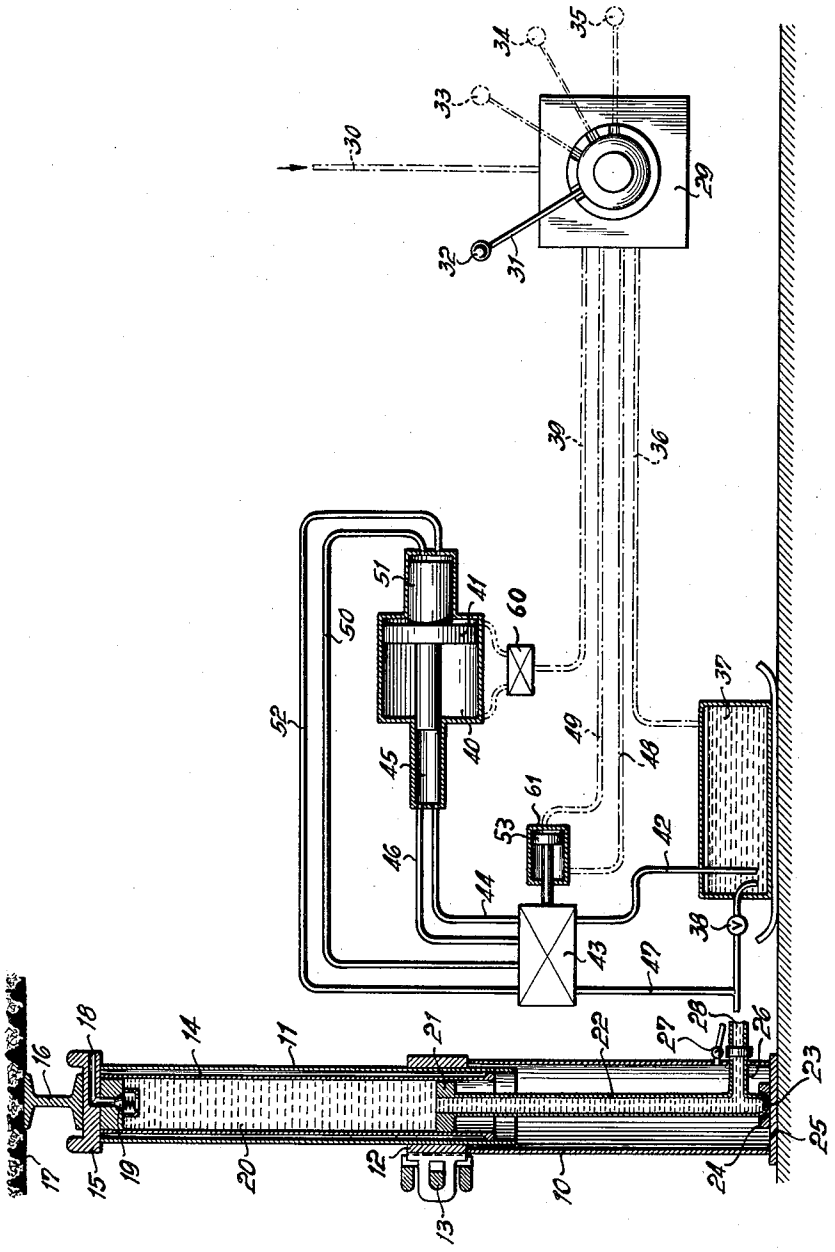
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TWO-PART METALLIC MINE PROP

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TWO-PART METALLIC MINE PROP

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The present invention relates to a two-part metallic mine prop in which the mine prop members are locked by friction while being elastically deformed. This type of mine prop has the advantage that it can quickly and simply be set while being able to withstand a considerable load.

It is an object of the present invention to provide an improved mine prop of the above type which can be particularly quickly set and robbed.

It is another object of this invention to provide a two-part metallic mine prop which can be quickly set by the employment of fluid operable means.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the attached drawing illustrating a section through a mine prop according to the invention with the units for feeding and withdrawing a fluid medium for setting the mine prop.

