The patent to Holken et al. on April 2, 1974, titled "MINE ROOF SUPPORT FRAMES," describes a mine roof frame with a roof girder to which a goaf screen or fender is pivotally suspended. A bracket assembly composed of a series of parallel shaped webs welded between two plates is attached to the roof girder. The lowermost plate carries a guide piece having a bore therein slidably receiving a spigot inclined in relation to the vertical and horizontal. The spigot has a support shoe which engages the fender to retain the latter in a working position. A shear pin extends through the guide piece and the spigot and the pin is designed to fracture when the fender is subjected to excessive loading to cause the spigot to slide inwardly of the guide piece to thereby allow the fender to pivot inwards to a near vertical position.

14 Claims, 4 Drawing Figures
MINE ROOF SUPPORT FRAMES

BACKGROUND TO THE INVENTION

The invention relates to a mine roof support frame, especially but not solely, to such frames as employed in the so-called walking roof support systems. It is known to provide goaf screens or rubble fenders at the goaf-side ends of support frames. These devices, hereinafter referred to throughout this specification and claims as "fenders", serve to prevent the goaf or stowage material from entering the longwall space adjacent the mineral face being worked. In practice, these fenders are apt to be damaged as a result of the high pressure exerted by the bulk of the stowage material. In addition to the damage to the fenders themselves the pertinent support arrangements and also the roof girders can also be damaged. It is not possible to reinforce the fenders to a sufficient extent to preclude all danger of damage since the restrictions on space imposed on equipment for mine workings is severe.

There is thus a need for an improved fender construction and a general object of this invention is to provide such a construction.

It is a further object of the invention to overcome the disadvantages of the known support frames with the simplest possible means and more particularly to provide a measure of protection for the fender as well as the ancillary components of the frame.

It is another object of the invention to prevent damage to the fender without rendering the latter completely ineffective.

SUMMARY OF THE INVENTION

In its broadest aspect, the invention provides in a mine roof support frame with a plurality of props a roof girder carried by the props and a fender connected to the goaf-side end of the roof girder; the improvement comprising support means for supporting the fender at a first working position in relation to the roof girder and means for causing the fender to move from said first position to a second position in relation to said girder when the external loading force on the fender exceeds a predetermined value.

In accordance with a preferred embodiment of the invention a mine roof support frame comprises a plurality of props; a floor rail interconnecting said props; a roof girder carried at the upper ends of the props; a fender pivotally connected to one end of the roof girder; a guide piece connected to the roof girder; a spigot slidably received within the guide piece and engageable with the fender; and a detachable shear pin extending through the guide piece and the spigot.

In this simplest form of the invention the shear pin is designed to fracture when the load on the fender becomes intolerably high to allow the spigot to slide inwardly of the guide piece until the fender pivots inwardly of the girder to a near vertical position where a wall surface of the guide piece provides a delimiting abutting face preventing further pivoting of the fender. In this innermost near vertical position the fender is still effective to screen off the stowage material.

The guide piece may be carried on a plate which is attached to a series of parallel shaped webs so as to dispose the spigot in an inclined position. A further plate also attached to the webs may serve to connect the support means to the roof girder. A spindle located by holes in the roof girder and the fender may render the latter pivotable. A tube attached to an edge of the further plate may also locate this spindle. Two or more bracket assemblies each composed of the aforesaid plates and webs can be provided on the underside of a single roof girder or where the invention is applied to parallel frames to the undersides of adjacent roof girders.

The guide piece may locate two bushes which receive end portions of the shear pin and the spigot has a transverse bore aligned with these bushes. It is preferable to provide the shear pin with grooves or notches to produce deliberately weakened regions.

Preferably a support shoe is disposed at an end of the spigot, said shoe serving to engage the fender. It is desirable for this shoe to be articulated to the spigot.

The invention may be understood more readily and various other features of the invention may become more apparent from consideration of the following description.

BRIEF DESCRIPTION OF DRAWINGS.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a side view of part of a mine roof support frame made in accordance with the invention;
FIG. 2 is a part-sectional enlarged side view of the fender support means of the frame shown in FIG. 1;
FIG. 3 is an end view of part of the support means shown in FIG. 2; and
FIG. 4 is a section taken along the line IV—IV of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENT.

A mine roof support assembly made in accordance with the invention is composed in known manner, of several telescopic props interconnected through a resilient floor rail at the floor region of the mine working. In FIG. 1 the numeral 10 denotes one of the props and the numeral 11 denotes the floor rail which is in the form of a pack of leaf springs. A roof girder 12 is carried at the upper ends or heads 13 of the props 10. The girder 12 is composed of a plurality of pivotably interconnected parts which are supported on the heads 13 of the props 10 in the manner of a universal joint denoted 14.

At the goaf side end 12' of the girder 12 there is provided a goaf or stowage fender 16. The aforesaid end 12' is bifurcated and the fender 16 is pivotably supported on a spindle 15 which is received in holes 17 in the bifurcated end 12' of the girder 12. The fender 16 itself is of hollow box-like construction and is reinforced transversely by means of interior ribs or the like. A shield is suspended from the fender 16. The fender 16 can take other constructional forms.

