures 3, 4, 5 and 8, a connection is made between the roof and the casings (9) having beams (32) in parallel to the sides of the roof (3) and substantially at the ends of said sides, close to the corners. Said beams (32) comprise strips (34) that protrude from the ends of the beams (32). Likewise, the casings (9) are fixed in their lower part to different second discs (13) which, before raising, are disposed under the strips (34) of the beams (32) present in each corner of the roof (3). The width of the beams (32) is substantially equal to the width of the wall moulds (30). Second reinforcing brackets (15) are disposed between the second disc (13) and the casing (9).

[0024] Figures 2, 6 and 7 show the raising of the roof (3) by synchronized activation of the casings (9) from an initial position wherein the walls (1) and the roof (3) rest on the floor (2) to a final position with the walls (1) vertical. The semi-rigid joints established between the walls (1) and the roof (3) through the first bars (7) allow, together with the weight of the walls (1), the incorporation of said walls (1), by folding and movement with respect to the lower edge of said walls (1), as the roof (3) is raised, until the walls (1) are disposed in substantially vertical position.

[0025] Then, the walls (1) are plumbed and fastened by conventional means and, then, as shown in figure 9, the walls (1) are joined together, fixing in the inner part and in the outer part of the corners of the walls (1) different first moulds (19) in the form of a square and proceeding with the pouring of concrete inside said first moulds (19). The side edges of the walls (1) incorporate different bars (20) which provide greater rigidity to the joint between said walls (1).

[0026] Next, figure 10 shows how the walls (1) are joined to the roof (3), pouring concrete inside different second moulds (21, 22) disposed in the corners of the walls (1) with the roof (3). The second moulds (21, 22) comprise metal U-shaped inner second moulds (21) welded to the beams and outer second moulds (22) in the form of a receptacle.

[0027] The roof (3) is provided in its edges with lugs (23) with curved ends to provide greater rigidity to the joint between the walls (1) and the roof (3). The second moulds (22) are fixed to the walls (1) and/or to the roof (3) by means of fixing means (24), comprising third jaws (24) to press the outer second moulds (22) against the walls (1) through anchoring flanges (25) actuated by means of a plurality of second through-bolts (26) and different pairs of nuts (27). The second bolts (26) are housed in holes (28) disposed throughout the upper part of the walls (1), obtaining said holes (28) by incrusting rods before the setting of the walls (1) and removing them before the hardening of the concrete, preferably not before four or five hours have passed from the pouring of the concrete, even better the next day.

[0028] The inner second moulds (22) also provide a joint between the beams (32) and the roof (3), in cooperation with rods (35) embedded in the concrete. Said rods (35) are fixed by third nuts (36), with the support of angles (37) welded to the beams (32), and the third nuts (36) can be released, once the raising has occurred, for the release of the beam (32). The use of the rods (35) and the nuts (36) makes it possible to increase the raising power, since the already hardened roof (3) performs a compression work, allowing the use of beams (32) of smaller size.

[0029] Finally, the jacks (4) are retracted and removed, and, if they had not been already removed, the removal of the first moulds (19) and the second moulds (21, 22).

Claims

1. Construction process of a semi-prefabricated building comprising:

- side walls (1) connected to a roof (3),maintaining a separation between said walls (1) and said roof (3), by means of connection means (7) disposed between said walls (1) and the roof (3) forming semi-rigid joints that allow the articulated joint raising of said walls (1) and roof (3), from an initial position wherein the walls (1) and the roof (3) rest on a floor (2) until a final raised position, wherein the walls (1) are disposed in vertical position, where the raising is by means of raising means (4) disposed in the corners of the roof (3), comprising a fixed part (8) disposed on the floor (2) and a moving part (9) displaceable with respect to the fixed part (8) and joined to the roof (3),

the construction process **characterized in that** it comprises the following stages:

- moulding the floor (3) on the ground (2);
- disposing on the floor (2), in the corners of the roof (3), the raising means (4);
- moulding the walls (1) and the roof (3) on the floor (2), placing on the floor (2) wall moulds (30) and roof moulds (31), and proceeding with the assembly of said moulds (30, 31), filling of said moulds (30, 31) with concrete, and setting of the concrete, where the walls (1) and the roof (3) are joined by connection means (7) which provides semi-rigid joints between said walls (1) and said roof (3);
- jointly raising the roof (3) and the walls (1) by the synchronized actuation of the raising means (4), where the walls (1) are incorporated by folding and displacement with respect to its lower edge from an initial position wherein said walls

(1) and said roof (3) rest on the floor (2) to a final position, thanks to the weight of the walls (1) and to the semi-rigid joints established through the connection means (7) wherein the raising of the roof (3) and the walls (1) comprises providing beams (32) in parallel to the sides of the roof (3) and close to the ends of said roof (3), said beams (32) equipped in their upper part with protruding strips (34) at the ends of the beams (32), to be pushed by second discs (13) fixed to the moving parts (9) of the raising means;
- plumbing and fastening the walls (1);
- joining the walls (1) together;
- joining the walls (1) to the roof (3); and
- removing the raising means (4).

