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(54) **SUPPORT PILLAR FOR MINE ROOF**

TRÄGERSÄULE FÜR EIN MINENDACH

PILIER DE SUPPORT POUR DE TOIT DU MINE

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Description

[0001] The subject matter of the invention is an artificial pillar, especially an inter-room pillar, for use in underground mining, especially in the mines of non-ferrous metal ores and chemical raw materials where single-layer, room and pillar or strip mining methods are used.

[0002] In order to minimize the loss of raw material left in the goaf, and to facilitate the transition of pillars into the range of operation under the post-destruction characteristics, inter-room pillars are removed to residual dimensions, and waste rock, being a part of the exploitation gate, can be located within the post-exploitation space so-called goaf, as dry backfill. The Polish patent description PL158092B1 discloses a room and pillar method of deposit exploitation in which the pillars located near the roof falls are partially removed by means of cuttings whereas the post-exploitation void is eliminated by roof collapse forced by blasting works, and at the same time the remains of pillars left in the post-exploitation void are blasted. In order to minimize the loss of raw material, the most efficient use of the deposit is sought. The Polish patent description PL 189980 B1 discloses a technology for the clean removing of mineral deposits using a room and pillar method, which lie in that the row of pillars located near the goaf line is mechanically removed after previously placing a substitute support pillar formed from the waste rock in the vicinity thereof.

[0003] The Chinese patent description CN107524470B discloses an artificial pillar which consists of a specific fluid-permeable geotextile bag reinforced with steel hoops. In the upper part, the pillar comprises a supply spigot and a vent spigot. The filling of the pillar is a mixture of a solidifying substance and broken waste rock. A similar solution is also disclosed in the Chinese patent description CN103562497B.

[0004] The polymer geo grids, are used in the mining industry as elements of backfill dam or as safety grids, forming the lining of the excavation. For example, international patent application WO2008/087537A2 discloses the use of a flexible polypropylene-polyethylene grid as a reinforcement for a geotextile in a backfill dam. Similarly, a polymeric safety grid made of polypropylene with flame retardant additives is known from US patent description US5096335A. The grid provides additional protection of the roof and the underground sides of work to which it is anchored and can also be used in room and pillar mining methods. The location of the safety grid on the pillars sidewalls and along the rooms prevents the rock from falling into the excavation and reducing its lateral dimensions, while at the same time it does not constitute an obstacle, in case of the need of ripping the pillars.

[0005] GB2186607 is considered the closest prior art publication disclosing a collapsible flexible containing bag with an inlet for fluid cementum material for use with a monolithic pumped pack system for structural support of a mine roof.

[0006] The purpose of the invention is to develop an easy-to-construct artificial pillar especially an inter-room pillar, which would make it possible to reduce the loss of raw material in the residual pillars left, where it is not possible to remove the deposit cleanly and, moreover, to make it possible to manage in situ waste rock whose increasing production is associated with the small thickness of seams or pseudo-seams and the need to rip off waste rock in the roof or seam floor during mining and preparatory works.

[0007] The essence of an artificial pillar, especially an inter-room pillar formed of a spatial structure filled with waste rock, is that the spatial structure is made of a flexible grid and comprises a sidewalls and a closing sidewall and a bottom resting on the floor, whereas at the top of the sidewalls and the closing sidewall are suspended to the roof by means of rock bolts, wherein the rock bolts suspending the closing sidewall being equipped with additional fastening elements.

[0008] Advantageously the flexible grid is made of a polymer, especially polyethylene or polypropylene.

[0009] Also, it is advantageous when the spatial structure is made of a single cross-shaped grid element and it is also advantageous when the spatial structure is made of two grid sections crossing each other in the area constituting the bottom of the spatial structure.

[0010] It is advantageous when the closing sidewall is located on the side of the exploitation front. Furthermore it is advantageous when the side edges of the adjacent sidewalls and the closing sidewall are fastened together by means of connecting elements or stitched together with cords.

[0011] It is advantageous when additional fastening elements are hooks or catches.

[0012] The subject matter of the invention is illustrated in the embodiment in the simplified drawing, in which Fig. 1 shows a spatial structure prepared for filling with waste rock, and Fig. 2 - the completed artificial inter-room pillar.

[0013] The artificial inter-room pillar (Fig. 1, Fig. 2) was built in a row of inter-room pillars, in place of the support pillar that was previously removed. On the floor 2 is the square bottom 5 of a spatial structure made of a single, originally flat cross-shaped polypropylene grid element, the arms of which are the sidewalls 6, 7, 8 and the closing sidewall 9, wherein the closing sidewall 9 is located on the side of the face of the exploitation front, and the sidewalls 7, 8 are located on the side of the adjacent pillars 3 and 4 in the same row, and the sidewall 6 - from the side of the goafs. The sidewalls 6, 7 and 8 are suspended directly on the roof 1 by means of rock bolts 10, 11, 12 and 13. The closing sidewall 9 located on the side of the face of the exploitation front, is fastened on additional fastening elements 14 and 15, which are hooks, constituting the rock bolt 13, 14 equipment. There is waste rock 16 inside the spatial structure. The side edges of the adjacent sidewalls 6 and 7, 6 and 8, 7 and 9, and 8 and 9, are additionally fastened together at half height by means of connecting elements, not shown in the drawing, which

are steel stitches .

