

[72] Inventors **Gunter Bell**
Heinrichstrasse 14, 4351 Horneburg;
Willy Watermann, Falterweg 22, 46
Dortmund-Berghofen, Germany

[21] Appl. No. **774,858**
 [22] Filed **Nov. 12, 1968**
 [45] Patented **Apr. 27, 1971**
 [32] Priority **Nov. 24, 1967, Mar. 16, 1968**
 [33] **Germany**
 [31] **K63,994 and K65,053**

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Primary Examiner—Roy D. Frazier
Assistant Examiner—Frank Domotor
Attorney—Malcolm W. Fraser

[54] HYDRAULIC PIT PROP MOUNTING IN A ROOF SUPPORT SYSTEM

7 Claims, 5 Drawing Figs.

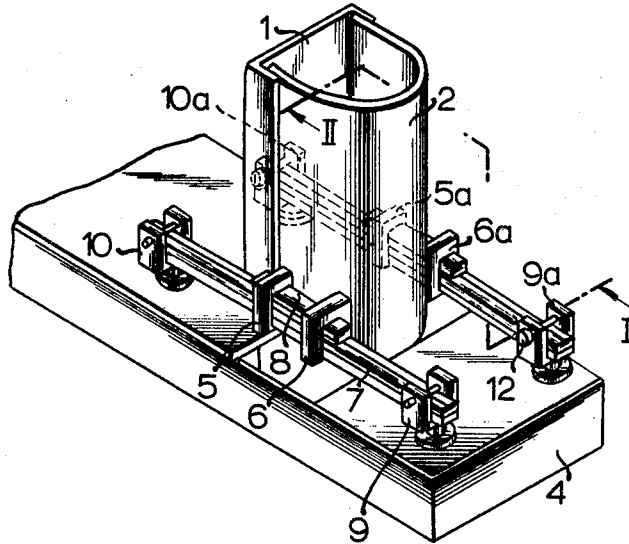
[52] U.S. Cl..... 248/357
 [51] Int. Cl..... E21d 15/00
 [50] Field of Search..... 248/357,
 354; 61/45.1

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ABSTRACT: A means for tiltably mounting a hydraulic pit prop in a roof support system, particularly at a long wall face, comprising a guide means for the reception of the prop and a solebar or soleplate upon which the guide means is tiltably mounted in a ball-and-socket joint and to which it is attached, said guide means being secured to the solebar or soleplate by attaching two substantially parallel spring elements, of which one is provided on each side of the guide means, to bearings affixed to the guide means and by locating the ends of said spring elements in holders secured to said solebar or soleplate. The spring elements may consist of bundles of spring rods.



