

[54] **DEVICE FOR ERECTION OF PRESSED MONOLITHIC LINING IN UNDERWORKINGS**

[76] **Inventors:** Vladimir Alexandrovich Khodosh, ulitsa Burdenko, 16/12, kv. 16; Sergei Fedorovich Salov, ulitsa Akademika Koroleva, 9, korpus 2, kv. 284; Valentin Alexandrovich Ivanov, ulitsa Konstantinova, 4, kv. 25; Arkady Ivanovich Mozhaev, Khavsko-Shabolovsky pereulok, II, kv. 446; Evstafya Andreevich Vasilenko, Rizhsky proezd, 1/5, kv. 50, all of Moscow; Budu Pavlovich Pachulia, ulitsa Paulova, 8-a, kv. 4, Ibilisi; Iosif David-Yankelevich Fishman, ulitsa Mashinostroitel'naya, 13, kv. 20, Yasinovataya Donetskoi oblasti; Ivan Iosifovich Melnikov, ulitsa Mashinostroitel'naya, 15, kv. 20, Yasinovataya Donetskoi oblasti; Faust Ivanovich Rusanov, ulitsa 8 Marta, 7, Yasinovataya Donetskoi oblasti, all of U.S.S.R.

[22] **Filed:** Jan. 13, 1971

[21] **Appl. No.:** 106,015

[30] **Foreign Application Priority Data**

Jan. 19, 1970 U.S.S.R. 1,396,644

[52] **U.S. Cl.** 249/180, 249/178

[51] **Int. Cl.** B28b 7/30

[58] **Field of Search** 25/32, 131.6, 131.5 D; 249/180-182, 178

[56]

References Cited**UNITED STATES PATENTS**

2,870,518	1/1959	Bossner	25/131.6
1,460,165	6/1923	McArthur	249/181
1,279,561	9/1918	Loxterman	25/131.6
2,114,785	4/1938	Porter	25/131.6 X
3,383,824	5/1968	Linnemann	25/131.6 X
1,530,283	3/1925	Nelson	249/180
1,983,117	12/1934	Bishop	249/178
1,734,773	11/1929	Murray	249/181

