United States Patent [19]

Thompson

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[45] **Nov. 4, 1975**

[54] **TRENCH SHORING MACHINES**

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[21] Appl. No.: **481,864**

[52] **U.S. Cl.** ..... **61/41 A**
[51] **Int. Cl.²** **E21D 5/12**
[58] **Field of Search** ..... 61/41 A, 41, 72.1

[56] **References Cited**

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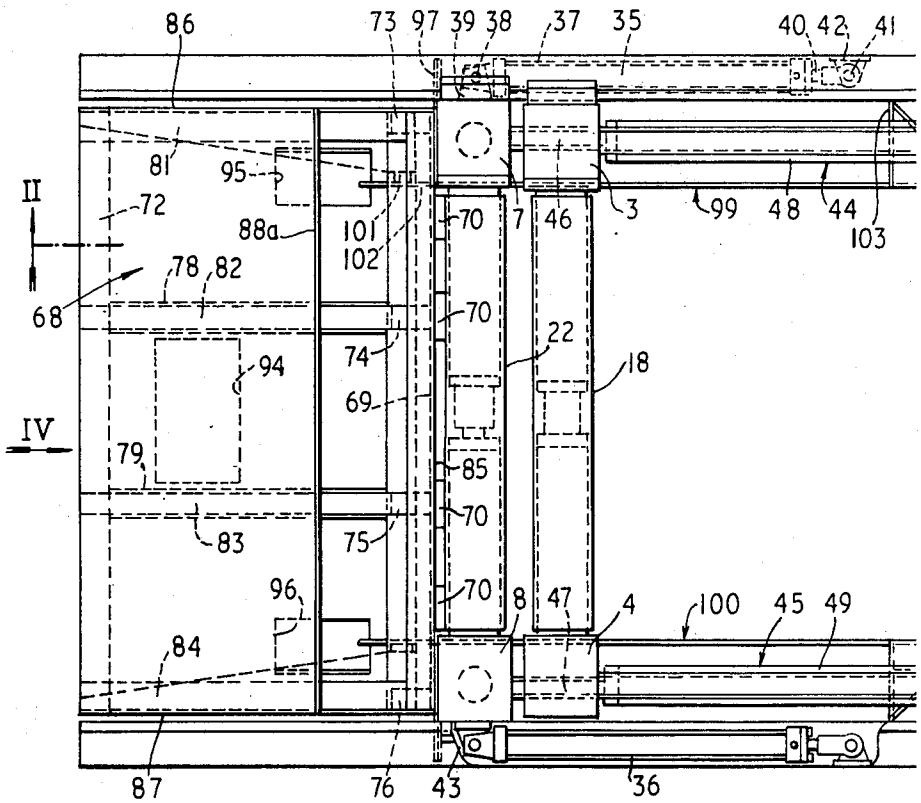
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Primary Examiner—Jacob Shapiro
Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

A trench shoring machine working on the principle of horizontal advance of piles at each side of the machine. The machine comprises a framework having guides for the piles, a drive mechanism for advancing the piles longitudinally of the framework and a holding device for holding the piles advanced while the framework is advanced relative to the piles. A holding device in the form of a further framework arranged in front of the framework is disclosed, the piles being guided simultaneously on both frameworks. The piles can be advanced independently of both frameworks and either framework can be locked to the piles during advance of the other framework, preferably by operation of rams extending between the two frameworks.

