United States Patent [19]

Sheets

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[54] **COAL DUST REMOVAL AND COAL TRANSPORTATION SYSTEM**

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[51] **Int. Cl.** **E21c 41/00**

[58] **Field of Search** 299/12, 18, 43, 44, 299/55, 56, 57, 64, 67, 68

[56] **References Cited**

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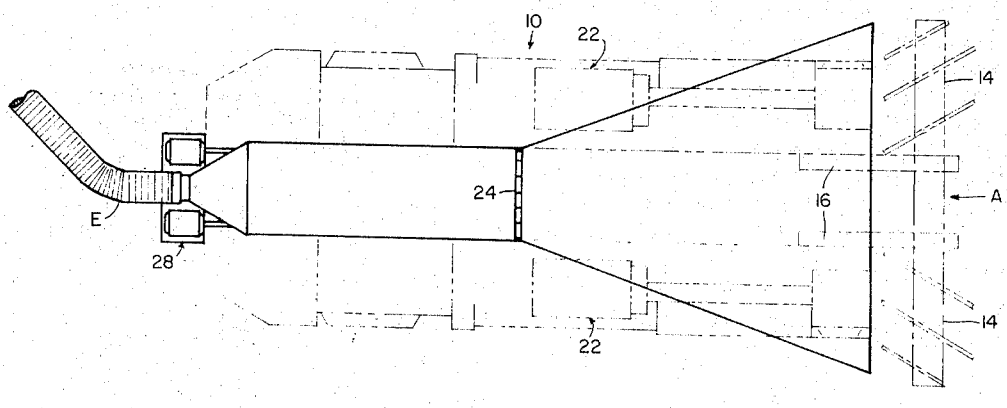
[57] **ABSTRACT**

Attachment to a continuous rotary ripper-type mining machine collects the dislodged coal and coal dust particles into a forward opening of a hood enclosure, pulverizes the conveyed coal into smaller particles in a processing chamber located within the forward portion of the hood enclosure, removes by suction fan assembly located within the rearward portion of the hood enclosure the coal dust laden air generated by the mining operation, collects the pulverized coal particles by gravity-fall into an auger-type conveyor screw that is mounted longitudinally in the lower portion of the hood enclosure and that exits through a rear hood opening, forms a suspended stream of an air and coal mixture from the screw conveyed coal particles and the suction collected air in a flexible/rigid booster-type pipeline that discharges the stream to a storage area outside of the mine.

