

- [54] **LONGITUDINALLY ADJUSTABLE DRILL BOOM**
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- [73] Assignee: **Atlas Copco AB, Nacka, Sweden**
- [22] Filed: **June 18, 1974**
- [21] Appl. No.: **480,517**

3,396,860	8/1968	Witwer	212/55 X
3,523,336	8/1970	Kimber	248/16
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Primary Examiner—J. Franklin Foss
 Attorney, Agent, or Firm—Flynn & Frishauf

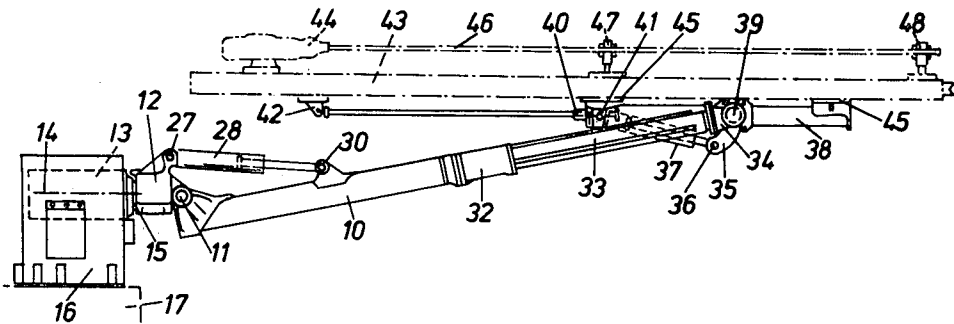
- [30] **Foreign Application Priority Data**
 July 3, 1973 Sweden 73093932
- [52] U.S. Cl. **248/16; 173/43; 212/55**
- [51] Int. Cl.² **E21C 11/00; B66C 23/00; E21C 11/00**
- [58] **Field of Search** 248/16, 2; 212/144, 55; 52/18; 173/42, 43