23 Claims, 13 Drawing Figures



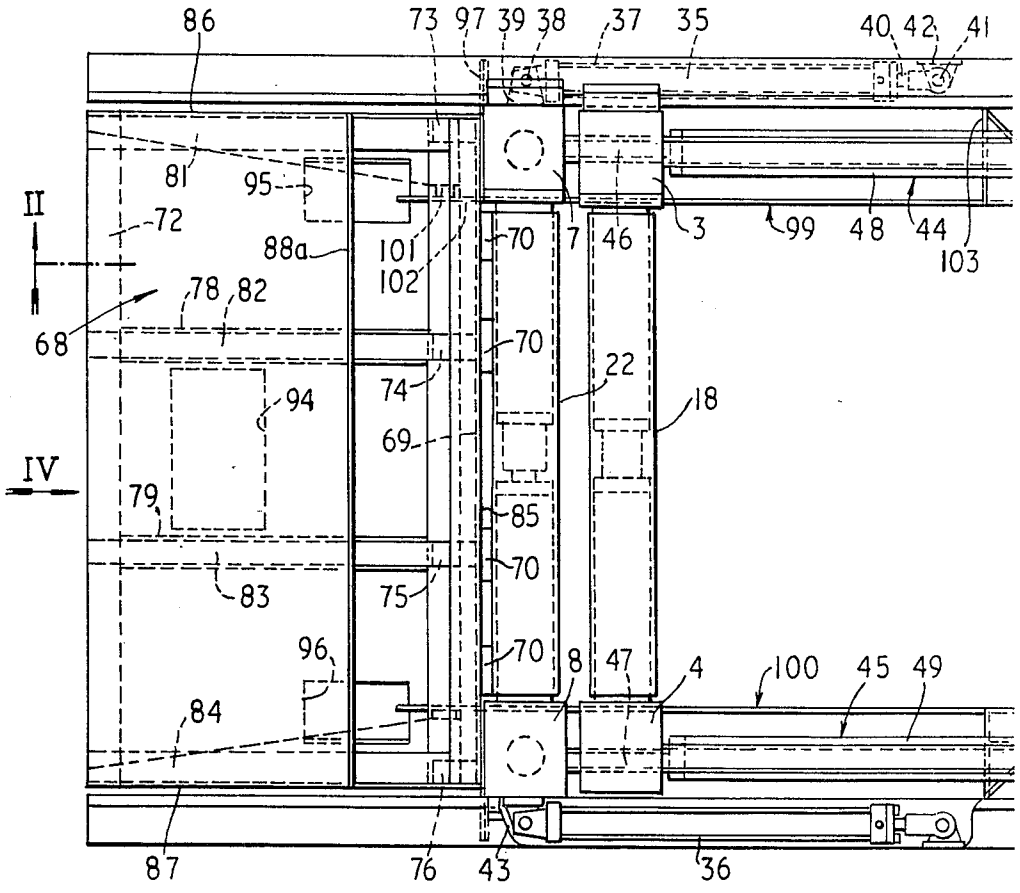

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FIG. 1

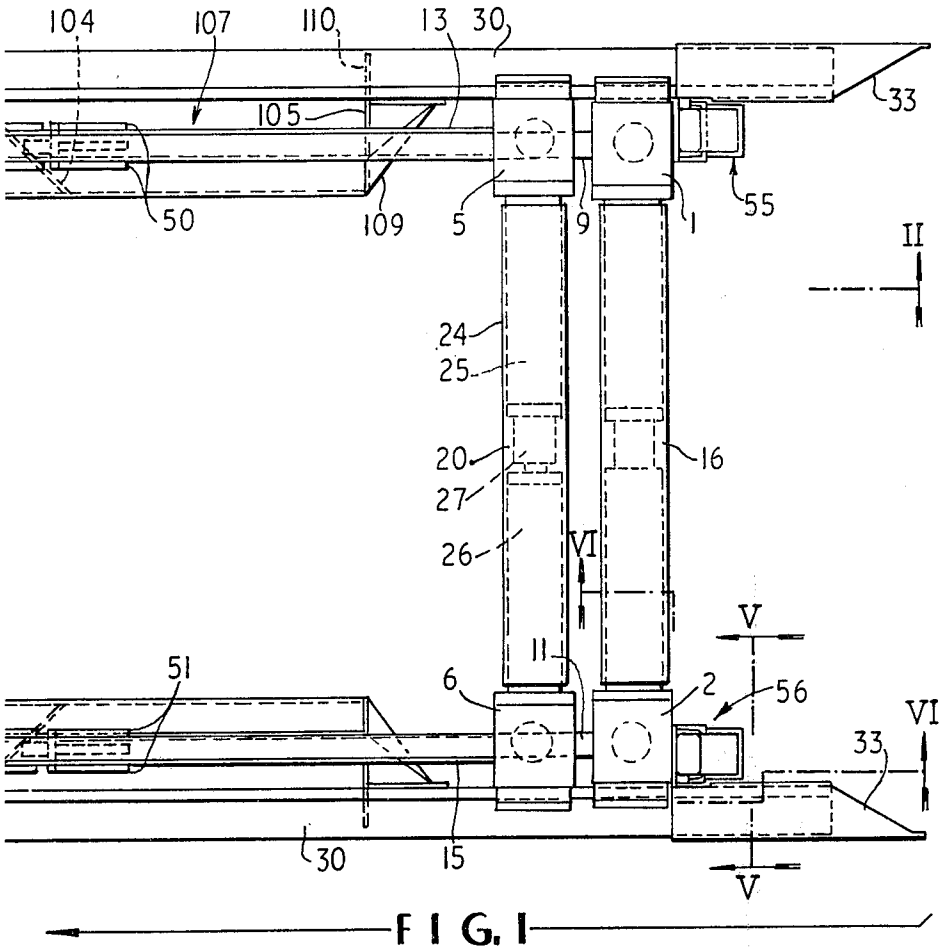

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FIG. 1

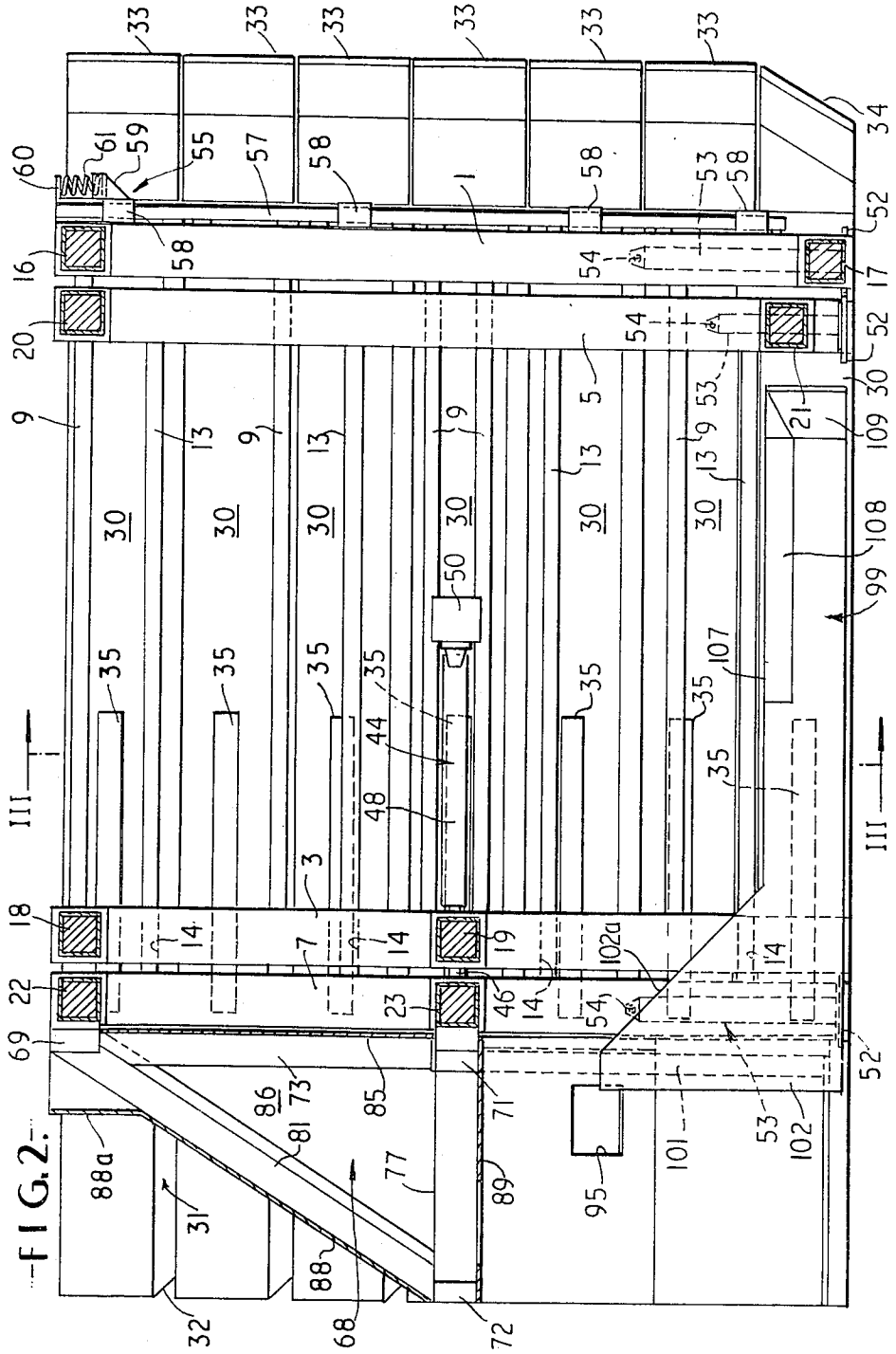


FIG. 2.

