

[54] MATERIAL COLLECTING MEANS FOR MINING MACHINES

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[51] Int. Cl.E21c 27/24, E21c 35/20

[58] Field of Search.....198/7-10; 299/56, 299/57, 64, 65, 66, 67

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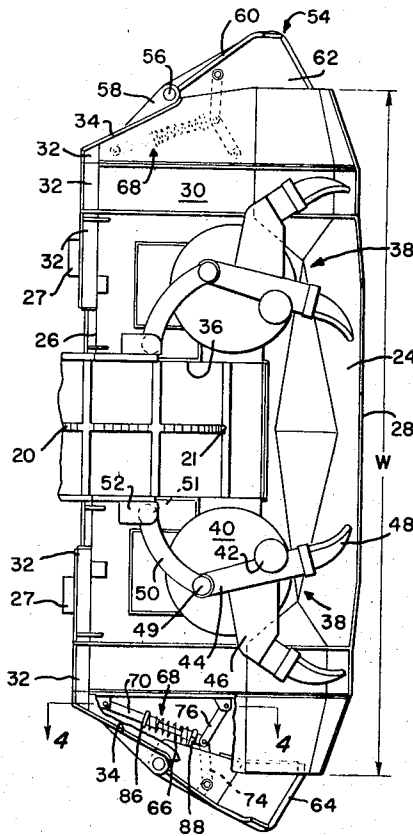
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[57] ABSTRACT

A mining machine in which the main gathering apron is at opposite sides provided with auxiliary gathering aprons pivotally mounted for movement relative to the main gathering apron towards and away from one another. Individual springs resiliently bias the auxiliary gathering aprons from one another; and individual fluid pressure operated motors are provided for pivotally moving the auxiliary gathering aprons.

