

[54] FEED TRAVERSE MECHANISM

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[51] Int. Cl. **E21c 11/00, F16m 13/00**

[58] Field of Search **248/2, 16; 173/38, 43; 74/480 R**

[56]

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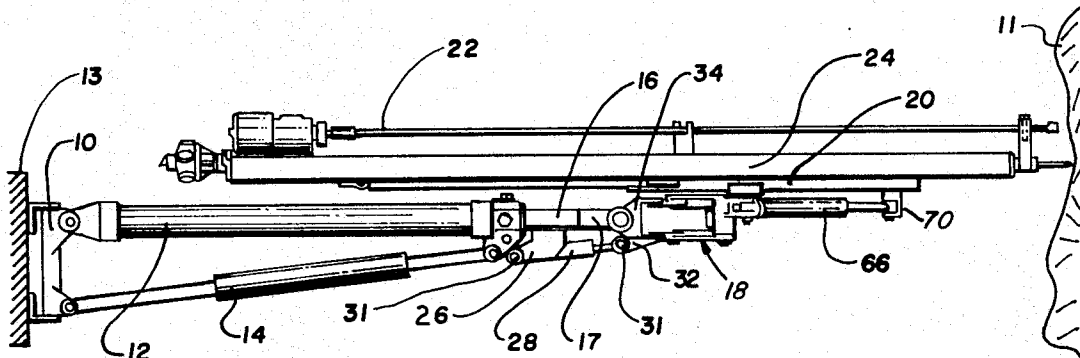
Primary Examiner—J. Franklin Foss

[57]

ABSTRACT

The invention herein relates to adjustable tool supports and more particularly to an adjustable rock drill mounting having a crossover mechanism which permits controlled lateral translation of a rock drill feed frame mounted thereon with respect to the longitudinal center line of its supporting boom.