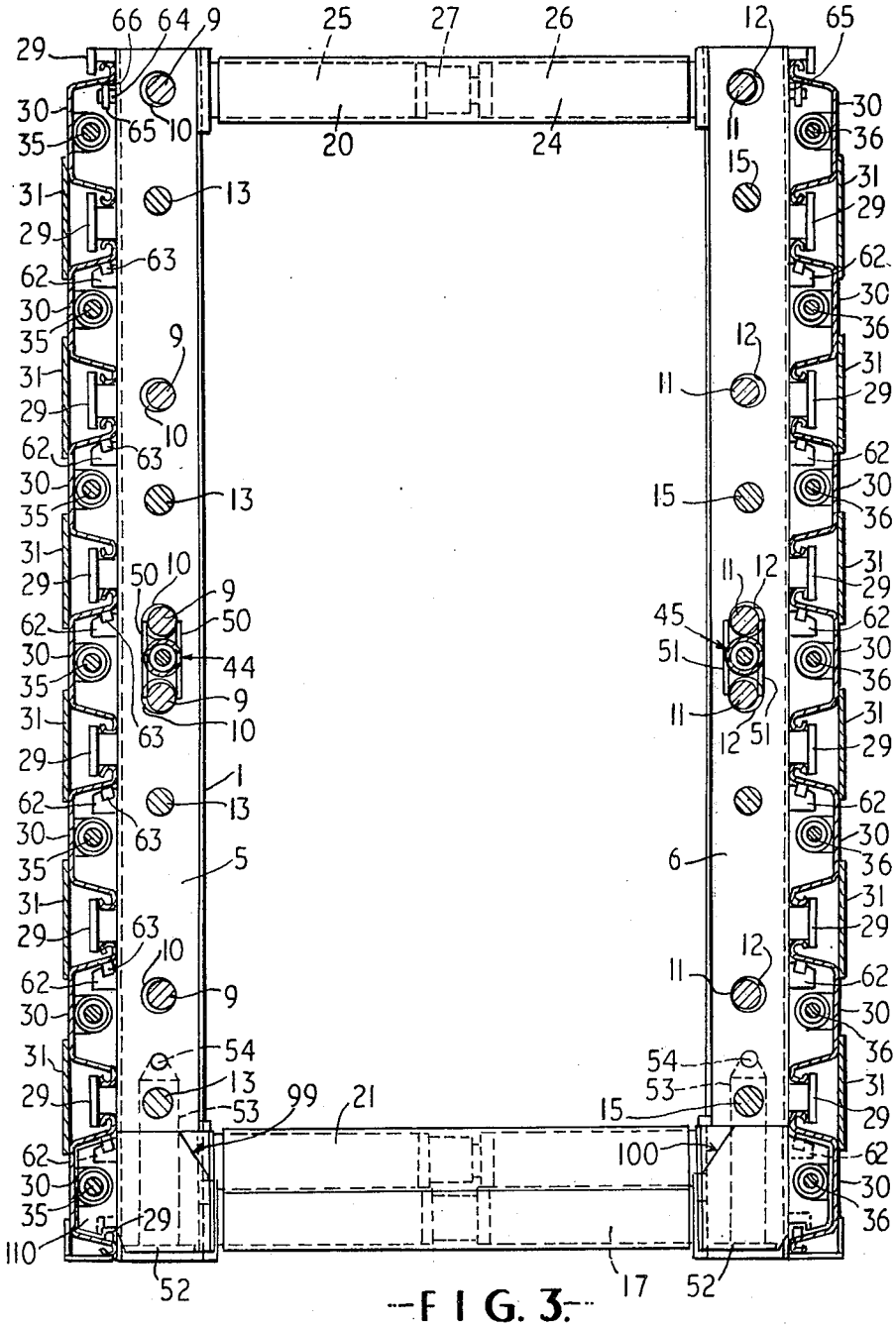

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FIG. 3.

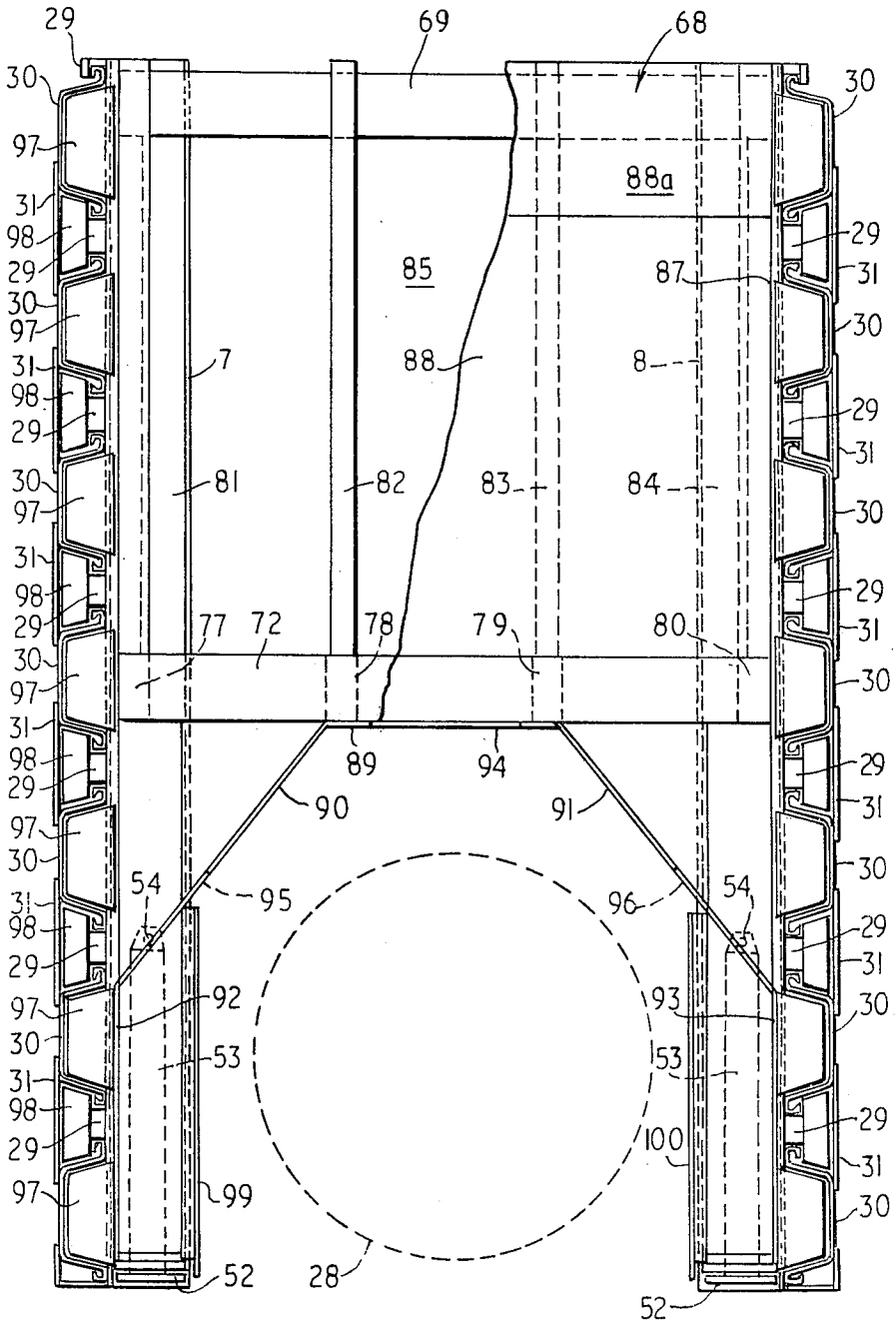

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FIG. 4.

