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[54] **SELF-ADVANCING MINE ROOF SUPPORTS**

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[51] **Int. Cl.²** **E21D 11/16**

[58] **Field of Search** ..... 61/45 D; 91/390

[56] **References Cited**

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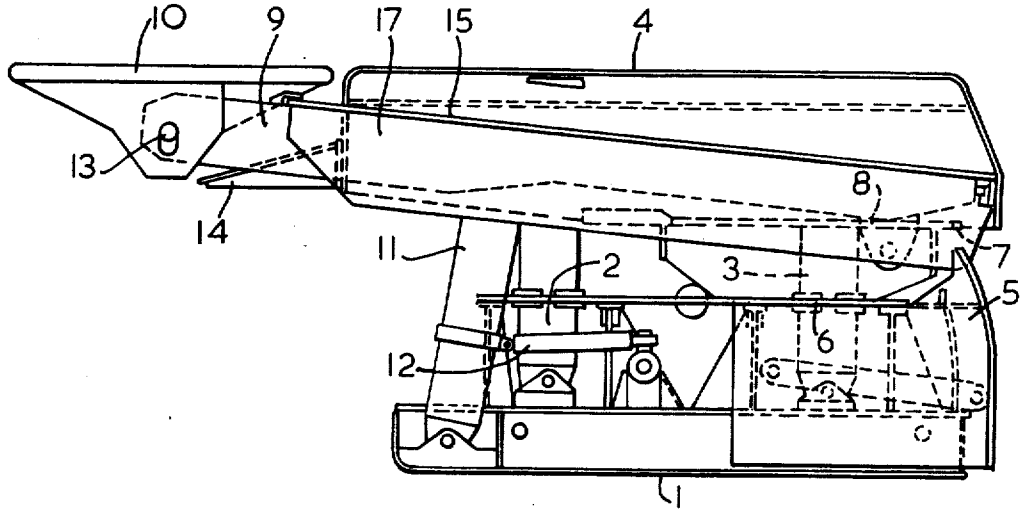
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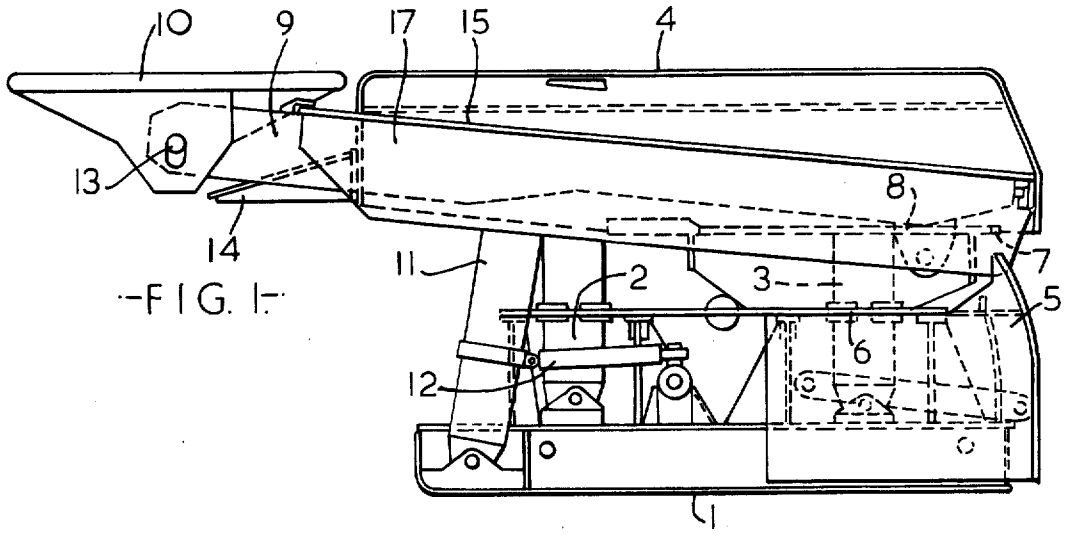
[57] **ABSTRACT**

A self-advancing mine roof support has a first or main roof supporting member and a second roof supporting member movable relatively to said first roof supporting member in the direction of advance of the support. The second roof supporting member has laterally extensible means on elements for abutting similar extensible means or elements or an adjacent support. The abutting means or elements serve to guide the supports during their advance and also prevent the caving of the roof between adjacent supports.

