Sept. 20, 1971 W. I. BERGERON ET AL 3,605,922

PULL HOLE CONNECTOR DEVICE

Filed July 29, 1969 3 Sheets-Sheet 1

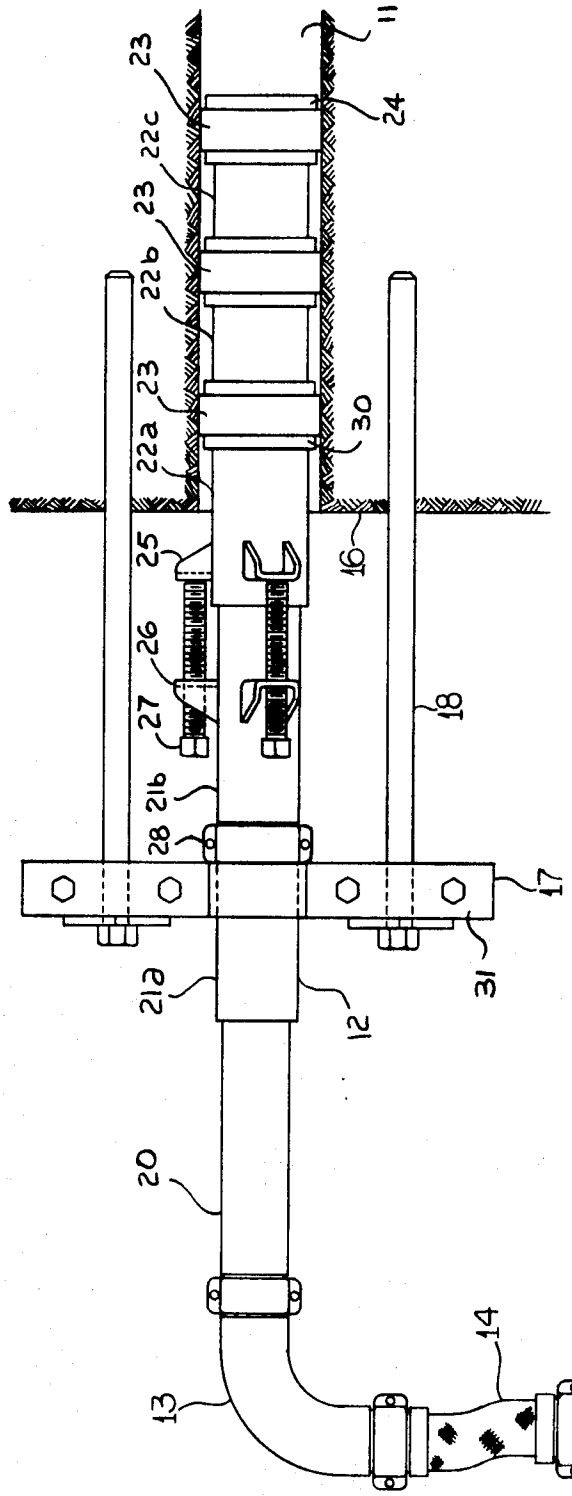

FIG. 1

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Filed July 29, 1969 3 Sheets-Sheet 2