9 Claims, 5 Drawing Figures



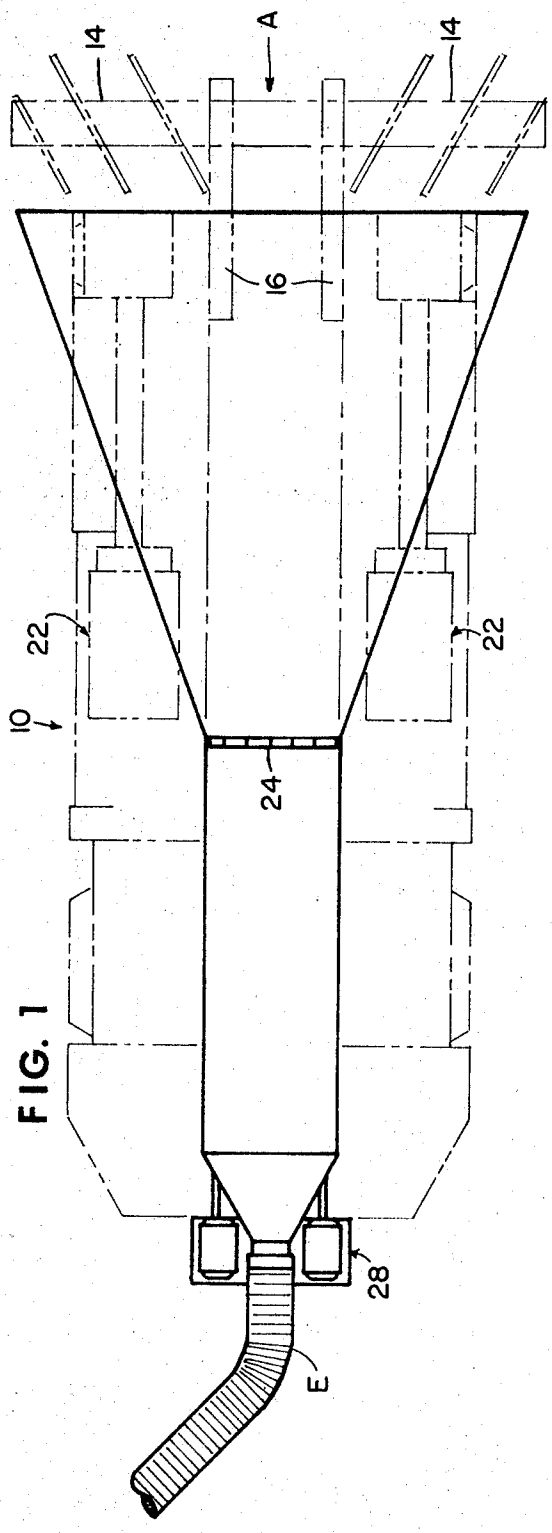


FIG. 1

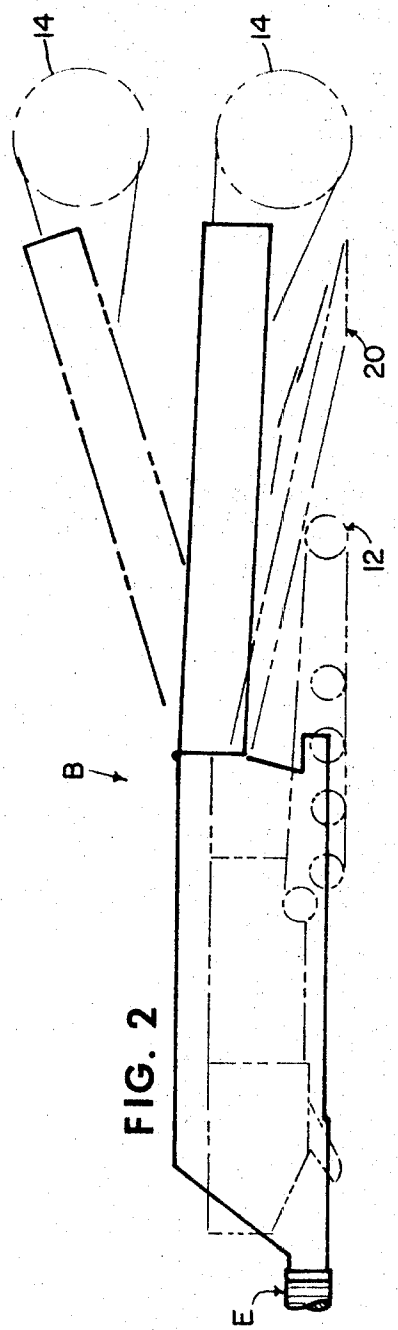


FIG. 2

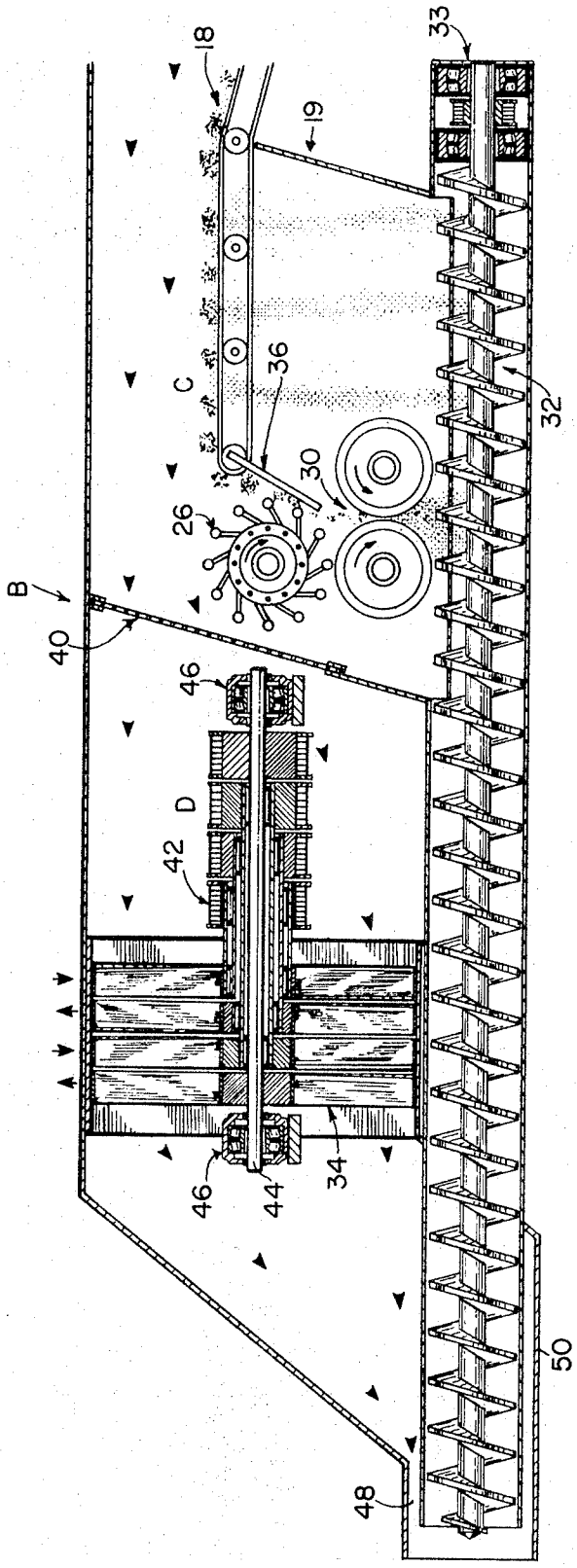


FIG. 3

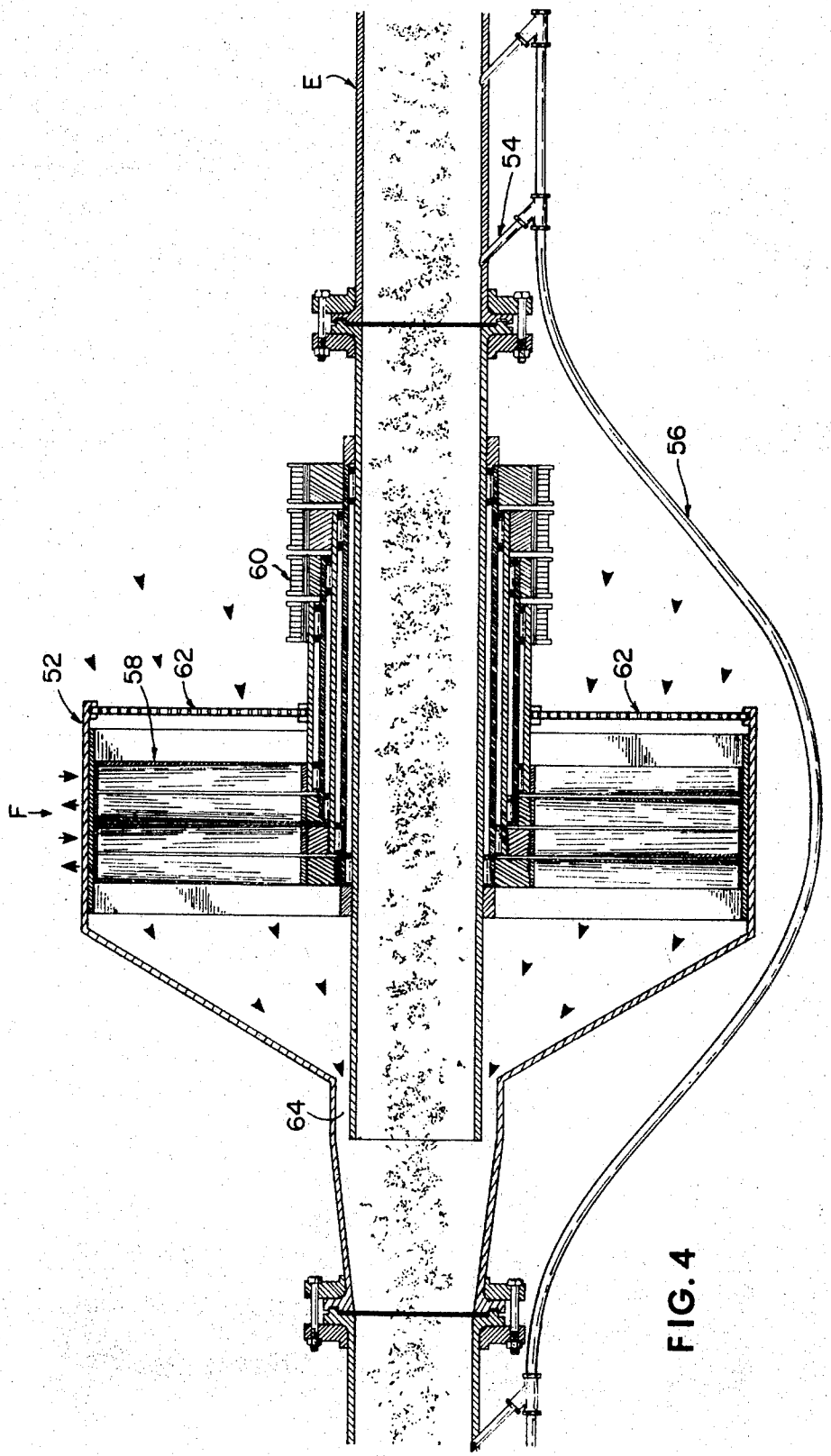


FIG. 4

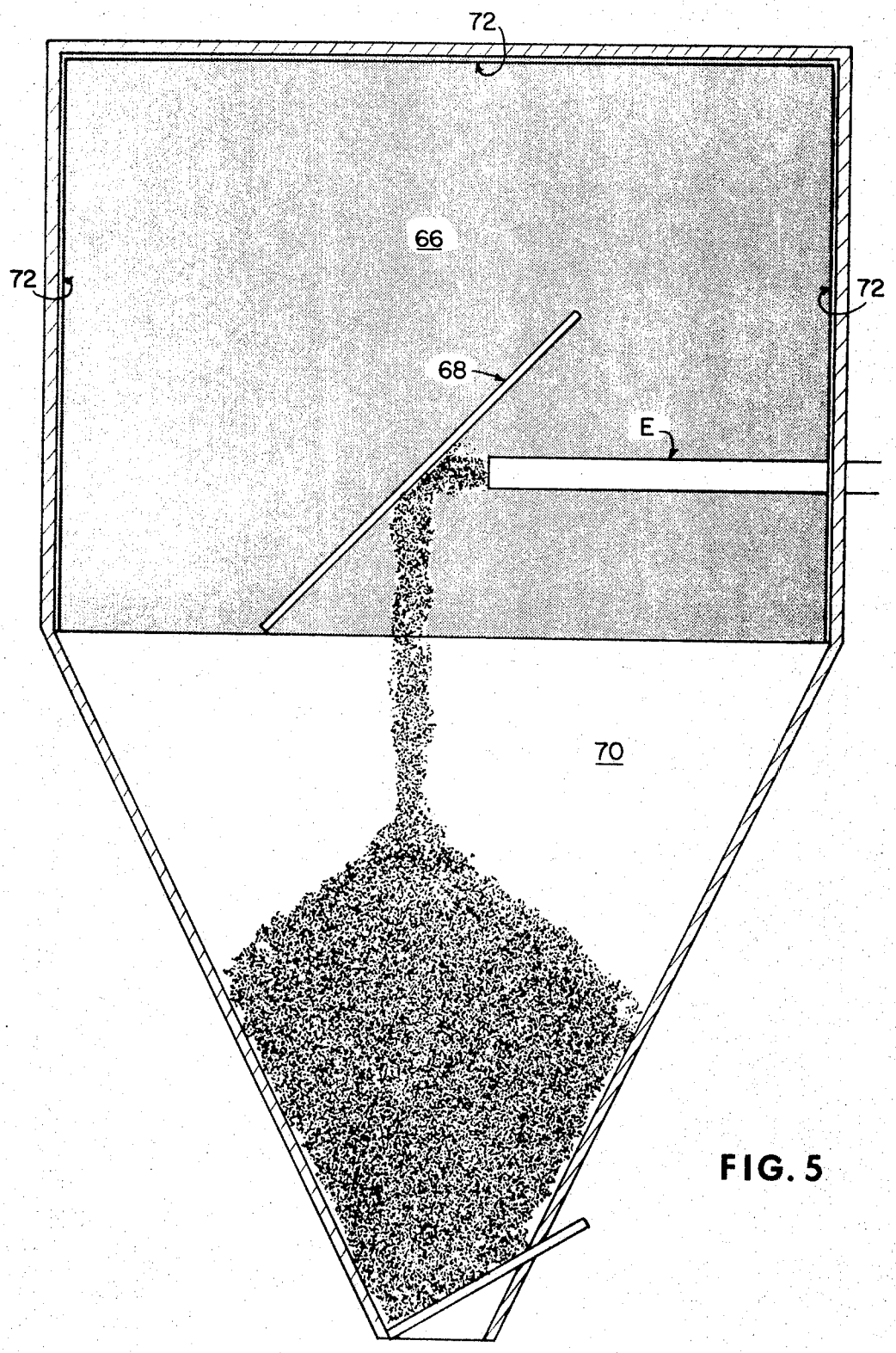


FIG. 5

COAL DUST REMOVAL AND COAL TRANSPORTATION SYSTEM

FIELD OF THE INVENTION

The present invention relates to mining machines, and particularly to an improved coal dust removal and coal transportation system as an attachment to a continuous rotary ripper-type mining machine for collecting the dislodged coal and coal dust particles into a forward hood enclosure opening, for pulverizing the conveyed coal into smaller particles, for removal by a suction fan arrangement the generated coal dust, for collecting the pulverized coal particles by gravity-fall into an auger-type conveyor screw that is mounted longitudinally in the lower portion of the hood enclosure and that exits through a rear hood enclosure opening, for forming a suspended stream of an air and coal mixture from the screw conveyed coal particles and the suction collected air in a combination flexible/rigid booster-type pipeline that discharges the stream to a storage area outside of the mine.

BACKGROUND OF THE INVENTION

Continuous mining has revolutionized the coal industry but at the same time intensified the problem of removal of air-borne coal dust particles from the vicinity of a working mine face.