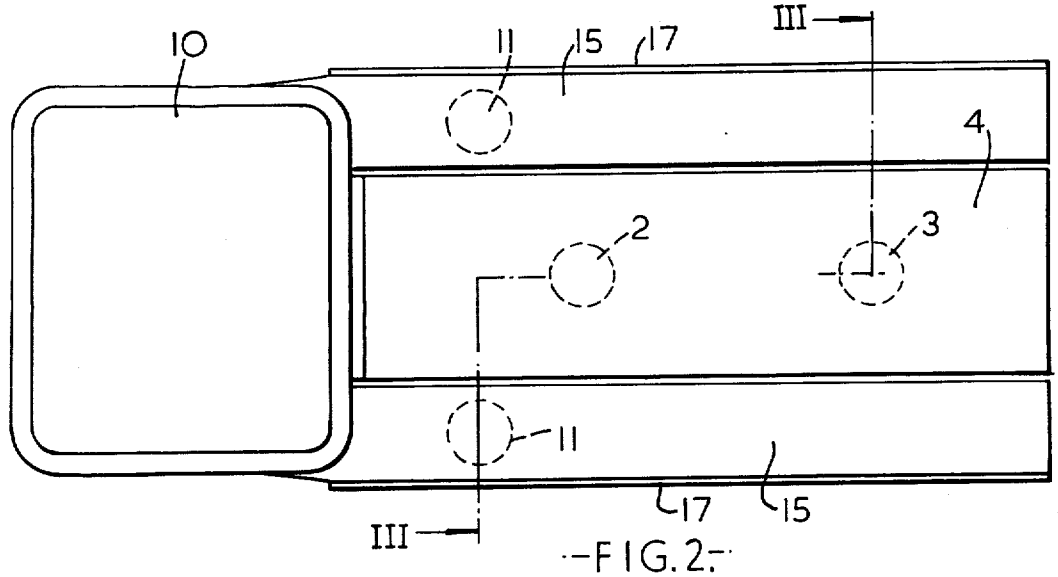
Conveniently the second roof supporting member constitutes a connecting element for connecting a roof-engaging member, at the forward part of the second roof supporting member, to the first or main roof supporting member, the first or main roof supporting member having guiding and pivotal supporting means for the second roof supporting member or connecting element. Conveniently the second roof supporting member or connecting element is of shield-like construction so that, in conjunction with a shield-like construction of the rear of the base of the support, it prevents mineral flushing into the support. The second supporting member or connecting element may be supported on a prop which is tiltable towards the mineral face so as to advance the second roof supporting member.

6 Claims, 3 Drawing Figures

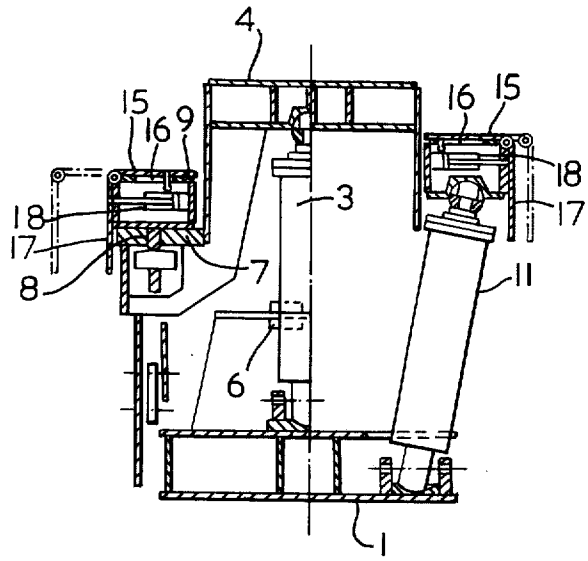




-FIG. 1-



-FIG. 2-



-FIG. 3-

SELF-ADVANCING MINE ROOF SUPPORTS

BACKGROUND OF THE INVENTION

This invention is for improvements in or relating to self-advancing mine roof supports and is particularly, but not exclusively, concerned with a mine roof support having a base plate on which are arranged several props which carry a main roof supporting member which can be pressed against the roof, and an auxiliary roof supporting member, in front of the main roof supporting member, which is displaceable in the direction towards the working face and is connected to permit movement in a vertical plane relative to the main roof supporting member and is pressed against the roof by prop means tiltable in the direction of the working face, relative to the base plate.

