

April 8, 1969

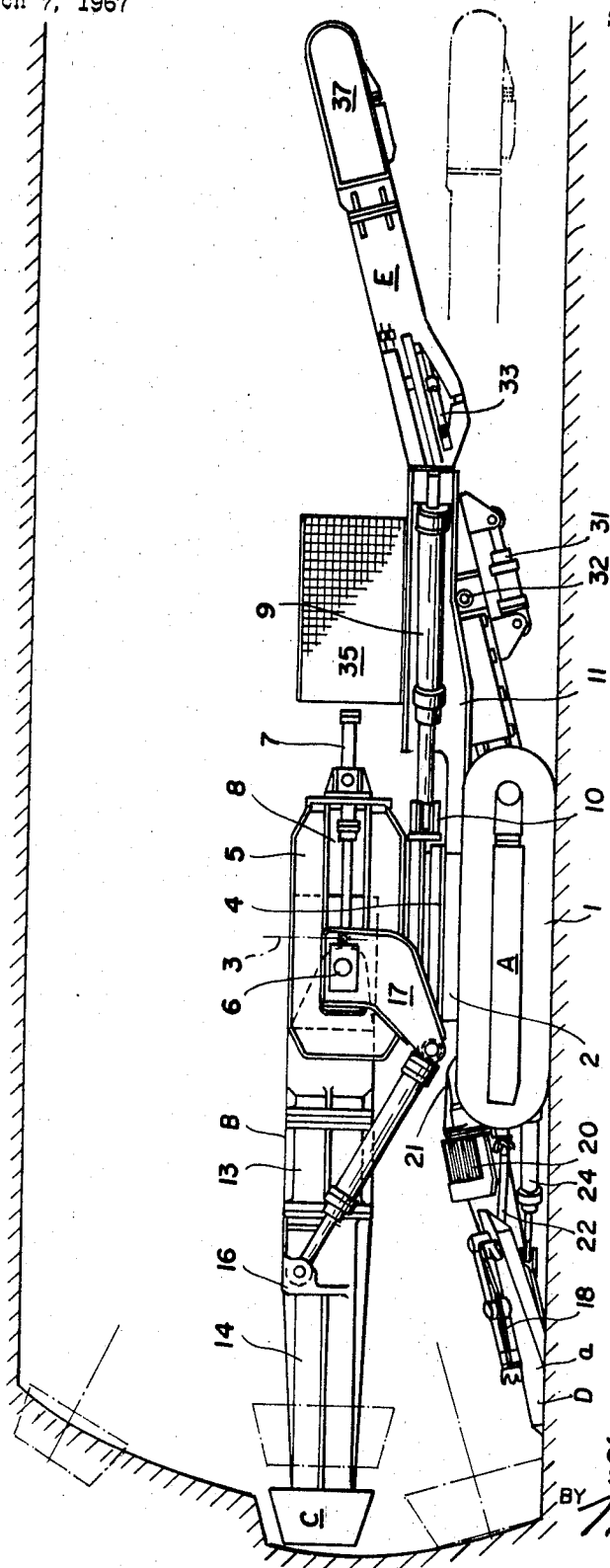
J. MEISSNER ET AL

3,437,382

MINING MACHINE WITH SELECTIVELY RETAINABLE LOADING APRON

Filed March 7, 1967

