

[54] **MINING MACHINE HAVING DUST COLLECTING MEANS**

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[51] Int. Cl. **E21c 27/24**

[58] Field of Search **299/12, 64, 68**

[56] **References Cited**

UNITED STATES PATENTS

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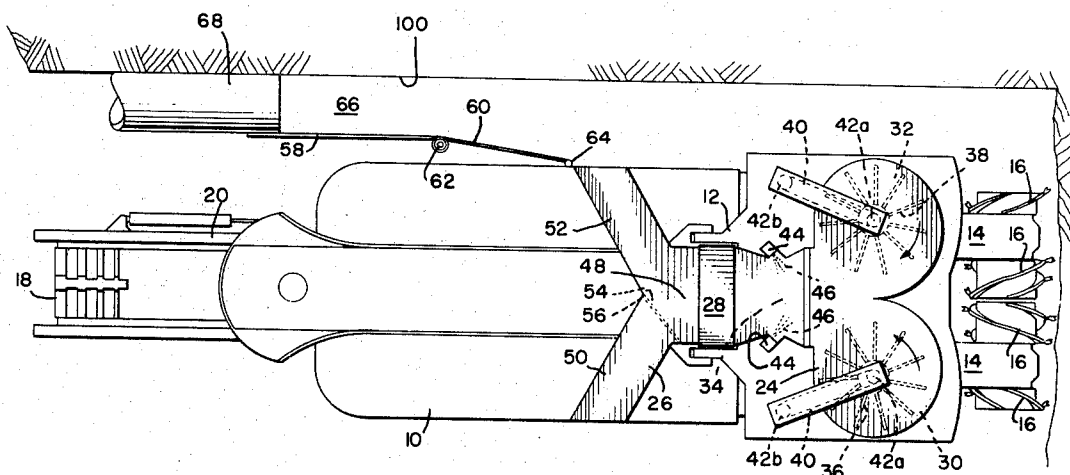
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[57] **ABSTRACT**

A continuous miner which is provided with dust collecting means comprising boom carried ducting adapted to receive dust entraining air adjacent and rearwardly of the mining head, and chassis carried ducting operable to alternatively discharge the air to opposite sides of the machine. Contrarotating centrifugal fans mounted in the boom carried ducting draw dust entraining air to such ducting whereby the air flows therethrough to the chassis carried ducting; and scrubbers or cleaners are operatively associated with the boom carried ducting for removing larger dust particles from the air flowing through the latter.