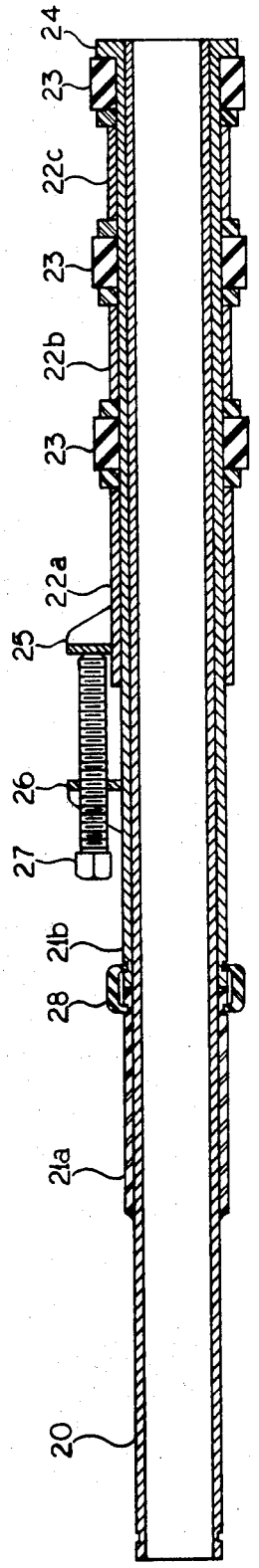

FIG. 2

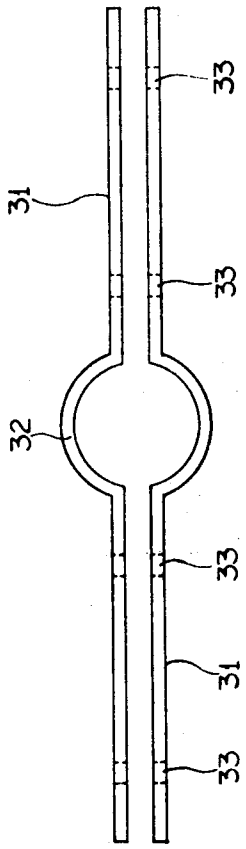

FIG. 3

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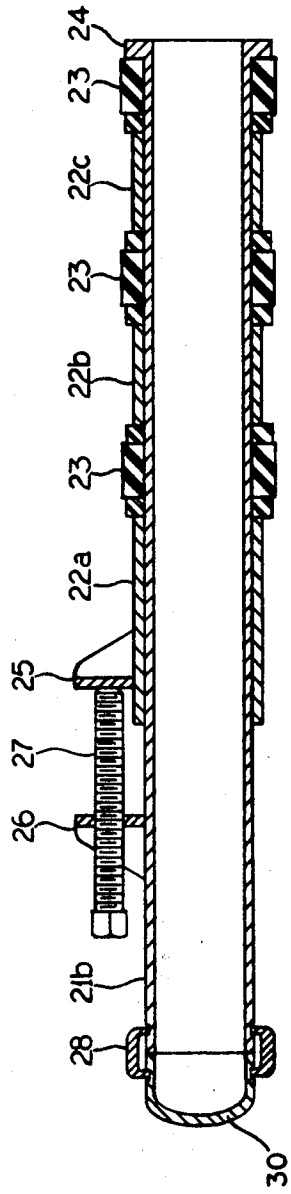

FIG. 4

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DRILL HOLE CONNECTOR DEVICE

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Int. Cl. E21b 23/06, 33/02
U.S. Cl. 175—210 7 Claims

ABSTRACT OF THE DISCLOSURE

A drill hole connector device for use in mines which comprises a housing having a cylindrical portion adapted to fit into a drill hole, a resilient ring surrounding the housing and being capable of being compressed by means of an external sleeve disposed about the housing. The axial compression and radial expansion of the resilient ring holds the device in the drill hole.

This invention relates to a connector device for drill holes in mines.

Diamond drilling is an integral part of underground mining and drill holes are used for a number of different purposes. However, these drill holes can also provide certain difficulties.

In a mine, as an underground excavation becomes quite large, it has been a practice to provide a platform from which additional drilling may be done, but the erection of such working platforms has proven to be rather expensive and cumbersome. Another technique that has been used is the "cut and fill" method, whereby as the excavation becomes larger the working floor is raised by bringing in fill from outside the excavation and distributing it about the working floor. In the past, rock and sand has been used for back fill but this method has also been found to be expensive and time consuming.

More recently a system has been developed whereby mill tailings are returned to the mines as back fill. It has been found that these mill tailings can be economically returned to the mines by crushing them into a fine powder and mixing this powder with about 40% water to produce a hydraulic fill which can be pumped and transported through conduits to a location in a mine at which it is to be deposited and distributed. It has been found to be particularly convenient to make use of drill holes in the rock as conduits for this hydraulic fill.

A problem has arisen in such a system at the point at which the hydraulic fill leaves a drill hole and commences travelling in a normal pipe. Thus, connecting the pipe to the drill hole has proven to be rather difficult and the usual method in use today is to insert the pipe into the drill hole area and line the whole surrounding area with grout in an effort to fix the pipe into the drill hole and prevent any leaks. This is obviously a very cumbersome and time consuming procedure and the connection obtained is prone to developing leaks. Moreover, when the pipe which is fixed in the drill hole wears out and must be replaced, it is necessary to repeat the entire procedure. Thus, there has been a need for a better system for connecting a pipe to a drill hole.

Another problem is encountered when drilling a hole through an area which may become flooded. Once water starts pouring out of a drill hole it has been found to be extremely difficult to then plug the hole. Thus, there has also been need for a drill hole connector which could be used to temporarily close such a hole until proper repairs can be made.

According to the present invention, a very simple and convenient multi-purpose connector for drill holes in rock has been developed. The connector device of the invention has a housing including a cylindrical portion which is adapted to be inserted into a drill hole in rock and a passageway extending longitudinally through the housing. One or more external sleeves are disposed over the insertable portion of the housing and are axially movable therealong and an external abutment is fixed on the insertable portion of the housing, preferably close to the end which is inserted. One or more compressible resilient rings surround the housing between the sleeve and the abutment and when a series of such resilient rings are used these are interspaced by individual sleeves. A means is also provided for forcing the sleeve or sleeves in the direction of the abutment, thus causing axial compression and radial expansion of the resilient ring or rings to fix the device within a drill hole.

A convenient means for forcing the sleeve in the direction of the abutment has been found to be one or more expansion bolts mounted on the housing and adapted to push axially against the sleeve. It will, of course, be appreciated that numerous other arrangements are available for this same purpose.

When the connector is being used for pumping hydraulic fill, which is a very abrasive material, it has been found to be advantageous to provide an internal tubular lining within the longitudinal passageway which can be replaced when it becomes worn. This avoids the expense of having to replace the entire connector because of wear.

When the connector is intended to be used for temporarily closing a hole during diamond drilling, a larger hole is drilled into the rock and a connector according to the invention is inserted. Then a smaller diamond drill is passed through the connector and the drilling is continued. Such a connector can be provided with a valve so that in the event that water is struck by the drill and starts flooding back through the hole, the drill can be removed and the valve closed thus stopping any further flooding.

