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MINING MACHINE WITH RADIALLY ADJUSTABLE BORING ARM

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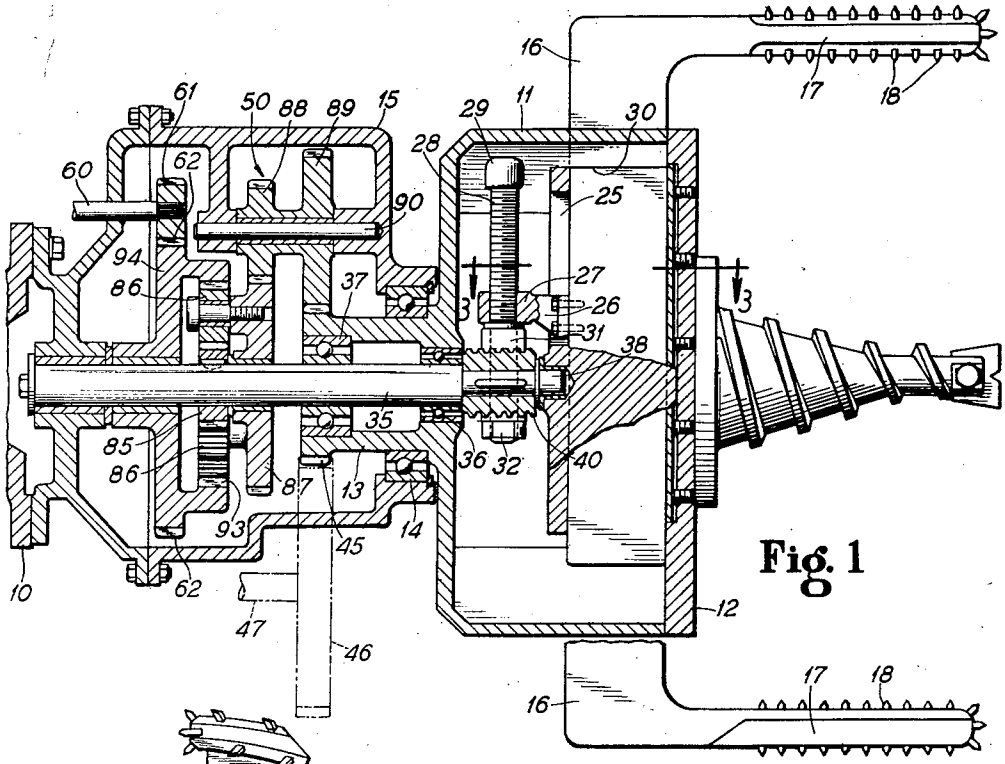


Fig. 1

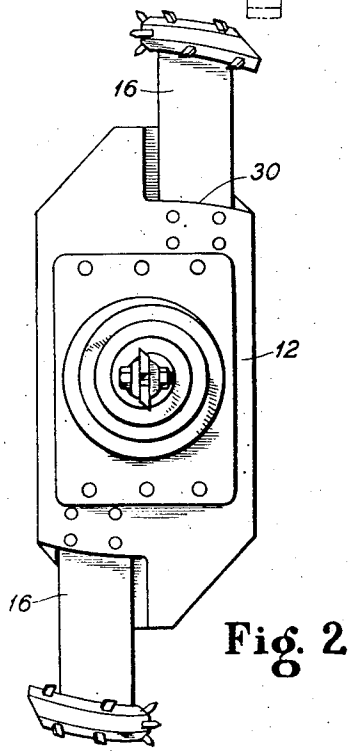


Fig. 2

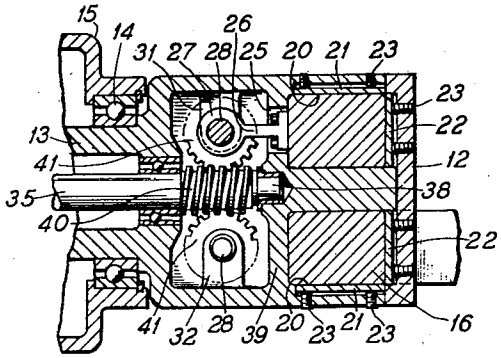


Fig. 3

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MINING MACHINE WITH RADIALLY ADJUSTABLE BORING ARM

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Original application December 17, 1952, Serial No. 326,399, now Patent No. 2,730,345, dated January 10, 1956. Divided and this application November 7, 1955, Serial No. 545,291