24 Claims, 2 Drawing Figures



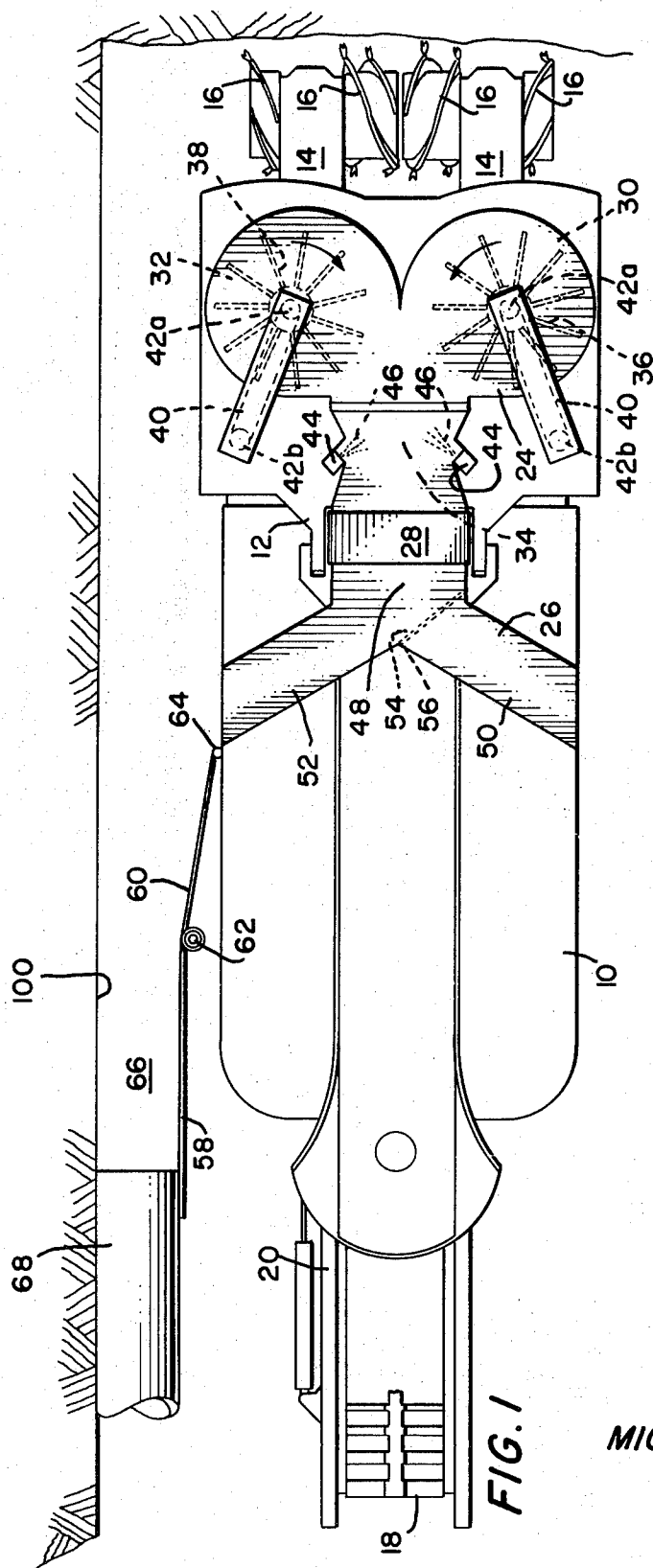


FIG. 1

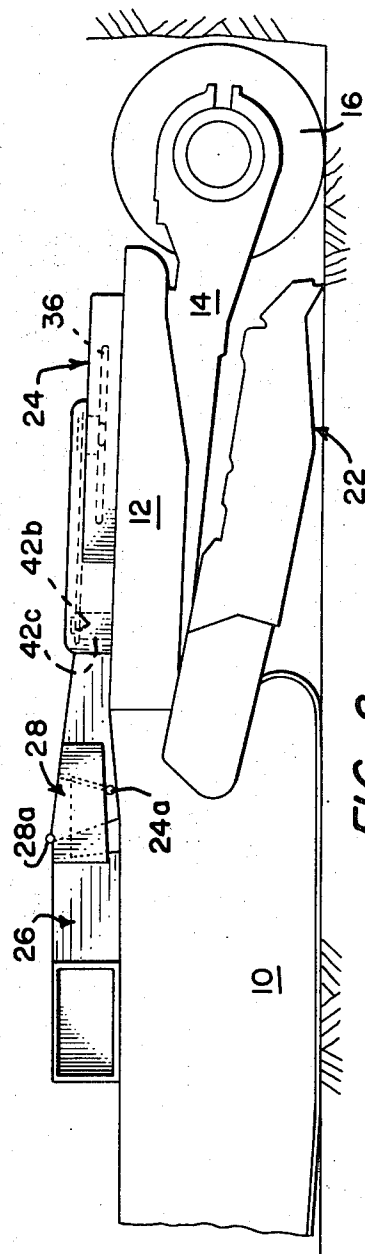


FIG. 2

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MINING MACHINE HAVING DUST COLLECTING MEANS

The present invention relates generally to mining machines and more specifically to the collection of the dust arising during the operation of a mining machine such as, for example, a continuous miner employed for the mining of coal.

During the operation of such a continuous miner, large amounts of dust are inherently generated. This dust, unless collected and removed, will rapidly spread throughout the air in the mine and present a hazard to the health and safety of the personnel in the mine. Conventionally, however, there is no commercially available equipment effective for efficiently and economically collecting this dust.

An object of the present invention is to provide a mining machine, such as for example a continuous miner, with new and improved collecting means particularly constructed and arranged for collecting this dust.

