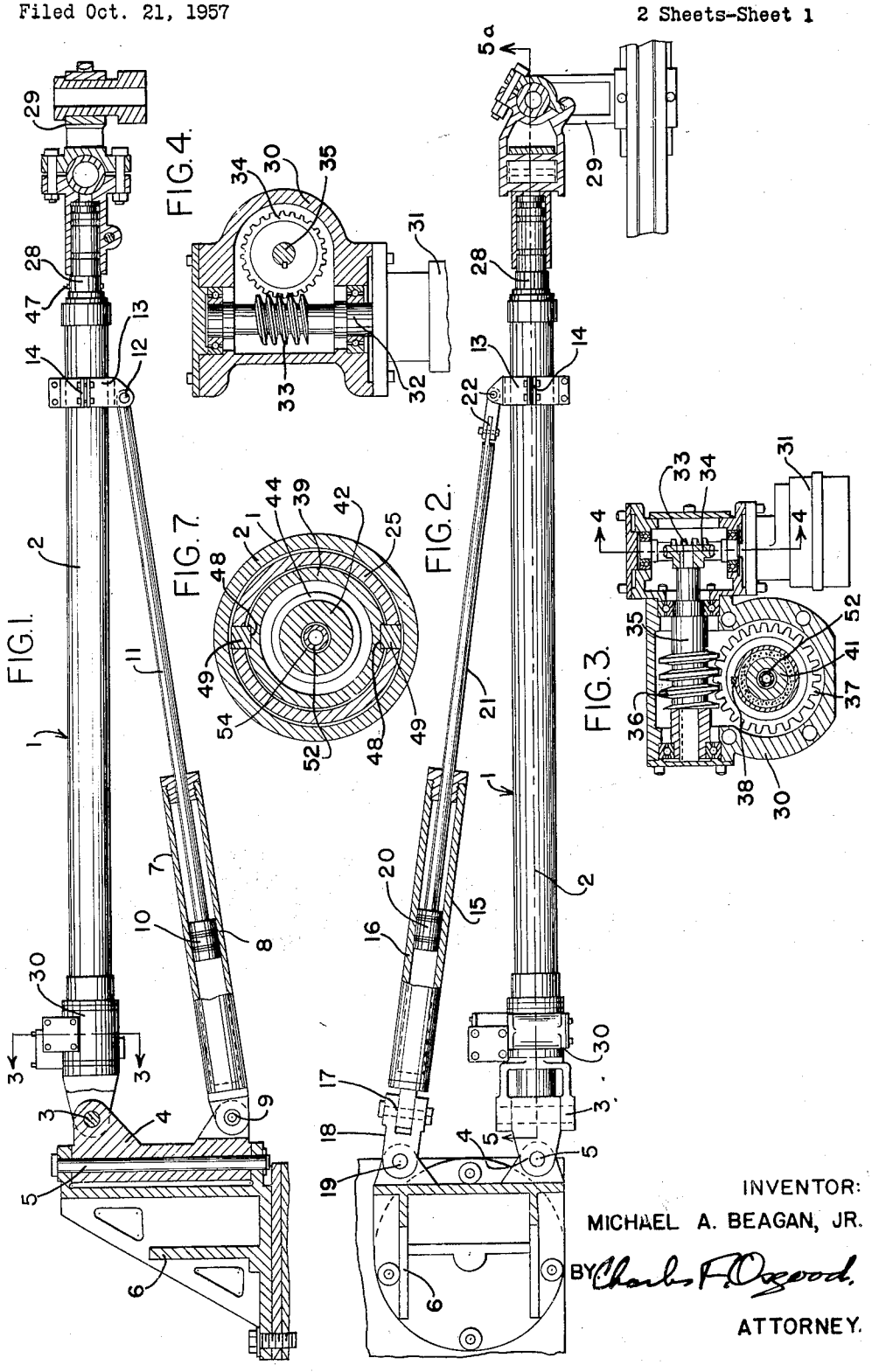
March 21, 1961 M. A. BEAGAN, JR 2,975,993

