Sept. 28, 1971 M. P. QUITADAMO, JR 3,608,319

SELF PROPELLING, TRENCH SHORING DEVICE

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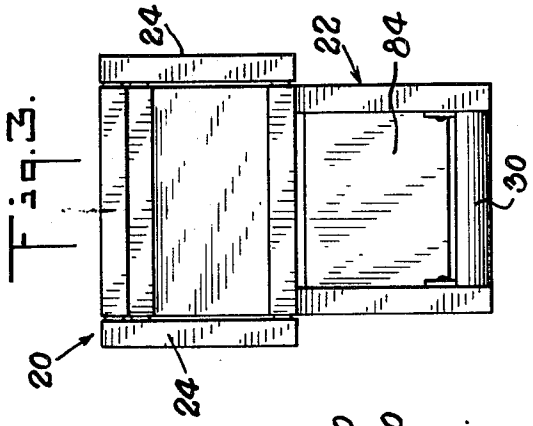


Fig. 3.

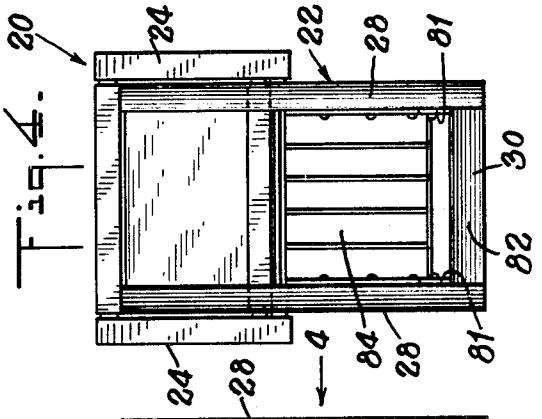


Fig. 4.

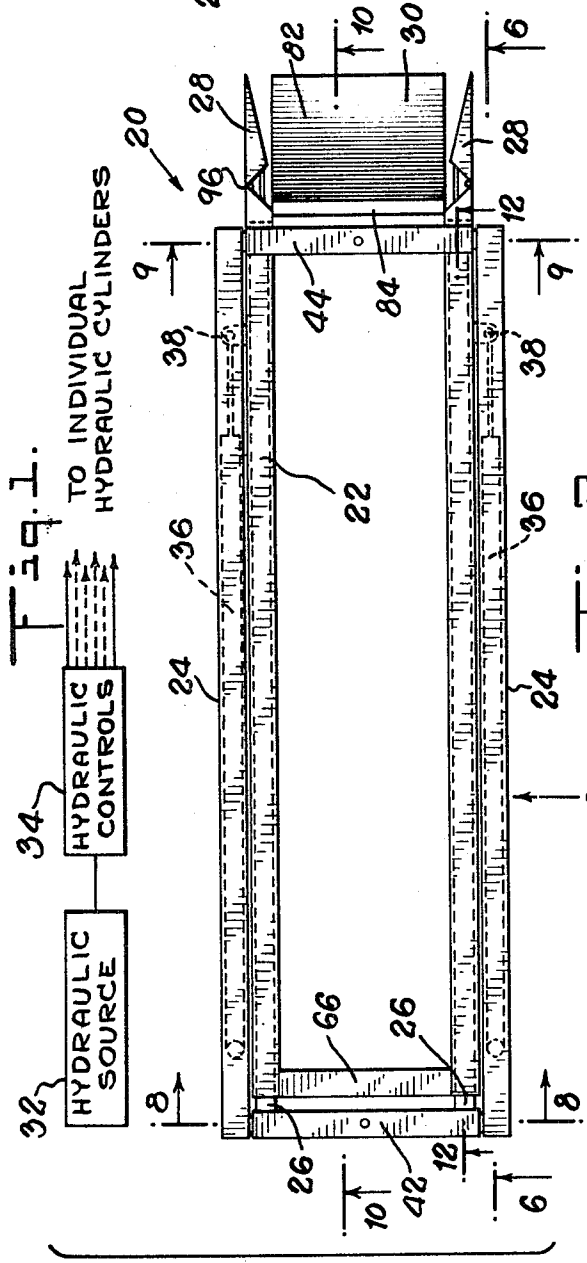


Fig. 1.

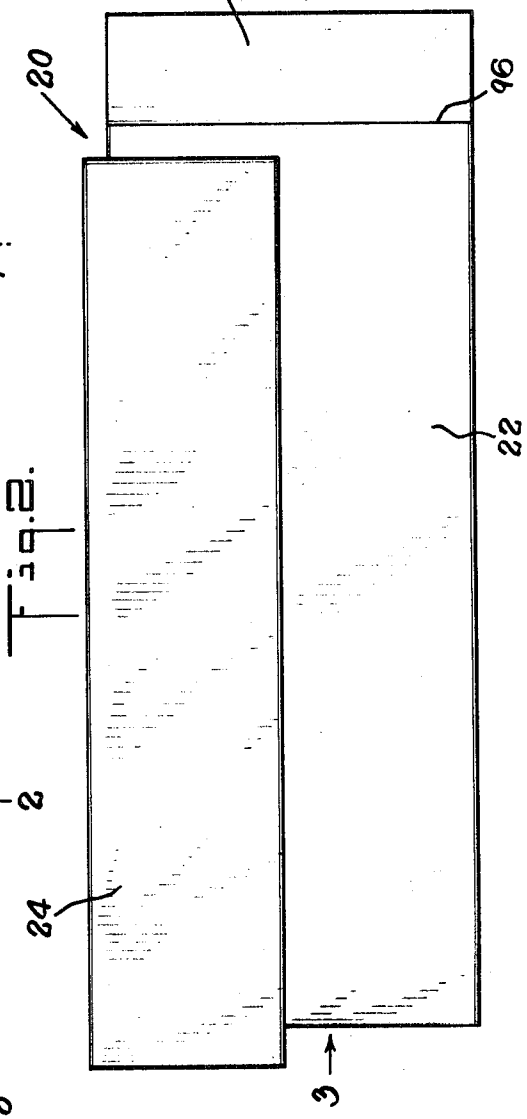


Fig. 2.

