Nov. 13, 1956 F. B. MILLER 2,770,448

EXTENSIBLE ROTARY CUTTER BAR FOR BORING TYPE MINER

Filed Feb. 14, 1955 3 Sheets-Sheet 1

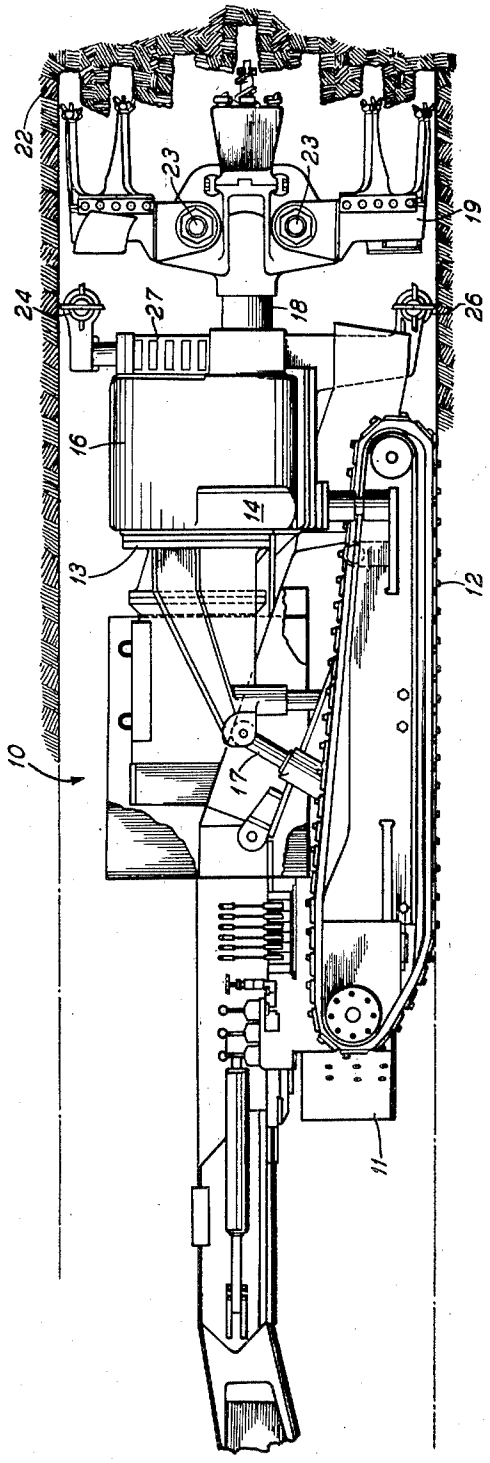


Fig. 1

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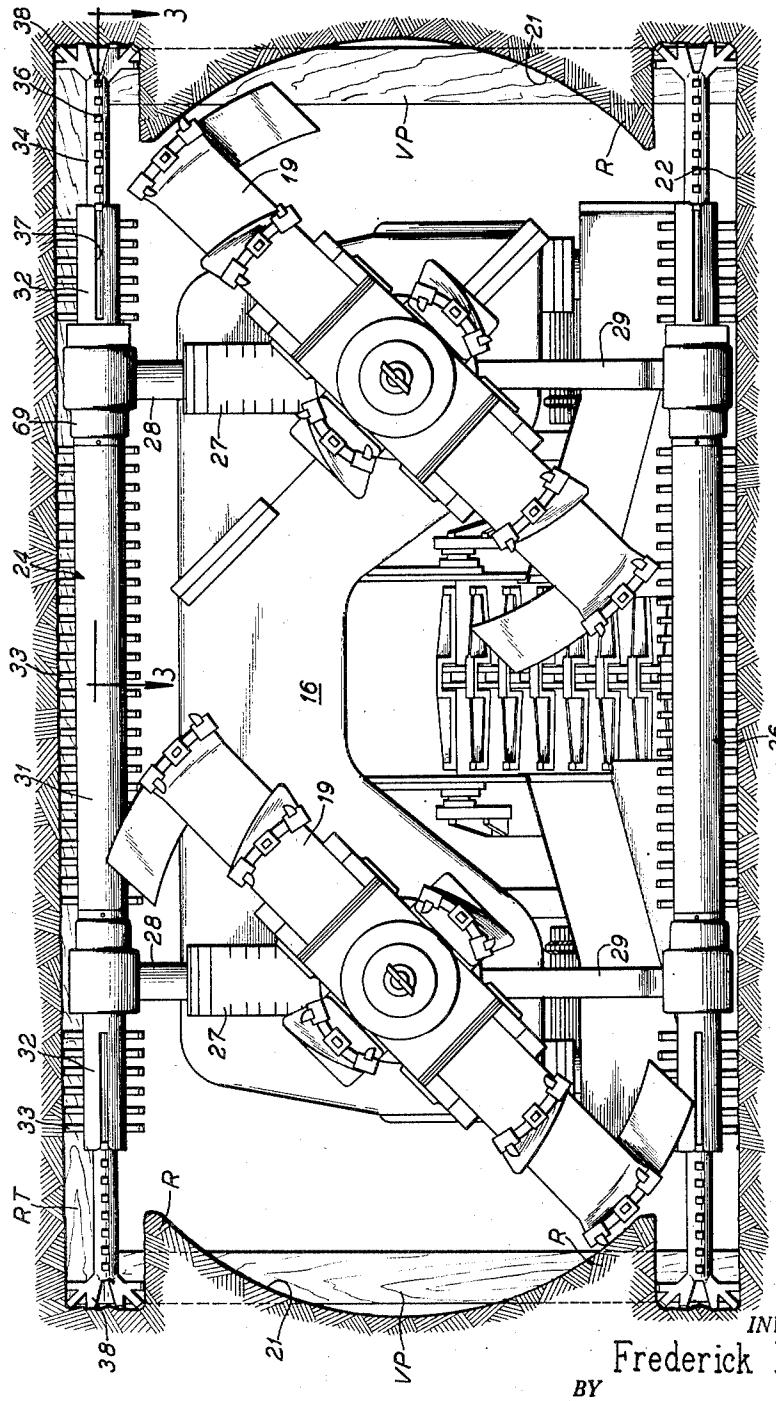


Fig. 2

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Filed Feb. 14, 1955 3 Sheets-Sheet 3

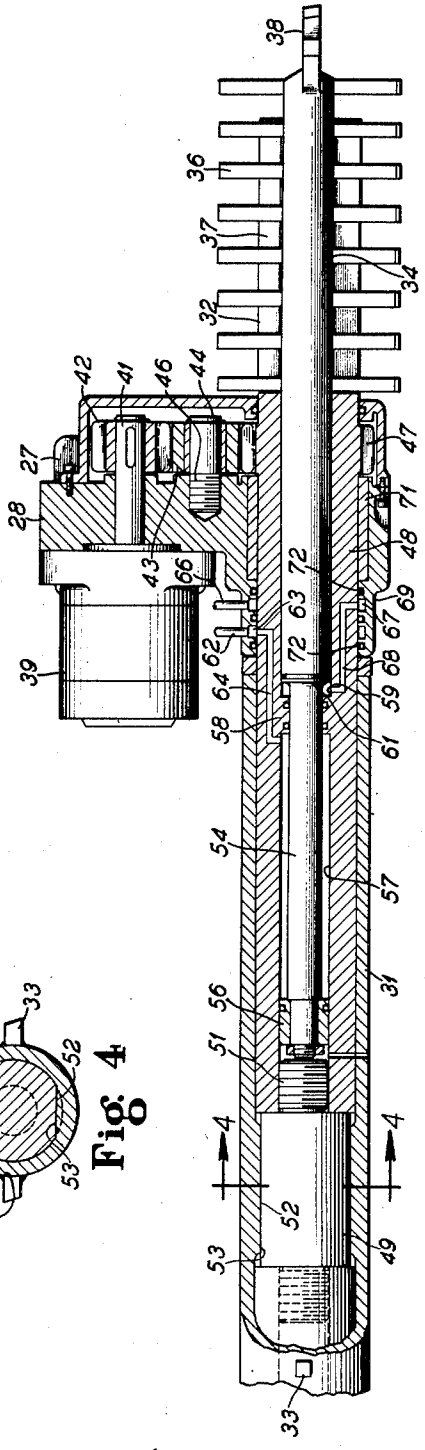


Fig. 3

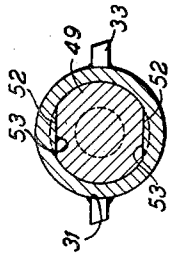


Fig. 4

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EXTENSIBLE ROTARY CUTTER BAR FOR BORING TYPE MINER

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Application February 14, 1955, Serial No. 487,981

6 Claims. (Cl. 262—7)

This invention relates generally to mining machines of the boring type, and more particularly to an improved machine wherein the bore pattern is modified to produce a substantially rectangular entry.

