Jan. 10, 1956 W. W. SLOANE 2,730,345

MINING MACHINE WITH RADIALLY ADJUSTABLE BORING ARM

Filed Dec. 17, 1952 2 Sheets-Sheet 1

Fig. 1

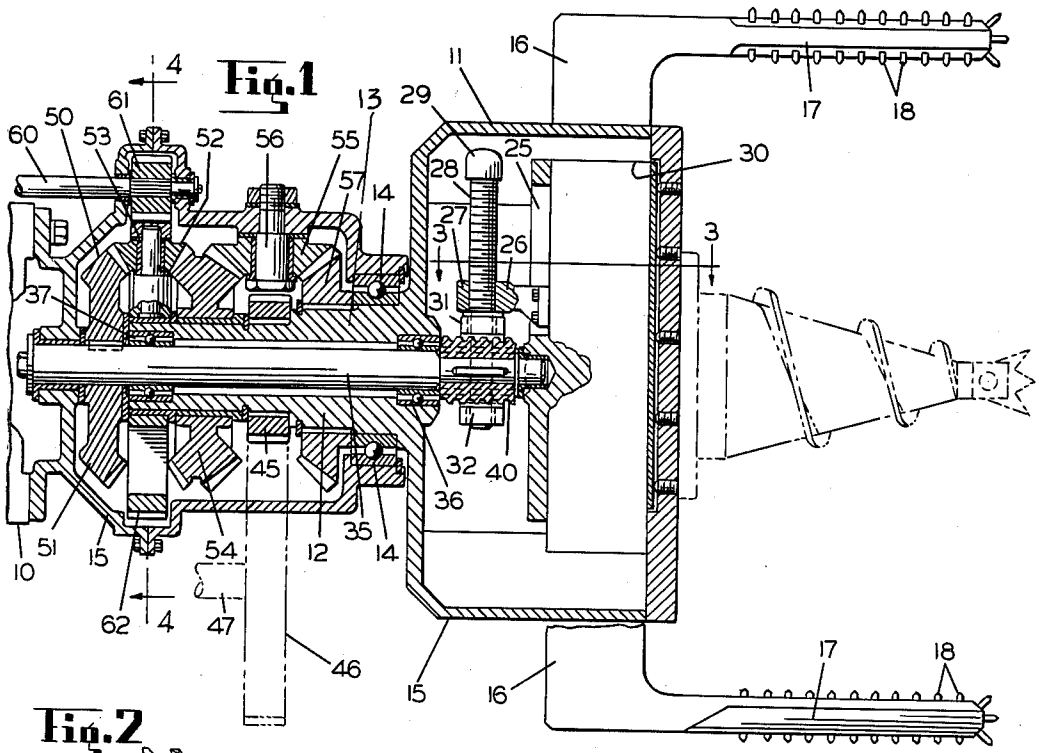


Fig. 2

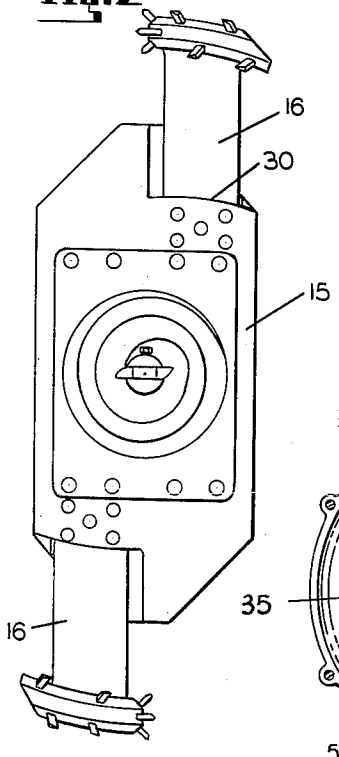


Fig. 3

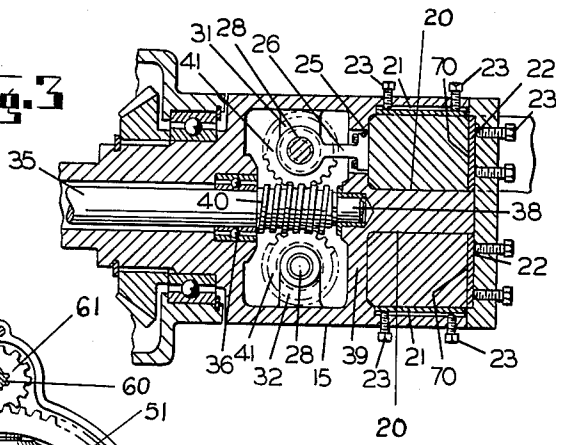
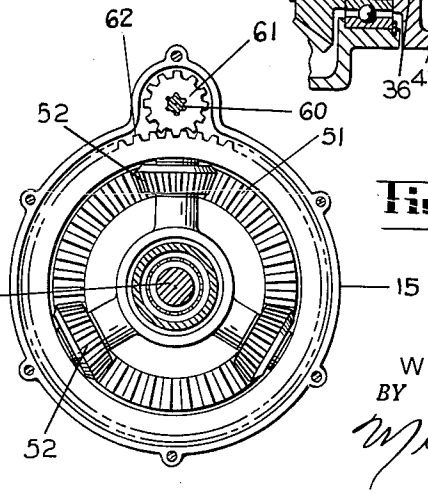


Fig. 4



INVENTOR.

WILLIAM W. SLOANE

BY

Murray A. Gleeson

ATTORNEY

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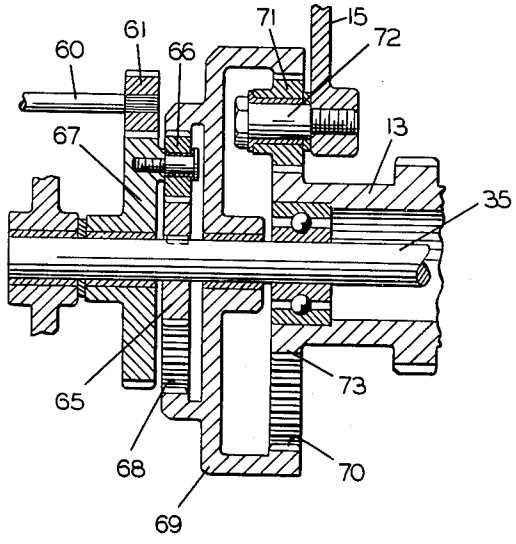


Fig. 5

INVENTOR.
WILLIAM W. SLOANE
BY
Murray G. Gleeson
ATTORNEY

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MINING MACHINE WITH RADIALLY ADJUSTABLE BORING ARM

William W. Sloane, Chicago, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application December 17, 1952, Serial No. 326,399

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 Number 255,058, filed November 6, 1951, owned by the assignee of the present invention 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 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 my invention;

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;

Figure 4 is a detailed section taken on line 4—4 of Figure 1;

Figure 5 is a fragmentary vertical section taken longitudinally of the axis of rotation of the boring element and showing a variant form of planetary drive gearing which can be used in connection with my invention.

Referring now to details of the embodiment of my invention shown in Figures 1 to 4, 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 my invention relates frequently have two or more similar boring elements rotating on parallel axes so as to cut contiguous bores. Since my 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 hub intermediate its ends, 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 mainly by power from said hub, I provide 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.

In the illustrative form of planetary mechanism shown in Figure 1, a bevel gear **51**, forming one element of the planetary system, is fixed on the adjusting shaft **35** and is meshed with a plurality of planetary gears **52, 52**, herein three in number, mounted in a cage **53**, which cage forms the second element of the planetary. Said cage is loosely mounted on the inner end of the hub **13**. The planetary gears **52** are also meshed with a double bevel gear **54** loosely mounted on the hub, which last-named

gear forms a third element of the planetary. Bevel gear **54** is driven from the hub **13** through a bevel gear **55** supported on a pin **56** fixed on the housing **15** and meshed with a bevel gear **57** carried on the hub near its outer end.

