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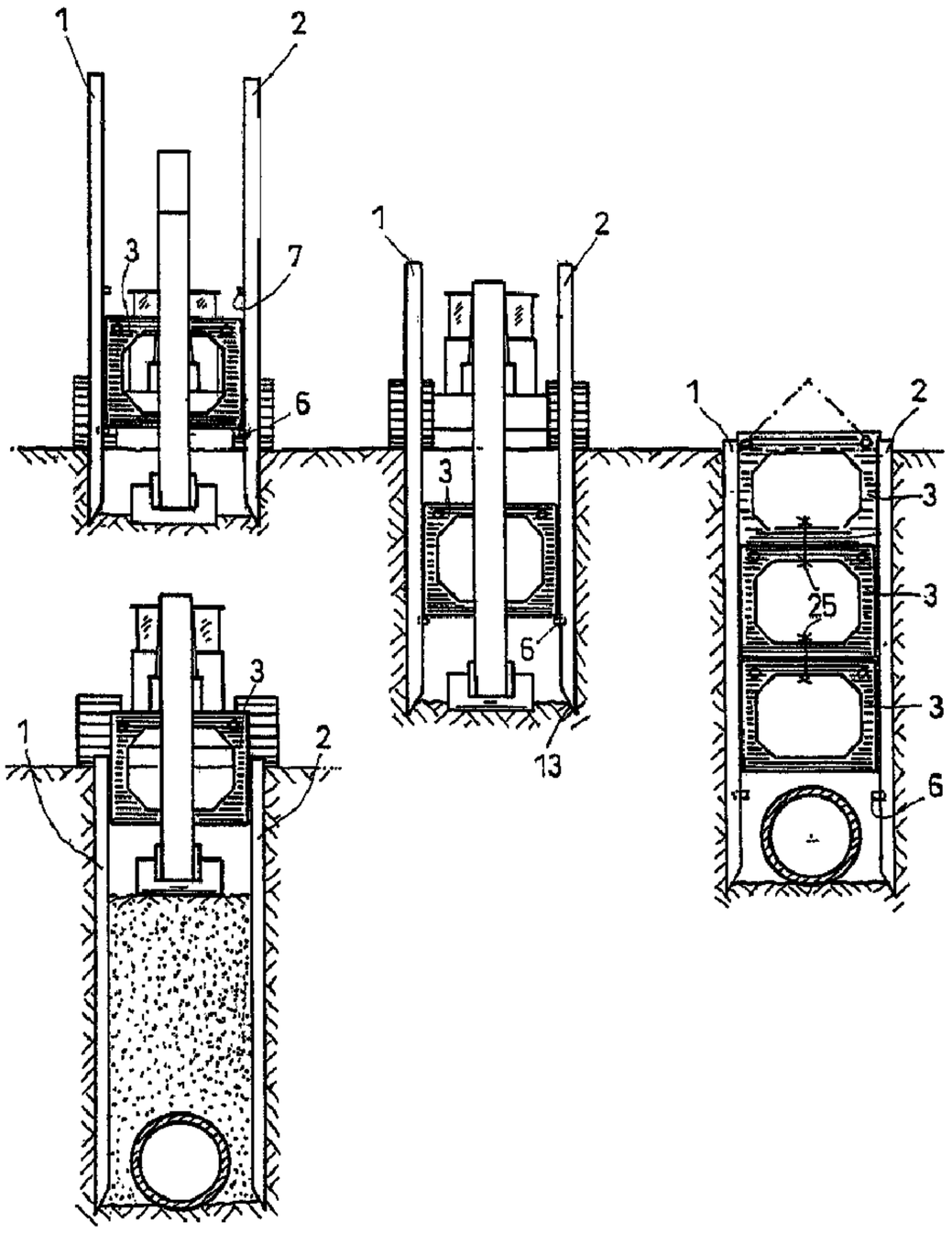
(54) Titre : METHODE DE TRANCHEES PROFONDES BLINDAGE
(54) Title: METHOD FOR THE SHEETING OF DEEP TRENCHES



(57) Abrégé/Abstract:
A method for sheeting deep trenches by means of supporting frames mountable lengthwise the trench at equal distances. The supporting frames comprise two parallel supporting elements and a rigid frame movable in the longitudinal direction of the supporting elements and connecting and keeping them spaced-apart, and large sheeting panels insertable into guide channels of the supporting elements. The supporting frames and the sheeting panels are pressed or lowered into the trench, following the direction of excavation. The rigid frame is movably guided between a lower stop and an upper stop along the supporting

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(57) Abrégé(suite)/Abstract(continued):
elements, whereby the lower stop is positioned at the required shovel clearance approximately 1 to 1.50 m from the end of the supporting element, and the upper stop is positioned at a distance from the lower stop, which distance corresponds to the height of the rigid frame, e.g., 1.75 m, and to an admissible support advance, e.g., 0.5 m. Once the supporting frame has been installed and lowered to a level at which the upper edge of the rigid frame is on the level of the trench's edge, the upper stops are removed, a second rigid frame is inserted into the supporting elements of the supporting frame, and the upper stops are fastened to the supporting elements at a distance above the second rigid frame. After lowering the supporting frame by another depth equal to a rigid frame, the upper stops are removed and, if necessary, a third rigid frame is inserted into the supporting elements of the supporting frame. The rigid frames are interconnected with each other to permit dismantling of the supporting frame.

ABSTRACT OF THE DISCLOSURE

A method for sheeting deep trenches by means of supporting frames mountable lengthwise the trench at equal distances. The supporting frames comprise two parallel supporting elements and a rigid frame movable in the longitudinal direction of the supporting elements and connecting and keeping them spaced-apart, and large sheeting panels insertable into guide channels of the supporting elements. The supporting frames and the sheeting panels are pressed or lowered into the trench, following the direction of excavation. The rigid frame is movably guided between a lower stop and an upper stop along the supporting elements, whereby the lower stop is positioned at the required shovel clearance approximately 1 to 1.50 m from the end of the supporting element, and the upper stop is positioned at a distance from the lower stop, which distance corresponds to the height of the rigid frame, e.g., 1.75 m, and to an admissible support advance, e.g., 0.5 m. Once the supporting frame has been installed and lowered to a level at which the upper edge of the rigid frame is on the level of the trench's edge, the upper stops are removed, a second rigid frame is inserted into the

supporting elements of the supporting frame, and the upper stops are fastened to the supporting elements at a distance above the second rigid frame. After lowering the supporting frame by another depth equal to a rigid frame, the upper stops are removed and, if necessary, a third rigid frame is inserted into the supporting elements of the supporting frame. The rigid frames are interconnected with each other to permit dismantling of the supporting frame.

A METHOD FOR THE SHEETING OF DEEP TRENCHES

The present invention is directed to a method for sheeting deep trenches by means of supporting frames mountable lengthwise the trench at equally spaced distances. The supporting frames consist of two parallel supporting elements and a rigid frame which keeps the supporting elements spaced-apart and interconnects them. The rigid frame is movable in the longitudinal direction of the supporting elements. The supporting frame further comprises large-size sheeting panels the lateral edges of which are insertable into guide channels positioned at both sides of the supporting elements. The supporting frame and the sheeting panels are pressed or lowered into the trench in the direction of excavation.

Such a method and a device for carrying out the method are known from U.S. Patent 3,950,952, which teaches a rigid frame formed by two horizontal spreaders and two vertical guide heads connected to form a stiff frame. The guide heads of the rigid frames are running within a supporting element having a C-shaped cross-section, and the guide heads are guided by a pair of

rollers positioned at both sides of a vertical slot in the wall of the support facing the trench. The rigid frame is vertically movable within the supporting elements without impairing the parallel orientation of the supporting elements.

The sheeting device with the vertically adjustable rigid frame proved to be a unsuccessful in practical operation, since the rollers of the rigid frame are unable to withstand the high pressure of earth transmitted from the sheeting panels via the supporting elements to th rigid frame. These rigid frames tend to get jammed. Another disadvantage of this known sheeting device is that the C-shaped supporting elements which embrace the guide heads of the rigid frames provided with the rollers narrow the free cross-section of the trench.

