June 13, 1967 A. D. ALLEN 3,324,664

RESILIENT BIASING DEVICE FOR MINE ROOF SUPPORT PROPS

Filed March 30, 1965 2 Sheets-Sheet 1

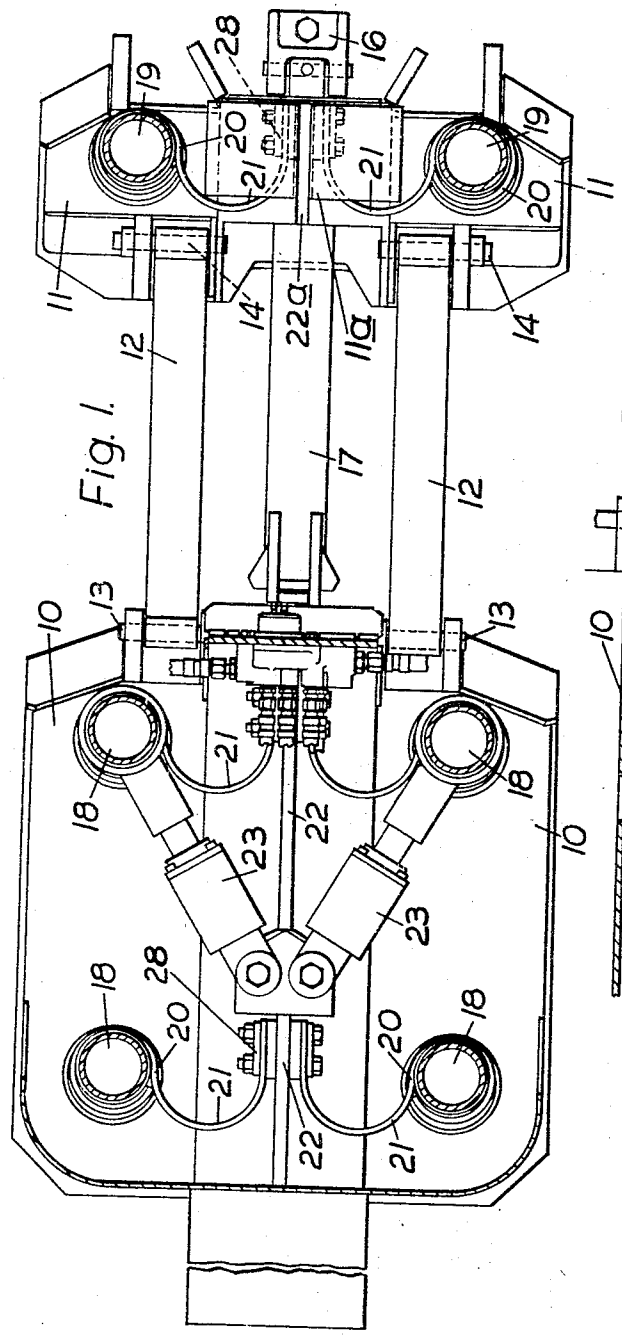


Fig. 1.

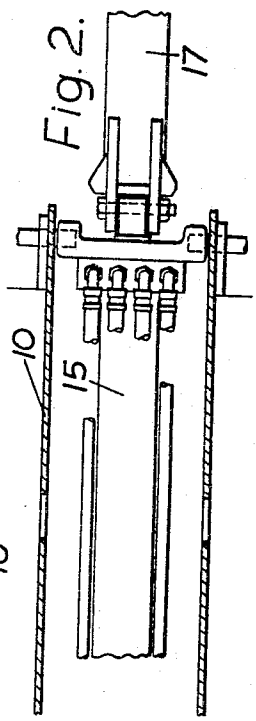


Fig. 2.