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SELF PROPELLING, TRENCH SHORING DEVICE

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Fig. 5.

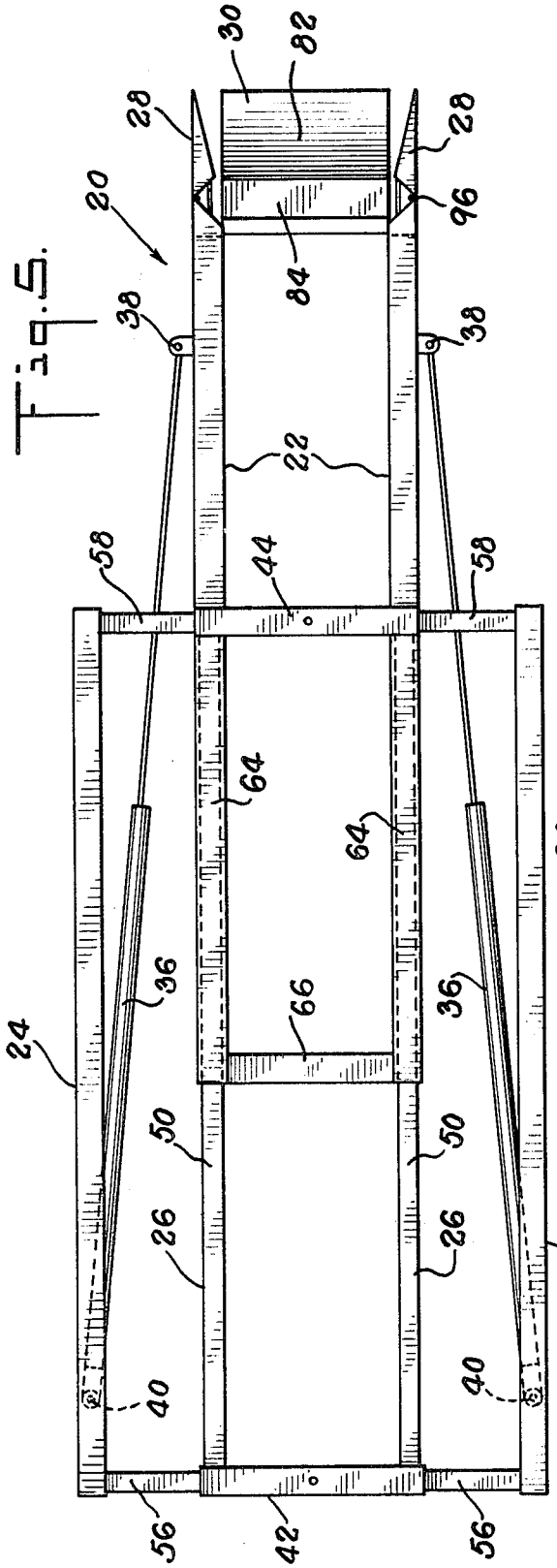
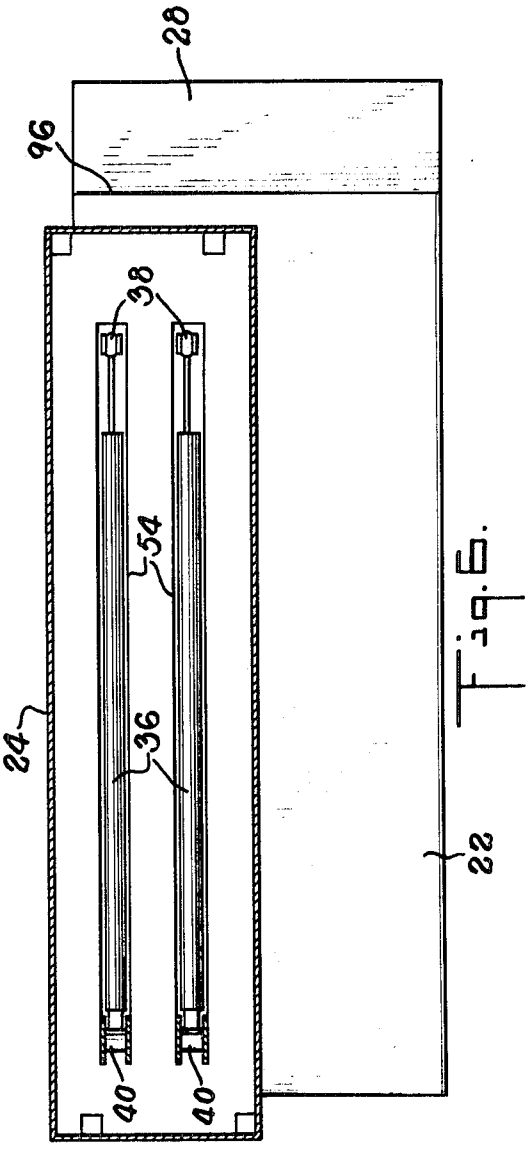


Fig. 6.