Another sheeting device is known from German patent publication DE-AS 17 08 539. In this case, spreaders spacing the supporting elements are connected to form a rigid frame via two vertical struts. The rigid frame is movable within the supporting elements when the

supporting elements are unloaded. Since, however, the rigid frame is guided in the supports by means of relatively short guide heads, movability of the rigid frames under load is neither provided for nor possible. When the supporting frame has been mounted, the rigid frame is fastened by bolts positioned at the required height to prevent it from sliding downwardly. This sheeting device did not prove to be successful either.

In order to shore trenches with large sheeting panels guided in supporting elements, supporting frames are generally used which consist of two supports and two or more spreaders which run in transverse direction of the trench and are hinged to the supports. The stability of the framings is achieved by prestressed springs which are positioned between the supports and the spreaders. The disadvantage of these support framings is that the longitudinal movement of the supports with respect to the opposite support is very limited. When one supporting element is pulled out during retraction, while the other element is left standing, the distance between the supporting elements becomes smaller because of the resulting inclined

position of the spreaders. Thus the earth may slide downward. If then the opposite supporting element is pulled off, the earth that slid has to be pressed back, requiring the use of powerful excavators. This method permits sheeting of trenches of more than 6 m depth only for particularly favourable soil conditions. In this connection there is another problem: when a supporting frame is inserted, the upper spreader which is hinged to the supporting elements at a high level so that the boom of the excavator has to extend over this high spreader. Only where relatively large excavators are used, is it possible for the main boom to extend over such high positioned spreaders. Further, excavation by means of pull shovel is difficult in this position.

The object of the present invention is to provide a method permitting the sheeting of deep trenches with large sheeting panels guided in supporting elements and allowing the use of smaller excavators in deeper trenches.

This object is achieved according to the present invention by a method using a rigid frame which is movably guided at the supporting elements between a lower stop and an upper stop, the lower stop being positioned at the required clearance of the shovel, i.e., approximately 1 to 1.50 m from the end of the support, and the upper stop being positioned at a distance from the lower stop which corresponds to the height of the rigid frame, e.g., 1.75 m, and an admissible advance of the supporting element, e.g., 0.5 m. After assembly and lowering of the supporting frame to a level, at which the upper edge of the rigid frame is on the level of the trench's edge, the upper stops are removed, a second rigid frame is inserted into the supporting elements of the supporting frame, and the upper stops are fastened to the supporting elements at a distance above the second rigid frame; after the supporting frame has been lowered by another height of the rigid frame, the upper stops are removed and, if necessary, a third rigid frame is inserted into the supporting elements of the supporting frame; the rigid frames are interconnected with each other to retreat the supporting frame.

The preferred structures for carrying out the method of the present invention are characterized by the following features:

a) both sides of the supporting elements are provided with at least one guide channel to support an outer sheeting panel and at least one inner sheeting panel, the guide channel receiving the edges of at least the outer sheeting panel with positive fitting in the longitudinal direction of the trench;

b) the internal sides of the supporting elements which face the trench are provided with flat C-shaped guide rails to guide the rigid frame, whereby the width of the guide rails substantially corresponds to the width of the supporting elements;

c) the rigid frame is formed as a stiff frame with fixed angles, the height thereof (e.g., 1.70 m) amounts to less than one third of the height of a supporting element and is guided in the guide rails of the supporting

elements by parallel rails extending over the height of the rigid frame and the clear width of the guide rail; and

d) the guide rails are provided with several openings arranged on top of each other and serve to insert stops therein which are to be placed below and above the rigid frame.

The method according to the present invention is suitable for sheeting trenches which are 5 to 10 meters deep, although sheeting of shallower trenches is, of course, possible by the same method. In case of very deep trenches, each side of the supporting elements is provided with three or four guide channels to receive the edges of the sheeting panels. Accordingly, the excavated trench is doubly or triply stacked. Although the supporting elements are very long, they are reliably held by only one rigid frame, thus the boom of the excavator may easily extend over the rigid frame when

excavation of the trench is started, in any case the upper edge of the rigid frame lies less than 2.50 m above the ground. This height results from the following values:

Depth of the excavated bed:	-	1.00 m
Height of the lower stop	+	1.50 m
Height of the rigid frame	+	1.70 m
		2.30 m

The supporting elements may be advanced independently of each other. In this connection, the upper stop entrains the rigid frame so that the free jib boom length in the lower region of the supports is not exceeded. Once the sheeting field has been lowered to the height of the sheeting panels, the two internal sheeting panels are inserted into the guide channels of the supporting elements. Since, due to its height (approximately 1.70 m), the rigid frame lies below the upper edge of the earth now, the upper stops are removed and the second rigid frame is inserted into the supporting elements and fastened to the lower rigid frame. The fastening is carried out to facilitate

dismantling later on. The upper stops are then installed again with the same displacement. Now lowering of the internal panels and supporting elements may continue. Since rigid frames are lowered one after the other as needed (depending on the final depth of the trench), an excavator with standard boom can easily dig above the frame evenly between the sheeting.

The supporting elements and the sheeting panels are formed such that at least two sheeting panels, and, if necessary, three or four sheeting panels, may be inserted at each side of the supporting elements.

The advantages of the novel method are that smaller excavators may be used; trenches of greater depth may be shored economically; and in case of shallower trenches, the sheeting work is completed quicker and with less disruption.

In the following description the method of the present invention is illustrated in more detail with reference to the accompanying drawings, in which:

Fig. 1 shows four phases of operation during insertion and lowering of a supporting frame;

Fig. 2 is a view of a supporting frame with inserted rigid frame and sheeting panels;

Fig. 3 is a diagram of a part of the supporting element and rigid frame;

Fig. 4 is a top view of the guide of a rigid frame within a supporting element;

Fig. 5 is a sectional view of a support with sheeting panels and rigid frame inserted therein;

Fig. 6 is a diagram of a stop during insertion into a supporting element;

Fig. 7 is a top view of an inserted stop;

Fig. 8 is a sectional view; and

Fig. 9 a top view of a locked stop.

The arrangement illustrated in Figures 1 through 3 is used for sheeting of trenches of more than 6 m depth. It consists of supporting frames which can be placed lengthwise the trench in equally spaced relation. The supporting frame consists of two parallel supporting elements 1,2 and a rigid frame 3 keeping said supporting elements in spaced-apart relationship and connecting them. The rigid frame 3 is movable in the longitudinal direction of the supports 1,2. Both sides of the supports 1,2 are provided with respective guide channels 8,9 in which the side edges of large-size sheeting panels 4,5 may be inserted. The supporting frame 1,2,3 and the sheeting panels 4,5 are lowered into the trench or pressed therein by means of the shovels, following the direction of excavation. The ends of the supports and the lower longitudinal edge of the sheeting panels 4,5 are provided with chisel edges 13 causing projecting earth at the wall of the trench to fall into the interior thereof during lowering of the supports 1,2 and the sheeting panels 4,5. These known bevel or chisel edges prevent the supporting elements 1,2 from being

forced to the center of the trench by the earth during driving in thus keeping them in vertical position and ensuring parallel lowering thereof.

The rigid frame 3 is movably guided at the supporting elements 1,2 between a lower stop 6 and an upper stop 7. The lower stop 6 is positioned at the required shovel clearance approximately 1 to 1.50 m from the lower end of the support. The upper stop 7 is placed at a distance from the lower stop 6 which corresponds to the height of the rigid frame 3 and an admissible support advance. The stops 6 and 7 are arranged in an easily removable manner and may be inserted into openings 14 which are ranged on top of each other within guide rails 11 of the supports 1,2.

Once the supporting frame 1,2,3 has been mounted and lowered to a level at which the upper edge of the rigid frame 3 is flush with or below the trench's edge (cf. FIG. 1 B), the upper stops 7 are removed and a second rigid frame 3 is inserted into the supporting elements 1,2 of the frame. The upper stops 7 are

fastened to the supporting elements 1,2 at a distance above the second rigid frame 3. After the supporting frame 1,2,3 has been lowered by another height of a rigid frame, the upper stops 7 are removed again and, if necessary, a third rigid frame 3 is inserted into the supporting elements 1,2 of the framing (cf. FIG. 1 C). For the purpose of retreating the sheeting device, the rigid frames 3 are connected with each other in an easily detachable manner so that the other rigid frames 3 positioned below the upper rigid frame and connected therewith will follow when the first one is drawn up.

