United States Patent [19]

Wehner et al.

[11] **3,739,586**

[45] **June 19, 1973**

[54] **SELF-ADVANCING COAL FACE SUPPORT SYSTEM**

[75] Inventors: **Karl-Heinz Wehner,** Castrop-Rauxel; **Willy Watermann,** Dortmund-Lanstrop; **Gunter Bell,** Horneburg, all of Germany

[73] Assignee: **Klockner-Werke AG,** Duisburg, Germany

[22] Filed: **June 1, 1972**

[21] Appl. No.: **258,867**

[30] **Foreign Application Priority Data**

June 5, 1971 Germany ..... P 21 28 023.9

[52] **U.S. Cl.** ..... **61/45 D,** 248/357

[51] **Int. Cl.** **E21d 23/00**

[58] **Field of Search** ..... 61/45 D; 299/31, 299/33; 248/357; 91/170 MP

[56] **References Cited**

UNITED STATES PATENTS

2,910,282	10/1959	Barrett	61/45 D
3,362,169	1/1968	Groetschel	61/45 D
3,570,255	3/1971	Shuttleworth	61/45 D

FOREIGN PATENTS OR APPLICATIONS

832,741	1/1970	Canada	61/45 D
1,948,280	1/1971	Germany	61/45 D
1,958,322	11/1970	Germany	61/45 D
212,198	0/1968	U.S.S.R.	61/45 D

Primary Examiner—Dennis L. Taylor
Attorney—Malcolm W. Fraser

[57] **ABSTRACT**

A self-advancing coal face support system includes support shields arranged side-by-side, each support shield comprising a front roof shield, a caving shield, a packing shield and a floor sill pivotally connected together. Each support shield is movable relative to a supporting frame for the face conveyor by means of hydraulic cylinders, the floor sill including a tapered front end portion which engages bearers on the frame. The packing shield and the caving shield both include laterally movable side shields movable under the action of hydraulic thrust pistons when a correction is to be effected in the direction of advance of the support system.

