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(54) SELF-DRILLING CONNECTION ANCHOR

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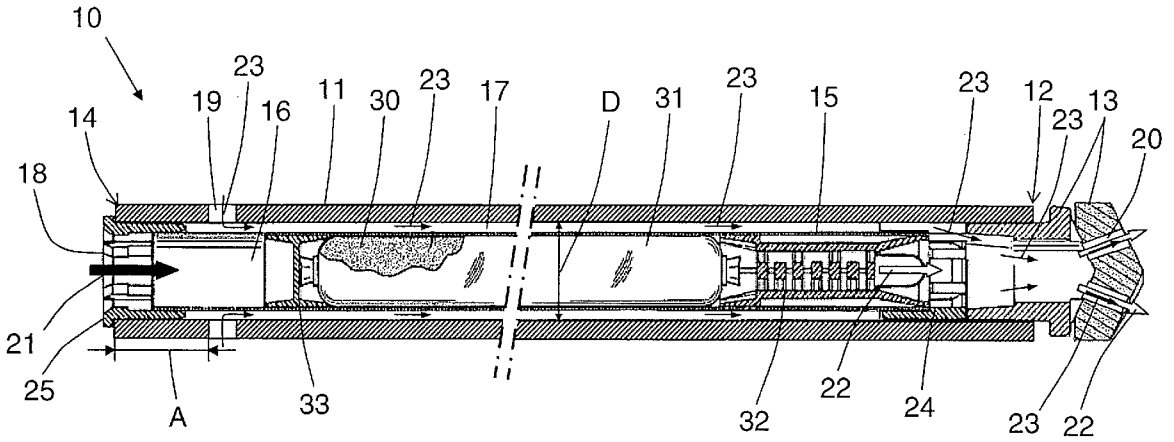
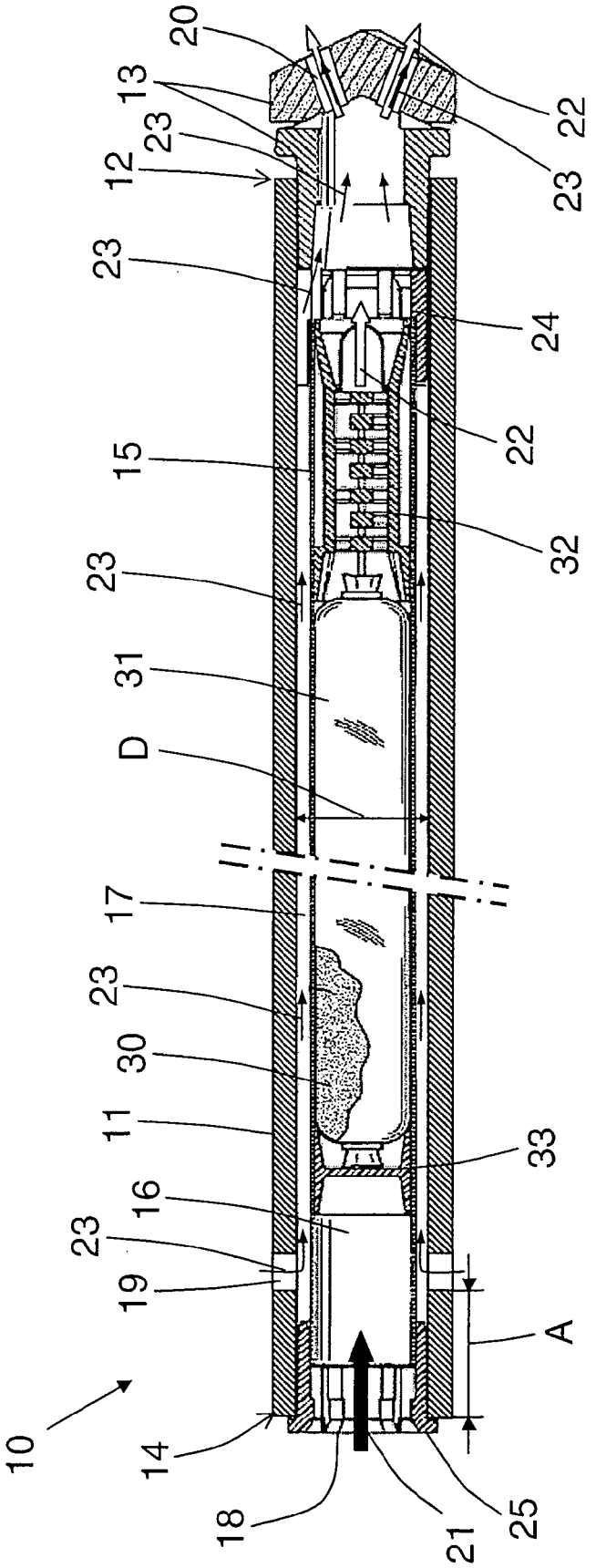
(57) **ABSTRACT**