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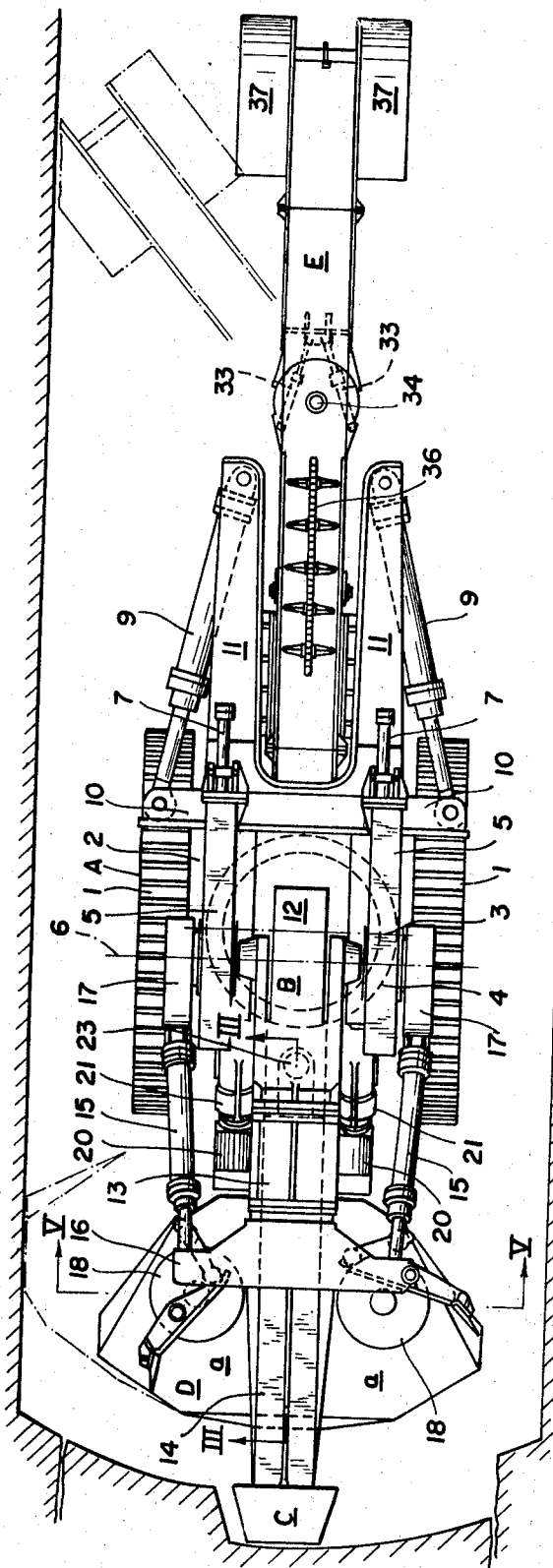


Fig. 2.

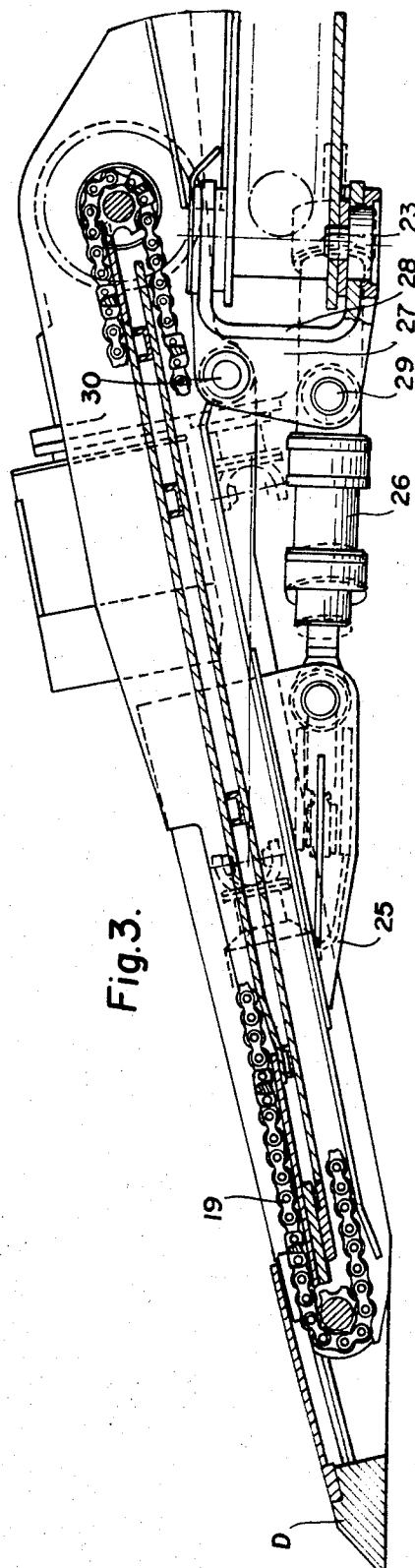


Fig. 3.

