A rotatable boom turret assembly for a rock drill carrier. The turret assembly is comprised of a swiveling boom support assembly mounted to a pedestal on the drill carrier and has an indexing ring driven by a single hydraulic cylinder assembly by which the boom can be swiveled. The indexing ring has a plurality of index positions with the boom support assembly so that rotation of the boom through large angles can be accomplished with a single hydraulic cylinder assembly.

10 Claims, 3 Drawing Figures
ROTATABLE BOOM TURRET ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of construction equipment and is more particularly directed to equipment which has a rotatable boom support mounted on a pedestal.

2. Description of the Prior Art

In construction equipment where a piece of apparatus such as a rock drill is supported at the end of a boom assembly, it is common to mount the boom on a pedestal so that it can be swiveled on the pedestal to position the boom-mounted tool or shovel anywhere within a circular area surrounding the pedestal. Further mobility is often provided by locating the pedestal itself on a carrier so that the entire piece of equipment can be moved from one location to another.

A typical example of construction equipment incorporating the mobile carrier with a swiveling boom assembly is a rock drill used for boring holes in the earth. Such a rock drill may include a pneumatic drill mounted on an articulated guide rail which in turn is supported from the end of the rotatable boom assembly. The boom assembly is mounted to a crawler-type carrier so that the entire rock drill can be transported across rough terrain.

The incorporation of a rotating mechanism with a boom assembly in construction equipment, particularly rock drills or other vibrating machinery, requires that the components of the rotating mechanism be exceptionally rugged due to the continuous, vibratory and large loads generally associated with construction equipment. Furthermore, it is desirable that the equipment be as unsophisticated and reliable as possible due to the various environmental factors such as dust, water and weather conditions in which such construction equipment is expected to function. In addition to these factors, the device often is controlled by an individual and, therefore, must be operated with a minimum of effort and difficulty.

Where a single hydraulic cylinder is employed to rotate a boom assembly, the maximum sweep of the boom is limited by the stroke of the hydraulic cylinder and mechanical interference between the hydraulic cylinder and the boom turret. The interference restricts the swiveling motion to an arc generally less than 180° and most probably less than 90° due to the size and geometry of the hardware. These limitations can be overcome by providing a mechanism which permits the hydraulic cylinder to be shifted from one relative position with respect to the boom assembly to another. The resulting arc through which the boom can be swept is accordingly increased. Such a mechanism is shown in U.S. Pat. No. 3,155,351. A difficulty in many such systems, however, is that the equipment is very bulky and difficult to maneuver by hand, particularly where the equipment is heavy due to the large loads involved.

It is, accordingly, an object of the present invention to disclose a rotatable boom turret assembly which can be operated by a single hydraulic cylinder.

It is a further object of the present invention to disclose a rotatable boom turret assembly in which a single hydraulic cylinder can provide rotation of the boom through an angle of 180° or more.

It is a further object of the present invention to disclose a rotating mechanism for a boom turret which employs an indexing system to swivel the boom through large angles.

It is a further object of the present invention to disclose a rotatable boom turret indexing assembly which can be easily indexed from one position to another.

SUMMARY OF THE INVENTION

The rotatable boom turret assembly of the present invention comprises a boom support assembly rotatable on a pedestal and an indexing ring concentrically mounted on the boom support assembly. The indexing ring has a plurality of index positions at which it can be locked to the boom support assembly by means of a spring-loaded lock pin. When the lock pin is pulled, the indexing ring is free to rotate about the boom support assembly from one index position to another. The lock pin has a mating aperture in the boom support assembly at each index position so that the ring can be secured to the boom support assembly at each index position.

In order to rotate the boom support assembly on the pedestal, a hydraulic cylinder is connected to the turret assembly through the indexing ring. By actuating the hydraulic cylinder through its comparatively limited stroke and by providing a plurality of index positions at least two of which are reachable within the limits of the stroke of the hydraulic cylinder, the boom can be rotated through 180° and more.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel rotatable boom turret assembly will be better understood by reference to the following drawings in which like elements are given like reference numerals throughout the several figures.

