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MODULAR TECHNOLOGY FOR SUPPORTING UNDERGROUND EXCAVATIONS

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ABSTRACT

NOVELTY - The invention relates to a modular technology for underground excavation timbering, which provides for the introduction of a modular-type system, obtained by associating the current classic metallic timbering, as a base construction, with the process of reinforcement by rock anchorage, the purpose of which is to give the reinforced rocks the role of partially taking over the mining pressure. According to the invention, in order to reduce the high consumption of metal used for supporting mining roadways, the technology provides for the mounting of some metallic sets (1) at upper bays, while providing the targeted bearing capacity by their association with the anchorage timbering having the role of reinforcing and taking advantage of the rock bearing capacity itself, the metallic sets (1) being supported on some barrings (2) made of round wood placed on the excavation floor, their longitudinal stability requiring the mounting of some metallic clamping elements (3) by means of the same type of flange used for joining the timbering elements, the modular-type supporting construction providing a wire mesh (4) to be mounted for wrapping purposes, which may be of continuous type or made of welded panels, the mesh (4) being fixed onto the rock by means of some anchors (5) with reinforcing role, the mounting of which consists in introducing and fixing, by friction or with a junction binder, the metallic rods into the mine shafts.

KEYWORDS

Anchorage timbering,
Modular technology,
Mining,
Reinforcing

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INTRODUCTION

The invention consists in the realization of a supportive technology that ensures the stability of underground excavations over much longer periods of time, with the recording of higher load-bearing capacities, at the expense of labor consumption and much lower maintenance costs. The new technology removes the disadvantages encountered in the case of classical metal support technology, in that, in order to ensure the portability of the excavation support and stability on all its points on the contour, including in the side walls where the voltage value can record maximum values, the installation of metal anchors for consolidation is foreseen. In this case, the effectiveness of the new supporting technology results from the installation of metal reinforcements in fields/distances increased from those currently practiced in the case of single-use mounting of the support, and the problem of taking over the excess pressure resulting by reducing the number of reinforcements mounted at the linear excavation meter level is solved by mounting the anchors in rows between the metal reinforcements.

RESULTS

The new technology provides for the execution of basic metal support, the use of laminated profiles that allow contact to be made at the joint both between the flanks and at the collar level, in the hollows practiced for this purpose at its base, resulting in the elimination of the current phenomenon of decalibration of profiles (parts 1 and 2, fig.1). For the joining of metal elements, the new supporting technology provides for the use of an appropriate bridle, the lower flat clamps of which (landmark 4, fig. 1) ensure contact and tightening of the elements, also at the level of the profile collar, in the hollows practiced for this purpose at the level of the lower laminate (pillar). For the coupling and joining of the support elements, the round necklace (landmark 3, fig.1) is also included in the bridle's composition, with a thread at the ends, with a view to tightening the bridle by means of the nut (landmark 5, fig.1). The collection of nuts from the bridles is done at pre-arranged tightening torques, manually, by using dynamometer or mechanical keys, with special compressed air-operated devices.

The new modular support technology can be practically transposed on the basis of reinforcement/support monographs designed for this purpose, according to the criterion of the conditions of the deposit and the site areas encountered in the execution of underground excavations. According to such a criterion, Figure 5 shows the reinforcement monograph corresponding to the modular support of thN 21 th-hand metal reinforcements, in combination with Split Set anchors, for the execution of a mining gallery at the GDM 11 profile, in hard rocks, of the type of faults.

Compared to the existing claims, the new construction allows to increase the service life in elasto-culising mode, and by periodically intervening in order to control and collect the nuts from the bridles ensure the load-bearing capacities for which this type of support is designed.

As a rock anchoring process, support technology involves the use of friction anchors of the Split Set type (fig.2), the working principle of which is shown in Figure 3, or the Swellex anchorage process (fig.4).

