# United States Patent

**Beagan, Jr.**

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[54] **ADJUSTABLE MOUNTING FOR ROCK DRILLS**


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[52] **U.S. Cl.** ..... **173/43,** 173/28

[51] **Int. Cl.** ..... **E21c 11/02**

[58] **Field of Search** ..... 173/28, 43, 44; 248/13, 16



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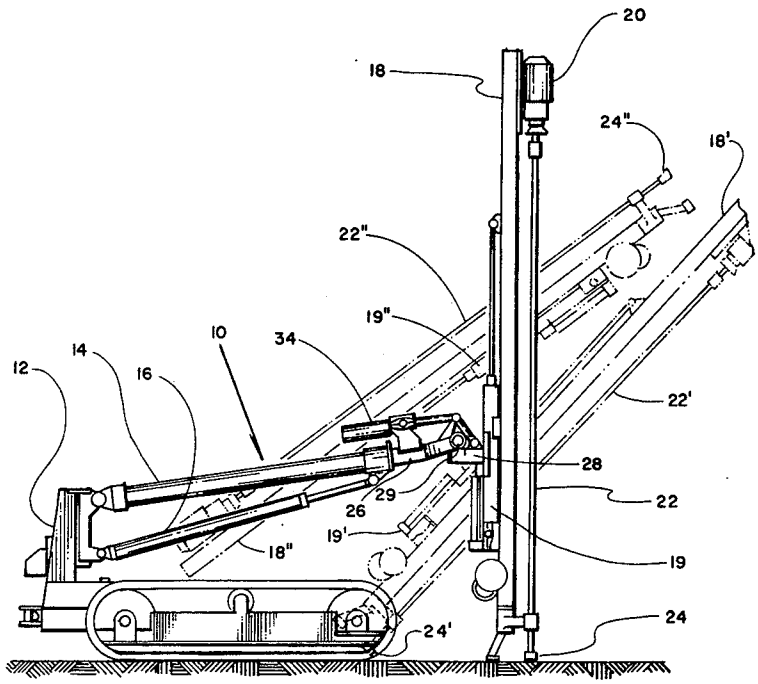
*Attorney*—E. Wallace Breisch



[57] **ABSTRACT**

An adjustable mounting for a rock drill having a feed tilt mechanism whereby the elongated drill guide frame is pivotable by a tilt cylinder through at least 150°. This capability is made possible by the use of a cylinder rod extension having its motion controlled by a pivot arm pivotably mounted on the same yoke as is the guide frame.