Auxiliary roof supporting members lying in front of the main roof supporting member and supported by props have the advantage that with advancing working the roof can be supported in the immediate neighbourhood of the coal face without the main roof supporting means having to be released from the roof for this purpose. Thus the roof is unsupported for a short period only and cavities in the roof are therefore avoided.

The problem occurs with roof support assemblies of this type that with strong forces acting on the tip of the auxiliary roof supporting member a strong torque is exerted about its support point or prop means and as a consequence of this torque the rear end of the auxiliary roof supporting member is pressed upwardly with great force whereby buckling can occur in the region of the roof structure of the support assembly particularly with the resultant leverages from the auxiliary roof supporting member. To avoid this requires the cantilevered portion of the auxiliary roof supporting member, arranged in front of the main roof supporting member, to be made as long as possible in the direction of the advance. Any rearward extension of the auxiliary roof supporting member is, however, not possible with the known constructions since the prop locations in the main roof supporting member would be in the way of the rear end of the auxiliary roof supporting member.

A further problem exists with such supports in obtaining a complete packing of the excavation towards the caving or stowing area. It is in fact already known to provide the rear of the support assemblies with stowing shields. These stowing shields can if necessary embrace the support assemblies on the flanks. Despite these screening shields the risk exists that rock or stowing material flushes between neighbouring support assemblies into the face area. The support assemblies could not as a rule abut each other in this case they would be jammed during the advancing sequence. For the same reasons it is also not possible to make the rear shield construction, of the support assemblies, wider in the face longitudinal direction than the support assemblies. Even with the use of such wider shields falls from the roof area between the main roof supporting member would have to be avoided with a crumbling roof strata.

It is an object of the invention to develop further the support assembly of the type mentioned initially in a way that the upwardly directed forces produced in the loading of the auxiliary roof supporting member are exerted as far as possible towards the rear of the main roof supporting member and additionally there is obtained, particularly at the roof, a closure to the face area against caving rock.

SUMMARY OF THE INVENTION

According to one feature of the invention there is provided a self-advancing mine roof support having a first roof supporting member and a second roof supporting member movable relatively to said first roof supporting member in the direction of advance of the support, the second roof supporting member having laterally extensible means or elements for abutting an adjacent roof support.

Conveniently the first roof supporting member has means for guiding and pivotally supporting the second roof supporting member.

According to a further feature of the invention there is provided a mine roof support in which a roof-engaging member is connected to a first or main roof supporting member by second roof supporting members or connecting elements of shield-like construction, arranged on either side of the first or main roof supporting member and which are guided longitudinally and are pivotally supported at their rear ends, at a distance below the roof-engaging surface and towards the rear end of the first or main roof supporting member, and support the roof-engaging member with their front ends.

According to a still further feature of the invention there is provided a mine roof support having a base plate on which prop means carry a first or main roof supporting member, a roof-engaging member in front of the first or main roof supporting member which is movable relatively thereto and in a direction towards the working face and is connected to permit movement in a vertical plane relative to the first or main roof supporting member, and is supported by further prop means which is attached to the base plate and tiltable in a direction towards the working face, characterised in that the roof-engaging member is connected to the first or main roof supporting member by second roof supporting members or connecting elements of shield-like construction arranged on either side of the first or main roof supporting member and which are guided longitudinally and are pivotally supported at their rear ends, at a distance below the roof-engaging surface and towards the rear end of the first or main roof supporting member, and support the roof-engaging member with their front ends and are supported by the further prop means.

With such a construction of the support assembly the upwardly directed forces produced during loading of the second or auxiliary roof supporting member, as a result of the torque occurring, are introduced towards the rear of the main roof supporting member so that upward buckling of the roof supporting construction need no longer be considered. As a result of the shield-like construction of the abutting means or elements these close the space or gap between the support assemblies in a shield-like manner so that rock caving in between the support assemblies is deflected backwardly towards the goaf.

