The screw aggregate for frontal extraction of thin coal seems

For solving the problem of manless coal mining from thin and hyperfine seams a screw aggregate for frontal manless extraction of thin coal seams SAFE is developed. It has a working body and the transport device (fig. 1, 2), made as a unit from located in series along working face of a longwall 1 auger sections AS 2 with the roll 3, on which lobes 4 roller cutters 5 are mounted. On outer side of each AS 2 shield fence 7 are fixed with the help of rods 6, which ends with shares 8 and 9.

SAFE contains the devices for creation of thrust force on working face and moving of the aggregate which is executed as input drive 10 connected to each AS 2 with the located pressure running rolls 11 which are supported on a base flange of seam 12 and are connected by the thrust rods 6 to the rods 3 of AS 2. Thus auger sections both auger 3, and input 10 drives are connected with each other using the half-cardan joints HCJ 13 which transmits rotation and supposes angular moving of the sections only in a vertical plane. First (angular) section AS 2 from the side of massif is made as the non-coring bit in the form of rotation shell 14 on which roller cutters 5 for drilling-out of coal along a longwall are placed.

Roller cutters 5 on lobes 4 of AS 2 make effective frontal destruction of coal in a seam, simultaneously providing small resistance to rotation of AS 2 (effect of the frictionless bearing). It considerably reduces capacity of drive for coal mining. Presence of a shield fence 7 forms transport space AS 2 that promotes transportation of coal and eliminates its losses on a longwall.

Pressure running rolls 11 which lean on a seam bottom 12, provide during rotation a necessary pressure of roller cutters 5 on working face of a longwall and move the aggregate forward. Half-cardan joints on rolls 3 and 10 allow the aggregate to adapt for change of hypsometry of a seam and provide linearity of a longwall that is important for its no-failure movement.

Aggregate SAFE works as follows. Before the beginning of coal extraction from a working site it is necessary to bore out borehole cavity with the help of first (angular) AS. Gradually while moving of a drill hole the AS 2 are spliced one by one while the drill hole will not achieve necessary depth. After that hydraulic engines which are on the drift are switched on which rotate AS 2, and with the help of rolls 11 of pressure devices hold down roller cutters 5 on lobes 4 AS to coal face 1. Roller cutters 5 clamp contact to coal face 1 and destroy its edge, which on depth 30-50 mm is always crushed by an abutment pressure of rocks before working face of 1 longwall. Coal gets inside AS 2. Screws, being rotating in

limits of a seam thickness (a rotational speed equal 1-2 Hz), bear on roller cutters 5, as on rolling-contact bearings.

The shield fence 7 retains the destroyed mass of coal in limits AS 2, and directive shares 8 and 9 brush coal from a seem floor 12 and a roof covering 15 seams, ensuring the aggregate sustainability of moving in a seam. Pressure device, due to rotation of its rolls 10 (with frequency of 0,002...0,001 Hz) and its running rollers 11, holds down AS 2 to working face 1, gradually move the aggregate forward along the seam. The aggregate itself is half in a coal seam and so the rock pressure affects the edge of coal seam.

Aggregate SAFE has tall technical-and-economic indexes. Speed of frontal moving of aggregate varies within 0,05...2 mm/s. For a seam thickness of 0,5 m the coal stream from the aggregate can exceed of 70...100 kg /s. The deformation of seem' roof has not time behind a high speed of a longwall (3-4 m/h). The console of main roof is extended, that changes pressure control in a longwall from a traditional complete roof fall to more safe and forecast smooth lowering-in. The increased console of seem roof of a longwall promotes breaking coal in front of screws that simplifies separation of coal from a massif. As the aggregate is half hidden in a coal massif, there is no necessity for powerful supporting of a seem roof, and its easy fence is sufficient. As presence of people at a longwall is completely eliminated, there is no necessity to ventilate a longwall.

Table - Technical-and-economic indexes of aggregate SAFE

The name of parameters	Value
1. Length of a longwall, m	up to 150 m
2. Angle of incline of seam, grad	from 0 up to 50
3. Thickness of coal seam, m	from 0,4 up to 1,2
4. Speed of moving of a longwall, m / hour	2-4
5. Installed capacity of motors, kWt	200-300
6. Mass of the aggregate of 1 m in a longwall, kg / m	200-300
7. Productivity on 0,7 m seam with a length of longwall 100 m, t/hour	150-200
8. Quantity of shift, men	2 … 3
9. Pay-back period when introduced, month	3-5

To advantages of SAFE are: a manless coal mining, in-line production engineering, total automation of operations, high efficiency, excluding of final and auxiliary operations, operation in neutral gaseous environment without ventilation of a longwall that eliminated "gas barrier", simplicity and low cost of construction, extraction of thin and hyperfine coal seams, a wide range of application.