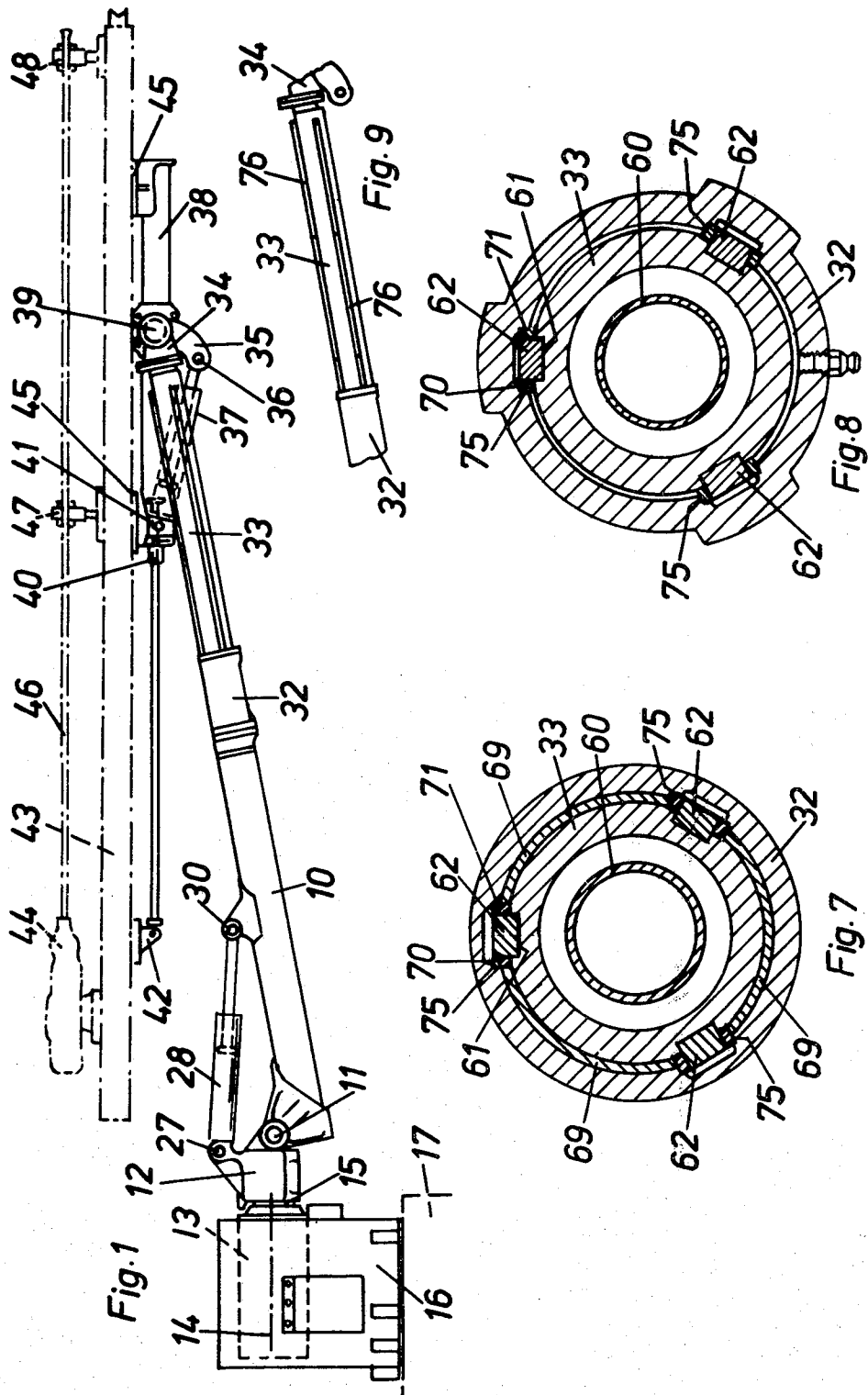
[57] **ABSTRACT**

A drill boom is longitudinally extensible and contractible by a power cylinder. The drill boom extension mechanism includes a boom extension member longitudinally slidably guided in a journal casing affixed to the outer end of the drill boom. The journal casing has longitudinal grooves cooperating with elongated wedge or guide means on the boom extension member for guiding the latter non-rotatably in the drill boom, the wedge or guide means having a length exceeding the length of the journal casing and traversing axially through the journal casing.

- [56] **References Cited**
UNITED STATES PATENTS
 3,298,548 1/1967 Long et al. 212/55 X