3 Claims, 5 Drawing Figures

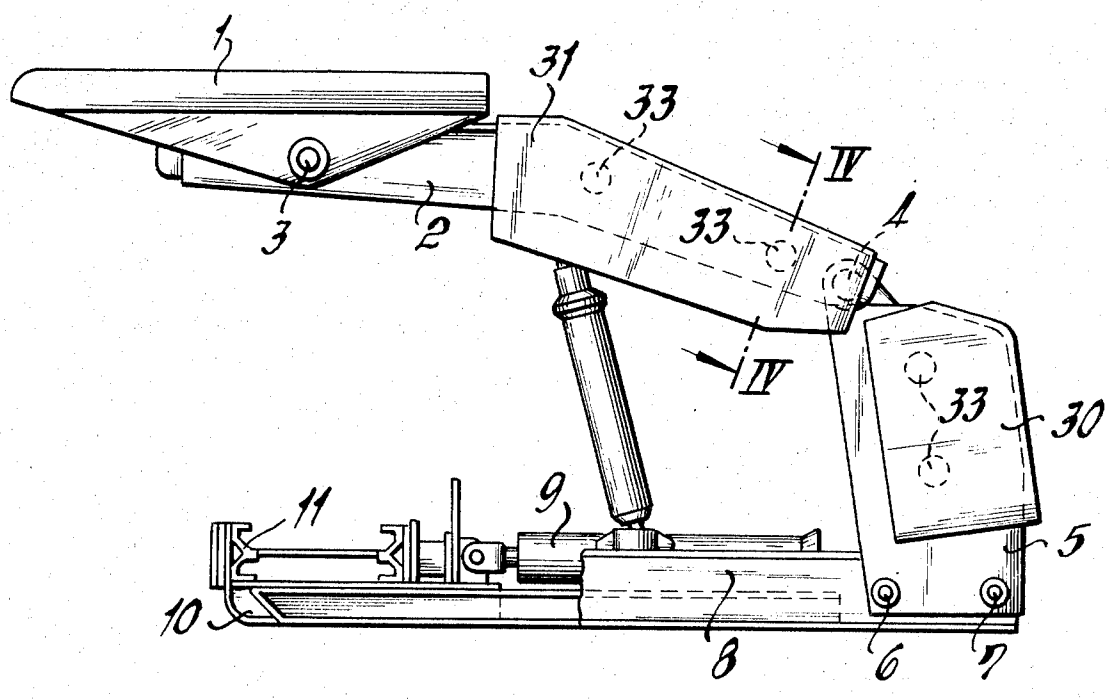


FIG. 1

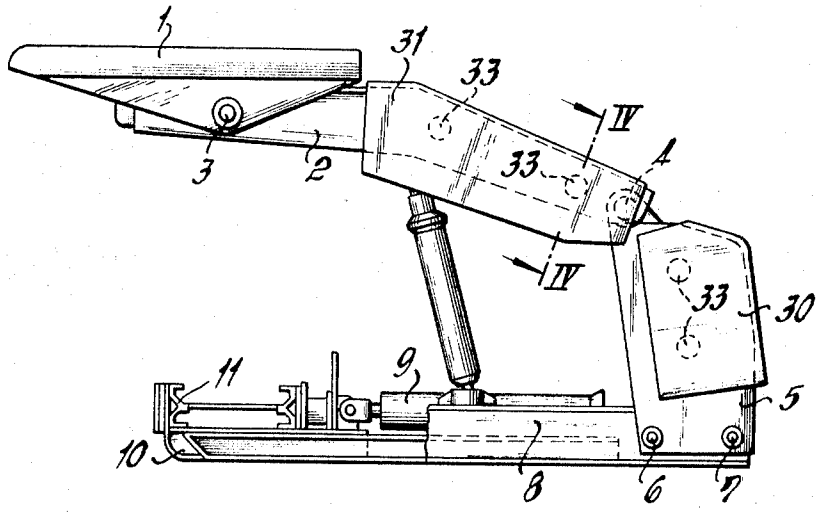

1
31
33
IV
3
2
33
4
IV
33
30
11
9
5
10
8
6
7

FIG. 2

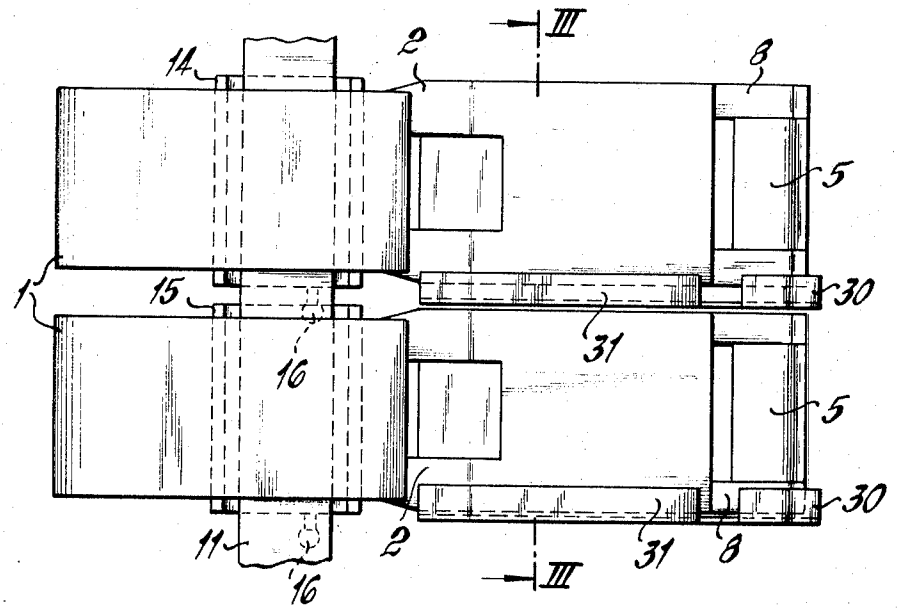

III
14
2
8
5
1
15
30
31
16
5
30
11
2
31
8
16
III

FIG. 3

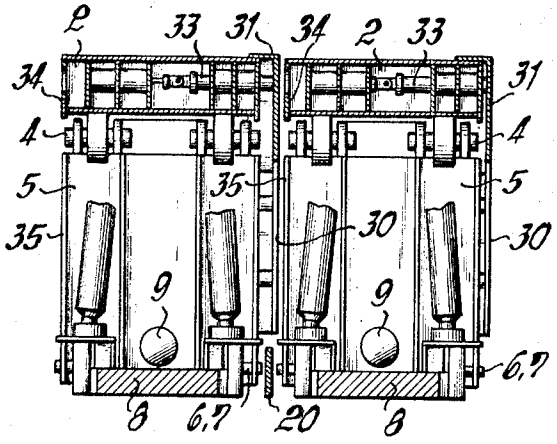


FIG. 4

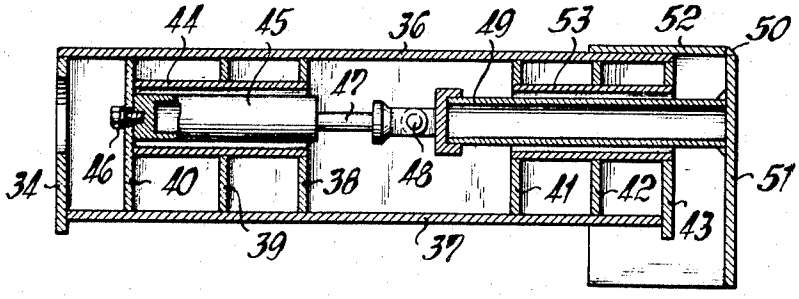
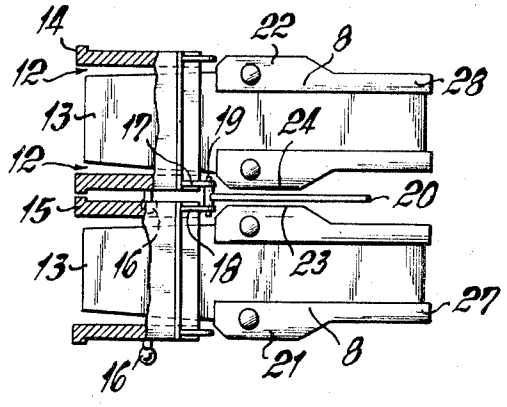


FIG. 5



SELF-ADVANCING COAL FACE SUPPORT SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to a self-advancing coal face support system with support shields arranged side-by-side, the support shields comprising a front roof shield, a caving shield hingedly connected thereto, a packing or rubble shield articulated to the caving shield and a floor sill, and being articulated by means of one or more shifting cylinders to an advanceable abutment extending through the coal face, in particular a supporting frame for the face conveyor, and being introduced by means of a front sill end into an opening provided in the advanceable abutment, bearers being provided on the advanceable abutment for forming a lateral guide for the support shields.

A coal face support system of this kind operates like a coal face support system with jacks. After the passage of a winning machine, which may be guided, for example, on the supporting frame or on the channel structure of a face conveyor laid on the supporting frame, each shield advances in each case in accordance with the relief of the load on the props supporting the caving shield and in so doing uses the supporting frame as an abutment. With reverse admission of pressure to the shifting cylinders, on the other hand, these cylinders exert the necessary bearing pressure for the face conveyor and/or the winning machine on the abutment. Support shields of the kind mentioned at the beginning are particularly stable; they are therefore suitable in particular for the mining of thick seams with correspondingly high seam openings.

Support shields with comparatively short floor sills are known (Spruth "Strebausbau in Stahl und Leichtmetall" (Coal Face Supports in Steel and Light Metal) 1963, p. 198, FIG. 177). They require, inter alia, frontal area roof bars carried by special props and keep open a coal face space which has a comparatively small cross-section. This is not sufficient for the large amounts of air which are required for efficient mining systems. In addition, it is a disadvantage that in consequence of the small length of the floor sills portions of the shifting cylinders are located outside the open coal face space.