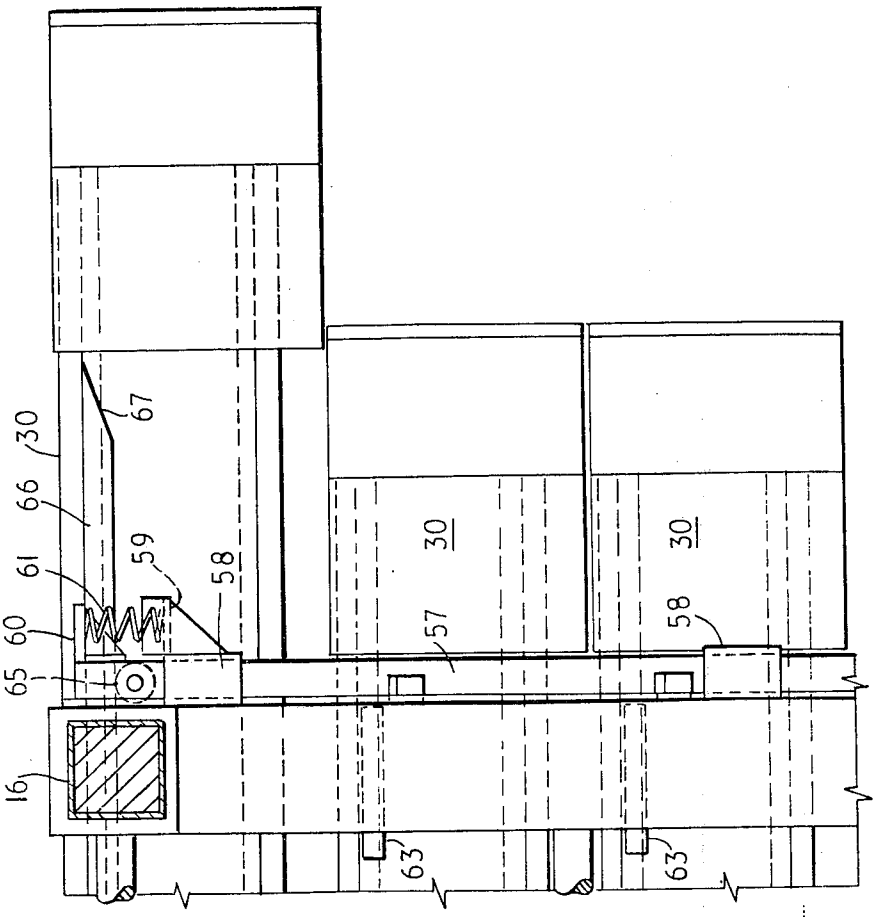

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FIG. 6.

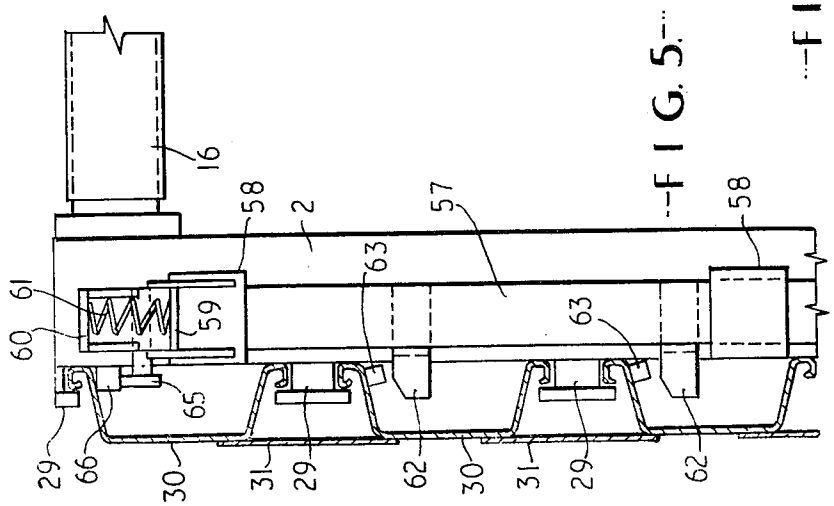

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FIG. 5.

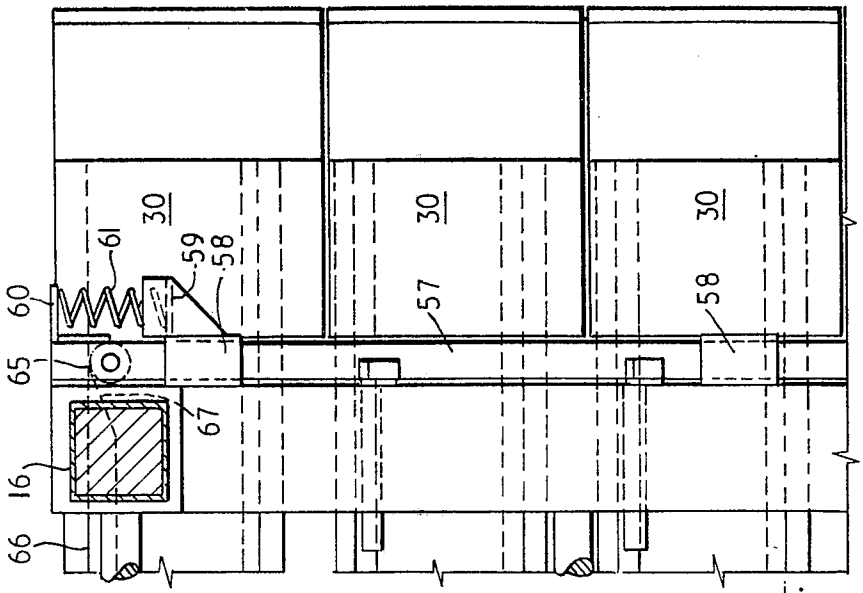

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FIG. 8.

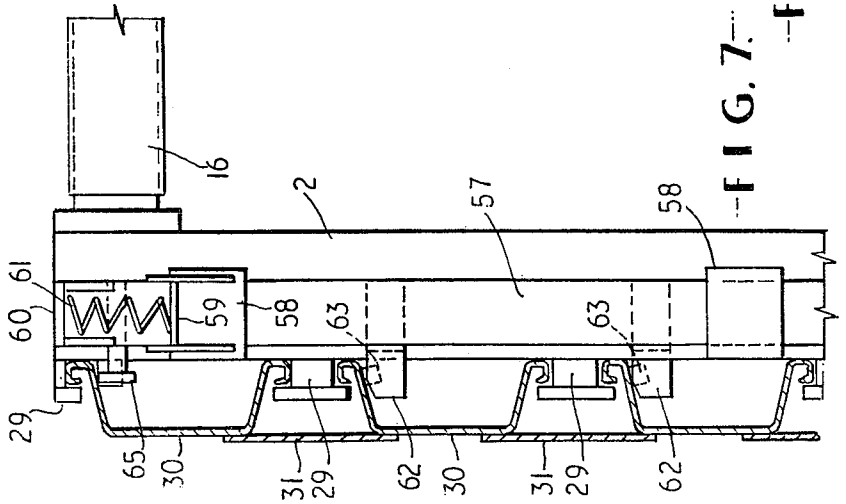

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FIG. 7.