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Fig. 4.

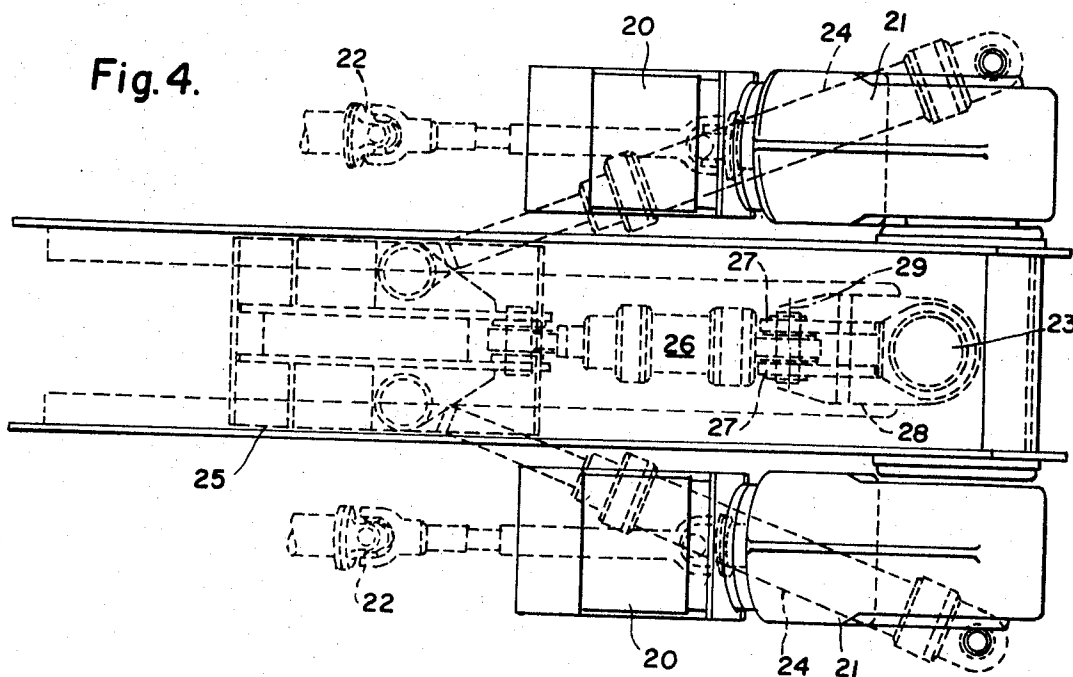


Fig.5.

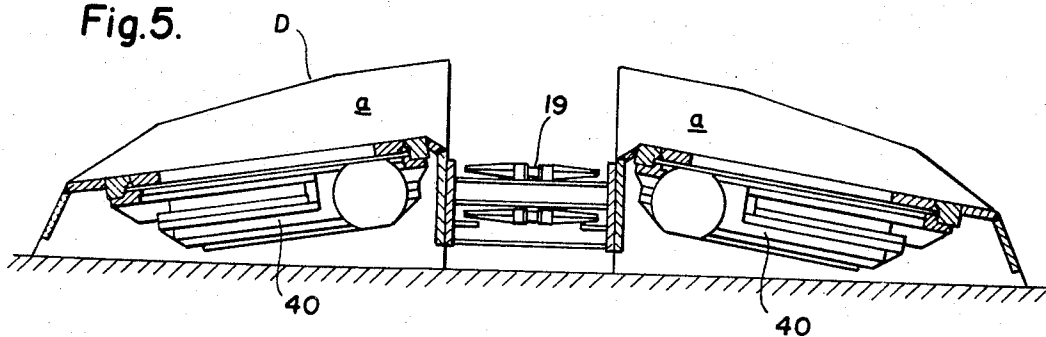
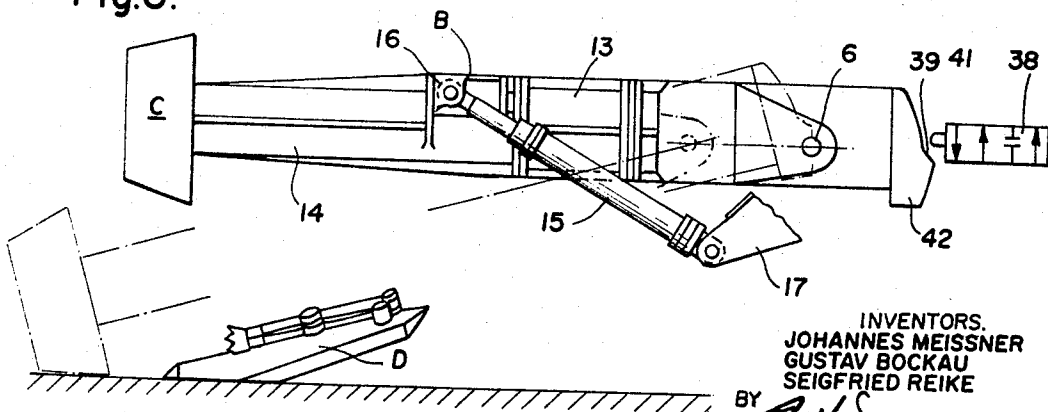