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SELF PROPELLING, TRENCH SHORING DEVICE

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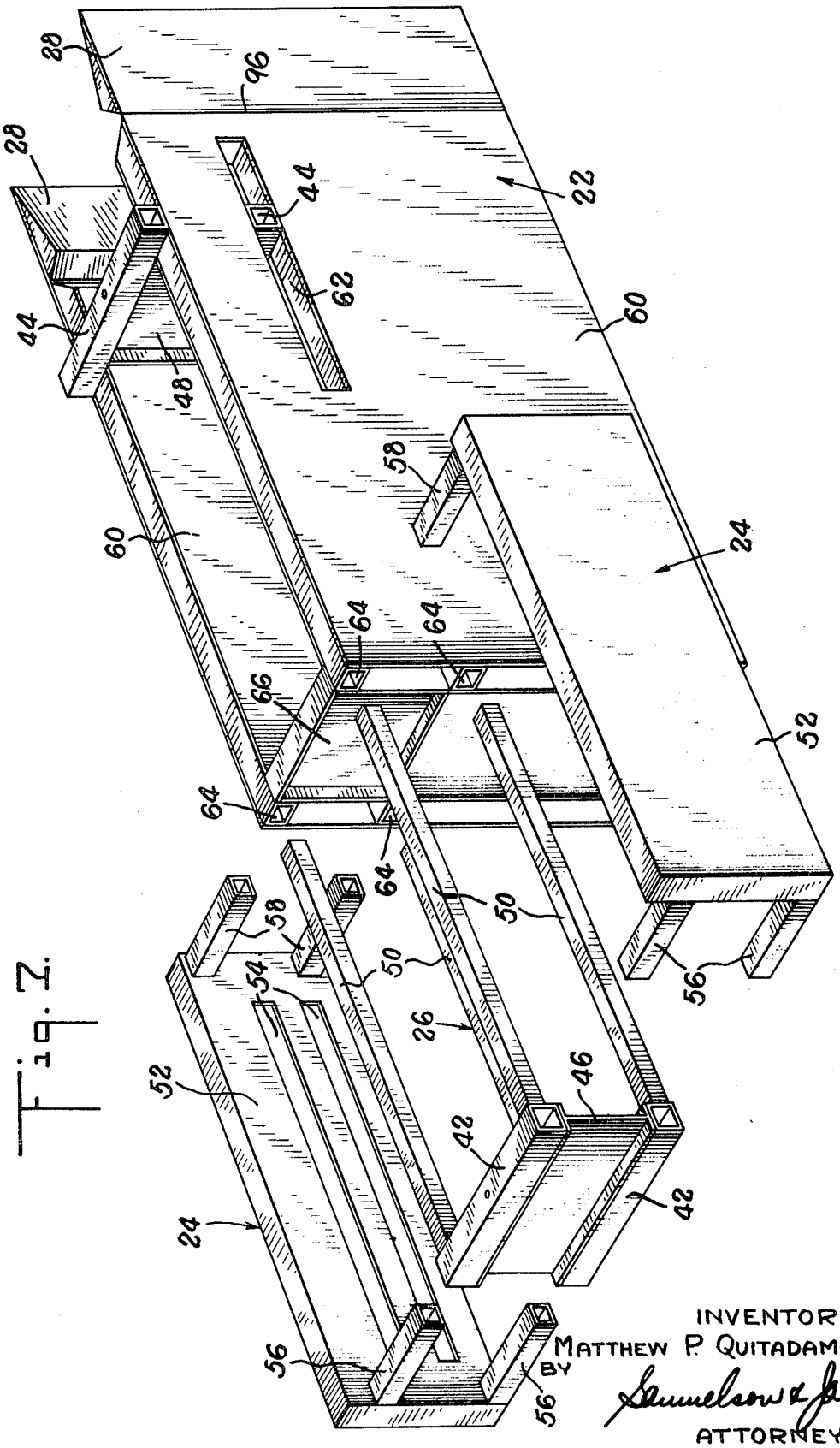


Fig. 7.

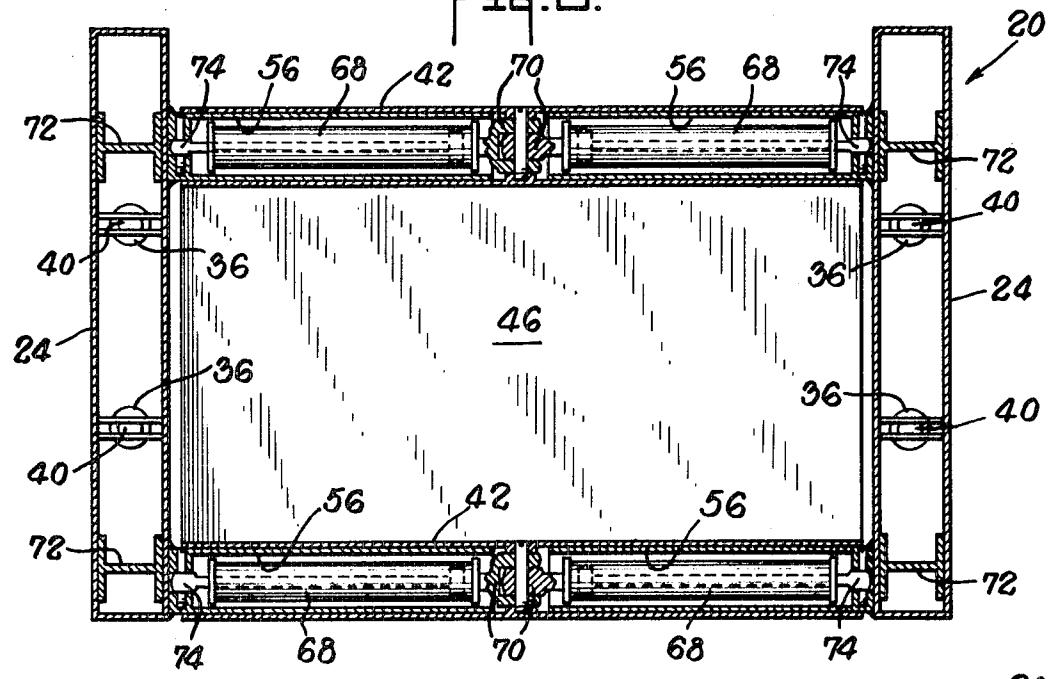
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SELF PROPELLING, TRENCH SHORING DEVICE