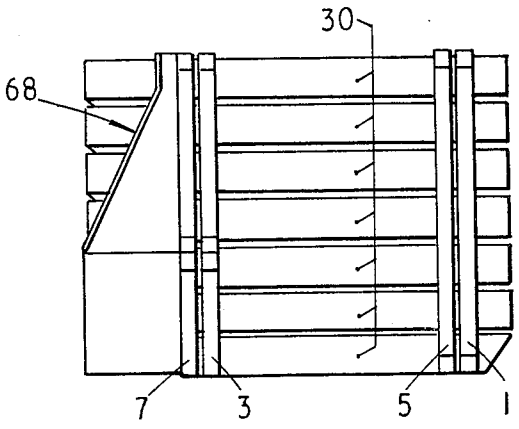


FIG. 9.

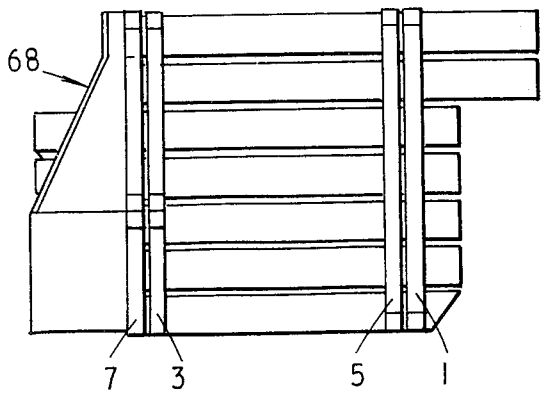


FIG. 10.

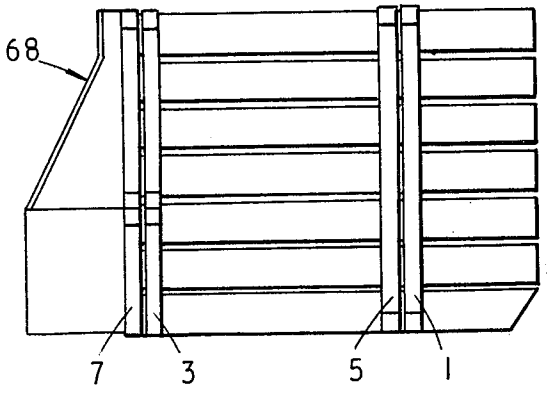


FIG. 11.

FIG. 12

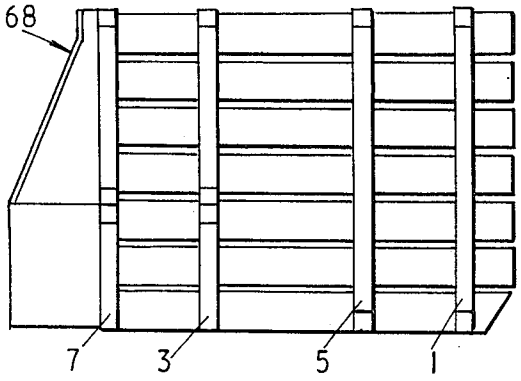
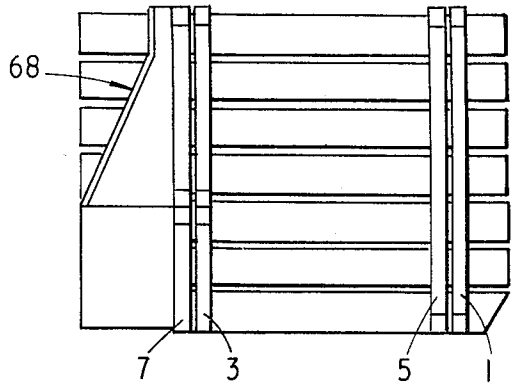


FIG. 13



TRENCH SHORING MACHINES

This invention relates to trench shoring machines.

There have in the past been various proposals for trench shoring machines, most of which have operated on the principle of driving a succession of vertical piles into the ground to define a space which can be excavated, the piles then shoring the walls of the resultant trench. Attempts have been made to drive vertically-extending shields horizontally along the sides of an already excavated trench, the shields being driven by rams, the reaction force of which acts against the backfill soil being put into the trench behind the shoring machine as this advances. The backfill soil does not give a particularly good bearing surface, and in any case, if the trench is for pipelaying then backfill is only present above the laid pipe. Thus horizontal thrust can therefore only be applied against the upper part of the shoring machine rendering the machine liable to unwanted vertical displacement of the forward part of the machine.

According to the present invention a trench shoring machine comprises a framework, a series of longitudinally extending vertically spaced piles arranged along each side of the framework, guide means guiding the piles for substantially horizontal sliding movement longitudinally of the framework, drive means for longitudinally advancing the piles with the framework held stationary, and holding means for holding the piles in their advanced positions and advancing the framework relative to the piles.

In operation, with the framework positioned in a section of a trench, the framework is held stationary and the piles are longitudinally advanced relative to the framework, the piles cutting into fresh ground ahead of the framework. The piles are preferably advanced independently and in sequence, the other piles being held in position relative to the framework and the frictional engagement of these other piles with the trench walls serving to hold the framework stationary. When all the piles have been advanced and the soil or other material dug from between the two sets of piles the piles are held in their advanced position and the framework is moved forward relative to the piles. A further sequence can then commence. It will be noted that advance of the piles is effected against the held framework and advance of the framework is effected against the held piles, the backfill never being used as a bearing surface. The use of a series of horizontal piles for shoring a trench side, rather than a single shield, makes this possible, as the piles can be advanced singly or in groups rather than attempting to advance the whole depth of a side-supporting shield at once. Preferably each pile is individually advanced.

The framework preferably includes first and second forward walings and first and second rearward walings, the walings being upright and, when seen in plan, being arranged at the corners of a rectangle, and longitudinal tie means between the first forward and first rearward walings and between the second forward and second rearward walings, and the guide means for the piles are secured to the walings.

The holding means preferably comprises a further framework, the two frameworks being arranged one in front of the other, and guide means for the piles are provided on each framework; further drive means for driving each of the frameworks forwardly relative to the other; and means for locking each framework against movement while the other is driven forwardly. However, where only one framework is provided there are a number of ways in which piles may be held in their advanced positions. For example a locking element may be provided to lock all the piles together and a ram may extend between the locking element and the framework for advancing the framework, the reaction force being borne by the frictional engagement of the piles with the trench walls. As an alternative, or in addition, transversely extending ram means may be provided for forcing the piles transversely away from each other and so increasing their grip on the walls. In a further embodiment the piles may carry at their front ends means for driving anchoring elements into the trench walls. Where such anchoring elements or transverse bracing is used, the means for advancing the piles, preferably hydraulic rams, are also used for advancing the framework.

In the preferred form of machine in which two frameworks are used the frameworks are preferably of similar construction, with the longitudinal tie means of each framework passing slidably through holes in the walings of the other framework, and the guide means for the piles being secured to the walings of both frameworks. In an alternative, however, either the front or the rear framework could comprise merely a pair of transversely aligned walings having guides for the piles.

The locking means desirably comprises means for locking the respective framework to some or all of the piles. When the drive means for the piles comprises an individual ram for each pile, acting between the rear framework and the pile, as is preferred, then the rear framework can conveniently be locked to the piles by hydraulically locking the rams of all those piles not being advanced. When the front framework is advanced relative to the rear framework all such pile rams are hydraulically locked so that the reaction force is borne by the frictional engagement of the piles with the trench sides.