Fig.6.



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3,437,382

MINING MACHINE WITH SELECTIVELY
RETAINABLE LOADING APRON

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E 31,208

Int. Cl. E21c 27/42, 27/38

U.S. Cl. 299—56

4 Claims

ABSTRACT OF THE DISCLOSURE

This patent discloses a machine for mining coal or the like of the kind that comprises a chassis movable on the mine floor, a machine body set on the chassis, a cutter head positioned at the free end of an arm swivel-mounted in the machine body for both horizontal and vertical movement, a gathering apron for taking up crushed mineral loosened by the action of the cutting head, and conveyor means for transporting to the rear of the machine the loosened metal ore taken up by the gathering apron. In a machine of this kind, this patent discloses the improvement that is obtained by having the cutter head and its associated arms mounted for movement longitudinally of the machine, so that a greater quantity of mineral can be loosened with the machine standing in one position, and at the same time providing a loading apron that is mounted for movement in the horizontal, i.e., pivoted about a vertical axis and anchorable, preferably by means of hydraulic jacks, in each horizontal position, so that the loading apron may be brought directly under the arm bearing the cutter head, thereby improving the position of stability of the machine. This patent further discloses the use of a stop, operable when the arm bearing the cutter head is in a fully retracted position, to prevent the cutter head from coming into contact with the gathering apron.

CROSS-REFERENCES TO RELATED
APPLICATIONS

None.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to machines for mining coal or like minerals, and in particular to such machines which have a chassis, a machine body mounted on such chassis, an arm bearing a cutter head universally swivel-mounted for movement in the horizontal and the vertical, a gathering apron positioned in the vicinity of the mine floor to take up the mineral loosened by the action of the cutter head, and conveyor means for moving to the rear the mineral loosened by the action of the cutting head.

Description of the prior art

Mining machines are known that are operable on a level surface and work free-standing upon the mine face with cutting heads thereon, both borne upon swivel-mounted arms, and loosen the minerals there standing. The materials thus caused to fall are gathered up by the mining machine with the aid of a loading apron, which lies with its forward end upon the mine floor and rises ramp-wise to the rear. Two hydraulic jacks in the region of the edge of the ramp under the loading apron, fix the position with respect to the height of the loading

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apron, which is swiveled about an axis which runs transverse to the direction of travel of the machine, while two transport devices are arranged upon the apron and lead the loosened material over the loading apron on to a conveyor belt running to the rear.

Moreover, there are also in the prior art machines, the universally swivel-mounted arm of which that bears the cutter head is movable with respect to the machine position or with respect to the equipment for moving the machine.