20 Claims, 6 Drawing Figures



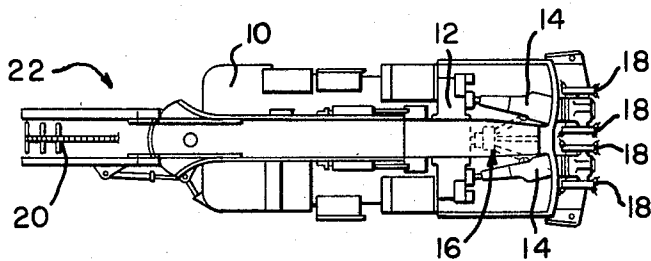


FIG. 1

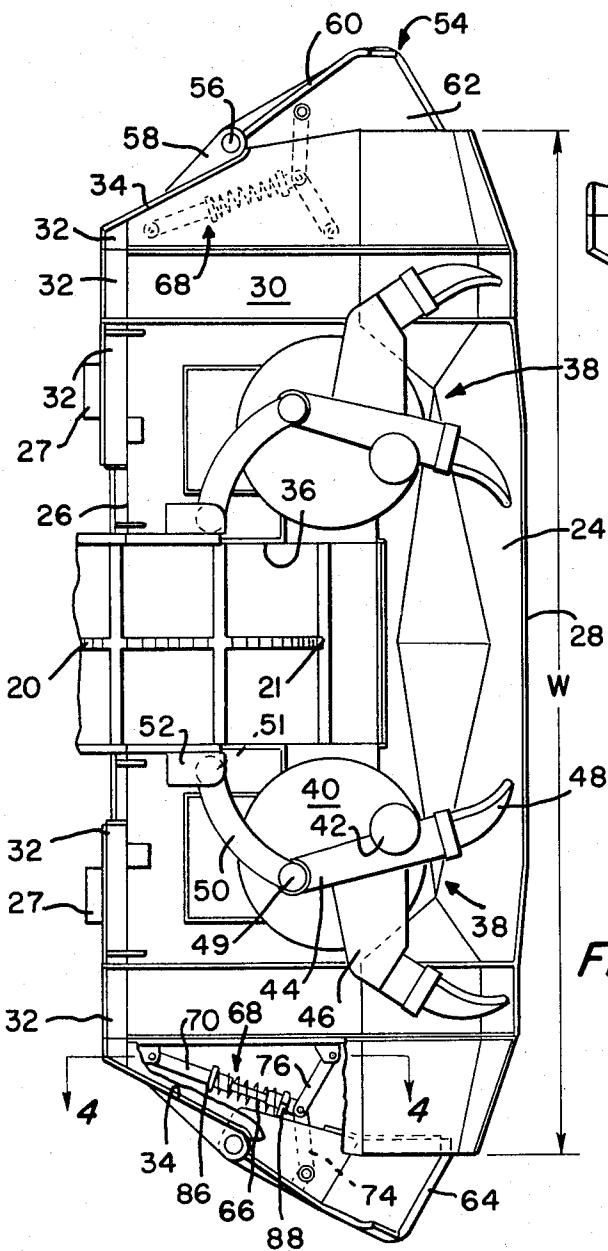


FIG. 2

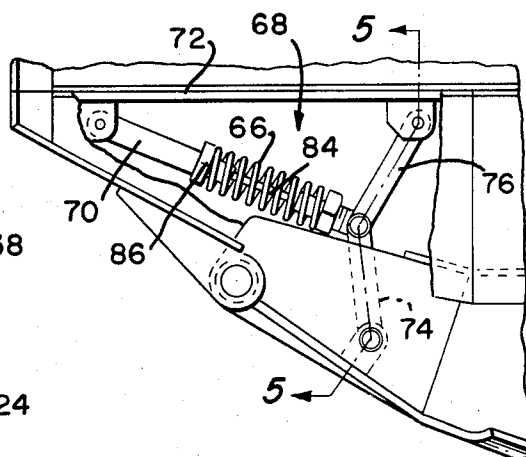


FIG. 3

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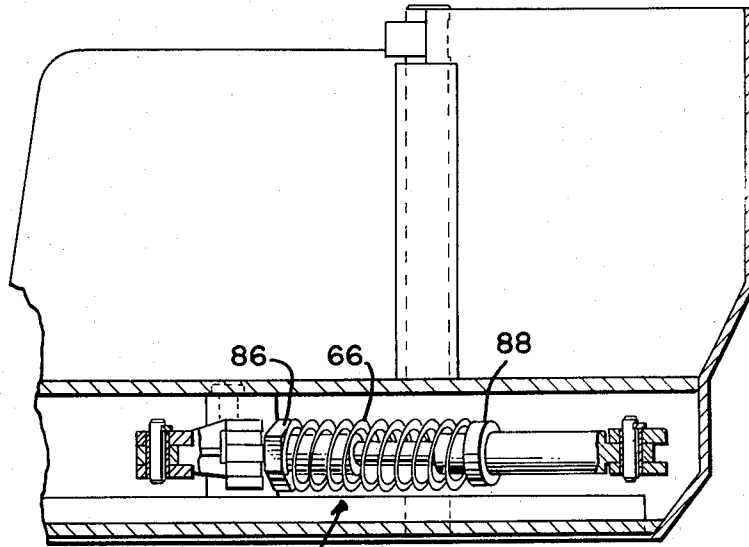