8 Claims, 4 Drawing Figures



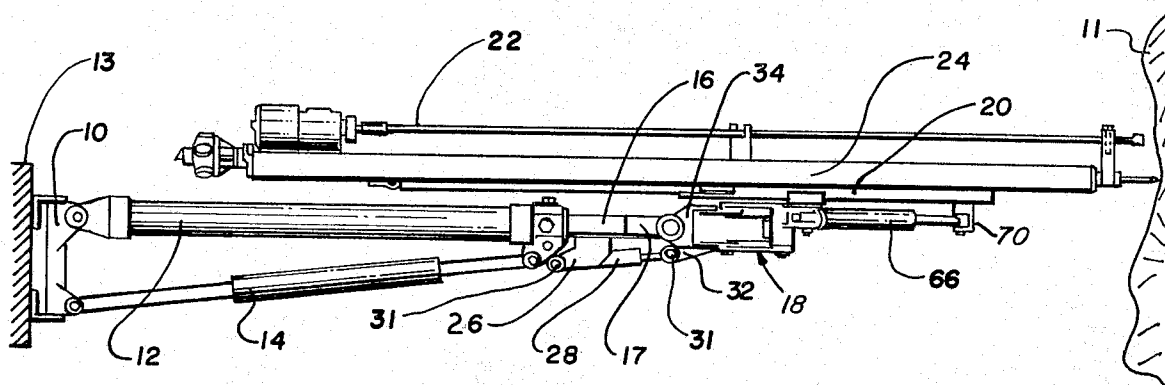


Fig. 1

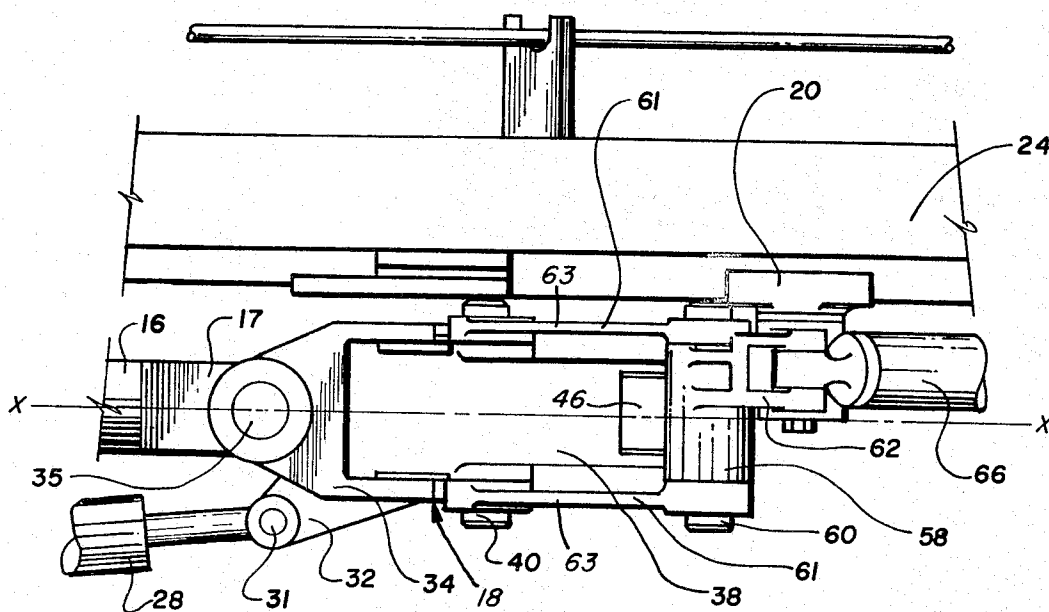


Fig. 2

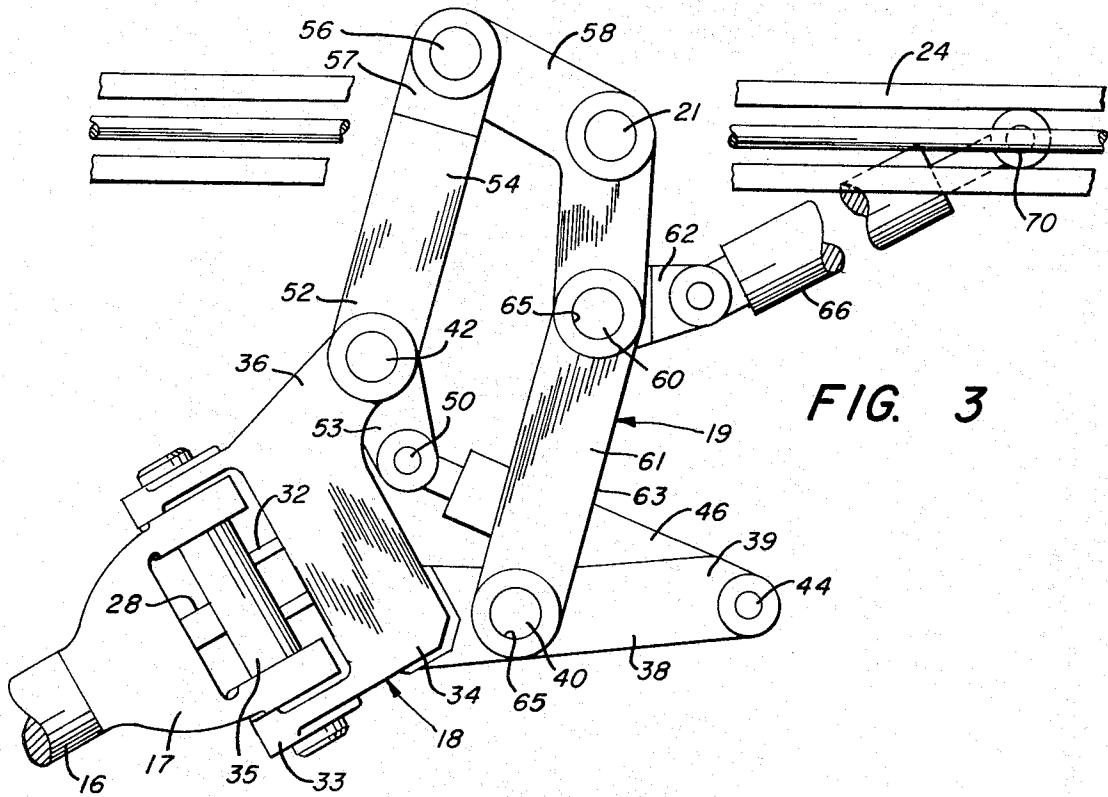


FIG. 3

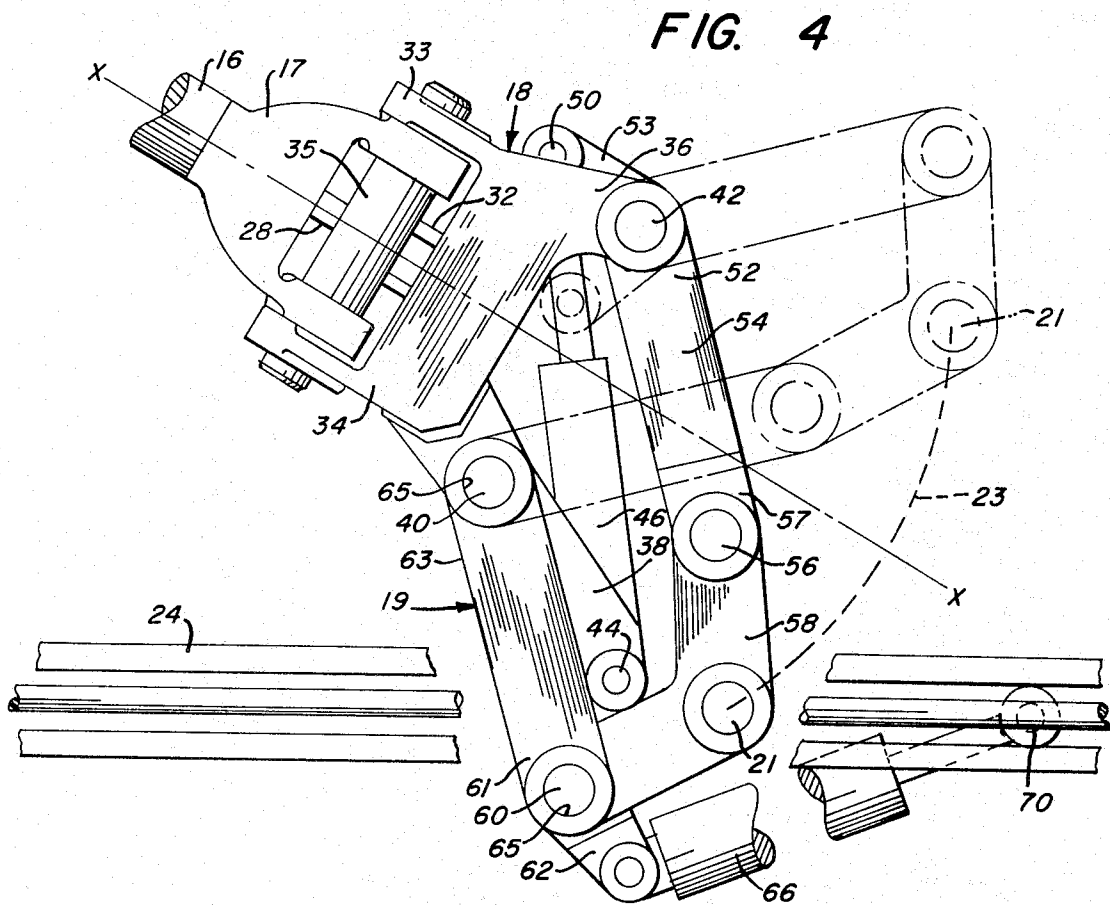


FIG. 4

FEED TRAVERSE MECHANISM

Modern rock drilling equipment typically is carried on a mobile, articulated support system comprising an elongated jib or boom adjustably affixed at one end thereof to a mobile base such as a truck and having adjustably affixed to the opposing end thereof a feed or guide frame whereon is mounted a rock drill. Although such drilling devices have served the purposes for which they were designed, they have nonetheless been subject to certain significant limitations. For example, in the prior art the drill feed frame has commonly been mounted pivotally at a point laterally displaced from the center line of the boom by, for example, no more than approximately twice the transverse dimension of the boom. There is inherent in such an arrangement mechanical interference between the boom and feed frame which limits access to the rock face in certain drilling operations. For example, a rock drill mounted to the left of the boom center line cannot be positioned proximate a right hand rib or wall for drilling parallel thereto into the rock face, nor can it access relatively large portions of the rock face to the right of the center line of the mobile base for a burn cut (parallel bores perpendicular to the rock face).