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Fig. 8.



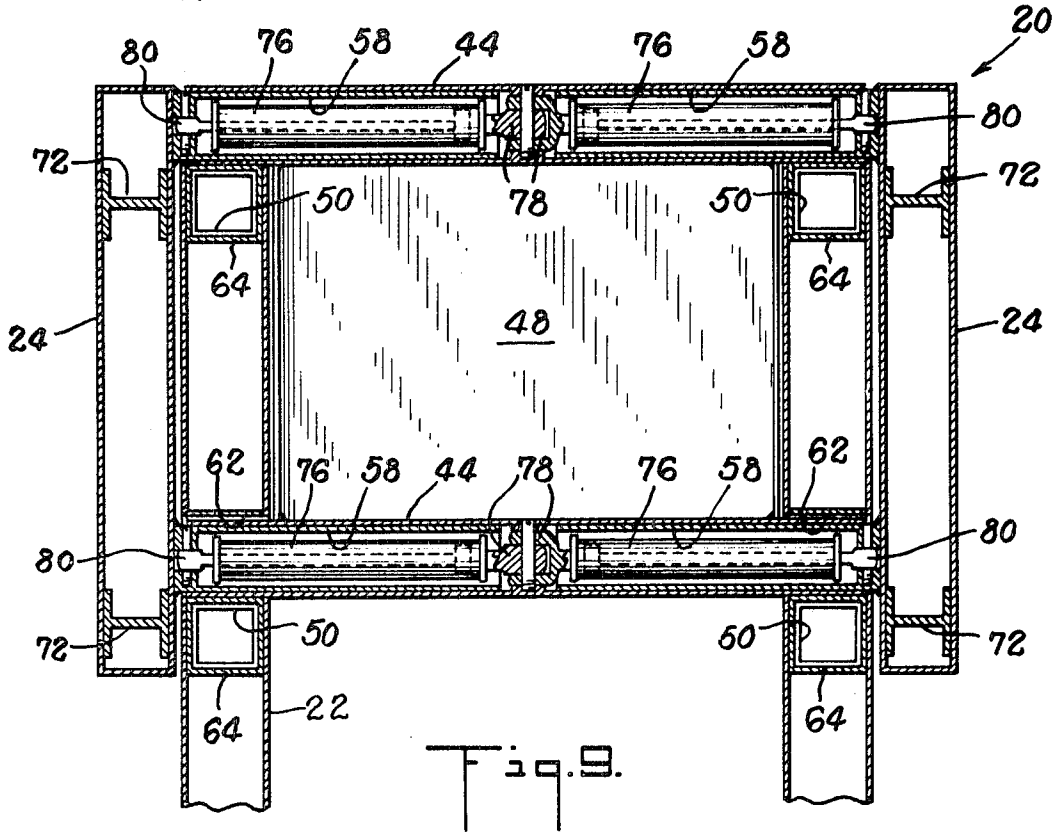


Fig. 9.

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SELF PROPELLING, TRENCH SHORING DEVICE