In accordance with the invention the fender 16 is held in a pre-determined angular position, for example at 30° to the vertical, with the aid of support means. This support means is constructed from a series of parallel webs 18 each of quadrilateral form disposed between plates 19, 20. The webs 18 can be welded to the plates 19, 20 to form a convenient bracket assembly. The plate 19 is attached to a lower wall 12 inches of the girder 12.
As may be seen best in FIGS. 2 to 4, the upper edge of the plate 20 is affixed as by welding to a tube 21 and this tube 21 receives the spindle 15. A guide piece 22 is affixed as by welding to the lower region of the plate 20. This guide piece 22 is provided with an inclined bore 23 which freely receives part of a spigot 24 carrying a support shoe 26 at its outer end. The shoe 26 is articulatedly connected to the spigot 24 with the aid of a hinge bolt 25 extending through aligned bores in the shoe 26 and the spigot 24. The bolt 25 has transversely-extending securing pins at its outer end portions which retain the bolt 25 in position. The shoe 26 is basically of U-shaped cross-section with a convex wall portion 27 which serves to engage the fender 16. The spigot 24 has at its innermost end region a transverse bore 29 which receives a shear pin 28.

The end portions of the shear pin 28 projecting outwardly from the spigot 24 are received in bushes 30,31 themselves located in bores in the guide piece 22 extending perpendicularly to the main bore 23. The pin 28 has a head at one end and underlying this head is a groove 33. The outer end portion of the interior of the bush 31 has a corresponding groove and a ring 34 seats in the grooves to locate and retain the pin 28. The pin 28 has weakened zones located at the exterior of the spigot 24 and these zones are produced by peripheral grooves or notches 35 or the like.

During operation, the stowage material exerts a force P (FIG. 1) upon the fender 16 held in position by the shoe 26 of the support means. This shoe 26 is of relatively great length, i.e., in a direction transverse to the fender 16, and this length is greater than the distance between two adjacent ribs so that deformation of the fender 16 is precluded.

When the fender 16 is subjected to loading the forces are transmitted via the support means to the wall 12 inches of the girder 12 while the plate 20, which acts as a tie plate, is subjected to tensile stress. If the force P exerted on the fender 16 exceeds a pre-determined value, typically about eight tons, the shear pin 28 will fracture along the weakened zones 35. The entire fender 16, which remains connected to the girder 12, will now pivot about the spindle 15 as the spigot 24 moves inwardly of the guide piece 22 sliding within the bore 23. The shoe 26 will finally come to rest against the outer face 22 of the guide piece 22 and the fender 16 will again be held firmly in a near vertical disposition so as to still screen off the stowage material. Obviously, the spindle 15 is made sufficiently strong in comparison to the shear pin 28 that the pin 28 fractures before the spindle 15 is damaged. To enable the frame to cope with different working conditions several shear pins 28 with different shear force characteristics can be provided. The shear pins 28 can easily be withdrawn and re-inserted into the guide piece 22 so that the appropriate pin 28 can be selected and readily incorporated into the support means.

With multiple parallel frames it is possible to provide common fender protection means with a bracket assembly 18, 19, 20 attached to each roof girder.

We claim:

1. In a mine roof support frame with a plurality of props, a roof girder carried by the props, and a fender connected to the goaf-side end of the roof girder, support means for supporting the fender at a first working position in relation to the roof girder, said support means being mounted on said roof girder in a position to bear against said fender and including a shear pin means through which the force on the fender may be transmitted, said shear pin being adapted to break when the force on the fender exceeds a predetermined value, means for allowing the fender to move from said first position to a predetermined second position in relation to said girder when the shear pin has broken and support means for supporting the fender in said predetermined second position, whereby the fender can continue to function as such while in said predetermined second position.

2. A frame according to claim 1, wherein said support means includes a guide piece having a bore and a spigot slidably received in said bore, the shear pin extending through the spigot and the guide piece and generally transversely to the longitudinal axis of the spigot.

3. A frame according to claim 1, wherein said support means comprises a plurality of parallel webs mounted between two plates, one of said plates being affixed to a lower wall of the roof girder and the other of said plates having a tube attached to one edge, said tube receiving a spindle pivotably supporting the fender.

4. A frame according to claim 2 wherein the shear pin means is a shear pin provided with weakened zones.

5. A frame according to claim 4, wherein the guide piece locates bushes receiving end portions of the shear pin.

6. A frame according to claim 2, wherein a support shoe is disposed at an end of the spigot, said shoe serving to engage the fender.

7. A frame according to claim 6, wherein the support shoe is articulated to said spigot.

8. A frame according to claim 2, wherein the spigot is inclined in relation to horizontal and vertical plates intersecting the axis of the spigot.

9. A frame according to claim 5, wherein the shear pin and one of the bushes have corresponding grooves which locate a ring serving to locate and retain the shear pin.

10. A frame according to claim 2, wherein the guide piece has a wall surface which serves to define said second position and the outer end of the spigot defines said first position.

11. A frame according to claim 2, wherein the support means further includes a plate connected to the roof girder, a further plate supporting said guide piece and means interconnecting said plates.

12. A frame according to claim 11, wherein the fender is pivotably connected to the roof girder by means of a spindle located in bores in the roof girder and the fender and wherein the further plate is affixed to means receiving the spindle.

13. In a mine roof support frame with a plurality of props, a roof girder carried by the props, and a fender connected to the goaf-side end of the roof girder, support means for supporting the fender at a first working position in relation to the roof girder, said support means being mounted on said roof girder in a position
ing a tube attached to one edge, said tube receiving a 
spindle pivotally supporting the fender, means for al-
lowing the fender to pivot inwardly from said first posi-
tion extending at about 30° to the vertical to a second 
predetermined position in which the fender extends 
substantially vertically in relation to said girder when

the shear pin has broken.

14. A frame according to claim 13, and further com-
prising stop means for limiting the movement of the 
fender beyond said second position.

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