2. Construction process of a semi-prefabricated building according to claim 1, **characterized in that** joining the walls (1) together comprises fixing in the inner part and in the outer part of the corners of the walls (1) different first moulds (19) in the form of a square and then pouring concrete inside said first moulds (19).

3. Construction process of a semi-prefabricated building according to claim 1, **characterized in that** joining the walls (1) to the roof (3) comprises disposing in the corners of the walls (1) with the roof (3) different inner second moulds (21) in the form of a square and different outer second moulds (22) in the form of a receptacle and then pouring concrete inside the second moulds (21, 22).

4. Construction process of a semi-prefabricated building according to claim 3, **characterized in that** the second moulds (21, 22) are fixed to the walls (1) and/or to the roof (3) by means of fixing means (24) comprising third jaws (24) that press the inner second moulds (21) and the outer second moulds (22) against the walls (1) through anchoring flanges (25) actuated by means of a plurality of second bolts (26) and second pairs of nuts (27), where the second bolts (26) are housed in holes (28) disposed throughout the upper part of the walls (1).

5. Construction process of a semi-prefabricated building according to claim 2 and 3, **characterized in that** it further comprises removing the first moulds (19) and/or the second moulds (21, 22).

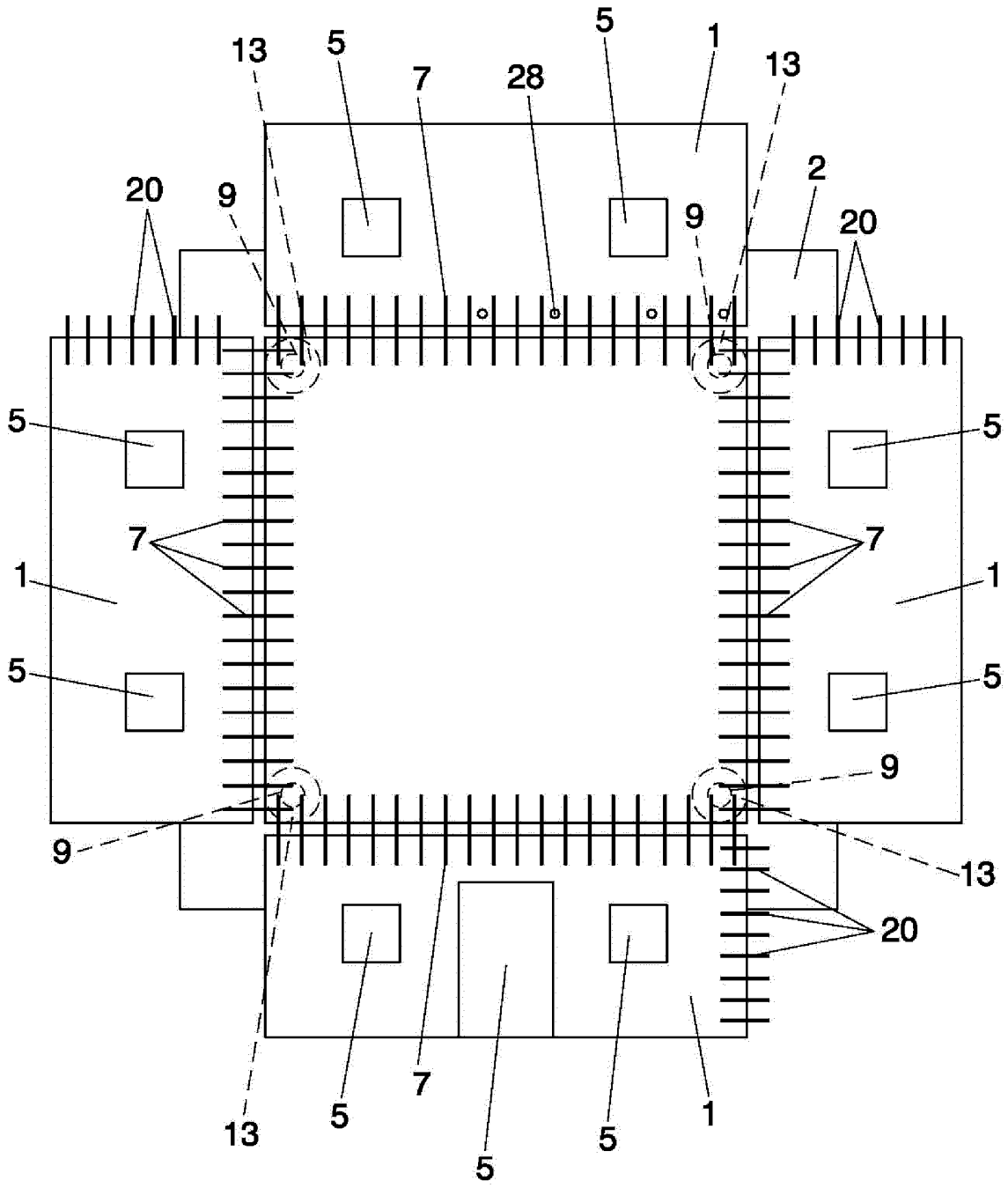

FIG. 1

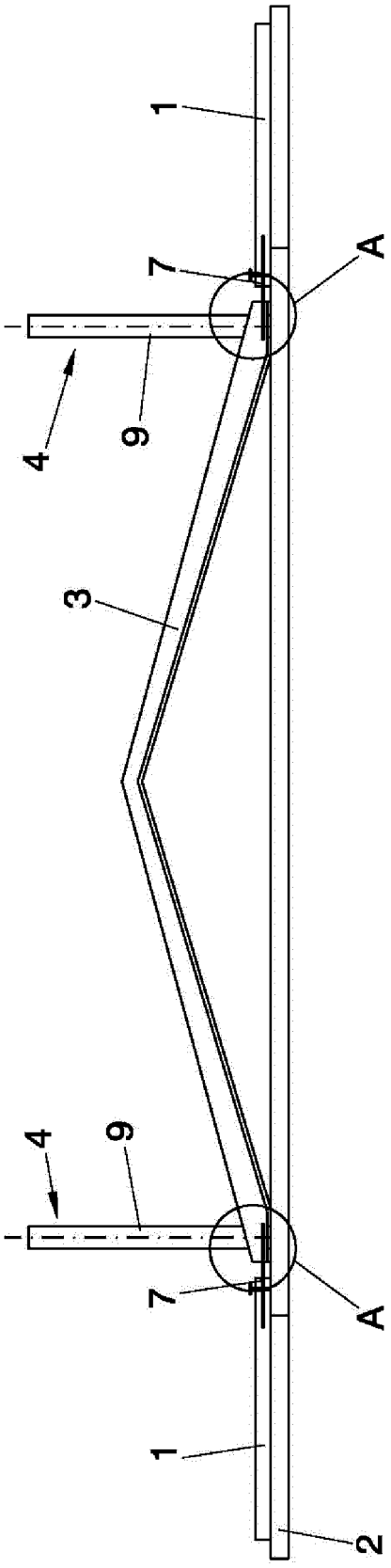

FIG. 2

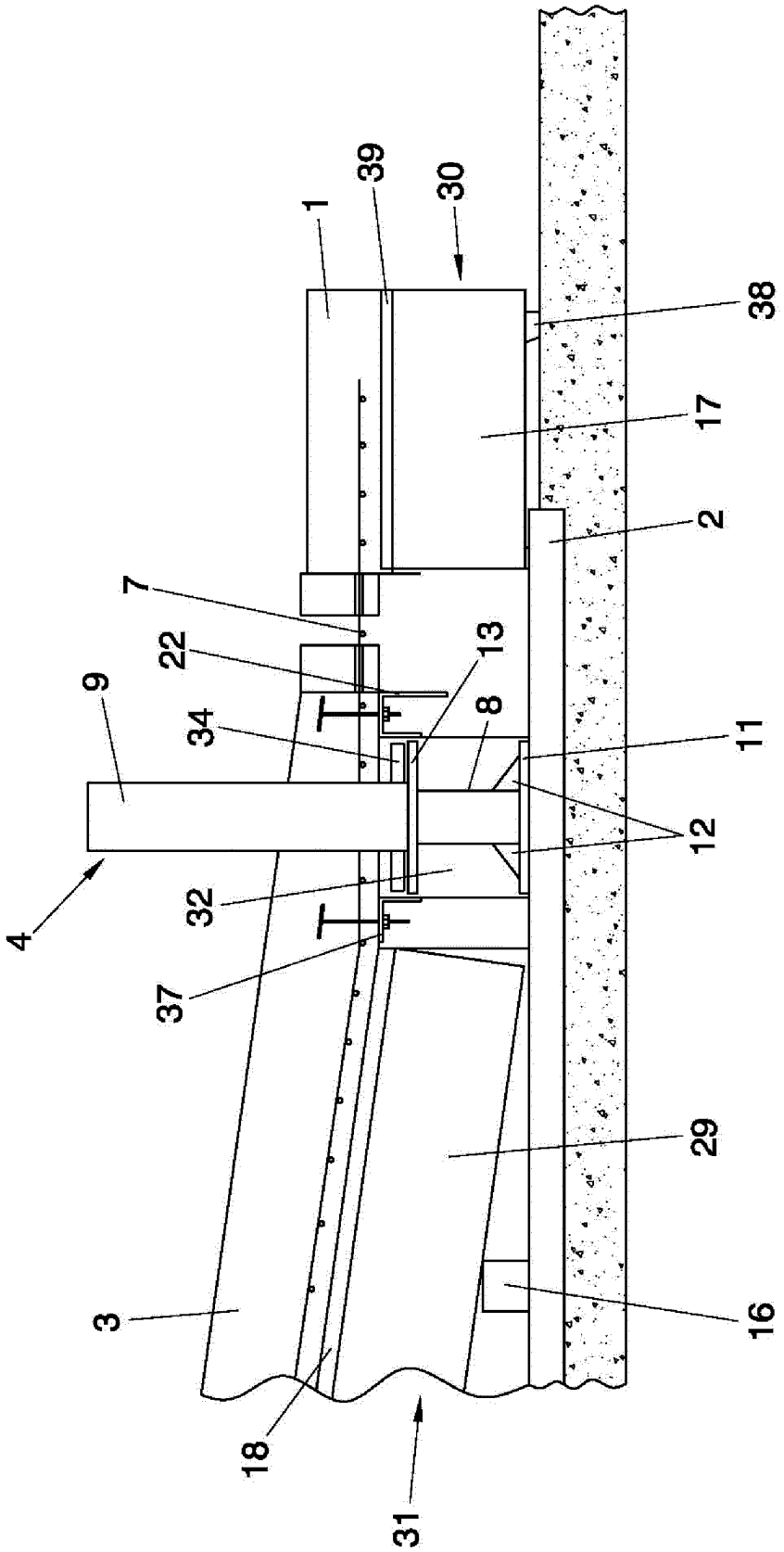

FIG. 3

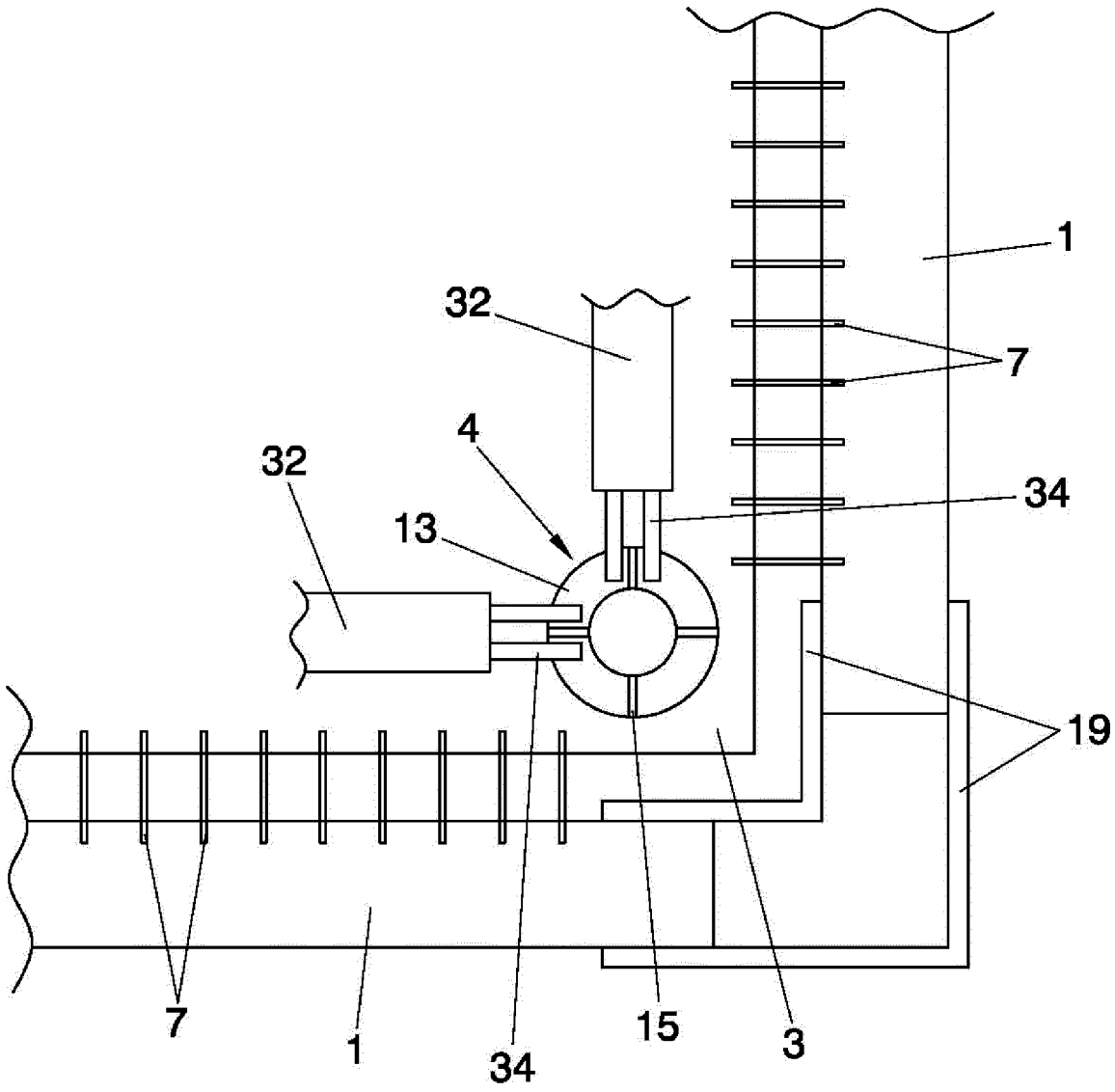

FIG. 4

