

[54] **TRENCH SHORING FRAME**

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[22] Filed: **July 13, 1971**

[21] Appl. No.: **162,168**

[30] **Foreign Application Priority Data**

July 18, 1970 Great Britain.....34,939/70

[52] U.S. Cl.**61/41 A, 61/63**

[51] Int. Cl.**F21d 5/12**

[58] Field of Search.....61/41, 41 A, 63,
61/72.1, 84, 85

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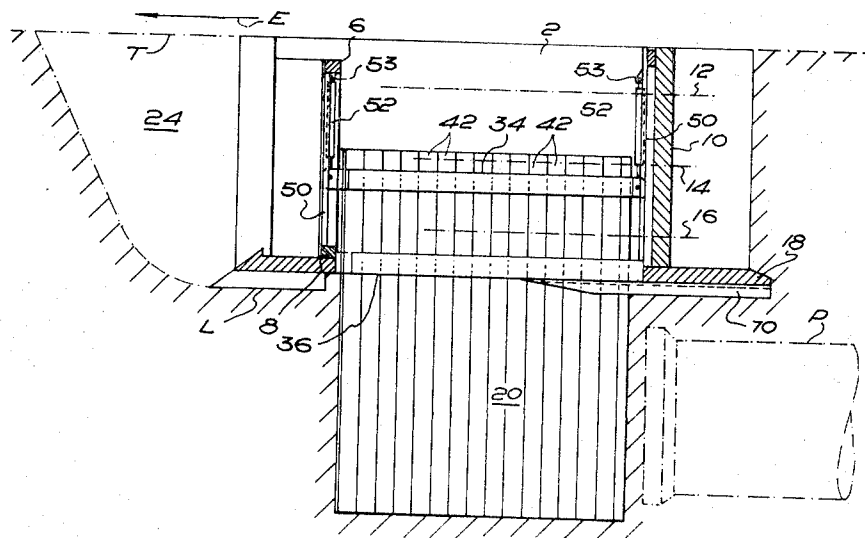
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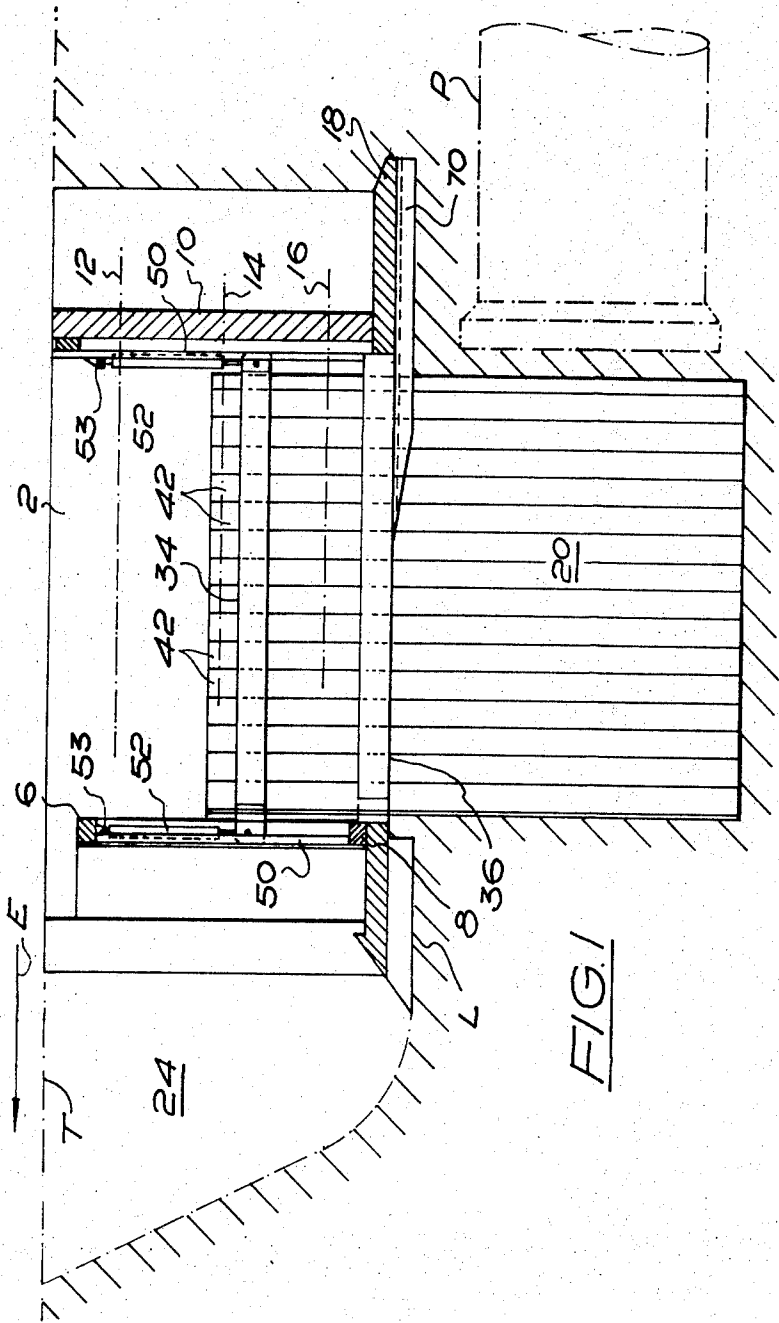
[57] **ABSTRACT**