FIG. 4

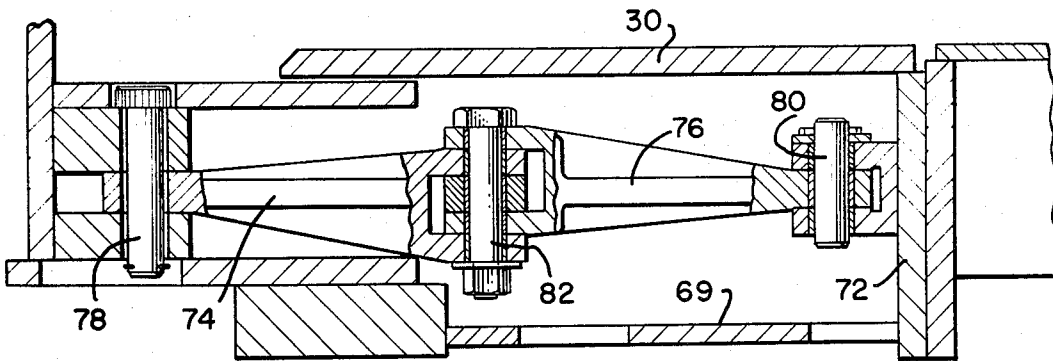


FIG. 5

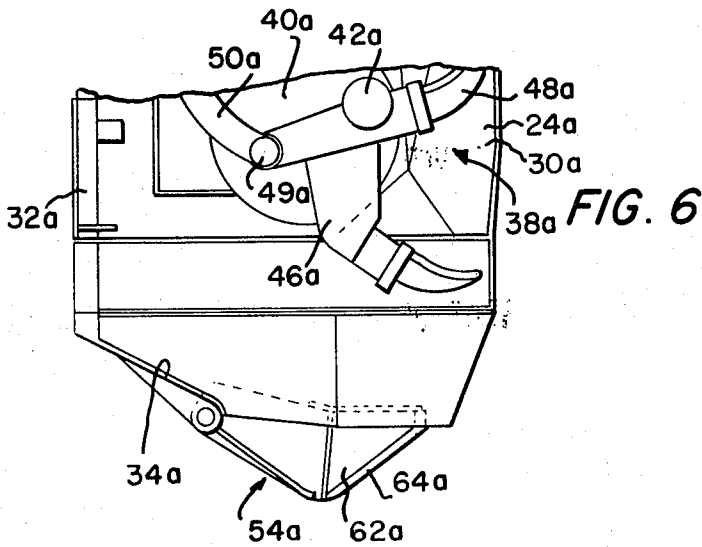


FIG. 6

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MATERIAL COLLECTING MEANS FOR MINING MACHINES

The present invention relates generally to mining apparatus and more specifically to the provision of new and improved collecting means particularly constructed and arranged for gathering material mined by a mining machine such as a continuous miner.

Conventionally, a mining machine such as a continuous miner is normally provided with a gathering apron adapted to collect the material mined by the machine whereby the collected material may be directed by gathering devices to a conveyor longitudinally of the machine. During the mining operation, it is desirable that this gathering apron transversely extend the full cutting width of the machine as otherwise spillage of the mined material will occur between the sides of the apron and the rib. However, during movement of the mining machine between locations to be mined, the sides of the apron must be sufficiently spaced from the rib to permit substantial maneuverability of the machine; and resultantly conventional mining machines generally have been provided with gathering aprons which, during both machine movement and mining operation, transversely extend for only the central portion of their cutting widths.

An object of the present invention is to provide new and improved gathering apron means particularly constructed and arranged to permit its transverse extension the full cutting width of the mining machine during the mining operation.

Another object of the invention is to provide new and improved gathering apron means of the type set forth particularly constructed and arranged to permit substantial maneuverability of the machine during its movement.

Another object is to provide new and improved gathering apron means particularly constructed and arranged to be extensible and retractable in effective width.

Generally considered, a mining machine embodying the invention may include a supporting base, rotary mining head means, means mounting the mining head means on the supporting base conveyor means extending along the supporting base and having a receiving end for receiving mined material to be conveyed, and collecting means for gathering material mined by the mining head means and directing such material to the receiving end of the conveyor means, such collecting means comprising gathering apron means below the mining head means and the gathering apron means including at least one portion movable relative to another portion thereof for varying the effective width of the gathering apron means, motor means connected to such movable portion of the gathering apron means for moving such movable portion to vary the effective width of the gathering apron means, and biasing means connected to such movable portion of the gathering apron means for resiliently biasing such movable portion from said another portion of the gathering apron means.

