

[54] TUNNELING SHIELD

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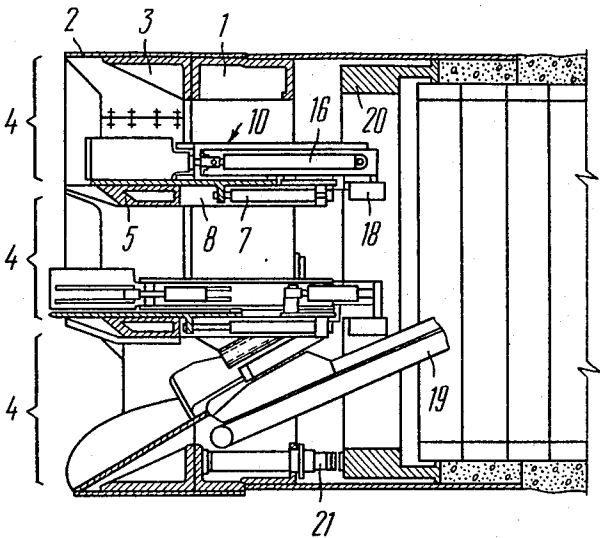
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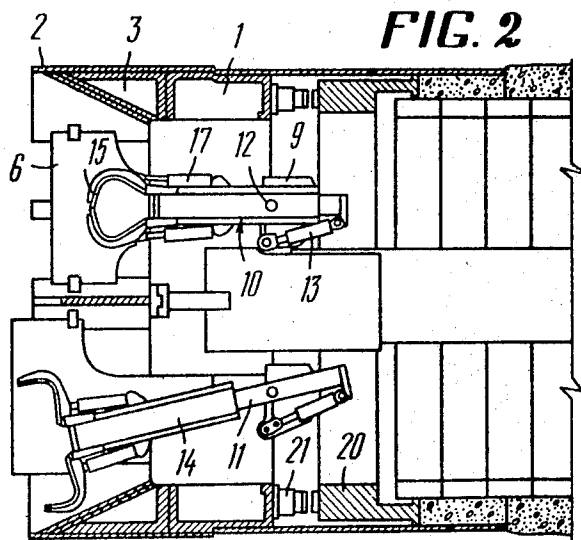
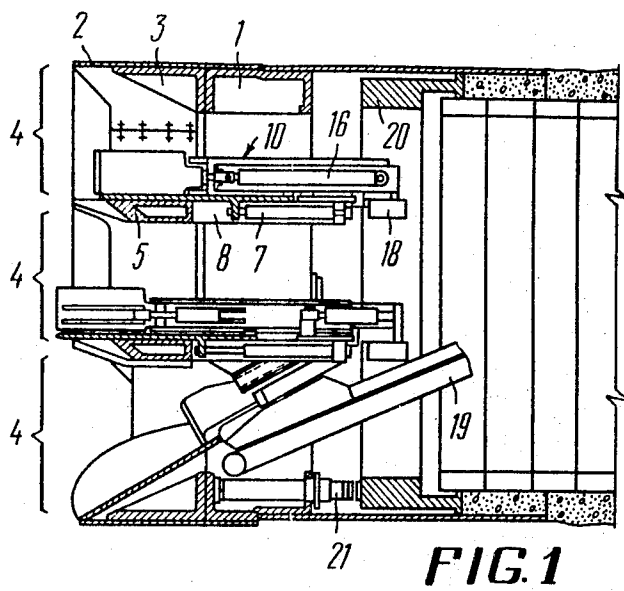
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[57] ABSTRACT

A tunneling shield for soft loose soils, whose face working space is divided into several decks accommodating the working tools the latter being installed so that they can move not only forward and backward but also from one side to the other.

1 Claims, 2 Drawing Figures





TUNNELING SHIELD

The present invention relates to the building of tunnels and more specifically it relates to the tunneling shields for soft loose solids.

Known in the art are the tunneling shields for soft loose soils wherein the face working space is divided by stationary horizontal partitions into several decks accommodating the working tools, mainly of the excavating type.

The working tools in the known tunneling shields are installed on frames moved forward and backward over the deck platforms by means of hydraulic jacks. (See, for example, the Author's Certificate No. I58926, Cl. I9f3/02, USSR).