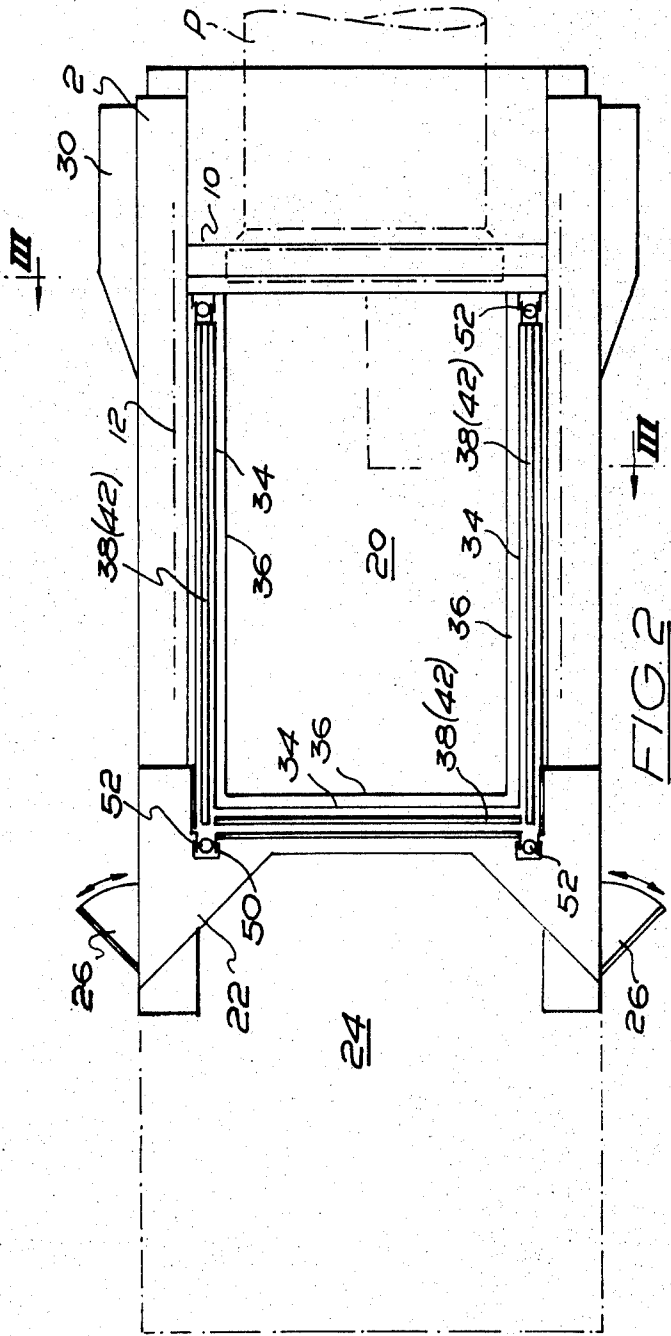
A trench shoring frame comprising a pair of side wall structures for engaging the side walls of a ground trench when said shoring frame is in said trench, said side wall structures being supported in spaced-apart relationship so as to be capable of supporting the trench walls, and a plurality of vertically disposed plate means movably connected to at least one guide frame so as to be capable of being moved vertically relative to said side wall structures and into and out of the ground below the lowermost level of the side wall structures when the frame is in said trench.