Referring to the drawings:

FIG. 1 is a top or plan view of a continuous mining machine including one embodiment of the present invention;

FIG. 2 is an enlarged, fragmentary top or plan view of the gathering apron means and associated structure of the mining machine shown in FIG. 1;

FIG. 3 is an enlarged, fragmentary top or plan view illustrating one side portion of the gathering apron means of such mining machine;

FIG. 4 is an enlarged elevational sectional view of such gathering apron means taken on Line 4—4 of FIG. 2, looking in the direction of the arrows;

FIG. 5 is an enlarged elevational sectional view of such gathering apron means taken on Line 5—5 of FIG. 3, looking in the direction of the arrows; and

FIG. 6 is a view generally similar to FIG. 3 but on a slightly reduced scale, showing a modified embodiment of the gathering apron means.

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 normally rotatably driven but non-oscillating during the mining operation.

The mining machine illustrated in FIG. 1 comprises a mobile supporting base in the form of a chassis 10 having mounted thereon a vertically movable boom 12 which projects forwardly of the forward end of the supporting base or chassis 10. The boom 12 carries a pair of cutter supporting arms 14, mounted adjacent opposite sides of the longitudinal centerline of the machine, which during the machine operation are laterally oscillated towards and away from one another by a hydraulic motor designated generally as 16 and located between the supporting arms 14. The rotary mining head of the machine comprises rotatably driven cutter carrying drums 18 mounted at the forward ends of the supporting arms 14. An endless conveying chain designated generally as 20 extends longitudinally along the chassis 10 and at its rearward or discharge end is mounted on a swing support designated generally as 22. The forward or material receiving end 21 (FIG. 2) of the conveying chain 20 projects below the boom 12 between the supporting arms 14. 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 to the assignee of the present invention.

As illustrated, the mined material collecting or gathering means of the mining machine comprises a gathering apron means including a plurality of portions relatively movable for varying its effective width, means for relatively moving such portions of the apron means, and movable gathering means operatively associated with the apron means and the receiving end 21 of the conveying chain 20 for directing mined material on the apron means to the chain receiving end 21.

More particularly, a central main gathering apron designated generally as 24 is at its rearward end 26

pivotaly mounted by mounting brackets 27 on the forward end of the chassis 10 below the boom 12 and its carried supporting arms 14 and cutter drums 18 of the rotary mining head. The forward end 28 of the apron 24 is, of course, rearwardly of the forward ends of the cutter drums 18 to permit the latter to mine in advance of the machine; and the apron 24 is of maximum width or transverse dimension W generally that of the chassis 10 to facilitate maneuverability of the machine between locations to be mined. The forward end 28 of the apron 24 is normally during the mining operation ground mounted; however, the apron 24 may adjacent its opposite sides be provided with hydraulically operation cylinder-and-piston means or jacks (not shown) for raising the forward end 28 from engagement with the ground during the movement of the machine.

The main apron 24 includes an upwardly facing apron floor or surface 30 which during the mining operation receives material mined by the cutter drums 18. The apron floor 30 adjacent the forward end 28 slopes downwardly to serve as a shovel or scoop for material on the ground in advance of the machine during forward driving of the machine with the main apron 24 engaging the ground at the forward end 28. As shown in FIG. 2, the main apron 24 has generally upstanding side walls 34 along minor portions of its sides and is provided with generally upstanding rear walls 32 which carry the mounting brackets 27. The receiving end 21 of the conveying chain 20 is received in a centrally located opening 36 which projects from the apron rearward end 26 for a portion of the length of the apron 24.

A pair of driven gathering devices or means, located on opposite sides of the receiving end 21 of the conveying chain 20 and each designated generally as 38, are provided for directing mined material on the apron floor 30 to the chain receiving end 21. As illustrated, each of these gathering devices 38 comprises a rotatable crank disc 40 pivotaly connected by a pivot pin 42 to a pair of arms 44, 46 each carrying a gatherer 48. The arms 44, 46 are pivotaly connected at 49 to a link 50, in turn, pivotaly connected at 51 to a fixed support 52, whereby rotation of the arms 44, 46 with the discs 40 is prevented. The discs 40 are connected to suitable driving means (not shown) to be rotatably driven in synchronization during the mining operation, whereby the arms 44, 46 are resultantly driven to direct mined material to the chain receiving end 21.