Another object of the invention is to provide a mining machine with new and improved dust collecting means particularly constructed and arranged to be of relatively compact configuration.

Another object is to provide a mining machine with new and improved dust collecting means particularly constructed and arranged such that dust entraining air is collected through the employment of fan means carried by the machine.

Another object is to provide a mining machine with new and improved dust collecting means particularly constructed and arranged to include cleaning means carried by the machine for at least partially cleaning the collected dust entraining air.

Another object is to provide a mining machine with new and improved dust collecting means of the type set forth which, although highly efficient in operation, are relatively simple and economical in construction.

Generally considered, a mining machine embodying the invention may include a supporting base, mining head means, means mounting the mining head means on the supporting base, dust collecting means including duct means on the machine extending adjacent the mining head means, such duct means being provided with at least one inlet for receiving air carried dust, and fan means on the machine operatively associated with the duct means and the inlet for causing air carried dust to pass through the inlet to the duct means.

Referring to the drawings:

FIG. 1 is a top or plan view schematically illustrating a continuous mining machine provided with one embodiment of the invention; and

FIG. 2 is an enlarged, fragmentary elevational view schematically showing the forward end of such continuous mining machine.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the invention has been illustrated and hereinafter described as applied to a continuous miner of the type wherein the rotary mining head includes cutter drums normally rotatably driven and also laterally oscillated during the mining operation. It will be understood, however, that the invention has been so shown and described by way of illustration only; and the invention is equally applicable

to other types of mining machines including, by way of example and not limitation, miners having rotary mining heads comprising cutter drums which are rotatably driven but non-oscillating during the mining operation, an example of such latter type of mining machine being described in my co-pending U.S. Pat. application Ser. No. 100,042 entitled MINING MACHINE, filed Dec. 21, 1970 and assigned to the assignee of the present invention.

The mining machine illustrated in FIG. 1 comprises a mobile supporting base in the form of a chassis 10 having pivotally mounted thereon a vertically movable boom 12 which projects forwardly of the forward end of the chassis 10 and is selectively vertically movable relative thereto by hydraulically operated cylinder-and-piston motors (not shown). The boom 12 carries a pair of cutter supporting arms or carriers 14, mounted adjacent opposite sides of the longitudinal or fore-and-aft centerline of the machine, which during the machine operation in the conventional manner are laterally oscillated towards and away from one another, for example by a hydraulically operated cylinder-and-piston motor (not shown) located between the supporting arms 14. The rotary mining head of the machine comprises rotatably driven cutter carrying drums 16 mounted at the forward ends of the supporting arms 14 for rotation about axes transverse to the machine longitudinal centerline. An endless conveying chain designated generally as 18 extends longitudinally along the chassis 10 and at its rearward or discharge end is mounted on a swing support designated generally as 20. The forward or material receiving end of the conveying chain 20 projects below the boom 12 between the supporting arms 14 and is operatively associated with a conventional gathering device, designated generally as 22, adapted for directing mined material thereto. Further details of a mining machine of this general construction can, if desired, be obtained from U.S. Pat. No. 3,353,871, issued Nov. 21, 1967, and assigned to the assignee of the present invention.

As illustrated, the dust collecting means of the mining machine comprises a first duct housing 24 mounted along the upper side of the boom 12 for vertical movement with the boom 12, and a second duct housing 26 rigidly mounted on the upper side of the chassis 10 adjacent the forward end thereof. The ducting or duct means contained in the duct housings 24, 26 are interconnected by ducting in an intermediate or connecting duct housing 28 which overlies the adjacent ends of the duct housings 24, 26; and the intermediate duct housing 28 and the boom carried duct housing 24 are pivotally mounted at 28a and 24a, respectively, to permit vertical movement of the boom carried duct housing 24 with the boom 12.