1 Claim. (Cl. 262—26)

This invention relates to improvements in mining machines adapted to remove coal or similar material from the face of the mine, and more particularly to mining machines of the type having one or more laterally spaced, radial boring arms with cutting devices thereon adapted to cut bores in advance of the machine. The present invention is especially designed as an improvement over the form of mining machine disclosed in the application of Frank Cartlidge and Frank A. Lindgren, Serial No. 255,058, filed November 6, 1951, now Patent No. 2,734,731, wherein the cutter bit supports on the outer ends of the boring arms are telescopically mounted for endwise extension by power means operating from the supporting frame of the rotatable boring member and effective through the drive shaft for said rotatable boring element to adjust the extension of the radial arms while the boring element is in operation.

The principal object of the present invention is to provide an improved form of adjusting mechanism for both extension and retraction of the arms radially of the boring element while the latter is in operation.

Other objects and advantages of the present invention will appear from time to time as the following description proceeds.

The present application is a division of copending application Serial No. 326,399, now Patent No. 2,730,345, and relates more particularly to a variant form of gearing originally shown and described in said parent application.

The invention may best be understood by reference to the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view taken generally along the vertical plane passing through the axis of rotation of a boring element constructed in accordance with the invention and illustrating the environment of the specific, but variant, form of gearing forming the subject matter of the present application;

Figure 2 is a front end view of the boring element shown in Figure 1;

Figure 3 is a detailed section taken on line 3—3 of Figure 1.

Referring now to details of the embodiment of the invention shown in Figures 1 to 3, these three figures illustrate the general form and arrangement of a boring head assembly for which the gearing of the present application is especially designed. In said assembly, a mining machine support or frame is indicated generally at **10** at the front end of which is mounted a boring element indicated generally at **11** adapted to be rotated by power on a generally horizontal axis in advance of the mining machine. In practice, machines of the kind to which the invention relates frequently have two or more similar boring elements rotating on parallel axes so as to cut contiguous bores. Since the present invention is directed more particularly to features of a single boring element, only one such boring element need be shown or described herein.

The boring element **11**, shown in Figure 1, consists of

a radially elongated, hollow supporting frame **12** having an integral hub **13** rotatable in suitable bearings **14** in a gear housing **15** secured to the front end of the main support **10**. The cutter arm support **12** is generally hollow and has a pair of radially extending cutter arms **16, 16** mounted for endwise telescopic movement relative thereto. Each cutter arm has a cutter bit support **17** on its outer end, extending at a right angle forwardly therefrom, and having a plurality of detachable cutter bits **18, 18** at its inner, outer and forward end portions.

The boring element **11** may also be provided with a tapered drill-like member projecting forwardly concentric with the hub **13**.

The inner ends of the radially extending cutter arms **16, 16** are telescopically adjustable in the hollow frame **12** along two parallel guideways **20, 20** formed closely adjacent each other on opposite sides of the axis of rotation of the boring element (see Figure 3). These guideways have wear plates **21** and **22** along the side and front inner faces thereof, engaged by bolts **23, 23** in the hollow frame for adjusting said wear plates relative to the cutter arms when necessary. Each of the guideways **20** has a vertically extending slot **25** opening rearwardly along its inner face through which extend a bracket **26** fixed to the rear face of the respective telescoping arm **16**. Each of the brackets **26** has an enlarged end portion **27** in which is threaded a screw shaft **28**.

