March 14, 1967 P. D. DAVIS-RATCLIFFE 3,309,054

PIVOTAL SUPPORTING DEVICES PARTICULARLY FOR MINE ROOF SUPPORTS

Filed Aug. 2. 1965 3 Sheets-Sheet 1

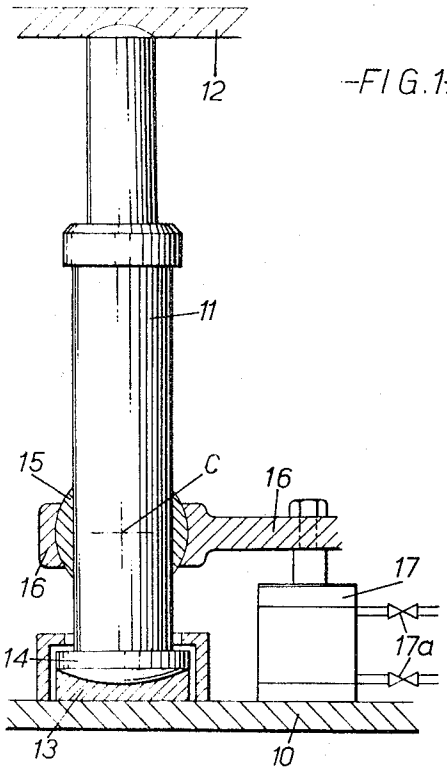


FIG. 1

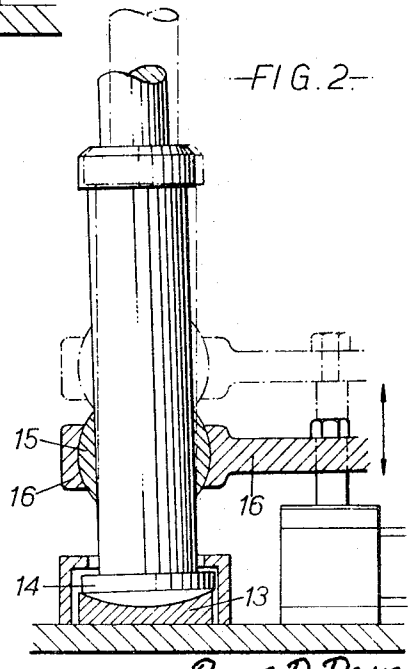


FIG. 2

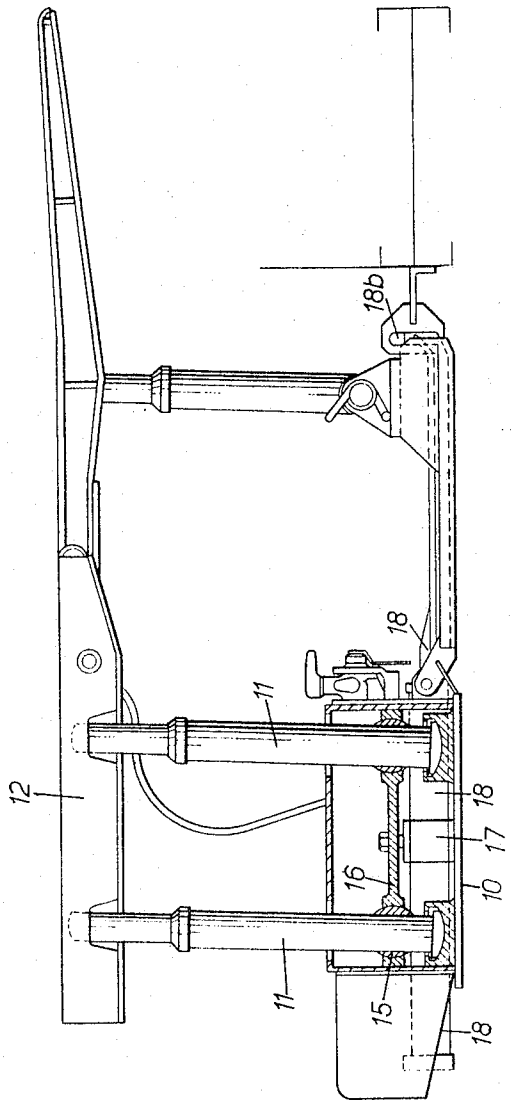
INVENTOR:
PETER D. DAVIS-RATCLIFFE
BY
Mirick and Hurley

March 14, 1967 P. D. DAVIS-RATCLIFFE 3,309,054

PIVOTAL SUPPORTING DEVICES PARTICULARLY FOR MINE ROOF SUPPORTS

Filed Aug. 2, 1965 3 Sheets-Sheet 2

FIG. 3.