To establish an efficient work cycle for the machine being used, conventional mechanized mining equipment provides four or more development faces. However, continuous mining, relying on a single machine, requires only one working face, although more than one can be driven alternately by the machine. In gaseous areas mined by older methods, the intermittent rate of exposure allowed time for the face to bleed off or be cleared, and the width obtained with such conventional units makes it possible to hang a brattice line almost to the face. However, with continuous mining, such practices are not permitted, as there is no margin of time and very limited space and thus the ventilation hazards are greatly increased.

For all practical purposes, continuous miners available today can be grouped into two major types, rippers and borers. The two can be further classified, respectively, as flexible and rigid.

Both types have been in operation in the coal mines of the United States for the past 20 to 25 years in the mining of many coal seams, under various conditions ranging from slightly gaseous to very gaseous. Common methods of face ventilation utilize jute or plastic brattice material for line curtains, stoppings, and checks. Air volumes to operating sections are greater than for conventional mining, and specific instructions must be given to section crews stressing the precautions needed in dealing with a steady rate of gas emission and the importance of maintaining reasonably air tight brattice to direct a good steady flow toward the face at all times.

The most modern of the self-powered vehicular-type coal mining machines can be guided up to the mine face to continuously dig and reduce the coal deposits to conveyable lumps which the machine itself continuously conveys rearwardly for loading and removal from the mine.

Thus, incidental to the operation of the continuous mining machine is the continuous production of coal dust particles which permeates the atmosphere of the mine. An environment of this type has long been recognized as detrimental to the health of personnel working in the mine. Coal dust pollution in the mine atmosphere contributes to the development of the "black lung" disease that exists among working mine personnel. Further, the existence of coal dust particles presents a potential danger of explosion. Further, the air pollution tends to seriously limit visibility in the mine and thus restrict the efficiency of the mining operation.

In addition to the coal particles in the mine atmosphere, a significant number of small coal particles are not conveyed by the mining machine, but remain on the working mine floor area and approaching passageway thereto. This results in an economic loss in operating efficiency and also contributes to the air pollution and unsafe conditions noted above, and requires an additional expense for the application of rock dust.

As existing coal fields are exhausted, more difficult mining fields will undoubtably be encountered. Consequently, it is anticipated that face ventilation for continuous miners will present greater problems as extremely gaseous, virgin coal areas are developed.