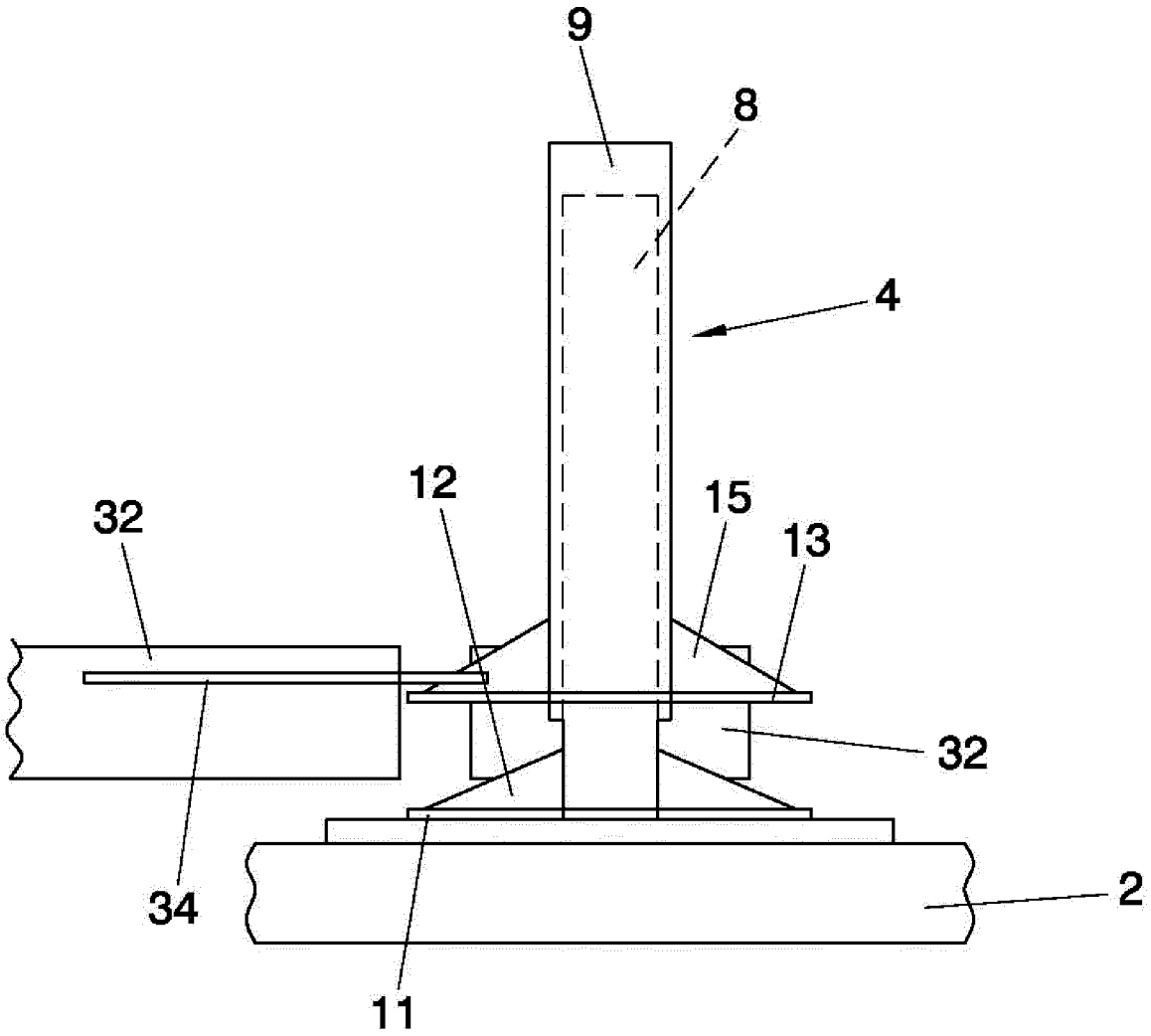

FIG. 5

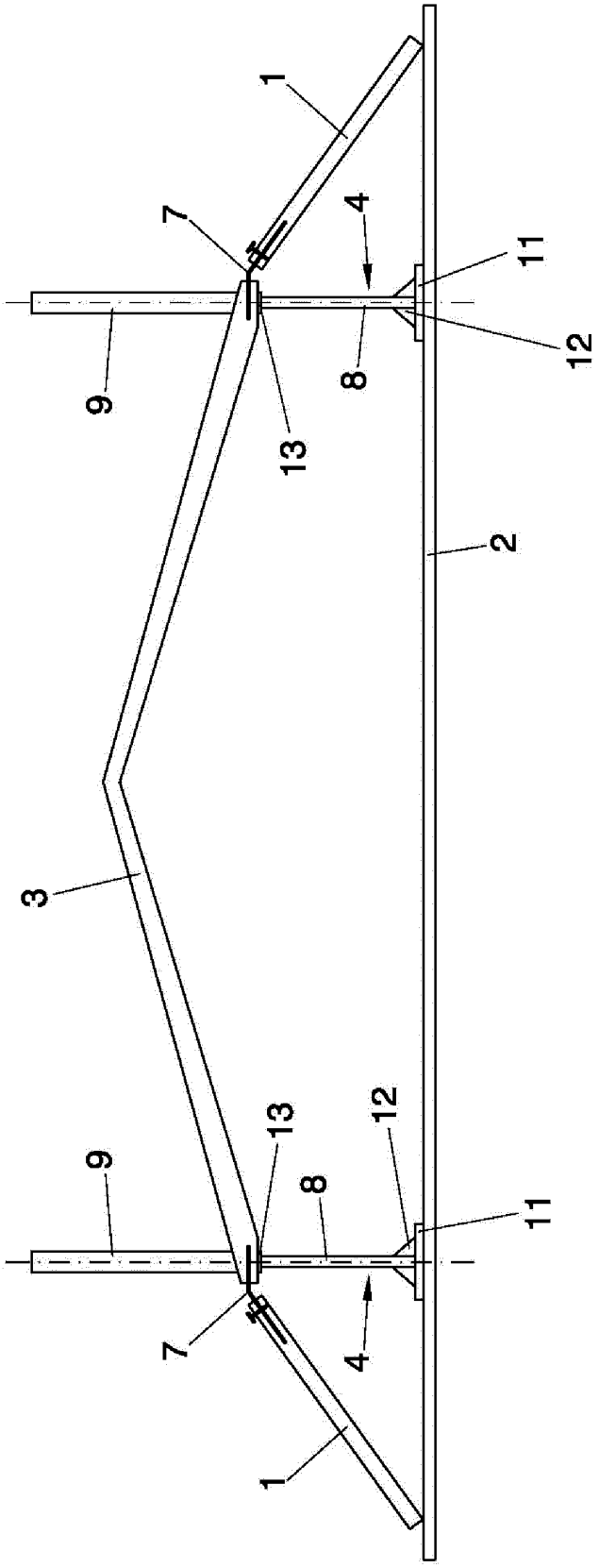

FIG. 6

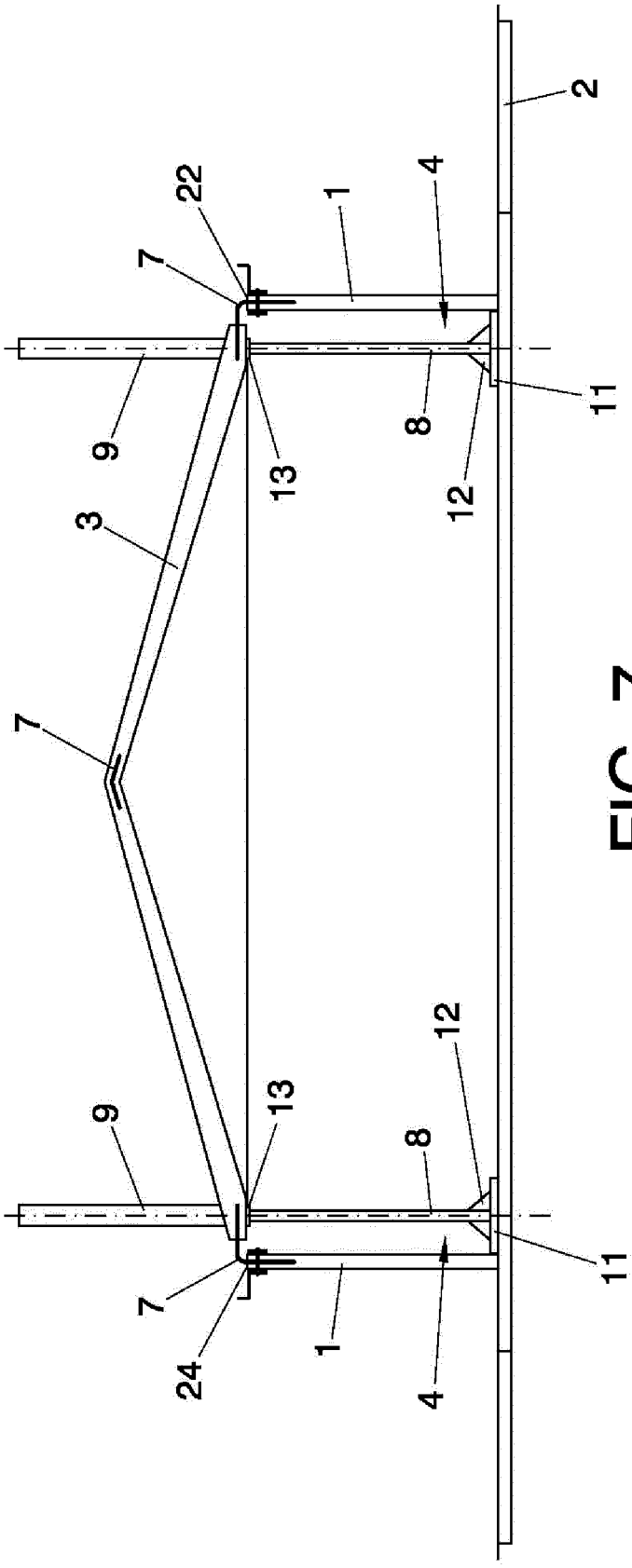

FIG. 7

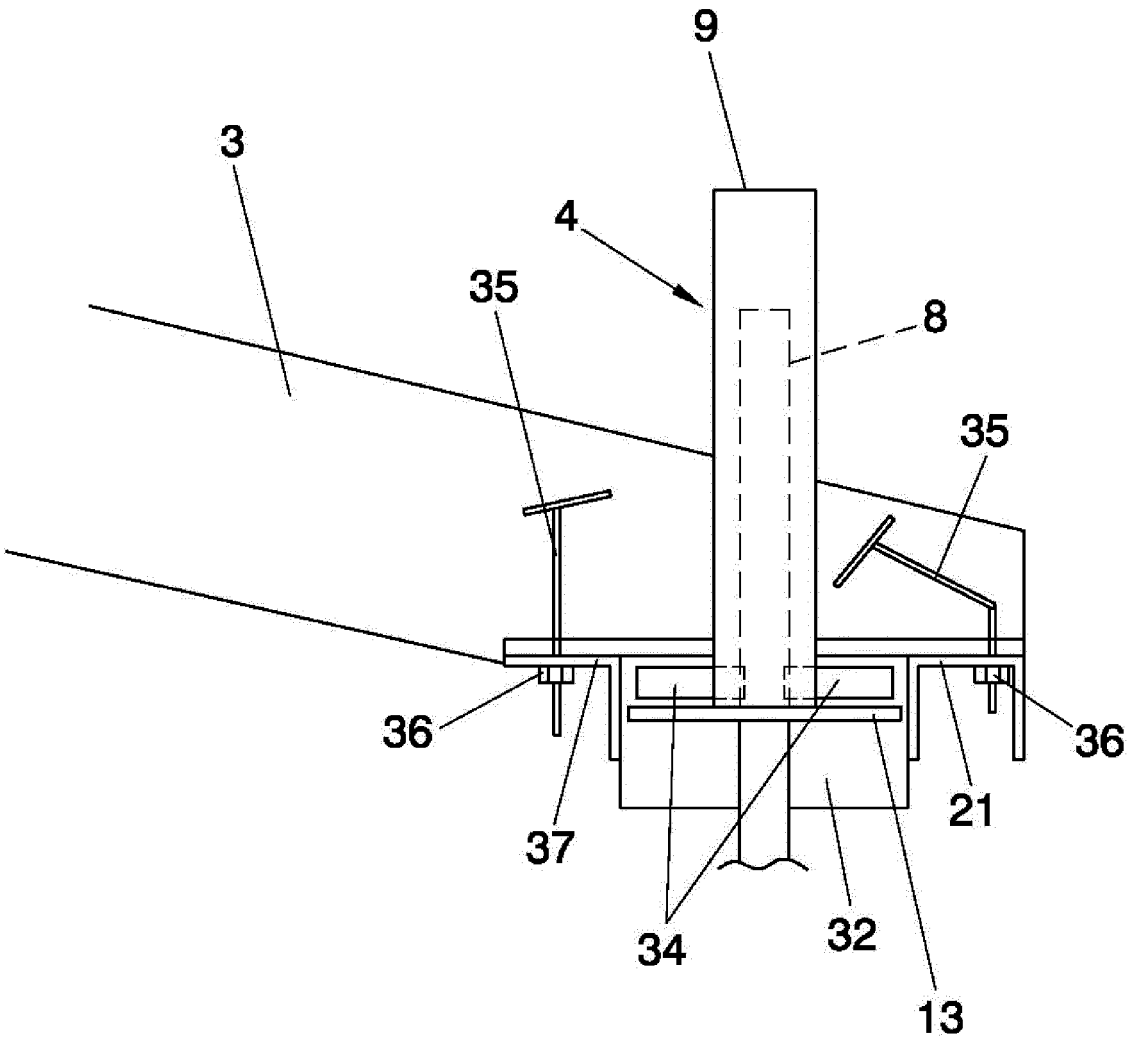

FIG. 8

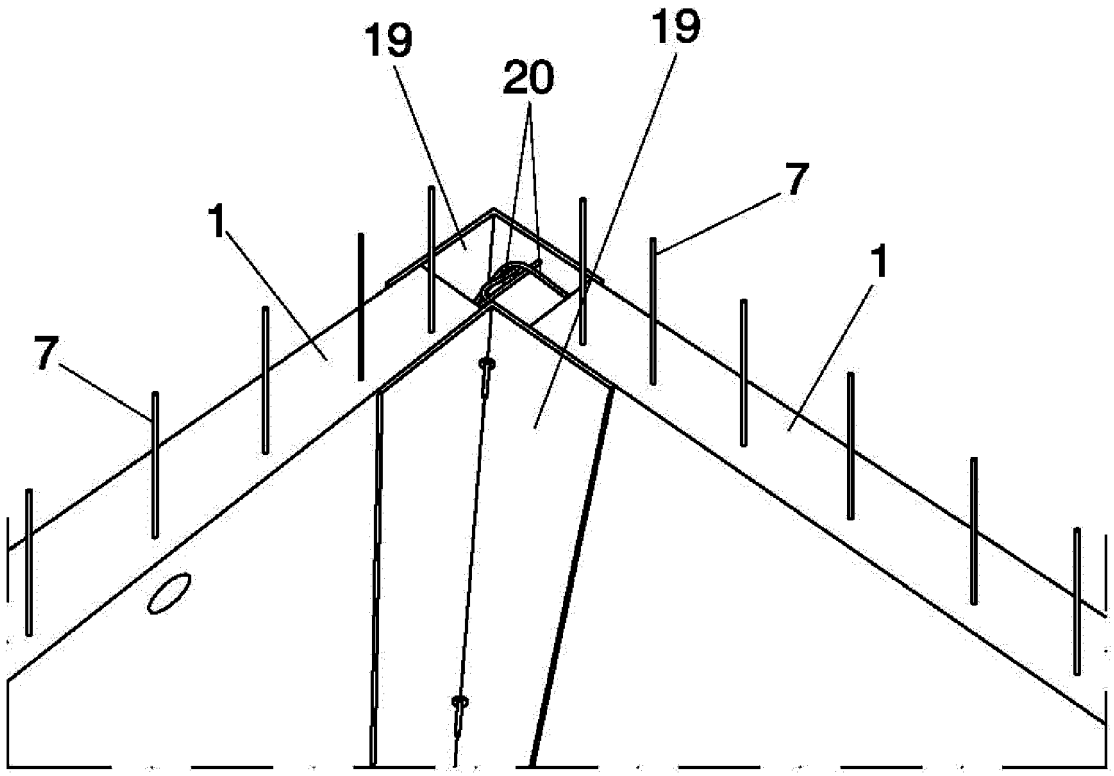

FIG. 9

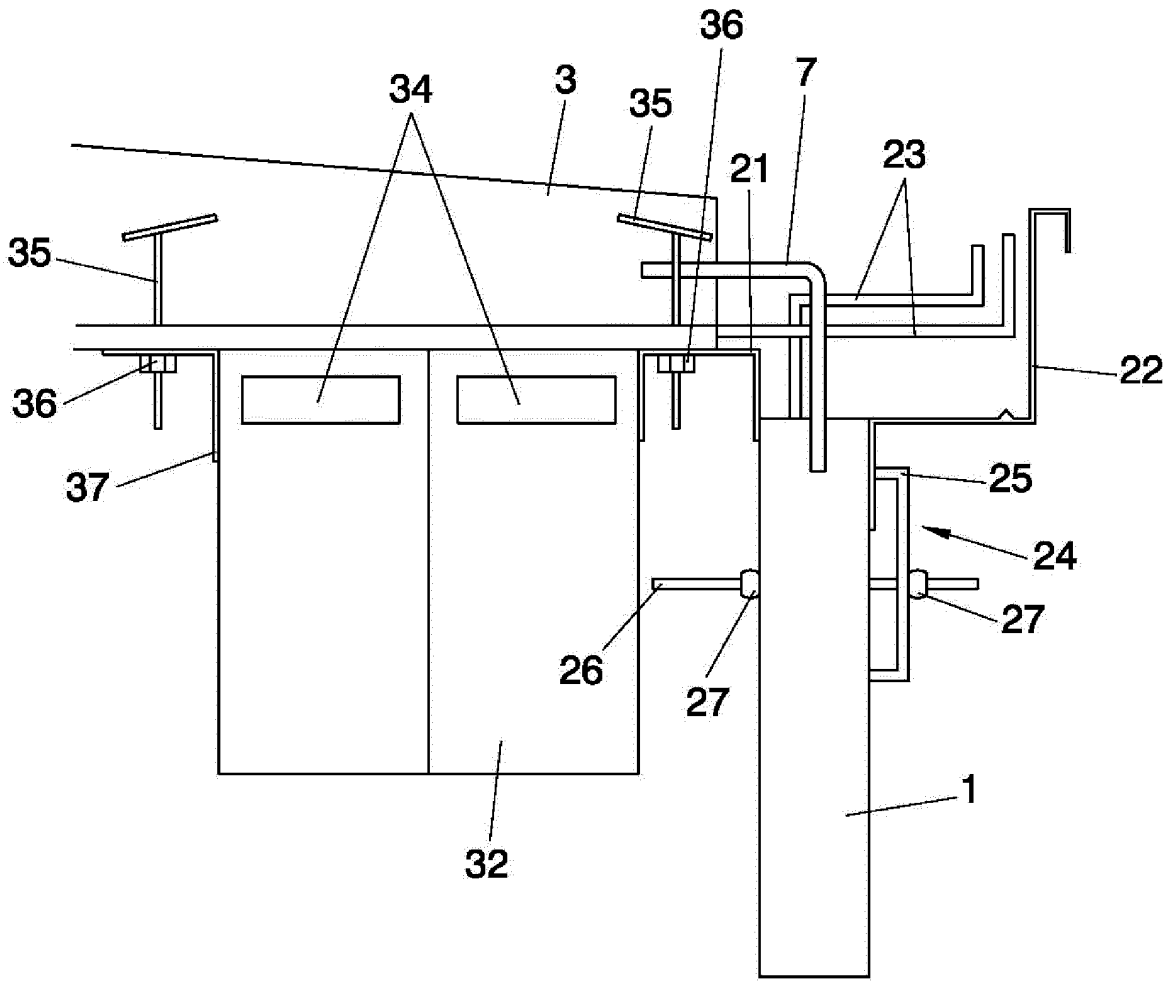

FIG. 10