PATENTED APR 27 1971

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FIG. 2

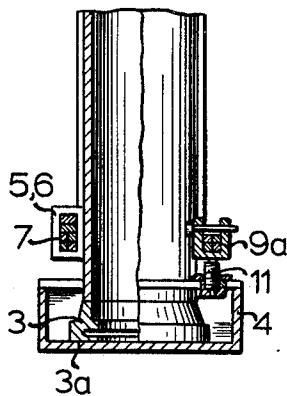


FIG. 1

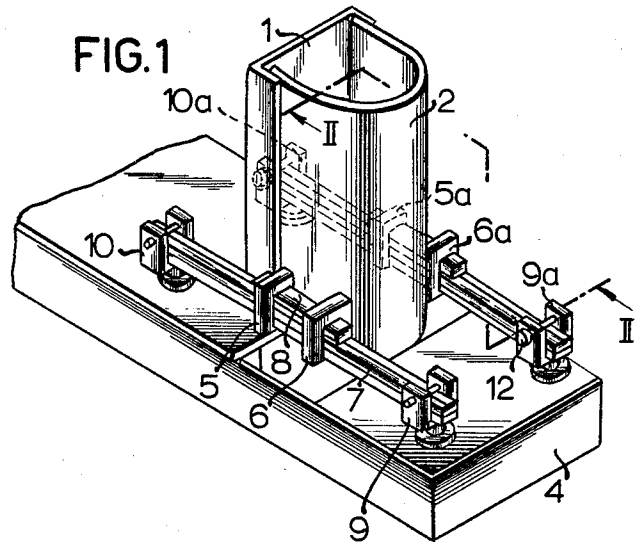


FIG. 3

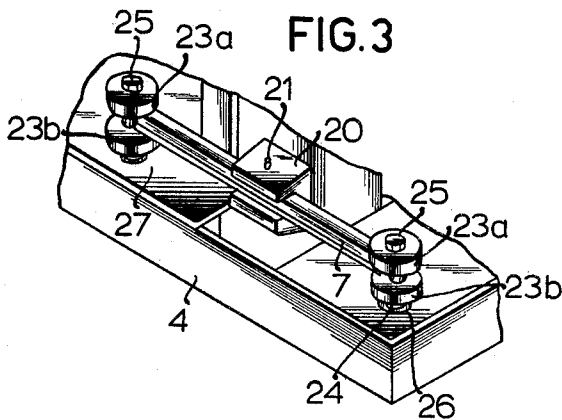
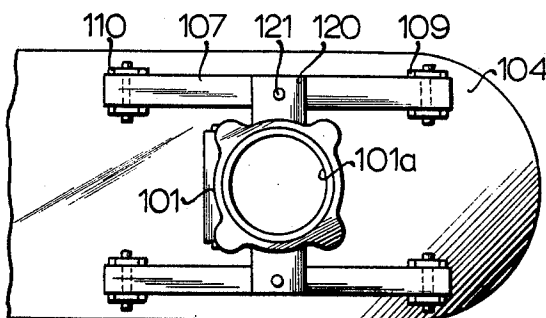


FIG. 4



HYDRAULIC PIT PROP MOUNTING IN A ROOF SUPPORT SYSTEM

The invention relates to means for tiltably mounting a hydraulic pit prop in a roof support system at a longwall face, comprising a guide means for the reception of the prop and a solebar or soleplate upon which the guide means is tiltably mounted in a ball-and-socket joint, and to which it is attached.

The use of such guide means for props obviates affixing the means for tiltably mounting the prop to the costly material of the cylinder of the prop. Moreover, such guide means can also be used as stilts. However, in such a case the guide means must be so designed that the prop can elastically yield to movements of the roof and floor and reassume its desired setting when the roof support is withdrawn.

In a known guide means for a hydraulic pit prop tiltably attached to a soleplate the closed end of the guide means is provided with a spherical head which stands in a corresponding socket in the top of the soleplate and which is held in this position by locking means. When the prop and hence its guide means are inclined at extreme angles to the soleplate this method of affixation is not sufficiently elastically yielding.

In another type of pit prop the head of the prop is so attached to a bar by two parallel spring elements provided on the bar in the lengthwise direction thereof, that attachment is frictional in the lengthwise direction and positive in the transverse direction of the bar. This arrangement requires prop heads of complicated design which are expensive to make. Moreover, the spring element must be located directly at the joint of the head, and this is not desirable.

It is an object of the present invention so to attach the guide means to the solebar or soleplate that the prop can tilt sufficiently in any direction and nevertheless spring-elastically reassume its desired setting.

According to the invention, means for tiltably mounting a hydraulic pit prop in a roof support system, particularly at a longwall face, comprising a guide means for the reception of the prop and a solebar or soleplate upon which the guide means is tiltably mounted in a ball-and-socket joint and to which it is attached, is characterized in that the guide means for the prop is secured by attaching two substantially parallel spring elements, of which one is provided on each side of the guide means to holders affixed to the guide means and by locating the ends of said spring elements on the solebar or soleplate in bearings secured to said solebar or soleplate.

Preferably, the bearings which are affixed to the guide means and to the solebar or soleplate are situated outside the parts of the guide means forming the ball-and-socket joint above or on the top of the solebar or soleplate.

Preferably the spring elements consist of bundles of spring rods, and the bearings embrace the bundles of rods. The spring elements may be held in their bearings by wedges or keys. In an alternative form of construction they are held by heavy locating pins.

It is also desirable that it should be possible to vary the setting into which the spring elements tend to restore the prop. According to another feature of the invention this is achieved by providing means for adjusting the ends of the spring elements securing the guide means in a direction normal to the solebar and substantially parallel to the guide means.

This can be done by making the holders adjustable for changing the position of the ends of the spring elements. For adjusting these holders these may comprise adjusting means in the form of a threaded shaft and a nut. However, it is not often always possible to avoid the necessity of removing the ends of the spring elements from the holders before these are adjusted and of then reinserting the same after the adjustment has been made.

This inconvenience can be overcome if, according to another feature of the invention, the holder comprises two parallel discs which grip one end of a spring element between them and which are jointly adjustable.

Whereas the described features permit the guide means to be so affixed to the solebar or soleplate that the prop can be

sufficiently tilted in any direction and elastically restored to its prescribed setting, the invention also permits the prop to yield to these tilting motions that are caused by movements of the roof or the floor without straining the ball-and-socket joint.