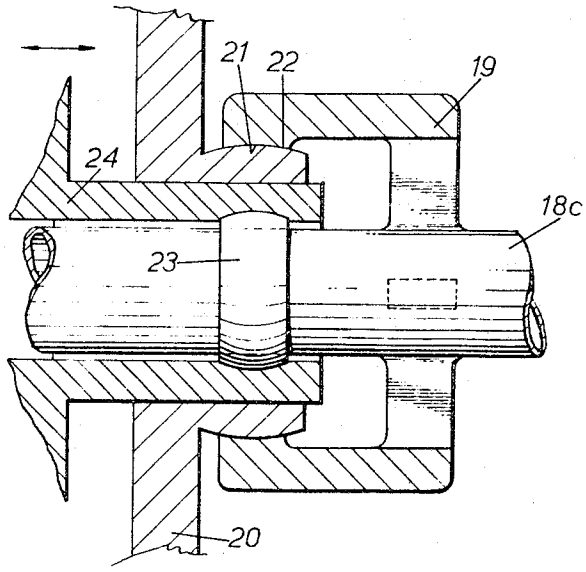


INVENTOR:
PETER D. DAVIS-RATCLIFFE
BY
Inirio and Inirio

March 14, 1967 P. D. DAVIS-RATCLIFFE 3,309,054

PIVOTAL SUPPORTING DEVICES PARTICULARLY FOR MINE ROOF SUPPORTS

Filed Aug. 2, 1965 3 Sheets-Sheet 3



-FIG.4-

INVENTOR:
PETER D. DAVIS-RATCLIFFE
BY
Mirie & Sibley

United States Patent Office

3,309,054

Patented Mar. 14, 1967

3,309,054

PIVOTAL SUPPORTING DEVICES PARTICULARLY FOR MINE ROOF SUPPORTS

Peter Derek Davis-Ratcliffe, Penketh, Warrington, England, assignor to Gullick Limited, Wigan, England, a British company

Filed Aug. 2, 1965, Ser. No. 476,333
Claims priority, application Great Britain, Aug. 11, 1964, 32,595/64
11 Claims. (Cl. 248—354)

This invention is for improvements in or relating to pivotal supporting devices for members which also require to be locked or held against pivoting movement.

The invention is particularly, although not exclusively concerned with hydraulic mine roof supports or chocks of the kind comprising a telescopic prop or props or legs adapted to be extended by hydraulic pressure-fluid. Such supports commonly comprise a base on which a plurality of props are mounted and a roof-bar structure supported on the upper parts of the props and which is applied to the roof when the props are extended. Provision is made whereby the props can be moved angularly out of the vertical. For instance, concave/convex seatings may be provided between the upper and lower ends of the props and the roof-bar structure and base respectively. The support may also include a double-acting ram means which, when extended, serves to push a coal conveyor towards the coal face, as cutting of the coal proceeds, and when anchored to, say, the conveyor and retracted, serves to advance the support up towards the conveyor.

With hydraulic roof supports and particularly supports of the chock type as above described, it has been found in practice that there is a tendency, due to geological conditions, for the roof of a mine to move relatively to the floor after removal of the coal or mineral being obtained. This movement is usually compensated for or allowed to a limited extent by the provision of resilient mountings for the extendible roof-supporting members or props which as indicated above are permitted some angular movement. Such resilient mountings are commonly of rubber or like material and tend to deteriorate in service, and have other disadvantages.

One object of the present invention is to provide an improved arrangement which will allow for relatively unrestricted movement of the support members or props, when set, to the extent necessary to provide for the above-mentioned relative movement between roof and floor and which, at the same time, when the support unit is being advanced and the props are released from between floor and roof, will provide the necessary control over movement of the props.

According to the present invention there is provided a device comprising two pivotal supports for a member, at least one of said pivotal supports being movable with respect to the other so that they have a position in which their pivotal centres coincide, whereby said member is pivotally supported, and a position in which said centres are out of coincidence whereby the member is held against pivotal movement.