Rotation of the cage **53** is effected by a reversible motor (not shown) under control of the operator in any conventional manner, and connected through a shaft **60** having a pinion **61** thereon meshed with external gear teeth **62** formed about the cage **53**.

As will be seen from Figure 1, the bevel gears **50**, **54** and **57** are all of the same pitch diameter. Assuming that the cage **53** is held stationary by the motor shaft **60**, the bevel gear **55** serves as an idler to rotate gear **54** in the opposite direction at the same speed. The planetary gears **52** will also serve as idlers to rotate the bevel gear **51** fixed to shaft **35** at the same speed and in the same direction as the hub **13**. Accordingly, so long as the control motor connected to shaft **60** is deenergized and said shaft is maintained in a stationary position, the adjusting shaft **35** will rotate in unison with the boring element as a whole, without causing any rotation of the two screw shafts **28** which effect endwise movement of the telescoping cutter arms **16**, **16**. When the control motor connected to control shaft **60** is rotated in one direction however, pinion **61** will turn the cage **53** bodily in the same direction so as to rotate the cage into a new angular position. This change in angular position will be reflected in either a corresponding speed-up or reduction in speed of the bevel gear **51** with respect to the bevel gear **54** so as to cause rotation of the adjusting shaft **35** and worm **40** relative to the hub **13**, thereby causing uniform rotation of the two screw shafts **28**. Rotation of the screw shafts **28**, in turn, produce inward or outward movement of the arms **16**, depending upon the direction in which the screw shafts are rotated.

The variant form of planetary gear mechanism shown in Figure 5 is similar in principle to that shown in Figure 1 but uses spur gears instead of bevel gears. In this case, a spur gear **65** is keyed on the adjusting shaft **35** and is meshed with a plurality of planetary gears **66** on a cage **67**. The cage is loosely mounted on the adjusting shaft **35**. The planetary gears **66** are also meshed with an internal gear **68** on a gear member **69**, also loosely mounted on the shaft **35**. The gear member **69** carries a second internal gear **70** meshed with a pinion **71** on stub shaft **72** fixed to the gear casing **15**. The pinion **71** is also meshed with a gear **73** on the inner end of the boring element hub **13**.

The planetary gear mechanism of Figure 5 has such gear ratios that, when the cage **67** is held stationary by the control shaft **60** and pinion **61**, the adjusting shaft **35** and hub **13** will rotate at the same speed and in the same direction. Any change in angular position of the cage **67** by rotating the control shaft **60** will be reflected in either a corresponding speed-up or reduction in speed of the adjusting shaft **35** relative to the hub **13** so as to produce an inward or outward movement of the arms **16**, depending upon which direction the control shaft is rotated.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish 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.

I claim:

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 an 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 gear fixed on said shaft, a planetary gear meshed with said first gear and journalled on a carrier concentrically mounted with respect to said hub and shaft, a second gear rotatably mounted concentrically with the first gear, the shaft and the hub, and also meshed with said planetary gear, a third gear journalled on the frame and meshed with the second gear, and a fourth gear fixed on the hub and meshed with the said third gear, and means for rotating said carrier reversely about the axis of said hub and shaft, including a control shaft disposed on an axis parallel with the axis of said hub and shaft.

References Cited in the file of this patent

UNITED STATES PATENTS

584,422	Smith	June 15, 1897
1,333,491	Hughes	Mar. 9, 1920
1,335,723	Campbell	Apr. 6, 1920
1,603,621	McKinlay	Oct. 19, 1926
1,726,963	McKinlay	Sept. 3, 1929
1,953,402	Graham	Apr. 3, 1934
1,993,948	Schroeder	Mar. 12, 1935
1,999,091	Ebert	Apr. 23, 1935
2,367,555	Arney	Jan. 16, 1945
2,370,675	McCoy	Mar. 6, 1945
2,392,556	Seppeler	Jan. 8, 1946
2,657,916	Von Stroh	Nov. 3, 1952