A self-drilling connection anchor (**10**) includes an anchor tube (**11**), a drilling head (**13**) provided at the first end (**12**) of the anchor tube (**11**), an inner tube (**15**) arranged in the anchor tube (**11**) and having an interior space (**16**) for receiving an ejectable mass (**30**), a first axial, with respect to the longitudinal axis (L) defined by the anchor tube, opening (**18**) provided in a region of the second free end (**14**) that communicates with the interior space (**16**) of the inner tube (**15**), at least one outlet opening (**20**) provided in a region of the drilling head (**13**), and at least one second radial, with respect to the longitudinal axis (L), opening (**19**) provided in the region of the free second end (**14**) and communicating with the at least one outlet opening (**20**) via an intermediate space (**17**) formed between the anchor tube (**11**) and the inner tube (**15**).

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SELF-DRILLING CONNECTION ANCHOR

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a self-drilling connection anchor including an anchor tube having a first end and a free second end, a drilling head provided at the first end, an inner tube arranged in the anchor tube and having an interior space for receiving an ejectable mass, a first axial, with respect to the longitudinal axis of the anchor, opening provided in a region of the second free end of the anchor tube and which communicates with the interior space of the inner tube, and at least one outlet opening provided in a region of the drilling head.

[0003] 2. Description of the Prior Art

[0004] Self-drilling anchors of the type described above are used in mining and tunneling where they serve for securing hollow spaces such as tunnels, galleries, and the like. During formation of hollow spaces, mechanical characteristics and in particular the carrying capacity of rock layers are reduced. These rock layers are anchored to and are, thereby, are secured to further, remote, undamaged rock layers with the connection anchors.

[0005] The setting process of the known connection anchors is carried out in two steps. In the first step, a connection anchor is drilled in the rock formation with a drilling tool. Stone, which is produced and crushed by the drilling head of the drill anchor which is provided a the boring direction-side end of the anchor, is removed through outlet openings, which are provided in a region of the drilling head, and the intermediate space between the bore wall and the outer circumference of the connection anchor. During a wet drilling process, water is fed in the setting direction, and the removed and crushed stone is flushed out. During a dry drilling process, the removed and crushed stone is aspirated. In the second step, from the side of the connection anchor remote from the setting direction side, a chemical mass is ejected in the direction of the bore bottom with a press-out mechanism. The mortar mass, which is located in the connection anchor, is thereby brought in the bore from the connection anchor through the outlet opening and the drilling head and is distributed in the intermediate space between the bore wall and the outer circumference of the anchor tube.

[0006] German Publication DE 103 36 043 A1 discloses a self-drilling connection anchor of the type discussed above. The disclosed connection anchor has an anchor tube at the first end of which a drilling head is provided, and a second free end. In the anchor tube, an inner tube is arranged. Between the inner tube and the anchor tube, there is provided an intermediate space extending along the longitudinal axis of the anchor tube at least in some regions and formed as an annular gap. The intermediate space provides for feeding of water during a wet drilling process. In the drilling head, to this end, outer openings are provided and which communicate with the intermediate space and which are connectable with the interior space of the inner tube. In the interior space, an ejectable mass, which is packed in a foil bag, is located. The chemical mass can be delivered through the outlet openings in the drilling head. At the second, free end of the anchor tube, there is provided a first opening that extends along the longitudinal axis and communicates with the intermediate space and the interior space of the inner tube.

[0007] An object of the present invention is to further improve a self-drilling connection anchor described in the German Publication DE 103 36 043 A1.

SUMMARY OF THE INVENTION

[0008] This and other objects of the present invention, which will become apparent hereinafter, are achieved by providing at least one second, radial, with respect to the longitudinal axis, opening in the region of the free second end which communicates with at least one outlet opening via an intermediate space formed between the anchor tube and the inner tube.

[0009] By separation of the access to the intermediate space, on one hand, from the access to the interior space of the inner tube, on the other hand, crossing of the fed flushing water and the advanced press-out means can be prevented. Separate feeds can be provided at the axial, first opening and the at least one radial, second opening. Thereby, conventional drill drive motors with central flushing water feeding in which no second loop for a high-pressure press-out media is available, can be used.

[0010] Advantageously, there are provided two opposite radial, second openings whereby a sufficient flushing water supply is insured when the connection anchor rotates.

[0011] Advantageously, the at least one radial, second opening is provided in the anchor tube. This insures a good access to the radial, second opening from outside and that it opens directly in the intermediate space.

[0012] It is further advantageous when the at least one radial, second opening is spaced from the free second end of the anchor tube by a distance corresponding to from 0.5 to 2 times of an anchor tube diameter. Thereby, it is achieved that common flushing water systems are used simultaneously with common drill motors with the central water feeding.