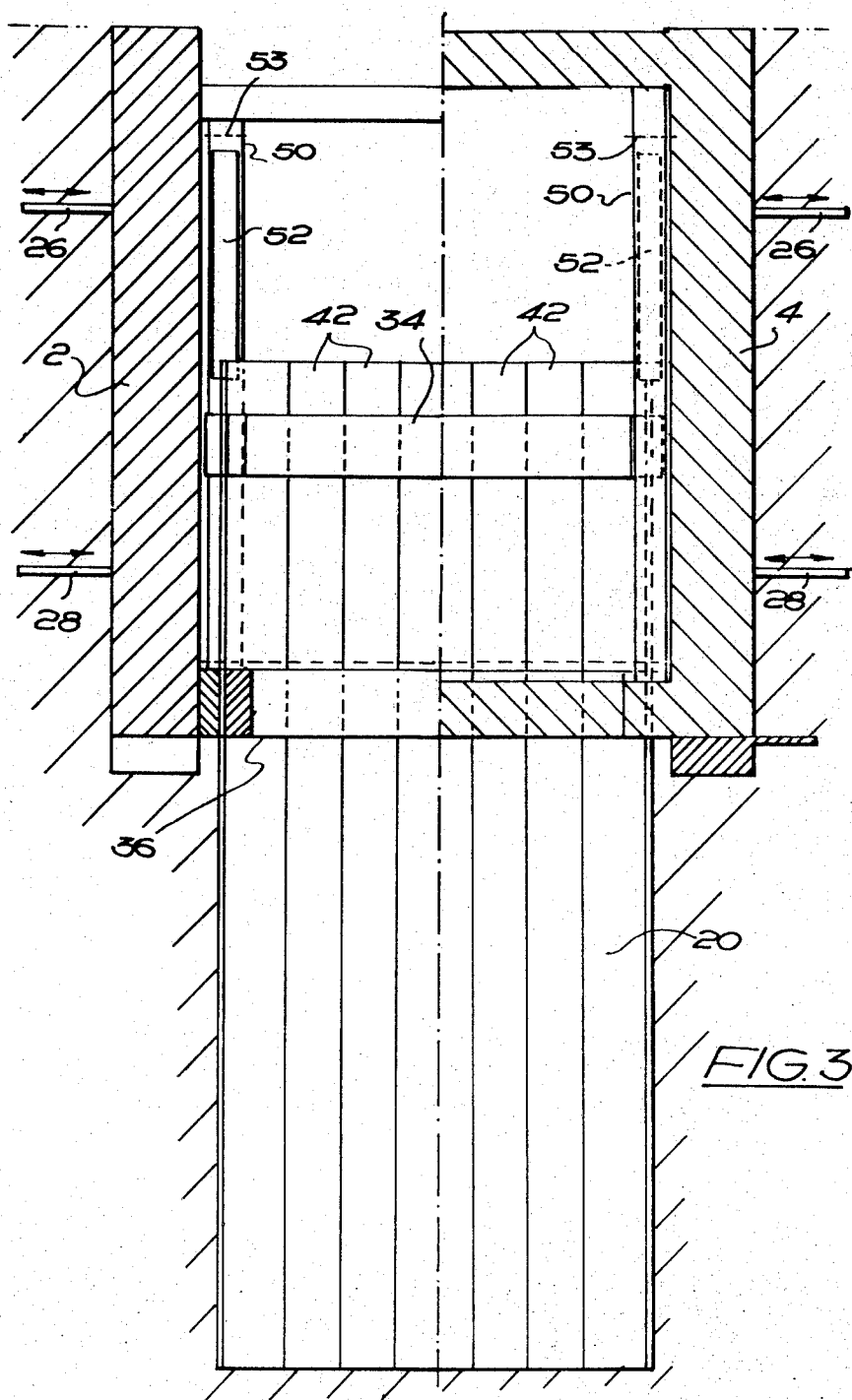
The plate means are preferably guided during their movement relative to the side wall structures by two vertically spaced guide frames through which the plate means are slotted, an upper one of said guide frames being movable upwards and downwards so as to move said plate means by a plurality of fluid pressure piston-and-cylinder devices.