**10 Claims, 5 Drawing Figures**



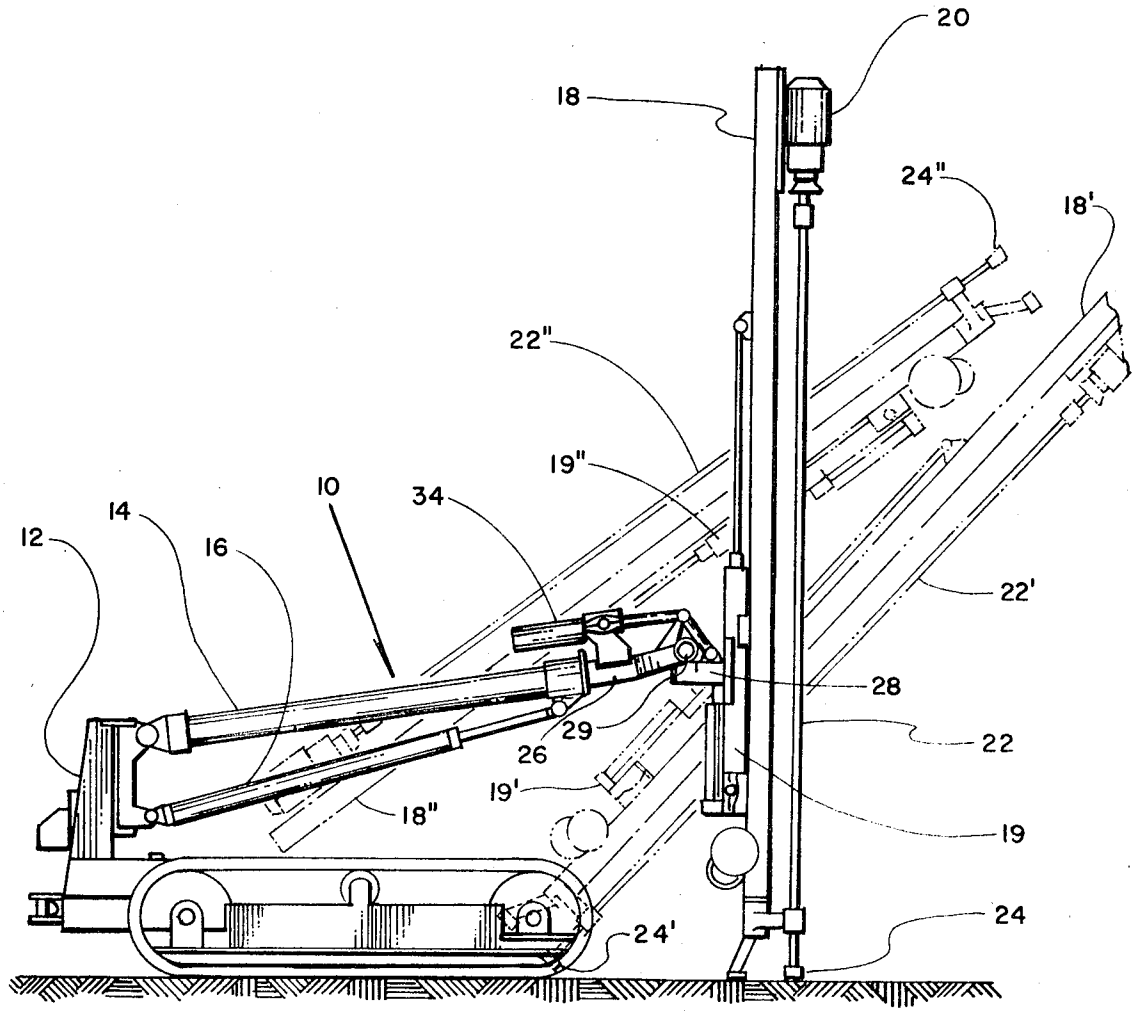



Fig. 1.