In order to avoid, during advance under cavities, that the rear end of the main roof supporting member is bent or tilted upwards by the upwardly directed forces, produced by the second or auxiliary roof supporting member, it is provided that the goaf side props of the support assembly are coupled, resistant to tension and

compression, to the main roof supporting member and the base plate, and are made double-acting. The main roof supporting member can in any case be held in its substantially horizontal position by the double-acting props, resistant to tension and compression attached to the base plate and the main roof supporting member.

In order to make possible an adaptation, independent to a large extent of the position of the main roof supporting member, and of the auxiliary roof-engaging member, carried by the second roof supporting member or shield-like connecting elements, to irregularities in the roof, the second roof supporting member or shield-like connecting elements act through hinges on the auxiliary roof-engaging member, the hinge bolts of said hinges having a certain play in a vertical direction. With such a construction of the connection between the auxiliary roof-engaging member and the connecting elements, the roof-engaging member can be swung or tilted to a limited degree towards the connecting elements.

In accordance with a preferred embodiment of the invention the connecting elements of shield-like construction are provided with laterally extensible shield parts. In this way it is possible to adapt the width of the connecting elements of shield-like construction to the spacing between adjacent support assemblies.

Conveniently the laterally extensible shield plates are guided in slot guides, running transversely to the direction of the advance, on the connecting elements of shield-like construction, said elements being provided with pressure-medium cylinders for the extension of the laterally extensible shield plates. In this way it is possible to retract the laterally extensible shield plates during the advancing sequence to a position where the support assemblies can advance without jamming.

In order to obtain a consistent packing between neighbouring support elements in all phases of the advance and in order to be able if necessary to guide the support assemblies towards one another during the advance sequence, the laterally extensible shield parts have, at their outwardly directed edges, support plates arranged in the vertical plane which are used for fitting against similar support plates of neighbouring or adjacent support assemblies. The vertically arranged support plates of neighbouring support assemblies can remain continually in contact with each other during the displacement process of one of the adjacent support assemblies so that a completely consistent packing results on the one hand and on the other hand continual sliding guide of the support assemblies to each other.

In order also to obtain a consistent closure between the main roof bar and the connecting elements of shield-like construction, the main roof supporting member is constructed as a box open from below and on the lateral lower edges of which horizontal flanges are arranged in which slot guides are arranged for the rear ends of the shield-like connecting elements.

For packing the lower part of the assembly against the stowing or caving area, the base plate is provided with a multi-part shield construction partially embracing the support assembly.

In order to prevent rock caving in from the roof falling between the main roof supporting member and the auxiliary roof-engaging member in the path of travel below the front end of the main roof supporting member, the latter has at its front end a projection below the auxiliary roof-engaging member at a small distance, which covers the space between the front edge of the main roof supporting member and the rear auxiliary roof-engaging member irrespective of the relative positions. The downwardly directed surface of the projection of the main roof supporting member runs appropriately inclined towards the working face. The rock which may fall between the main roof supporting member and the auxiliary roof-engaging member is thus deflected towards the working face and falls on to the conveyor located at the working face.

In order to align the props of the support assembly relative to the base plate an aligning device is arranged between the base plate and the props supporting the main roof supporting member.

BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of the invention by way of example is described in more detail below with reference to the drawings in which:

FIG. 1 shows a side view of a support assembly in accordance with the invention,

FIG. 2 shows a plan view of the support assembly of FIG. 1, and

FIG. 3 shows a section through the support assembly along the line III—III of FIG. 2.

DESCRIPTION OF PREFERRED EMBODIMENT

In the drawing the base plate of the support assembly is indicated by reference numeral 1. On this base plate a hydraulic prop 2 is attached on the face side and a hydraulic prop 3 is attached on the goaf side. The hydraulic props 2 and 3 jointly support a first or main roof supporting member 4. The goaf side hydraulic prop 3 is made double-acting and is attached, resistant to tension and compression, to the base plate 1 as well as to the main roof supporting member 4. The base plate 1 is provided on the goaf side with a shield construction 5, which partially surrounds the rear part of the support assembly. In addition between the base plate 1 and the hydraulic props 2 and 3 aligning devices 6 are provided which are used for aligning the props 2 and 3 relative to the base plate 1 with the support assembly lowered.

