Oct. 29, 1968 P. LOCKWOOD 3,408,109

MINING MACHINE WITH ROCKER ARM CONTROLLED FRONT PUSHER PLATE

Filed June 10, 1966 3 Sheets-Sheet 1

FIG. 5a.

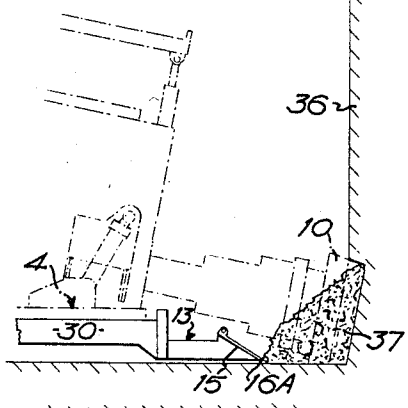
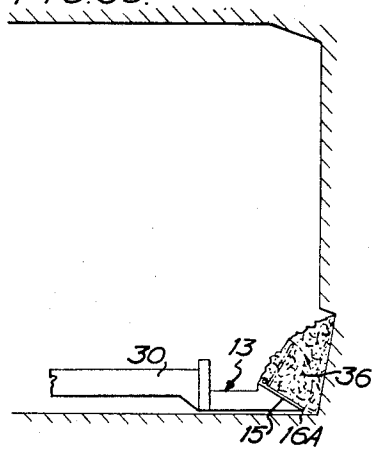


FIG. 5b.



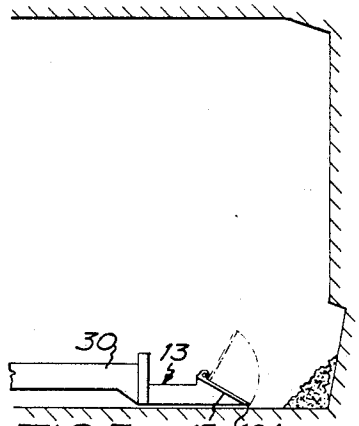


FIG. 5c.

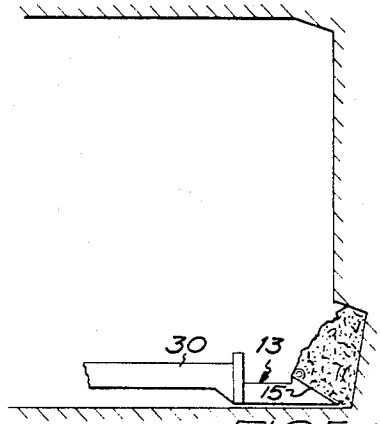


FIG. 5d.

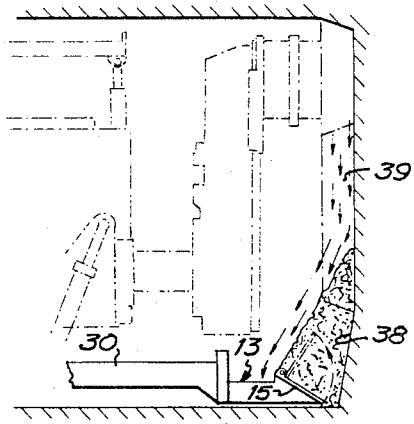


FIG. 5e.

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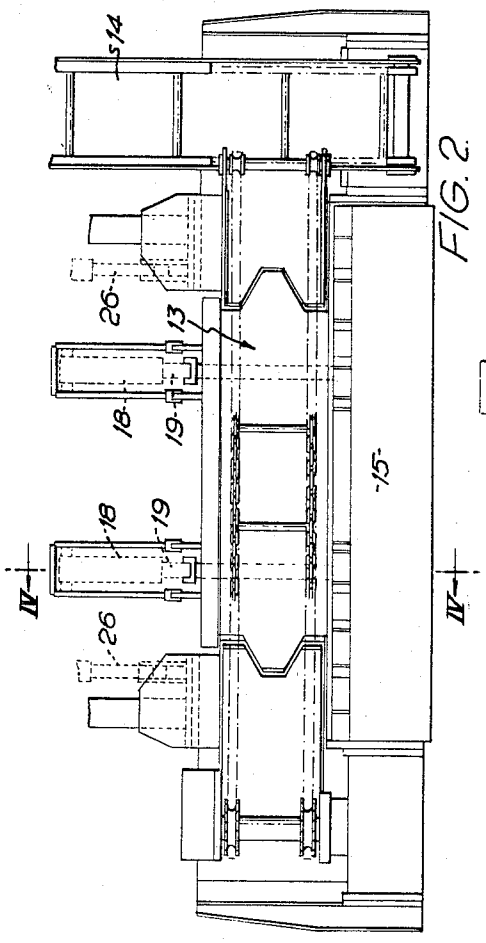


FIG. 2.