Removal of the stacked sheeting unit is carried out analogously to inserting it, i.e., after the pipes have been laid, earth is refilled in layers, that is up to the lower edge of the lower rigid frame 3 at maximum. Then the rigid frame 3, the sheeting panels 4,5, and the supporting elements 1,2 are pulled upwardly to the new level. Once retreating has reached the corresponding level, the internal sheeting panels 5 and the upper rigid frame 3 (after removal of the upper stops 7) may be removed from the sheeting unit. Then the upper stops 7 are positioned above the last rigid frame 3 and the

framing 1,2,3 is drawn off the substantially refilled trench. The supporting frame 1,2,3 may then again be used at the head of the trench.

In case of very deep trenches or large-diameter pipes to be laid, the retreat of the sheeting device may be effected such that only the sheeting panels 4,5 and the rigid frame 3 are drawn upwardly, following the direction of the filling, when the stops 6 and 7 have been removed. When the last lower rigid frame 3 has been removed from the guide rails 11 of the supporting elements 1,2 (cf. FIG. 1 D), the smooth supporting elements 1,2 may be withdrawn individually. In this connection, the excavator may be positioned near the supporting elements 1,2 in such a way that it may pull off the supports 1,2 at its maximum power. Prior to withdrawal of the supporting elements 1,2 the cavity and the guide channels 8,9 of the supports 1,2 may be filled with sand or gravel.

Assembly of the frame:

One supporting element 1 is laid on the floor with its back in horizontal position. Then the lower stop 6 is inserted at the required height into an opening 14 of the track of holes positioned in the supporting element 1. The height of the stop may amount to 1 to 1.50 m from the end 13 of the support so that the gap of the excavator may grip under the rigid frame 3 and excavate the trench between the supporting elements 1,2 so that the supports may be lowered further. From the top of the support, the rail 12 of the rigid frame 3 is horizontally inserted into the guide rail 11 of the support 1. Then the second supporting element 2 is horizontally inserted into the opposite rail 12 of the rigid frame 3. Subsequently the upper stops 7 are positioned. The distance between the lower stop 6 and the upper stop 7 should be approximately 0.5 m be larger than the height of the rigid frame 3. The supporting element 1 or 2 is prevented from being pushed further by the stop 7 so that the free jib boom length of the supports 1,2 may not exceed its maximum value. Thus the first supporting frame is formed. Additional supporting frames are constructed correspondingly.

Installation of the sheeting device:

At first, part of the trench's bed is prepared, i.e., the width corresponding to that of the supporting frame 1,2,3 and the length amounting to 1 x the length of the sheeting panel plus the width of one supporting element (e.g., 0.5 m). Depending on the soil conditions said preparation is effected at a depth of approximately 1 m. Subsequently the first supporting frame 1,2,3 is positioned by means of a chain hanger and an excavator. The chain hanger is fastened to the heads of the supporting elements. In this connection, the rigid frame is held by the lower stops 6. When the supporting frame has been aligned, the two outer upper sheeting panels 4 are inserted into the guide channels 8 of the supporting elements 1 and 2 of the first framing and, relative to the trench's axis, are aligned in parallel. Subsequently, a second frame is inserted, the edges of the sheeting panel 4 which are facing the excavator being placed in the guide channels 8. Thus the first sheeting unit is formed and excavation of the trench can be started. Since the upper edge of the rigid frame 3 is less than 2.50 m above the ground, even a relatively

small excavator may grab over the rigid frame and excavate a deep trench.

To effect insertion of the rails 11 of the rigid frame 3 into the guide rails 12 of the supports 1 and 2 without trouble and as rapid as possible, the upper ends of the guide rails 11 are enlarged in the shape of a funnel and the side rails 12 of the rigid frame 3 are bevelled at the lower and upper corners 29 (cf. FIG. 4). In addition, guide plates 27 and 28 may be positioned at the upper end of the guide rail 12 so that the insertion of the rails 11 of the rigid frame 3 into the guide rails 12 of the supporting elements 1,2 is facilitated. In this connection, said guide plates 27,28 are placed to the supports 1,2 in such a way that insertion of the sheeting panels 4,5 into the inner guide channels 9 is not impaired. Said guide plates 27,28 are left out in Figure 3.

Figure 3 shows a view of the upper part of a supporting element 1 with two guide channels 8,9 on each side thereof and a guide rail 11 positioned at the wall facing the trench and receiving a lateral rail 12 of the rigid frame 3.

The illustrated supporting element 1 is formed such that the guide channels 8 and 9 can accommodate the edges of the outer sheeting panels as well as those of the inner sheeting panels in the longitudinal direction of the trench with positive fit.

At the upper end of the supporting element 1 there is an opening 23 for the hook of a chain hanger. The rigid frame 3 is also provided with an eyelet 24 for securing a hook therein.

The rigid frame 3 consists of horizontal and vertical box-type hollow sections 33 and 34. Corner gusset plates 35 are located at the edges of the overlapping hollow sections 33 and 34 so that, even in case of relatively small wall thicknesses, the rigid frame is provided with a very high rigidity, and the lateral rails 12 of the rigid frame are kept absolutely parallel even under highest loads.

As is shown by Figure 4, lengthwise narrow slide ribs are located at those portions of the guide rail 11 which embrace the rail 12, they fit to the backside of

rail 12 with play. Slide strips 32 are located at both sides of the guide rail 11, they are fastened either to the guide rail 11 or to the rail 12 of the rigid frame 3; relative to the narrow slide ribs 31, said slide strips are broad since they have to transmit the high loads from the supporting elements to the rigid frames. The slide strips consist of a material with very good sliding properties. The distance between said slide strips should be as large as possible and larger than the support lines of the edges of the sheeting panels 4 and 5 within the supporting elements 1 and 2. This measure has the advantage that in case of a one-sided load on the supporting elements 1 and 2 there is no torque acting on the supporting elements 1 and 2.

Although the play between the slide rib 31 and the backside of the rail 12 may be relatively large, there is no danger of displacement of the supporting elements 1 and 2 because of the height (1.50 to 1.90 m).

With reference to Figure 5, only one guide channel 8' (instead of two) is provided at each end of a supporting element 1', said guide channel 8' being

formed by a supporting flange 50 and a guiding flange 51. Both the outer sheeting panels 4' and the inner sheeting panels 5' are guided in this guide channel 8'. The sheeting panels 4' and 5' are supported by the supporting flange 50 of the supporting element 1' via supporting webs 52 and 53. The sheeting panels 4' and 5' are formed differently. The outer sheeting panels 4' are broader and have a relatively long supporting web 52 which embraces the inner sheeting panel 5'. The edge of the outer sheeting panels 4' is guided with positive fit in the longitudinal direction of the trench within the guide channel 8' of the supporting element 1'. The inner sheeting panels 5' are supported by the supporting flange 50 via the support web 53. The supporting flange 50 is reinforced by the guide rail 11. A lateral flange 56 is angled from the supporting flange 50 in such a way that supporting rollers 57 may be ranged on top of each other between said lateral flange 56 and the side walls 59 of the supporting element 1', said rollers serve as stoppers for the supporting webs 52 and 53 of the sheeting panels 4' and 5'.

To avoid jamming of the sheeting panels 4' and 5' between the two supporting elements 1' and 2' during advancing and pulling of the supports, open pocket-type housings 58 are located in the four corner regions of the sheeting panels 4' and 5' at their narrow sides. Rollers 54 and 55 are located in said housings. The rollers 54 roll on the side walls 59 of the supports 1, whereas the corner rollers 55 of the inner sheeting panels 5' roll on the outer sides of the lateral flanges 56. Said corner rollers 54 and 55 prevent the sheeting panels from jamming between the supports in case of a relative motion of one supporting element of the loaded sheeting wall.

As is shown in Figures 6 to 9, the stops 6 and 7, which may be inserted into the recesses 14 of the guide rail 11 and are positioned below and above the rigid frame 3, are provided with a connector member 15 which is adapted to fit to the rectangular cross-section of said openings 14. The stops 6 and 7 are provided with a bolt 16 which is rotatable about 90 and may be swung into the opening and closing position by a shaft 17, which runs through the interlocking device 16, and a

lever 18. The lever 18 is formed in such a manner that it pushes the bar 16 into the locking position when a rigid frame is pressed against a stop 6 or 7. Since relatively high loads may act on the stop 6 and 7, it is provided with a hook-type prolongation 19 with a second insertion 20 which may be inserted into a second opening 14 of the track of holes. A lug 21 engages into the guide rail 11. The stop 6 or 7 or the prolongation 19, respectively, is provided with a bow-shaped handle 22 which permits easy insertion of the stop into the opening 14 of the guide rail 11. Figs. 8 and 9 illustrate the stop 6 in locked position.