34 Claims, 9 Drawing Figures





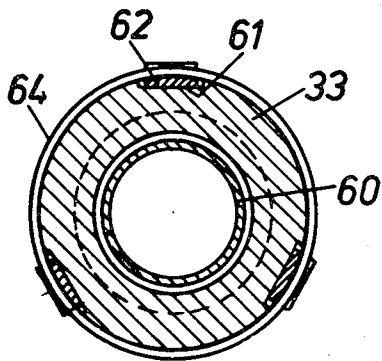


Fig. 5

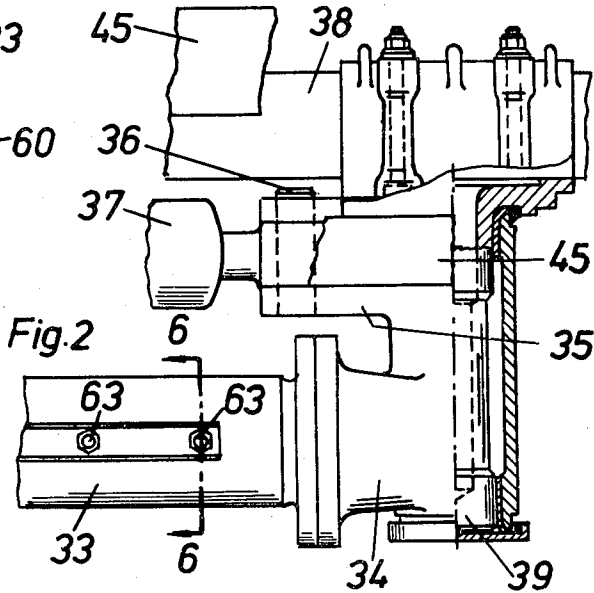


Fig. 2

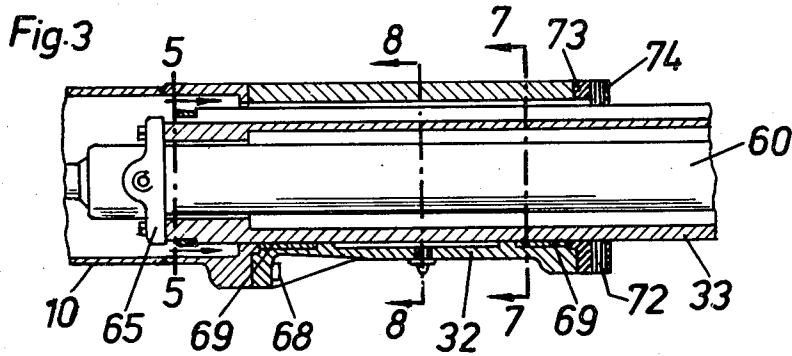


Fig. 3

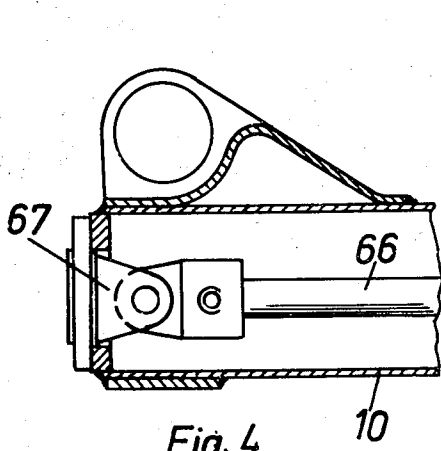


Fig. 4

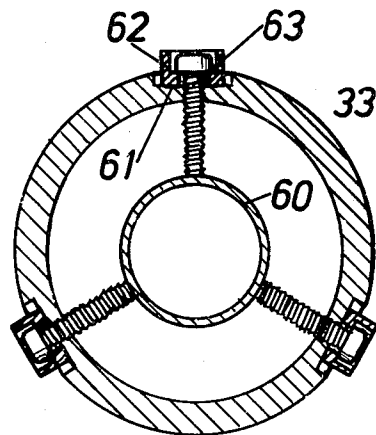


Fig. 6

LONGITUDINALLY ADJUSTABLE DRILL BOOM

This invention relates to drill booms and more particularly to longitudinally adjustable drill booms adapted for positioning a rock drilling apparatus to different alternative drilling positions with respect to a work surface of the type incorporating a drill boom pivotally journalled on a boom support, a journal casing arranged at the outer end of the drill boom, a boom extension member longitudinally slidable in the journal casing carrying an adjusting head which adjustably supports the rock drilling apparatus and a power cylinder connected to the boom extension member for adjusting the length of the drill boom as measured between the boom support and the adjusting head.

BACKGROUND OF THE INVENTION

In the application of such drill booms, turning between the boom extension member and the drill boom is normally prevented by a wedge construction, which during all load conditions on the one hand shall prevent harmful tangential play and on the other must not disturb the function of the journal casing as an effective pillow shell for the boom extension member. An example of a prior solution is disclosed in U.S. Pat. No. 3,523,336.

It is an object of the present invention to simplify in the abovementioned type of drill booms the construction which safeguards non-turning of the boom extension member for purpose enabling the drill boom to be made substantially lighter. At the same time the capability of the construction to be adjusted because of wear during operation shall be substantially simplified.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a longitudinally adjustable drill boom adapted for positioning an elongated rock drilling apparatus to different alternative drilling positions with respect to a work surface, comprising in combination therewith a drill boom, a boom support, pivot means on said support for pivotally journaling thereon said drill boom at the inner end thereof, a journal casing arranged at the outer end of said drill boom, an adjusting head, a boom extension member longitudinally slidable in said journal casing and carrying said adjusting head, said rock drilling apparatus being adjusting head, a power cylinder connected to said boom extension member for adjusting the length of said drill boom between said boom support and said adjusting head, an axial guiding groove in said journal casing, and elongated wedge or guide means extending along said boom extension member and attached thereto, said wedge or guide means being non-turnably received in said guiding groove for guiding said boom extension member while traversing axially through said journal casing. The length of the elongated wedge or guide means exceeds the length of the journal casing in the axial direction of the boom.