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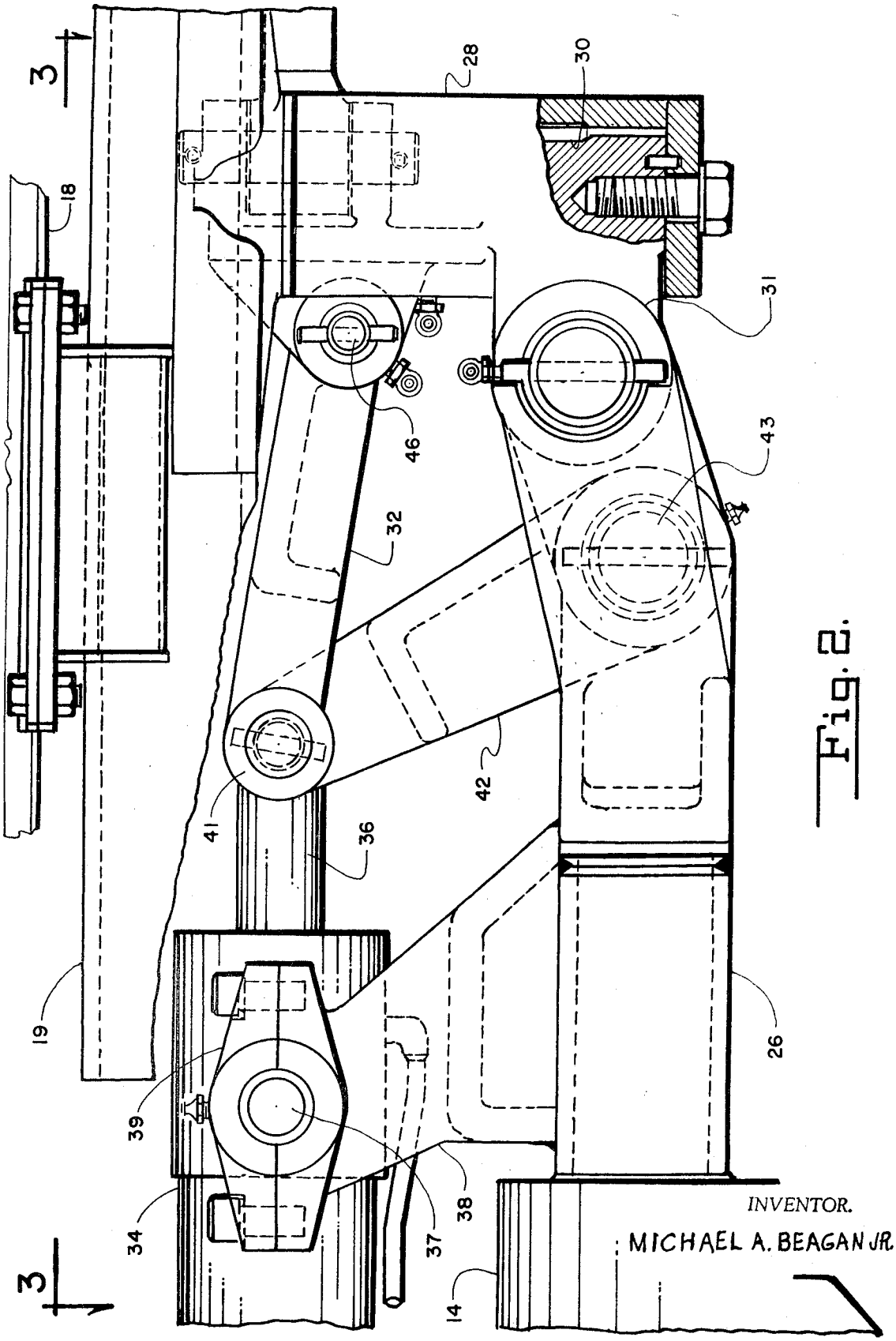



Fig. 2.