Heretofore mechanical interference problems have been solved by manual means such as removing the feed frame from its supporting boom and remounting it at a point laterally displaced to the opposite side of the boom center line as necessary, or by the utilization of specialized support systems, for example the roll-over boom such as that disclosed by U.S. Pat. No. 3,226,064, or the crossover boom such as that disclosed by U.S. Pat. No. 3,212,738. These and other similar solutions, although workable, have proven deficient in practice. Manual methods such as remounting the feed frame or relocating the mobile base necessitate interruption of drilling operations and are therefore intrinsically inconvenient and inefficient. Specialized support booms are deficient in numerous respects: they generally are heavy, complex and bulky devices; they are costly to manufacture and may be difficult to maintain in the field; and they may obstruct the operator's view of the drill steel and rock face in certain operating configurations, for example.

The simplified boom traverse mechanism of the present invention offers a superior solution to mechanical interference problems such as hereinabove described without the attendant deficiencies of prior art solutions. It is therefore an object of this invention to provide a simplified, reliable and compact traverse mechanism which will permit operation of a tool mounted thereon in any configuration within the limits of maximum boom lift and swing capability, and subject only to interference with external obstructions such as tunnel walls. It is a further specific object of this invention to provide such a traverse mechanism for a rock drill feed frame.

Additional objects and advantages of the present invention will become readily apparent upon a reading of the following description and illustrations in which:

FIG. 1 is a side view of rock drill and feed frame assembly mounted at the forward end of an extensible boom on a feed traverse mechanism constructed in accordance with the principles of the present invention;

FIG. 2 is an enlarged fragmentary portion of FIG. 1 illustrating the feed traverse mechanism of the present invention;

FIG. 3 is a top plan view of the feed traverse mechanism of FIG. 2 illustrating the feed frame positioned to the left of the boom center line; and

FIG. 4 is a top plan view similar to FIG. 3 illustrating the feed frame positioned to the right of the boom center line.

FIG. 1 illustrates an elongated rock drill feed or guide frame 24 having slideably mounted thereon and longitudinally feedable with respect thereto a rock drill assembly 22 for the purpose of drilling into a rock face 11 indicated as forwardly adjacent the forwardmost end of frame 24.

Frame 24 is pivotally adjustably affixed at a point intermediate the axial ends thereof to a feed frame support and traverse assembly generally indicated at 18 in FIG. 1 and rigidly affixed to the forwardmost end of a forwardly extensible portion 16 of an elongated support boom 12. Boom 12 is suitably pivotally affixed at its rearwardmost end to a suitable mobile base 13 such as a truck or crawler frame by means of, for example, a universal mount 10 having means such as mutually perpendicular vertical and horizontal pivot axes whereby boom 12 is rendered adjustably pivotal through a predetermined range of vertical lift by any suitable means such as a suitably powered hydraulically actuated elevating cylinder 14, and simultaneously adjustably pivotal through a predetermined range of horizontal swing by similar suitable means (not shown). Suitable means are also provided whereby boom portion 16 is longitudinally movable with respect to the longitudinal axis X—X of boom 12 (FIG. 2). The structure and operation of such booms, boom supports and actuating means are not described further here inasmuch as such description is not necessary for an understanding of the present invention. Applicant hereby refers to U.S. Pat. No. 2,975,993 for a detailed description of such apparatus.