According to another aspect of the invention there is provided in an extensible and contractible drill boom an elongated hollow jib portion connected to a support at the inner end thereof, a journal casing arranged at the outer end of said jib portion, an axial guiding groove in said journal casing, an elongated boom extension member longitudinally slidably guided in said journal casing, a power cylinder connected to said boom extension member for longitudinal adjustment of said

boom extension member relative to said jib portion, elongated wedge or guide means attached to said boom extension member and being non-turnably received in said guiding groove, and readily removable shim-rules disposed in opposed spaced relation in said guiding groove for receiving said wedge or guide means slidably therebetween.

According to a further aspect of the invention there is provided an improved extension member for adjustably supporting a rock drilling apparatus at the other end thereof and of the type wherein the extension member is slidably guided by means of a power cylinder in a supporting member, and wherein the improvement comprises a journal casing arranged at the outer end of said supporting member, an axial guiding groove in said journal casing, elongated wedge or guide means extending along the main part of said extension member and attached thereto, said wedge or guide means being non-turnably received in said guiding groove while traversing axially through said journal casing.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other purposes of the invention will become obvious from the following description and from the accompanying drawings in which two embodiments are shown by way of example. It should be understood that these embodiments are only illustrative of the invention and that various modifications thereof may be made within the scope of the claims following hereinafter.

In the drawings, FIG. 1 shows a side view of a drill boom according to the invention. FIG. 2 is a fragmentary enlarged top view of the drill boom in FIG. 1. FIG. 3 is an enlarged longitudinal section through the middle part of the drill boom in FIG. 1. FIG. 4 is an enlarged longitudinal section through the rear end of the drill boom in FIG. 1. FIG. 5 is an enlarged section on the line 5—5 in FIG. 3. FIG. 6 shows an enlarged section on the line 6—6 in FIG. 2. FIG. 7 is an enlarged section on the line 7—7 in FIG. 3. FIG. 8 is an enlarged section on the line 8—8 in FIG. 3. FIG. 9 is a fragmentary side view of another embodiment of a drill boom according to the invention.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

In FIG. 1 a drill boom 10 is sustained pivotally on a cross shaft 11 which is carried by a boom support 12. By means of a conventional hydraulic turning means 13 the boom support 12 is turnable 360° around a geometrical polar axis 14 which passes through the centre line of a shaft 15 incorporated in the turning means 13. The boom support 12 is non-turnably attached to the shaft 15. The turning means 13 is mounted in a housing 16 which is supported by an element 17. The latter element 17 forms part of a drill wagon or rig, not shown. The boom support 12 carries the cross shaft 11 laterally of the shaft 15. The boom support 12 further carries a shaft 27 parallel with the cross shaft 11. The shaft 27 forms a pivotal connection for a single or preferably a couple of adjacent mounted hydraulic elevating cylinders 28, which with the ends of their piston rods are pivotally attached to a shaft 30 on the drill boom 10.

The drill boom 10 supports at its outer end a journal casing 32 in which a boom extension member 33 is carried axially slidably but non-rotatably. The boom extension member 33 is adjustable longitudinally relative to the drill boom 10 by means of a hydraulic cylinder

means 60 mounted within the drill boom, FIGS. 3, 4. The boom extension member 33 further supports an adjusting head 34 provided with journaling lugs 35 at which a hydraulic tilt cylinder 37 is pivotally journalled at a shaft 36. The tilt cylinder 37 is pivotally connected to a shaft 41 on a feed holder 38 which by means of a cross shaft 39 parallel with the cross shaft 11 is turnably journalled on the adjusting head 34.

An hydraulic feed bar displacing cylinder 40 is fixed to the feed holder 38 and to a bracket 42 on a feed bar 43. The feed bar 43 supports in conventional manner a rock drilling machine 44 mechanically fed to and fro therealong, which rock drilling machine rotates and delivers impacts against a drill steel 46 guided by means of drill steel centralizers 47, 48 on the feed bar 43. The feed bar 43 is supported slidably and adjustably in longitudinal the direction by means of guides 45 on the feed holder 38 and by means of the hydraulic feed bar displacing cylinder means 40. The feed holder 38, the feed bar 43 and the rock drilling machine 44 are in the following description referred to as a rock drilling apparatus.