One drawback of machines of the kind having a movable cutter head mounted at the end of an arm that is universally swivel-mounted to provide for both vertical and horizontal movement is that, from considerations of machine stability, it has generally been necessary to limit the area worked upon by the cutter head, in both the horizontal and the vertical, in such fashion that, at best, a passage barely wide and high enough to permit passage of the mining machine is produced. It is advantageous, of course, to provide machinery such that the cutting head may move sideways sufficiently that of the mine passageway produced by the operation of the machine is sufficiently broader than the machine itself to allow workmen access to the forward parts of the machine without the necessity of withdrawing the machine from the mine passageway in which it is working. It is understandable, moreover, that a coal-mining machine of the type described above that has a loading apron that is not pivoted for movement about a vertical axis is necessarily limited to the production of such a relatively narrow mine passageway, there being danger of having the machine tip over if the arm bearing the cutter head is moved laterally to such an extent that it lies an appreciable distance to one side or another of the loading apron. Difficulties of the kind indicated above are exacerbated if the arm bearing the cutter head is extensible longitudinally with respect to the body of the mining machine. It is desirable, moreover, to provide that the arm bearing the cutter head be so extensible, in order that it may be possible to work upon a substantially larger volume of minerals without being required to activate the transport means to move the mining machine forward in the passage that it is creating.

It has also not been hitherto appreciated that, in mining machines of the kind described above, the machine may damage itself if, when the arm bearing the cutter head is fully retracted, that arm is lowered to such an extent that the cutter head begins to bear upon the loading apron. The instant invention provides means for overcoming this difficulty.

SUMMARY OF THE INVENTION

This invention relates to a machine for mining coal or the like of the kind that comprises a chassis movable on the mine floor, a machine body set on the chassis, a cutter head positioned at the free end of an arm swivel-mounted in the machine body and for both horizontal and vertical movement, a gathering apron for taking up crushed mineral loosened by the action of the cutting head, and conveyor means for transporting to the rear of the machine the loosened metal ore taken up by the gathering apron. In a machine of this kind, this patent discloses the improvement that is obtained by having the cutter head and its associated arms mounted for movement longitudinally of the machine, so that a greater quantity of mineral can be loosened with the machine standing in one position, and at the same time providing a loading apron that is mounted for movement in the horizontal, i.e., pivoted about a vertical axis and anchorable, preferably by means of hydraulic jacks, in each horizontal position, so that the loading apron may be brought directly under the arm bearing the cutter head, thereby improving the position of stability of the machine. This invention fur-

ther relates to the use of a stop, operable when the arm bearing the cutter head is in a fully retracted position, to prevent the cutter head from coming into contact with the gathering apron.

DESCRIPTION OF THE DRAWINGS

A complete understanding of the invention may be obtained from the foregoing and following description thereof, taken together with the attached drawings in which:

FIGURE 1 is a side elevation view of a mining machine in accordance with the present invention;

FIG. 2 is a plan view of said mining machine;

FIG. 3 is a view taken on the line III—III of FIG. 2;

FIG. 4 shows in detail the operation of a hydraulic jack upon the loading apron of a mining machine in accordance with the instant invention;

FIG. 5 is a vertical sectional view taken on the line V—V of FIG. 2; and

FIG. 6 is a side elevation view of the machine body, in which only selected parts are shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The mining machine of the instant invention consists essentially of the transport means A, the machine body B arranged on said transport means, the cutting head assembly C, the gathering apron D, and the discharge conveyor E.

In the selected example of the practice of the invention, the transport means A is furnished with two crawler tracks 1, which are driven by separately controlled hydraulic motors (not shown). The bridge 2 that joins the two transport means parts together bears a movable ring 4, pivotable about a vertical axis 3, the ring 4 having on its upper side two pieces 5, one on each side of the machine body B. These pieces 5 hold the ends of a horizontal axis 6 of the machine body B, each in a bearing, which by means of the hydraulic jacks 7 may be shifted against the piece 8 of the fixtures 5. Two double-acting extensible hydraulic jacks 9, which press with their piston rods on the parts 10 arranged in the ring 4 and are themselves affixed on the parts 11 of the transport device A, bring about pivotal movement in the ring 4.

The machine body B is formed of the drive motor 12, the supporting drive 13, and the arm 14 having the cutting head assembly C. While the two hydraulic jacks 9 effect the motion of the machine body B about the vertical axis 3 of the ring 4, the double-acting extensible hydraulic jacks 15 produce pivotal movement around the horizontal axis 6, and hold the machine body B at the desired elevation. To this end, they bear upon a cross piece 16 arranged on the arm 14 and are supported with their ends on the side pieces 17 of the fixtures 5 located in pieces 8.