ADJUSTABLE TOOL MOUNTING

Filed Oct. 21, 1957 2 Sheets-Sheet 1



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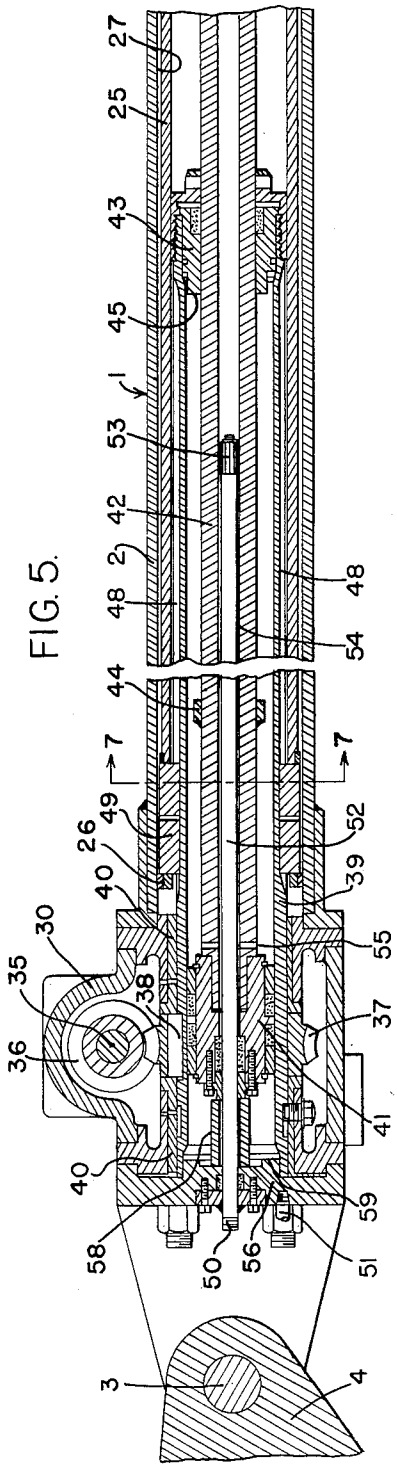


FIG. 5.

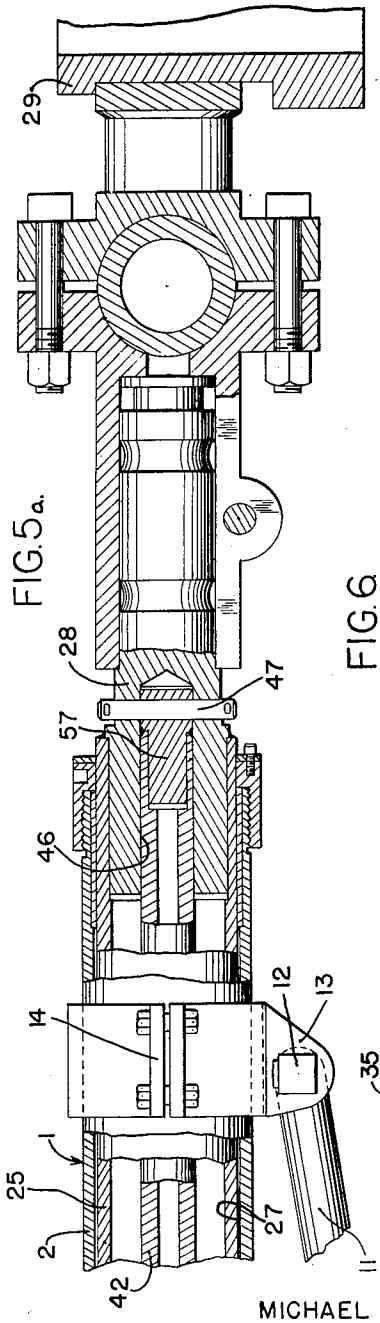


FIG. 5a.

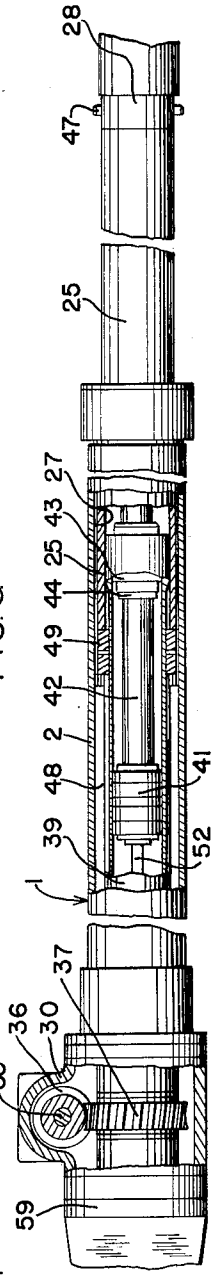


FIG. 6

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ADJUSTABLE TOOL MOUNTING

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This invention relates to adjustable tool mountings and more particularly to an adjustable mounting for a drilling tool such as a hammer rock drill whereby the tool may be readily adjusted into various drilling positions with respect to the work.