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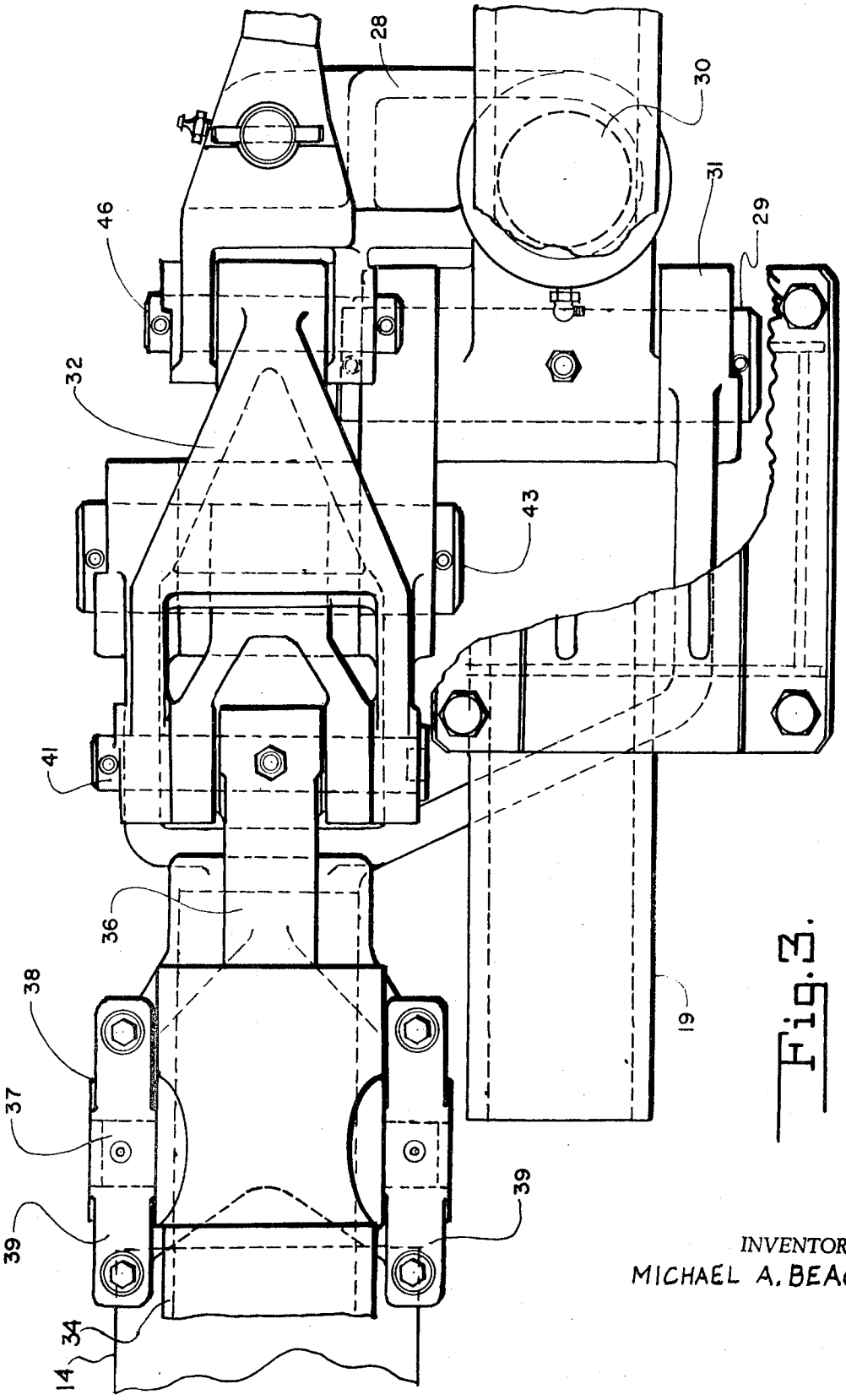



Fig. 3.

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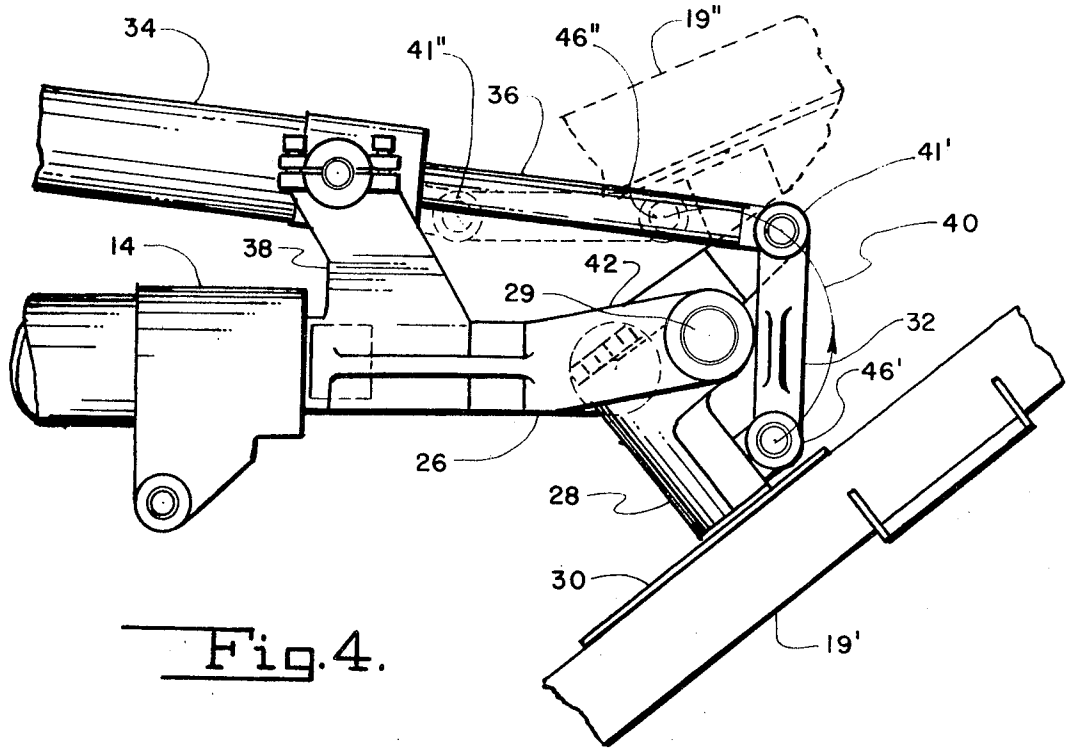