SUMMARY OF THE INVENTION

In view of the foregoing considerations, it is a primary object of the present invention to provide an improved method of reducing the amount of coal dust suspended in the atmosphere near a mine face during the operation of a continuous mining machine.

Another object of this invention is to provide apparatus to implement the foregoing method, for conveniently conveying newly mined coal away from the working mine face area to the loading area outside of the mine.

Another object of the present invention is to provide continuous mining apparatus in which relatively coarse coal particles are broken down to a very fine size as it is being mined, rather than in a separate process away from the area of the continuous mining apparatus.

Another object of the present invention is to provide continuous mining apparatus which permits the mining operation to continue at maximum efficiency without delays caused by such problems as coal dust pollution and the inability of removing mined coal from the vicinity of the mining machine.

Another object of the present invention is to provide continuous mining apparatus which retains control over the small coal particles that usually settle to the mine floor and which transfers these coal particles along with the coal lumps pulverized within the continuous mining apparatus.

Another object of the present invention is to reduce or remove the requirement for brattice-type arrangements in the vicinity of the mine face for maintaining a steady air flow.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature of the invention has generally been described and will now be referred to in more detail by referring to a machine according to the invention, of preferred construction, and particularly adapted to mining coal which is illustrated in the accompanying drawings and in which:

FIG. 1 is a top plan view of a continuous coal mining system constructed with a pivotably mounted hooded suction head section in accordance with the principles of the present invention with certain parts broken away in order to illustrate certain details;

FIG. 2 is a side elevation view of the continuous coal mining system of FIG. 1, with certain parts broken away in order to illustrate certain details;

FIG. 3 is an enlarged longitudinal sectional view of the continuous coal mining system having a fixed enclosure hood arrangement in accordance with the present invention with certain parts broken away and certain other parts shown in plan view;

FIG. 4 is an enlarged longitudinal sectional view of a line booster assembly surrounding the pipeline of the continuous coal mining system of this invention; and

FIG. 5 is an enlarged sectional view of a coal bin arrangement of the continuous coal mining system of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method of continuous coal mining of the present invention broadly includes the following steps:

continuously dislodging coal from the working mine face in an underground mine by a rotary ripper-type cutter arrangement;

collecting the dislodged coal through a front opening of a hood enclosure to a processing chamber within the hood enclosure;

utilizing hammer-type breakers and counter-rotating crushers within the processing chamber to pulverize the conveyed coal lumps into a stream of fine coal particles;

removing or pulling the coal dust laden air by a suction fan assembly located in a fan chamber that is provided in the rear portion of the hood enclosure;

drawing the coal dust laden air from the working mine face area through the afore-mentioned front hood opening, then through the upper portion of the processing chamber, through a fine mesh screen that separates the processing and fan chambers, and thence into the intake side of the fan assembly;

providing an auger-type conveyor screw that is mounted along the entire longitudinal dimension of the lower portion of the hood enclosure and that exits through a rear hood opening collecting the pulverized fine coal particles falling by gravity from the processing chamber into the forward end of the screw conveyor;

collecting the coal dust particles passing from the fan chamber to join with the screw conveyed coal particles to form a suspended stream of an air and coal mixture in a combination flexible/rigid booster-type pipeline and exiting the suspended stream through the pipeline to a storage area outside of the mine.

More specific reference will now be made to the drawings. In brief, a preferred form of an attachment to a continuous mining machine in accordance with the present invention comprises:

a ripper-head mechanism A;

a hood enclosure B which includes a pivotably hooded suction head section as shown in FIGS. 1 and 2 and the fixed enclosure hood arrangement in FIG. 3,

a processing chamber C in FIG. 3,

a fan chamber D in FIG. 3,

a combination flexible/rigid discharge hose or pipeline E in FIGS. 1, 2 and 4, and

a discharge pipeline booster assembly F in FIG. 4.

With reference to FIGS. 1 and 2, wherein like reference characters designate like or corresponding parts throughout the several views, there is illustrated a mobile or vehicular coal mining machine to which the present invention is shown attached. The machine is specifically constructed to have, in accordance with prevalent practices, a low form or silhouette to enable its use in a mine where overhead is limited. The main frame member 10 of the machine, and hence the entire machine is supported on traction tread caterpillar tractor devices 12 which are disposed one at each side of the machine. The tread devices 12 propel the machine along the mine floor from one working area to another.

At the forward end of the longitudinal axis of the main frame 10 there is disposed the ripper head mechanism A that preferably includes a pair of rotary cutter drums or ripper heads 14 that contacts the coal seam on the working mine face. As used herein the term "working mine face" is intended to designate that portion of the mine where the continuous mining machine is dislodging coal from the seam. Each ripper head 14, mounted on a transverse axis to the longitudinal axis of the main frame 10, is advanced into the working mine face and is traversed through the coal seam of the mine face whereby the coal is dislodged by a cutting and breaking action. Each ripper head 14 is supported on the main frame 10 in advance thereof on pivotally mounted spaced support arms 16. The arms 16 hold the ripper heads 14 in position for movement into the working mine face along the mine floor and thence for movement upwardly along the working face by positive upward feeding movement of the arms 16 as generally shown by dotted lined head movement in FIG. 2.

The mining machine includes a conveyor boom 18 (see FIG. 3) extending from a position adjacent the ground, at the forward end of the machine in an upwardly inclined direction.