In the boring type miner according to the present invention cutter bars are provided for removing the upper and lower cusps remaining from the operation of the boring arms, which rotating cutter bars are not only movable in a vertical plane to retracted positions, but are also capable of being retracted along the axes thereof whereby it is possible to withdraw the machine past horizontally extending roof timbers and also past vertical timbers supporting such roof timbers. It is to the construction whereby the length of the rotating cutter bars may be altered to provide such retractile movement that this invention is particularly directed.

With the foregoing considerations in mind, it is a principal object of this invention to provide a construction whereby a mining machine of the general type referred to is able to cut a substantially rectangular bore, and whereby the cutting means of such a miner may readily be retracted.

Another object is to provide an improved rotating cutter bar for machines of the general class referred to in which the end portions of the cutter bars are telescopically adjustable with respect to the central portion thereof whereby retractile movement of the machine may readily be had.

A further object is to provide an improved construction in which each of the cutter bars is rotatable by individual power means mounted integrally therewith.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawings, which together show a preferred embodiment of the invention and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein, and it is therefore intended that the invention be limited only by the spirit and breadth of the subjoined claims.

In the drawings:

Fig. 1 is a side view of a boring type miner having the improvements according to the present invention embodied therein;

Fig. 2 is a front view of the machine shown in Fig. 1, showing the machine in a fully extended working position in a mine entry or room;

Fig. 3 is a detailed longitudinal sectional view through one of the rotating cutter bars shown in Fig. 2; said view being taken along the line 3—3 of Fig. 2, and showing the telescoping cutting element of such cutter bar in retracted position; and

Fig. 4 is a section taken through the cutter bar shown in Fig. 3 along the line 4—4 and looking in the direction of the arrows.

Referring now to Fig. 1 of the drawings, there is shown a mining machine of the boring type referred to generally by the reference numeral **10**. Such a machine

includes a main frame **11** mounted upon crawler treads **12** for propelling the machine along a mine floor or the like. An auxiliary frame **13** is mounted upon the front end of the main frame **11** and is arranged to be raised or lowered by a jack assembly **14**, disposed on opposite sides of a drive or gear housing **16**. The auxiliary frame **13** is arranged to be tilted in a vertical plane by means of tilting jacks **17**.

The drive housing **16** has extending in a forward direction therefrom a pair of laterally spaced drive shafts **18**, each of which supports a boring arm referred to generally by the reference numeral **19**. The boring arms **19** are arranged to rotate in timed relationship to each other to cut a pair of overlapping contiguous bores **21**, as seen in Fig. 2, in a seam of coal **22** or the like. The precise details of the boring arm assembly forms no part of the present invention and is as more clearly disclosed in a co-pending application of Frank Cartlidge, Serial No. 463,867, filed October 22, 1954, now Patent No. 2,736,542, for Retractable Boring Assembly. Suffice it to say, however, the boring assembly is arranged to be retracted by pivoting about pivot points **23** seen in Fig. 1 whereby clearance is afforded for withdrawal of the machine from the entry being cut thereby.

Referring now to Fig. 2, the upper and lower cusps remaining from the action of the boring arms **19** are arranged to be cut by upper and lower rotating cutter bars referred to generally and respectively by reference numerals **24** and **26**. These cutter bars are disposed in a plane behind the boring arm assembly **19** seen in Fig. 1. In a preferred form of the invention the upper rotating cutter bar **24** is arranged to be raised and lowered in a vertical plane by means of cylinders **27** disposed on the forward wall of the gear housing **16** and spaced laterally of each other, each having piston members **28** which are connected to the upper rotating cutter bar **24** as seen more particularly in Fig. 3.

The lower cutter bar **26** may likewise be arranged to be raised and lowered in a vertical plane, but as seen in Fig. 2, is supported upon laterally spaced vertical members **29** secured to the forward wall of the drive housing **16**. In the form of the invention shown herein the upper cutter bar **24** may be lowered from contact with the roof of the entry seen in Fig. 1 by means of the piston members **28**, and the lower cutter bar **26** raised from the floor of the entry by means of the tilting jacks **17**.