Fig.4.

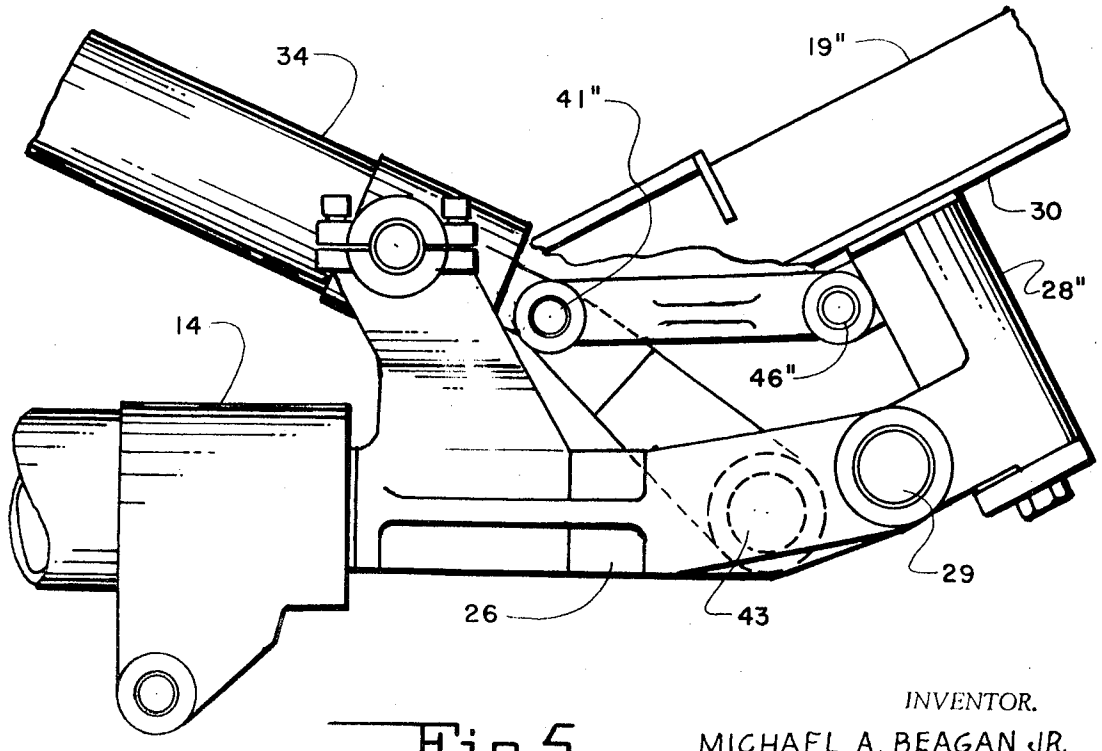



Fig.5.