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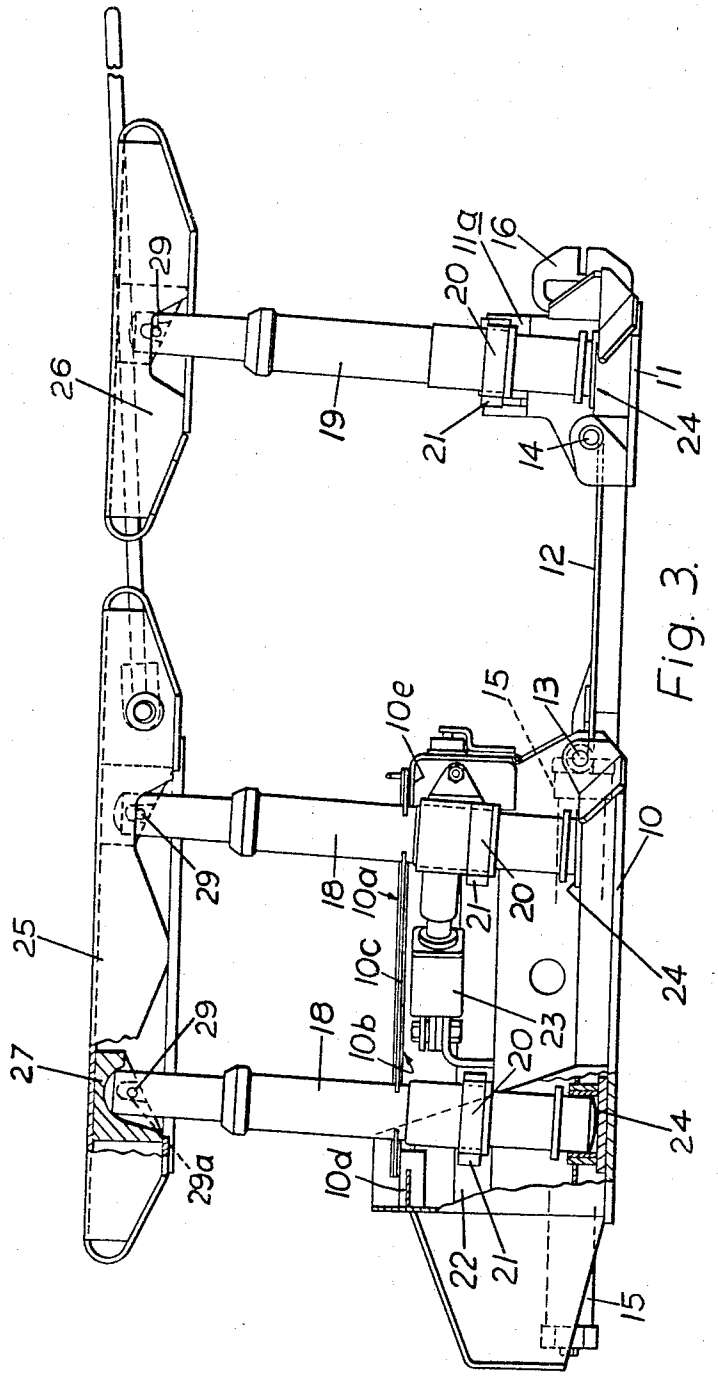


Fig. 3.

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United States Patent Office 3,324,664
Patented June 13, 1967

3,324,664

RESILIENT BIASING DEVICE FOR MINE ROOF SUPPORT PROPS

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Filed Mar. 30, 1965, Ser. No. 443,901
Claims priority, application Great Britain, Apr. 3, 1964, 13,787/64
4 Claims. (Cl. 61—45)

ABSTRACT OF THE DISCLOSURE

The invention provides a mine roof support comprising a base, at least one pressure-fluid extensible prop mounted on said base for universal tilting movement out of the vertical, a fixed anchorage on the base, a leaf-spring device which is U-shaped in plan having one of its resilient arms secured at its end engaging the prop. The leaf-spring device biases the prop towards a predetermined position whatever the direction in which it has been moved from said position. A cover is secured to said base and overlies the anchorage and spring device, the cover including a sheet of flexible material having an opening through which the prop passes.

The invention is for improvements in or relating to mine roof and like supports.

The invention is more particularly, although not exclusively, concerned with self-advancing roof supports for mines.