Some prior art conveyors will extend over the top of the machine beyond the rear end thereof, for discharging the mined coal into shuttle cars or other material transporting arrangements. An inclined apron or pan 20 (see FIG. 2) extends across the front of the conveyor boom 18 and rearwardly along opposite sides thereof, and generally has a gathering arm mechanism (not shown) mounted thereon for gathering the mined coal and moving it onto the receiving end of the pan 20. It is obvious that a plurality of gathering arm mechanisms may be provided to move the gathered coal from the sides of the pan 20 toward the center thereof, and upwardly therealong the conveyor 18 in a well known manner, so not herein specifically illustrated or described further.

The drive for rotating each of the rotary ripper heads 14 is from separate motors 22 which are mounted on the main frame 10. Each motor 22 is directly coupled to the rotary head 14 which it drives through conventional drive shaft and gears. Also, the gathering arms are powered by said motors 22.

It is to be understood that the mining machine to which the present invention is an attachment is of somewhat less cross-section than the cross-section of the mine and that sections C and D of the present invention are surrounded by the hood enclosure B. The hood enclosure B has an open forward end located as close as practically possible to the ripper head mechanism A and the working mine face and an open rear end for discharge through the combination flexible/rigid pipeline E as will be more fully explained hereinafter.

For an example of the prior art, reference is made to a continuous mining machine of the ripper type that feeds a rotary mining head into and vertically along the working face of a mine, in U.S. Pat. No. 3,141,703 to Joseph Gonski. This patented machine is mounted on laterally spaced continuous traction treads that propel the machine along the mine floor from one working area to another. The conveyor shown is a conventional laterally flexible single strand chain and flight conveyor which extends from a position adjacent the mine floor in advance of the forward end of the machine in an upwardly inclined direction along an inclined floor engaging boom and horizontally along the top of the machine beyond the rear end thereof, for discharging the large lump mined coal into shuttle cars or other material transporting means.

According to the present invention a steel baffle plate **19** (FIG. 3) separates the lower portion of the processing chamber C from the mining area. Beyond the steel plate **19** and within the hood enclosure B, the conveyor boom **18** has perforations in the chain pan to permit the passage of the fine coal particles to gravity-fall through the processing chamber C.

In the embodiment of FIGS. **1** and **2**, a steel hinge **24** couples the processing chamber C to the pivotally mounted hooded suction head section of the hood enclosure B. The enclosure B consists of two parts, that is, a hinged section that extends from hinge **24** to the ripper mechanism A, and a rigid section that encompasses the processing chamber C and fan chamber D. In FIG. **3**, the processing chamber C in the forward portion of the hood enclosure B is provided for the purpose of pulverizing the mined coal lumps into a form suitable for pipeline passage. Hammer breakers **26** are mounted on the main frame **10** and perform the function of breaking up the larger coal particles which fall by gravity from the rear end of the conveyor boom **18.** The hammer breakers **26** are driven by motors **28** which preferably are electric speed motors of the 3-phase A.C. or D.C. type and are mounted on the rear of the mining machine. These motors **28,** in addition to driving hammer breakers **26,** drive counter-rotating crushers **30,** auger-type conveyor screw **32** and fan blower assembly **34,** which units will be described fully hereinafter.

A rigid steel breaker hopper plate **36** is mounted on the main frame **10** adjacent to the rear end of the conveyor boom **18** at an inclined angle to the longitudinal axis of the mining machine, whereon the coal pieces from the conveyor **18** are broken through the action of the hammer breakers **26** and diverted into the counter rotating crusher rollers **30** that are mounted on the main frame **10.** The crusher rollers **30** reduce the coal particles to a size small enough to enter into an air suspension stream that is ultimately fed by an auger-type conveyor screw **32** that is longitudinally mounted along the entire bottom portion of the hood enclosure B. The conveyor screw **32** is journaled for rotation on a plurality of carrier bearings **33** on the main frame **10.**

During the operation of a mining machine a large quantity of fine dust is formed, especially from the cutting operation of a ripper-head type mechanism. Heretofore, various arrangements have been utilized to combat this pollution condition, which is also a dangerous condition, since such dust ladened air is subject to explosion.

For example, U.S. Pat. No. 1,644,227 to Benedict discloses an exhausting apparatus that comprises a blower mounted at the forward of the machine body. An inlet chamber is provided from which extends an inlet pipe leading downwardly and laterally to a point adjacent the path of the cutter and terminating at its lower and in a vertically arranged hood having a lateral opening facing toward the cutter and spaced a short distance from it. A discharge pipe is provided that extends laterally and tangentially toward the side of the machine and thence downwardly and is connected near the ground level with a flexible hose that extends rearwardly and leads to a point remote from the machine.

Thus, it is readily seen that the structure of the Benedict Patent as applied to the reduction of coal dust constitutes a hazard and a source of discomfort to the user. Whereas, the present invention relates to the combined transport of coal particles and coal dust generated by the mining operation by a single method and by the recovery of the coal dust outside of the mine thereby contributing to the overall efficiency of the total mining operation.