An auxiliary gathering apron is pivotaly connected adjacent each of the sides of the main apron 24, such auxiliary aprons each being designated generally as 54 and pivotaly connected at its rearward end by a vertical pivot pin 56 to a flange 58 mounted on the thereadjacent side wall 34 of the main apron 24. The auxiliary gathering aprons 54 along their remote sides have generally upright outer side walls 60 and also have apron floors 62, unitary with their respective side walls 60, which extend inwardly generally towards each other and have at least portions transversely sloping downwardly towards one another. The apron floors 62 adjacent their forward ends 64 slope downwardly to serve as shovels or scoops for material on the ground in advance of the machine during forward driving of the machine with the auxiliary aprons 54 in extended positions; and the forward ends 64 are provided with sharp

edges. The apron floors 62 extend slidably below the adjacent sides of the main apron 24 to permit movement of the auxiliary aprons 54 between extended and retracted positions. The apron floors 62, as illustrated in FIG. 2, may gradually taper adjacent their forward ends 64 or alternatively may be of any other suitable configuration. By way of example, FIG. 6, wherein parts similar to those shown in FIGS. 1 through 5 are designated by the corresponding reference character followed by the suffix a, illustrates a slightly modified auxiliary apron 54a which differs from that aforedescribed only in that a sharper taper is provided adjacent the forward end 64a of the apron floor 62a.

The auxiliary aprons 54 are biased one from the other towards extended positions by individual helical or coil biasing springs 66 and are selectively driven towards and away from one another by individual cylinder-and-piston motors 68. The springs 66 and motors 68 are located in chambers 69 below the apron floors 30, 62, the motors 68 each including a cylinder 70 which is pivotaly connected to a supporting wall 72 depending from the apron floor 30 of the main apron 24. Each auxiliary apron 54 is connected to its respective spring 66 and motor 68 by a link means including first and second links 74, 76, respectively, having adjacent inner ends and remote outer ends. The outer end of each first link 74 is pivotaly connected to the respective auxiliary apron 54 by a vertical pivot pin 78; the outer end of each second link 76 is pivotaly connected to the thereadjacent wall 72 by a vertical pivot pin 80. The links 74, 76 of each link means are pivotaly interconnected at their inner ends by a vertical pivot pin 82; and an extension rod 84, joined to the piston of the respective motor 68 for movement therewith, is connected to the pivot pin 82 to therethrough drive the links 74, 76. The springs 66 each are mounted peripherally of the adjacent motor 68 and each at opposite ends about an annular collar 86 circumferentially around the cylinder 70 of such motor 68 and an annular collar 88 adjacent the respective pivot pin 82.

During the movement of the mining machine to a mining location, hydraulic fluid is maintained in the cylinders 70 of the motors 68 to retain the auxiliary aprons 54 in their extreme retracted or adjacent positions. Thus, during this driving of the machine the effective width of the apron assembly as formed by the main apron 24 and auxiliary aprons 54 is only substantially that of the chassis 10 and maneuverability of the machine is thereby facilitated. When the machine has been driven to its operating location, hydraulic fluid is supplied to the cylinders 70 to move the contained pistons whereby the extension rods 84 are extended to drive the auxiliary aprons 54 one from the other to outward or extended positions. Then, the activating hydraulic fluid is permitted to freely drain from the cylinders 70 and the springs 66 resiliently maintain the auxiliary aprons 54 in their extended positions. Thus, the auxiliary aprons 54 are permitted to slidably engage the rib of the tunnel in which the mining operation is proceeding and, in the event of deviations in the width of the tunnel, the auxiliary aprons 54 automatically retract towards one another due to the force of the rib overcoming the resilient biasing forces of the springs 66. Throughout the mining operation, the gathering

devices 38 are driven to direct mined material to the receiving end 21 of the conveying chain 22 and the chain 22 is longitudinally driven to remove the received mined material.