FIG. 1 is a perspective view of the novel rotatable boom turret assembly employed in a rock drill.

FIG. 2 is a top view of the rotatable boom turret assembly showing the indexing mechanism partially cut away.

FIG. 3 is a side view of the rotatable boom turret assembly partially sectioned along the line 3-3 of FIG. 2 to show the indexing mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the novel rotatable boom turret assembly disclosed herein can be employed in a plurality of environments, the particular embodiment described in the present application is a rock drill, generally designated 10 in FIG. 1. The principal drilling components of the rock drill include a pneumatic drill 12, a drill rod 14 and a drill mast 16 which is articulated on the end of a boom 18 by a set of motors 20, one of which is visible. The boom 18 is pivotally mounted to a boom support assembly 22. The boom assembly has a pair of upright lugs 24 between which the boom 18 is supported and journeled by means of a pin 26. In order to elevate the boom, a hydraulic cylinder 28 extends from a pair of lugs 30 projecting laterally from the boom support assembly 22 and a pivot connection 32 approximately midway along the boom 18. A manifold apparatus 36 containing appropriate valving is mounted at the lower end of mast 16 for the purpose of controlling the drifter and feed mechanism of the rock drill.

The rotatable boom turret assembly is supported from a crawler-type carrier indicated generally by the reference numeral 40. The carrier 40 has a frame 50 from which the tracks are mounted and driven in order to transport the rock drill for short distances across rough terrain from one site to another.

FIGS. 2 and 3 disclose the mounting details of boom support assembly 22 on carrier 40. Frame 50 of the rock drill carrier has a pedestal comprised of plate 52 to which post 54 is mounted by lower flange 55 and a plurality of bolts 56. Flange 55 is secured to post 54 usually by welding. Boom support assembly 22 includes lugs 24 at its upper end and sleeve 58 at its lower end. Sleeve 58 has a pair of internal bearing surfaces 60 and 62 in close fitting contact with post 54. These bearing surfaces hold the boom assembly aligned on post 54 and slide around the post as the boom and support assembly rotate about the axis of post 54. Below the lower end of sleeve 58, a ring-shaped bearing plate surrounds post 54. The lower end of sleeve 58 rests against bearing plate 64 so that when the boom and support assembly swivel on post 54, plate 64 acts as a bearing between support assembly 22 and flange 55.

At the upper end of post 54 lock plate 66 is secured to post 54 by means of bolts 68. Interposed between plate 66 and the upper end surface of post 54 is a shim 70. With plate 66 bolted to post 54 and the shim interposed between the periphery of plate 66 and the upper end of post 54, sleeve 58 is prevented from shifting vertically on post 54.

Surrounding the base of sleeve 58 is a doubting ring 72 which may be welded or otherwise secured concentrically to
sleeve 58. An indexing ring 74 is rotatably mounted on the outer surface of the doubling ring 72. The indexing ring is concentric with sleeve 58 and post 54. A step in doubling ring 72 captures an internal flange 76 on indexing ring 74 and prevents ring 74 from sliding vertically with respect to the rest of boom support assembly 22.

At the right-hand side of boom support assembly 22, as seen in FIGS. 2 and 3, indexing ring 74 carries pin housing 77. Lock pin 78 is mounted within the bore of pin housing 77 so that pin 78 can be reciprocated longitudinally within the bore. Coil spring 80 is sandwiched between flange 82 at an inward end of pin 78 and bushing 84 at the opposite end of the pin. Bushing 84 is retained within the bore of housing 77 by means of an end plate 86 which in turn is held by bolts 88.