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# ADJUSTABLE MOUNTING FOR ROCK DRILLS

In the field of rock drills it has been well known for many years to mount the guide frame and drill on the end of a universally pivotable boom and to make the drill carrying guide frame pivotable with respect to the ends of the boom in both directions. Rotation of the guide frame transversely to the axis of the boom (lateral rotation) is normally accomplished by a single cylinder giving a limited amount of swing such as 50° or 60° total. In a similar manner rotation of the guide frame about an axis substantially normal to the axis of the boom (hereinafter designated tilting) has been accomplished in various ways but usually limited to about 90° with a single cylinder. In prior art machines to translate the positioning of the guide frame and drill mounted thereon from the forward drilling mode including the ability to drill somewhat upwardly of the boom axis as in drilling a toe hole, to the mode of drilling required in presplit operations wherein the bottom end of the guide frame is pointed backwardly under the mobile support, i.e. the crawler frame, it has usually been necessary to change a pivot pin from one hole to another, employ two separate tilt cylinders, or as in the latest development employ a bell crank and double pivots between the boom and the guide frame to give the required ability to tilt through a total arc of nearly 180° to accomplish the above described change in mode of operation.

Such prior art arrangements have been able to provide the necessary ability for change of direction but have been unsatisfactory in that when it was necessary to change a pin as in the earlier devices there was a necessary interruption of productive drilling plus the inconvenience and even danger to the operators in removing a stabilizing portion of the machine even temporarily. In the case of using two separate tilt cylinders the added weight and expense and complication of using two cylinders in place of one is obvious. In the latest apparatus where the bell crank and two parallel pivot pins are used between the boom and the guide frame it is obvious that the added crank element between these two members will seriously affect the stability of the guide frame with respect to the boom with well known deleterious effects on drilling action and wearing life of the drill bits and steels.

With the design according to the instant invention no shifting of pins, no second tilt cylinder, or second pivot pin with accompanying extra element are necessary with the result that the total tilting action is achieved without interruption in the drilling procedures, without danger to the operator and without the added complication of an extra cylinder. Furthermore the apparatus according to the instant invention provides superior stability in all modes of operation because the guide frame tilts with respect to boom about a single pivot pin secured to both the guide frame and a boom element.

These and other advantages of the apparatus of this invention will be more readily apparent upon consideration of the following description and drawings in which:

FIG. 1 is a side elevational view of the adjustable rock drill mounting of this invention including phantom views of different guide frame positions made possible by the action of the tilt mechanism;

FIG. 2 is a side elevational fragmentary view of a portion of the apparatus shown in FIG. 1;

FIG. 3 is a view of the apparatus portion shown in FIG. 2 taken substantially on line 3—3 of FIG. 2;

FIG. 4 is a fragmentary view showing a greater amount of the machine of FIG. 1 including all the mechanisms shown in FIGS. 2 and 3 with phantom views to show the position of various parts of the apparatus in different attitudes;

FIG. 5 is a side elevational view of the same fragment as that shown in FIG. 4 with the parts shown in an extreme position to illustrate the novel capabilities of the apparatus of this invention.

In FIG. 1 there is shown a track drill of a type well known in the art generally indicated at **10** and comprising a crawler tracked mobile support **12** having universally pivotally mounted thereon a drill supporting boom member **14** supported and rendered universally movable by a lift cylinder **16** and a swing cylinder (not shown) in a manner more completely illustrated and described in my earlier U.S. Pat. No. 2,975,993. The forward end (to the right as seen in FIG. 1) of the boom **14** supports a guide frame support **19** slidably supporting an elongated drill guide frame **18** on which is mounted, for longitudinal drill feed action, a drill motor **20** connected to elongated drill steels **22** having rigidly secured at one end thereof a drill bit **24**, all as well known in the rock drilling art.



The principles of this invention are particularly embodied in the connection of the boom **14** of the drill frame support **19** through a yoke member **26** and a trunion support member **28** pivotally connected together by a single pivot pin **29** which three members constitute the portion of the apparatus which gives freedom for tilt action of the guide frame **18** with respect to the boom **14** about an axis substantially normal to the central longitudinal axis of the boom **14**. This tilting action to an extreme in each direction is shown in FIG. **1** by the broken line representation of the guide frame **18'** and the bit end of drill steel **22'** in the downwardly and backwardly inclined (presplit) position with the drilling action taking place toward and underneath the mobile support **12** and the broken line representations indicated at **22''** and **18''** showing the extreme opposite tilted position with the drill steel pointing upwardly forwardly along the guide frame **18''** in a position relative to the boom **14** such as would be necessary for drilling an extremely low horizontally forwardly directed toe hole in the face which is one of the more difficult positions to accomplish in face drilling. This tilt capability as illustrated in FIG. **1** is more clearly shown in FIG. **4** where an arc **40** having a center on the axis of the pivot pin **29** and extending between extreme positions of a single element shows a total arcuate length of more than 150° (shown as approximately 170°) which is the total difference in attitude necessary for the above described extreme positions providing the presplit **22'** and the toe hole **22''** capabilities required in a track drill such as herein illustrated.