Expected Effects

The following advantages are obtained by the development of the new support technology:

- ensuring an elasto-sliding operating regime of metal support, for loads close to but smaller in size to the carrying capacity of the support recorded at a given time;
- increasing the degree of stability and safety in operation of underground excavations;
- considerable reduction in labour consumption and additional costs for carrying out excavation maintenance work (re-arming, re-profiling, planning);
- reducing the operating time of the panels and abattoir fields by reducing the time allocated to maintenance work, resulting in ensuring the rhythmicity of production for the main beneficiaries;
- ensuring rhythmicity in the execution of laminated and bridle profiles, as well as rock-strengthening anchors and continuity in the underground exploitation of various useful mineral substances.

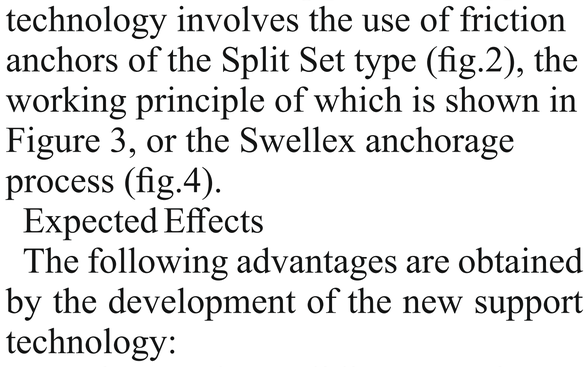

Figure 1.

Figure 2. Split Set Tubular Metal Anchor

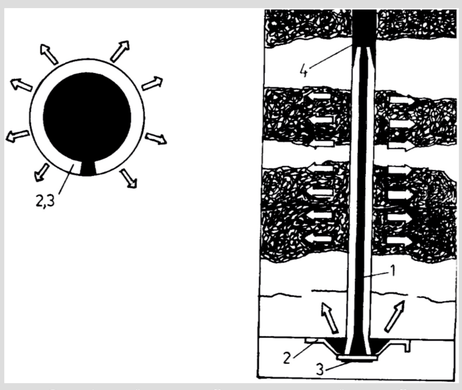

Figure 3. Action of supporting forces in the case of split set anchor

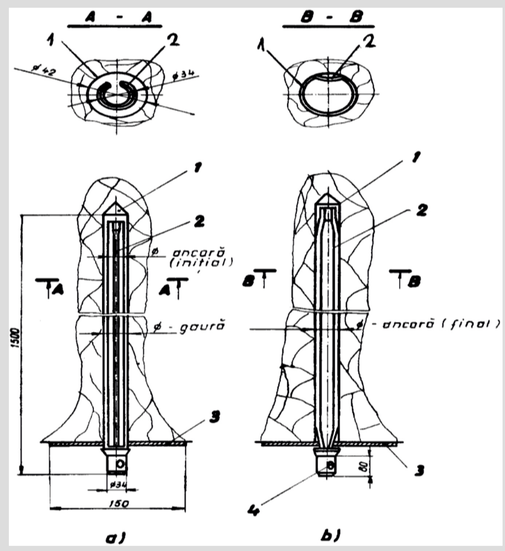

Figure 4. Principle of fixing the Swellex anchor in the rock massif:
a) the free introduction of the anchor
b) elastic expansion of the rod

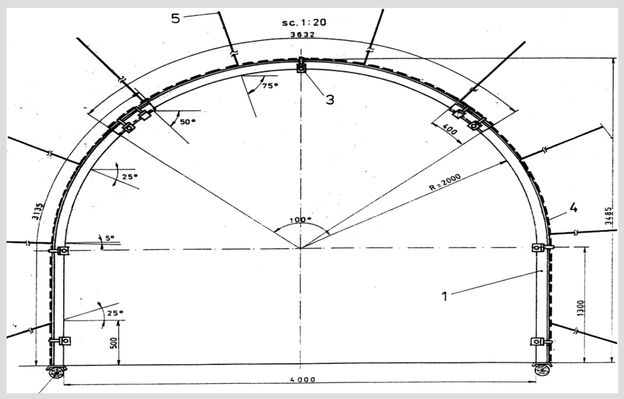

Figure 5. GDM–11 profile support monograph:
Combined support - metal reinforcements