Referring specifically to FIG. 3 it is noted that assembly 18 comprises a feed tilt coupling 34 having a rearward bifurcated (U-shaped) portion 33, the legs of which straddle the respective forwardly extending legs of a mounting yoke 17 which is suitably rigidly affixed to the forwardmost end of extensible boom portion 16. Coupling 34 is pivotally secured thereat and rendered vertically pivotal by means of a pivot pin 35 disposed normal to axis X—X of boom 12 and in a horizontal plane. Coupling 34 has a bifurcated yoke portion 32 rigidly affixed to and extending generally downwardly from the lower surface thereof (FIGS. 1 and 2) in longitudinal alignment with a similarly positioned bracket yoke 26 rigidly affixed to the lower side of boom portion 16 rearwardly adjacent the mounting yoke 17. Yokes 32 and 26 secure in suitable pivotal engagement the respective axial ends of a suitably powered hydraulically actuated tilt cylinder 28 by means of, for example, pivot pins 31 disposed on axes parallel to the pivot pin 35 whereby cylinder 28 may be actuated to adjustably control the vertical tilt of feed frame 24 with respect to boom 12.

Assembly 18 additionally comprises a feed traverse mechanism generally indicated at 19 which is pivotally secured to coupling 34 and extends generally forwardly therefrom. Mechanism 19 comprises links 52, 58 and 61 suitably coupled in pivotal engagement in a manner as hereinafter described to form a closed four bar parallelogram linkage mechanism wherein coupling 34 functions as one link of the parallelogram.

Link 52 is a generally angular bellcrank comprising: an elongated lever portion 54 havin a bifurcated end portion 57; and a bracket yoke portion 53 set at an angle to lever portion 54. A bifurcated yoke portion 36 extending generally forwardly from coupling 34 and rigid with respect thereto has pivotally secured intermediate the respective legs thereof the link 52 by means of a pivot pin 42 disposed on an axis normal to both the axis of pin 35 and the longitudinal axis X—X of boom 12. The pin 42 renders link 52 pivotal with respect to coupling 34 about an axis passing through the apex of the angle between link portions 53 and 54.

Link 58 is a generally angular or bent trunnion support member having one end thereof secured in pivotal engagement between the legs of bellcrank end portion 57 by means of a pivot pin 56 disposed on an axis parallel to the axis of pin 42, and having the opposing end thereof secured to link 61 (FIG. 2) by means of a pivot pin 60. Link 61 comprises a pair of longitudinally extending bars 63 disposed in laterally spaced parallel relationship, each bar 63 having a bore 65 adjacent each axial end thereof which extends therethrough on an axis perpendicular to the longitudinal axis of the bar 63. The respective axes of such bores 65 in each bar 63 are mutually parallel whereby the laterally spaced parallel relationship of bars 63 is such that respective bores 65 are aligned and coaxial and are spaced apart such that the end of link 58 opposite the end pivoted about pin 56 is disposed between bars 63 at one end thereof and pivotally secured thereto by pivot pin 60 disposed within the respective bores 65 and extending therebetween through link 58 on an axis parallel to the axis of pin 56.

A traverse cylinder support member 38 is rigidly affixed to coupling 34 at a point laterally opposite yoke portion 36 with respect to boom axis X—X and extends generally forwardly therefrom. The longitudinal end of link 61 opposite the end pivoted about pin 60 is pivotally secured to member 38 at a point forwardly adjacent the rearwardmost end thereof by means of a pivot pin 40 disposed on an axis parallel to the axis of pin 60. It is noted that pivot pins 40, 60, 56 and 42 are disposed on mutually parallel axes at fixed spaced portions of links 61, 58, 52 and coupling 34 such that the distance between pivot pins 56 and 42 equals that between pins 60 and 40, and the distance between pins 56 and 60 equals that between pins 42 and 40, whereby a parallelogram linkage is defined which permits limited lateral translation of trunnion support member 58 with respect to boom axis X—X while maintaining therebetween a constant angular relationship throughout such translation.

