

[54] **ROD AND PIPE PUSHER AND PULLER**

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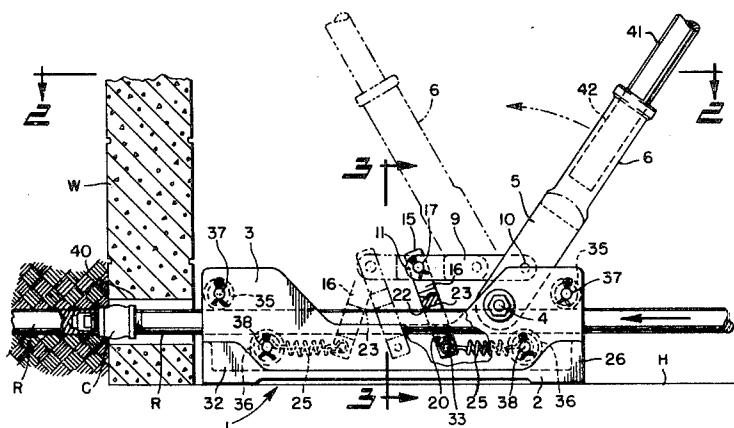
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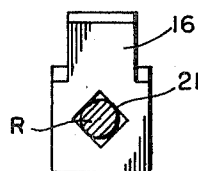
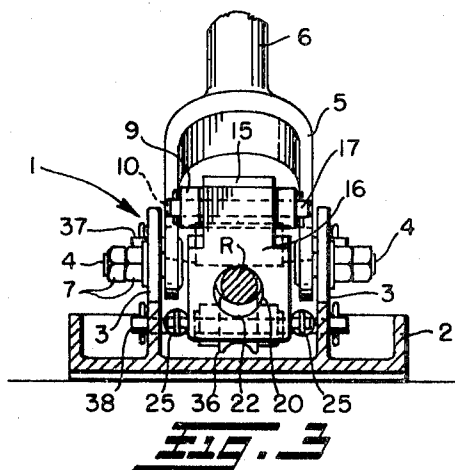
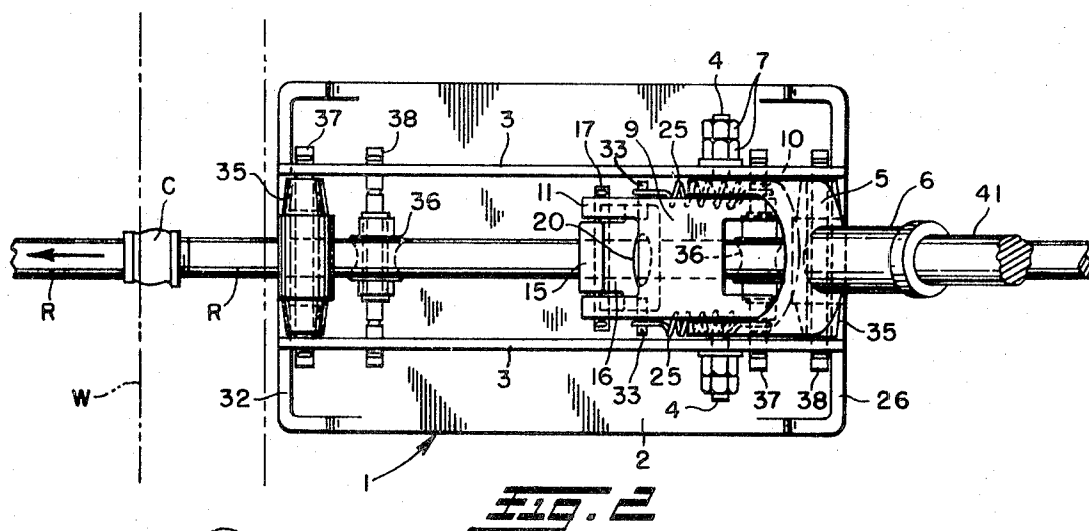
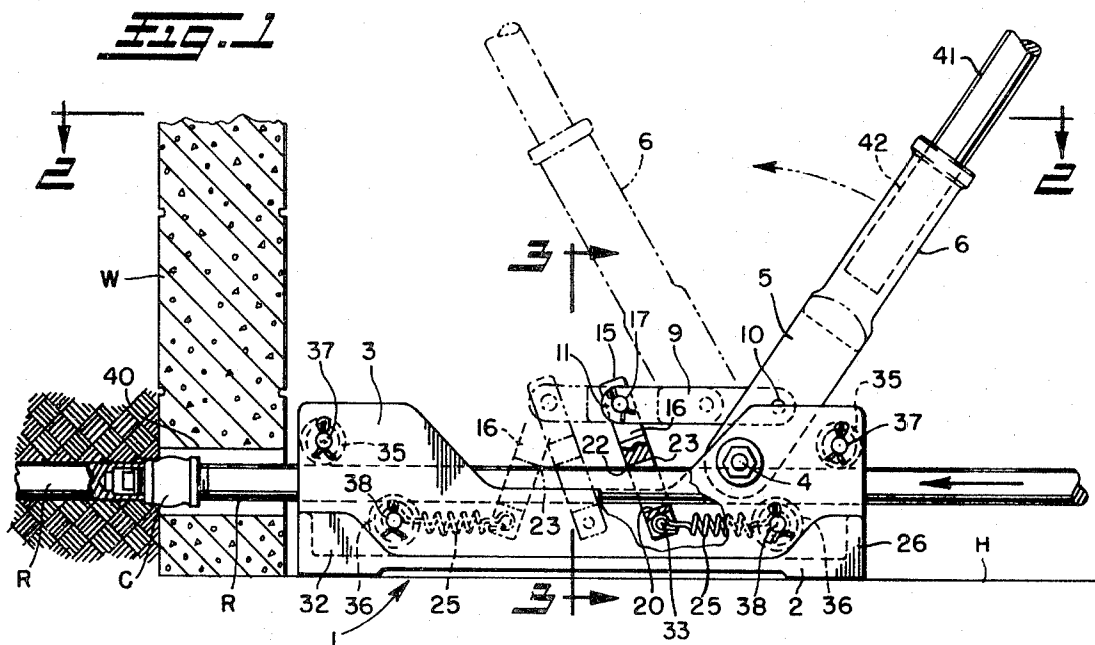
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[57] **ABSTRACT**