Referring now to the fragmentary view of FIG. **2** it is to be seen that a portion of the guide frame support **19** is shown approximately parallel to the illustrated fragment of the boom **14** in which intermediate position the drill steel **22** would be projecting horizontally forward if the boom at this time were horizontally disposed. In this intermediate position as shown in FIG. **2** and also illustrated in plan view in FIG. **3** it is to be seen that the 170° of tilting capability is accomplished by the apparatus of this invention with a single tilt cylinder **34** having a rod end **36** connected by a single link **32** to the trunion support member **28**. Control of the positioning of the tilt cylinder **34** in its pivoting support pivot bracket **38** is accomplished by an arm element **42** pivotally connected to both the rod **36** and the link **32** at a common point and pivotally mounted on the yoke **26** at a point intermediate the pivot pin **29** and the boom **14** by means of an arm pin **43** while the end of the link **32** remote from the tilt cylinder **34** is pivotally connected to the trunion support **28** by way of a pin **46**. Since the guide frame must have lateral rotative capability about various axes represented by the different positions of the central axis of the trunion support member **28** the frame **18** is mounted on a substantially cylindrical trunion member **30** extending normal to the frame **18** and pivotally secured within the support member **28** to yield these rotative capabilities.

For better understanding of the connection just described it is recommended to examine FIG. **3** which is a plan view partially cut away of the fragment shown in elevation in the FIG. **2**. In observing FIG. **3** it is to be noted that the pivot bracket **38** has a pair of bearing caps **39** which captively pivotally retain mounting trunions **37** of the tilt cylinder **34** in a manner well known in the art. It is further to be noted that the forward end of the rod **36** is enlarged into the usual circular rod end to receive a pin **41** which is also pivotally received in suitable bores in the upper end portion of the arm element **42** and in the widely spread apart rear end portions of the link **32** connecting all three together as earlier described. The pin **46** con-

necting the forward end of the link **32** to the rearwardly extending ear portions of the trunion support member **28** may also be well observed in FIG. **3** wherein it also becomes clear that to give the maximum tilt capability to the guide frame **18** the direct support portion of the yoke **26** is offset to the right of the boom (toward the bottom of the sheet as seen in FIG. **3**) so that the pin **43** extends between a pair of arm portions **31** of the yoke member **26** on opposite sides of the centerline of the guide frame support **19** but offset from the centerline of the boom **14** and of the tilt cylinder **34** by an amount sufficient to allow the guide frame support **19** to swing downward along side the tilt cylinder **34** and the boom **14** as best seen in FIG. **3**.

