TRAVELING FACE SUPPORT WITH AN ATTACHED EXTENSIBLE SHIELD

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ABSTRACT

A travelling face support has an attached extensible shield which, besides providing the means of shoring up the roof of the seam and providing a connected coal cutting shield, has both a packing shield to protect the coal cutting area and a floor beam. One or more pull-back cylinders act upon a supporting frame divided into sections along its length. A continuous recess, transverse to the direction of the prop conveyor, is provided in each section of the supporting frame to receive a forward longitudinal section of the corresponding floor beam. A lifting device, which is supported on the prop floor, is fixed in a recess of a section of the supporting frame in the rear part of the extensible shield beneath the coal cutting shield. The lifting mechanism of this device is used to control the position of the forward longitudinal position of a heel plate of the supporting frame section.

11 Claims, 14 Drawing Figures
TRAVELING FACE SUPPORT WITH AN ATTACHED EXTENSIBLE SHIELD

BACKGROUND OF THE INVENTION

The invention concerns a travelling face support with an attached extensible shield which, besides providing the means of shoring up the roof of the seam and providing a coal cutting shield connected to this, has both a packing shield to protect the coal cutting area and a floor beam as well as one or more pull-back cylinders which act upon a supporting frame longitudinally divided into sections. For this purpose in the section of the supporting frame allotted to an extensible shield for a forward longitudinal portion of the floor beam of the extensible shield concerned, a continuous recess, transverse to the direction of the prop conveyor, is provided.

A face support with extensible shields of this type acts like a face support with jacks. After the passage of an extracting machine which is usually guided on the prop conveyor generally supported on the supporting frame, the shields advance and thus use the conveyor or the supporting frame as the advancing support for the conveyor. When the pull-back cylinder is loaded in the reverse direction the shields, on the other hand, operate as supports for the pressure forces on the supporting frame exerted in the direction of the coal face. Extensible shields of the type initially mentioned can, however, be very rigidly constructed and are therefore particularly suitable for working large seams with correspondingly large openings.

Extensible shields which in addition to a coal cutting shield only carry a lining hood are well known (Spruth "A Light Metal and Steel Face Support," 1963 page 198, FIG. 177). Such an extensible shield has the disadvantage that it maintains a facing area of relatively small cross-section. This is insufficient for the high quantities of ventilation essential to efficient working. Moreover, the protecting props have disadvantages although they are essential to prevent the tilting of the extensible shield about the forward edge of the heel plate when moving forward. The small extent of the facing area maintained by such an extensible shield has the disadvantage that the longitudinal sections of the pull-back and advance cylinders must lie outside the cutting shield in the filling.

Extensible shields of the type mentioned at the beginning are also known (OS 1,958,322). These are suitable for large seams and for the output of large quantities of ventilation. Moreover, considerable extensions of the floor beams are essential to protect the shield from tipping over the forward edge of its floor beam. Generally this length increases considerably with the thickness of the deposit. This does not depend on the slope of the coal face and the automatic exposure, thus caused, of a large part of the roof of the seam before the coal face.

The invention is a solution to the technical problem of achieving the maximum elongation of the floor beams whilst avoiding the difficulties which occur when using long floor beams of this type on a prop floor which undulates in the direction of the extension of the beams. In such instances the tips of the floor beams do not immediately follow the surface of the prop floor and therefore change the height of the prop conveyor.

This causes difficulties both during extraction and haulage.

SUMMARY OF THE INVENTION

In accordance with the invention the solution of this problem is achieved by fixing a lifting device, which is supported on the prop floor, in a recess of a section of the supporting frame in the rear part of the extensible shield beneath the coal cutting shield, the lifting mechanism being used to control the position of the forward longitudinal section of the heel plate.

With such a lifting mechanism the position of the floor beam concerned can be controlled. If the prop floor, for example, suddenly falls downwards towards the coal face, then the rear end of the appropriate floor beam, and therefore the extensible shield at this position can be raised by the extension of the lifting device. This causes the forward longitudinal section of the floor beam to deflect downwards and as a result, therefore, prevents the supporting frame from rising. By this means the extraction and haulage of the feed are not unfavourably affected.