According to the invention, one of the two mine prop members has mounted therein a pressure cylinder fixedly connected thereto. The said pressure cylinder cooperates with a piston relatively movable thereto. The mine prop member comprising said pressure cylinder has an opening for connection with a pressure fluid adapted to bring about the setting of the mine prop. The pressure cylinder may form the inner wall of the tubular mine prop member fixedly connected thereto. It is also possible to mount a separate pressure fluid cylinder in the hollow mine prop and fixedly to connect said pressure cylinder to the hollow mine prop member. A mine prop according to the invention may be set by filling the pressure fluid cylinder with the pressure fluid and, after the mine prop has been placed under setting load, the mine prop members are locked to each other. Thereupon, the pressure fluid is released and is, at least to a major extent, withdrawn from the mine prop. When robbing the mine prop, the friction lock only of the locked mine prop member has to be released. The mine prop may be set particularly quickly when the pressure fluid is employed and made effective in two stages, namely in a first stage in which the cylinder is filled and the upper mine prop member is lifted at low pressure up to a height at which the head of the mine prop engages the beam carrying the over-burden. In the second stage, the mine prop is subjected to a higher pressure corresponding to the setting load and, after the desired pressure has been obtained, the interlocking of the mine prop members is effected.

Referring now to the drawing in detail, the mine prop illustrated therein represents a so-called clamping ring mine prop. This mine prop comprises a lower tubular mine prop member **10** and an upper tubular mine prop member **11**. The lower mine prop member **10** has mounted thereon a clamping ring **12** which is tightened by driving in a wedge **13**.

A simple and sturdy construction for the mine prop according to the invention is obtained when the pressure cylinder is arranged within the tubular upper mine prop

member **11** and is fixedly connected thereto. The pressure cylinder may be formed by the inner wall of the tubular upper mine prop member **11**. In such an instance, the upper mine prop member must not only have a wall thickness necessary to withstand the considerable forces of the overburden to be absorbed by the mine prop but must also have a sufficient smooth inner surface so that the piston **21** reciprocable therein can slide properly therein. The shape of the inner surface must very precisely correspond to that of a cylinder in order to assure a tight sealing for the pressure fluid by means of the cylinder wall and the piston.

If the upper mine prop member consists of a drawn steel pipe, its inner surface must be post-machined because drawing itself cannot yield a sufficiently precise inner diameter of the steel pipe.

According to a further development of the invention, a light metal tube for instance of aluminum may be inserted into the steel upper mine prop member **11** and may be connected thereto in any convenient manner so that the light metal tube forms the pressure cylinder. When producing light metal tubes by drawing, it is possible when employing a mandrel or a ball to maintain a precise inner diameter within close tolerances and also to obtain a proper circular cross section. The inner surface obtained by drawing in this way will have the required smoothness and will be able without requiring post-machining satisfactorily to seal the pressure cylinder in cooperation with a sealing sleeve mounted on the piston.

The employment of light metal has the advantage that also when employing water or water containing pressure fluid, no corrosion will occur.

As will be seen from the drawing, the head **15** of the upper mine prop member which is mounted below the beam **16** carrying the overburden **17**, is provided with an outlet bore **18**. This bore **18** is normally closed with regard to the pressure chamber **20**, by means of a spring-loaded breather valve **19**. This breather valve opens when the pressure in the pressure chamber drops below atmospheric pressure and makes it possible immediately to remove the pressure fluid conveyed into the mine prop for setting the same. When handling the mine prop, the pressure fluid is not contained therein so that it does not increase the weight of the mine prop during its transportation or mounting.

As will be seen from the drawing, the cylinder **14** confines a piston **21** which latter is mounted on a tube **22**. The cylinder **14** and piston **21** are telescopically slidable relative to each other. The tube **22** is preferably coaxially arranged in the hollow lower mine prop member **10**. The bottom of the tube **22** has a semi-spherical shape and is journalled in a correspondingly shaped portion **24** of the foot of the mine prop member **25** so that the tube is journalled in the manner of a Cardan joint. The lower end of the tube **22** has connected thereto a connecting pipe **26** adapted selectively to be closed by a cap **27**. When the cap **27** is removed, a hose **28** may be connected with the pipe **26** in a pressure tight manner.