By actuation of the hydraulic cylinder means 28 and the hydraulic cylinder means 37 the drill boom 10 and the rock drilling apparatus are adjusted angularly whereat whereby the latter is supported and moves in a pivotal plane extending through the polar axis 14. By actuation of the turning means 13 this plane can be turned around the polar axis 14.

According to the embodiment in FIGS. 1-8 the boom extension member 33 is along the main part of its length provided with one or more, preferably three, wedge or guide grooves 61 in which elongated wedges or guides 62 are placed and affixed to the extension member 33 by means of screws 63 only in the vicinity of the adjusting head 34, FIG. 2. As is evident from FIG. 6 the screws 63 can be used for affixing of the outermost end of the hydraulic cylinder 60 with respect to the boom extension member 33. At the end of the boom extension member 33 which is directed from the adjusting head 34 the wedges 62 are thus longitudinally freely movable relative to the boom extension member 33 when the latter is bent under the load of the adjusting head 34. As is evident from FIGS. 3 and 5 the ends of the wedges or guide 62 are reduced and surrounded by a ring 64 resting against the boom extension member 33, which ring keeps the free ends of the wedges or guides 62 together.

The hydraulic cylinder 60 is by means of a couple of yokes 65 affixed to the gable end of the boom extension member 33 and its piston rod 66 is pivoted to a bracket 67 which is affixed to the rear end of the drill boom 10, FIG. 4.

The journal casing 32 is by means of screws 68 detachably fastened to the outer end of the drill boom 10 and carries at its opposite ends inner bearing shells 69. These bearing shells 69 are partly cylindrical, are glued to the inside of the journal casing 32 and provide effective pillow shells for guiding of the boom extension member 33. The wedges 62 are non-turnably received in axial guiding grooves 75. Between the bearing shells 69 and the wedges 62 are inserted spacing shim-rules 70, 71 on both sides of the wedges 62. The spacing shim-rules 70, 71 are retained between a shoulder arranged at the outer end of the drill boom 10 and adjusting rings 72 which are screwed to the outer gable of the journal casing 32 between an end piece and a covering 74.

By extension or contraction of the hydraulic cylinder means 60 the boom extension member 33 is displaced with respect to the journal casing 32 so that the length of the drill boom reckoned as measured between the boom support 12 and the adjusting head 34 can be adjusted. By unscrewing and removing of the gable-ring 74 and the adjusting rings 72 the spacing shim-rules can be changed easily when worn so that the tangential play between the boom extension member 33 and the journal casing 32 can be kept at a desired low operating value. At damage during operation the journal casing 32 together with the boom extension member 33 and the hydraulic cylinder means 60 can be changed easily by detaching the screws 68 and disconnecting the bracket 67 at which the piston rod 66 of the hydraulic cylinder means 60 is pivoted.

In the modified embodiment of the drill boom according to FIG. 9 the boom extension member 33 is provided with wedge grooves arranged in analogy with the wedge grooves 61 of the embodiment shown in FIGS. 1-8. Instead of a single, continuous wedge there are at least two, preferably three, wedges 76 in each of the wedge grooves. The wedges 76 are at both sides affixed to the boom extension member 33 by means of screws. The screws are traversing the wedges 76 with a peripheral play so as to permit axial and lateral movement of the wedges relative to the boom extension member 33.

What I claim is:

1. A longitudinally adjustable drill boom adapted for positioning an elongated rock drilling apparatus to different alternative drilling positions with respect to a work surface, comprising in combination therewith:
 - a drill boom,
 - a boom support,
 - pivot means on said boom support for pivotally journaling one end of said drill boom to said boom support, said one end being the inner end thereof,
 - a journal casing arranged at the opposite outer end of said drill boom,
 - an adjusting head,
 - a boom extension member longitudinally slidable in said journal casing and carrying said adjusting head at the outer end thereof remote from said drill boom, said rock drilling apparatus being adjustably supported on said adjusting head,
 - a power cylinder connected to said boom extension member for adjusting the overall length of said drill boom and boom extension member between said boom support and said adjusting head,
 - an axial guiding groove in said journal casing, and
 - elongated guide means extending along said boom extension member and attached at one end to said boom extension member, the opposite end of said elongated guide means being slidably supported relative to said boom extension member in the longitudinal direction thereof, the length of said elongated guide means exceeding the length of said journal casing in the axial direction of said drill boom, said elongated guide means being non-turnably received in said guiding groove for guiding said boom extension member over substantially the whole length thereof while traversing axially through said journal casing.
2. A drill boom according to claim 1 comprising an elongated groove in said boom extension member for receiving said elongated guide means, said elongated groove extending along a major portion of the axial

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length of said boom extension member.