Desirably the locking means for the front framework is a locking system provided between each forward waling of the front framework and one or more piles on the respective side of the machine, the locking system being effective to prevent rearward movement of the waling when the or each pile is stationary and in its most rearward position relative to the waling.

In addition to hydraulic and mechanical locking arrangements as mentioned above, or alternatively, the locking means may comprise rams acting laterally between transversely aligned walings. Such rams act to brace the piles against the trench sides and thus to increase the reaction force that can be withstood by the piles without slipping on the trench sides.

At least some of the walings are preferably provided with levelling feet operated by further rams housed in the walings. This enables vertical adjustment to be effected.

The invention will be better understood from the following description of a specific embodiment thereof, given in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view of the machine;

FIG. 2 is a cross-section on line II—II of FIG. 1; FIG. 3 is a cross-section on line III—III of FIG. 2; FIG. 4 is a rear elevation in the direction of arrow IV of FIG. 1;

FIGS. 5 and 6 are detail sectional views on lines V—V and VI—VI of FIG. 1, on a larger scale;

FIGS. 7 and 8 are similar to FIGS. 5 and 6, but showing parts in different positions; and

FIGS. 9 to 13 are schematic sequence diagrams illustrating the operation of the machine.

The machine comprises a forward framework including first and second forward walings 1 and 2 and first and second rearward walings 3 and 4, and a rearward framework including first and second forward walings 5 and 6 and first and second rearward walings 7 and 8. Each waling is a box-section structure. The first forward and rearward walings 1 and 3 of the forward framework are joined by longitudinal tie rods 9, each tie rod passing slidably through a hole 10 centered on the neutral axis of forward waling 5 of the rearward framework. Each hole 10 is of larger diameter than the rod passing through it. Each waling may be reinforced in the region of each hole by a plate (not shown) welded to the waling, the plate having a hole aligned with the respective hole in the waling.

Similarly, walings 2 and 4 are joined by longitudinal tie rods 11 passing through holes 12 in waling 6, walings 5 and 7 are joined by longitudinal tie rods 13 passing through holes 14 in waling 3, and walings 6 and 8 are joined by longitudinal tie rods 15 passing through holes (not shown) in waling 4. Each end of each tie rod is welded to the respective waling.

Lateral struts 16, 17 extend between walings 1 and 2; lateral struts 18, 19 extend between walings 3 and 4, lateral struts 20, 21 extend between walings 5 and 6 and lateral struts 22, 23 extend between walings 7 and 8. Each strut is of identical construction and comprises a box-section guide 24 in which two bars 25, 26 are slidable, a first ram 27 being positioned between the bars to urge the bars away from each other when the ram is extended. In the drawings the rams in struts 16 to 19 are shown retracted and those in struts 20 to 23 extended. Struts 16, 18, 20 and 22 extend between the upper ends of the respective pairs of walings, struts 17 and 21 extend between the lower ends of the respective pairs of walings and struts 19 and 23 extend between the respective pairs of walings some distance above the lower ends thereof. In each case the box-sections 25, 26 are welded to the respective waling. The space below the struts 19 and 23 is sufficiently deep to accommodate a pipe, indicated at 28, which may be laid in the trench.

Each waling has a series of vertically spaced guide elements 29 welded thereto. Each side of the machine carries a series of seven horizontally extending piles 30, adjacent piles being vertically spaced one above another. The piles are fitted between the guide elements 29 and each pile is thus supported and guided by guide elements on all four walings at the respective side of the machine. The piles and guides are so shaped and dimensioned that the piles and guides are free for relative longitudinal sliding movement, and so that each waling has a limited freedom of movement transversely of the piles. Each pile except the lowermost ones has a cover plate 31 welded along the lower edge thereof and covering the space between such pile and the lower adjacent pile to prevent access of earth to the guide elements 29. At the rear end of each pile the cover plate terminates in an upwardly and rearwardly inclined section 32. The front end of each pile has a forwardly and outwardly tapered nose piece 33 secured thereto. The two lowermost piles each have a rearward and downward taper 34 at their front ends.

Two series of rams 35, 36 are provided on opposite sides of the machine. Each ram 35 has a cylinder element 37 pivoted at 38 to a lug 39 welded to the waling 7, and a piston rod element 40 pivoted at 41 to a lug 42 welded to an associated one of piles 30. Similarly each ram 36 on the opposite side of the machine extends between a lug 43 welded to waling 7 and a lug welded to a further pile 30. One ram 35 or 36 is provided in association with each pile 30, the piston rod element of each ram being secured to the associated pile. Thus, by extending any ram 35 or 36 the associated pile can be advanced relative to the walings 7 and 8. Only the uppermost rams 35, 36 are shown in detail in FIG. 1, the others being merely shown in outline for the sake of clarity.

Two further rams 44, 45 also have their piston rod elements 46, 47 secured to respective ones of walings 7 and 8, the piston rods passing through holes (not shown) in the neutral axes of walings 3 and 4. The cylinder elements 48, 49 of these rams are secured respectively to two vertically adjacent ones of the tie rods 9 by a pair of connector plates 50, 51 welded to the tie rods. Extension of rams 44 and 45 will thus advance the framework comprising walings 1 to 4 relative to the framework comprising walings 5 to 8.

Walings 1, 2, 5, 6, 7 and 8 each have a levelling foot 52 capable of being extended from the lower end of the waling by a ram 53 pivotally mounted at 54 on the respective waling. These rams can thus be used for levelling the machine both laterally and longitudinally by adjusting the foot members as appropriate.

At each side of the front of the machine there is a locking system 55, 56 for locking the respective one of walings 1 and 2 to the piles at the appropriate side of the machine. Only locking system 55 will be described in detail, it being understood that locking system 56 is identical except for being of opposite hand. Locking system 55 comprises a box-section element 57 slidably mounted in guides 58 welded to the front surface of the waling 1. The top one of guides 58 has a forward projection 59 and the upper end of the element 57 has a plate 60 extending forwardly therefrom. A compression spring 61 acts between the projection 59 and plate 60 to bias the element 57 upwardly. Welded to the element 57 are six vertically spaced locking members 62 each of which lies in front of a bar 63 welded to a respective one of the piles 30 when the element 57 is in its raised position. Towards the upper end of the element there is welded a stub shaft 64 on which a roller 65 is rotatably mounted. The roller is engageable by a runner 66 welded to the uppermost one of piles 30, the runner 66 having a tapered front end 67. A forward movement of runner 66 can thus act on roller 65 to move the element 57 downwardly against the biasing force of spring 61 and so move locking members 62 downwardly to a level below bars 63.

