For drilling in earth material it has been found suitable to employ percussion drilling, using a central drill rod with a surrounding drill tube, both the rod and the tube being connected to the drilling machine and both having cutting inserts at their lower ends. A drill of this kind can be used for drilling in earth only and is especially suitable in hard and stony materials such as unsorted glacial drift and the like, but it is also useful for drilling through earth and rock as when the rock is covered by a stratum of earth. In the latter case, when the drilling in earth is followed by a drilling in rock situated under the earth, the drill comprising the drill rod together with the drill tube is drilled down to the rock and possibly a short distance into the rock. After this the drill tube is disconnected from the drilling machine and the drilling is continued into the rock with only the drill rod, the drill tube remaining as a protective casing, protecting the drill rod during the drilling and making it possible to perform different operations after the drilling such as applying implements for blasting, grouting of the rock and mounting of grouted anchor bolts, without hindrance from the earth layer.

Drills of this kind usually have a flushing channel in the center of the drill rod. This flushing facility is, however, not always sufficient, especially when the drill diameter is large, and therefore flushing medium is supplied also through the space between the drill tube and the drill rod. For this purpose a separate flushing adapter has been used. It is, however, desirable to reduce as much as possible the number of separate parts of a drill, e.g., in order to facilitate connection and disconnection and also because each joint implies an increase of the loss of energy during the transport of energy from the drilling machine to the drill bit.

The invention provides an improvement of previous devices by which the separate flushing adapter can be eliminated. This is achieved by providing the slack adapter, which is connected to the drilling machine, with channels for supplying flushing medium to the space between the drill tube and the drill rod.

The invention is more fully described and illustrated by the following specification with the accompanying drawings which show an embodiment of the invention.

In the drawings FIG. 1 is a longitudinal section of the lower part of a drill, and FIG. 2 is a longitudinal section of the upper part of the same drill with the adapter device according to the invention.

As appears from the drawings the drill comprises an internal drill rod 11 and a surrounding tube 12. The drill rod has the usual flushing channel 32 and is composed of rod elements consisting of extension rods 13, which are threaded at their ends and threaded coupling sleeves 14 connected to the extension rods. The drill tube 12 is composed of threaded tube elements 15 interconnected by shorter tubular coupling elements 16. At the lower end of the drill rod 11 there is a drill bit 17 which has cutting inserts 18 of sintered hard metal. The lower end of the drill tube 12 is also provided with sintered hard metal inserts 19 which are placed around the periphery of the tube.

The upper part of the drill comprises an adapter device for connecting the drill tube 12 and the drill rod 11 with each other and with the drilling machine (not shown). For this purpose the upper end of the drill tube 12 is connected to an adapter sleeve 20 the lower part of which has an internal thread 21 with a rounded section, the upper part having an internal thread 22 with trapezoidal section. The drill tube 12 is connected to the rounded thread 21 by means of a coupling element 16a and a shank adapter 23 having an external trapezoidal thread is connected to the trapezoidal thread 22. The shank adapter 23 abuts against the adapter sleeve 20 at a somewhat inclined annular surface 25. At the lower part of the shank adapter 23, at the center thereof, there is a recess 24 with a rounded thread matching the thread on the end of the drill rod for connecting the shank adapter to the upper end of the drill rod. The threads in recess 24 suitably can be at about the same level as in the illustrated embodiment but they can in the other embodiments be situated somewhat at different levels.

In the shank adapter 23 there is a central flushing channel 30 and also a number of flushing channels 31 which are parallel to the drill axis. The lower end of the central flushing channel 30 is connected to the central flushing channel 32 of the drill rod and the flushing channels 31 are connected to the space between the drill tube 12 and the drill rod 11. At their upper ends the flushing channels 31 are connected to openings 33 extending to the outer surface of the shank adapter 23, said outer surface being cylindrical. These openings 33 are connected to the annular channel 35 in the flushing box 34. The channel 35 is sealed by gaskets 36. The channel 35 is connected to the socket 37 for supplying flushing medium during rotation of the drill, the flushing box 34 being stationary. The upper part 33c of the shank adapter 23 is shaped for connection to a drilling machine.

The flushing box 34 is held in the desired position on the shank adapter 23 by the locking ring 41 which is divided into two halves and countersunk in an annular groove in the outer surface of the shank adapter 23. The two halves of the locking ring 41 are held in place by a surrounding locking sleeve 42 which is fastened by means of screws 43 to the flushing box 34. In the outer surface of the locking sleeve 42 there is a groove 44 which serves to lessen the weight of the sleeve and provide a resilient locking of the screws 43. As appears from FIG. 2, the flushing box 34 is held in position between the locking ring 41 and the upper surface of the adapter sleeve 20 and the shank adapter 23 is permitted to rotate in relation to the flushing box 34.

When drilling in rock covered by a stratum of earth, the earth is first penetrated by the drill rod 11 and the drill tube 12 coupled together as shown in the drawings. When the rock has reached the drill may be drilled a short distance into the rock after which the adapter device is disconnected from the drill. The trapezoidal thread 22 has such a pitch with several entrances if necessary, that the connection between the shank adapter 23 and the adapter sleeve 20 is loosened by turning the shank adapter 23 can be lifted together with the drill rod 11 and the drill rod can then be disconnected from the shank adapter by use of the wrench grip 40. The drilling can then be continued by connecting the drill rod directly to the drilling machine or by attaching additional extension rods if necessary.

The illustrated device has one thread connection less than previously known similar devices which facilitates detaching the drill tube from the drill rod. The elimination of a thread also reduces the energy losses during the drilling.

We claim:

1. An adapter device for connecting a percussion drill-
3. The machine with a drill comprising a central drill rod and a surrounding drill tube, said adapter device consisting essentially of a shank adapter, an adapter sleeve and a flushing box, said shank adapter having a rear end portion shaped for connection to a percussion drilling machine, a front end portion having an internally threaded axial recess for connection to a drill rod and an externally threaded portion for connection to said adapter sleeve and between said rear and front portions an intermediate portion of circular cross section, said shank adapter having also a central flushing channel extending from the rear end surface of said rear end portion to said axial recess and at least one flushing channel parallel to said central flushing channel and extending from an orifice in the surface of said portion of circular cross section to the front end surface of said front end portion between said axial recess and said externally threaded portion, said adapter sleeve having an internally threaded rear end portion connected to said externally threaded portion of said shank adapter and a threaded front end portion for connection to the drill tube of a drill, and said flushing box being journalled on said portion of circular cross section of said shank adapter and having a channel communication with said orifice and a connection for supplying flushing medium to said channel.

2. An adapter device as defined in claim 1 in which the front end surface of said shank adapter is seated on a corresponding rearwardly facing surface in said adapter sleeve.

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