In the event that the mining machine is to be driven from one tunnel or mining area to another, the auxiliary aprons 54 are retracted towards one another by hydraulic fluid supplied to the cylinders 70 and are maintained in this retracted relationship until the machine again reaches its mining location.

From the foregoing description, it will be seen that the invention provides new and improved means for accomplishing all of the aforesaid objects. However, it will be understood that, although only two embodiments of the invention have been illustrated and hereinbefore specifically described, the invention is not limited merely to these two embodiments but rather contemplates other embodiments and variations within the scope of the following claims.

Having thus described my invention, I claim:

1. In a mining machine, a supporting base, rotary mining head means, means mounting said mining head means on said supporting base, conveyor means extending along said supporting base and having a receiving end for receiving mined material to be conveyed, and collecting means for gathering material mined by said mining head means and directing such material to said receiving end of said conveyor means, said collecting means comprising gathering apron means below said mining head means and said gathering apron means including at least one portion movable relative to another portion thereof for varying the effective width of said gathering apron means, motor means connected to said movable portion of said gathering apron means for moving said movable portion to vary the effective width of said gathering apron means, and biasing means connected to said movable portion of said gathering apron means for resiliently biasing said movable portion from said another portion of said gathering apron means.

2. A mining machine according to claim 1, wherein said biasing means comprises a spring, and a plurality of interconnected links connect said spring and said motor means to said movable portion.

3. A mining machine according to claim 2, wherein said spring is a coil spring extending peripherally around said motor means.

4. In a mining machine, a supporting base, a boom mounted on said supporting base, rotary mining head means carried by said boom forwardly of the forward end of said supporting base, conveyor means extending along said supporting base and having a receiving end for receiving mined material to be conveyed, and collecting means for gathering material mined by said mining head means and directing such material to said receiving end of said conveyor means, said collecting means including gathering apron means comprising a central gathering apron below said mining head means and auxiliary gathering aprons adjacent each of opposite sides of said central gathering apron mounted for movement towards and away from one another to vary the effective width of said gathering apron means, motor means connected to said auxiliary gathering aprons for moving said auxiliary gathering aprons to vary the effective width of said gathering apron means,

and biasing means connected to said auxiliary gathering aprons for resiliently biasing said auxiliary aprons from one another.

5. A mining machine according to claim 4, wherein said biasing means for each said auxiliary gathering apron comprises a spring, and a plurality of interconnected links connect said motor means and said springs to said auxiliary gathering aprons.

6. A mining machine according to claim 4, wherein said biasing means comprises individual springs for said auxiliary gathering aprons and said motor means comprises individual fluid pressure operated motors for said auxiliary gathering aprons, and further comprising a common set of interconnected links connecting the spring and the motor for each said auxiliary gathering apron to the latter.

7. A mining machine according to claim 4, wherein said biasing means comprises individual biasing elements for said auxiliary gathering aprons, and said motor means comprises individual fluid pressure operated motors for said auxiliary gathering aprons.

8. A mining machine according to claim 7, further comprising link means connecting said biasing elements and said motors to said auxiliary gathering aprons, said link means for each auxiliary gathering apron comprising first and second links having inner and outer ends, each said first link being connected at its outer end to one of said auxiliary gathering aprons and each said second link being connected at its outer end to a support fixed with respect to said central gathering apron, said first and second links for each auxiliary gathering apron being pivotally interconnected at their inner ends, and said motors and said biasing elements being connected to said links at the pivotal connection of the inner ends of the links.

9. A mining machine according to claim 8, wherein said biasing elements each comprise a spring peripherally of one of said motors.