Primary Examiner—J. Spencer Overholser

Assistant Examiner—B. D. Tobor

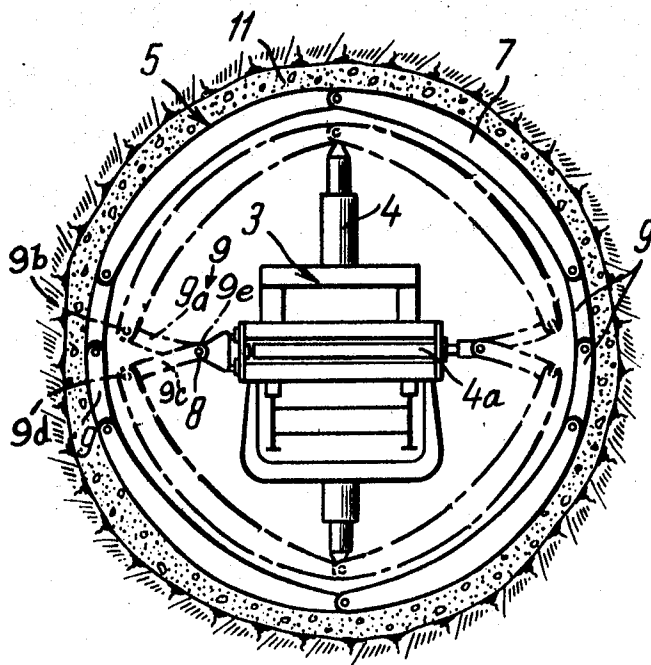
Attorney—Holman & Stern

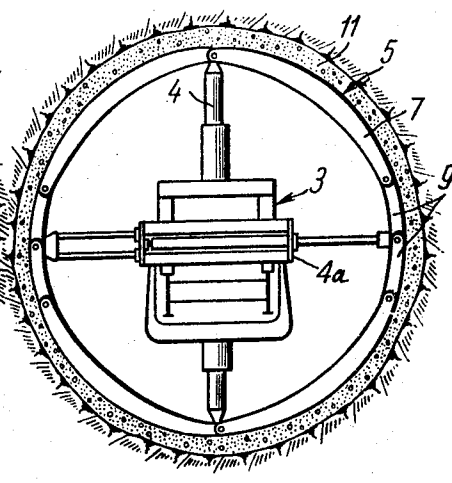
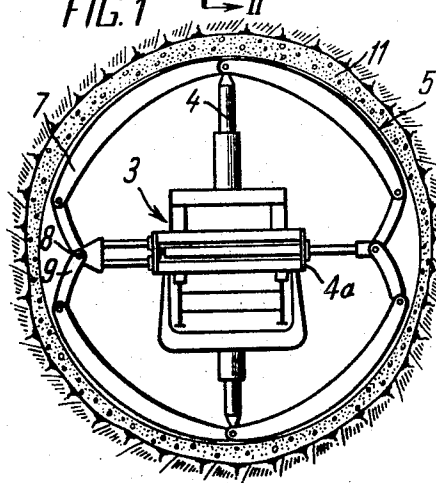
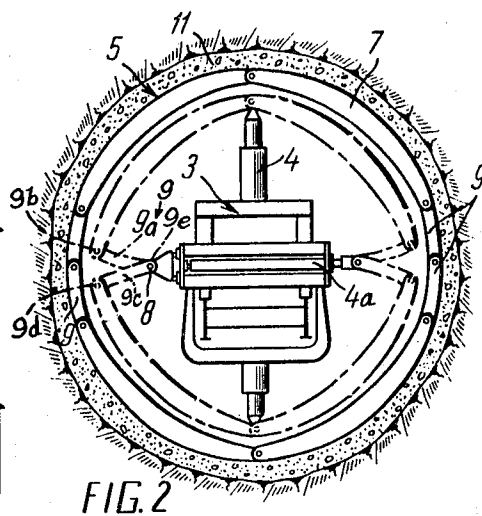
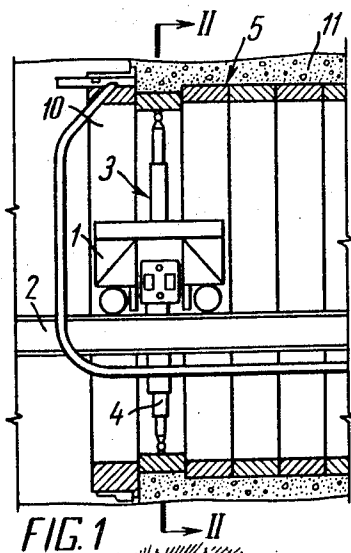
[57]

ABSTRACT

A collapsible device for the erection of a pressed monolithic lining in underworkings wherein a pressing member, along its perimeter, is made of separate parts linked through hinge joints connected to drives acting in radial directions, and in which case the end portions of the parts adjoining the hinge-joints connected to the drives are adapted for rotation or function as toggle mechanisms. This makes it possible to develop an adequate pressure force in the radial directions.