The rearward framework carries a hopper 68. This comprises a welded framework including an upper front transverse member 69 welded to plates 70 which are in turn welded to guide part 24 of strut 22, a lower front transverse member 71 welded to guide part 24 of strut 23, a rear transverse member 72, vertical front members 73 to 76 extending between transverse members 69 and 71, horizontal longitudinal members 77 to 80 extending between transverse members 71 and 72

and diagonal struts **81** to **84** extending between transverse members **69** and **72.** The hopper is enclosed by a front plate **85,** side plates **86, 87** and a rear plate **88,** all welded to appropriate members of the framework. The rear plate **88** has an upward extension **88***a* so that an opening into the hopper is defined between plates **85, 86, 87, 88***a*. The base of the hopper is formed by a central horizontal plate **89** and two downwardly and outwardly extending plates **90, 91,** each having a side plate **92, 93** respectively extending downwardly from its lower edge. Holes **94** to **96** are formed in plates **89** to **91** respectively. The space below the hopper accommodates the pipe being laid, and the pipe can be surrounded by granular material fed into the hopper and falling through holes **94** to **96.**

It is desirable to prevent as much of the granular material entering into spaces between the piles and other movable elements of the machine. To assist this each of the walings **7** and **8** has seven plates **97** welded thereto, each plate having a shape corresponding to but slightly smaller than that of the internal shape of the piles **30** and fitting closely within a respective one of the piles. The guide elements **29** on walings **7** and **8,** other than the uppermost and lowermost guide elements, each have a plate **98** welded thereto and fitting closely within the space between adjacent piles **30** and cover plates **31.** The plates **97** and **98** substantially prevent granular material from passing forwardly of walings **7** and **8** within the piles.

Further restriction of granular material is effected by two side cheeks, **99** and **100,** one provided at each side of the machine. The side cheeks are identical except for being of opposite hand and only one will be described in detail. Thus, side cheek **99** is bolted or otherwise secured to a member **101** welded to and depending from member **71,** and also having side plate **92** welded thereto. The side cheek has a first section in the form of a plate **102** extending forwardly from member **101,** with the rear part **102***a* of the upper edge being downwardly inclined. Welded to plate **102** in a position forward of waling **7** by a distance substantially equal to the stroke of the ram **44** is a transverse section **103** and diagonal bracing strut **104.** There is a further transverse section **105** at the front end of plate **102** and an offset plate **106** extends forwardly from section **105.** Forwardly of section **103** the side cheek has a top cover plate **107,** joined to the plate **102** by a downwardly and inwardly inclined plate **108.** At its forward end, plate **102** is joined to offset plate **106** by a further plate **109** to form a tapering front end, and the cover plate **107** and inclined plate **108** are continued to complete the tapered front end. Welded to transverse section **105** is a plate **110** which fits inside the lowermost pile **30** and is shaped so as to be a close fit within this pile.

The sequence of operation of the machine will be apparent from the sequence diagrams shown in FIGS. **9** to **13.** The rest position is shown in FIG. **9,** from which it will be seen that the two frameworks lie one immediately in front of the other and the piles **30** project to a greater extent behind the walings **7, 8** than they do in front of walings **1, 2.** In this position the locking systems **55, 56** are in the condition shown in FIGS. **7** and **8,** with the locking members **62** lying in front of the bars **63,** and with the runner **66** lying immediately behind the roller **65.**

To advance the machine the rams **35, 36** connected to the uppermost ones of the piles **30** are extended, so driving the uppermost piles forward. During this movement the remainder of rams **35, 36** are held in their retracted condition by valves preventing any fluid movement in these rams and so creating an hydraulic lock. During this movement of the uppermost piles the runners **66** act on the rollers **65** to move the element **57** downwardly and move the locking members **62** to lie beneath the level of the bars **63** as shown in FIGS. **5** and **6.** After extension of the uppermost piles the remaining piles **30** are advanced by extending the appropriate ones of rams **35** and **36.** The rams are preferably controlled so that one ram at a time at each side of the machine are advanced simultaneously, all other rams being hydraulically locked in their retracted or extended states as appropriate. As the locking members **52** have been lowered these do not hinder advance of the piles. Earth is excavated from between the advanced piles to extend the trench, and can be deposited as backfill behind the shoring machine. During advance of the piles the rams **27** in struts **16** to **23** are all extended, to brace the piles against the walls of the trench, so firmly supporting the walls and also allowing the reaction forces of rams **35, 36** to be borne by the walls of the trench. FIG. **10** shows the machine with the two uppermost piles advanced.

After all the piles **30** have been advanced (FIG. **11**) the rams **27** in struts **16** to **19** of the forward framework are retracted. The piles continue to be held against the trench walls by the struts **20** to **23** of the rearward framework, and the spacing between the guide elements **29** and the piles **30** allows a slight inward movement of the walings **1** to **4** relative to the piles as the rams in struts **16** to **19** are retracted. The rams **44, 45** are then extended to advance the forward framework to the position shown in FIG. **12,** the reaction forces of rams **44, 45** being borne through walings **7** and **8,** hydraulically locked rams **35, 36** and piles **30** by the walls of the trench. As the forward framework reaches its forward limit the rollers **65** move on to the tapered front sections of the runners **66** and the springs **61** then lift the elements **57** so moving the locking members **62** to lie immediately in front of the bars **63.**

In this position the rams **27** in struts **16** to **19** of the forward framework are extended and the rams **27** in struts **20** to **23** of the rearward framework are then retracted, so that the piles are held braced against the trench walls by the forward framework only. The rams **44, 45** are then retracted. The locking systems **55, 56** prevent rearward movement of the forward framework relative to the piles, so that this retraction causes the rearward framework to be pulled forwardly to a position immediately behind the forward framework, as shown in FIG. **13.** During this forward movement of the rearward framework the hydraulic locks on rams **35, 36** are released, so allowing fluid to flow freely externally of the cylinder from one side of the piston to the other so that the rams may retract. Any surplus fluid is allowed to drain to tank.

As the rearward framework moves forwardly the tapered front ends of the side cheeks clear rubble from adjacent the inner faces of the lower piles. Granular material runs from the holes **94** to **96** in the hopper **68** and flows around the laid pipe to fill any cavities. The plates **97** and **98** prevent this material from passing to the space within the piles. Once the rearward framework has reached the position shown in FIG. **13,** and the hydraulic locking of rams **35, 36** has been effected

once again, the machine is ready for a further cycle to be commenced.

Obviously the machine can be constructed in ways different from that illustrated. The particular shapes and or number of the piles and guides, and the types of rams and their mounting points may be varied. The form of the hopper can differ, and the locking system between the forward framework and the piles may take other forms than that shown. Either one of the frameworks may comprise only two transversely aligned walings, instead of four. Thus, the front framework may comprise only walings such as **1** and **2** or **3** and **4**, or the rear framework may comprise only walings **5** and **6** or **7** and **8**, with rams equivalent to rams **44** and **45** being appropriately mounted to act between the two frameworks. Furthermore, as mentioned in the introduction the machine may comprise only one framework, for example a framework comprising walings **5** to **8**, with means separate from the framework for locking the piles in their advanced positions.