With this end in view another feature of the invention provides that the center of the ball of the ball-and-socket joint should be located on the axial centerline of the guide means at its point of intersection with a connecting line containing the centers of the holders and of the spring elements which they grip.

These centers are the centers of gravity resulting from the geometrical combination of the centers of gravity of the portions of the spring elements in their bearings, possible including the center of gravity of the associated bearing itself.

When the ball-and-socket joint is thus designed any tilt of the guide means towards the face or the goaf does not affect the coordinates of the fulcrum of this deflection and of the centers of the bearings which do not change their positions. If the holders are adjusted in contrary directions to tilt the prop contrary to the direction of dip, the centers of the bearings move substantially exactly in the vertical.

In either case no forces in addition to frictional moments will affect the ball-and-socket joint, such as might lead to the guide means or the soleplate or solebar being damaged.

Preferably the bearings are located in corresponding cross sections, i.e. at the same elevational heights on the guide means. It is also advisable so to design the arrangement that the connecting line is normal to the two parallels containing the spring elements.

The invention will now be described in greater detail, by way of example, with reference to the drawing, in which

FIG. 1 is a representation in perspective of a first embodiment of guide means for attaching a hydraulic pit prop to a soleplate of which only a fragmentary portion is shown,

FIG. 2 is a longitudinal section of the arrangement according to FIG. 1,

FIG. 3 is a similar view to FIG. 1 of a part of another embodiment of the invention,

FIG. 4 is a top plan view of the embodiment shown in FIG. 5, and

FIG. 5 is a partially sectioned side elevation of a third embodiment of the invention.

By means of the arrangements shown in the drawing a hydraulic pit prop which is to be used in a roof-supporting assembly, for instance in a frame or mount, is tiltably mounted.

For this purpose there is primarily provided a prop guide for the reception of the pit prop. In the embodiment of FIGS. 1 and 2 this guide consists of a U-shaped part 2 and a cover plate 1. At one end the guide is open, whereas the other carries a spherical head 3. The latter forms one member of a ball-and-socket joint of which the other part is a hollow spherical socket 3a formed in a solebar 4. The prop guide and the pit prop (not shown) received therein are therefore universally deflectable. The pit prop is assumed to be of conventional construction.

Attached, for instance by welding to the outside of the prop guide, more particularly to the two shanks of the U-shaped member 2, are bearings 5, 6 and 5a, 6a respectively. In the embodiment according to FIGS. 1 and 2 these bearings are substantially rectangular frames of which a pair is affixed to each shank of the prop guide 2. These bearings embrace spring elements consisting of bundles of spring rods 7. The bundles of spring rods are wedged tight in the bearings 5, 6 and 5a, 6a by keys 8.

For the reception of the ends of the bundles of spring rods 7, holders 9 and 10 are provided on the top of the solebar 4. In the embodiment of FIGS. 1 and 2 these holders are of generally U-shaped design and they are so placed that the open end of the U faces upwards. The ends of the bundles of spring rods are received between the shanks of the U of each holder and held in position by pins 11.

It will be understood that this arrangement permits the bundles of spring rods 7 to be replaced whenever required. The

rods may incidentally be of diverse cross section. For instance, they may be square section spring rods or flat spring steel strips placed horizontally or edge up.

Assuming that the prop and hence the prop guide tilts in the direction of dip, then the bundle of spring rods 7 and its bearings 5 and 6 on the side of the dip will move substantially vertically downwards, whereas the bearings 5a, 6a on the other side will correspondingly vertically rise. On the other hand, should the prop tilt in the direction of strike, then the bundle of spring rods will assume a wavy shape.

The bearings 5 and 6 and the pins 11 which are affixed to the prop guide 2 and to the solebar 4, respectively, are located above the top of the soleplate outside the parts of the prop guide forming the ball-and-socket joint.

This provides a very simple form of construction which requires no complicated ball heads. Moreover, a given angle of tilt of the prop guide in relation to the soleplate generates relatively large spring deflections, a result which is desirable for a variety of different reasons.

The U-shaped holders 9, 10, 9a, 10a in the embodiment illustrated in FIGS. 1 and 2 are not welded to the solebar, but they are adjustably affixed thereto. Adjustment can be made by threaded means comprising a screw shaft and nut. By raising the holders 9 and 10 and lowering the holders 9a and 10a the prop can be tilted to the dip. Alternatively, if the holders 9 and 9a are lowered and the holders 10 and 10a raised, the prop will tilt in the direction of strike.