Inspection of FIGS. **4** and **5** will make it easier to understand the action of the arm **42** as applied to the link **32**, the rod **36** and the tilt cylinder **34**. To provide for positive powered rotation of a pivotally mounted lever it is well known to connect the rod end of a pivotally mounted cylinder thereto so that the pivot lever can be rotated through an arc. It is however also well known that it is very difficult to achieve a rotation of more than perhaps 90° or 100° by such direct action. It is in order to increase this pivoting capability that prior art mechanism have applied a pin shiftable between different portions of the pivoting lever to give rotation in different sectors of the desired arc while other prior art mechanisms have employed two or more cylinders to achieve greater arcuate capability and the latest ideas have centered around using two or more pivoting elements between the boom and the guide frame. According to the instant invention however, direct pivoting connection is maintained between the boom and the guide frame about a single pivot axis for tilting action and a single tilt cylinder **34** is utilized with a single rod end **36**. But the link **32** extending between the rod end **36** and the trunion support member **28** gives the effect of a flexible connection which is however longitudinally rigid to provide both push and pull action between the rod **36** and the trunion support member **28** so that a full 170° of rotation is possible with single cylinder and single pivot pin action in a way quite unique in the drill support art. Consistently with the other figures the extreme upwardly forwardly slanting position of the guide frame support **19** is indicated as **19''** in FIGS. **4** and **5** with the position of the pivot pins **41'** and **46'** indicating positions of the guide frame as indicated at **18'** in FIG. **1** and also in FIG. **4** although shown solid in FIG. **4**. The **19''** guide frame support position from FIG. **1** with pins **41''** and **46''** is shown solid in FIG. **5** in the extreme upwardly and forwardly pointing position of the guide frame **18''**. It is to be noted that neither the pin **29** nor the pin **43** changes its position relative to the boom **14** during all of the tilting action.

It is of course to be realized that the yoke **26** may be connected to the boom **14** in any desirable manner such as being rotatable as shown in U.S. Pat. No. 3,226,064 (Thompson) or extendable along the line of the boom axis without departing from the principles of this invention so long as no tilting action of the yoke **26** with respect to the boom **14** is possible.

It is further to be noted that mounting of the boom **14** on a tracked vehicle is not limiting upon this invention which may be used with any type of boom support either mobile or fixed.

One embodiment of this invention having hereinabove been described and illustrated it is to be realized that variations of the application of the principles of this invention are possible and are envisioned. It is therefore respectfully requested that this invention be interpreted as broadly as possible and limited only by the scope of the claims appended hereto.

What is claimed is:

**1**. A drill mounting comprising: an elongated boom; a yoke member non-pivotally mounted at the free end of said boom; a guide frame supporting member pivotally mounted on said yoke member for limited rotation with respect to said boom about a single axis substantially normal to the axis of said boom; a guide frame mounted on said supporting member; an extensible fluid operated cylinder pivotally mounted on said yoke member having an extendable and retractable rod element; a link element pivotally connected to said rod element and to said supporting member; an arm member pivotally mounted on said yoke member and pivotally connected to at least one of said elements whereby at least about 150° of guide frame tilting action is provided relative to said yoke member.

**2**. A drill mounting as specified in claim **1** wherein said boom has therein an extensible inner member and said yoke member is mounted at the emergent end of said extensible member.

**3**. A drill mounting as specified in claim **1** wherein said rod element said link element and said arm member are pivotally connected together by a single pin to pivot relative to each other about a common axis.

**4**. A drill mounting as specified in claim **1** wherein said guide frame is pivotally mounted on said supporting member for limited rotation about an axis generally parallel to the plane of the axis of said boom.

**5**. A drill mounting as specified in claim **4** wherein said guide frame is an elongated member having a drill motor slidably mounted thereon for powered movement longitudinally of said guide frame.

**6**. A drill mounting as specified in claim **5** wherein said drill motor is drivingly connected to an elongated drill steel and a drill bit is drivingly mounted upon the end of said drill steel remote from said motor.

**7**. A drill mounting as specified in claim **1** wherein said arm member and said guide frame supporting member are pivotable relative to said yoke member about respective parallel axes.

**8**. A drill mounting as specified in claim **7** wherein said rod element, said link element and said arm member are connected by a common pin to pivot about a common axis and said fluid operated cylinder is pivotable about an axis parallel to the said common axis which is in turn parallel to the aforementioned parallel axes.

**9**. A drill mounting as specified in claim **8** wherein said yoke member has a pair of spaced apart end portions each of said end portions having a pair of parallel bores extending therethrough substantially normal to the axis of said boom and mating with the parallel bores of the opposite one of said spaced arm portions to receive therein respective pins providing the pivoting action of said arm and said guide frame support member relative to said yoke member.

**10**. A drill mounting as specified in claim **1** wherein said yoke member is rigidly secured to the free end of said boom member.

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