The ducting contained within the boom carried duct housing 24 comprises a pair of generally volute-shaped collecting chambers 30, 32 located on opposite sides of the fore-and-aft centerline of the mining machine adjacent and rearwardly of the rearward side of the rotary mining head, and a communicating discharge duct 34 which extends rearwardly from the collecting chambers 30, 32 generally along such fore-and-aft centerline and has its rearward end adjacent the rearward end of the boom 12. The collecting chambers 30, 32 are enclosed at their upper ends and along the peripheries by walls

of the duct housing 24, but the lower ends of the collecting chambers 30, 32 are open and serve as inlets for introducing dust entraining air into the duct housing 24. The discharge duct 34 is enclosed throughout its length by walls of the duct housing 24.

Centrifugal fans 36, 38 of conventional construction are carried by the boom 12 in the collecting chambers 30, 32, respectively. The fans 36, 38 are connected to separate rotary drive means which drive the fans 36, 38 in opposite rotary directions such that they are contrarotating (as schematically depicted by the arrows in FIG. 1) to draw dust entraining air through the open bottoms of the collecting chambers 30, 32 whereby such air flows rearwardly through the duct 34 of the duct housing 24. As illustrated, the rotary drive means for each of the fans 36, 38 comprises an endless drive belt 40 wound around a driven sheave 40a rotatable with its respective fan and also wound around a driving sheave 42b rotatably driven by an individual, conventional, variable speed, rotary output drive motor 42c carried by the boom 12. The variable speed characteristic of the motors 42c, as will be noted, permits the driven speeds of the fans 36, 38 to be adjusted in accordance with variables such as the volume of air provided to the mining location by the mine ventilation system.

Air cleaner or scrubber means are provided along the duct 34 for removing larger particles of dust in the air flowing rearwardly through the duct 34. In the illustrated embodiment of the invention, this air scrubber means is shown as being a pair of wet-type air scrubbers 44 located at opposite sides of the duct 34 and arranged to each discharge a curtain 46 of water transversely into the duct 34 throughout the height of the latter. These curtains of water, as will be understood, cause wetting of the larger particles of dust carried by the air flowing rearwardly through the duct 34 such that these larger particles resultantly fall downwardly onto the bottom of the duct 34 from where they may be removed through a discharge outlet (not shown) to suitable discharge means such as the therebelow conveying chain 18. Alternatively, the air scrubber means could be of the dry-type and include venturis or other arrangements suitable for separating larger particles of dust from the air.

The ducting or duct means contained in the chassis carried duct housing 26 comprises a duct 48 which extends generally along the longitudinal centerline of the mining machine and at its forward end communicates with the rearward end of the discharge duct 34, and also branch ducts 50, 52 connected to the rearward end of the duct 48 and extending to the opposite sides of the mining machine. An imperforate damper or baffle 54, pivotally mounted at 56 at the intersection of the branch ducts 50, 52 with the duct 48, is provided for alternatively preventing flow of dust entraining air through the branch ducts 50, 52 whereby such air may be selectively and alternatively directed to the opposite sides of the mining machine. As illustrated in the drawings, the baffle 54 closes the branch duct 50 to prevent air flow therethrough; and the branch duct 52 is resultantly employed in the discharge of the dust entraining air flowing through the duct 48.

A vertical partition or wall 58 is mounted in the tunnel 100 containing the mining machine adjacent the

rearward end of the chassis 10 on the side of the machine to which the dust entraining air is directed by the one of the branch conduits 50, 52 in use. A spring loaded roll brattice or partition 60 is at one end coiled around a vertical mounting post 62 which is fixedly mounted at the forward end of the partition 58. The other end of the brattice 60 is fixedly connected to a vertical post or element 64 which is rigidly, although adjustably, mounted on the chassis 10 adjacent the rearward end of the branch duct 52 through which the air is being discharged. Hence, the partition 58 and the brattice 60 cooperate to bound a chamber 66 in the tunnel 100 adjacent one side of the mining machine; and the effective length of the brattice 60 is automatically varied during longitudinal movement of the mining machine as the brattice 60 is automatically coiled and uncoiled during such movement. Suitable discharge means, shown as a duct 68, is provided for discharging the air from the chamber 66.