The cutter head assembly C, which consists of a round, tapered cutting head, can be driven at two speeds. As the cutter head piece has cutting pieces both on its mantel face and on its side faces, it is capable, because of its universally swivel-mounted position with respect to the machine body 2, of striking the mine face in a working pass, without change in the position of the mining machine, and can thereby with the aid of the two hydraulic jacks 7 drive into the mineral about the length of the stroke of said jacks 7. The material thereby loosened and falling upon the mine floor is taken up by the loading apron D and is led, with the help of the two gathering arms 18, provided with an overload device, to the conveying means 19. The latter extends substantially over the length of the loading apron D and is located with its middle between the two gathering arms 18. It obtains its drive motion from the two motors 20, which are located at its posterior end and which each operate upon a supporting drive 21 formed as a worm drive on the conveyor return and, moreover, which each operate to drive the gathering arms 18 by means of a shaft 22. The forward

edge of the gathering apron D lies on the mine floor, but also the gathering apron D slopes gently downwardly side-wardly from both sides of the conveying means 19 and is cut off there at a boundary slope or angle with the mine floor in regions parallel to the side walls of the passage being produced. The gathering apron D, which is pivotable about the vertical axis 23 with the aid of the two hydraulic jacks 24, is thus able, by its horizontal pivotal movement, also to take up coarse mineral over its side slopes.

For convenience, it is recommended that the gathering apron D be built of several parts. In the working example shown, the gathering apron thus consists of the conveying means 19, on the side walls of which the lateral apron parts a are housed. The two double-acting extensible pressure cylinders 24 and also the double-acting extensible hydraulic jack 26 are all attached to a bracket 25 located on the underside of the loading apron D. While the two laterally located hydraulic jacks 24 are supported with their posterior ends universally swivel-mounted on bridge 2 of the transport means A, the backward end of the middle hydraulic jack 26 is positioned between two pieces 27 of the yoke 28 pivotable about a horizontal axis 29. Above this axis 29 there is placed—likewise in the yoke 28—the horizontal shaft 30, which gives the gathering apron D the necessary freedom of movement in the vertical. The horizontal shaft 30 joins over the yoke 28, both of whose legs grip the vertical pivot axis 23, the gathering apron D with the bridge 2 of the transport means A. As the loading apron D is universally pivotable with the two hydraulic jacks 24 around the vertical axis 23 with the help of these two hydraulic jacks 24 and also of the hydraulic jack 26 around the horizontal axis 29, the gathering apron can not only be raised from the mine floor but also can be lowered below the level of the mine floor, and moreover, be pivoted over the entire breadth of the mine passage being produced. The hydraulic jack 26 located in the center plane beneath the gathering apron D, which relates to the height position of the gathering apron D, holds or leads the gathering apron in its horizontal pivotal movement in the established movement plane existing at the moment, as in the movement period the two hydraulic jacks 24 producing the pivotal movement in the horizontal are not able to serve this purpose. As a consequence of the longitudinally shiftable position of the machine body B, the gathering apron D may be taken up to the mine face and thus the loosened crushed mineral may be taken up from the mine floor without leaving any residue. In this withdrawn position of the cutting head C, the vertical movement region of the machine body B is bounded by a stop pin, such as will be later shown and described, in order to prevent the cutting head from being lowered unintentionally onto the loading apron D.

A discharge conveyor E lying between the two crawler tracks 1 of the transport means A grasps the posterior return end of the conveyor means 19 and gives up the crushed mineral at its posterior end to a separately controlled, unshown means conveying the coal or other minerals further down the mine passage. The discharge conveyor E is also shown as a conveyor, the discharge end of which is positionable as to height about the axis 32 as a result of the linked endless chain 36 and the double-acting extensible hydraulic jack 31. Also, the discharge end can, by means of the double-acting extensible hydraulic jacks 33, be pivoted about the vertical axis 34, and thus, both the position and the height of the conveyor means for conveying the coal along the mine passage can be suitably matched. Two drive motors 37 are arranged on opposite sides of the discharge conveyor E in the vicinity of their posterior ends, which motors are provided with suitable drives operating on the discharge conveying means E.