Instead of providing the connection for the pressure fluid at the bottom portion of the tube **22**, such connection may also be provided on the pressure cylinder **14**.

The supply and withdrawal of the pressure fluid may be effected for instance by a piston pump. The pressure fluid may consist of oil or a mixture of oil and water. The oil pump may be a two-stage pump and may be so designed that in one stage it works with a larger quantity of fluid at a lower pressure, whereas in the second stage it works with a smaller quantity of fluid at a higher pressure. Such oil pump may be manually operated or by an electric motor or compressed air op-

erated motor. Such pump must be so designed that in its second stage it will produce the required setting pressure.

The arrangement shown in the drawing furthermore comprises an air control valve 29 which is connected through a hose 30 with a compressed air container (not shown). Valve 29 has a control lever 31 adapted to be moved into any of four different positions 32 to 35. Position 32 of the lever 31 represents the zero or neutral position in which the hose 30 is closed off, in other words, in which no air is conveyed through the valve. Position 33 represents the filling position. Position 34 represents the pressing position, whereas position 35 represents the release position.

A particularly simple arrangement for supplying a hydraulic fluid is obtained when employing a hydraulic fluid container the upper surface of which is adapted to be subjected to the influence of air under pressure. Such container works in the manner of the well known tandem pumps (Vorortspumpen) operable by compressed air. After the container has been connected to the pressure cylinder of the mine prop, the fluid is quickly pressed into said pressure chamber (first stage) and only then a smaller pump driven manually or by a motor is made effective (second stage), which produces the pressure required for setting the mine prop. When the mine prop has been locked, the fluid returns to the container which now is under no pressure of compressed air. As far as the return of the fluid does not follow the natural drop in pressure, it is drawn back into said container by means of a pump.

According to the showing in the drawing, such fluid container is represented by the oil container 37. When the lever of the air control valve 29 occupies the position 33, compressed air is pressed through the pressure conduit 36 into the oil container 37. As a result thereof, oil is conveyed from the oil container or reservoir 37 through check valve 38 and hose 28 into the mine prop. The upper mine prop member 11 is then lifted up until it engages the beam 16.

When the lever 31 of the control valve 29 occupies the position 34, air passes through conduit 39 and a control valve 60 into the air cylinder 40 of a piston pump comprising the piston 41 the movement of which in either direction is controlled by the valve 60. Thus, the piston 41 is actuated and draws oil from the oil container or reservoir 37 through conduit 42, reversing valve 43 and conduit 44 into the high pressure cylinder 45 and presses the oil through conduit 46, reversing valve 43 and conduit 47 as well as pipe 28 into the mine prop while producing a high pressure.

After the necessary setting pressure has been obtained, the clamping ring 12 is tightened by the wedge 13 whereby the upper mine prop member 11 is locked to the lower mine prop member 10. When the control lever 31 occupies the position 35, compressed air passes through conduit 49 into the cylinder 61 where it acts upon the piston 53 which in its turn is connected to a valve spool not shown of the reversing valve 43 so as to adjust the same. The piston pump 41 then draws oil from the mine prop through hose 28, conduit 47, reversing valve 43 and conduit 50 into the oil cylinder 51 and presses the oil at low pressure through conduit 52, reversing valve 43 and conduit 42 into the oil reservoir 37, the conduit 46 of which was vented by shifting the control lever 31 into the position 35. When a low pressure occurs in chamber 20, valve 19 opens. The hose 28 is then removed from the mine prop. The mine prop which is now in operative position, will then not contain any pressure fluid.

When taking advantage of a compressed air installation which as a rule is always available in mining operations and has a usual pressure of from 5 to 6 atmospheres above atmospheric pressure, it is possible by means of an oil pump to carry out a two step operation in such a way that first the cylinder is filled with compressed air by connection with a compressed air conduit. As a result thereof, the upper mine prop member is lifted. Thereupon oil is pressed into the mine prop by means of an oil pump whereby the air is further compressed and a pressure is created in the cylinder in conformity with the pressure required for the respective setting load. After the mine prop members have been locked to each other, the cylinder is connected to an oil container or reservoir so that the enclosed air will press out the oil.