The upper side of housing 77 as well as end plate 86 includes cutout 90, which is seen more clearly in FIG. 2, through which operating rod 92 secured to lock pin 78 can be translated to draw lock pin 78 to its phantom position in FIG. 3. The inner end of lock pin 78 includes a tapered end portion 94 which fits snugly within the mating conical surface of housing 96. Housing 96 is replaceable and mounted in aperture 98 extending through both the wall of sleeve 58 and ring 72. It is radially inward position, lock pin 78 engages bushing 96 and locks index ring 74 to boom support assembly 22. When lock pin 78 is withdrawn to its phantom position in FIG. 3, tapered end portion 94 is completely withdrawn from bushing 96 and aperture 98 and, therefore, indexing ring 74 is free to rotate independently about boom support assembly 22.

As a plurality of apertures 96, 100, 102 extend through ring 72 and sleeve 58. Each of the apertures includes a bushing which may be engaged by lock pin 78 to establish a plurality of index positions of ring 74 on assembly 22. In one embodiment of the invention, aperture 100 and bushing 104 are spaced approximately 45° about assembly 22 from the aperture 98 and bushing 96. In the same manner, aperture 102 and bushing 106 is spaced 45° in the opposite direction from aperture 98. Additional apertures and bushings may be distributed at intervals around the base of sleeve 59 so that index ring 74 may be locked to sleeve 58 by means of pin 78 at a plurality of index positions.

On the upper side of pin housing 76, a pair of lugs 110 are integrally formed on indexing ring 74. Lugs 110 form the connecting point for a hydraulic cylinder assembly 112. Piston rod 114 is connected to lugs 110 by means of a pin 116. The hydraulic cylinder 118 at the opposite end of hydraulic cylinder assembly 112 is pivotally connected to a load reaction plate 120 as seen in FIG. 1 of means of connecting pin 122. The load reaction plate 120 is secured to the frame of carrier 40 and therefore the hydraulic cylinder assembly 112 serves as a motor for swiveling indexing ring 74, boom support assembly 22 and boom 18 on frame 50 of carrier 40.

The operation of the novel rotatable boom turret assembly is as follows. With indexing ring 74 locked to the boom support assembly through lock pin 78, hydraulic cylinder assembly 112 is actuated by the machine operator and piston rod 114 either extends or retracts in cylinder 118. The translation of piston rod 114 causes indexing ring 74 and boom support assembly 22 to rotate on bearing 64 about post 54. This rotation causes boom 18 to swing in an arc about carrier 40. As piston 114 reaches the end of its stroke within cylinder 118, the motion of piston 114 is stopped by the operator and lock pin 78 is withdrawn by means of operating handle 92 against the biasing pressure of coil spring 80. At this point, indexing ring 74 can be rotated by cylinder assembly 112 independently of boom support assembly 22 from one index position to another, for example from aperture 98 to aperture 100. It should be noted that the changing of index position after lock pin 78 has been withdrawn is accomplished merely by displacement of piston 114 toward the opposite end of its stroke. As the new index position is approached, the operator simply releases operating handle 92 and lock pin 78 automatically falls into the bushing at the adjacent index position. Coil spring 80 assisted by the conical surfaces on tapered lock pin end 94 and the appropriate bushing allow pin 78 to self-align itself and fully engage the housing within sleeve 58 and doubling ring 72. There is no necessity for removing pivot pin 116 nor does piston rod 114 need to be aligned with a connection hole such as that in lugs 110. The registering of lock pin 78 with the index aperture automatically results in pin 78 falling into its locking position.

With a plurality of apertures and bushings distributed evenly around the base of sleeve 58, boom 18 can be pivoted by means of the single hydraulic cylinder assembly 112 through an arc substantially greater than that permitted by the single stroke of cylinder assembly 112. With the apertures in sleeve 58 distributed around the entire base of sleeve 58, it is possible to swivel boom 18 through a full 360°. Generally a smaller arc is satisfactory for most operations and in the particular apparatus disclosed, an arc of 180° is permitted with the three index positions shown at 45° intervals.