The present invention is an improvement over that disclosed in the patent to Curtis et al. No. 2,791,399, granted May 7, 1957, owned by the assignee of the present invention, in that the extensible boom and rotatable tool support are power operated. In this improved construction the extendible tool supporting boom may be extended and the tool support may be rotated about the longitudinal axis of the boom by power devices desirably operated by fluid under pressure. The improved rotating means for the tool support is operatively connected with the boom extending means thereby to provide a simplified and more compact structure.

An object of this invention is to provide an improved adjustable tool support. Another object is to provide an improved adjustable tool support embodying a swingable boom having improved power operated means for extending the boom and for rotating the tool support about the longitudinal axis of the boom. Yet another object is to provide an improved boom extending power device of the fluid cylinder and piston type arranged coaxially in the boom and having operatively connected therewith a fluid motor for rotating the tool support about the longitudinal axis of the boom, with the tool rotating motor operatively connected with an element of the boom extending device. A further object is to provide a rotating means for a tool support operatively connected to the rotatable cylinder of the boom extending power device whereby the tool support may be rotated by turning the boom extending cylinder. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a side view and Fig. 2 is a plan view of a drill supporting boom with the boom swing cylinders broken away to show structural details.

Fig. 3 is an enlarged cross section taken on line 3—3 of Fig. 1, illustrating a portion of the rotating means for the tool support.

Fig. 4 is an enlarged detail vertical section taken on line 4—4 of Fig. 3 with parts shown in full.

Figs. 5 and 5*a*, taken together, constitute an enlarged longitudinal axial section taken on line 5—5*a* through the boom of Fig. 2, showing the boom extending and tool support rotating means, with the boom retracted.

Fig. 6 is a view similar to Figs. 5 and 5*a*, on a reduced scale, with the boom extended.

Fig. 7 is an enlarged cross section taken on line 7—7 of Fig. 5.

The adjustable boom mounting, as disclosed in the patent above referred to, is generally designated 1 and

includes an elongated tubular boom member 2 pivoted at 3 on a support 4 to swing in vertical planes. The support 4 is swivelly mounted on a vertical pivot shaft 5 carried by a supporting frame 6 and is turnable on its pivot as the boom member 2 is swung horizontally. An extensible fluid jack 7 comprising a cylinder 8 pivoted at 9 on the support 4 to swing in vertical planes contains a reciprocable piston 10 having its outwardly extending piston rod 11 pivotally connected at 12 to a bracket 13 secured, as by a clamp 14, to the outer portion of the boom member 2. Thus by operating the fluid jack 7 the boom member may be swung in vertical planes. Another fluid jack 15 comprises a fluid cylinder 16 pivotally connected at 17 on a support 18 to swing in vertical planes. The support 18 is swivelly mounted on a vertical pivot shaft 19 parallel with the shaft 5, and the fluid jack 15 may swing horizontally with the swivelled support 18 about its pivot. Reciprocable in the cylinder is a piston 20 having a forwardly extending piston rod 21 universally pivotally connected at 22 likewise to the bracket 13. By suitably operating the fluid jack 15 the boom member 2 may be swung in horizontal planes about its pivot. Thus the boom member may be swung both in horizontal and vertical planes to vary the height and lateral position of its outer end, and by trapping fluid within the fluid jacks the boom member may be firmly held in adjusted position.

The outer tubular boom member 2 has telescopically arranged therein an extendible tubular boom member or inner boom part 25 having a cylindric guide or guiding head 26 at its rear end slidingly guided in the bore 27 of the tubular boom member 2. Secured to the outer portion of the inner boom member 25 is a support 28 carrying at its outer portion a suitable tool support 29 which may carry a conventional drilling tool such as a hammer rock drill. The outer tool support may assume various forms but herein for illustrative purposes may be generally similar to that disclosed in the above mentioned patent.