1 Claim, 5 Drawing Figures





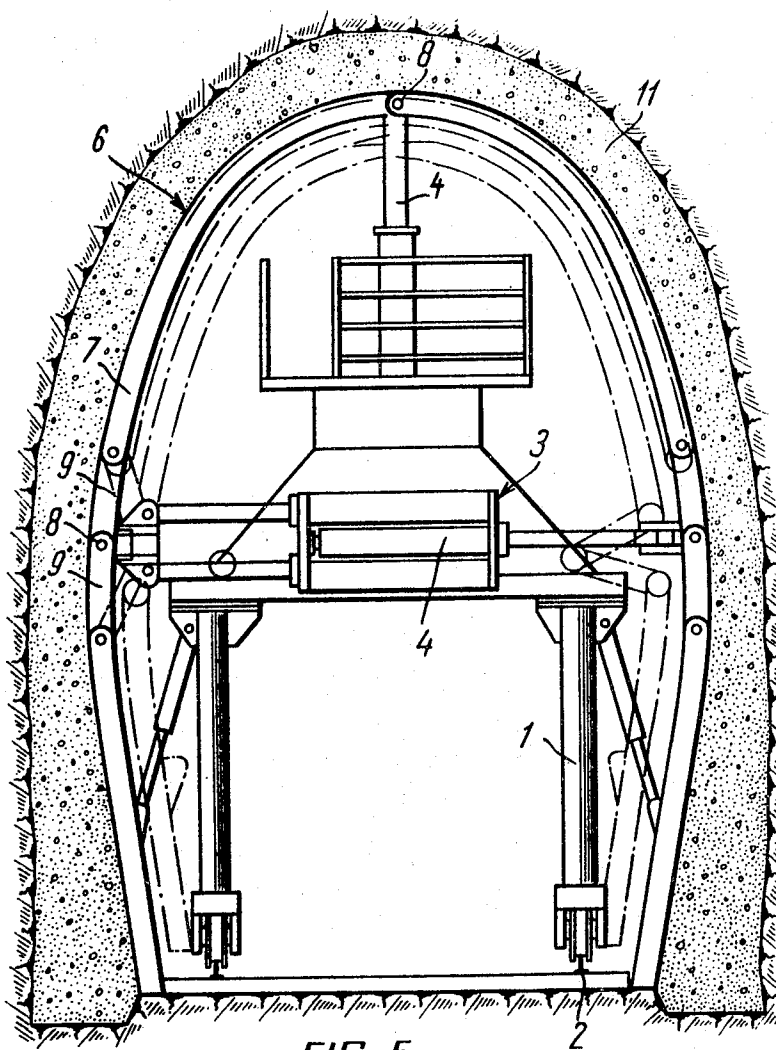


FIG. 5

DEVICE FOR ERECTION OF PRESSED MONOLITHIC LINING IN UNDERWORKINGS

BACKGROUND OF THE INVENTION

The present invention relates to underground building and, more particularly, to collapsible devices for the erection of pressed monolithic linings in underworkings.

PRIOR TECHNIQUES

At the present time, the devices used for the erection of a pressed monolithic lining provide for pressing the lining material in a direction along the axis of the underworking.

These devices consist of a structure including a support ring wedged in the walls of the underworking, a ring-shaped pressing member, and hydraulic jacks transmitting a pressure force to the pressing member. Such a device operates in a combination with a falsework. The lining material is fed between the falsework and the wall of the underworking and is pressed by the end face of the pressing member, thus compacting this material between the falsework and the walls of the underworking.

These devices are disadvantageous in that they can not be used for the erection of linings of the underworkings made by a drill-explosion method which does not provide for a definite and constant gap between the outer shape of the pressing member and the walls of the underworking.

Furthermore, the longitudinal pressing of the linings is associated with difficulties in reinforcing such linings, because a considerable displacement of the reinforcement occurs in the process of pressing the lining.

Attempts have been made to provide devices for pressing the linings in a radial direction. However, as far as we know, up to the present time there is no efficient device providing for a radial pressure on a material being pressed which is adequate for making a lining of a required quality.

An object of the present invention is to eliminate the disadvantages of the known devices for the erection of pressed monolithic linings in underworkings.

The main object of the invention is to provide such a pressing member which, when used in conjunction with drives, makes it possible to obtain a required pressure applied in a radial direction onto the material being pressed.

SUMMARY OF THE INVENTION

This object is accomplished by providing a device for the erection of pressed monolithic lining of an underworking including a pressing member and drives developing a pressing force, in which, according to the invention, the pressing member, along the perimeter is made of separate parts interconnected through hinge joints and connected to drives acting in radial directions, and in which case, the end portions of at least two interconnected parts are adapted to rotate or function as toggle mechanisms so as to increase the separating force.

The invention will be better understood from the following detailed description of a particular embodiment thereof, reference being made to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical longitudinal sectional view of the device for the erection of pressed monolithic lining in underworkings according to the present invention;

FIG. 2 is a cross-section view of the same device taken along the line II—II in FIG. 1, wherein the pressing member is shown in a retracted position in dot-dash lines and in the expanded position in solid lines;

FIG. 3 is a view similar to that shown in FIG. 2, wherein the pressing member is shown in a position preceding the beginning of pressing the lining;

FIG. 4 is a view similar to FIG. 3, the pressing member being shown in a position after completing the pressing operation; and

FIG. 5 is a view of the same device in which the pressing member has a horseshoe shape.