The housing 35, which is mounted on the two parts 11 of the transport means A, contains the fluid pumps neces-

sary for the production of hydraulic pressure, the electric motor required for driving these pumps, the fluid reservoir, and also the hydraulic and electrical control apparatus. With the help of the so-positioned fluid pumps, both the hydraulic motors that drive the transport means A and also all of the hydraulic jacks of the mining machine are provided with suitable fluid pressure.

FIG. 5 shows a cross-section of the loading apron D.

The gathering arms 18 are here extended and thus the drive 40 of the gathering arms is shown.

In FIG. 6 is shown the machine body B with the cutter head assembly C, which is arranged on the arm 14. The cutter head is shown in solid lines in its horizontally furthest retracted position. It bears at its rear end an end piece 32, upon which is located a boss 39. On this boss there bears, in certain circumstances, a pin 41, connected to the piezoelectric switch device 38.

Indicated in dotted lines is a diagonal position of a cutting head, in which only the cutter head and the end piece 42 are seen. By the switch device 38, in combination with the pin 41 and the boss 39, the cutting head C is prevented then in its furthest retracted position from entering the region of the loading apron D (disclosed in part in FIG. 6).

While it must be possible, when the arm 14 is in a further extended position, to work with the cutter head assembly C in a lower position, even down to the mine floor, when the cutting head C is in its furthest retracted position, it can be moved downwardly only to the horizontal, as is shown in FIG. 6, before further downward motion of the cutter head C is stopped by reason of contact with the boss 39 with the pin 41 of the switch device 38.

While we have shown and described herein certain embodiments of our invention, we intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

We claim as our invention:

1. A mining machine that is movable upon the mine floor and with its cutter head, borne on a universally swivelable arm, works in free-standing manner the mine face and takes up the mineral thereby loosened with the help of a loading apron that has a forward end that lies upon the mine floor and that rises rampwise toward its rear, the angle of repose of the loading apron being adjustable by means of a pressure cylinder about an axis that is horizontal and runs perpendicularly with respect to the mine passage, therein distinguished, that the arm bearing the cutter head is movable with respect to and in the direction of said mine passage and is retractable to a

position behind the forward end of said loading apron, and that the loading apron, height-positionable about the said horizontal axis, is pivotable together with its said axis and horizontal pressure-cylinder pivot axes about a machine axis that is vertical and located centrally of said machine, said loading apron being selectively retainable in each working position by means of a pressure cylinder operating thereon.

2. A mining machine according to claim 1, therein distinguished, that its loading apron and its transport means are joined together by means of a U-shaped yoke that grasps with its two legs a horizontal pivot axis located on said transport means and contains on the rear surface of its crosspiece two vertical pieces provided with first and second horizontal pivot axes lying one above the other, between which the loading apron, pivotable about the first and upper one of said axes, is connected with its rear end to a piece and a pressure cylinder pivotable about the second of said axes, and that upon both sides of said last-named pressure cylinder there are positioned on said transport means additional pressure cylinders that with their piston rods are connected, diagonally with respect to the longitudinal axis of the machine, to said loading apron.

3. A mining machine as defined in claim 2, therein distinguished, that the loading apron is provided, between a pair of gathering arms, with an individual chain conveying means that extends only over the length of said loading apron, said conveying means together with said gathering arms being driven by means of two motors that are arranged to either side of the rearward point of reversal of said conveying means.

4. A mining machine as defined in claim 3, therein distinguished, that said loading apron slopes downwardly to both sides away from said conveying means and rests with its side slopes upon the mine floor.

References Cited

UNITED STATES PATENTS

2,691,513 10/1954 McElhattan ----- 299—64

FOREIGN PATENTS

120,483 1959 U.S.S.R.
123,914 1959 U.S.S.R.

ERNEST R. PURSER, *Primary Examiner*.

U.S. Cl. X.R.

198—10; 299—64