Support shields of the kind mentioned at the beginning are likewise known from Offenlegungsschrift No. **1958322.** These shields have relatively long floor sills. This is the reason not only for their stability, but also for the size of the face space kept open by them, which is adequate for efficient mining. On the other hand, the support shields are lacking in all facilities for excluding the penetration of rubble into the face space between the shields. The support shields must therefore be immediately adjacent one another.

Of course, support shields are also known which consist of an inclined caving shield and a head plate serving to support the still unbroken coal face roof (Journal "Glueckauf" 103 (1967), No. 20, pp. 1013 to 1014). Although a support shield of this kind keeps open a coal face space which is comparatively small and of inadequate size for modern winning systems, it is provided on one side with movable side shields supported on side shields corresponding to them and which are fixed to the neighboring support shield. The movable side shields are supported resiliently by means of a telescopic guide on the caving shield and are thereby so biased that they are applied so firmly against the corresponding fixed side shields of the neighboring support frame that a reliable seal is produced.

The self-advancing coal face support system with the known support shields does not cause any particular difficulties as long as the support shields retain the direction of advance specified for them. In support shields with comparatively long floor sills, however, there is a considerable increase in the risk of the shields sideslipping in spite of the lateral guides provided on the advanceable abutment. With this there is linked a swinging of the support shields and a change in their direction of advance, which must be corrected. Since, because of the required sealing of the coal face space against the penetration of stowing material or dirt, the support shields must be supported on one another either directly or by way of the side shields, the correction of the direction of advance entails exceptional difficulties. These are still an obstacle to the utilization of the special advantages of shield support systems.

The principal object of the present invention is the provision of support shields with means for correction of their direction of advance without changes in the basic structure of such shields and in particular the endangering of the seal against the penetration of rubble or stowing material becoming necessary for this purpose.

SUMMARY OF THE INVENTION

According to the invention, the floor sills of the support shields have sections the longitudinal sides of which are supported against the associated bearers, the front and rear end of each floor sill being tapered and the packing shield and the caving shield being provided adjacent the rear end of the floor sill with laterally movable shields which are supported on corresponding side shields of the respective support shield and screen the coal face space against the penetration of rubble. The movable side shields are supported on hydraulic thrust piston drives to which pressure can be admitted to swing the support shields when a correction of the direction of advance is required.

The invention provides a shield support system for coal face spaces of large cross-section, and thereby for efficient mining systems, with reliable sealing against the penetration of rubble with the aid of side shields which, in consequence of their support on thrust piston drives, perform an additional function. This consists in swinging the rear end of a support shield by retracting or extending the thrust pistons and in this way producing a correction of the direction of advance of the support shields. This swinging movement is rendered possible by the tapering of the ends of the floor sills and is effected without the sealing of the face space being lost. This movement therefore cannot be blocked by loose rock in the face space.

The possibility of swinging the support shields is all the greater the longer and narrower the floor sill ends are. The section of each support shield which is supported by means of its longitudinal sides against the associated bearers therefore only needs to be long enough to be able to accommodate the props or rams supporting the caving shield, because the guiding function of the bearers is supplemented by the guiding action which is produced by the side shields.

It has been found advantageous to taper forwardly the front floor sill end introduced into the opening in

the advanceable abutment. In this way, an increase in the swinging range of the floor sills is achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a support shield for a self-advancing coal face support system according to the invention in side view;

FIG. 2 is a plan view of two adjacent support shields;

FIG. 3 is a section through the two support shields on the line III—III of FIG. 2;

FIG. 4 is a section through the caving shield on the line IV—IV of FIG. 1, and

FIG. 5 is a plan view of the floor sills of two support shields with a conveyor supporting frame.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The coal face support system shown in the drawings includes support shields each of which has a front roof shield 1 supporting the still unbroken roof zone. This roof shield is articulated to a caving shield 2 at 3 and the caving shield is attached in turn at 4 by means of a joint to a packing shield 5. The packing shield is connected immovably by means of transverse bolts 6 and 7 to a floor sill designated generally by the reference 8. Hydraulic rams act between the floor sill 8 and the caving shield 2. By means of one or more shifting cylinders 9, which are designed so that they are double-acting, the support system can be advanced by using a supporting frame 10 extending along the coal face (not shown) as an advanceable abutment; with reverse admission of pressure to the shifting cylinder or cylinders 9, a face conveyor 11 laid on the supporting frame 10 is held against the coal face with the necessary contact pressure.

