

[54] EARTH BORING APPARATUS

[76] Inventor: Jack Dean Lovig, 1417 Mariners Drive, Newport Beach, Calif. 92660

[22] Filed: Sept. 24, 1971

[21] Appl. No.: 183,400

[52] U.S. Cl. 173/24, 173/147, 175/53

[51] Int. Cl. E21c 5/06, E21c 11/02

[58] Field of Search 173/24, 147; 175/53, 175/62, 118

[56] References Cited

UNITED STATES PATENTS

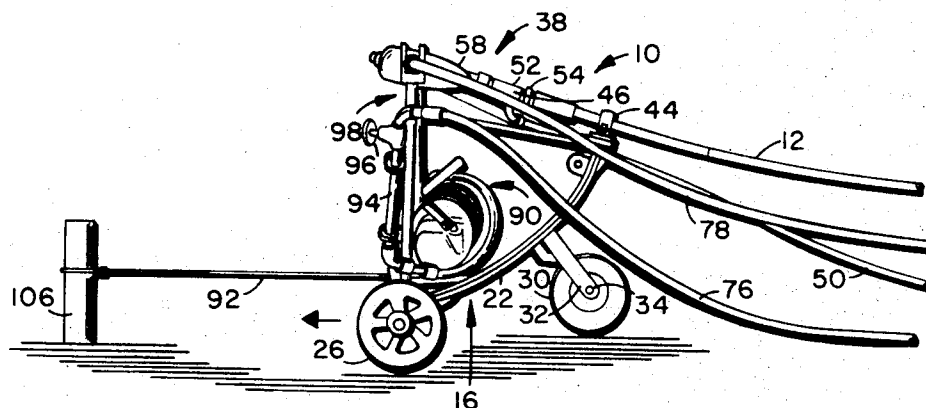
7,128,240	8/1938	Foster	173/24
3,150,723	9/1964	Hale	173/159 X
3,066,924	12/1962	Queer	173/147 X