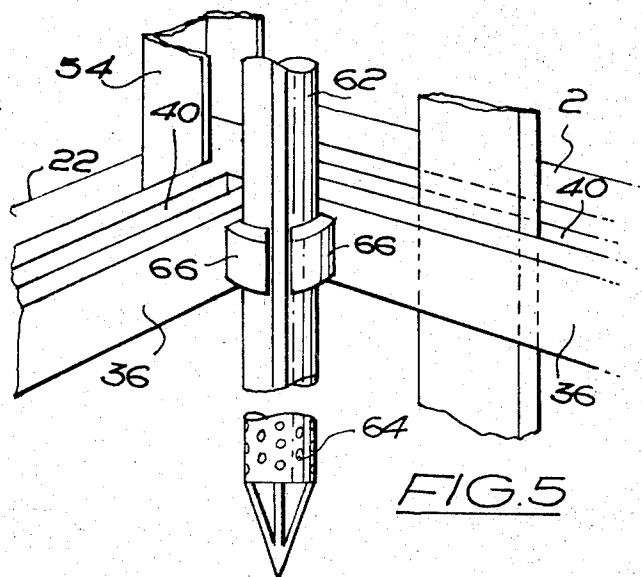
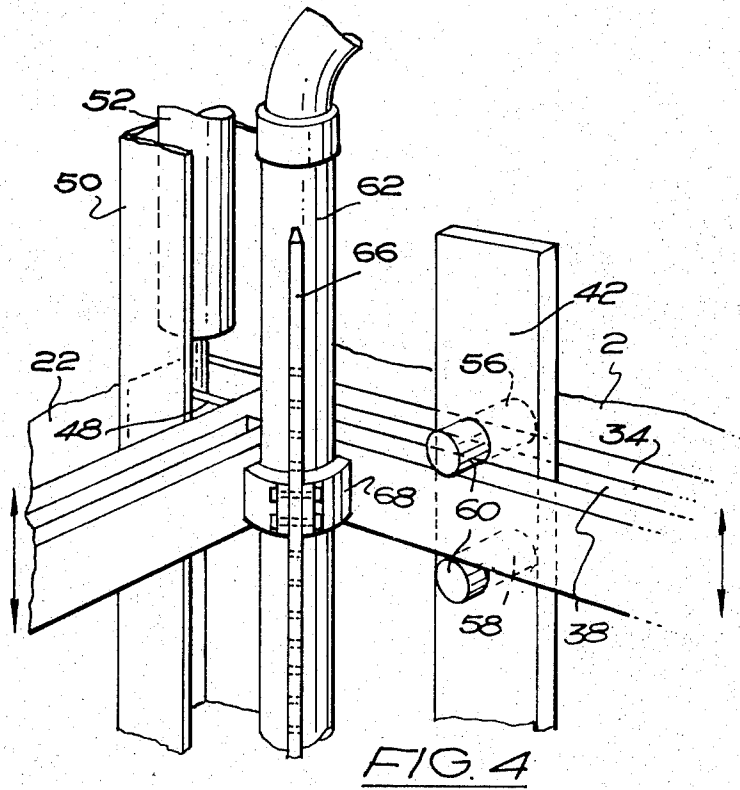
7 Claims, 5 Drawing Figures











TRENCH SHORING FRAME

This invention relates to a trench shoring frame which is adapted to move along a trench whilst located therein.

A main use of such a trench shoring frame is in connection with the laying of pipes, cables or the like in the said trench, the shoring frame being for the purposes of mechanising the shoring of the trench and for protecting workmen in the trench from trench wall cave-ins.