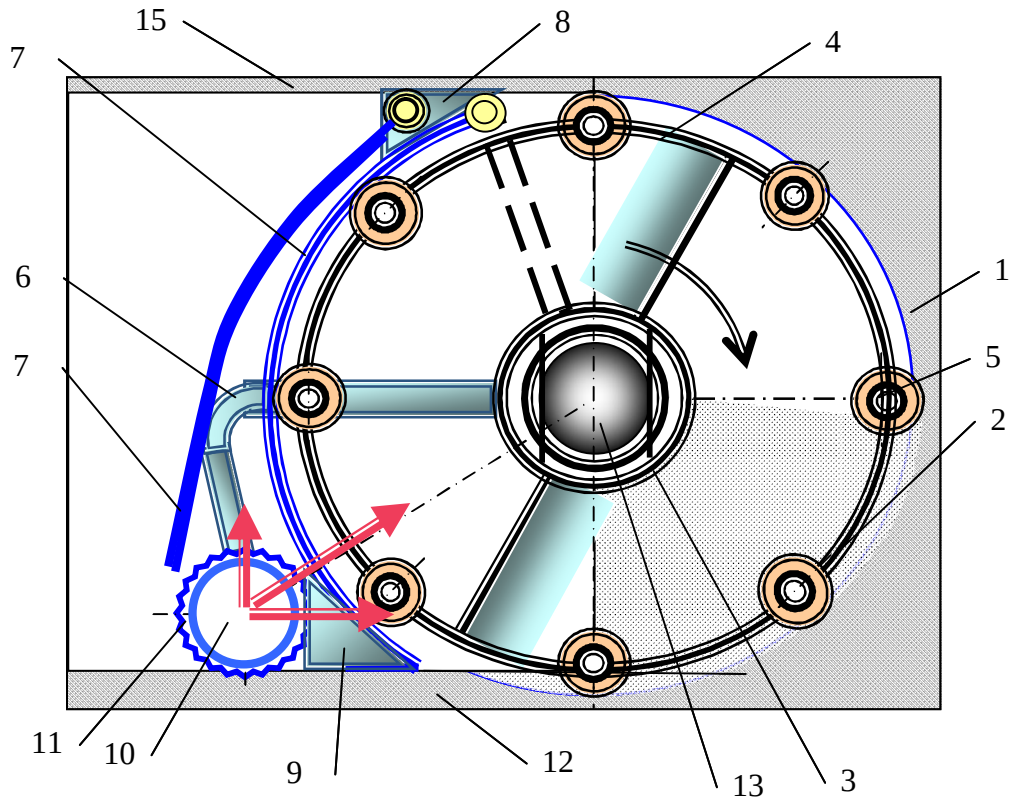

Fig. 1 – Screw aggregate of frontal extraction SAFE
of thin and hyperfine coal seams

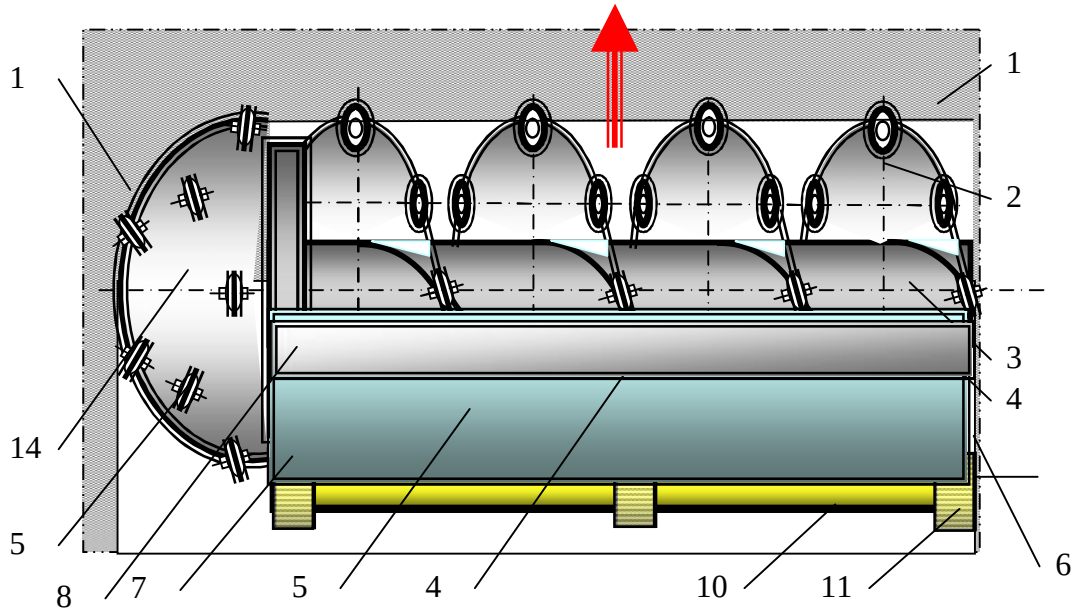

Fig. 2 – End (angular) section of aggregate SAFE, the top view

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