The member just referred to may be a mine roof supporting prop or one of several props incorporated in a mine roof supporting chock and some or all of which are provided with a pivoting and locking arrangement as described.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings. In the drawings:

FIGURE 1 shows an application of the invention to a mine roof supporting prop, the prop being in the "free to pivot condition" and upright,

FIGURE 2 shows the arrangement according to FIGURE 1 but with the prop slightly tilted or pivoted out of the vertical to allow for the above-mentioned tendency for the roof to move relatively to the floor.

FIGURE 3 shows an arrangement, similar to that illustrated in FIGURES 1 and 2 applied to a multiple leg chock, and

FIGURE 4 shows an embodiment of the invention applied to the advancing ram means of a hydraulic roof support or chock, the ram being in the "free to pivot condition."

Referring first to the embodiment of the invention shown in FIGURES 1 and 2, the support has a base **10** on which is mounted a hydraulically extensible telescopic prop **11** which at its upper part supports the roof-bar structure or cap **12**. Convex/concave seatings are provided where the roof-bar structure **12** rests on the upper ends of the props.

Generally (i.e., when the support is in the form of a chock) there will be two, three, four or more props mounted on the base **10** or on two or more bases, which may be linked together.

The mounting on the base **10** for the prop **11** comprises a block or pad **13** having a concave face in which is seated the convex surface of the foot **14** of the prop. The centre of curvature of these concave/convex faces is indicated at C.

For the purpose of the present invention a spherical bush or sleeve **15** is slidably mounted on the prop **11** and is carried in a bearing block **16** having an arm **16***a* adapted to be raised and lowered by means of a double acting hydraulic piston and cylinder device **17**. Valves **17***a* are provided for controlling the operation of the device **17**.

In the condition shown in FIGURE 1, which is the condition when a support is set between floor and roof and is supporting the roof, the prop **11** is free to move angularly (i.e., pivot or rock) on the base pad **13**, to allow for movement of the roof relative to the floor, because the centre of curvature of the spherical bush or sleeve **15** coincides with the centre of curvature C of the convex/concave faces of the pad **13** and foot **14**. For instance, the prop can move to or be set in the angular position indicated in FIGURE 2.

When, however, the prop has been released from between floor and roof, e.g., when it is required to advance it up towards the conveyor and any freedom of movement of the prop would be a nuisance, then the arm **16** and spherical sleeve **15** are raised, by introducing pressure-fluid into the cylinder **17**, to the position shown in dotted lines in FIGURE 2. In this position the centre of curvature of the spherical sleeve **15** is out of coincidence with the centre C and tilting movement of the prop cannot take place. When the support has been reset the ram **17** is operated so as to retract the arm **16** back to the position shown in full lines in FIGURES 1 and 2 so that the prop is again free to move.

The arrangement just described could, of course be used to lock a prop in an angularly set, roof supporting position should this be desirable. For such an arrangement the axis of the piston and cylinder device **17** will be parallel to said angular setting of the prop.

The support shown in FIGURE 3 is similar to that described in British patent specification No. 950,066 and in the specifications of U.S.A. application for patent No. 89,159 and German application for patent No. G 31,545. The rear unit of the support has a plurality of props or legs **11** mounted on its base **10** as above described with reference to FIGURES 1 and 2. The locking arrangement for the props or legs is also similar to that described with reference to FIGURES 1 and 2 except that a single hydraulic device **17** operates a double ended locking member **15**, **16** for a pair of the legs or props **11**.

Mounted in the base **10** is a double acting ram **18** for pushing over the conveyor and advancing the support as previously described, the ram having a thrust bar **18***a* coupled to the conveyor as indicated at **18***b*.

FIGURE 4 shows an application of the invention to the cylinder of a hydraulic or like ram (e.g., the advancing ram **18** of a roof support as shown in FIGURE 3) where it is desirable that universal movement for the cylinder should be available whilst in certain circumstances the cylinder should be locked against such movement.

In the embodiment of the invention shown in FIGURE 4 the cylinder **18***c* of the ram **18** (FIGURE 3) is carried by an annular yoke member **19** by which it is supported from a fixed mounting **20**. This mounting could, for example be fixed to the base **10** of the support shown in FIGURE 3. The yoke member **19** has an annular concave face **21** which seats on the convex face **22** of the mounting **20**.