To enable the machine to work at deeper levels, particularly when doing trench work in roads, a removable top section may be provided. This comprises a first frame having feet for insertion into the box sections of walings **1** and **3** so that the frame lies longitudinally of the machine, and a second similar frame having feet for insertion into the box sections of walings **2** and **4** and so that again the frame lies longitudinally of the machine. Each frame has pile guides facing outwardly of the machine. The top section also includes two pile assemblies, one for each side of the machine, these assemblies cooperating with the pile guides. Each pile assembly is removably secured to the uppermost pile **30** on the respective side of the machine, so that as the uppermost pile is moved the respective pile assembly moves with it, and is guided by the pile guides on the frames. The frames and pile assemblies obviously extend the height of the machine, and they may be set so that the outer surfaces of the pile assemblies are spaced slightly further apart than the outer surfaces of the main piles **30**. When the height of the machine is extended in this way it may also be desirable to attach a further top section to the hopper **68**, and this may simply be achieved by providing a top section having a lower part which will fit closely within the top opening into the hopper.

By use of these detachable parts the versatility of the machine can be increased. In particular the machine can be used in roads with the main body of the machine shoring a trench below the level of existing pipes and cables providing services below the road and the detachable top parts extending the trench up to road level. When pipes or cables are encountered as the machine advances the top parts can be detached and the main body of the machine advanced below the pipes and cables.

I claim:

1. A trench shoring machine comprising a first framework; a series of longitudinally extending vertically spaced piles arranged along each side of said first framework; guide means guiding said piles for substantially horizontal sliding movement longitudinally of said first framework; first drive means for longitudinally advancing said piles with said first framework held stationary; and holding means for positively holding said piles in their advanced positions and advancing said first framework relative to said piles.

2. A trench shoring machine as claimed in claim **1** wherein said first framework includes first and second forward walings and first and second rearward walings, all said walings being upright and, when seen in plan, being arranged at the corners of a rectangle, and longitudinal tie means between said first forward and first rearward walings and between said second forward and second rearward walings; and said guide means are secured to said walings.

3. A trench shoring machine as claimed in claim **1** wherein said holding means comprises a second framework, said first framework and said second framework being arranged one in front of the other, said guide means being provided on each of said first framework and said second framework; second drive means for driving each of said first framework and said second framework forwardly relative to each other; and means for positively locking one of said first framework and said second framework against movement while the other one of said first framework and said second framework is driven forwardly.

4. A trench shoring machine as claimed in claim **3** wherein said second framework includes first and second forward walings and first and second rearward walings, all said walings being upright and, when seen in plan, being arranged at the corners of a rectangle, and longitudinal tie means between said first forward and first rearward walings and between said second forward and second rearward walings; and said guide means are secured to said walings.

5. A trench shoring machine as claimed in claim **3** wherein said second drive means comprise rams acting between said first framework and said second framework.

6. A trench shoring machine as claimed in claim **1** wherein said first drive means for longitudinally advancing said piles comprise ram means acting between said first framework and said piles.

7. A trench shoring machine as claimed in claim **6** wherein said ram means comprises an individual ram for each of said piles.

8. A trench shoring machine as claimed in claim **1** wherein said first drive means for longitudinally advancing said piles is such that each of said piles may be advanced independently of the others.

9. A trench shoring machine as claimed in claim **2** wherein at least some of said walings are provided with levelling feet operable by rams housed in the respective said same of said walings.

10. A trench shoring machine as claimed in claim **1** wherein a hopper is secured to said first framework at the rear of said machine.

11. A trench shoring machine comprising a first framework; a second framework arranged in front of said first framework; each of said first framework and said second framework including first and second forward walings and first and second rearward walings, all said walings being upright and when seen in plan, being arranged at the corners of a rectangle, and longitudinal tie means between said first forward and first rearward walings and between said second forward and second rearward walings, said longitudinal tie means of said first framework passing slidably through respective ones of said rearward walings of said second framework and said longitudinal tie means of said second framework passing slidably through respective ones of said forward walings of said first framework; a series of lon-

gitudinally extending, vertically spaced piles arranged along each side of said first framework and said second framework; guide means on said walings guiding said piles for substantially horizontal sliding movement longitudinally of said first framework and said second framework; first drive means for longitudinally advancing said piles with said first framework held stationary; second drive means for driving each of said first framework and said second framework forwardly relative to each other; and means for locking one of said first framework and said second framework against movement while the other one of said first framework and said second framework is driven forwardly.

12. A trench shoring machine as claimed in claim **11** wherein said longitudinal tie means for each framework comprises a series of longitudinal tie rods extending between respective ones of said forward and rearward walings and passing through holes formed on the neutral axis of a respective one of said walings of the other one of said first framework and said second framework.

13. A trench shoring machine as claimed in claim **11** wherein each of said walings carries a series of vertically spaced guide elements, with guide elements on all of said walings at each side of said machine being arranged in horizontally aligned rows, and each of said piles is mounted on and engages at least one of said rows of said guide elements.

14. A trench shoring machine as claimed in claim **13** wherein vertically adjacent ones of said piles are spaced apart by one of said rows of said guide elements, and cover plates are secured to said piles to cover the spaces between them.

15. A trench shoring machine as claimed in claim **11** wherein said rearward walings of said first framework carry plates which fit closely into spaces within said piles and into spaces between said piles.

16. A trench shoring machine as claimed in claim **11** wherein said rearward walings of said first framework carry side cheeks extending forwardly adjacent to the lowermost one of said piles.

17. A trench shoring machine as claimed in claim **16** wherein each said side cheek has a front end and an upper surface which are inclined inwardly towards the longitudinal center line of said machine.

18. A trench shoring machine as claimed in claim **16** wherein each said side cheek carries, close to its front end a series of plates which fit closely into the spaces within said piles.

19. A trench shoring machine comprising a first framework; a second framework arranged in front of said first framework; a series of longitudinally extending vertically spaced piles arranged along each side of said first framework and said second framework; guide means on each of said first framework and said second framework guiding said piles for substantially horizontal sliding movement longitudinally of said first framework and said second framework; first drive means for longitudinally advancing said piles with said first framework and said second framework held stationary; second drive means for driving each of said first framework and said second framework forwardly relative to the other; and means for positively locking one of said first framework and said second framework independently of the other to at least some of the piles while the other one of said first framework and said second framework is driven forwardly.

20. A trench shoring machine as claimed in claim **19** wherein said second framework includes at its forward end two upright, laterally spaced walings, one at each side of the machine; and said locking means for said second framework comprises cooperating locking means between each of said walings and at least one of said piles on the respective side of said machine, said cooperating locking means holding each of said walings against rearward movement when said at least one pile is stationary and in its most rearward position relative to each of said walings.

21. A trench shoring machine as claimed in claim **20** wherein each cooperating locking means is releasable by a forward movement of said at least one pile relative to a waling.

22. A trench shoring machine as claimed in claim **20** wherein each locking means comprises an element extending parallel and adjacent to one of said walings and movable vertically relative to said one of said walings, at least one locking member projecting from said element to lie in front of part of a respective one of said piles, means biasing said element to an upper position wherein said locking member is level with said part of said one of said piles and engageable therewith, and means for moving said element downwardly against said biasing means to move said locking member to a level below, and not engageable with, said part of said one of said piles.

23. A trench shoring machine as claimed in claim **22** wherein said means for moving said element downwardly comprise a roller journalled on said element, and a cam runner secured to one of said piles and slidable on said roller as said one of said piles is advanced, to move said roller and thus said element downwardly.

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