In the advanceable abutment described there are openings 12 into which tapered front ends 13 of the floor sill 8 are introduced in each case. As shown in FIG. 2, the supporting frame 10 consists of individual sections 14 and 15 which are articulated to one another by means of ball-and-socket joints 16 so that they are swingable horizontally and vertically. These sections have the same length as the sections of the channel structure of the conveyor 11. At the joints of each two frame sections 14 and 15 adjacent one another in the supporting frame 10 there are plates 17 and 18, respectively, for receiving horizontal link pins 19 serving to articulate bearers 20 which form lateral guides for the support shields.

The support shield floor sills have intermediate sections 21 and 22. At the longitudinal sides of these sections there are ridges 23 and 24, respectively, which are supported on the respective longitudinal sides of the bearer 20. Adjacent the sections 21 and 22 at the front are the floor sill ends 13 which are introduced into the openings 12 in the frame sections 14 and 15. In the embodiment illustrated, these front floor sill ends 13 are tapered forwardly. Adjacent and to the rear of sections 21 and 22 are rear floor sill ends 27 and 28, respectively, which are reduced on both sides.

As shown in FIG. 1, in the region of the rear floor sill ends 27 and 28, the packing shield 5 and the caving shield 2 are provided with laterally movable shields 30,31. These are supported on thrust piston drives at 33. Fixed side shields 34 and 35 correspond to the side shields 30, 31 and are movable by means of the thrust piston drives. Supporting the shields on one another protects the coal face space against the penetration of rubble. The arrangement of the thrust piston drives is moreover shown in FIG. 4.

The caving shields 2 and the packing shields 5 each consist of a welded structure which is formed by an outer plate 36 and an inner plate 37. These plates are interconnected by a plurality of cross-pieces 38 to 40 and 41 to 43. A tube 44 extends through the cross-pieces 38, 39 and serves to accommodate a cylinder 45 of a thrust piston drive. The thrust piston drive is fixed to the cross-piece 40 by a bolt 46.

The thrust piston acts through a piston rod 47 and a joint 48 on a tubular support 49 which supports the side shield in question. The side shield for its part consists of two plates 51 and 52 disposed at an angle to one another and welded together at 50. The plate 52 is applied against the outer plate 36 of the shield and the plate 51 is supported on the adjacent side shield. A tube 53 extending through the cross-pieces 41, 42, 43 and fixed to them serves to guide the tubular support 49.

By retracting and extending the thrust piston in the cylinder 45, the support shields can be swung within the limits of the play or movement of the bearers 20, as a result of which correction of the direction of advance is possible.

What is claimed is:

1. A self-advancing coal face support system with support shields arranged side by side, the support shields comprising a front roof shield, a caving shield hingedly connected thereto, a packing shield articulated to the caving shield and a floor sill, and being articulated by means of one or more shifting cylinders to an advanceable abutment extending through the coal face, in particular a supporting frame for the face conveyor, and being introduced by means of a front sill end into an opening provided in the advanceable abutment, bearers being provided on the advanceable abutment for forming a lateral guide for the support shields, the floor sills of the support shields including sections and longitudinal sides of which are supported against the associated bearers, the front and rear end of each floor sill being tapered and the packing shield and the caving shield being provided adjacent the rear end of the sill with laterally movable shields which are supported on corresponding side shields of the respective support shield and screen the coal face space against the penetration of rubble, and the laterally movable shields permitting swinging of the support shield when a correction of their direction of advance is required.

2. A support system according to claim 1, wherein the front floor sill end introduced into the opening of the advanceable abutment tapers forwardly.

3. A support system according to claim 1, wherein hydraulic thrust piston mechanisms act between each movable shield and the associated side shield.

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