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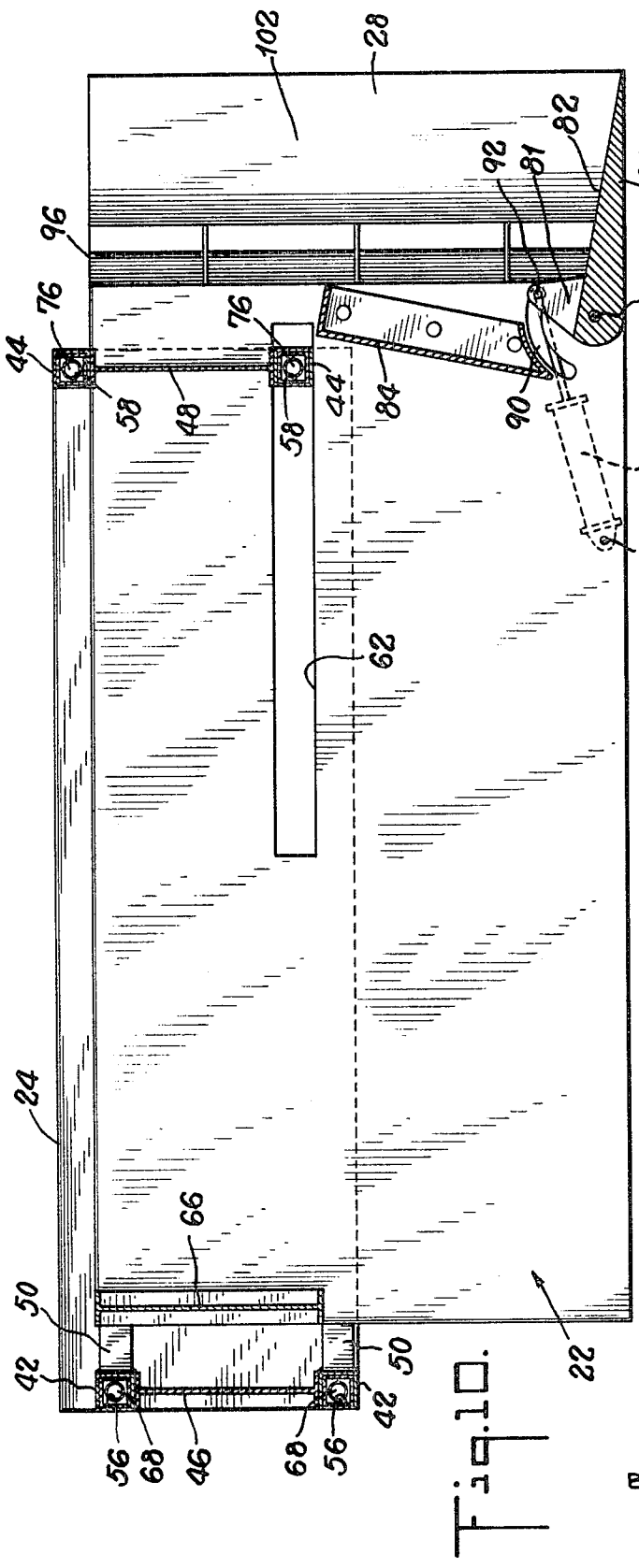


Fig. 10.

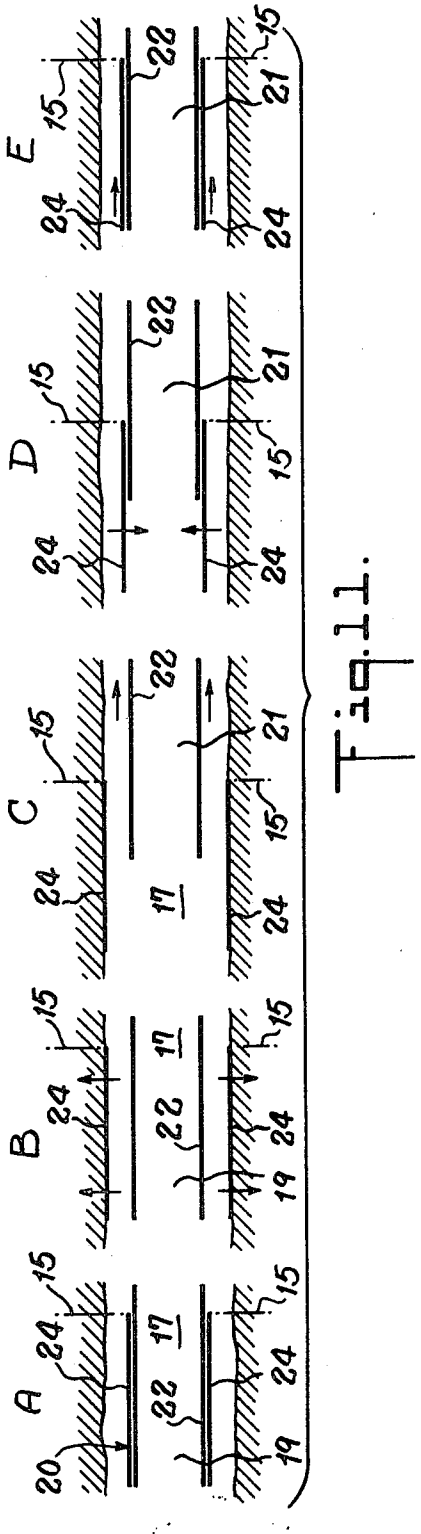


Fig. 11.

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SELF PROPELLING, TRENCH SHORING DEVICE