With reference to FIG. **3** of the present invention the path of the air flow is shown by a series of arrows within the hood enclosure B of the mining machine. The air flow from the vicinity of the upper portion of the hood enclosure B which enters the forward hood opening from the mining area into the processing chamber C is directed rearwardly and out of the processing chamber C by the created sub-atmospheric pressure or suction action of a fan assembly **34** supported on the main frame **10** in the fan chamber D at the rear portion of the mining machine within the hood enclosure B. The air intake into the fan chamber D is preferably screened with a fine mesh screen **40** which permits passage of the coal dust laden air and at the same time prevents the entrance of substantially large coal particles which may be swept into the air stream entering the fan chamber D.

The fan assembly **34** preferably consists of four counterrotating turbine fans that are driven by a chain sprocket drive **42** which in turn is driven by a shaft **44** mounted for rotation on carrier bearings **46.**

The flow of air exits downwardly from the discharge end of the fan assembly **34** into a peripheral opening **48** formed between an inner surface of a flexible pipeline tubing section **50** and an outer surface of the auger-type conveyor screw **32.**

Therefore, as outlined above, the dust laden air flow is conducted from the working mine face area through the upper portion of the processing chamber C, passing through the fine mesh screen **40,** through the fan chamber D and thence into the pipeline section **50.**

Thus, the coal dust removal system presented by the present invention conveys dust laden air away from the mine face and combines it with the heavier coal particles for recovering outside of the mine.

Thus it is to be understood that the stream of fine coal particles are collected from the processing chamber C in the forward end of the auger-type conveyor screw **32,** and are screw conveyed rearwardly whereby these coal particles are joined by a stream of coal dust laden air from the fan chamber D. Thence the formed air and coal mixture becomes a suspended stream within the pipeline E to follow a tortuous path therein and be assisted at selected location by a line booster assembly F as will be explained hereinafter.

Referring to FIG. 4, there is disclosed the steel pipeline E which preferably is an armored flexible and rigid steel tubing. As noted previously, the stream of air and coal mixture is discharged from the conveyor screw 32 into the pipeline tubing section 50 that is rigidly connected to the hood enclosure B. It is to be readily understood that pipeline tubing sections may be constructed along the mine passageways until such a pipeline terminates outside the mine.

To assist the flow of the suspended stream of the air and coal mixture in the pipeline, to re-suspend the coal particles that could settle in the pipeline in case of power failure, and to avoid stoppages in the pipeline, air jets 54 are provided at selective locations along the pipeline. The jets 54 inject air under high pressure at inclined angles to the stream flow as shown in FIG. 4. High pressure air lines 56 provide the supplied air and are constructed to run parallel to the pipeline E.

For the purpose of increasing the speed of the suspended stream of the air and coal mixture in the pipeline, pipeline booster assemblies F are provided at selective locations along the pipeline E. Each line booster assembly F consists of a turbine fan blade arrangement 58 that is powered by fan drives 60 and that surround the pipeline E. As shown by the arrows in FIG. 4 the air is suctioned in through a heavy screen member 62 which protects the fans 58. The stream of air from the fans 58 exit from the line booster assembly F and enter through a peripheral opening 64 into the pipeline as shown by the path of arrows in FIG. 4.

As illustrated in FIG. 5 the pipeline E discharges the stream of air and coal mixture into a coal bin enclosure 66 located outside of the underground mine. A steel plate 68 is mounted therein at an inclined angle to the flow path of the suspended stream of air and coal mixture to defect the incoming coal stream downwardly into a storage area 70. Wall 72 of the upper portion of the coal bin 66 are composed of a dust filtering material which allows the discharge air to pass therethrough as indicated by the arrows in FIG. 5.

GENERAL OPERATION

The overall operation of the coal dust removal and coal transportation system is as follows:

The entire machine is advanced into the cut by the endless track mechanism 12. The ripper heads 14 fixed on pivotally mounted spaced support arms 16 are traversed through the coal seam of the mine face whereby the coal is dislodged by a cutting and breaking action. The dislodged coal falls within the reach of the gathering arm mechanisms that move the coal from the sides of the inclined pan 20 that extends across the front of the conveyor boom 18. The coal then moves upwardly therealong the conveyor 18. Beyond the steel plate 19 that separates the processing chamber from the mining area, the conveyor 18 has perforations in the chain pan on the conveyor boom to permit the passage of the fine coal particles to fall directly to the auger-type conveyor screw 32. The large coal lumps are transported to the terminus of the conveyor boom 18 where the coal lumps tumble over the end of the conveyor boom 18 to engage the hammer breakers 26 and thus the coal lumps are broken up. The inclined steel breaker plate 36 directs the broken coal into the counter rotating crushers 30 whose crushing action reduces the coal particles to a size small enough to eventually go into air suspension and allow them to fall directly into the auger-type conveyor screw 32. The arrows in FIG. 3 show the path movement of the coal dust laden air above the conveyor boom 18 and below the roof of the hood enclosure B in the upper portion of the processing chamber C. The air is suction drawn into adjacent fan chamber D. The fine mesh screen 40 prevents the passage beyond the breaker and crusher assembly of coal particles large enough to damage the fan blower assembly 34. The coal dust laden air passes through the fan chamber D and flows as a suspended mass into the flexible discharge pipeline E. The stream of fine coal particles in the conveyor screw 32 discharges same into the network of armored flexible and rigid steel tubing pipeline E which is surrounded at selective locations by turbine fan line boosters E to assist the flow of the suspended stream of the air and coal mixture for eventual delivery outside of the mine.