A device for pushing and pulling pipe or rod through the ground having a gripping plate connected to a lever arm mounted for reciprocating movement by swinging movement of the lever arm. An opening is provided in the gripping plate for insertion of the pipe or rod therethrough, and the gripping plate is maintained in tilted position by a spring which may be connected between the bottom of the plate and either end of the pusher and puller frame depending on the desired direction of tilt for pushing or pulling the pipe or rod in either direction.

8 Claims, 4 Drawing Figures





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ROD AND PIPE PUSHER AND PULLER

BACKGROUND OF THE INVENTION

The present invention relates generally as indicated to a rod or pipe pusher and puller, and more particularly to a device for progressively pushing and pulling rod or pipe through the ground from a single location so as to avoid the necessity of having to dig a substantially continuous trench or the like in the ground for laying the pipe.

In the laying of heavy gauge gas and water pipes and the like, pipe pushers have long been used for pushing pipe from the main in the street to the house or vice versa without having to dig a substantially continuous ditch between the street and house. It was only necessary to provide one hole of a length sufficient to accommodate both the pipe pusher and at least one section of pipe.

One known type of pusher has a grip collar which is freely pivotally connected to a movable link, with an opening through the collar for insertion of the pipe therethrough. During forward movement of the link, the collar is tilted at an angle so that the forward edge of the collar opening bites into the pipe and forces the pipe forward along with the collar. During reverse movement of the collar, engagement with the pipe is precluded by a lug on the link, whereby the collar is free to move along the pipe in the reverse direction.

Although such a pusher may operate satisfactorily in most instances, nevertheless there may be a tendency for the collar to slide relative to the pipe during the initial movement in the forward direction since the collar is not positively maintained in gripping engagement with the pipe. Another objection is that the pusher cannot be used to pull the pipe out of the ground without first turning the entire mechanism around due to the fact that its gripping action is only effective during movement in one direction and cannot be selective in gripping the pipe during movement in either direction.

SUMMARY OF THE INVENTION

With the pipe pusher and puller of the present invention, a pipe or rod may be either pushed through the ground or pulled out without repositioning the device. This is particularly advantageous where copper tubing or the like is to be used, since copper tubing cannot be directly pushed through the ground, and even steel pipe has a tendency to bend and become nicked if laid in this manner. Accordingly, it has been found that installation may be quickly and easily achieved by first pushing a rod through the ground with the pipe pusher and puller of the present invention, then attaching the copper tubing or pipe to the protruding forward end of the rod, and finally pulling the rod back through the ground, pulling the tubing or pipe with it.

It is accordingly a principal object of this invention to provide a device of the type described which may be used to push and pull pipe or rod through the ground without having to reposition the device.

Another object is to provide such a device with a gripping plate which may be maintained positively tilted in the desired direction of movement of a pipe or rod to provide a positive grip in that direction, and yet the gripping plate is free to slide relative to the pipe or rod in the reverse direction.