The main roof supporting member 4 is constructed as a box open from below and in the rear part is provided with horizontal flanges 7 at its lower side edges. In these horizontal flanges 7 are provided slots 8, which extend in the direction of advance, in which the rear ends of second roof supporting members or shield-like connecting elements 9 are guided, these being longitudinally movable and also movable in a vertical plane. These shield-like connecting elements 9 have a box-shaped cross-section and support with their front end an auxiliary roof-engaging member 10 arranged in front of the main roof supporting member 4. These shield-like connecting elements 9 are themselves supported in their longitudinal area, approximately in the centre by hydraulic props 11 which are tiltable on the base plate 1 in the direction of advance of the support. For tilting the props 11 and thus for advancing the auxiliary roof-engaging member 10, and the shield-like supporting members or connecting elements 9 connected with the latter, towards the working face a further hydraulic cylinder 12 is attached to the base plate 1 which acts approximately centrally on the hydraulic props 11.

The connection between the shield-like connecting elements 9 and the auxiliary roof-engaging member 10

is effected by hinges **13** the hinge bolts of which have relatively large play in the associated hinge eyes in the vertical direction. The main roof supporting member **4** is provided at its forward end with a projection **14** below the main roof-engaging member **10** at a short distance and the downwardly directed surface of which runs inclined towards the working face. This projection **14** deflects rock, which can cave in between the front edge of the main roof supporting member **4** and the rear edge of the auxiliary roof-engaging member **10**, in a forward direction towards the working face so that it falls on a conveyor located at the working face.

Laterally extensible shield plates **15** are arranged on the shield-like connecting elements **9**. These shield plates **15** are guided on the shield-like connecting elements **9** by slot guides **16** running in the longitudinal direction of the face. At their outwardly directed edges the laterally extensible shield plates **15** are provided with support plates **17** in a vertical plane, which are used for fitting against similarly arranged support plates **17** of neighbouring or adjacent support assemblies. For the lateral extension of the shield plates **15** the shield-like connecting elements **9** are provided with hydraulic cylinders **18** which extend in the longitudinal direction of the face and act on the support plates in the vertical plane. With the assistance of these hydraulic cylinders **18** the support plates **17** of neighbouring support assemblies can be pressed against each other during the advance sequence and thus give a safe lateral guide to the advancing support assembly. At the same time they screen the face excavation between the support assemblies towards the roof also during the advance sequence.

I claim:

1. A mine roof support with a base plate on which prop means carry a first roof supporting member and with a second roof supporting member in front of the first roof supporting member which is movable relatively thereto towards the working face and carried by connecting elements of shield-like construction arranged on either side of the first roof supporting member, said connecting elements are guided longitudinally and pivotally supported at their rear ends on both sides of the first roof supporting member at a distance below the roof engaging surface thereof, are pivotally connected with their forward ends to the second roof supporting member and are supported by further prop means which is attached to the base plate and tiltable in a direction towards the working face, wherein the connecting elements are provided with laterally extensible shield parts which are guided in slot guides in the connecting elements and which slot guides extend transversely to the direction of advance of the support.

2. A mine roof support as claimed in claim **1** wherein the first roof supporting member is in the form of a box, open at its lower part and the lower edges of which have horizontal flanges in which there are said slot guides for the rear ends of the connecting elements between the first and the second roof supporting members.

3. A mine roof support as claimed in claim **1** wherein the first roof supporting member has at its front end an extension which is extended below the second roof supporting member and which covers the space between the front edge of the first roof supporting member and the rear edge of the second roof engaging member on each possible advance distance between both members.

4. A mine roof support as claimed in claim **1** wherein the connecting elements are provided with pressure-medium cylinders for extending the laterally extensible shield parts.

5. A mine roof supports as claimed in claim **1** wherein the laterally extensible shield parts have on their outwardly directed edges support plates arranged on a vertical plane and which are used for abutting on similar support plates of neighbouring support assemblies.

6. A support assembly as claimed in claim **3** wherein the upper surface of the extension is inclined downwardly towards the working face.

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