Oct. 14, 1969 V. A. KHODOSH ET AL 3,472,036

SHIELD FOR CONSTRUCTING TUNNELS

Filed Jan. 19, 1968

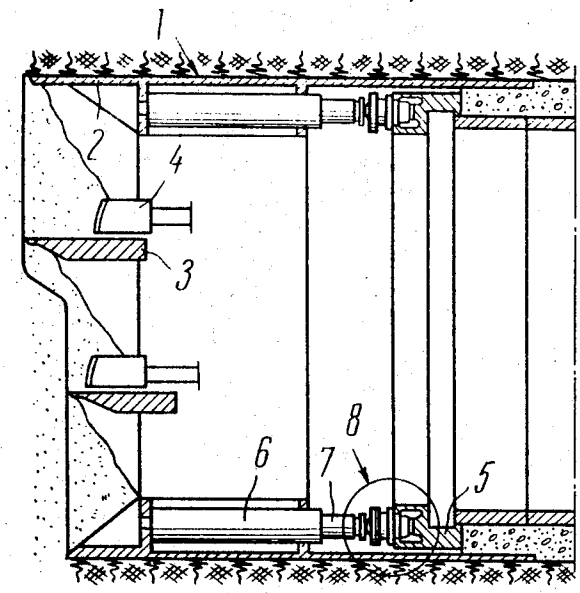


FIG. 1

FIG. 2

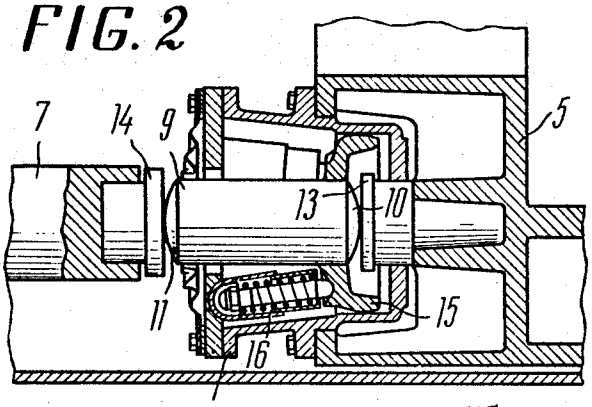
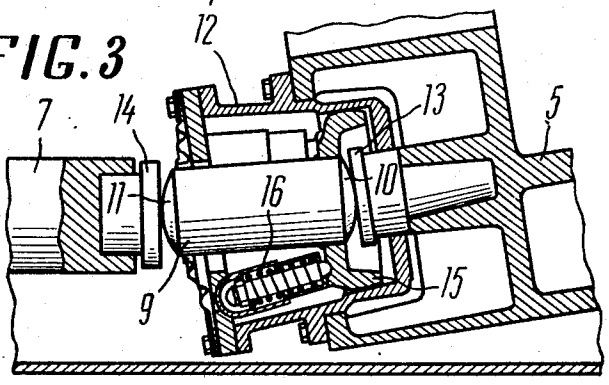


FIG. 3



United States Patent Office

3,472,036
Patented Oct. 14, 1969

3,472,036

SHIELD FOR CONSTRUCTING TUNNELS

Vladimir Alexandrovich Khodosh, Valentin Alexandrovich Ivanov, Sergei Fedorovich Salov, Arkady Ivanovich Mozhaev, Evstafy Andreevich Vasilenko, Moscow, Aliovsad Ibragim Ogly Abdulragimov and Sergei Nikolaevich Vlasov, Baku, and Leonid Ivanovich Saveliev, Evgeny Moiseevich Bolotin, and Leonid Konstantinovich Khaidurov, Moscow, U.S.S.R., assignors to Gosudarstvenny Ordena Trudovogo Krasnogo Znameni Proektno-Izvskatelsky Institut Metrogiprotrans, Moscow, U.S.S.R.

Filed Jan. 19, 1968, Ser. No. 699,181
Claims priority, application Union of Soviet Socialist Republics, Jan. 23, 1967, 1,129,134
Int. Cl. E01g *5/16, 5/08;* E21d *23/00*
U.S. Cl. 61—85 3 Claims

ABSTRACT OF THE DISCLOSURE

A shield is provided for constructing tunnels with concrete walls, the shield containing hydraulic jacks which act on a pressing ring to press against the concrete, there being provided support devices between the rods of the jacks and the pressing ring, each support device having a rod with spherical end surfaces respectively in rolling contact with an associated jack rod and the pressing ring.

The present invention relates to constructing tunnels and, more particularly, to shields which are used in the construction of tunnels with concrete walls.

Known in the prior art are shields for constructing tunnels with concrete walls, which press the concrete dressing material by the reactive force of shield jacks by means of a pressing ring mounted behind a carrier ring of the shield.