While the novel rotatable boom turret assembly has been disclosed in a particular embodiment, it will be understood that various modifications and substitutions can be made without departing from the spirit of the invention. For example, while hydraulic cylinder assembly 112 is located in a horizontal plane above index ring 74, it may be lowered so that lugs 30 and cylinder 28 clear assembly 112 to permit a full 360° of rotation of boom support assembly 22. It is also possible that lugs 110 and pin housing 77 may be located at different portions of indexing ring 74. Of course, the shape and positions of the lock pins and its operating handle can be varied without changing the essential functions of the locking device. It may be desirable in certain embodiments to fix the lock pin to rotateable support assembly 22 and locate the bushings and apertures in indexing ring 74. Accordingly, the present invention has been described by way of illustration rather than limitation.

What is claimed is:

1. A rotatable boom turret assembly comprising:
   a. a pedestal having a mounting post extending therefrom;
   b. a boom supporting assembly rotatably mounted on the mounting post of the pedestal about a given axis of rotation;
   c. an indexing member mounted on the boom supporting assembly and rotatable on the supporting assembly about the supporting assembly, the member having a plurality of index positions about the supporting assembly;
   d. locking means for interlocking the indexing member with the support assembly at the plurality of index positions, and
   e. motive means connected to the indexing member for rotating the member about the axis of rotation of the boom supporting assembly.

2. The rotatable boom turret assembly of claim 1 wherein:
   a. the indexing member is a ring member rotatably mounted on the supporting assembly.
   b. the indexing member is a ring member mounted coaxially on the supporting assembly.
   c. the indexing member is a ring member mounted radially on the supporting assembly.
   d. the indexing member is a ring member mounted co-axially on the supporting assembly.
   e. the indexing member is a ring member mounted co-axially on the supporting assembly.

3. The rotatable boom turret assembly of claim 1 wherein:
   a. the indexing member is a ring member mounted co-axially on the supporting assembly.
   b. the indexing member is a ring member mounted co-axially on the supporting assembly.
   c. the indexing member is a ring member mounted co-axially on the supporting assembly.
   d. the indexing member is a ring member mounted co-axially on the supporting assembly.
   e. the indexing member is a ring member mounted co-axially on the supporting assembly.

4. The rotatable boom turret assembly of claim 3 wherein:
   a. the indexing member is a ring member mounted co-axially on the sleeve.
   b. the indexing member is a ring member mounted co-axially on the sleeve.
   c. the indexing member is a ring member mounted co-axially on the sleeve.
   d. the indexing member is a ring member mounted co-axially on the sleeve.
   e. the indexing member is a ring member mounted co-axially on the sleeve.

5. The rotatable boom turret assembly of claim 4 wherein:
   a. the indexing member is a ring member mounted co-axially on the sleeve.
   b. the indexing member is a ring member mounted co-axially on the sleeve.
   c. the indexing member is a ring member mounted co-axially on the sleeve.
   d. the indexing member is a ring member mounted co-axially on the sleeve.
   e. the indexing member is a ring member mounted co-axially on the sleeve.

6. The rotatable boom turret assembly of claim 5 wherein:
   a. the indexing member is a ring member mounted co-axially on the sleeve.
   b. the indexing member is a ring member mounted co-axially on the sleeve.
   c. the indexing member is a ring member mounted co-axially on the sleeve.
   d. the indexing member is a ring member mounted co-axially on the sleeve.
   e. the indexing member is a ring member mounted co-axially on the sleeve.

7. The rotatable boom turret assembly according to claim 6 wherein:
   a. the inwardly extending end of the lock pin is a tapered end.
8. The rotatable boom turret assembly according to claim 7 wherein:
the cylindrical sleeve of the boom supporting assembly includes an internally tapered bushing in each cutout.
9. The rotatable boom turret assembly according to claim 6 wherein:
a release handle is connected to the resiliently biased pin for releasing the pin and the ring member from the sleeve at
the index positions.
10. The rotatable boom turret assembly of claim 6 wherein:
the pedestal is mounted to a vehicle frame; and
the motive means includes a fluid operated piston and cylinder assembly pivotally connected between the vehicle frame and the ring member.

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