List of reference numbers:

1,1'	supporting element
2	supporting element
3	rigid frame
4,4'	sheeting panel
5,5'	sheeting panel
6	lower stop
7	upper stop
8,8'	guide channel
9	guide channel

10 inner side

11 guide rail

12 rail of the rigid frame

13 chisel edge

14 openings

15 insertion (connecting member)

16 bar (lock)

17 shaft

18 lever

19 prolongation

20 insertion

21 lug

22 handle

23 eyelet in supporting element

24 eyelet in rigid frame

25 connector member

26 funnel-shaped enlargement

27 guide plate

28 guide plate

29 bevel

30 cavity

31 slide rib

32 slide strip

33 box-type hollow section

34 box-type hollow section

35 corner gusset plate

36 screw-type flange

50 supporting flange

51 guide flange

52 supporting web

53 supporting web

54 corner roller

55 corner roller

56 lateral flange

57 supporting roller

58 housing

59 side wall

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

1. A method for sheeting deep trenches by means of supporting frames mountable lengthwise the trench at an equal distance, said supporting frames consisting of two parallel supporting elements and a rigid frame movable in the longitudinal direction of said supporting elements and connecting and keeping them in spaced-apart relationship, and large sheeting panels the lateral edges of which are insertable into guide channels positioned at both sides of said supporting elements, in which method the supporting frames and the sheeting panels are pressed or lowered into the trench, following the direction of excavation, and which is characterized by the following:

- the rigid frame is movably guided between a lower stop and an upper stop along said supporting elements, whereby the lower stop is positioned at the required shovel clearance approximately 1 to 1.50 m from the lower end of the supporting element, and the upper stop is positioned at a distance from the lower stop, which distance corresponds to the height of the rigid frame,

and to an admissible support advance,

- after installation and lowering of the supporting frame to a level, at which the upper edge of the rigid frame is on the level of the trench's edge, the upper stops are removed, a second rigid frame is inserted into the supporting elements of said supporting frame, and the upper stops are fastened to the supporting elements at a distance above the second rigid frame,
- after lowering of the supporting frame by another height of a rigid frame, the upper stops are removed and, if necessary, a third rigid frame is inserted into the supporting elements of the supporting frame,
- the rigid frames are interconnected with each other to retreat the supporting frame.

2. The method according to claim 1 wherein during retreat of the sheeting unit, after removal of the lower stops, the trench is filled and the sheeting panels and the rigid frame, following the filling, are pulled upwardly, and then the upper rigid frames are pulled off guide rails first, then the sheeting panels are removed from the guide channels, then the lower rigid

frame is pulled up, and finally, after the trench has been filled, the supporting elements are pulled out individually.

3. The method according to claim 2 wherein, prior to pulling out the supporting elements, a cavity left by the supporting members and the guide channels are filled with sand or gravel.

4. The method according to claim 1 wherein, during retreating the sheeting unit, the trench is filled and the sheeting panels, the supporting elements, and the rigid frame are pulled out, following the direction of the filling, and, after removal of the upper stops, the upper rigid frames are removed from guide rails of the supporting elements, and the sheeting panels are pulled off the guide channels of the supporting elements, and the upper stops are located above the rigid frames and the supporting frame is pulled out the filled trench.

5. The method as claimed in any one of claims 1 to 4, wherein:

- vertical supporting elements arranged in pairs equally spaced lengthwise the trench in opposite relations,
- a rigid frame which keeps the supporting elements in spaced-apart relationship is guided in a vertically movable manner within said supporting elements, and
- large-surface sheeting panels the edges of which are guided and supported in guide channels of said supporting elements,

said device being characterized by the following features:

a) both sides of the supporting elements are provided with at least one guide channel for supporting an outer sheeting panel and at least one internal sheeting panel, said guide channel receiving the edges of at least the outer sheeting panels in the longitudinal direction of the trench with positive fit,

b) flat C-shaped guide rails for guiding the rigid frame are located at the trench-oriented inner sides of the supporting elements, the width of said guide rails substantially corresponding to the width of the supporting elements,

c) the rigid frame is formed as a stiff frame with rigid angles, the height thereof being less than one third of the height of one supporting element, and being guided in the guide rails of the supporting elements by parallel rails extending over the height of the rigid frame and the clear width of the guide rail,

d) several openings for insertion of stops which are to be located below and above the rigid frame are ranged on top of each other within the guide rails.

6. The method according to claim 5 wherein the C-shaped guide rails are provided with a funnel-shaped enlargement at least at their upper ends.

7. The method according to claim 6 wherein the upper end of the C-shaped guide rails are provided with guide plates facilitating the insertion of the lateral rails of the rigid frame and leading into the guide gap in a funnel-like manner at both sides and in the central region of the guide rails.

8. The method according to any one of claims 5, 6 or 7 wherein lateral corners of the rails of the rigid frame are bevelled at the upper and lower end.

9. The method according to any one of claims 5 to 8 wherein the openings are formed as rectangular recesses positioned in the lengthwise center of the guide rail and the stops are provided with insertions the shape of which corresponds to that of the openings.

10. The method according to claim 9 wherein the stops are provided with a bar which is slewable about 90° and may be swung into an open and a closed position by means of a shaft, which runs through the insertion, and a lever.

11. The method according to any one of claims 5 to 10 wherein the stop is provided with a hook-shaped prolongation insertable into a second opening of the track of holes, said prolongation being provided with an insertion and an engaging projection.

12. The means according to claim 11 wherein the stop is provided with a bow-shaped handle.

13. The method according to any one of claims 5 to 12 wherein the rigid frames are formed in a mirror-inverted manner with respect to the horizontal central line and are provided with eyelets at their four corner regions for fastening a chain therein.

14. The method according to claim 13 wherein connector members engage into the eyelets of the rigid frames in a plug-like manner.

15. The method according to any one of claims 5 to 10 wherein the rigid frames consist of horizontal and vertical box-type hollow sections.

16. The method according to claim 15 wherein the horizontal box-type hollow sections verge into the vertical box-type hollow sections via corner gusset plates.

17. The method according to claims 15 or 16 wherein the horizontal hollow sections are detachably connected

with the vertical hollow sections via screw-type flanges.

18. The method according to any one of claims 15 to 17 wherein the side rail of the rigid frame form the outer walls of the vertical box-type hollow sections.

19. The method according to any one of claims 5 to 18 wherein longitudinally running narrow slide ribs are located at embracing portions of the guide rail adjoining the backside of the rails with play.

20. The method according to any one of claims 5 to 19 wherein relatively broad slide strips are located at both aides of the guide rail which are either fastened to the guide rail or to the rail of the rigid frame.