In practice the axial ends of a suitably powered hydraulically actuated traverse cylinder 46 are secured in pivotal engagement between the legs of a bifurcated forwardmost end portion 39 of member 38, and within yoke portion 53 of bell crank 52 by suitably disposed pivot pins 44 and 50. Additionally, an elongated trunnion 20 having frame 24 suitably mounted thereupon (FIG. 1) is suitably pivotally secured intermediate the opposing ends thereof to trunnion support 58 by means of a pivot pin 21 disposed intermediate and parallel to pins 56 and 60, and a suitably powered hydraulically actuated swing cylinder 66 is suitably secured at the respective ends thereof in pivotal engagement with the forward end of trunnion 20 at a point 70, and with a yoke 62 rigidly affixed to trunnion support 58 at a point

adjacent pivot pin 60. It is to be understood that inasmuch as the angular relationship between boom 12 and trunnion support 58 in the horizontal plane is a fixed constant as hereinabove described, the actuation of cylinder 66 serves to control the horizontal angular position of frame 24 with respect to boom 12 in a manner well known in the art.

In practice the mechanism 19 operates as shown in FIGS. 3 and 4. FIG. 3 illustrates the feed traverse mechanism in the extreme left hand position (looking forward along axis X—X) with the cylinder 46 fully retracted. Powered extension of cylinder 46 from the position shown in FIG. 3 pivots crank 52 in a clockwise direction thereby translating mechanism 19 toward the extreme right hand position shown in FIG. 4 (solid lines) from its former position (broken lines), and causing trunnion mounting point 21 to traverse an arcuate path 23 from left to right across axis X—X of boom 12. As mounting point 21 traverses the path 23 the feed frame 24 mounted thereon likewise traverses a path laterally across axis X—X in constant angular attitude with respect to axis X—X. Upon retraction of cylinder 46 the feed frame 24 retraces its path from right to left.

It is to be understood that the interposition of traverse mechanism 19 in no way affects operation of the tilt and swing apparatus incorporated in the present invention. The swing cylinder 66 and the tilt cylinder 28 may be actuated independently of traverse mechanism 19, and the angular relationship of feed frame 24 with respect to boom axis X—X is controlled solely by such actuation.

The embodiment hereinabove teaches an inventive concept of adjustable tool supports and is illustrative thereof, and therefore numerous modifications may be incorporated therein without departing from the spirit or scope of the invention. For example: actuating cylinders 56 and 46 could be pneumatic rather than hydraulic or could be located at numerous alternative positions other than those described hereinabove; the parallelogram linkage could be a closed polygon linkage of another configuration although the parallelogram configuration described herein does provide certain simplifying advantages such as symmetry of motion; trunnion support member 58 and bell crank 52 need not necessarily be angular members; and mount 18 could be rotated 90° about axis X—X so as to provide a vertically transversable rather than a horizontally transversable tool support. These and other modifications having been anticipated and envisioned, it is respectfully requested that this invention be interpreted broadly and limited only by the scope of the claims appended hereto.

What is claimed is:

1. A drill mounting comprising: an elongated boom assembly; guide frame supporting and traversing means pivotally carried by said boom assembly adjacent one end portion thereof for limited rotation about a first pivot axis extending in a direction substantially normal to the longitudinal axis of said boom; said traversing means having a serial plurality of link elements each pivotally connected to the adjacent link elements to form a closed polygon with the pivot axes of said link elements being located at the respective apexes of said polygon, being parallel to each other, and extending in a direction substantially normal to the longitudinal axis of said boom and said first pivot axis; an elongated drill guide frame assembly pivotally carried by at least one

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of said link elements for rotation about a second pivot axis; and selectively operable means pivotally carried by at least one of said link elements and cooperable with said traversing means to selectively move said second pivot axis generally transversely to either side of said longitudinal axis.

2. A drill mounting assembly as specified in claim 1 wherein said polygon is a parallelogram.

3. A drill mounting assembly as specified in claim 1 wherein said second pivot axis extends in a direction substantially parallel to said pivot axes of said link elements.

4. A drill mounting assembly as specified in claim 2 wherein said selectively operable means is pivotally connected to two of said link elements.

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5. A drill mounting assembly as specified in claim 4 wherein said two of said link elements are pivotally connected to each other at the respective adjacent ends thereof.

6. A drill mounting assembly as specified in claim 2 wherein said link elements maintain a parallelogram throughout the transverse movement of said guide frame assembly.

7. A drill mounting assembly as specified in claim 6 wherein said plurality of link elements is four link elements.

8. A drill mounting assembly as specified in claim 4 wherein said selectively operable means is fluid operable.

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