With such an arrangement of the working tools the side sections of the face adjoining the shield body prove to be poorly accessible to the working tools and, when the shield encounters inclusions of hard ground, mechanized tunneling across the entire width of the face becomes impossible which increases the resistance to the penetration of the shield and, consequently, reduces the tunneling speed, leads to unproductive expenditures of energy, etc.

An object of the invention resides in eliminating the disadvantages of the known shields for tunneling in soft loose soils.

The main object of the invention is to install the working tools in the shield in such a manner that they could be brought closer to the shield body walls when necessary.

This object is accomplished by providing a tunneling shield for soft loose soils, whose face working space is divided into a number of decks accommodating the working tools wherein, according to the invention, each working tool is installed on a movable link of a telescopic boom whose link, immovable during the telescopic movement, is articulated in such a manner that the boom can be moved by a drive from one side of the face to the other. This allows the working tools to be brought to the side sections of the face.

Now the invention will be described in detail by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal vertical section of the tunneling shield for soft loose soils according to the invention;

FIG. 2 is a longitudinal horizontal section of the same shield.

The tunneling shield consists of a body I (FIGS. 1,2) with a lip 2, said body having a cutter ring 3 in the front part thereof. The face working space of the shield is divided into a number of decks 4 (FIG. 1) by stationary horizontal partitions 5 on which are installed platforms 6 (FIG. 2) which are moved out by means of jacks 7 (FIG. 1) secured on cantilever brackets 8 of the partitions 5.

Secured to the same cantilever brackets are supporting plates 9 (FIG. 2) carrying the telescopic booms 10 (FIGS. 1,2).

The link 11 (FIG. 2) of each boom 10, immovable during the telescopic movement, is fastened to the supporting plate 9 with the aid of a vertical axial joint 12. This allows the boom 10 to be turned by the hydraulic jacks 13 from one side to the

other.

The ends of the links 14 of the booms 10, movable during the telescopic movement, carry the working tools 15 of the excavating type.

The telescopic motion of the booms 10 is effected with the aid of the hydraulic jacks 16 (FIG. 1).

The jaws of the working tools 14 are turned by the hydraulic jacks 17 (FIG. 2).

The operation of the hydraulic jacks 13, 16, 17 is controlled by the electromagnetic valve switches 18 (FIG. 1). The excavated soil is taken away by the conveyor 19 installed in the lower deck 4.

In the course of tunneling, when the shield encounters a considerable resistance to its progressive movement, the working tools 15 are set in operation for working the ground by layers.

For this purpose, first the hydraulic jacks 7 move forward the platforms 6 which break up the face within the limits of the cutting part of the shield and prevent caving in of the soil before the horizontal partitions 5 after which the working tools 15 are moved forward and backward by the telescopic motion of the booms 10 which are actuated by the jacks 16, for grabbing the soil by the jaws of the working tool 15 and taking it back to the unloading ports. Then, as the shield moves forward, this working cycle is repeated in the same sequence. When the shield encounters inclusions of hard ground, this ground becomes compacted near the walls of the shield body which increases greatly the resistance to its forward motion. In this case the booms are moved sidewise additionally; before moving the working tools 15 forward, they are turned by the hydraulic jacks 13 towards the required side and through the required distance after which the telescopic booms 10 move the working tools forward for biting into the soil and grabbing it; then the boom is again turned to the initial position and the working tool is retracted backward as described above. Then the cycles are repeated in the same sequence.

The proposed tunneling shield is adapted for building tunnels with either a prefabricated reinforced-concrete lining or a monolithic concrete lining. In the latter case the concrete mix is pressed by the ring 20 powered by the shield jacks 21.

The shield may be realized with one or more telescopic booms 10 on each deck 4.

What we claim is:

1. A tunneling shield for soft loose soils comprising: a body having a cutter ring; a plurality of horizontal partitions in said cutter ring positioned one above another so as to divide the space with the cutter ring into decks; vertical joints installed on said horizontal partitions; telescopic booms; each said boom having a link immovable during the telescopic movement of said boom and mounted on one of said joints; a further link of each of said booms being movable during said telescopic movement; further vertical joints installed on each said last mentioned movable link; and excavating members comprising cooperative jaws positioned on said further vertical joints.

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