3. A drill boom according to claim 2 in which said elongated guide means comprises at least one single, continuous wedge or guide member at one end attached to said boom extension member and at the opposite end supported freely slidably relative to said boom extension member in the longitudinal direction thereof in said elongated groove of said boom extension member.

4. A drill boom according to claim 3 in which said one end is the outer end of said wedge or guide member which is closest to the outer end of said boom extension member.

5. A drill boom according to claim 3 in which said elongated guide means comprises a plurality of elongated wedge or guide members extending along separate generatrices of said boom extension member, and a ring surrounding said boom extension member and said wedge or guide members for keeping together the freely slidable ends of said wedge or guide members.

6. A drill boom according to claim 2 in which said elongated guide means comprises at least two elongated wedges oriented in end-to-end relationship.

7. A drill boom according to claim 1 comprising a plurality of readily removable shim-rules disposed in opposed spaced relation in said guiding groove for receiving said elongated guide means slidably therebetween.

8. A drill boom according to claim 1 comprising a plurality of guiding grooves, and partly cylindrical bearing shells affixed in said journal casing between said guiding grooves for providing bearing surfaces of said journal casing.

9. A drill boom according to claim 1 comprising screws attaching said elongated guide means to said boom extension member, said screws also affixing the outer end of said power cylinder relative to said boom extension member.

10. An extensible and contractible drill boom comprising:

an elongated hollow jib portion connected to a support at the inner end thereof,

a journal casing arranged at the outer end of said jib portion,

at least one axial guiding groove in said journal casing,

an elongated boom extension member longitudinally slidably guided in said journal casing,

a power cylinder connected to said jib portion and to said boom extension member for longitudinal adjustment of said boom extension member relative to said jib portion,

elongated guide means attached at one end to said boom extension member and being non-turnably received in said guiding groove, the opposite end of said elongated guide means being slidably supported relative to said boom extension member in the longitudinal direction thereof in said elongated groove of said boom extension member, and

a plurality of readily removable shim-rules disposed in opposed spaced relation in said guiding groove for receiving said elongated guide means slidably therebetween.

11. A drill boom according to claim 10 comprising three axial guiding grooves in said journal casing, said elongated guide means comprising three elongated guide members attached to said boom extension member along three separate generatrices, said elongated

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guide members respectively being non-turnably received in respective ones of said guiding grooves.

12. A drill boom according to claim 10 comprising a shoulder arranged at the outer end of said jib portion, and a retaining ring attached to the outer end of said journal casing for retaining therebetween said shim-rules.

13. A drill boom according to claim 11 comprising partly cylindrical bearing shells in said journal casing between said guiding grooves for providing bearing surfaces of said journal casing.

14. A drill boom according to claim 13 in which said bearing shells are located at opposite ends of said journal casing.

15. An improved extension member for adjustably supporting a rock drilling apparatus at the outer end thereof, the extension member being slidably guided by means of a power cylinder in a supporting member, the improvement comprising:

a journal casing arranged at the outer end of said supporting member,

an axial guiding groove in said journal casing, and

elongated guide means extending along a major portion of the length of said extension member and attached at one end to said extension member, the

opposite end of said elongated guide means being slidably supported relative to said extension member in the longitudinal direction thereof, said elongated guide means being non-turnably received in

said guiding groove for guiding said extension member over a major portion of the length of said extension member while traversing axially through

said journal casing.

16. An extension member according to claim 15 comprising an elongated groove in said extension member for receiving said elongated guide means, said elongated groove extending along a major portion of the axial length of said extension member.

17. An extension member according to claim 16 in which said elongated guide means comprises at least one single, continuous wedge or guide member at one end attached to said extension member and at the opposite end supported freely slidably relative to said extension member in the longitudinal direction thereof in said elongated groove of said extension member.