During the concrete pressing operation, especially when the shield moves along curved portions of the route, the pressing ring becomes warped, which results in mutual displacement of the end portions of the rods of the shield jacks and the face surface of the pressing ring, as well as in a transverse bending of the rods, the latter effect sharply decreasing the efficiency of the shield jacks and even putting them out of operation due to the appearance of intolerable deformations.

In the known shields the transmission of forces of the shield jacks through joints to the pressing ring does not relieve the rods of the shield jacks of the transverse bending, since at great specific pressures said joints do not provide for the radial displacement of the end portions of the jack rods with respect to the face surface of the pressing ring (c.f. U.S.S.R. Author's Certificate No. 141,177, Cl. 19f, 3/02).

It is an object of the present invention to eliminate the disadvantages of the known shields.

The present invention has for its principal object the provision of contact between the jack rods and pressing ring along a rolling surface.

In the accomplishment of the above and other objects of the invention, support devices are mounted between the rods of the shield jacks and the pressing ring, said support devices contacting the rods and the ring along rolling surfaces.

A roller member of the support device is essentially a rod having spherical end surfaces, enclosed in a casing rigidly secured in the pressing ring the end surfaces contacting flat inserts, one of which is secured to the pressing ring, and the other—to the end portion of a shield jack rod.

For centering the rod of the roller support device inside the casing thereof and for returning the rod to its initial position after it is relieved of load, a spring-loaded ferrule is employed.

The following detailed description of the invention is given with reference to the accompanying drawing, in which:

FIG. 1 is an elevation view which diagrammatically shows, partially in section, a shield, built in accordance with the present invention;

FIG. 2 is a section view which shows a support device, according to the invention; and

FIG. 3 shows the support device with the pressing ring displaced relative the shield.

The shield of the invention (FIG. 1) comprises a housing with a knife edge and carrier rings **2**. Installed in the head portion of the shield housing are horizontal platforms **3** with devices **4** disposed thereon to perform mechanized working of the face.

Mounted behind the carrier ring is a ring **5** which is used for pressing against the concrete dressing material and ring **5** will hereinafter be refered to as a pressing ring, for the sake of simplicity.

Disposed in the carrier ring **2** are hydraulic jacks **6** resting against the pressing ring **5** and serving for the pressing of the dressing material.

The pressing ring is of annular form, and, depending upon the cross-section of the tunnel, may be of any shape.

Installed between rods **7** (FIGS. 1, 2 and 3) of the hydraulic jacks **6** and the pressing ring **5** are support devices **8**. A roller member in the device **8** is essentially a rod **9** (FIGS. 2 and 3) having spherical end surfaces **10** and **11**. The rod **9** is mounted in a casing **12** rigidly secured in the pressing ring **5**.

The end surfaces of rod **9** contact flat inserts **13**, **14**, insert **13** being secured to the pressing ring **5**, and insert **14** being secured to the end portion of the rod **7**.

For centering the rod **9** inside the casing **12**, a spring-loaded ferrule is employed, said ferrule being rigidly connected to the rod **9**.

During the operation of the hydraulic jacks **6**, axial forces from the rods **7** are transmitted through the flat inserts **14**, rods **9** and flat inserts **13** to the pressing ring **5**. If the ring **5** is warped, the rods **9** roll with their spherical end surfaces **10** and **11** along the inserts **13** and **14**, respectively, which precludes the bending of the rods of the hydraulic jacks.

When rods **7** are retracted from the ring **5**, the rods **9** are relieved of load and, under the action of springs **16** on the ferrule **15**, the rod **9** of each device **8** returns to its initial position.

We claim:

1. A shield for the construction of tunnels with concrete walls, said shield comprising: a housing including a carrier ring; a pressing ring mounted within said housing behind said carrier ring for pressing against the concrete wall; jacks supported by said carrier ring and facing said pressing ring to apply force thereto; and support devices interposed between respective jacks and said pressing ring; each support device including means with spherical surfaces respectively in rolling contact with the associated jack and said pressing ring.

2. A shield as claimed in claim 1 wherein said means comprises a rod having opposite ends which are provided with said spherical surfaces, each said support device including a casing rigidly secured in said pressing ring and a pair of flat inserts for each support device, one insert being secured to said pressing ring and the other to the associated jack, said spherical surfaces being in rolling contact with said flat surfaces.

3. A shield as claimed in claim 2 wherein each support device comprises a spring-loaded ferrule installed inside the respective casing for centering said rod in said casing and returning the rod to its initial position after removal of force by the jack.

References Cited

UNITED STATES PATENTS

1,355,290 10/1920 Updegraff ..... 61—85

FOREIGN PATENTS

443,158 2/1936 Great Britain.

JACOB SHAPIRO, Primary Examiner

U.S. Cl. X.R.

299—33