It is, therefore, a familiar construction with removable bottom plates and with two pull-back cylinders arranged vertically on top of one another, which can be differentially loaded. In this way the channels of a prop conveyor can be so controlled that they follow the course of the prop floor to the coal face. In this invention the lifting device is however incorporated in the face support and helps to raise the back end of the construction. The advantage of this is that the belt of the prop conveyor is not loaded with further forces and that the construction promptly adapts itself to the new course of the prop floor when any change in inclination occurs.

In particular the forward portion of the floor beam, provided for insertion into the recess in the section of the supporting frame, must be tapered towards its free end. Thus, jamming between the forward part of the floor beam and the supporting frame is very largely avoided if the conveyor is moved by stages and thus adopts an S shape.

The invention involves special precautions to ensure that the section of the supporting frame is not raised by the forward longitudinal section of the floor beam associated with it.

These precautions generally involve the provision of projections at the lateral limits of the frame recesses and the application of detents at the appropriate part of the floor beam for the guidance of the projections.

The projections are made of a specially favourable type of pin and the detents are made in the form of grooves located in the longitudinal sides of the appropriate longitudinal sections of the floor beam. Another such precaution consists of projections in the form of two parallel strips whose strength in the direction perpendicular to the floor beam gradually decreases from approximately the centre of their longitudinal extension toward each of their ends. The detents consist of recesses of angular cross-section on the lower side of the floor beam.

The advantage of all these solutions is that the forward longitudinal sections of the floor beams can pivot about axes, in the recesses of the supporting frame, which run parallel or approximately parallel to the longitudinal direction of the props.
Further characteristics of the invention can be obtained from the following description of a form of construction illustrated, by way of example, in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of the extensible shield of a travelling face support according to the invention, with an operating piston rod fully entered into the pull-back cylinder.

FIG. 2 is a corresponding side view with the piston rod extended with the seam floor falling away to the coal face, which is not shown.

FIG. 3 is a corresponding side view after making a step towards the coal face.

FIG. 4 shows a cross-section through a conveyor support frame and the front end of a heel plate associated with it according to the first embodiment.

FIG. 5 shows a cross-section on the line V — V in FIG. 4.

FIG. 6 is a view corresponding to that of FIG. 4 but of another embodiment.

FIG. 7 shows a cross-section on the line VII — VII in FIG. 6.

FIG. 8 is a plan view of part of the travelling face support, with two extensible shields shown side by side.

FIG. 9 shows a cross-section on the line IX — IX in FIG. 8.

FIG. 9a shows a divided floor beam according to FIG. 9.

FIG. 10 is an end view of a front lateral guide on the advancing support and shows the condition of the parts when the seam floor is even.

FIG. 11 is a similar view when the seam floor is inclined downwards towards the coal face.

FIG. 12 is a similar view when the seam floor is rising towards the coal face, and

FIG. 13 is an end view of the connection of a forward lateral guide into the advancing support via an intermediate cover plate, after the removal of various parts of the extensible shield.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the various drawings the same reference numerals refer to like parts.

Extensible shields possessing at the front a roof-supporting shield 2 are used for the construction of a support, the floor of the seam being denoted by 1. By means of a horizontal linkage 3 this can be rotated relative to a coal cutting shield 4. The coal cutting shield 4 consists of a rigid welded arrangement of plates, rods and tubes which can be rotated around 5. A field of movement is thus available between the two struts 6 and a packing shield 8 of sufficient height and breadth, connected at 7 to the rear end of the coal cutting shield. The packing shield 8 is fixed by two bolts 9 and 10 to a floor beam 11.

A pull-back cylinder 14 is connected via a horizontal hinge 13 to the beam 11. The piston rod 15 of this cylinder has a forked end 16 to accept a connecting bolt 17 which is fixed to a suitable bracket 18 located at the rear part of a supporting frame 19. This supporting frame 19 is divided into separate sections and serves to brace the internal structure 20 of a strut conveyor of known type.

The conveyor supporting frame 19 is of a rigid welded construction. Its longitudinal sections are approximately the length of one of the channels of the conveyor 20. The separate longitudinal sections of the supporting frame are connected together by a universal joint which is not shown. Such a joint can, for example, comprise a ball at one end of a section for which there is a corresponding socket on the connecting end of the next section.