[0014] In another embodiment of the pillar, the spatial structure is made of two intersecting sections of polyethylene grid, which overlap in the area constituting the bottom 5 of the spatial structure, and the side edges of the adjacent sidewalls 6, 7, 8, 9 of the spatial structure are stitched along the entire height with a polyethylene cord.

[0015] The use of flexible grid for the construction of the spatial structure makes it possible to spread it on the floor 2 of the excavation and freely suspend the sidewalls 6, 7, 8, whereas the closing of the closing sidewall 9 can be realized in stages, by pinning or stitching from below a section of its edge with the edges of the adjacent walls 7 and 8 after locating a storage parts of waste rock 15 in the emerging spatial structure of the artificial pillar. After the spatial structure is completely filled with waste rock 16, the structure is finally closed by suspending the closing sidewall 9 by means of fastening elements 14 and 15 and by additionally clipping or stitching its edges with the edges of the adjacent walls 7 and 8.

[0016] The invention is defined by the features specified in the appended claims.

Claims

1. An artificial pillar, especially an inter-room pillar, formed of a spatial structure filled with waste rock, wherein the spatial structure is made of flexible grid and comprises sidewalls (6, 7, 8) and a closing sidewall (9) and a bottom (5) resting on the floor (2), whereas at the top the sidewalls (6, 7, 8) and the closing sidewall (9) are suspended to the roof (1) by means of rock bolts (10, 11, 12, 13), wherein the rock bolts (12,13) suspending closing sidewall (9) are equipped with additional fastening elements (14).
2. The pillar according to claim. 1, **characterized in that** the flexible grid is made of a polymer, especially polyethylene or polypropylene.
3. The pillar according to claim 1, **characterized in that** the spatial structure is made of a single cross-shaped grid element.
4. The pillar according to claim 1, **characterized in that** the spatial structure is made of two grid sections intersecting in the area of the bottom (5).
5. The pillar according to claim 1, **characterized in that** the closing sidewall (9) on the side of the exploitation front is located.
6. The pillar according to claim 1, **characterized in that** the side edges of adjacent to each other sidewalls (6, 7, 8) and closing sidewall (9) are fastened together by means of connecting elements or stitched together with cords.

7. The pillar according to claim. 1, **characterized in that** the additional fastening elements (14) are hooks or catches.

Patentansprüche

1. Künstlicher Pfeiler, insbesondere Zwischenraum-pfeiler, gebildet aus einer mit Taubgestein gefüllten räumlichen Struktur, **wobei** die räumliche Struktur aus einem flexiblen Gitter gebildet ist und Seitenwände (6, 7, 8) und eine abschliessende Seitenwand (9) sowie einen auf der Sohle (2) aufliegende Boden (5) umfasst, wobei die Seitenwände (6, 7, 8) und die abschliessende Seitenwand (9) mittels Ankerbolzen (10, 11, 12, 13) oben am First (1) eingehängt sind, wobei die die abschliessende Seitenwand (9) eingehängenden Ankerbolzen (12, 13) mit zusätzlichen Befestigungselementen (14) versehen sind.
2. Pfeiler nach Anspruch. 1, **dadurch gekennzeichnet, dass** das flexible Gitter aus einem Polymer, insbesondere Polyethylen oder Polypropylen, besteht.
3. Pfeiler nach Anspruch 1, **dadurch gekennzeichnet, dass** die räumliche Struktur aus einem einzigen kreuzförmigen Gitterelement besteht.
4. Pfeiler nach Anspruch 1, **dadurch gekennzeichnet, dass** die räumliche Struktur aus zwei sich in dem den Boden (5) bildenden Bereich schneidenden Gitterabschnitten besteht.
5. Pfeiler nach Anspruch 1, **dadurch gekennzeichnet, dass** sich die abschliessende Seitenwand (9) abaufreitseitig angeordnet ist.
6. Pfeiler nach Anspruch 1, **dadurch gekennzeichnet, dass** Seitenränder der benachbarter Seitenwände (6, 7, 8) und der Schließseitenwand (9) mittels Verbindungselementen miteinander verbunden oder mit Seilen zusammengenäht sind.
7. Pfeiler nach Anspruch. 1, **dadurch gekennzeichnet, dass** die zusätzlichen Befestigungselemente (14) Haken oder Klemmen sind.