Because substantial trench wall pressures are exerted on the shoring frame, high forces are required to advance the frame along the trench, and it is an object of the invention to provide a trench shoring frame having means which may be inserted into and withdrawn from the bottom of the trench, below the lower extremities of the shoring frame, so as to enable the forces required to move the shoring frame for advancement thereof to be less than has hitherto been the case.

According to the present invention, there is provided a trench shoring frame comprising a pair of side wall structures for engaging the side walls of a ground trench when said shoring frame is in said trench, said side wall structures being supported in spaced-apart relationship so as to be capable of supporting the trench walls, and a plurality of vertically-disposed plate means movably connected to at least one guide frame so as to be capable of being moved vertically relative to said side wall structures and into and out of the ground below the lowermost level of the side wall structures when the frame is in said trench.

Said plate means are preferably guided during their movement relative to the side wall structures by two vertically spaced guide frames through which the plate means are slotted. Said guide frames are preferably rectangular, each frame having elongated slots along three of their sides through which the plate means pass.

The upper one of said guide frames, and hence the plate means, is movable vertically relative to the side wall structures of the shoring frame by means of a plurality of fluid pressure piston-and-cylinder devices which preferably act on the corners of said upper guide frame.

The plate means are movable with said upper guide frame preferably by providing each of said plate means with a plurality of vertically spaced holes through which may be passed a bar or peg. Said holes are spaced apart by an amount at least equal to the depth of said upper guide frame, so that the bar or peg may be inserted at an appropriate position depending upon whether the guide frame, and hence the plates, are being lowered or raised. Alternatively, said plates may be connected to the guide member by jaws.

The plate means may be moved individually, all together or in selected groups.

The upper guide frame is preferably guided during its vertical movement by the structure of the shoring frame, although it could be free of such structure if desired. The bottom guide frame may be connected to the structure or it may be free standing.

The trench shoring frame is preferably provided with well point dewatering means which are movable into and out of the ground during movement of the upper guide frame. The well point dewatering means will be connected to a vacuum pump.

The trench shoring frame will preferably include a rear thrust plate structure which is connected to the side wall structures through jacking means whereby, with the plate means in their raised positions, the shoring frame can be advanced along the trench by jacking the thrust plate structure against back fill placed in the trench so as to cause advancement of the side wall structures and then the thrust plate structure by retraction of the jacks so as to leave a space in the trench behind the thrust plate structure for further back fill material.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, wherein:

FIG. 1 is a sectional side elevation of a trench shoring frame according to the invention and showing the shoring frame in a trench;

FIG. 2 is a plan view of the trench shoring frame of FIG. 1;

FIG. 3 is a sectional elevation of the shoring frame taken along line III—III of FIG. 2;

FIGS. 4 and 5 respectively are perspective views to an enlarged scale of two details of the shoring frame.

Referring to the drawings, and firstly to FIGS. 1, 2 and 3, the trench shoring frame comprises opposed side walls 2 and 4 which are held in spaced parallel relationship by means of cross-struts, two of which are indicated by reference numerals 6 and 8 in FIG. 1, and by which the side wall structures 2 and 4 are held against the walls of the trench T to prevent cave-ins of the trench walls. The side wall structures are movably connected to a rigid thrust plate structure 10 by means of three pairs of double-acting fluid pressure jacks, the centre lines of which are indicated by reference numerals 12, 14 and 16. The thrust plate structure 10 is movable towards and away from said side wall structures, as will be more fully explained, by means of the jacks 12, 14 and 16, the thrust plate structure 10 sliding on a bridge structure 18 located at the rear of the shoring frame. The side wall structures 2 and 4 and the thrust plate structure 10 define an excavation area 20 for an excavator, not shown.

The leading ends of the side wall structures 2 and 4 carry a forward extension 22 which as will be seen from FIG. 2 is cut back towards the longitudinal axis of the shoring frame so as to define the rear extremity of a second excavation area 24 for the excavator.

Said forward extension 22 has two pairs of horizontal plate means or fins 26 and 28 which are movable into and out of the extension 22 and hence out of and into the side walls of the trench T so as to maintain the operational level of the shoring frame or to adjust to level the operation of the shoring frame. Stabilising fins 30 and 32 are provided towards the rear of the side wall structures, said fins being fixed projections as shown or inwardly and outwardly movable in like manner to the fins 26 and 28.