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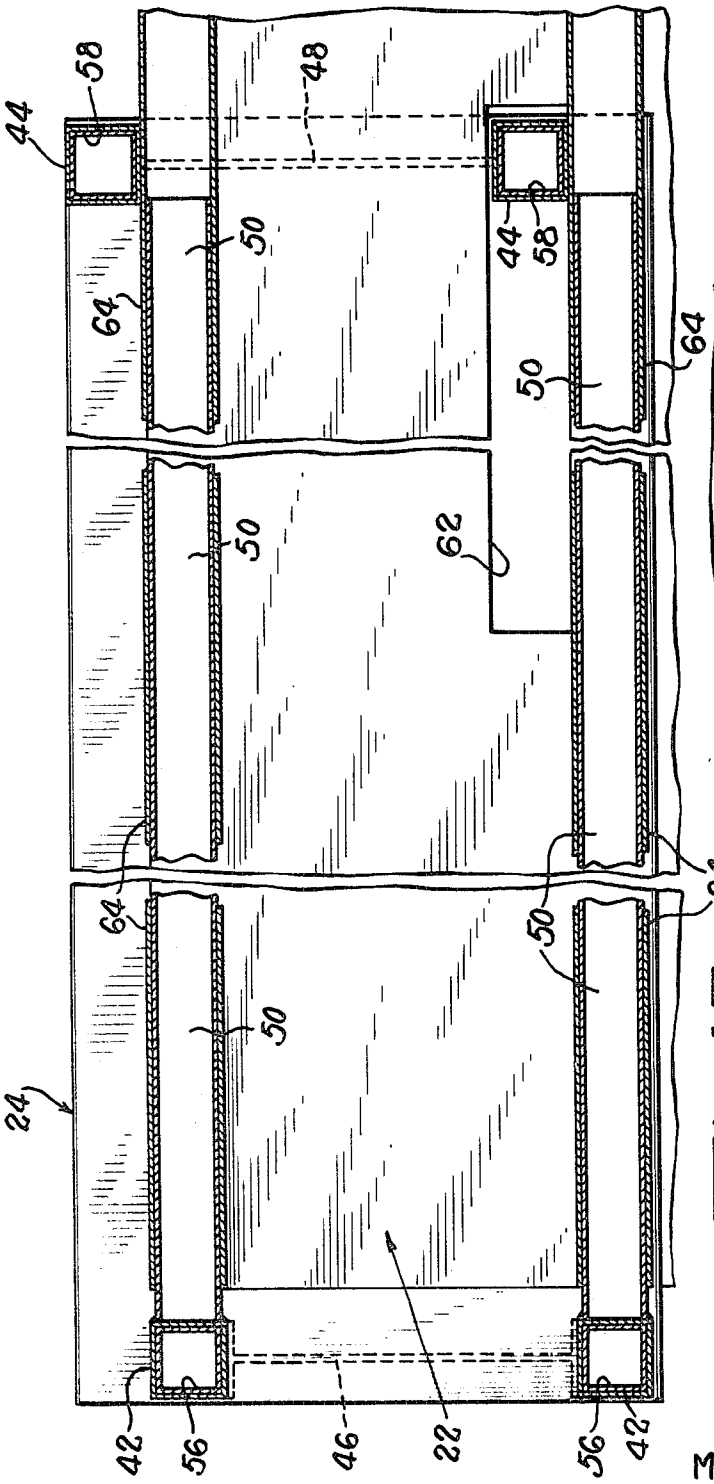


Fig. 12.

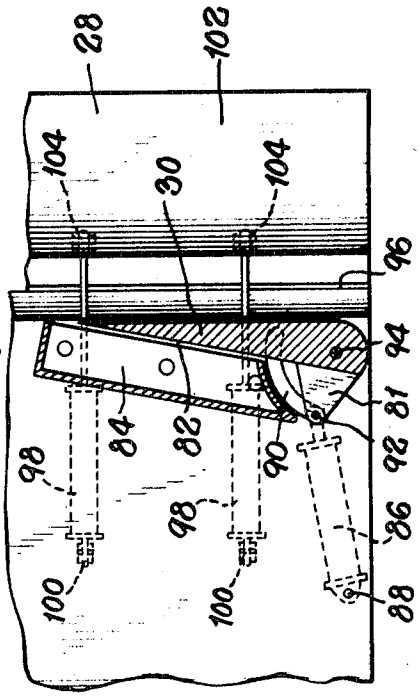


Fig. 13.

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United States Patent Office 3,608,319 Patented Sept. 28, 1971

3,608,319

SELF-PROPELLING, TRENCH SHORING DEVICE

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Int. Cl. E21d 5/00
U.S. Cl. 61—41A 6 Claims

ABSTRACT OF THE DISCLOSURE

A self-propelling, trench shoring device for shoring the sides of an excavated trench while laying pipe therein and which moves forward to the next excavated section as the previous section is completed having a frame member, a pair of side panels movable toward and away from the frame member and means for moving the side panels between a first position when they are close to the frame member and a second position when they are spaced from the frame member and pressure is exerted on the sides of the excavated trench to support the same, a longitudinal member movable between a first position when its longitudinal dimension is substantially coincident with the frame and a second position when it is rearward of the frame, the longitudinal member being moved to the second position while the side panels are in the second position to move the frame to the next excavated section; the side panels being moved to the first position and the longitudinal member being moved forward so that it is in the first position preparatory to moving the side panels to the second position in the next excavated section, the frame being provided at its front with a pair of vertical steering vanes and a lateral steering vane for aiding in the positioning of the device as it moves from section to section.

The invention relates to self propelling, trench shoring devices which are used to support the sides of a section of an excavated trench while pipe is being laid therein and which may then move forward to the adjacent newly excavated section of the trench to continue the process until the pipe laying in the trench is completed.

There have been prior art trench shoring devices which are partially self propelled and which have the same general objects as those of the instant invention. However, these prior art units were not inherently easy to use and were rather elaborate in construction.

Broadly, the device of the invention comprises a frame, a pair of side panels movable with respect to the frame between a first position in which the side panels are close to the frame and a second position in which the side panels are moved away from the frame to support the walls of the excavated trench, a longitudinal member movable with respect to the frame between a first position in which the longitudinal member is close to the frame and a second position in which it is extended rearward of the frame, the front of the frame being provided with a pair of oppositely spaced, movable vertical vanes and a movable, lateral vane.

Accordingly, it is an important object of the invention to provide such a self propelling, trench shoring device which is operated by first moving the side panels out against the walls of the excavated trench section to support the sides of the excavated trench under hydraulic pressure, then moving the frame forward against the force due to the pressure of the side panels against the walls, then retracting the side panels toward the frame and moving the longitudinal member and side panels forward toward the frame member due to the greater mass of the frame as compared to that of the longitudinal member and side panels combined.