21. The method of claim 1 wherein the distance which corresponds to the height of the rigid frame is 1.75m.

22. The method of claim 1or 21 in which the distance which corresponds to the admissible support advance is 0.5m.

23. The method of claim 5 wherein the rigid frame has a height of 1.70m.

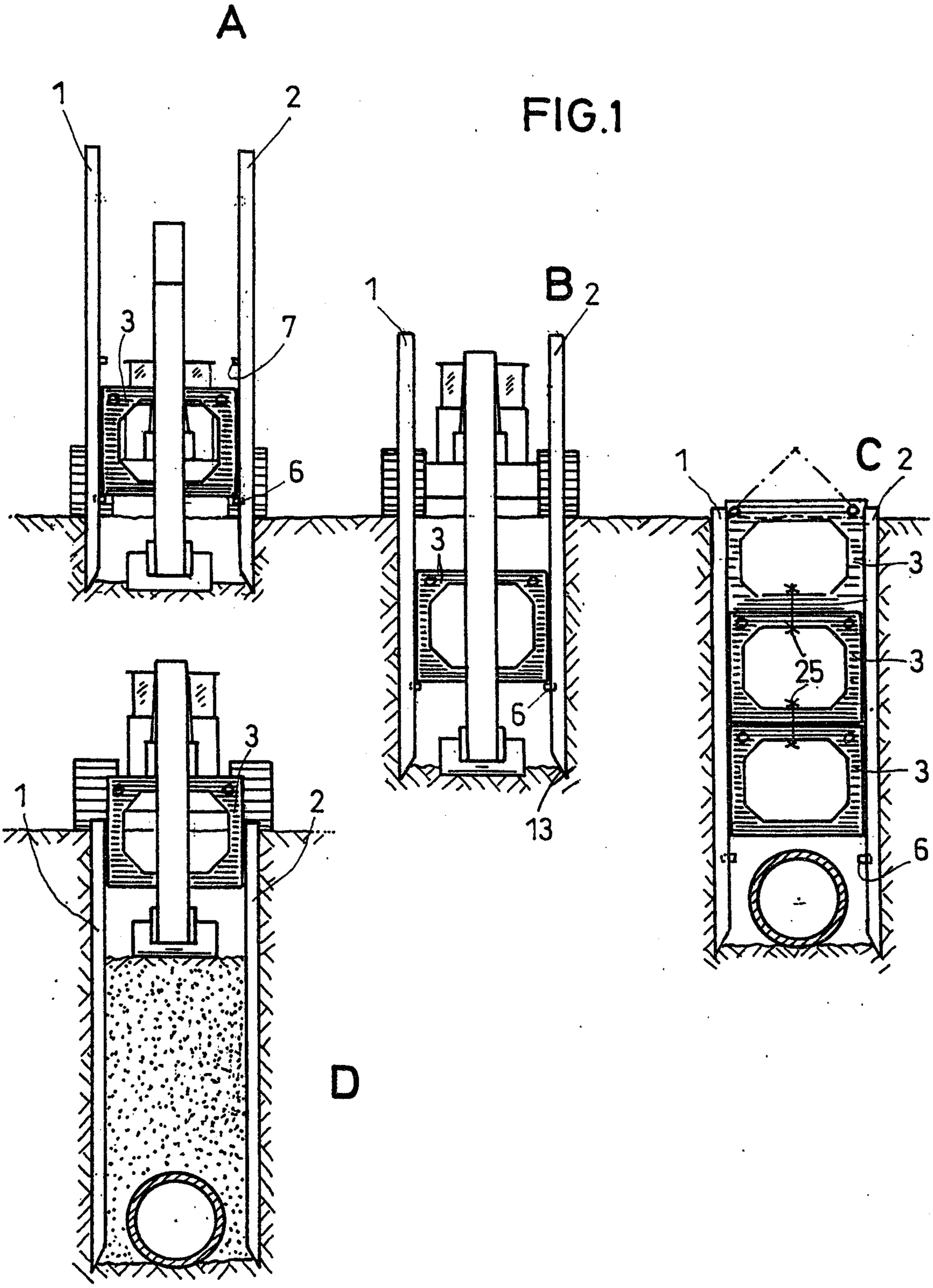


FIG.1

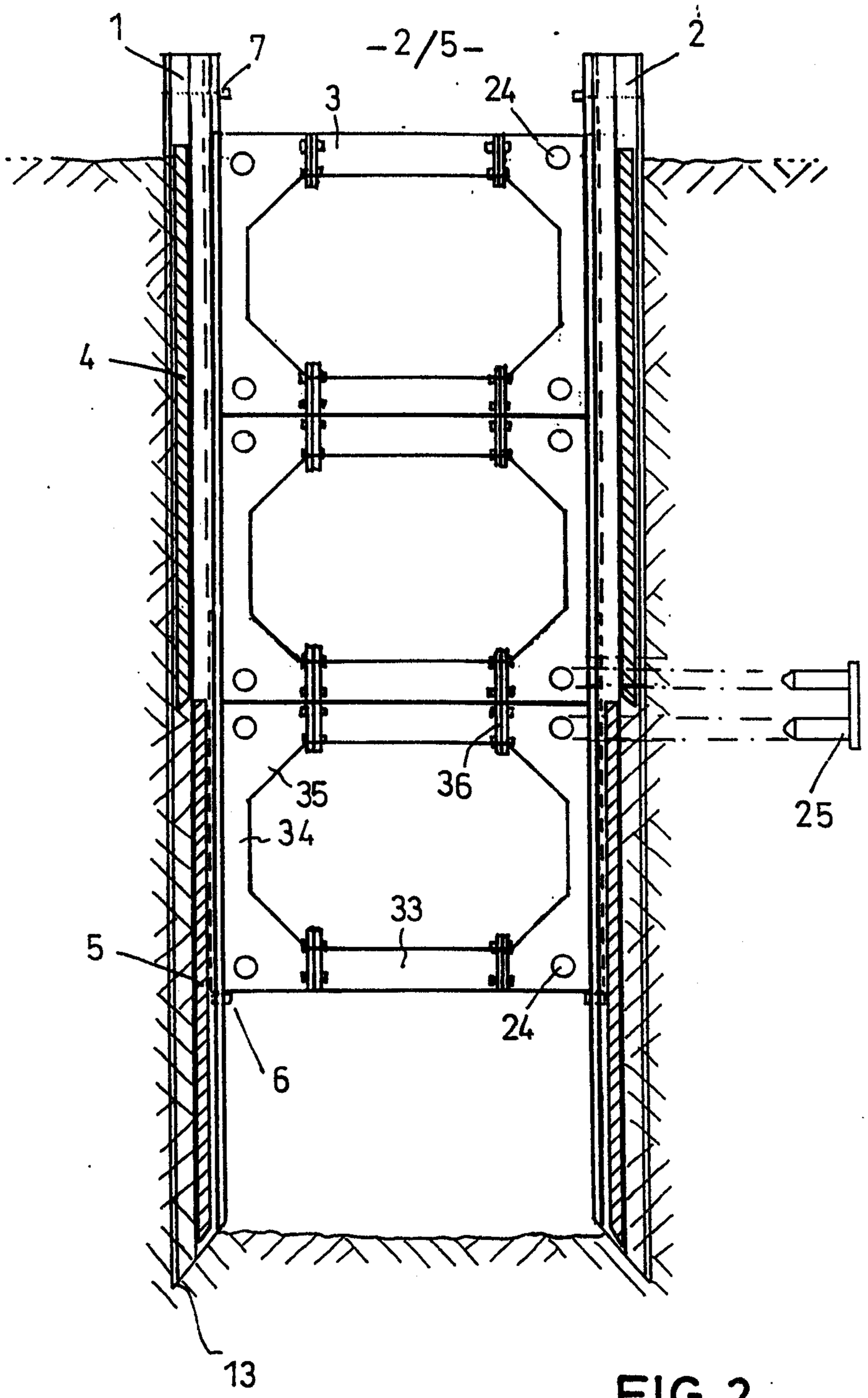


FIG. 2

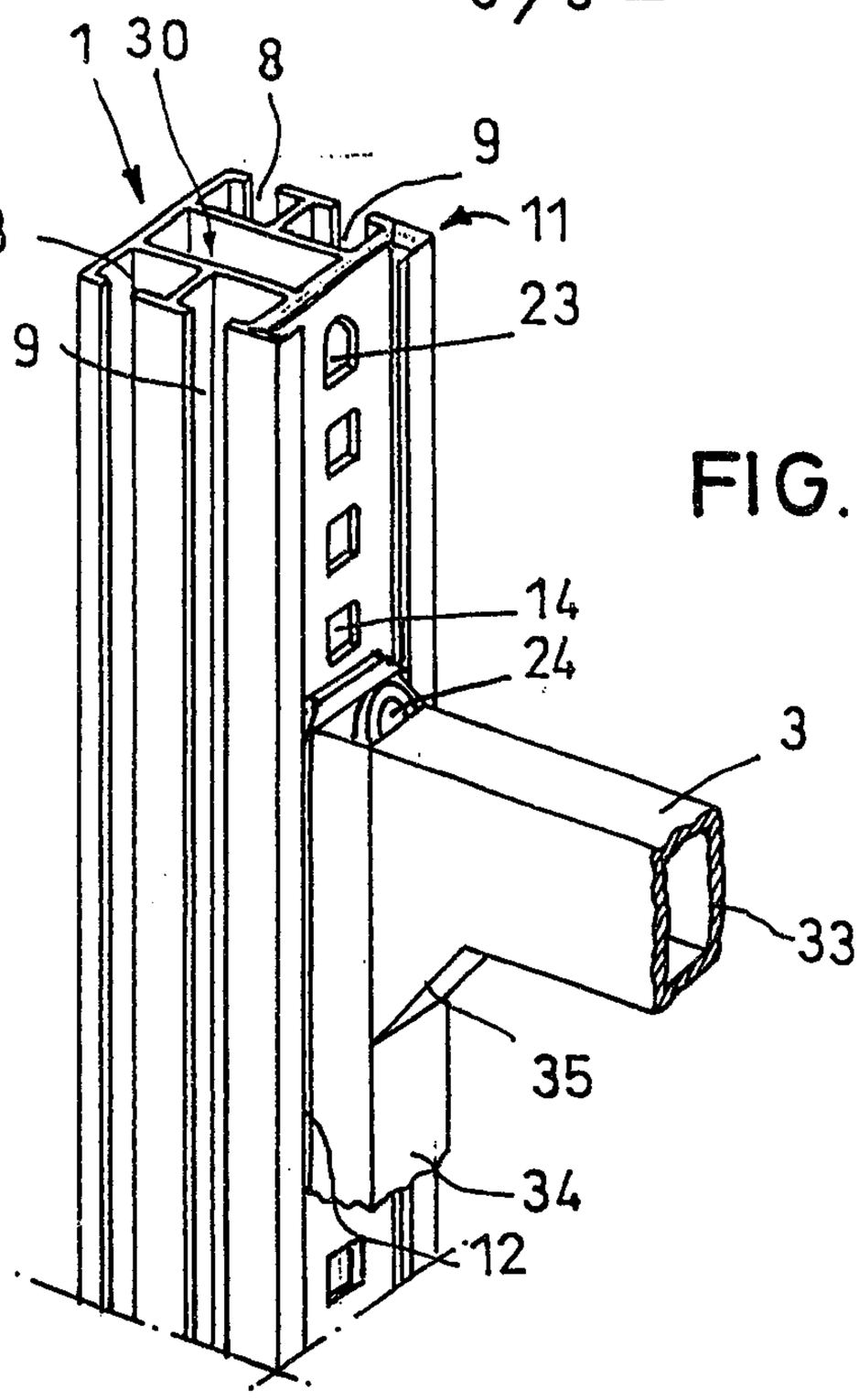


FIG. 3

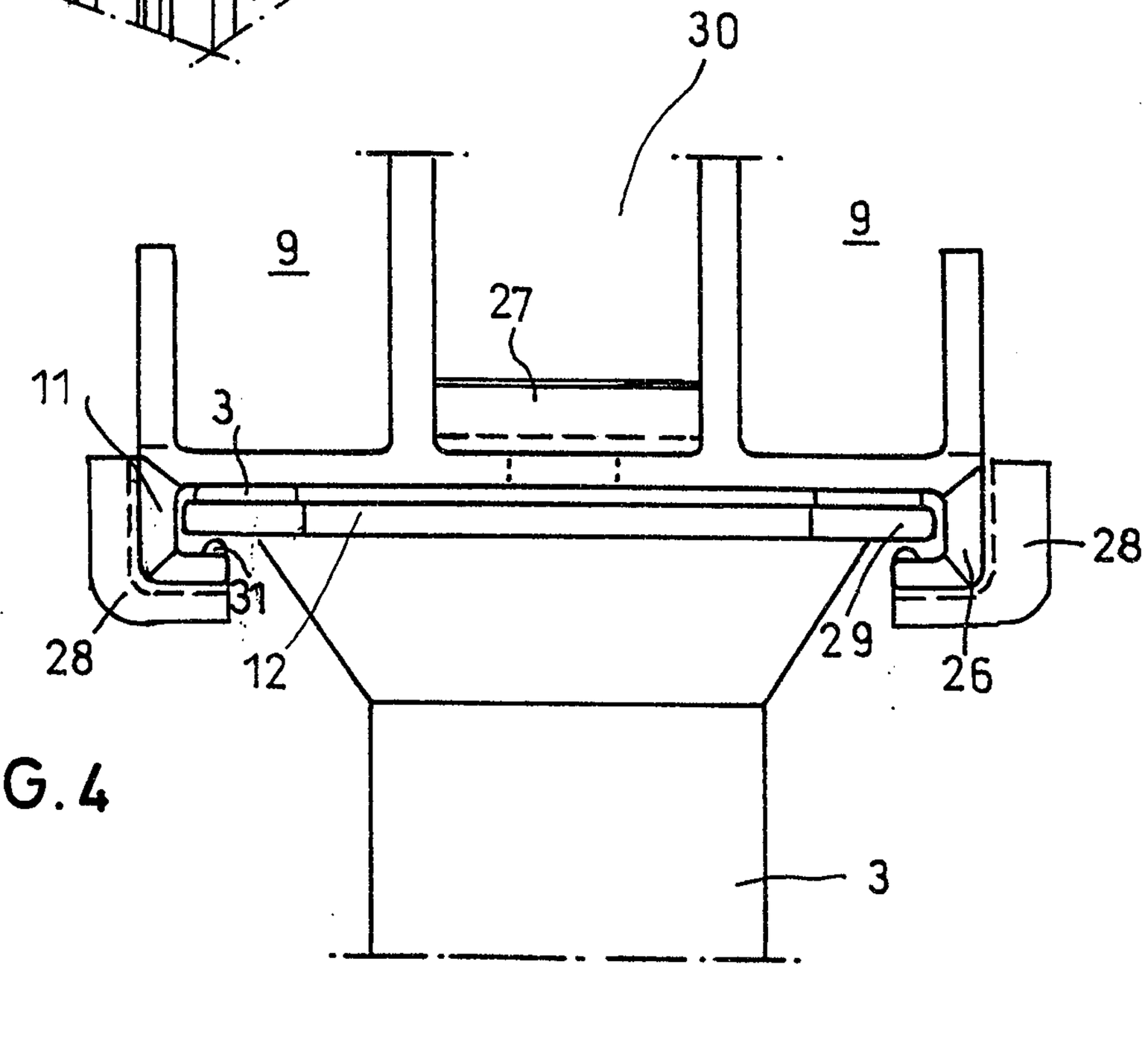


FIG. 4

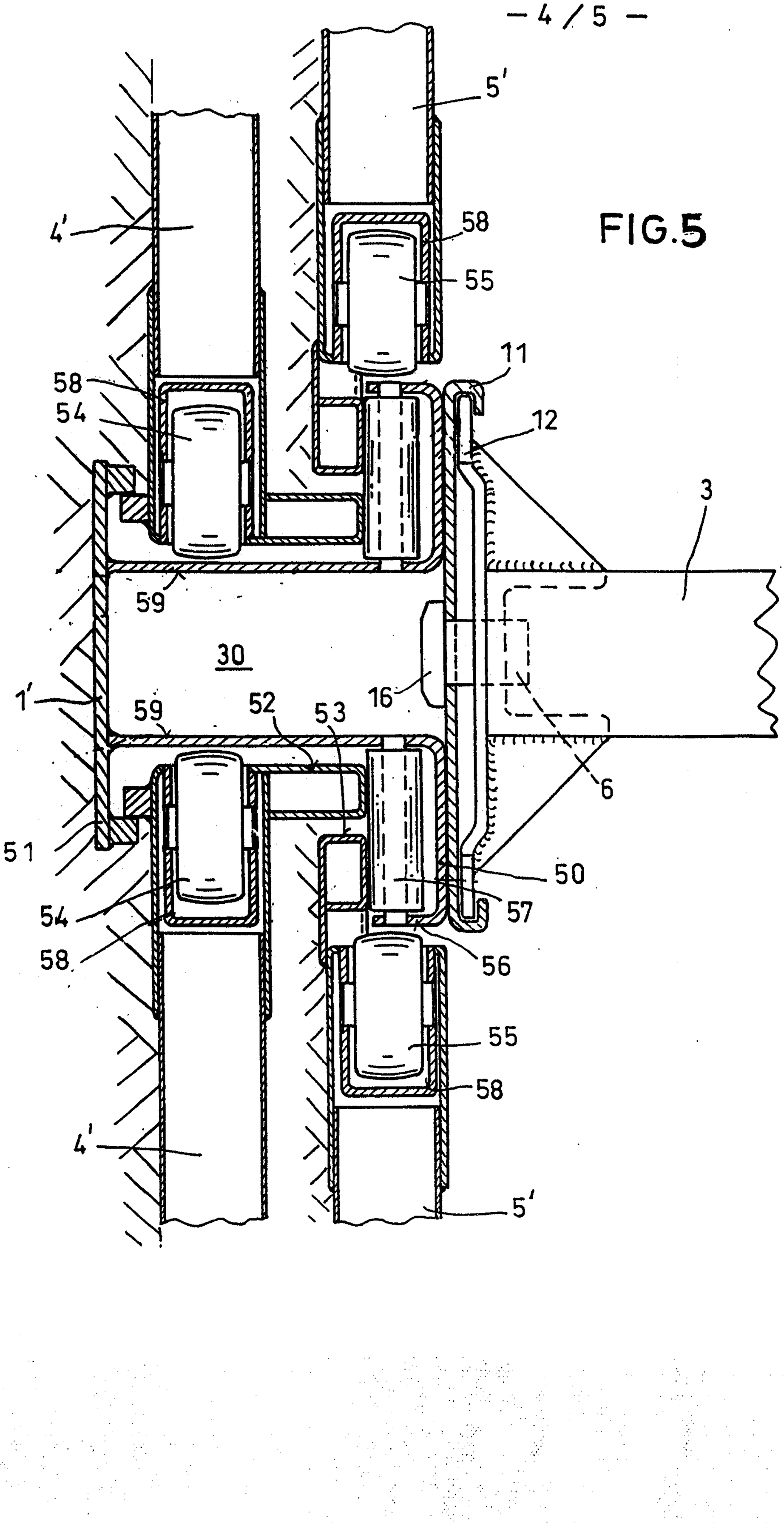


FIG.5