A single stage method in which only oil under high pressure will be employed, may be carried out in the following manner. A high pressure conduit for oil and an oil withdrawing conduit extend through the entire mine prop. The pump for producing the oil pressure and the suction pump are mounted in the portion of the shaft in which the mining has to be carried out. Both conduits are equipped with a sufficient number of closable connections. Two hose sections each of which may be connected to one of the two conduits, lead through a three-way valve into a further hose section which is brought into communication with the cylinder chamber of the mine prop. First the three-way valve is placed into such a position that the cylinder chamber of the mine prop is connected to the high pressure oil conduit. When the mine prop has absorbed the necessary setting load, the locking will be effected. Thereupon the three-way valve is shifted into a position according to which the cylinder chamber will communicate with the oil withdrawing conduit. The oil will then return to the oil reservoir.

It is, of course, to be understood that the present invention is, by no means, limited to the particular construction shown in the drawing but also comprises any modification within the scope of the appended claims.

What I claim is:

1. In a two-part metallic mine prop having an upper mine prop member, a lower mine prop member, and locking means for frictionally interlocking said mine prop members, the combination of: a pressure fluid cylinder confined by one of said mine prop members and forming a rigid unit therewith, a hollow piston extending into said cylinder, said cylinder being movable relative to said piston, a tubular piston rod connected to said piston and being open at that end thereof which is connected to said piston for selectively feeding fluid into and withdrawing fluid from said cylinder, said piston being provided with connecting means for connection with a pressure fluid system, means for preventing any substantial movement of said piston rod in axial direction thereof, conduit means associated with said cylinder and adapted to establish fluid communication between the upper portion of said cylinder and the atmosphere, and breather valve means arranged in said conduit means and operable in response to a sub-atmospheric pressure in said cylinder to establish communication between the latter and the atmosphere through said conduit means.

2. In a two-part metallic mine prop having an upper mine prop member, a lower mine prop member, and locking means for frictionally interlocking said mine prop members, the combination of: a pressure fluid cylinder confined by one of said mine prop members and forming a rigid unit therewith, a hollow piston extending into said cylinder, said cylinder being movable relative to said piston, a tubular piston rod connected to said piston and being open at that end thereof which is connected to said piston for selectively feeding fluid into and withdrawing fluid from said cylinder, said piston being provided with connecting means for connection with a pressure fluid system, the other end of said piston rod being closed and provided with a spherical bearing surface to allow adjustment of said piston rod relative to said cylinder for preventing jamming of said piston in case of a slight tilting movement of said prop members relative to each other, means for preventing any substantial movement of said

piston rod in axial direction thereof, conduit means associated with said cylinder and adapted to establish fluid communication between the upper portion of said cylinder and the atmosphere, and breather valve means arranged in said conduit means and operable in response to a sub-atmospheric pressure in said cylinder to establish communication between the latter and the atmosphere through said conduit means.

3. A method of setting a two-part load supporting mine prop having an upper mine prop member with a cylinder and a lower mine prop member with a stationary piston supported thereby and extending into said cylinder, which comprises the steps of: introducing air under pressure into said cylinder to thereby move said upper mine prop member into engagement with the load to be sustained, subsequently introducing oil under pressure into said cylinder to thereby place said upper mine prop member under pressure for sustaining the load to be supported while simultaneously compressing the air in said cylinder, mechanically locking said mine prop members in their relative load sustaining position, and subsequently releasing at least the major portion of said oil from said cylinder

by permitting the compressed air in said cylinder to aid in expelling the oil from said cylinder.

4. A method according to claim 3, which includes the step of subjecting the oil in said cylinder during the filling thereof to high pressure, and subjecting the oil in said cylinder to sub-atmospheric pressure during the withdrawal of said oil from said cylinder.

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