10. In a mining machine, a supporting base, a boom mounted on said supporting base and projecting forwardly thereof, rotary mining head means supported by said boom, conveyor means extending along said supporting base and having a receiving end for receiving mined material to be conveyed, gathering apron means comprising a main gathering apron mounted below said mining head means for collecting material mined by said mining head means and auxiliary gathering aprons adjacent each of opposite sides of said main gathering apron pivotally mounted for movement relative to said main gathering apron towards and away from one another, to vary the effective width of said gathering apron means, movable gathering means operatively associated with said main gathering apron for directing mined material on said main gathering apron to said receiving end of said conveyor means, said auxiliary gathering aprons having remote sides including generally upwardly extending side walls and said auxiliary gathering aprons also including apron floors unitary with said side walls which extend generally towards one another, biasing means operatively connected to said auxiliary gathering aprons for resiliently biasing said auxiliary gathering aprons each from the other, and motor means operatively connected to said auxiliary gathering aprons for pivotally moving said auxiliary gathering aprons relative to each other to thereby vary the effective width of said gathering apron means.

11. A mining machine according to claim 10, wherein said biasing means includes individual biasing springs for said auxiliary gathering aprons, and said motor means comprises individual fluid pressure operated motors for said auxiliary gathering aprons.

12. A mining machine according to claim 11, further comprising link means connecting said biasing springs and said motors to said auxiliary gathering aprons, the link means for each said auxiliary gathering apron including first and second links having inner and outer ends, each said first link being connected at its outer end to one of said auxiliary gathering aprons and each said second link being connected at its outer end to a support fixed with respect to said main gathering apron, said first and second links for each said auxiliary gathering apron being pivotally interconnected at their inner ends, and said motors and said biasing springs being connected to said links at the pivotal connection of their inner ends.

13. A mining machine according to claim 12, wherein said biasing springs are coil springs peripherally of said motors.

14. A mining machine according to claim 10, further comprising a common set of interconnected links connecting the biasing spring and motor for each said auxiliary gathering apron to the latter.

15. A mining machine according to claim 10, wherein said apron floors of said auxiliary gathering aprons taper adjacent towards their forward ends.

16. A mining machine according to claim 10, wherein said auxiliary gathering aprons are pivotally mounted adjacent their rearward ends for movement about generally vertical axes.

17. Collecting means for gathering mined material, comprising gathering apron means including a central gathering apron and auxiliary gathering aprons adjacent each of opposite sides of said central gathering apron mounted for movement towards and away from one another to vary the effective width of said gathering apron means, motor means operatively connected

to said auxiliary gathering aprons for moving said auxiliary gathering aprons towards and away from one another, and biasing means resiliently biasing said auxiliary gathering aprons from one another.

18. Collecting means for gathering mined material, comprising gathering apron means including a main gathering apron and auxiliary gathering aprons at each of opposite sides of said main gathering apron mounted for pivotal movement relative to said main gathering apron towards and away from one another, to vary the effective width of said gathering apron means, said auxiliary gathering aprons having remote sides including generally upwardly extending side walls and said auxiliary gathering aprons also including transversely extending apron floors unitary with said side walls projecting generally towards one another, biasing means for resiliently biasing said auxiliary gathering aprons one from the other, and fluid pressure operated motor means connected to said auxiliary gathering aprons for pivotally moving said auxiliary gathering aprons towards and away from one another.

19. Collecting means according to claim 18, wherein said biasing means includes individual biasing springs for said auxiliary gathering aprons, and said motor means comprises individual motors for said auxiliary aprons, and further comprising link means connecting said motors and said springs to said auxiliary gathering aprons, the link means for each auxiliary gathering apron comprising first and second links having inner and outer ends, each said first link being connected at its outer end to one of said auxiliary apron means and each said second link being connected at its outer end to a support fixed with respect to said main gathering apron, said first and second links for each said auxiliary gathering apron being pivotally interconnected at their inner ends, and said motors and said springs being connected to said links at the pivotal connections of their inner ends.

20. Collecting means according to claim 18, wherein said springs are coil springs peripherally of said motors.

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