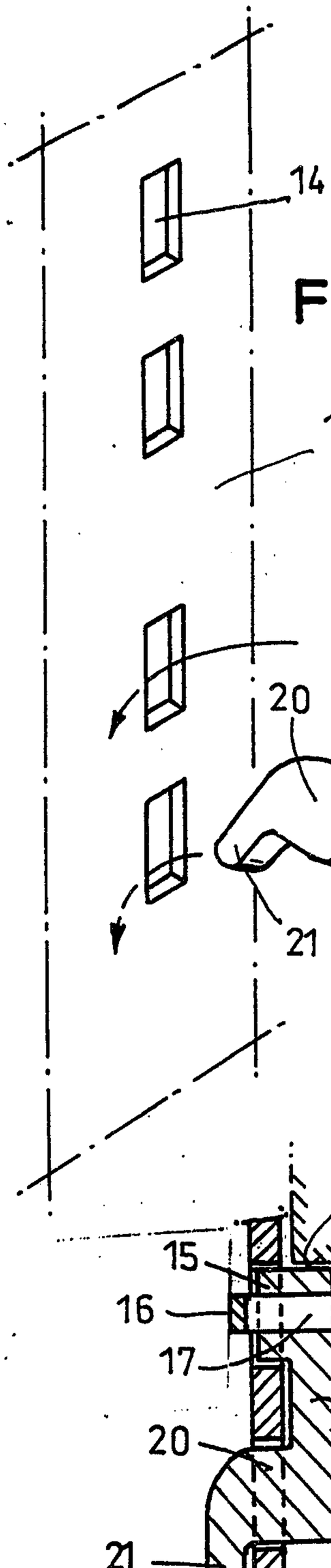


FIG.6

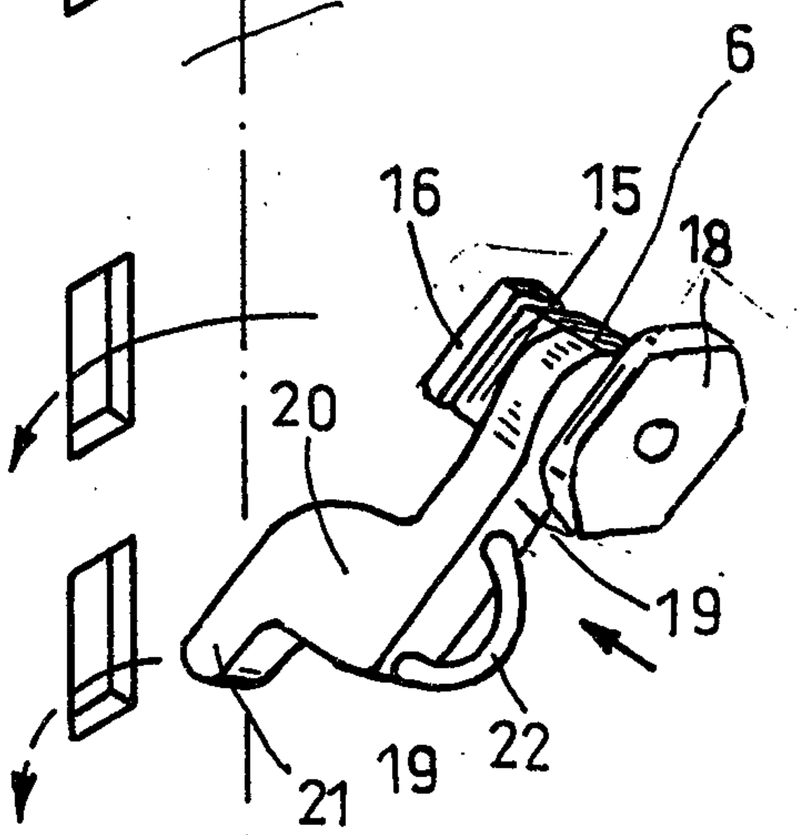


FIG.7

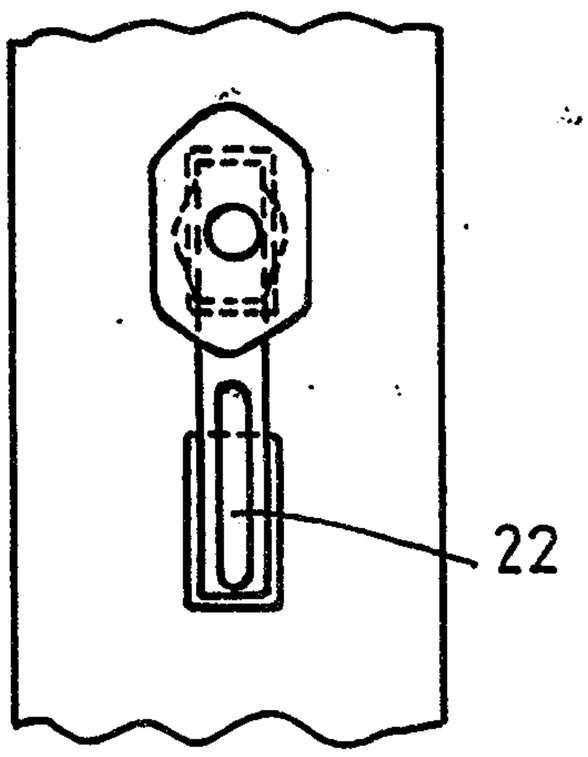


FIG.8

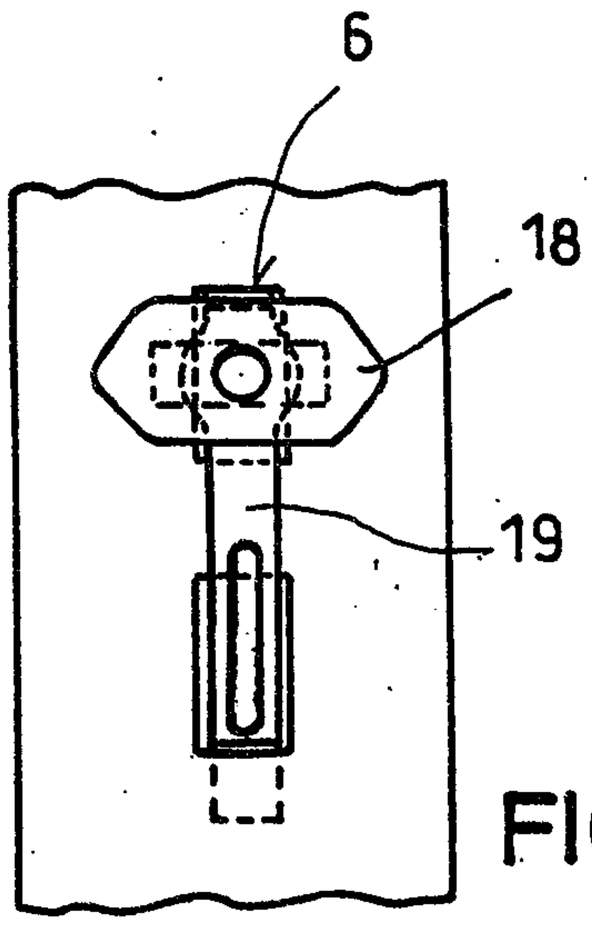
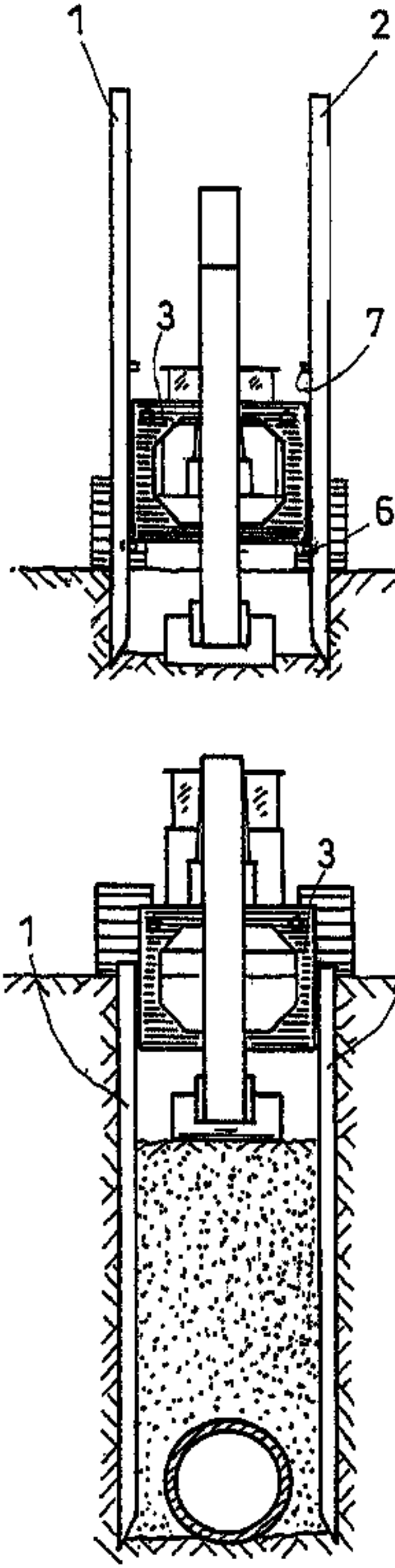


FIG.9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