The upper cutter bar **24** will now be described and the description thereof, it is believed, will suffice for the lower cutter bar **26**. The upper cutter bar **24** consists of a central or inner rotating portion **31** and end or outer rotating portions **32**. Each of these supports cutter bits **33** so that upon rotation thereof the cusps will be cut from the roof or the floor of the entry as the case may be. Each end portion **32** includes a telescoping portion consisting of an arbor **34** having cutter bits **36** extending therefrom in opposed diametrical directions, such cutter bits **36** being arranged during telescoping movements to enter a slot **37** formed on the extension **32**. The bits **36** entering the slot **37** provide a driving means for turning with the end portion **32**.

The telescoping arbor **34** is provided with cutter bits **38** mounted at the end thereof and adapted to cut clearance for the end of such arbor **34** upon rotation thereof.

Means are provided for driving the upper cutter bar **24** rotatably. Such driving means is effective to drive the central portion **31** and the two end portions **32** together as a unit. To this end a fluid motor **39** is mounted at the upper end of each of the pistons **28** and includes a drive shaft **41** having a driving pinion **42** keyed thereto. The driving pinion **42** meshes with a reaching pinion **43** arranged to turn freely upon a stub shaft **44** threaded at

46 into the piston member 28. Said reaching gear meshes with a gear 47 formed integrally on a hollow support shaft 48 nested within the central portion 31 of the cutter bar 24 and turning therewith. A coupling 49 is threaded at 51 to the inner end of the hollow shaft 48, and is provided with opposed flat surfaces 52 which engage corresponding flat surfaces 53 formed on the inner side of the central cutter bar portion 31, as seen more particularly in Fig. 4. The hollow shaft 48 also extends as shown in Fig. 3 continuous with end portion 32 also supporting cutter bits 33.

The coupling member 49 likewise forms a means of connecting a similar assembly for the left hand portion 32 seen in Fig. 2.

It will thus be seen that the fluid motor 39 drives the central cutter bar portion 31 and the extensible portion 32 together as a unit through the medium of the gear train consisting of pinion 42, reach pinion 43, and the shaft mounted gear 47.

Means are provided to move the extensible portion 36 telescopically with respect to end portion 32, and to this end telescoping arbor 34 has a reduced diameter portion 54 which is fitted with a piston 56 at the inner end thereof slidable together with the arbor 34 within a bore 57 formed in the hollow shaft 48. A land 58 separates the bore 57 from a similar bore 59 within the hollow shaft 48.

Means are provided for directing fluid under pressure against the piston 56 to retract the arbor 34, or to direct fluid under pressure against a shoulder 61 formed by the juncture of the reduced diameter portion 54 to extend the arbor 34. To this end there is provided a pressure conduit 62 arranged to supply fluid under pressure to an annular port 63 communicating with a passageway 64 connected to the cylinder bore 57. A similar pressure conduit 66 is connected to an annular pressure port 67 communicating with a pressure passageway 68 in turn connected to the bore 59. Annular ports 63 and 67 are contained within a flange 69 extending from the upper end of the piston rod 28 and forming together with a bushing 71 a support for the shaft 48 and the cutter bar 31. The annular passageways are separated by suitable seals 72, which may be of the O-ring type to prevent leakage of pressure fluid.

It is believed evident that the telescoping arbor 34 can readily be retracted or extended as desired while the cutter bars are being rotated. In the extended position seen in Fig. 2 a substantially rectangular shaped bore is thus achieved. All that remains from the action of the boring arms 19 and the upper and lower rotating cutter bars 24 and 26 are small triangular shaped ribs R which may readily be removed by the operator by any suitable hand tool. Thereafter, a vertical prop VP may be placed in position to support a horizontally extending roof timber RT seen in Fig. 2. As seen, prop VP may be disposed in a position corresponding to line drawn vertically and tangent to the orbit of the boring arms 19.

When it is desired to retract the miner from the entry seen in Fig. 1, the boring arms 19 are collapsed as is described more clearly in the aforementioned Cartlidge application, Ser. No. 463,867, and the lower and upper cutter bars 24 and 26 moved to a position to clear both the mine floor and the roof timber RT. The telescoping arbors 34 are then retracted by means of the fluid pressure retracting means seen in Fig. 3 whereby the clearance is had past the props VP.