In the embodiment illustrated in FIG. 3 the spring rods 7 are fixedly gripped in a shackle 20 by a heavy locating pin 21. Each holder comprises two parallel discs 23a and 23b coaxially mounted on a threaded bolt 24 with a hexagonal head 25, so arranged that the discs will contain and fix the end of at least one of the spring rods 7. Rotation of the screw bolt 24 in a nut 26 on the top 27 of the solebar 4 by applying a spanner to the hexagonal head 25 permits both discs 23a and 23b to be jointly adjusted. This arrangement permits the same adjustments of the position of the prop to be made as those described with reference to the previous embodiment without previously removing the spring rods from the holders.

In the embodiment illustrated in FIG. 4 the prop guide 102 for the reception of the prop consists of an arched member and a cover plate 101. This prop guide holds the bottom end of hydraulic pit prop 101a. The prop guide holds the bottom end of a hydraulic pit prop 101a. The upper end of the prop guide is open, whereas its bottom end has a spherical head 103 forming one part of a ball-and-socket joint, the other part of the joint being formed by a spherical socket 103a formed in a solebar 104.

Bearings 120 are affixed to the outside of each shank of the U-shaped part 102 of the prop guide. The two bearings and their components on opposite sides of the prop are identical.

A spring element 107 is fixed inside each bearing 120 by means of a heavy locating pin 121. The free ends of the spring element 107 are contained in holders 109 and 110. The holders have a U-shaped head for the reception of the ends of the spring elements 107 and a threaded part 130 which works in a tapped hole 131 in the top of the soleplate 104. The holders 109 and 110 can therefore be elevationally adjusted.

By appropriate adjustments the prop can be tilted in any direction in relation to the solebar, as will be readily understood.

The axis of the prop and of the prop guide is indicated by the chain line 132. This axis intersects a line normal to the plane of the paper which it penetrates at a point marked 133.

This line connects the centers of the bearings 120 and hence the centers of gravity of the assembly of spring elements 107 and their associated bearings 120.

The point of intersection of the connecting line 133 and of the axis 132 is the center of a radius R. This radius is that of the ball of the ball-and-socket joint comprising the two parts 103 and 103a.

It will also be understood that if the prop should tilt towards the face or towards the goaf, this point of intersection of the two lines 132 and 133 will not change its position in space. However, if the holders 109 and 110 on one side are adjusted with respect to the holders on the other side, as would be necessary for tilting the prop contrary to the direction of dip, then the centers of the bearings 120 will move substantially exactly in the vertical.

In either case the ball-and-socket joint can operate without constraint.

Incidentally the bearings 120 are affixed to the prop guide at the same level. As will be understood more particularly from the plan view, the connecting line runs perpendicularly to the parallels defined by the spring elements.

We claim:

1. A mine roof support system having a tiltable mounting for a hydraulic pit prop, comprising guide means for the reception of the pit prop, a solebar or soleplate upon which said guide means is mounted, cooperating means on said solebar or soleplate and on said guide means forming a ball-and-socket joint, a horizontal spring element on each side of said guide means, the spring elements being arranged in parallel relation, bearing means affixed to the guide means for attaching an intermediate portion of each spring element to the respective side of said guide means, and a holder mounted on said solebar or soleplate supporting each end of each spring element.

2. A system according to claim 1, in which the center of the ball-and-socket joint is located on the axis of said guide means, said axis being intersected by a line connecting the centers of said bearings for said spring elements, and the point of such intersection constituting the center of the radius extending to said ball-and-socket joint.

3. A system according to claim 1, in which the bearings affixed to the guide means and the holders affixed to the solebar or soleplate are located thereon in similar arrangement above said ball-and-socket joint.

4. A system according to claim 1, in which the spring elements consist of bundles of spring rods and in which the rods, which may have different cross sections, are fixed in the holders and bearings, said holder and bearings on each side being of approximately the same size, thereby to receive the same size spring rod bundle.

5. A system according to claim 1, in which the ends of the spring elements are adjustable substantially parallel to the guide means, and comprising an adjustable connection between each holder and said solebar or soleplate, thereby enabling adjustment of the end of each spring element in directions parallel to the axis of the guide means.

6. A system according to claim 5, in which the adjustable connection of the holder is a threaded means comprising a nut and a screw shaft, for connecting the holders to the solebar or soleplate.

7. A system according to claim 5, in which the holder comprises two parallel discs which between them contain one end of a spring element, and which are jointly adjustably movable.