During the operation of the aforescribed embodiment of the invention, the centrifugal fans 36, 38 are continuously contra-rotatably driven in the opposite rotary directions schematically depicted by the arrows in FIG. 1. Hence, the dust entraining air is drawn upwardly through the open bottoms of the chambers 30, 32 into the boom carried duct housing 24 and flows rearwardly through the duct 34 in such duct housing 24. During the passage of the dust entraining air through the duct 34 the curtains 46 of water discharged by the air scrubbers 44 wet the larger particles of dust in the air to cause the latter to fall downwardly to the bottom of the duct 34 from which location it is removed by a suitable discharge opening (not shown). The remainder of the dust entraining air flows from the duct 34 through the ducts 48, 52 in the chassis carried duct housing 26 to the chamber 66 and is discharged from the latter to a suitable place of disposal by the duct 68. The brattice 60 is automatically extended in effective length during forward driving of the mining machine to thereby longitudinally extend the effective length of the chamber 66.

In the event that it becomes necessary or desirable to discharge the dust entraining air to the opposite side of the mining machine, the imperforate baffle 54 is pivoted to close the branch duct 52 while opening the branch duct 50; and the partition 58, brattice 60 and duct 68 are positioned on the opposite side of the machine. Thereafter, the operation of the illustrated embodiment of the invention proceeds as hereinbefore described.

From the foregoing, it will be seen that the invention provides new and improved means for accomplishing all of the aforesaid objects and advantages. It will be understood, however, that, although only one embodiment of the invention has been illustrated and hereinbefore described, the invention is not limited merely to this single embodiment but rather contemplates other embodiments and variations within the scope of the following claims.

Having thus described my invention, I claim:

1. A mining machine comprising a chassis, a boom mounted on said chassis for vertical movement thereto and projecting forwardly of the forward end of said chassis, rotary mining head means, means mounting said rotary mining head means on the forward end of

said boom on an axis transverse to the fore-and-aft centerline of the machine, dust collecting means including first duct means carried by said boom and communicating second duct means carried by said chassis, said first duct means extending adjacent the rearward side of said rotary mining head means and being provided with at least one inlet adjacent and rearwardly of said rotary mining head means for receiving dust entraining air at such location, said first duct means including portions adjacent said rotary mining head means on the opposite sides of the fore-and-aft centerline of the machine, rotary fan means in each of said portions of said first duct means, and drive means connected to said rotary fan means for rotating said rotary fan means each in opposite rotary direction to the other for drawing dust entraining air through said inlet to said first duct means whereby such dust entraining air flows through said first duct means to said second duct means.

2. A mining machine according to claim 1, further comprising air scrubber means operatively associated with one of said duct means downstream of said rotary fan means for cleaning the air flowing through said duct means.

3. A mining machine according to claim 2, wherein said second duct means includes ducts extending towards opposite sides of the machine for conveying dust entraining air thereto, and further comprising means operable for preventing flow of dust entraining air through one of said ducts whereby the flow of dust entraining air through said second duct means may be alternatively directed to opposite sides of the machine.

4. A mining machine according to claim 1, wherein said first duct means is mounted along the upper side of said boom, and said inlet is through the lower side of said first duct means.

5. A mining machine according to claim 1, wherein said first duct means is mounted for vertical movement relative to said second duct means.

6. A mining machine according to claim 1, wherein said first duct means comprises a rearward portion adjacent the rearward end of said boom which extends generally along the fore-and-aft centerline of the machine.

7. In combination, a mining machine comprising a chassis, a boom mounted on said chassis for vertical movement thereto and projecting forwardly of the forward end of said boom, rotary mining head means, means mounting said rotary mining head means on the forward end of said boom on an axis transverse to the fore-and-aft centerline of the machine, dust collecting means including first duct means carried by said boom and communicating second duct means carried by said chassis, said first duct means extending adjacent the rearward side of said rotary mining head means and being provided with at least one inlet adjacent and rearwardly of said rotary mining head means for receiving air carried dust at such location, said first duct means including portions adjacent said rotary mining head means on the opposite sides of the fore-and-aft centerline of the machine, rotary fan means in each of said portions of said first duct means, separate drive means connected to said rotary fan means for rotating said rotary fan means each in opposite rotary direction to the other for drawing air carried dust through said inlet to said first duct means whereby the air carried dust flows

through said first duct means to said second duct means, and extensible wall means defining a duct communicating with said second duct means for receiving air carried dust therefrom.