Slidably mounted on the ram **18** is a spherical bush or sleeve **23**, said bush being located in a convex seating in a member **24** slidably supported in the mounting **20**.

When the parts are in the relative positions shown in FIGURE 4 in which the curvature of the concave/convex faces **21** and **22** has the same centre C as the curvature of the spherical bush or sleeve **23**, the ram **18** is permitted more or less universal movement. When it is desired to fix the ram, i.e., prevent universal or other movement thereof, the member **24** together with the spherical sleeve **23** is moved along the axis of the ram so as to create an eccentric or locked condition.

Instead of the bush or sleeve **15** or **23** having a part spherical surface it may, for example, have a cylindrical surface where freedom of movement in one plane only is required.

I claim:

1. A device comprising two pivotal supports for a member, at least one of said pivotal supports being movable with respect to the other so that they have a position in which their pivotal centres coincide, whereby said member is pivotally supported, and a position in which said centres are out of coincidence whereby the member is held against pivotal movement.

2. A device comprising two pivotal supports for a member, at least one of said pivotal supports having means slidably mounting it on said member for movement therealong with respect to the other so that said pivotal supports have a position in which their pivotal centres coincide, whereby said member is pivotally supported, and a position in which said centres are out of coincidence whereby the member is held against pivotal movement.

3. A device comprising two pivotal supports for a member, one of said pivotal supports including a foot for said member and a block on which said foot is mounted by a concave/convex mounting arrangement, the other pivotal support having means slidably mounting it on said member for movement therealong with respect to the other pivotal support so that said pivotal supports have a position in which their pivotal centres coincide, whereby said member is pivotally supported and a position in which said centres are out of coincidence whereby the member is held against pivotal movement.

4. A device comprising two pivotal supports for a member, one of said pivotal supports including a foot for said member and a block on which said foot is mounted by a concave/convex mounting arrangement the other pivotal support including a bearing block and a sleeve having a concave/convex seating in said bearing block and being slidably located on said member, and means for moving said bearing block and sleeve along said member so that the pivotal supports have a position in which their pivotal centres coincide, whereby said member is pivotally supported, and a position in which said centres are out of coincidence whereby the member is held against pivotal movement.

5. A device comprising two pivotal supports for a member, at least one of said pivotal supports being movable with respect to the other so that they have a position in which their pivotal centres coincide, whereby said member is pivotally supported, and a position in which said centres are out of coincidence whereby the member is held against pivotal movement, pressure-fluid ram means, and means operatively connecting said ram means to said movable pivotal support for effecting movement thereof.

6. A device as claimed in claim **4** wherein the means for moving the bearing block and sleeve is a pressure-fluid-operated ram.

7. A mine roof support comprising at least one pressure-fluid extensible prop member and two pivotal supports for said prop member spaced apart along the length thereof, at least one of said pivotal supports being movable with respect to the other so that they have a position in which their pivotal centres coincide, whereby said prop member is pivotally supported, and a position in which said centres are out of coincidence whereby the prop member is held against pivotal movement.

8. A mine roof support as claimed in claim **7** and further comprising a pressure-fluid-operated ram means for effecting movement of said one pivotal support with respect to the other.

9. A mine roof support comprising at least one pressure-fluid extensible prop member, two pivotal supports for said prop member, one of said pivotal supports including a foot for said prop member and a block on which said foot is mounted by a concave/convex mounting arrangement, the other pivotal support including a bearing block and a sleeve having a concave/convex seating in said bearing block and slidably located on said prop member, pressure-fluid-operated ram means and means operatively connecting said ram means to said block for effecting said movement of the block and sleeve along the prop member, so that the pivotal supports have a position in which their pivotal centres coincide, whereby said prop member is pivotally supported, and a position in which said centres are out of coincidence whereby the prop member is held against pivotal movement.

10. A pressure-fluid-operated ram having two pivotal supports, at least one of said pivotal supports being movable with respect to the other, along the length of the ram, so that they have a position in which their pivotal centres coincide, whereby said ram is pivotally supported, and a position in which said centres are out of coincidence whereby the ram is held against pivotal movement.

11. A ram as claimed in claim **10** and further comprising a pressure-fluid-operated ram means for effecting movement of said one pivotal support with respect to the other.

No references cited.

CLAUDE A. LE ROY, *Primary Examiner.*

F. DOMOTOR, *Examiner.*