Located within the space defined by the side wall structures 2 and 4, the thrust plate structure 10 and the forward extension 22 are two vertically spaced guide frames 34 and 36 which are three-sided structures, the two sides and front of each of the guide frames 34, 36 having elongated slots 38, 40 respectively, through which extend a plurality of vertical plate members 42. A fourth side to the guide frames 34 and 36 may be

provided if desired so that plate means may be inserted at the rear of the excavation area 20.

Referring to FIG. 4, the upper guide frame 34 is, as will be seen, composed of spaced-apart members 44, 46 so as to form the slots 38 therein. The corners of the guide frame, one of the corners being indicated by reference numeral 48, are located in channel members 50 which serve to guide the guide frame 34 during its vertical movement relative to the side wall structures 2 and 4. The guide frame 34 is movable vertically by four double-acting fluid pressure piston-and-cylinder devices 52 located at each corner of the guide frame 34 and housed in the channel members 50. The upper ends of the devices 52 are secured at 53 to structure of the shoring frame. The devices 52 may be coupled to operate in unison or they may be independently operable.

The lower guide frame 36, FIG. 5, having slots 40 is maintained in position by engagement of its corners in channel members, one of which is indicated at 54.

Extending between the guide frames 34 and 36 are the vertical plate means 42 which as will be seen from the one indicated in FIG. 4, each have a plurality of spaced-apart holes 56 and 58 which are spaced apart by an amount at least equal to the depth of the guide frame 34. The holes 56, 58 or any one of them are adapted to be engaged by pegs or bars 60 as will be hereinafter explained. The plate means 42 may be located in side-by-side abutting relationship or they may be in overlapping, interlocking relationship but such that they may be moved relatively to one another.

When the shoring frame is to operate in bad ground conditions, i.e., water bearing strata, there will be secured to the guide frames 34 and 36 a plurality of tubes 62 — one only is shown in FIGS. 4 and 5 — at the lower ends of which are well point dewatering means 64. The tubes 62 have an elongated boss 66 which is engageable by clamp means 68 so as to clamp the tubes 62 to the upper guide frame 34 to ensure that the well point dewatering means 64 move in unison with the plate means 42, the tubes 62 being guided during such movement by means 66 carried by the lower guide frame 36. The upper ends of the tubes 62 are connected to one or more vacuum pumps (not shown) preferably located above ground level.

In operation, assuming that a pipeline P has been laid to the position shown in FIG. 1, with the shoring frame now in its rest position, and the leading face of the trench having been excavated to the point shown and down to the level L, bars or pegs 60 will be placed in the holes 56 and 58 of the vertical plate members, or as many of them as will be moved during a first stroke of the piston-and-cylinder devices 52, whereafter the devices 52 are actuated so as to move downwardly the upper guide frame 34 and hence move the connected plate means 42 downwardly to the unexcavated ground below the formation level L of the trench until the plate means 42 reach the positions shown in FIGS. 1 and 3. The plate means 42 may be moved to the positions shown all together in a number of stages, if the reaction forces of the unexcavated ground are not too great, or they may be moved in selected groups or individually, depending upon ground conditions, the upper guide frame being coupled and uncoupled to subsequent plate means 42. The depth of penetration of the plate

members 42 at each actuation of the piston-and-cylinder devices 52 will obviously be dependent upon the length of stroke of the devices 52.

It is preferred, where the plate means are not lowered all together that the plate means 42 be driven to the same depth before driving the first driven plate members further into the unexcavated ground.

It will be appreciated that during their downward movement, the plate means 42 will be guided by the lower guide frame 36, and that simultaneously with the insertion of the plate means, the well point dewatering means 64 (when in use) will be inserted into the ground, the means 64 being successively coupled to the guide frame 34 by means of the clamp means 68.