8. A mining machine according to claim 7, wherein said extensible wall means is connected to the machine to be variable in effective length by movement of the machine.

9. A mining machine according to claim 8, wherein said wall means comprises a spring loaded roll brattice.

10. A mining machine comprising a supporting base, mining head means, means mounting said mining head means on said supporting base for vertical movement thereto, dust collecting means including duct means extending adjacent said mining head means and vertically movable with said mining head means, said duct means being provided with at least one inlet adjacent said mining head means for receiving dust entraining air, fan means vertically movable with said mining head means and operatively associated with said duct means for drawing dust entraining air through said inlet to said duct means whereby the dust entraining air flows through said duct means, and air cleaner means vertically movable with said mining head means and operatively associated with said duct means for cleaning air flowing through said duct means.

11. A mining machine according to claim 10, wherein said air cleaner means is operatively associated with said duct means downstream of said fan means.

12. A mining machine according to claim 10, wherein said fan means comprises at least one centrifugal fan.

13. A mining machine according to claim 10, wherein said fan means is adjacent said inlet.

14. A mining machine according to claim 10, wherein said fan means comprises at least one centrifugal fan adjacent said inlet, and said air cleaner means is downstream of said fan.

15. A mining machine comprising a chassis, a boom mounted on said chassis for vertical movement thereto, mining head means, means mounting said mining head means on said boom, dust collecting means including duct means carried by said boom extending adjacent said mining head means, said duct means being provided with at least one inlet adjacent said mining head means for receiving dust entraining air, fan means carried by said boom in said duct means for drawing dust entraining air through said inlet to said duct means whereby the dust entraining air flows through said duct means, and air cleaner means carried by said boom operatively associated with said duct means for cleaning air flowing through said duct means.

16. A mining machine according to claim 15, wherein said fan means is adjacent said inlet.

17. A mining machine according to claim 15, wherein said fan means comprises at least one centrifugal fan.

18. A mining machine according to claim 15, wherein said fan means comprises at least one centrifugal fan adjacent said inlet, and said air cleaner means is operatively associated with said duct means downstream of said fan.

19. A mining machine according to claim 15, wherein said air cleaner means is operatively associated with said duct means downstream of said fan means.

20. A mining machine according to claim 19, wherein said duct means is provided with means operable for directing dust entraining air to the opposite sides of the machine.

21. A mining machine comprising a chassis, a boom mounted on said chassis for vertical movement thereto, mining head means, means mounting said mining head means on said boom, dust collecting means including duct means carried by said boom extending adjacent said mining head means, said duct means being provided with at least one inlet adjacent said mining head means for receiving dust entraining air, and fan means carried by said boom in said duct means adjacent said inlet for drawing dust entraining air through said inlet to said duct means whereby the dust entraining air flows through said duct means.

22. A mining machine according to claim 21, wherein said fan means comprises at least one centrifugal fan.

23. A mining machine according to claim 21, wherein said fan means comprises a plurality of rotary fans, and drive means are connected to said fans for

rotatably driving said fans in opposite rotary directions.

24. A mining machine comprising a chassis, a boom mounted on said chassis for vertical movement thereto, mining head means, means mounting said mining head means on said boom, dust collecting means including first duct means carried by said boom and communicating second duct means carried by said chassis, said first duct means extending adjacent the rearward side of said mining head means and being provided with at least one inlet adjacent said mining head means for receiving dust entraining air at such location, said first duct means including portions adjacent said mining head means on the opposite sides of the fore-and-aft centerline of the machine, rotary fan means in each of said portions of said first duct means, and drive means connected to said rotary fan means for rotating said rotary fan means each in opposite rotary direction to the other for drawing dust entraining air through said inlet to said first duct means whereby such dust entraining air flows through said first duct means to said second duct means.

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