As shown in FIGS. 4 to 7 each section of the supporting frame 19, which is assigned an extensible shield, possesses a continuous recess 23 transverse to the direction of the strut/prop conveyor for a forward longitudinal section 22 of the floor beam 11 of the appropriate removable shield.

FIG. 8 shows that the section 22 of the floor beam is tapered towards its free end to assist its guidance into the recess provided in the section of the supporting frame. This part, however, can have a constant breadth, but, in such a case, it is generally narrower than the section to which it is connected and cannot be introduced into the recess 23 in the floor beam.

To ensure that the front longitudinal section 22 of the floor beam cannot be lifted out of the section of the supporting frame assigned to it (as shown in the embodiment of FIGS. 4 and 5) projections in the form of pins, 24 and 25, are provided on the perpendicular sides, 26 and 27, of the recess 23 in the supporting frame. Detents in the form of grooves 29 are provided for the pins 24 and 25 permit for them a relatively large amount of play so that the front heel plate of the longitudinal section 22 can pivot about the axis defined by the pins 24 and 25.

In the form of construction shown in FIGS. 6 and 7 the projections are realised by means of two longitudinal strips, 30 and 31, which form an integral part of the perpendicular walls, 32 and 33, and the other portions of the respective section 19 of the supporting frame. The longitudinal strips, 30 and 31, are identical in shape.

The strength, measured in the direction perpendicular to the heel plate, is approximately greatest at the longitudinal centre of each strip, at the position indicated by the number 36. This strength decreases constantly towards the two ends, 38 and 39. This produces a recess 40 which widens in a flared manner towards both sides, on each perpendicular wall, 32 and 33, formed in the sides of the recess 23 in the section 19 of the supporting frame. The recesses 40 take the projecting parts 41 and 42 on the upper side of the respective longitudinal section of the floor beam. The projections, 41 and 42, which are produced by the angular recesses, 44 and 45, on the lower side 46 of the horizontal/floor beam, form the detents to guide the projections, 30 and 31.

In the rear portion of the extensible-removable shield, below the coal cutting shield 8, there is a lifting mechanism 50 which, in all the forms of construction shown in the drawings, consists of a hydraulic ram.

The hydraulic ram, which constitutes the lifting device, can be pivoted about its attachment to a gider 51 about an approximately horizontal axis 52 which is at right angles to the direction of advance. The gider 51 consists of a plate welded on to the welded arrangement of the packing/back filling shield, 8. The ram 50
rests on a foot plate 53 which is rigidly connected to a casing of rectangular or circular cross-section (the casing is designated 53a). On one of its sides 54 the casing supports a hinge 55. A hinge pin 56 permits the foot plate 53 to be pivoted relative to the floor beam 1. The surface which rests on the strut floor is very slightly convex relative to the floor.

FIGS. 1 to 3 show how, by loading the ram 50, it is possible to raise the back end of the extensible shield so that the forward longitudinal section 22 of the floor beam 1 of the movable shield can follow the undulating course of the floor of the seam by altering its inclination.

As FIG. 8 shows, lateral guides are mounted at the point where two sections of the frame are connected together in the manner described above. Essentially they consist of a beam or girder 60 which can be tilted about an axis defined by a bolt 61. The axis of the bolt runs parallel to the strut conveyor 20 and to the floor.

According to the form of construction shown in the drawings, the beam 60 has a rectangular cross-section 71. The height of the rectangular cross-section of the beam 60 is selected to ensure that the floor beam cannot rest on the upper edge 74 of the beam 60. The height of the cross-section which is, therefore, selected after taking into consideration the unevenness in the seam floor, also permits control of the two floor beams which are side by side, if, as a result of the unevenness of the floor, these assume different vertical positions as already described.

The axis of rotation of the beam 60, provided by the bolt 61, is specially related to a bracket 75 which is fixed to the advancing support. Each bracket 75, as shown for example in FIG. 8, is made up of two cover plates 76 and 77. These are fixed to the ends of the section of the supporting frame. Each of the cover plates has an elongated slot, the axis of which is perpendicular to the plane of the conveyor, or supporting frame. As a result the supporting frame can be adjusted, together with the conveyor, to the various levels of the angular floor of the seam, independently of the position of the floor beam.