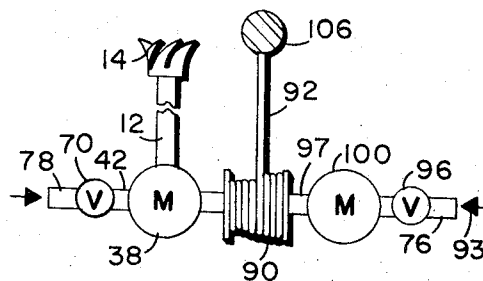
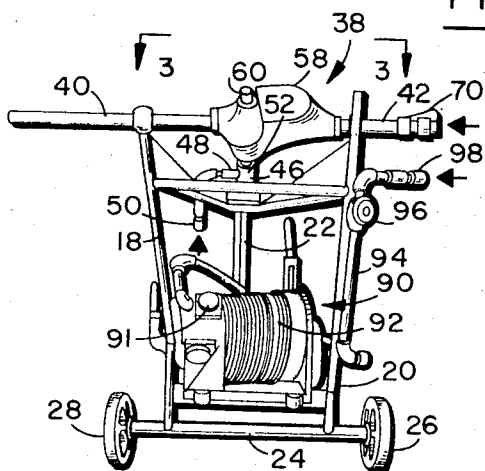
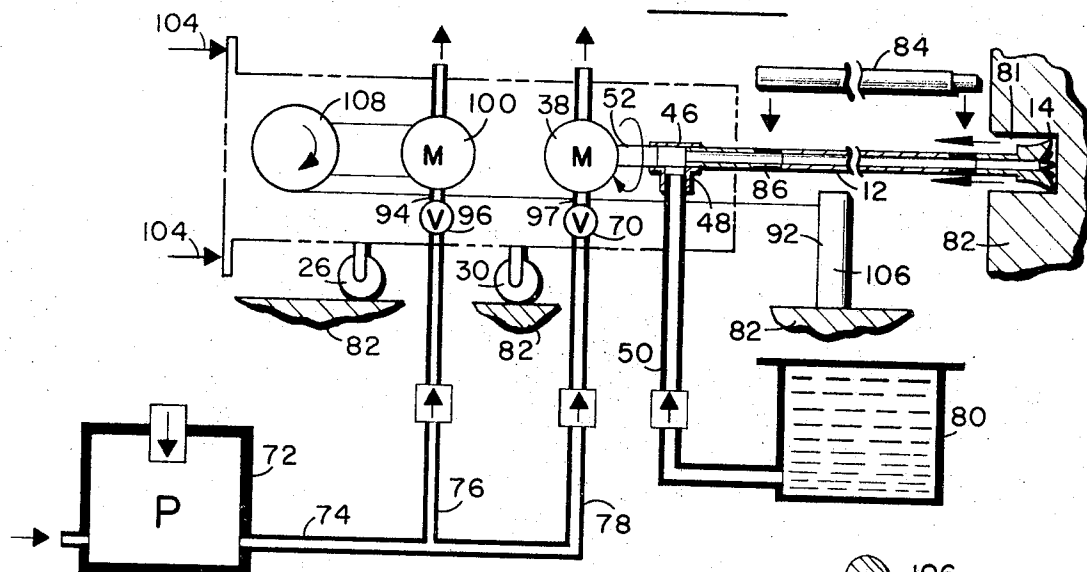
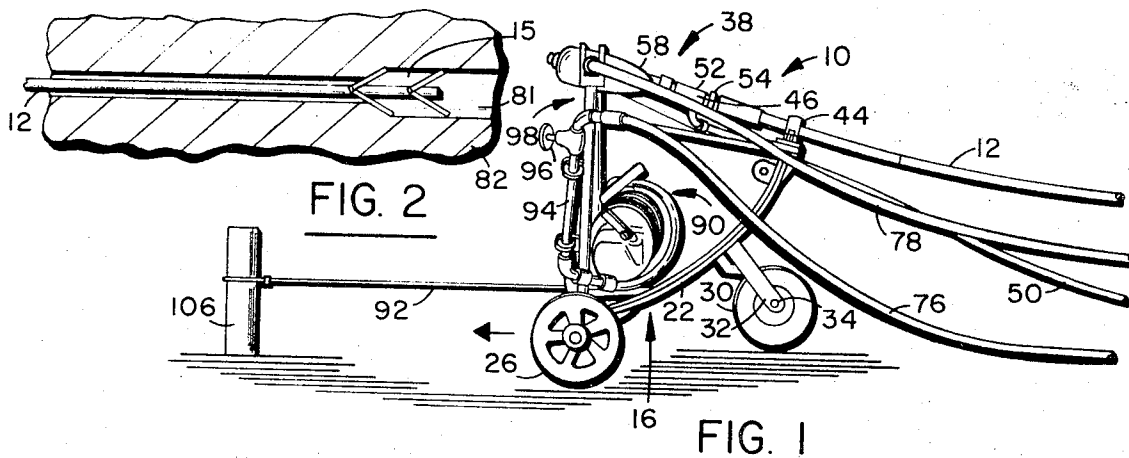
Primary Examiner—Ernest R. Purser
Attorney—George F. Bethel

[57] ABSTRACT

An earth boring apparatus having a hollow bore pipe and bit for the introduction of water through an axial passage thereof to loosen the strata through which said boring apparatus is boring and having a first air motor for driving said boring tool. The boring apparatus has a wheeled carriage with a support for a second air motor driven winch with a cable extending therefrom for pulling said carriage backwardly or forwardly along the length of the bore. The winch motor can be controlled by a valve which delivers air under pressure thereto so that the carriage can be moved backwardly or forwardly at a selected speed in response to the amount of air which is delivered through said valve.

5 Claims, 5 Drawing Figures





INVENTOR
 JACK DEAN LOVIG
 BY
 GEORGE F. BETHEL
 ATTORNEY

EARTH BORING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of this invention is within the earth boring art, specifically related to flexible boring tools which do not require a bore pit.

2. Description of the Prior Art

The prior art discloses tunneling devices comprising stationary frames having movable frames mounted thereon. The stationary frame can be mounted on skids and a tunneling pipe can be attached to the movable frame. An auger can be placed in a tunneling pipe and made to rotate in a specific direction and the movable frame moved forwardly by means of a winch.

The foregoing prior art devices incorporate skids and other means which do not have the portability of the instant invention. Furthermore, the prior art does not disclose pneumatic means for operating air motors as this invention, nor is the use of water generally shown. Other prior art embodiments disclose drills mounted on a platform for boring a tunnel. The platform is supported on wheels, and incorporates ratchet wheels which can be manually turned by a lever and pall in the direction necessary to create a bore. Such devices require an excavated bore pit in contradistinction to this invention.

Coal mining and boring machines also incorporate sprocket wheels which are operated by a motor. As the sprocket wheels turn, a chain is retracted and a drill is driven into the coal. However, the prior art related to such coal mining machines does not disclose the lightweight freely operating invention disclosed herein.

Horizontal rotary drills are utilized with drilling heads mounted thereon, and a driving unit mounted on the rear thereof. A series of pulleys and sprockets drive such units and are connected to a drilling head which rotates a series of drilling blades. The driving units incorporate winches and lines thereon but do not include the overall combination as disclosed in this application.

The prior art also discloses carriages mounted on wheels which roll upon wheel supporting frames. The carriage of such units support a power plant and a winch which moves the carriage between the ends of the frame. A wheeled frame is provided with four supports which are used to raise the boring machine thereof off its wheels to a desired boring level. Such devices do not incorporate any of the features of this invention and would not fill the requirements as the invention disclosed herein does.

Other boring machines include complete apparatus with internal combustion engines and several clutch assemblies with plurality of transmissions. The boring machines also include square drilling rods with cylindrical tools mounted on the forward ends thereof. The square drilling rod passes through a sprocket which has a square hole in its center. This sprocket is turned to provide a rotary motion to the drilling rod. Two winches with associated winch lines are provided at either end of the boring machine. The winch lines on the forward end are attached to a collar mounted between the square drilling rod and the cylindrical drive tool. The winch lines at the rear of the machine are attached to a rear collar. The winches can be operated independently to impart forward or rearward thrust to the drilling rod. However, such devices are complex and do

not incorporate the novel features of a lightweight single combination unit as disclosed herein.

The prior art also discloses boring rigs having a lightweight carriage, similar to the one disclosed herein. However, such boring rigs incorporate a boring tool which is hand operated as to its longitudinal movement along the bore. In other words, the boring tool has to be pushed forwardly for it to bore through a strata, and when retracted from its bore it is pulled by a group of able bodied men.

It will be apparent that this invention overcomes many of the foregoing enunciated deficiencies of the prior art, as will be clarified by the following specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a side elevation view of this invention with the air and water supply pipes leading thereto in a partially fragmented form;

FIG. 2 shows a section of earth strata with a bit reaming a bore hole therein;

FIG. 3 shows a rear elevation view of an embodiment of this invention;

FIG. 4 shows a fragmented schematic flow diagram of the fluid mechanical functions of this invention during a boring operation; and,

FIG. 5 shows an alternative embodiment of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention hereof is substantially comprised of a boring apparatus 10 having a bore pipe, rod, or stem 12 terminating in a drill bit 14 or reaming bit 15. The boring apparatus can comprise a carriage 16 having an upright frame member 18 and 20 with an upstanding arcuate frame member 22 for supporting the front portion thereof.

In order to provide movement for the frame, an axle 24 is provided with a pair of wheels 26 and 28. The wheels 26 and 28 are journaled upon bearing surfaces of the axle 24. At a forward portion of the apparatus, a wheel 30 is provided with a support fork 32 attached to the frame member 22. The wheel is journaled on an axle 34 on said fork member, and is free to rotate in a tricycle manner along with wheels 26 and 28.

A bore motor 38 is provided in a manner so that it is connected to the upstanding frame members 28 and 20 by means of extensions 40 and 42. The extension 42 is formed as a pipe for the delivery of compressed air to the bore motor 38 so the bore motor can be driven by an air compressor.

The bore pipe 12 is journaled for rotation in a journal 44 on the frame member 22. Connected to the bore pipe 12 is a coupling 46 which has an inlet 48 connected to a pipe 50. The coupling 46 is attached to the shank 52 of the bore motor 38 by means of a coupling 54 or in the alternative can be one solid piece. The bore motor 38 has a housing 58 which houses a rotor, which has not been shown, for receipt of air impinging thereon. The air is delivered through the pipe 42, and the rotor turns the bore pipe 12 by means of the previous couplings enumerated herein. The rotor has an extension 60 which is journaled in a journal of the motor frame 58. In this manner, the bore pipe 12 and coupling 52 are maintained in axially directed relationship as it passes through the bore motor 38.

The air pressure line 42 delivering air under pressure from a compressor is controlled by a valve 70. The valve 70 can be of any suitable type and preferably should be adjustable to deliver air under pressure in varying amounts to the bore motor 38. The valve can be a spring loaded valve having an opening operated in response to the squeeze of a lever by an operator's hand. As can be appreciated, when greater amounts of air are delivered to the air motor 38, greater torque is delivered by the motor to the bore pipe 12.

As previously discussed, a source of pressure is required for the bore motor 38. A source of pressure 72 is shown which can be in the form of a compressor introducing air through a line 74 to a pair of lines 76 and 78. The lines 76 and 78 are utilized for the operation of this invention and as previously stated in past, deliver air to the bore motor 38. In this specific embodiment the line 78 is connected through the valve 70 to the pipe 42 for delivery of air to the bore motor 38.

As previously discussed, a source of water 80 can be utilized to deliver water through a pipe 50 to a coupling 46 at a connection point 48. The water is caused to flow down the bore pipe 12 and out through a bit 14 so that as the bit is rotated, it bores a hole 81 in the strata 82. The bore pipe 12 can be coupled as a plurality of separable sections 84 which can be connected by a joint 86. In this manner a continuous flexible bore pipe 12 can be provided as the length of the bore hole 81 increases within the strata 82.

The carriage 16 has a winch 90 attached thereto which has a cable for retraction therearound. The winch 90 has an air line 94 connected thereto through a valve 96 attached to a hose line 76, by a coupling 98. The valve 96 delivers the required volume and pressure of air to a winch motor 100. The winch motor is in the housing of the winch and turns the winch in accordance with the pressure and volume of air delivered through the valve 96. As the winch motor 100 turns, it tends to pull the cable 92 in the direction from which it has been extended. In the drawings, as shown in FIG. 1, the cable, when wound around the winch 90, causes the carriage 16 to move backwardly. In FIG. 4, the schematic shows the carriage boring in the direction of arrows 104.

The wire 92 can be attached to any suitable non-moveable object such as a post 106 which can generally be referred to as a dead man. The winch 90 which comprises a capstan 108 can be utilized in any suitable manner such that the capstan will effectively pull the wire 92 when the capstan is driven by the motor 100.

The capstan 108 and air motor 100 can be affixed to the bore motor 38 in any suitable manner so that the capstan is free to rotate and move the bore motor 38 in the direction of the wire 92. In this manner the bore motor 38 can be combined with the winch 90 so that when the capstan 108 thereof turns about its axis it either retracts or drives the bore pipe 12 into the strata 82. As can be appreciated, the entire carriage can be eliminated so that only a combination bore motor 58 and winch 90 is included in the apparatus.

FIG. 5 shows a winch 90 having a wire 92 wrapped therearound. The winch 90 and the wire 92 are analogous to those shown in the other figures. Additionally, a motor 100 is shown having a source of pressure from the direction of arrow 93 which is led through a pipe 76 through a valve 96 to the motor 100. The motor 100 is connected by a shaft 97 to the winch 90 for purposes

of reeling the wire 92 around the winch 90. Thus, when the wire 92 is attached to a dead man or stake 106, the entire mechanism shown in FIG. 5 moves forwardly in the direction of the stake 106.

A second air motor 38 is shown in FIG. 5 for purposes of turning a bore shaft 12. Air is delivered under pressure through a line 42 which is connected through a valve 70 to a positive source of air pressure by the pipe 78. The motor 38 turns the shaft 12 and the bit 14 to effectively cause a boring of the hole generally shown as 81 in strata 82.

As can be appreciated, the foregoing showing of FIG. 5 can be of a lightweight construction whereby the entire device thereof is held by an operator as the boring proceeds. Furthermore, the entire device can be placed upon a single bipod or single pod construction with wheels or a wheel thereunder, for forward movement.

It should also be noted that the valve 70 can be such that it delivers air to the rotor in a reversible manner to cause the bore pipe 12 to rotate in either direction. In this manner the bit 14 can be caused to dislodge, and/or and/or the bore pipe 12 as well as bore the hole 81.

It should be appreciated that the foregoing combination of the winch and the portable drilling rig can be used in many combinations wherein the boring pipe 12 is moved forwardly or backwardly by the winch drive. Specifically, the wire 92 can be affixed to any suitable dead man or stake to move the entire unit backwardly or forwardly whether it be in the portable unit shown in FIG. 5 or the wheeled unit of FIG. 1. Other embodiments and alternatives of this invention can be used incorporating the inventive concept and scope as defined by the following claims. However, this invention is only to be read in light of the following claims.

I claim:

1. A boring apparatus comprising:

a bore motor which is driven by a source of air under pressure;

a flexible bore pipe attached to said bore motor for rotational movement in response to the torque provided by said bore motor;

a bit for placement at the terminal end of said boring pipe;

an air operated winch having an air motor which rotates in both directions;

frame means for attaching said winch to said bore motor;

cable means wound around said winch for retraction by said winch so that said bore motor will move in relationship thereto thereby withdrawing said flexible boring pipe or driving said flexible boring pipe into a strata which is being bored in response to the direction and retraction of said cable; and, valve means for variably controlling the amount of air delivered under pressure to said bore motor.

2. The boring apparatus as claimed in claim 1 further comprising:

valve means for variably controlling the amount of air delivered to the air operated motor of said winch.

3. The boring apparatus as claimed in claim 1 further comprising:

a frame mounted on wheels carrying said winch and bore motor for wheeled movement in response to said winch pulling the frame in relation to a fixed point; and,

5

6

means to deliver water under pressure to said flexible boring pipe.

4. The boring apparatus as claimed in claim 3 wherein said means for delivering water under pressure to said flexible boring pipe comprises:

a coupling connected to said boring pipe allowing rotational movement for providing water under pressure through the axis of said boring pipe.

5. A boring tool in combination with a portable winch comprising:

a bore motor having a flexible bore pipe extending therefrom with a coupling for the receipt of water under pressure for passage through the axis of said bore pipe to a distal end thereof which can be uti-

5

10

15

20

25

30

35

40

45

50

55

60

65

lized for the receipt of a bit;

frame means for supporting said bore motor; an air operated winch which moves in two rotational directions mounted on said frame means;

a cable for connection around said winch to be pulled and drawn around said winch to move said frame means in response to said movement when said cable is connected to a substantially static body;

valve means for delivering varying amounts of air under pressure to said winch; and,

valve means for delivering air under pressure to said bore motor in a reversible manner for changing the direction of rotation of said bore motor.

* * * * *