As will be seen from Figure 1, each screw shaft **28** has its outer end journalled in a bearing support **29** carried on the inner face of the hollow frame **12** adjacent the aperture **30** through which its respective cutter arm **16** projects. The inner end of each screw shaft **28** is journalled in a pair of bearing supports **31, 32** projecting inwardly and fixed to the end of the side face of the hollow frame **12**. The two screw shafts **28, 28** rotate on parallel, laterally spaced axes, but are disposed in endwise offset relation to each other toward opposite ends of the hollow frame.

The hub **13** of the boring element has an adjusting shaft **35** extending axially therethrough and journalled on longitudinally spaced bearings **36** and **37** therein. The outer end of the adjusting shaft **35** may also have a reduced end portion **38** journalled in a cross web **39** of the hollow frame **12**, which cross web also forms a part of the guideways **20** for the cutter arms **16**. A worm **40** is fixed on the outer end of the shaft **35** in engagement with worm wheels **41, 41** fixed on the two screw shafts **28, 28** between their respective bearing supports **31** and **32**.

The dual sets of worm gearing and screw shafts are arranged to cause simultaneous telescopic extension or retraction of the cutter arms **16, 16** in the hollow frame **12** when the adjusting shaft **35** is rotated in one direction or the other.

The hub **13** of the boring element may be driven through any suitable power-driven gearing, in the form shown in Figure 1 a gear **45** being fixed on the rear end of the hub and driven by a gear **46** on shaft **47**, from any suitable power source on the supporting frame **10**.

Referring now to the means for operatively connecting the hub **13** with the adjusting shaft **35** so as to rotate the latter in one direction or the other, there is provided a planetary gear mechanism generally indicated at **50**, having one element operatively connected with the hub **13** of said boring element, a second element operatively connected with the adjusting shaft **35**, and a third element arranged for positive rotation by power in one direction or the other under the control of the operator.

The form of planetary gearing shown in Figure 1, which forms the subject matter of the present divisional application, employs a gear **85**, which might be termed a sun gear, and which is keyed on the control or adjusting

shaft **35** and meshed with a planetary gear **86** on a gear **87**, which is loosely mounted on the adjusting shaft. The gear **87** has geared connection with the boring element hub **13** through spur gears **88** and **89** formed integrally with each other and rotatably mounted on a shaft **90** fixed on the housing **15**, the last-named gear **89** being meshed with the gear **45** fixed on the inner end of said hub. In this instance, the outer periphery of the planetary gear **86** is meshed with an internal gear **93** of gear member **94** loosely mounted on the adjusting shaft **35**.

Rotation of the gear member **94** is effected by a reversible motor (not shown) under control of the operator in any conventional manner, and connected through a control shaft **60** rotated on an axis parallel with the axis of the adjusting shaft **35** and having a pinion **61** thereon meshed with external gear teeth **62** formed about the gear member **94**.

The gearing just described is such that the adjusting shaft **35** will rotate in the same direction and at the same speed as the hub **13** so long as the internal gear member **94** is held stationary by the control shaft **60** having pinion **61** meshed with teeth **62** on the gear member **94**. Any change in angular position of the gear member **94**, caused by rotation of the control shaft **60**, will cause the adjusting shaft **35** to rotate with respect to the hub **13** for adjusting the cutter arms **16**, **16** telescopically with respect to the hollow cutter frame **12** of the boring element **11**.

Although there has been shown and described a certain embodiment of the invention, it will be understood that

the invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claim.

What is claimed is:

In a mining machine having a frame and a power-driven boring element rotatably mounted thereon, including a hub and at least one cutter carrying arm adjustable radially of said hub, means for adjusting the position of the arm relative to said hub, including a shaft extending concentrically through and axially of said hub and operably connected with the arm at the front end thereof to move the latter in response to rotation of the shaft relative to the hub, the improvement comprising a first sun gear fixed on said shaft meshed with a planetary gear on a gear loosely rotatable on said shaft, said gear having geared connection with the boring element through gears rotatably mounted on the frame, said planetary gears also being meshed on their outer peripheries with an internal gear on a gear member loosely mounted on said shaft, and means for rotating said gear member reversely including a control shaft disposed on an axis parallel with the axis of said shaft and having geared connection with said gear member.

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