It will be readily appreciated that a technician skilled in the mining art will realize that the mining machine arrangements shown in the drawings are only representative of various designs for such machines in the industry.

The system of the present invention is specifically constructed to be securably mounted on a mobile mining machine frame either permanently or removably, and is positioned with respect to the various parts of the machine frame so as not to interfere with the operations of the various movable machine parts.

ADVANTAGES

It is anticipated that the practice of the present invention will improve the economics of the coal mining operation at least in the following:

a. reduces the costs of applying rock dust necessary to maintain an explosive-proof condition within the mine;
b. significantly increases the volume of coal extracted;
c. eliminates the requirements for shuttle cars, belt lines and feeders;
d. reduces the labor force requirements by eliminating the need for shuttle car operators, the shovelers around feeders and belt line operators;
e. provides for removal and recovery of the coal dust pollution from the mined area;
f. delivers the pulverized coal to a point remote from the area of the coal vein being mined; and
g. provides a closed enclosure system throughout the various steps of operation that includes the mining of the coal in the underground mine, the processing of the air and coal, the transporting of the air and coal mixture and the storing of the coal outside of the mine.

The machine has been described with respect to coal mining. It will be understood, however, that the machine is applicable to mining other minerals occurring in similar deposits and having similar characteristics.

Having heretofore disclosed a method and a type of apparatus associated with the mining operation, it is understood that only illustrative embodiments of the invention have been shown herein for the purpose of demonstration and that various changes may be made in the construction shown by those skilled in the art without departing from the spirit and disclosed concepts of the invention as particularly pointed out and defined in the appended claims.

What is claimed is:

1. A coal dust removal and coal transport system comprising:

a longitudinal mobile frame member;

a hood enclosing said frame member and having front and rear openings;

a rotary ripper-type cutter means disposed at the forward end of said frame member adjacent said front opening and mounted on said frame member for angular movement about a horizontal axis extending transversely of said frame member;

conveyor means positioned on said frame member and extending longitudinally from the front of said frame member adjacent said cutter means;

said cutter means operable to dislodge coal from the working mine face and to direct said dislodged coal on said conveyor means;

said conveyor means operable to convey said dislodged coal rearwardly;

breaker means and crusher means mounted on said frame member;

said conveyor means terminating at said breaker and crusher means and depositing the conveyed coal therein for pulverizing by said breaker and crusher means;

an auger-type conveyor screw mounted longitudinally in the lower portion of the hood enclosure and exiting through said rear hood opening;

said pulverized coal falling by gravity to form a stream of coal particles in said conveyor screw;

a chamber formed at the rear of said hood enclosure and exiting through said rear hood opening;

a suction fan assembly mounted in said chamber for handling the incoming coal dust laden air generated from the mining and processing operations;

a combination flexible/rigid pipeline connected with said rear hood opening;

said collected coal dust laden air and said screw conveyed coal particle stream forming a suspended stream of an air and coal mixture in said pipeline; and

means for operatively driving said cutter means, said conveyor means, said breaker means, said crusher means, said suction fan-assembly and said conveyor screw.

2. Apparatus, according to claim 1, wherein the conveyor means includes a perforated conveyor section ahead of said breaker and crusher and within said hood enclosure thereby allowing small coal particles to fall by gravity into said conveyor screw.

3. Apparatus, according to claim 2, wherein a rigid metallic plate separates said perforated conveyor section from the forward section of said conveyor means to prevent coal particles from escaping from said hood enclosure.

4. Apparatus, according to claim 2, wherein a rigid metallic plate is mounted at the terminus of said perforated conveyor section, such that, in combination with said breaker means, the broken coal is diverted to said crusher means.

5. Apparatus, according to claim 1, wherein a fine mesh screen is supported on said frame member to separate said rear mounted fan chamber from the forward end of said enclosure, said screen capable of passing the coal dust laden air into the intake side of said fan assembly.

6. Apparatus, according to claim 1, wherein said pipeline consists of a plurality of connecting flexible and rigid armored steel tubing sections to convey said suspended stream of air and coal mixture away from the mining area.

7. Apparatus, according to claim 6, wherein a plurality of fan means surrounds said pipeline at selective locations along said pipeline to assist the stream flow of the air and coal mixture in said pipeline.

8. Apparatus according to claim 6, wherein high pressure jet means are mounted beneath said pipeline at selective locations along said pipeline and are positioned at oblique angles thereto, said jet means expediting the flow of the stream of the air and coal mixture in said pipeline.

9. A method of continuous coal mining comprising the following steps:

a. continuously dislodging coal from a working mine face in an underground mine by rotary ripper-type cutter means;

b. conveying the dislodged coal through a front opening of a hood enclosure to a processing chamber within said hood enclosure;

c. pulverizing the conveyed coal in a processing chamber into a stream of fine coal particles;

d. screw conveying the stream of fine coal particles out a rear opening of said hood enclosure;

e. suction removing by fan means the coal dust laden air generated in the atmospheric vicinity of the mining operation and in the processing chamber and passing said coal dust laden air out the said hood rear opening;

forming a suspended stream of an air and coal mixture from the screw conveyed coal particles and the suction collected coal dust laden air in a pipeline that connects with said rear hood opening;

f. and transferring said suspended stream of air and coal mixture in a combination flexible/rigid pipeline to an area outside of the mine.

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