Revendications

1. Pilier artificiel, notamment une esponge, constitué d'une structure spatiale remplie de gangue, dans laquelle la structure spatiale est réalisée en grille flexible et comporte des parois latérales (6, 7, 8) et une paroi latérale de fermeture (9) et un fond (5), reposant sur la sole (2), et en haut les parois latérales (6, 7, 8) et la paroi latérale de fermeture (9) sont suspendues au toit (1) à l'aide des boulons d'ancra-

ge (10, 11, 12, 13), les boulons d'ancrage (12, 13) auxquels est suspendue la paroi latérale de fermeture (9) étant équipés d'éléments de fixation additionnels (14).

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2. Pilier selon la revendication 1, **caractérise en ce que** la grille flexible est réalisée en polymère, notamment en polyéthylène ou en propylène.
3. Pilier selon la revendication 1, **caractérise en ce que** la structure spatiale est réalisée en un seul élément de grille en forme de croix. 10
4. Pilier selon la revendication 1, **caractérise en ce que** la structure spatiale est réalisée en deux tronçons de grille, qui se croisent dans la zone constituant le fond (5). 15
5. Pilier selon la revendication 1, **caractérise en ce que** la paroi latérale de fermeture (9) se situe du côté du front d'exploitation. 20
6. Pilier selon la revendication 1, **caractérise en ce que** les bords latéraux, des parois latérales voisines (6, 7, 8) et de la paroi latérale de fermeture (9) sont attachées l'une à l'autre à l'aide des éléments de liaison ou sont ligaturés avec des cordons. 25
7. Pilier selon la revendication 1, **caractérisé en ce que** les éléments de fixation (14) constituent des crochets ou des clips. 30

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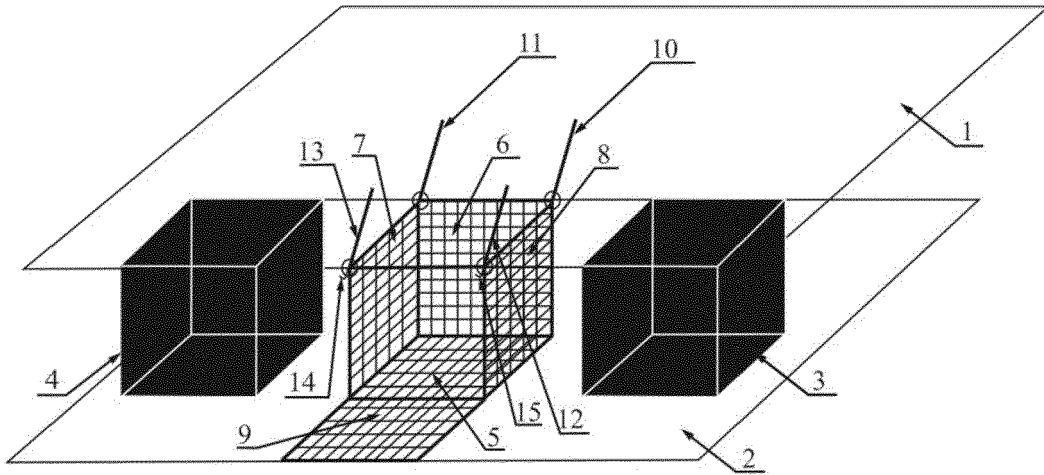


Fig. 1

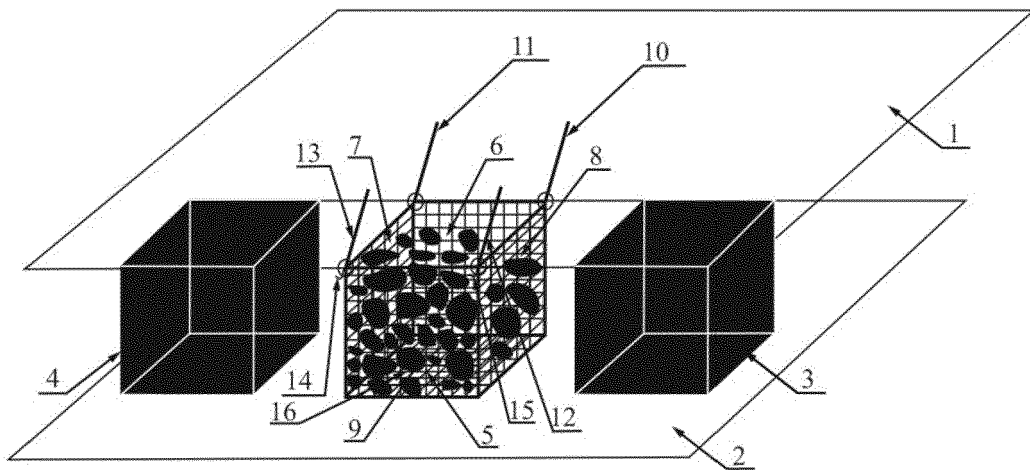


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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