Now referring to the improved power operated means for extending the boom to vary its effective length and for rotating the tool support about the longitudinal axis of the boom, it will be noted that carried by a gear housing 30 at the rearward portion of the outer boom member 2 is a motor 31 (see Figs. 3 and 4) herein desirably a conventional motor of the fluid operated type. As shown in Fig. 4, secured to the upright motor shaft 32 is a worm 33 meshing with and driving a worm wheel 34 (see also Fig. 3) secured to a transverse shaft 35 suitably journaled within the gear housing 30. Secured to the shaft 35 is a worm 36 meshing with and driving a worm wheel 37 secured, as by a key 38, to the rearward portion of a rotatable fluid cylinder 39, the latter arranged centrally within the tubular boom (Fig. 5). The rearward portion of the fluid cylinder 39 is journaled for rotation in spaced sleeve bearings 40 supported within the gear housing at opposite sides of the worm wheel 37. Reciprocable within the bore of the fluid cylinder 39 is a piston 41 having its piston rod 42 extending forwardly through the packed front head 43 of the fluid cylinder. An abutment such as a collar 44 surrounding and secured to the piston rod serves to limit the forward movement of the piston 41 by contact with the rear face 45 of the front cylinder head. The front end of the piston rod extends axially forwardly into a bore 46 in the front support 28 and is suitably rigidly secured to the front support as by a cross pin 47 (Fig. 5*a*).

The rotatable fluid cylinder 39 has external splineways 48 engaged by splines or keys 49 carried by the rear head 26 of the extendible inner boom member 25 so that the fluid cylinder and inner boom member may

rotate together irrespective of the extended position of the boom.

Fluid under pressure may be supplied to and vented from the ends of the cylinder bore at the opposite sides of the piston through connections **50** and **51** (Fig. 5) and the connection **50** includes a fluid conduit or conducting tube **52** extending axially within the hollow piston rod **42**. This tube has a grooved guide **53** at its front end slidable in the bore of the piston rod for guiding the forward portion of the tube and fluid may flow through the grooves to a clearance space **54** between the tube exterior and the bore walls and through ports **55** to the cylinder bore at the forward side of the piston. Fluid may flow from the supply connection **51** through a passage **56** to the cylinder bore at the rear side of the piston. The front end of the bore of the piston rod is suitably closed as by a plug **57** (Fig. *5a*). A stop such as a sleeve **58** surrounding the rearward portion of the tube **52** and engaging the rear head **59** for the cylinder bore serves to limit the rearward travel of the piston.

By properly supplying fluid under pressure to the cylinder bore the piston **41** may be moved forwardly relative to the cylinder while the latter remains stationary as regards longitudinal axial movement thereby to move the inner boom member **25** axially forwardly relative to the outer boom member to increase the effective length of the boom. As the inner boom member moves axially forwardly it may be rotated about the longitudinal axis of the boom by the motor **31** through the worm speed reducing gearings **33**, **34** and **36**, **37** which rotate the cylinder and the spline and splineway connection between the cylinder and the inner boom member. Upon rearward movement of the piston in the cylinder bore the inner boom member may be retracted, in an obvious manner. Thus the outer tool support **28** may be rotated as desired at any point of its longitudinal axial adjustment. By trapping fluid in the cylinder at opposite sides of the piston **41** the tool support may be held in its position of longitudinal adjustment. The self-locking teeth of the worm gearings, when the motor **31** is stopped, serve to lock the inner boom member **25** against rotation.

As a result of this invention an improved adjustable tool mounting is provided whereby the tool support may be readily adjusted to locate the tool in its various operating positions with respect to the work. By the provision of the rotating means for the extendible boom member and the axial moving means therefor the tool support may be quickly adjusted as desired. The sliding interlocking connection between an element of the boom extending power device and the tool rotating motor enables simultaneous rotation and axial adjustment of the tool support and when adjusted the tool support is firmly held in adjusted position. By locating the tool rotating motor at the rearward portion of the boom and arranging the boom extending power device within the boom not only are simplicity and compactness obtained but also the weight is more effectually distributed. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an adjustable tool mounting, an extensible boom comprising cooperating boom parts one telescoping within and extendible relative to the other, said extendible part also being rotatable relative to the other part, power operated means for extending said extendible boom part comprising power actuated cylinder and piston members one having movement relative to the other and said movable member being connected to said extendible boom part, power operated rotating means, and means for connecting said rotating means to said extendible and rotatable boom part for rotating the latter relative to said other boom part.

2. A tool mounting as set forth in claim 1 wherein said boom is at least in part tubular and said power actuated members of said power operated boom extending means have movement one axially relative to the other and arranged within said tubular boom longitudinally of the latter.

3. A tool mounting as set forth in claim 1 wherein the rearward portion of the boom is hollow and said rotating means for said extendible boom part includes a power device carried at the rearward portion of said boom, and means for connecting said power device to said extendible and rotatable boom part.

4. A tool mounting as set forth in claim 1 wherein said relatively movable power actuated members of said boom extending means are in the form of cylinder and piston elements one having reciprocating movement relative to the other and said rotating means for said extendible boom part is connected to the reciprocating element of said power device for reciprocation thereby.