When the plate 42 and, when in use the well point dewatering means 64, have travelled downwardly by an amount equal to the length of stroke of the piston-and-cylinder devices 52, the pegs or bars 60 will be withdrawn and the clamps 68 eased off, whereafter the devices 52 will be operated in reverse so as to raise the upper guide frame 34 relative to the now partly inserted plate means 42. The guide frame 34 will then again be coupled to the plate means 42 by the insertion of pegs or bars 60 in the next series of holes, the clamps 68 will be re-tightened, and the above described operation carried out again. This is repeated until the plate means 42 are inserted to the required depth. The vacuum pump(s) not shown attached to the well point dewatering means 64 may then be actuated so as to remove excess water from the trench area.

Where the upward forces of the undisturbed ground into which the plate means 42 are being inserted is greater than the force applied through the piston-and-cylinder devices 52, or where extra anchorage is required, the forward pairs of fins 26 and 28 may be moved outwardly into the walls of the trench by means (not shown) located in the side wall structures. In addition, where the rear fins 30 and 32 are not fixed structures, these may be moved outwardly into the walls of the trench so as to in effect increase the downward force applied to the guide frame 34 and hence plate means 42. These fins will also provide resistance in an opposite direction when the plate means 42 are withdrawn.

The excavator (not shown) may then excavate between the inserted plate means 42, so extending the excavation area 20, whereafter a further section or sections of the pipeline may be laid. When the section(s) of pipeline have been laid they are covered in the usual manner, whereafter the plate means 42 and the well point dewatering means 64 (after switching off the pump(s) connected thereto) are withdrawn so that their lower extremities are above the indicated level L of the trench. The withdrawal of the plate means 42 and the well point dewatering means is achieved by reversing the procedure used for insertion.

When the plate means 42 and well point dewatering means have been so withdrawn, the jacks connecting the side wall structures 2 and 4 to the thrust plate structure 10 are actuated to move rearwardly the thrust plate structure 10 so as to compact back fill placed behind the structure 10, the thrust plate structure travelling along the bridge structure 18. When the resistance of the back fill, now compacted, is greater than the force applied through the jacks, the side wall struc-

tures 2 and 4 will be caused to move forwardly in the direction of arrow E (FIG. 1), the rear of the machine having a slide surface 70 which serves to ease the shoring frame in the direction of arrow E and to trim the sliding surface. When the jacks reach the end of their stroke, the jacks are reversed so causing the thrust plate structure 10 to move forwardly towards the side wall structures 2 and 4. This is continued until the shoring frame has travelled the desired distance, whereafter the plate means 42 and well point dewatering means 64 may be inserted again using the procedure described above.

It will be appreciated that the plate means 42 may be used without the well point dewatering means 64 where the ground encountered is not of the water bearing type.

I claim:

1. A trench shoring frame comprising a pair of side wall structures for engaging the side walls of a ground trench when said shoring frame is in said trench, said side wall structures being supported in spaced-apart relationship so as to be capable of supporting the trench walls, and a plurality of substantially vertically disposed plate means capable of being moved up and down relative to the side wall structures out of and into the ground below the lowermost level of the side wall structures when the shoring frame is in said trench, a movable drive structure which is capable of making releasable driving engagement with said plate means, and drive means connected between the drive structure

and structure of the shoring frame for driving the plate means, through the drive structure, into and out of the ground.

2. A trench shoring frame according to claim 1, including a guide frame which is vertically spaced from said drive structure and which is fixed relative to the side wall structures.

3. A trench shoring frame according to claim 1, wherein said drive structure is guided, during its up and down movement in structure of the shoring frame.

4. A trench shoring frame according to claim 2, wherein said drive structure and said guide frame each have an elongated slot through which the plate means may pass.

5. A trench shoring frame according to claim 1, including well point de-watering means which are carried by said drive structure so as to be moved with said plate means into and out of the ground.

6. A trench shoring frame according to claim 1 including a thrust plate structure which through hydraulically-operated jacking means is operable to cause said side wall structures to be advanced along the trench by jacking said thrust plate structure against back fill placed in the trench behind the thrust plate structure.

7. A trench shoring frame according to claim 1, wherein each side wall structure carries substantially horizontally disposed plate means which project into the trench walls so as to increase the resistance to up and down movement of the shoring frame.

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