Another situation in which the connectors of this invention have been found to be extremely convenient has been when blasting is being done in areas which are joined by drill holes. This can be rather a serious problem since compression waves travelling through the drill holes can cause damage and injury to personnel in adjoining areas. By inserting one of the connectors of the invention into each such drill hole and placing a cap over the outer end of the connector, these drill holes can be conveniently shut off until blasting has been carried out.

Certain preferred embodiments of the invention are illustrated by the attached drawings in which:

FIG. 1 is a general view showing the pipe connection in relation to a diamond drill hole in a rock face;

FIG. 2 is a longitudinal sectional view of the connector;

FIG. 3 is a detail of a safety clamp; and

FIG. 4 is a longitudinal sectional view of a further embodiment of the connector.

The particular arrangement shown in FIG. 1 is intended for conveying hydraulic fill. A diamond drill hole **11**, which is usually about 3 inches in diameter, is provided in the rock face **16**. The connector **12** is positioned in the hole and is connected to elbow **13** which is in turn connected to a flexible deflector hose **14** and finally into a conveyor pipe **15** which conveys the hydraulic fill to any location within an excavated area as desired.

To ensure the rigidity of the connector **12** in the hole **11**, an additional safety clamp **17** can be used. This safety clamp is mounted on the rock face **16** by means of rock bolts **18**.

The details of the connector are shown in FIG. 2. The tubular liner **20** is surrounded by the main housing **21** of

the connector and in this particular embodiment the housing **21** is divided into two portions **21***a* and **21***b* joined together by a coupling **28** of the compression type. The housing portion **21***a* is welded to the liner **20** so that the liner can be conveniently removed simply by removing coupling **28** and taking out the liner with the housing portion **21***a*.

A series of sleeves **22***a*, **22***b* and **22***c* surround the housing **21***b* with the sleeves **22***b* and **22***c* acting as spacers between resilient rubber rings **23**. An annular abutment **24** is provided at the end of housing **21***b* and washers **30** are positioned between the sleeves **22** and the resilient rings **23**.

A series of equally spaced brackets **26** are mounted on the housing **21***b* and hold bolts **27** which are adapted to press against an abutment **25** fixed on sleeve **22***a*. When the end of the connector containing the resilient rings **23** is placed in a diamond drill hole in a rock face, the bolts **27** are turned forcing the sleeves **22***a*, **22***b*, and **22***c* in the direction of abutment **24** thus causing axial compression and radial expansion of the rings **23** so that they press against the wall of the drill hole and snugly hold the connector in position in the drill hole.

The safety clamp **17** is shown in greater detail in FIG. 3 from which it will be seen that the clamp consists of a pair of clamping members **31** having mating semi-cylindrical portions **32** which fit around housing **21** and are firmly held in place on the housing by means of bolts passing through the holes **33**. This clamp is then also rigidly fixed to the rock wall by means of the rock bolts **18** as shown in FIG. 1.

FIG. 4 is a simplified version of the connector which is intended for use purely as a closure means for a drill hole. This device does not include the tubular liner **20** since abrasive materials are not passing through and is closed at the outer end by means of cap **30** which is connected to housing **21***b* by means of the coupling **28**.

When the connector is used to prevent flooding during diamond drilling, the cap **30** is removed and replaced by a gate valve. With this gate valve open the drill bit can pass through the passageway of the connector, but when flooding begins the drill bit is removed and the gate valve is closed to prevent any further flooding until the cause of the flooding can be corrected.

What we claim is:

1. Drill hole connector device, comprising:

(a) a housing having a cylindrical portion adapted to be inserted into a drill hole in rock and including a passageway extending longitudinally therethrough adapted to convey hydraulic fill,

(b) at least one external sleeve disposed over the insertable portion of said housing and axially movable therealong,

(c) an external abutment fixed on the insertable portion of said housing,

(d) at least one compressible resilient ring surrounding said housing between the sleeve and the abutment,

(e) means for forcing the sleeve in the direction of the abutment, causing axial compression and radial expansion of the resilient ring to fix the device within a drill hole, said means adapted to be located exteriorly of said drill hole,

(f) a replaceable tubular liner positioned within said housing and protruding beyond the external end of said housing, and

(g) means for connecting a conduit system for hydraulic fill to the external end of said replaceable tubular liner.

2. A drill hole connector according to claim **1**, wherein a series of resilient rings is provided interspaced by sleeves.

3. A drill hole connector according to claim **1**, connected to a conduit system for hydraulic fill.

4. A drill hole connector according to claim **1**, including a safety clamp fixed to a portion of the housing outside the drill hole and fixed to a rock wall by means of rock bolts.

5. A drill hole connector according to claim **1**, wherein the external end of said tubular liner is provided with a closure cap.

6. A drill hole connector according to claim **1**, wherein the means for forcing the sleeve in the direction of the abutment includes a bolt.

7. A drill hole connector according to claim **6**, wherein the bolt is mounted in a bracket fixed to the housing.

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