Such supports commonly comprise a base on which there is mounted one or more pressure-fluid extensible props or legs and a roof-engaging structure mounted on the upper part of said prop or props and adapted, when the latter is or are extended, to be applied to the roof for the support thereof. The support also incorporates pressure-fluid ram means which enables the support to move itself forwardly as stripping or cutting of the coal face proceeds. For instance, said ram means may be a double-acting ram adapted to push over a coal conveyor to the newly exposed coal face after which, using the conveyor as an anchorage, the ram is retracted so as to draw the supports up to the conveyor after the props or legs of the support have been temporarily retracted. One typical example of a mine roof support of this character and to which the present invention may with advantage be applied, is described in Patent No. 3,197,966 to Leslie John Arnott.

When re-setting the props or legs between floor and roof after a support has been advanced, it is advantageous to incline the legs towards the coal face so as to allow for the natural movement of the roof towards the goaf which tends to move the props or legs to a vertical or backward leaning attitude. Upon release of the legs or props, for a further advance movement of the chock or support, it is important that such props or legs should automatically again take up the predetermined forwardly inclined attitude towards the coal face, otherwise the rearward movement becomes cumulative and damage would result to the equipment after a support has been advanced a number of times.

The most common arrangement for positioning the props or legs for re-setting has been by means of resilient bushes usually of rubber which are situated between the support or chock frame and the leg or prop. It will be appreciated that with such an arrangement the amount of movement permitted to the leg or prop and the returning force will be determined by the nature and size of the mounting. Such movement and returning force are

very restricted where resilient bushes are used. Furthermore, rubber bushes are not stable and tend to deteriorate. It has also been proposed to use a plurality of springs spaced around a prop or leg so as to bias it to the required canted attitude. Such arrangements, however, tend to give varying loads dependent upon the direction of deflection. For instance, if the direction of deflection is between two adjacent springs the return force will differ from the case where deflection is against one spring only.

An object of the present invention is to provide a spring arrangement for automatically canting the legs or props to the required attitude but which, being of metal, is not subject to the same degree of deterioration as rubber and which at the same time is not subject to the defects of spring arrangements as used heretofore and such as that just referred to.

A further object of the invention is to provide an effective and reliable yet simple means for canting the legs or props out of the vertical to the required extent automatically, when they are released from between floor and roof, so that they will be in the correct inclined position for re-securing between floor and roof when supplied with pressure-fluid.

According to the present invention there is provided a mine roof support comprising a base, at least one pressure-fluid extensible prop mounted on said base for universal tilting movement out of the vertical, a fixed anchorage and a leaf-spring device secured to said fixed anchorage and having a laterally projecting resilient arm, said laterally projecting resilient arm of the leaf-spring device acting on the prop and being shaped so as to bias said prop back into a predetermined position whatever the direction in which it has been moved from said position.

In one preferred embodiment of the invention the spring device comprises a part curled about the prop and a reversely curled, bent or curved arm attached at its extremity to the relatively fixed anchorage. The relatively fixed anchorage may be a part on the base of the support, the spring device being located towards the lower end of the prop or leg so as to obtain the required degree of canting of the prop with a spring of reasonable strength.

One particular embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing. In the drawing:

FIGURE 1 is a plan view of the support with the canopy and rear base casing removed and shows more particularly the base of the support with the hydraulic props or legs in cross-section,

FIGURE 2 is a fragmentary plan view of the ram arrangement for pushing over the conveyor and then advancing the support up to it, and

FIGURE 3 is a side elevation of the support with a part of the rear base casing broken away.

The support shown on the drawing comprises a rear unit having a base **10** and a forward unit having a base **11**. The base **10** and the base **11** are coupled together by substantially rigid links **12** pivotally attached to the base **10** at **13** and to the base **11** at **14**. A double-acting ram **15** is housed in the base **10** and is connected to a clevis **16** by means of a thrust relay bar **17**. The thrust relay bar **17** operates freely through an arch or the like **11***a* on the base **11** of the forward unit.