5. A tool mounting as set forth in claim 4 wherein one of said cylinder members of said boom extending means is rotatable and said rotating means for said extendible boom element is connected to said rotatable element of said power operated means to be rotated thereby.

6. A tool mounting as set forth in claim 5 wherein said rotatable element of said power operated means is the cylinder member of said cylinder and piston type power device.

7. A tool mounting as set forth in claim 6 wherein a sliding spline connection is provided between said rotatable cylinder element and said extendible boom element.

8. In an adjustable tool mounting, a pivoted boom comprising cooperating boom elements one telescoping within and extendible relative to the other, said extendible element also being rotatable relative to the other element, said boom being hollow in part, power operated extending means within said boom including power actuated members one having movement relative to the other and said movable member being connected to said extendible boom element for extending the latter to vary the effective length of said boom, power operated rotating means carried by said boom, and means for connecting said power operated rotating means to said extendible boom element for rotating said extendible boom element in any extended position thereof.

9. A tool mounting as set forth in claim 8 wherein the means for extending the boom is in the form of an extensible power device and said extendible boom element is rotatable, and said power operated rotating means is connected by said connecting means to said extendible boom element for rotating the latter.

10. A tool mounting as set forth in claim 9 wherein a sliding interlocking connection is provided between said rotatable power operated connecting means and said extendible boom element.

11. A tool mounting as set forth in claim 10 wherein said power operated connecting means comprises a rotatable fluid cylinder containing a piston and said sliding interlocking connection is between said rotatable fluid cylinder and said extendible boom element.

12. An adjustable tool mounting comprising a pivoted boom carrying a tool support at its outer end and comprising cooperating inner and outer boom elements one telescoping within and extendible relative to the other, said extendible element also being rotatable relative to the other element, the inner element movable axially relative to the outer element for varying the effective length of the boom, a feed cylinder arranged axially within the outer boom element and mounted for rotation about its longitudinal axis relative to said outer boom

element, a reciprocable feed piston contained in said cylinder and connected to the outer portion of said inner boom element, a sliding interlocking connection between said cylinder and said inner boom element whereby rotation of said cylinder effects rotation of said inner boom element thereby to turn the tool support about the longitudinal axis of the boom, a motor carried by said boom, and means for connecting said motor to said cylinder for rotating the latter.

13. An adjustable tool mounting as set forth in claim 12 wherein said feed cylinder is arranged within the rearward portion of said outer boom element and said motor is located at the rear end of said boom and is connected to the rearward portion of said cylinder.

14. An adjustable tool mounting as set forth in claim 12 wherein said inner boom element is tubular and surrounds said cylinder and said interlocking connection is between the inner wall of said tubular boom element and the exterior wall of said cylinder.

15. In an adjustable tool mounting, an extensible boom comprising an outer tubular member having a bore open at one end and closed at its other end, an inner tubular member mounted within the outer tubular member and extending outwardly through the open end of said member and having secured thereto at its outer end an element of a tool support, said inner tubular member being rotatable and extendible relative to said outer tubular member, means for rotating and extending said inner tubular member relative to said outer tubular member, a fluid cylinder extending within and rotatable with the inner tubular member, said fluid cylinder having at its outer end a packed head, and a rod extending through said head and having secured thereto at one end a piston reciprocable in said fluid cylinder and at its other end

secured to said element of said tool support whereby outward movement of said piston provides boom extension.

16. In an adjustable tool mounting as defined in claim 15 wherein the said tubular and cylinder members and said piston rod are telescopically and coaxially arranged in relation to each other.

17. In an adjustable tool mounting as defined in claim 16 wherein means is provided for supplying fluid to said fluid cylinder to effect extension of said piston rod and said inner tubular member from a relative position in which the said tubular and cylinder members and said piston rod are intersected by a plane to which the axes of the tubular and cylinder members and said piston rod are perpendicular to another relative position in which such plane intersects only said outer tubular member and said fluid cylinder.

18. In an adjustable tool mounting as defined in claim 17 wherein there is provided a driving means mounted at the rear end of said outer tubular member for rotating said fluid cylinder and said inner tubular member which latter member is connected to said fluid cylinder by a sliding spline connection to effect rotation of said inner tubular member by said driving means through said fluid cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,952,080	Lake	Mar. 27, 1934
2,060,814	Lewis	Nov. 17, 1936
2,766,012	Hale	Oct. 9, 1956
2,791,399	Curtis et al.	May 7, 1957