It is a further object of the invention to provide such a device wherein there are a pair of oppositely spaced vertical vanes and a lateral vane affixed to the front of the frame to assist in controlling the direction of forward motion of the unit.

These and other objects, advantages, features and uses will be apparent as this description proceeds when taken in conjunction with the accompanying figures wherein:

FIG. 1 is a plan view of a preferred embodiment of the shoring device of the invention in the retracted position;

FIG. 2 is a side elevational view taken in the direction of arrow 2 of FIG. 1;

FIG. 3 is an end elevational view taken in the direction of arrow 3 of FIG. 2;

FIG. 4 is an end elevational view taken in the direction of arrow 4 of FIG. 2;

FIG. 5 is a plan view of the device of FIG. 1 with the longitudinal member moved rearward with respect to the frame and the side panels moved outward with respect to the frame;

FIG. 6 is a sectional view taken along the lines 6—6 of FIG. 1, viewed in the direction of the arrows and showing a pair of the pistons used to control the position of the longitudinal member with respect to the frame;

FIG. 7 is an exploded, perspective view of the device of FIG. 1;

FIG. 8 is an enlarged sectional view taken on lines 8—8 of FIG. 1, viewed in the direction of the arrows;

FIG. 9 is an enlarged sectional view taken on lines 9—9 of FIG. 1, viewed in the direction of the arrows;

FIG. 10 is an enlarged sectional view taken on lines 10—10 of FIG. 1, viewed in the direction of the arrows;

FIG. 11 is a diagrammatic plan view showing the various positions of the elements of the trench shoring device of the invention during the operation of laying pipe in an excavated trench;

FIG. 12 is an enlarged sectional view taken on the lines 12—12 of FIG. 1, viewed in the direction of the arrows; and

FIG. 13 is an enlarged, fragmentary view of the front end of the device of FIG. 1 showing the lateral vane in its up or closed position.

In the drawings, wherein, for the purpose of illustration, there is shown a preferred embodiment of the invention, the numeral 20 designates a self propelling, trench shoring device of the invention. Device 20 is seen to comprise a frame member 22, a pair of side panels 24 and a movable longitudinal member 26. A pair of vertical vanes 28 are mounted at the front of frame 22, one at each vertical edge and are pivotable outwardly and inwardly with respect to the sides of the frame 22. A lateral vane 30 is mounted to the lower lateral edge of the frame 22 and is pivotable between positions in which it extends forward of the frame and a position in which it is substantially vertical and closes a portion of the front of the frame.

Preferably, the movements of the various elements of device 20 with respect to each other are controlled by hydraulic cylinders which are fed from a hydraulic source 32. Each hydraulic cylinder is controlled from hydraulic controls 34. Hydraulic source 32 and hydraulic controls 34 are not a part of the invention and are, therefore, shown schematically. Any source and set of controls which are standard in the art may be used in carrying out the teachings of the invention.

In FIG. 5, there is shown a plan view of the trench shoring device of the invention with the side panels 24 moved out (away from frame 22) and longitudinal member 26 moved rearward of frame 22 (or, put another way, frame 22 has moved forward of longitudinal member 26). The movement of frame 22 and longitudinal member 26 with respect to each other is accomplished by means of

hydraulic cylinder-pistons **36**. There are two such cylinder-pistons **36** on each side of the device. One end of the cylinder-piston **36** is affixed to the frame as shown at **38** and the other end is affixed to the side panel **24** as shown at **40**.

The exploded, perspective view of FIG. 7 shows the relationship of the elements of shoring device **20** to each other (the motion inducing means are now shown). Longitudinal member **26** comprises lateral tubes **42** joined by plate **46** and longitudinal tubes **50**. Each side panel **24** comprises plate **52**, slotted as shown at **54**, rear tubes **56** and forward tubes **58**. The rear tubes **56** slide within tubes **42** and the forward tubes **58** slide within tubes **44**. Tubes **44** are joined by plate **48** and they remain in position because the tubes **44** are in engagement with tubes **58**.

Plates **60** of frame **22** are slotted as shown at **62** to permit movement of the frame and longitudinal member **26** with respect to each other. Tubes **50** move within tubes **64** to further permit relative movement of the frame and longitudinal member. Rear lateral brace **66** serves to prevent torsional distortion of the assembly.

FIG. 8 is a sectional view showing the rear of device **20** with the side panels **24** in their first position (close to frame **22**). It is seen that tubes **56** are nested within tubes **42** and there is a hydraulic cylinder-piston **68** mounted within each of the tubes **56**. One end of each such hydraulic cylinder-piston **68** is affixed to its associated tube **42** as shown at **70** and the other end is affixed to side panel **24** as shown at **74**, preferably close to a reinforcing H-beam **72**.

FIG. 9 is a sectional view of the front of device **20** with the side panels **24** in their first position. Tubes **58** are nested within tubes **44** and a hydraulic cylinder-piston **76** is mounted inside each tube **58** and one end thereof is affixed to tube **58** as shown at **78** and the other end thereof is affixed to a side panel **24** as shown at **80**.

Thus, from FIGS. 8 and 9, it can be seen that as fluid is introduced into each of the hydraulic cylinders, its piston is moved out and the side panels **24** are moved outwardly with respect to frame **22**. Conversely, when the fluid is vented, the spring bias of the piston causes the side panels **24** to be drawn toward frame **22**. It is within the contemplation of the invention to use other motion inducing means so long as the side panels **24** may be moved toward and away from frame **22** on command.