18. An extension member according to claim 17 in which said one end is the outer end of said wedge or guide member which is closest to the outer end of said extension member.

19. A boom extension member according to claim 17 in which said elongated guide means comprises a plurality of elongated wedge or guide members extending along separate generatrices of said extension member, and a ring surrounding said extension member and said wedge or guide members for keeping together the freely slidable ends of said wedge or guide members.

20. An extension member according to claim 17 comprising screws attaching said elongated guide means to said extension member, said screws also affixing the outer end of said power cylinder relative to said extension member.

21. An extensible and contractible drill boom comprising:

an elongated hollow jib portion connected to a support at the inner end thereof,

a journal casing arranged at the outer end of said jib portion,

at least one axial guiding groove in said journal casing,

an elongated boom extension member longitudinally slidably guided in said journal casing,

a power cylinder connected to said jib portion and to said boom extension member for longitudinal adjustment of said boom extension member relative to said jib portion,

elongated guide means attached at one end to said boom extension member and being non-turnably received in said guiding groove, the opposite end of said elongated guide means being slidably supported relative to said boom extension member in the longitudinal direction thereof in said elongated groove of said boom extension member, and

a plurality of readily removable shim-rules disposed in opposed spaced relation in said guiding groove for receiving said elongated guide means slidably therebetween.

11. A drill boom according to claim 10 comprising three axial guiding grooves in said journal casing, said elongated guide means comprising three elongated guide members attached to said boom extension member along three separate generatrices, said elongated

at least three axial guiding grooves in said journal casing,
 an elongated boom extension member longitudinally slidably guided in said journal casing,
 a power cylinder connected to said jib portion and to said boom extension member for longitudinal adjustment of said boom extension member relative to said jib portion,
 at least three elongated guide means attached to said boom extension member along three separate respective generatrices and being non-turnably received in respective ones of said guiding grooves, and
 a plurality of partly cylindrical bearing shells in said journal casing, each being between a respective pair of said guiding grooves for providing bearing surfaces of said journal casing.

22. A drill boom according to claim 21 wherein said bearing shells are fixedly connected to said journal casing.

23. A drill boom according to claim 21, further comprising a plurality of readily removable shim-rules disposed in opposed spaced relation in each of said guiding grooves for receiving a respective elongated guide means slidably therebetween.

24. A drill boom according to claim 23 comprising a shoulder arranged at the outer end of said jib portion, and a retaining ring attached to the outer end of said journal casing remote from said jib portion for retaining therebetween said shim-rules.

25. A drill boom according to claim 24 further comprising at least one adjusting ring removably attached to said journal casing by means of said retaining ring.

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26. A drill boom according to claim 24 wherein said retaining ring is slidable over said boom extension member and is removably threadably connected to said journal casing.

27. A drill boom according to claim 21 comprising a plurality of said bearing shells at opposite ends of said journal casing.

28. A drill boom according to claim 27 comprising a shoulder arranged at the outer end of said jib portion, and a retaining ring attached to the outer end of said journal casing remote from said jib portion for retaining therebetween said shim-rules.

29. A drill boom according to claim 28 further comprising at least one adjusting ring removably attached to said journal casing by means of said retaining ring.

30. A drill boom according to claim 28 wherein said retaining ring is slidable over said boom extension member and is removably threadably connected to said journal casing.

31. A drill boom according to claim 12 further comprising at least one adjusting ring removably attached to said journal casing by means of said retaining ring.

32. A drill boom according to claim 12 wherein said retaining ring is slidable over said boom extension member and is removably threadably connected to said journal casing.

33. A drill boom according to claim 1 wherein said elongated guide means is attached to said boom extension member proximate the outer end of said boom extension member.

34. A drill boom according to claim 10 wherein said elongated guide means is attached to the end portion of said boom extension member remote from said journal casing.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,923,276
DATED : December 2, 1975
INVENTOR(S) : Erich V. KIMBER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 2, change "realtes" to --relates--;

Column 8, line 32, change "elnogated" to --elongated--.

Column 1, line 47, after "drilling apparatus being"
insert --adjustably supported on said--.

Signed and Sealed this

sixteenth Day of March 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks