Jan. 4, 1966 C. I. WILLIAMS 3,227,426

GROUT-DELIVERY UNIT

Filed May 4, 1964 2 Sheets-Sheet 1

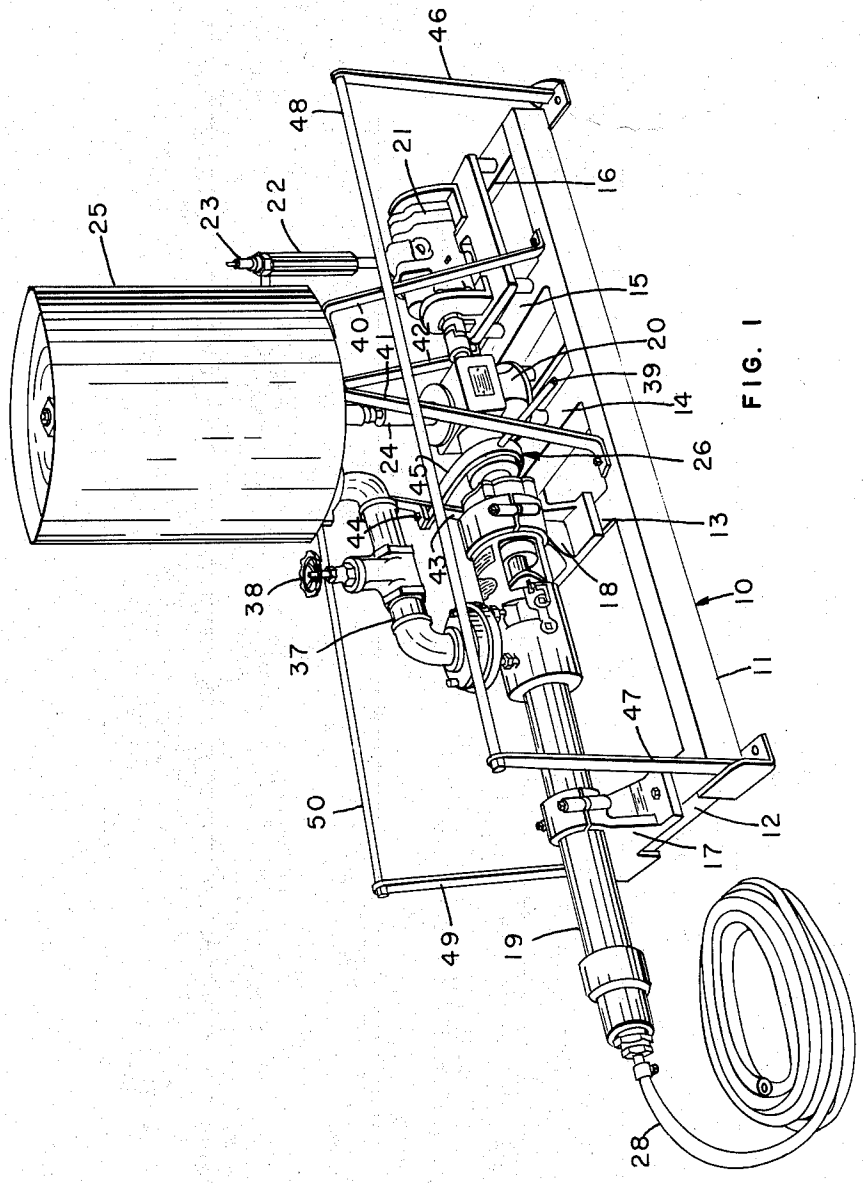


FIG. 1

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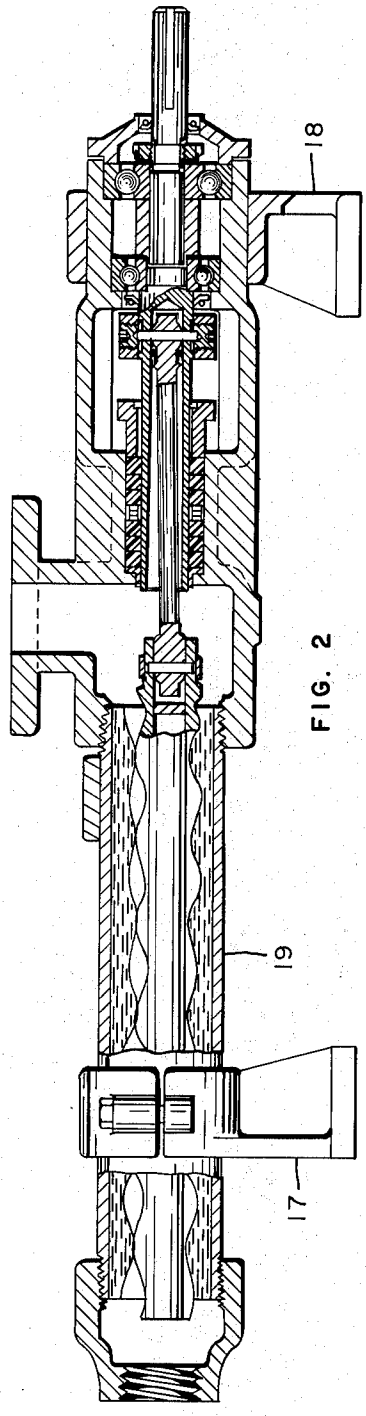


FIG. 2

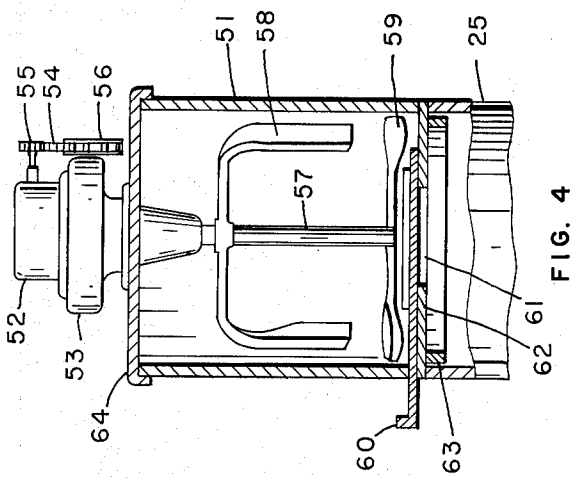


FIG. 4

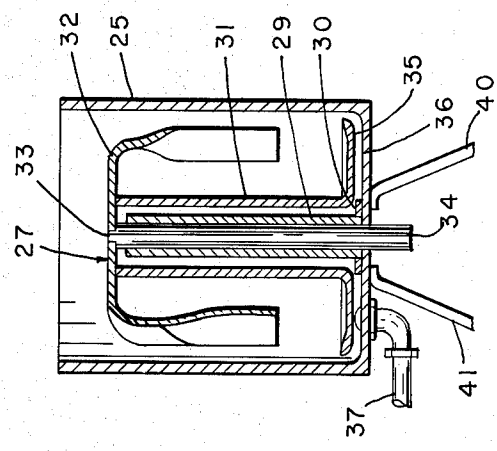


FIG. 3

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GROUT-DELIVERY UNIT

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5 Claims. (Cl. 259—153)

This invention provides a system for delivering grout under pressure, and has been developed primarily to facilitate the installation of rock bolts. A rock bolt is essentially a long rod inserted in a hole drilled in a rock formation, with some form of anchoring device provided to at least temporarily hold the bolt in position until it is grouted. The "grouting" operation consists in pumping the space around the rod full of grout under pressure to effect a bond between the rod and the surrounding rock, and to protect the rod against corrosion. The purpose of these rods is to hold the rock formation against collapse or movement, and it is often desirable to install them under conditions where space it extremely limited. Grout is a cementitous paste-like mixture until it has hardened, and the delivery of it must be without sufficient loss of time to interfere with its flow characteristics. This invention provides a unit including a pump, a motor, and a power take-off driving a tank agitator, with these units mounted in such a manner that the entire assembly can be carried easily from place to place by a few men as the contsruction work progresses. A gravity flow of the grout from the tank is assured, while maintaining the total center of gravity of the unit low enough so that the unit can be carried without instability.

The several features of the invention will be analyzed in further detail through a discussion of the particular embodiment illustrated in the accompanying drawings. In the drawings:

FIGURE 1 is a perspective showing the entire unit ready for use, except for the connection of a conduit carrying compressed air.

FIGURE 2 presents a sectional elevation of a screw pump of conventional design, this being the preferred form of pump for use in connection with this invention.

FIGURE 3 is a sectional elevation through the tank and agitator system.

FIGURE 4 is a section of an additional tank and agitator that may be used together with the assembly shown in FIGURE 1.

Referring to the drawings, the device includes a frame generally indicated at **10** having the siderails **11**, and the transverse rails **12–16**. The rails **12** and **13** are provided with the brackets **17** and **18** for supporting the pump **19** shown in FIGURE 2. The rails **13** and **14** support the power take-off unit **20**, and the rails **15** and **16** provide support for the compressed air motor **21**. A rotary control valve **22** of conventional design is incorporated in the air supply line connected normally at **23**.

The motor unit **21**, the horizontal shaft of the power take-off unit **20**, and the pump **19** are preferably coaxial. The output shaft **24** of the take-off unit is substantially vertical, and coaxial with the cylindrical tank **25** normally containing the supply of grout. A conventional clutch unit **26** is interposed between the power take-off and the pump **19** so that the pump may be disengaged without stopping the rotation of the vertical shaft **24**. The action of the pump may, therefore, be terminated without stopping the rotation of the agitator assembly **27** within the tank **25**. This is highly desirable, as continuous agitation tends to prevent a premature setting of the grout. It also provides for continuation of the mixing action, which is desirable prior to the injection of the grout through the flexible conduit **28**.

The tank **25** has a central cylindrical column **29** secured to the bottom of the tank preferably by welding. A reinforcing ring **30** can be used to strengthen this junction, if desired. The height of the column **29** is normally in excess of the depth of the charge of grout loaded into the tank. The agitating device includes a tubular member **31** surrounding the column **29**, and the upper portion of the member **31** is bridged by the agitator arm **32**. This member has a central opening receiving the key **33** of the shaft **34**, and this shaft is normally coupled to the output shaft **24** of the power take-off device **20**. The lower agitator unit **35** is mounted at the lower extremity of the member **31** for the purpose of maintaining circulation in the grout immediately adjacent the bottom **36** of the tank. The entire agitator assembly may be withdrawn upwardly to clean the unit and the inside of the tank.

In operation of the device, grout is withdrawn by the combination of suction in the pump **19** and the action of gravity, and passes through the pipe **37** controlled by the valve **38**. During this time, the clutch-control handle **39** will be positioned to cause a transfer of torque to the pump **19**. After completion of the grouting, the clutch **26** is disengaged to stop the pump **19**, and the end of the conduit **28** is inserted in the tank **25**. The pump is restarted, and is run long enough to clear it of grout that might otherwise set in the pump. Preferably, the tank is then emptied and the whole unit flushed out with water.

The tank **25** is supported on the legs **40–43**, and the leg **43** serves the additional purpose of providing a fulcrum at **44** for the clutch yoke **45**. This arrangement provides a central position for the center of gravity of the entire unit, both in the full and empty conditions of the tank **25**. The arms **46** and **47** extend from the base of the frame **10** to support the carrying bar **48**, and the arms **49** support the bar **50** at the opposite side of the unit. These carrying bars are located well above the normal center of gravity of the entire device, and provide for carrying the unit with whatever number of men may be available, arranged in position suitably disposed with respect to the center of gravity.

Referring to FIGURE 4, an auxiliary tank **51** is shown positioned on top of the tank **25**. It is anticipated that this unit will be mixing a charge of grout while the charge in the tank **25** is being delivered. A motor **52** drives the gear unit **53** through the chain **54** and the sprockets **55** and **56**. This, in turn, rotates the shaft **57** containing the agitators **58** and **59**. When the unit has properly mixed the charge of grout, the dam **60** may be withdrawn. The contents of the tank **51** are then dumped out through the opening **61** into the container **25**. Preferably, the bottom **62** of the tank **51** is provided with a fixed ring **63** which is received easily within the tank **25** to locate the tank **51** properly in position. The motor and gear units **52** and **53** are mounted on a removable cover **64**, and the entire assembly carried by the shaft **57** may be removed with the cover **64**. This arrangement provides for the gravity feed of grout from the mixing tank **51** to the feeding tank **25**, and from there to the pump **19** at a minimum utilization of vertical height. This factor is of considerable importance in tunnel excavations, and it will be noted that the unit can be carried from one place to another with the mixing tank **51** removed.

The particular embodiments of the present invention which have been illustrated and discussed herein are for illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claims. In these claims, it is my intent to claim the entire invention disclosed herein, except as I am limited by the prior art.

I claim:

1. A portable grout-delivery unit, comprising:
a frame;
a pump mounted on said frame;
a power take-off unit mounted on said frame and having an output shaft extending normally upward;
a motor mounted on said frame in driving relationship with said power take-off unit and said pump;
clutch means operative to disengage and engage said pump from said driving relationship;
a tank mounted on said frame, and having agitator means rotatably mounted on a vertical axis and operably connected to said power take-off output shaft;
conduit means extending from said tank to said pump; and
handle means mounted on said frame.

2. A unit as defined in claim 1, wherein said pump, power take-off unit, and motor are coaxial.

3. A unit as defined in claim 1, wherein said power take-off unit is interposed between said motor and pump, and said tank agitator is coaxial with said output shaft.

4. A unit as defined in claim 1, wherein said clutch is interposed between said power take-off and pump.

5. A unit as defined in claim 1, wherein said handle means includes normally horizontal bars extending along opposite sides of said frame, and substantially above said pump, power take-off, and motor.

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