The rear unit **10** has four hydraulically extensible telescopic legs or props **18** and the forward unit has two hydraulically extensible telescopic props or legs **19**. These props or legs are supported in sockets **24** on the bases **10** and **11** and engage in sockets on the underside of a canopy or roofing-bar structure **25**, **26** supported on the

upper parts of the props or legs and adapted to be applied thereby to the roof. One of said sockets on the underside of the roof-bar structure is indicated at **27**. It will be noted that said socket **27** is of concave form. The sockets **24** may also be of concave form. The props have convex upper and lower ends and the socket arrangements **24** and **27** are such that the props or legs can cant or tilt universally out of the vertical.

The props are located at their upper ends in the roof-bar structure by pins **29** positioned at the centre of curvature of the convex upper parts of the props and in vertical slots **29***a*. This arrangement allows relative universal angular movement in the vertical plane of the roof-bar structure and the props whilst it prevents rotation of the inner member of the props **18** and **19** about the vertical axes of the props.

The base **10** has a cover part comprising upper and lower metal plates **10***a* and **10***b* between which is sandwiched a rubber sheet or plate **10***c* through which the props **18** pass as a snug fit. So that the cover plate **10***a*, **10***b*, **10***c* does not interfere with the canting or tilting of the props or legs it is slidably supported on members **10***d* and **10***e* of the base frame.

No cover plate is necessary for the base **11** and this can be left completely open as during mining operations there is not a lot of dirt or debris towards the front of the support.

To ensure that the props or legs are canted or tilted to the desired extent and held in the canted attitude, when they are freed from the roof for advance of the support and re-setting, each is provided with a spring-biasing device made from spring strip steel or like material.

Each spring-biasing device comprises a part **20** which encircles the prop or leg and a reversely curved laterally projecting part or arm **21** the extremity of which is clamped, by a clamping device **28**, to a web or rib **22** on the base **10** or **22***a* on the base **11** as the case may be.

It will be appreciated that when the support is positioned securely between floor and roof there may be some roof movement which tends to move the legs or props **18** and **19** from their forwardly leaning attitude towards the vertical or even cause them to lean rearwardly. Whatever the direction of movement it will strain or load the spring devices **20**, **21** because of their shape. When the support is released from between floor and roof these spring devices react automatically to cant the legs or props out of the vertical to the desired predetermined extent so that they automatically take up, and are held by the spring devices in, a correct position ready for the support to be re-secured between floor and roof after it has been advanced.

The usual single acting hydraulic rams **23** may be provided, in addition to the springs **20**, **21**, for adjusting the legs or props to the required extent out of the vertical. The rams **23** are useful where the springs **20**, **21**, may not be sufficient to tilt the props unaided to the required extent. This may be the case in rather high seams or where the roof-bar structure **25**, **26** has not been properly released from the roof prior to advancing the support and re-setting the props. For many applications, however, it will be sufficient to provide the springs **20**, **21** only.

It will be appreciated that the springs **20**, **21** provide for substantially universal adjustment of the props in all lateral directions.

I claim:

1. A mine roof support comprising a base, at least one pressure-fluid extensible prop mounted on said base for universal tilting movement out of the vertical, a fixed anchorage on said base and a leaf-spring device, which is U-shaped in plan, having one of its resilient arms secured at its end to said fixed anchorage and its other resilient arm at its end engaging the prop thereby to bias said prop towards a predetermined position whatever the direction in which it has been moved from said position.

2. A mine roof support comprising a base, at least one pressure-fluid extensible prop mounted on said base for universal tilting movement out of the vertical, a fixed anchorage on said base, a leaf-spring device secured near one end to said fixed anchorage and having a laterally projecting resilient arm, said laterally projecting resilient arm of the leaf-spring device engaging the prop and being shaped so as to bias said prop toward a predetermined position whatever the direction in which it has been moved from said position, and a cover secured to said base and overlying said anchorage and spring device, said cover including a sheet of flexible material having an opening through which said prop passes.

3. A mine roof support according to claim **2** wherein said cover comprises a rubber sheet sandwiched between upper and lower metal border plates.

4. A mine roof support according to claim **2** wherein the wall of said opening engages and closely surrounds said prop.

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