While the invention has been described in terms of a preferred embodiment thereof its scope is intended to be limited only by the claims here appended.

I claim as my invention:

1. In a mining machine having a boring arm for cutting a bore, the improvement comprising, an elongated rotary cutter means supported by the machine substantially tangentially to the cutting limit of the boring arm, said cutter means including an inner portion and an outer portion, means providing longitudinal relative movement between said portions, drive means for rotating said cutter means including connection means between the inner and outer portions thereof, said connection means including a slot in one of said portions and a bit disposed on the other portion in alignment with said slot, said bit being so positioned in relation to said slot to provide a positive drive means between the inner and outer portions of the cutter means.

2. The structure defined in claim 1 wherein said inner and outer portions are telescopically engaged and said slot is in said inner portion and said bit is on said outer portion.

3. In a mining machine having a plurality of boring arms for cutting contiguous bores, a pair of elongated vertically spaced upper and lower rotary cutter means supported by the machine substantially tangential to the upper and lower cutting limits, respectively, of said boring arms, each of said cutter means including an inner portion and an outer portion telescopically engaged with the inner portion for longitudinal relative movement in relation thereto, drive means for rotating each cutter means including connection means between each inner and outer portions thereof, each of said connection means including a slot in one of said portions and a bit disposed on the other portion in alignment with the respective slot, said bits being so positioned in relation to the respective said slots to provide a positive drive means between each inner and outer portion of each cutter means.

4. In a mining machine having a boring arm for cutting a bore in advance of the machine in a material being mined, an elongated rotary cutter means supported by the machine substantially tangentially to the cutting limit of the boring arm, said cutter means including a central portion and longitudinally extending outer portions telescopically engaging the opposite ends of said central portion, means for longitudinally relatively movably retracting and extending said outer portions in relation to said inner portion, drive means for rotating said cutter means including drive connection means between said central portion and each outer portion, said drive connection means including a longitudinally extending open ended slot in each end of said central portion and a plurality of longitudinally aligned, transversely extending bits on each outer portion, said bits being positioned on said outer portions in alignment with the respective slot so that certain of said bits will enter said slot during the longitudinal relative movement of said portions to provide a positive drive means between the central and outer portions of the cutter means.

5. In a mining machine having a boring arm for cutting a bore, the improvement comprising, an elongated cutter means supported by the machine substantially tangentially to the cutting limit of the boring arm, said cutter means including an inner rotating cutter element and a longitudinally extending outer rotating cutter element, means providing longitudinal relative movement of said outer cutter element in relation to the inner cutter element, drive means for rotating said inner cutter element, drive connection means providing common rotation between said inner cutter element and said outer cutter element, said drive connection means including a longitudinally extending open ended slot in one of said elements and a plurality of longitudinally aligned, transversely extending bits on the other element, said bits being positioned on said other element in alignment with said slot.

6. In a mining machine including a pair of boring arms having the rotational axes thereof laterally spaced and extending horizontally longitudinally of the machine for cutting contiguous bores in advance of the machine in a material being mined, a pair of elongated vertically spaced upper and lower cutter means, each of said cutter means including a central rotating cutter portion and longitudinally extending rotating cutter portions telescopically engaging the opposite ends of the central cutter portion, means for longitudinally relatively movably retracting and extending each of said outer cutter portions in relation to the respective center cutter portion, said

upper and lower cutter means being supported by the machine and disposed substantially horizontally and generally tangentially to the upper and lower cutting limits, respectively, of said boring arms and spaced rearwardly of the circular path made thereby to cut substantially flat upper and lower transverse surfaces, drive means for rotating said center cutter portions, drive connection means between said center cutter portions and each respective outer cutter portion, said drive connection means including an open ended longitudinally extending slot in the ends of each center cutter portion and a plurality of longitudinally aligned, transversely extending bits on each of the outer cutter portions, said bits being positioned on

each of said outer cutter portions in alignment with the respective slots of said center cutter portions so that certain of said bits will enter the respective slots during longitudinal relative movement of the outer cutter portions with respect to the central cutter portions to provide positive common rotation between the respective central cutter portion and outer cutter portions.

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