These and other objects of the present invention may be achieved by providing the pusher and puller with a pipe or rod-gripping plate which is adapted to be reciprocated back and forth through swinging movement of a lever arm. The gripping plate has an opening therethrough for the pipe, and the gripping plate is maintained in tilted position by a spring which may be used to tilt the plate in opposite directions for pushing or pulling the pipe in opposite directions, as desired.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view, partially broken away, of a preferred form of pipe or rod pusher and puller constructed in accordance with this invention, shown disposed on a flat surface below ground level;

FIG. 2 is a top plan view of the device of FIG. 1, as seen from the plane of the line 2—2 thereof;

FIG. 3 is a vertical transverse section through the device of FIG. 1, taken on the plane of the line 3—3; and

FIG. 4 is a front elevation view of a modified form of pipe or rod gripping plate for the device of FIGS. 1 through 3, shown tilted forward into engagement with a rod.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in detail to the drawing, a preferred form of pipe or rod pusher and puller 1 is shown in FIG. 1 disposed below ground level, as for example, in the basement of a building but of course any hole of required size and depth may be provided for the device wherever desired. The device 1 generally comprises a main frame 2 which may be an aluminum alloy casting having vertical sides 3 providing mounting surfaces for the pins 4, which extend through openings in the vertical sides 3 and pivotally support the yoke end 5 of a lever arm 6 of cast steel or the like on the frame. Jam nuts 7 may be threaded onto the outer ends of the pins 4 to secure the pins in place.

Projecting forwardly from the lever arm 6 from between the yoke 5 is a lever of link 9 which is pivotally connected to the yoke 5 by a steel-hardened pin 10. Both ends of the link 9 are desirably in the shape of a yoke and the forward end 11 receives the upper end 15 of a pipe or rod gripping plate 16. A pin 17 extending through aligned openings in the yoke end 11 and gripping plate 16 provide a pivotal connection therebetween.

The opposite faces of the gripping plate 16 are desirably flat, and there is a longitudinal opening 20 through the gripping plate 16 which is of a size somewhat larger than the pipe or rod sections R and pipe couplings C between pipe sections to permit passage through the opening 20, in a manner to be subsequently fully explained. The opening 20 may be made round for ease of manufacture, but it has been found that a diamond-shaped opening 21 such as shown in FIG. 4 is very effective in gripping the pipe. Regardless of the shape of the opening, both the front and rear edges 22 and 23 of the opening must be relatively sharp for proper gripping of the pipe, and the gripping plate should be of hardened tool steel or the like for long life.

The gripping plate 16 is maintained in a positively tilted position by one or more springs 25, two being shown, having one of their ends connected to opposite sides of the gripping plate 16 adjacent the bottom edge thereof. The other ends of the springs 25 are adapted to be connected to either end of the frame 2, depending on the desired direction of tilt of the gripping plate for pushing or pulling of the pipe. Thus, for example, with the springs 25 connected to the rear 26 of the frame 2 as shown in solid lines in FIG. 1, the gripping plate 16 is tilted forwardly so that the upper forward edge 22 of the opening 20 engages the pipe or rod R for advancing the pipe during forward swinging movement of the lever arm 6.

During reverse movement, the gripping plate 16 is free to slide relative to the pipe due to the force of the lever 10 acting on the upper end of the gripping plate 16 which tends to move the gripping plate 16 at right angles to the pipe, thus overcoming the force of the springs 25 tending to maintain the gripping plate 16 in a forwardly tilted position. However, as soon as the force urging the gripping plate 16 toward the rear is released, the gripping plate 16 is automatically fully tilted in the forward direction by the springs 25 for reestablishing the desired grip with the pipe for pushing the pipe forward during the next forward stroke of the lever arm, and so on.

In the event that it is desired to pull the pipe or rod R back out of the ground, this may readily be accomplished with the apparatus 1 of the present invention without having to change

its location. The operator need only disconnect the springs 25 from the rear of the frame and reconnect such springs to the forward end 32 thereof for tilting of the gripping plate 16 in the reverse or rearward direction, as shown in phantom lines in FIG. 1. The ends of the springs 25 connected to the gripping plate 16 are looped about the horizontal pins 33 on opposite sides of the gripping plate as clearly shown in FIGS. 1 and 2 and thus are free to pivot thereabout so that they need not be disconnected when changing the connections between the other ends of the springs and opposite ends of the frame. When so disposed, the top rear edge 23 of the opening 20 in the gripping plate 16 is maintained in gripping engagement with the rod by the springs 25 for pulling the pipe out of the hole during rearward movement of the lever arm 6, and the gripping plate 16 is free to move relative to the pipe R during return movement in the forward direction.

Vertically spaced rollers 35 and 36 may be located adjacent opposite ends of the frame 2 for supporting and guiding the pipe as it is pushed or pulled by the device 1. As shown, the top engaging rollers 35 are desirably generally cylindrical, and the bottom-engaging rollers 36 are contoured to conform to the shape of the pipe, and the rollers 35 and 36 are rotatably mounted on suitable hardened steel pins 37 and 38 having their ends extending through aligned openings in the vertical sides 3 of the frame 2.

To use the device, a hole H must be provided therefor which is of a size sufficient to accommodate not only the pusher and puller 1, but also at least one section of pipe or rod R, which are generally made in 6-foot lengths. The pusher and puller 1 should be positioned at a depth approximately equal to the desired depth of pipe to be laid and suitably anchored in place with the forward end 32 of the frame 2 located adjacent the side of the hole into which the rod is to be pushed. When the pusher and puller is placed in a basement, an opening 40 of desired size must be provided in the wall W of the basement to permit unobstructed passage of the rod therethrough.

In any event, with the pusher and puller 1 properly anchored in place, the first section of pipe or rod R is passed through the opening 20 in the gripping plate 16, and the springs 25 are connected to the rear end 26 of the frame 2, which positively tilts the gripping plate 16 in the forward direction for gripping engagement with the pipe during swinging movement of the lever arm in the forward direction. A handle 41 or other suitable extension is inserted into the socket 42 in the upper end of the lever arm 6 for additional leverage. The lever arm 6 is swing back and forth until the first section of pipe or rod R has been advanced into the ground to the extent possible, after which a second pipe section is suitably coupled to the end of the first pipe section, and the lever arm is again moved back and forth to advance the second pipe section and so on until pipe of the desired length is in place.

If copper tubing or thin walled pipe is to be installed, a rod is first pushed through the ground by the device 1 in the manner just described to provide a passage for the tubing or pipe, after which the copper tubing or pipe is suitably coupled to the leading end of the rod. Then the direction of tilt of the gripping plate 16 is reversed by disconnecting the springs 25 from the rear of the frame and reconnecting such springs to the forward end thereof and the plate is again reciprocated back and forth to pull the rod back out of the ground, dragging the tubing or pipe with it.

From the foregoing, it will now be apparent the gripping plate of the present invention automatically positively grips the pipe or rod in the direction of desired movement so as to reduce to a minimum the amount of slippage therebetween, and yet the gripping plate is free to move in the reverse direction. Moreover, it is a simple matter to reverse the direction of movement of the rod without having to reposition the pusher and puller, it only being necessary to change the connection between the frame and plate tilting springs for positively tilting the gripping plate in the direction of desired movement of the pipe or rod.

I claim:

1. A device for pushing and pulling pipe or rod comprising a frame, a lever, means mounting said lever on said frame for reciprocating movement, a gripping plate pivotally connected to said lever for movement therewith, said gripping plate having an opening therethrough for passage of the pipe or rod, and spring means for biasing said gripping plate to a tilted position for providing positive gripping engagement of an edge portion of said opening with the pipe or rod during movement of said gripping plate in the direction of tilt, said means mounting said lever for reciprocating movement comprising a lever arm having a yoke at one end, said frame having a pair of vertical sides, said yoke being received between said sides, pin means pivotally connecting said yoke to said sides, said one end of said lever received in said yoke on said sides, said one end of said lever received in said yoke on said lever arm and pivotally connected thereto, the other end of said lever having a yoke for receipt of one end of said gripping plate and pivotally connected thereto, and the other end of said gripping plate having said spring means connected thereto.

2. The device of claim 1 wherein there are two of said spring means pivotally connected to opposite sides of said gripping plate.

3. The device of claim 1 wherein said opening in said gripping plate is round.

4. The device of claim 1 wherein said opening in said gripping plate is diamond-shaped.

5. The device of claim 1 further comprising a pair of vertically spaced guide rollers at opposite ends of said frame for supporting and guiding the pipe or rod during movement through said opening, the upper roller of each pair being generally cylindrical and the lower roller of each pair being contoured to conform to the shape of the pipe or rod.

6. The device of claim 1 wherein said spring means has a pivotal connection with said gripping plate permitting said spring means to be connected to either end of said frame without disconnecting said spring means from said gripping plate for tilting said gripping plate in opposite directions to grip the pipe or rod for movement in either direction without changing the location of said device.

7. The device of claim 6 wherein said gripping plate has a horizontal pin projecting from one side of said gripping plate about which one end of said spring means is looped to provide said pivotal connection between said spring means and gripping plate.

8. The device of claim 7 wherein said gripping plate has horizontal pins projecting from opposite sides of said gripping plate, and there are two of said spring means having one of their ends looped around said pins to provide pivotal connections between both of said spring means and said gripping plate.

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