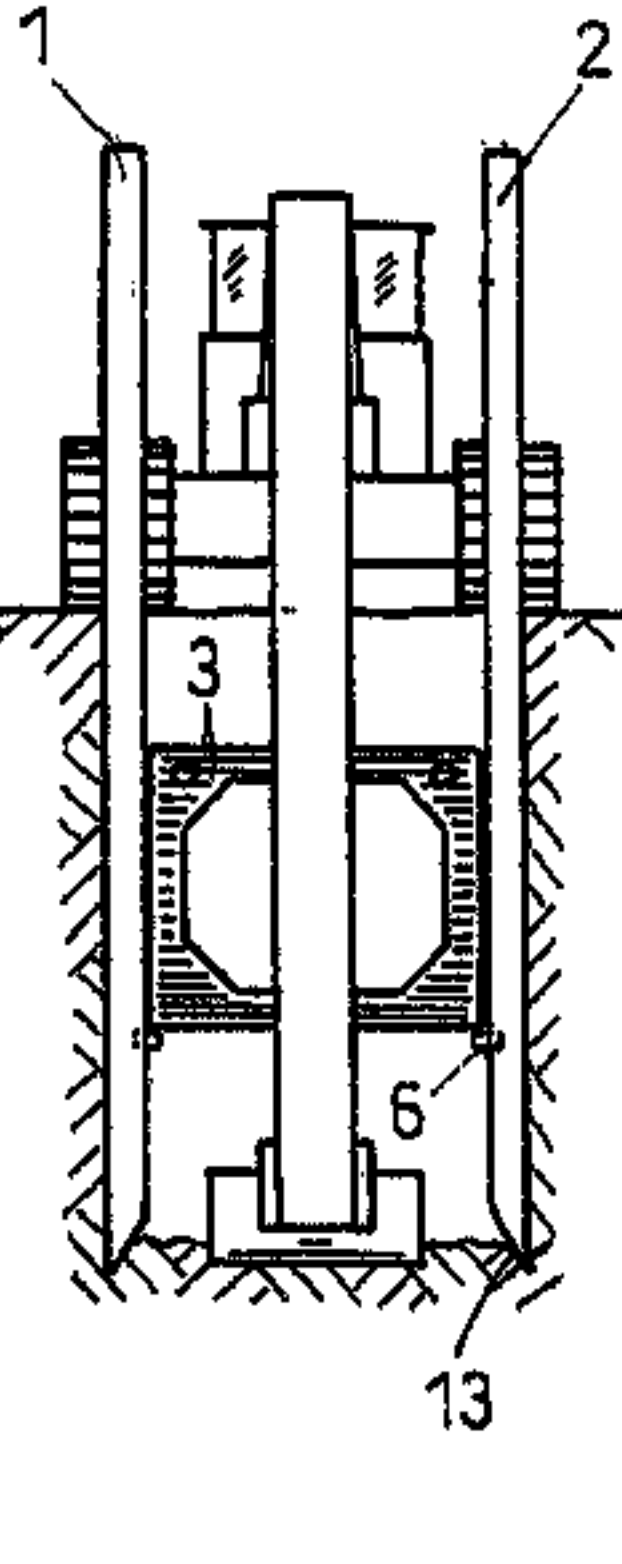
7
6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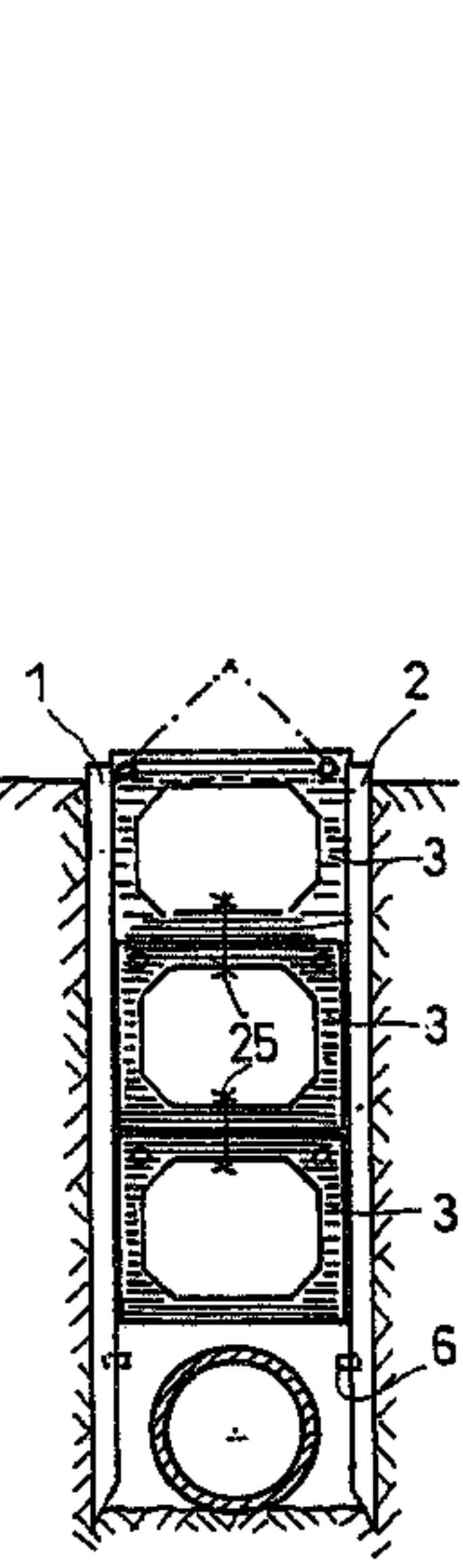
13


1
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3
25
3
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1
2
3