[0013] The novel features of the present invention, which are considered as characteristic for the invention, are set forth in the appended claims. The invention itself, however, both as to its construction and its mode of operation, together with additional advantages and objects thereof, will be best understood from the following detailed description of preferred embodiment, when read with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In the drawings:

[0015] Single FIGURE shows a longitudinal cross-sectional view of a self-drilling connection anchor according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] A self-drilling connection anchor **10** according to the present invention, which is shown in the FIGURE, includes a steel anchor tube **11** and an inner tube **15** which is formed of steel or a plastic material and is arranged in the anchor tube **11**. In the interior space **16** of the inner tube **15**, there is arranged an ejectable mass **30** such as one-or multi-component chemical mass and which is packed in a foil bag **31**. The anchor tube **11** has a first end **12** with a drilling head **13** inserted therein, and a free second end **14**. The anchor tube **11** defines a longitudinal axis L of the connection anchor **10**. A first centering element **24** and a second centering element

25 axially and radially retain the inner tube **15** in the anchor tube **11**, so that the inner tube **15** can be guided coaxially with respect to longitudinal axis L.

[0017] In the region of the free second end **14** of the anchor tube **11**, there is provided an axial, with respect to the longitudinal axis L, first opening **18** that communicates with the interior space **16** of the inner tube **15**. Through this first opening **18**, a pressure medium (first arrow **21**), e.g., water can be fed under pressure in the interior space **16**, whereby the foil bag **31**, which is located in the inner tube **15**, is ejected by a press-out member **33** displaceable in the inner tube **15** between the axial first opening **18** and the foil bag. The mass **30**, which is contained in the foil bag **31**, is displaced through a mixing member **32**, whereby the components of the mass **30** intermix. The intermixed mass **30** can then be displaced in the direction of the second arrow **22** from the inner tube **15** or the mixing member **22** into the drilling head **13** and further through outlet opening **20**, which are provided in the drilling head **13**, into an outer space that surrounds the connection anchor **10**.

[0018] The centering element **24**, **25** so position the inner tube **15** in the anchor tube **11** that an intermediate space **17** in form of an annular gap is formed between the anchor tube **11** and the inner tube **15**. In the region of the free second end of the anchor tube **11**, there are provided, in the anchor tube **11**, two, opposite, with respect to the longitudinal axis L, radial openings **19**. The radial openings **19** communicate with outlet openings **20** formed in the drilling head **13** via the intermediate space **17**. The intermediate space **17** provides for feeding water in case of a wet drilling process. The water can flow through the radial second openings **19** into the intermediate space **17** (third arrow **23**) and, finally, through the outlet openings **20** in the outer space of the connection anchor **10**.

[0019] The radial second openings **19** are preferably axially spaced by a distance A from the free second end **14** of the anchor tube **11**. The distance A corresponds to form 0.5 to 2 times of the diameter D of the anchor tube **11**.

[0020] It should be clear that the outlet openings **20**, the intermediate space **17**, and the radial second openings **19** can be used for aspirating bore dust during a dry drilling process.

[0021] Though the present invention was shown and described with references to the preferred embodiment, such is merely illustrative of the present invention and is not to be construed as a limitation thereof and various modifications of the present invention will be apparent to those skilled in the art. It is therefore not intended that the present invention be limited to the disclosed embodiment or details thereof, and the present invention includes all variations and/or alternative embodiments within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A self-drilling connection anchor (**10**) for use in mining and tunneling, comprising an anchor tube (**11**) defining a longitudinal axis (L) and having a first end (**12**) and a free second end (**14**); a drilling head (**13**) provided at the first end (**12**); an inner tube (**15**) arranged in the anchor tube (**11**) and having an interior space (**16**) for receiving an ejectable mass (**30**); a first axial, with respect to the longitudinal axis (L), opening (**18**) provided in a region of the second free end (**14**) that communicates with the interior space (**16**) of the inner tube (**15**); at least one outlet opening (**20**) provided in a region of the drilling head (**13**); and at least one second radial, with respect to the longitudinal axis (L), opening (**19**) provided in the region of the free second end (**14**) of the anchor tube **11** and communicating with the at least one outlet opening (**20**) via an intermediate space (**17**) formed between the anchor tube (**11**) and the inner tube (**15**).

2. A connection anchor according to claim **1**, comprising two opposite radial second openings (**19**).

3. A connection anchor according to claim **1**, wherein the at least one second radial opening (**19**) is provided in the anchor tube (**11**).

4. A connection anchor according to claim **1**, wherein the at least one radial second opening (**19**) is spaced from the free second end (**14**) of the anchor tube (**11**) by a distance (A) corresponding to from 0.5 to 2 times of an anchor tube diameter (D).

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