The floor beams of the neighbouring extensible shields are braced with longitudinal sections on both sides of the beam 60. These longitudinal sections consist of strips, 67 and 68, on each side of the floor beam 11.

FIG. 1 clearly shows how each extensible shield is provided, at the rear end 84 of the floor beam 11, with a hinge 85. The hinge pin 86 runs at right angles to the packing shield and parallel to the floor. The purpose of this hinge is to turn a cover plate on which the broken coal lies. The purpose of the cover plate is to prevent the rear end 84 of the extensible shield from rising too high. It therefore acts as a stabiliser.

In the construction shown in FIG. 9 two types of floor beam are provided in accordance with the invention. These facilitate the removal of cut coal from the face area in the mine filling. In this way small coal can be dealt with if it collects on the filling edge of the conveyor or the supporting frame.

In the example shown on the lefthand side in FIG. 9, this device consists of a groove 90, on the underside 91 of the floor beam 11, which travels the whole length of the extensible shield.

On the other hand, the example illustrated on FIG. 9a shows a floor beam divided into two parts, 93 and 94, which have a recess 95 between them, which corresponds to a recess 96 surrounded by the groove 90 in the example shown on FIG. 9. Both parts, 93 and 94, run parallel to one another and are held together by the packing shield. In FIG. 13 the beam 60 is connected to the brackets 76 and 77 via a cover plate 100, which is connected by bolts 101 and 102 respectively to the bracket and the beam. This cover plate improves the mobility of the conveyor supporting frame relative to the extensible shield.

We claim:

1. A travelling face support for coal mining comprising a shiftable shoring shield for shoring up the roof of a seam,
a coal shield articulated to said shoring shield,
a packing shield to which said coal shield is articulated and adapted to protect the coal cutting area,
a floor beam to which said packing shield is fixedly secured,
a conveyor supporting frame adjacent said floor beam,
a pull back piston and cylinder assembly hingedly connected between said floor beam and supporting frame for actuating the latter,
means providing a connection between said conveyor supporting frame and said floor beam for guiding movement of said frame relative to said floor beam and also enabling tilting of said frame to accommodate ground conditions, and
a lifting device connected at one end to said packing shield and with its other end adapted to rest on the ground surface.

2. A traveling face support for coal mining as claimed in claim 1, in which said connection between said conveyor supporting frame and said floor beam comprises a continuous recess transverse to the direction of intended movement of the conveyor for said frame, and means on said floor beam tapered toward its free end for insertion into said recess.

3. A traveling face support for coal mining as claimed in claim 2, comprising projections on said floor beam extending into said recess, and detents on said conveyor supporting frame to receive said projections.

4. A traveling face support for coal mining as claimed in claim 3, in which said projections comprise pins, and said detents comprise grooves.

5. A traveling face support for coal mining as claimed in claim 3, in which said projections comprise two parallel strips, the strength of each of which, when measured at right angles to said floor beam, decreases toward each of the two ends of the strip, and said detents comprise recesses of rectangular cross-section in the underside of said floor beam.

6. A traveling face support for coal mining as claimed in claim 1, in which said connection between said conveyor supporting frame member and said floor beam member comprises a vertically elongate guide slot in one member, and a bolt engaging said slot and carried by the other member.

7. A traveling face support for coal mining as claimed in claim 1, comprising a cover plate at the lower rear end of said packing shield adapted to lie transverse to said packing shield and parallel to the prop floor, and
a hinge connection between said cover plate and packing shield.

8. A travelling face support according to claim 1, wherein the lifting device consists of a hydraulic ram.

9. A traveling face support for coal mining as claimed in claim 8, comprising means for pivoting said hydraulic ram about an approximately horizontal axis perpendicular to the direction of advance of the support, means for attaching said ram to a member disposed inside of said packing shield, and a foot plate upon which said ram rests hingedly connected to said floor beam.

10. A traveling face support for coal mining as claimed in claim 9, comprising a framework attached to a recess in said floor beam, said foot plate forming the lower termination of said framework, and a horizontal hinge pin for said foot plate supported on said framework.

11. A travelling face support according to claim 9, wherein the surface of the foot plate facing the prop floor has a convex curvature.

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