FIGS. 10 and 13 show the two positions of lateral vane **30** and the motion-inducing controls for it and vertical vanes **28**. Vane **30** comprises plate **82** with upstanding ears **81** and hydraulic cylinder-pistons **86** connected to side panels **60** at **88** and the ears **81** at **92**. The movement of the pistons moves the linkage points **92** in curved or radial slots **90** between the positions of FIGS. 10 and 13. Plate **82** is adapted to secure the leading end of frame **22** to prevent distortion as does rear lateral brace **66**. Plate **82** pivots around shaft **94** so that when the pistons are extended, the plate **82** is in the position of FIG. 10 and when the pistons are retracted, the plate is in the position shown in FIG. 13.

Each vane **28** is pivoted inwardly and outwardly with respect to frame **22** and is hinged to forward vertical edge **96**. Preferably, hydraulic cylinder-pistons **98** are used to move each vane. One end of each cylinder-piston is affixed to side **60** of frame **22** as shown at **100** and the other end is affixed to plate **102** of vane **28** as shown at **104**.

FIG. 11 illustrates the operation of the trench shoring device of the invention. In FIG. 11A, the device **20** has been placed in an excavated section **19** of a trench **17**. The side panels **24** are in their first position (close to frame **22** and longitudinal member **26**). The reference marks **15** indicate the extreme front of side panels **24**. Next (FIG. 11B), the side panels **24** are urged outward in the direction of the sides of the trench (as shown by the arrows) until they are in firm contact and pressure is exerted to support the sides of the trench.

Now, the pipe is laid inside the frame, below the longitudinal member, set to grade and the section is back filled to prevent collapse of the sides of the trench. Simultaneously, with all or a part of the foregoing procedure, section **21**, which is forward of section **19**, has been excavated. The hydraulic cylinder-pistons **36** (FIG. 5) are actuated so as to push frame **22** forward (in the direction of the arrows of FIG. 11C) with respect to side panels **24** and longitudinal member **26** to the position shown in FIG. 11C. The frame **22** moves forward because the force due to the pressure of side panels **24** on the sides of the excavation is greater than the force due to the mass of frame **22**. While moving forward, the vanes **28** and **30** are positioned so that they serve to steer the frame to the desired position.

Now (FIG. 11D), the side panels **24** are moved in the direction of the arrows so that the side panels **24** are close to frame **22**. Next, hydraulic cylinder-pistons **36** are deactuated so that the pistons are drawn into the cylinders and the side panels **24** and longitudinal member **26** move forward in the direction of the arrows of FIG. 11E and the device assumes the position of FIG. 11E. This forward movement is assured because the mass of frame **22** is much greater than the combined mass of longitudinal member **26** and side panels **24**. It is seen that FIG. 11E is the same as FIG. 11A and that the procedure is ready to be repeated.

While a particular embodiment of the invention has been shown and described, it is obvious to those skilled in the art that modifications and changes may be made without departing from the spirit of the invention and the scope of the subjoined claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A self propelled, trench shoring device for shoring the sides of an excavated trench while work is done in the trench and which moves forward to a newly excavated section of the trench when work in the previous section is completed comprising:

a frame whose longitudinal dimension is greater than its lateral dimension;

a pair of side panels mounted to the frame with one panel on each side of the frame movable between a first position in which the side panels are close to the frame and a second position in which the side panels are spaced from the frame;

a longitudinal member having a mass combined with that of the side panels much smaller than the mass of the frame mounted to the frame, the frame and longitudinal member being movable with respect to each other between a first position in which the longitudinal dimension of the longitudinal member is substantially coincident with the longitudinal dimension of the frame and a second position in which the longitudinal member is rearward of the frame;

means for moving each of the side panels between its first position and its second position so that pressure is exerted against the sides of the trench in the second position and the side panels are out of contact with the sides of the trench in the first position;

means for moving the longitudinal member between its first position and its second position so that the frame moves forward to the newly excavated section when the side panels are in their second position and the longitudinal member and the frame are moved from their first position to their second position; and

upon moving the side panels to their first position, the longitudinal member may be moved to its first position thereby effectively moving the device to the newly excavated section.

2. The invention of claim **1** including:

at least one vertical vane mounted on one of the front

vertical edges of the frame and pivoted with respect thereto;

means for pivoting the vertical vane outwardly and inwardly with respect to the lateral dimension of the device.

3. The invention of claim 2 wherein there are two such vertical vanes, one on each front, vertical edge of the frame and two such pivoting means, one associated with each vertical vane.

4. The invention of claim 3 including:

a lateral vane mounted at the front, lower, lateral edge of the frame and pivotable with respect thereto between positions in which it extends forward of the frame and a position in which it is vertical and closes a portion of the front of the frame;

means for pivoting the lateral vane.

5. The invention of claim 2 including:

a lateral vane mounted at the front, lower, lateral edge of the frame and pivotable with respect thereto between positions in which it extends forward of the frame and a position in which it is vertical and closes a portion of the front of the frame;

means for pivoting the lateral vane.

6. The invention of claim 1 including:

a lateral vane mounted at the front, lower, lateral edge of the frame and pivotable with respect thereto between positions in which it extends forward of the frame and a position in which it is vertical and closes a portion of the front of the frame;

means for pivoting the lateral vane.

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