DETAILED DESCRIPTION OF THE INVENTION

The device includes a self-propelled transport carriage 1 (FIGS. 1 and 5) moving along a track 2 inside a tunnel.

Mounted on the carriage 1 is a hydraulic thrust mechanism 3 (FIGS. 1-5) consisting of a system of hydraulic jacks 4, 4a acting in a radial direction and a pressing member. The pressing member may be ring-shaped (FIGS. 1-4) as shown at 5 or horseshoe shaped (FIG. 5) as shown at 6 depending on the configuration of the underworking and the lining.

The ring-shaped member 5 is used for erection of the linings in annular underworkings, while the horseshoe-shaped pressing member 6 is used for operation in underworkings having a corresponding shape when the bottom of the underworking is concreted separately from its walls and arch.

The pressing member 5, 6 along its perimeter is composed of four parts 7 (FIGS. 2-5) linked through hinge joints 8. In this case, end portions 9 of the parts 7 are capable of rotating. The end portions 9 constitute toggle mechanisms. More specifically, each end portion includes a first link 9a pivotally connected at 9b to one part 7 and a second link 9c pivotally connected at 9d to another part 7. The free ends of the links 9a and 9c are pivotally interconnected as shown at 9e. The hydraulic jacks 4a are operably connected to the pivotal connections 9e. This allows the overall dimensions of the member 5, 6 to be changed. The present device is equipped with a sealing member 10 closing at one end a gap 11 (FIGS. 1-5) between the walls of the underworking and the pressing member.

The sealing member 10 may be mounted on the same carriage 1 or spaced therefrom, in which case the member 10 moves independently as fast as the lining is being erected.

The concrete mixture is fed into the gap 11 between the walls of the underworking and the circular surface of the member 5, 6.

Before supplying the concrete mixture, the hydraulic jacks are moved in a radial direction, thus installing the pressing member 5, 6 into a position shown in FIG. 3, which position is selected so that further movement of the jacks in the radial directions to the position shown in FIG. 4 and corresponding to a predetermined outline of the lining results in compacting the concrete mixture for 10-15 percent of its initial volume.

The concrete mixture is pressed by the circular surface of the pressing member 5, 6 in a radial direction,

3

with the pressure force appearing due to an increase in the dimensions of the pressing member 5, 6 when the end portions 9 are turned to the outside by the hydraulic jacks 4, 4a of the thrust mechanism 3, while at the end face the gap between the walls of the underworking and the pressing member is closed by the sealing member 10.

As fast as the lining is being pressed, the device is being moved on the carriage 1 along the underworking.

In order to accelerate the process of pressing the lining, it is expedient to use several pressing members 5 (FIG.1) disposed successively along the length of the underworking. In this case, each member 5 should be detachably connected to the hydraulic jacks 4, 4a.

After completing the pressing, the pressing member is disconnected from the hydraulic jacks 4, 4a, and the carriage 1 is moved back relative to the direction of erection of the lining to the place of location of the last of the pressing members 5.

The hinge joints 8 of the last pressing member 5 are connected to the hydraulic jacks 4. By pulling-in the rods of the hydraulic jacks 4, 4a, the member 5 is ar-

4

ranged in a transport position and the carriage 1 is again moved forwardly, thus returning to the next pressing place, and thereafter, all operations for pressing the lining are effected as described above.

We claim:

1. A collapsible device for the erection of pressed monolithic linings of underworkings comprising in combination: a pressing member, said pressing member being defined by separate parts along the perimeter thereof, hinge joints through which said parts of said pressing member are connected to each other, a first drive means connected to each hinge joint and acting in radial directions, at least two of said parts having end portions, each end portion including two links, one link being pivoted at one end to one of said two parts, the other link being pivoted at one end to the other of said two parts, and a pivotal connection between the other ends of said two links, and a further drive means connected to each pivotal connection and acting in radial directions to increase the separating force.

* * * * *

25

30

35

40

45

50

55

60

65