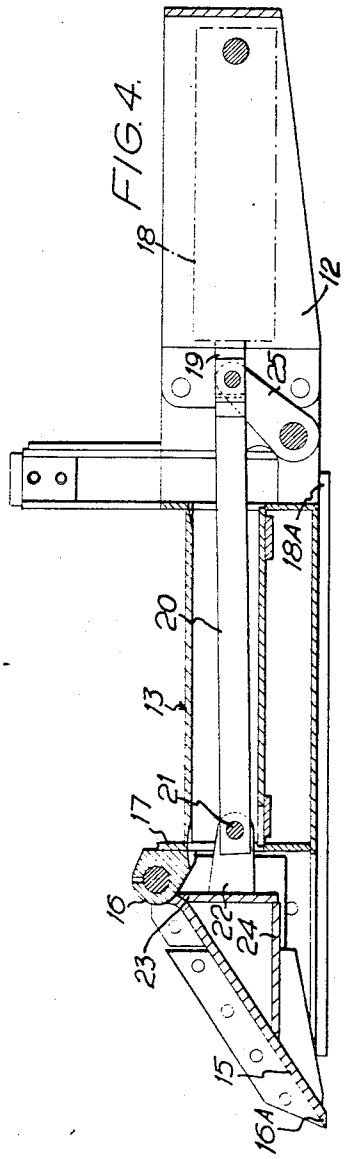


FIG. 4.

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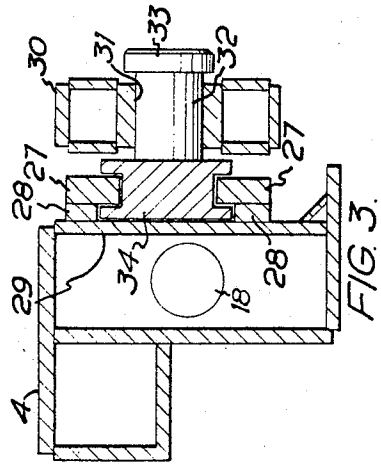


FIG. 3.

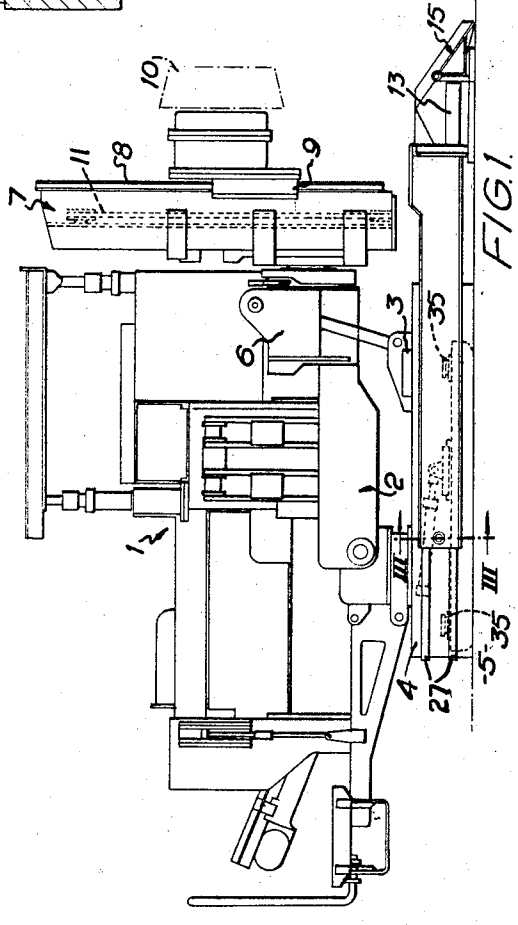


FIG. 1.

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3,408,109

MINING MACHINE WITH ROCKER ARM CONTROLLED FRONT PUSHER PLATE

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Claims priority, application Great Britain, July 9, 1965, 29,122/65
3 Claims. (Cl. 299—56)

ABSTRACT OF THE DISCLOSURE

Self-advancing mining machine having forwardly mounted rotary cutting means on the machine frame, a conveyor transversely mounted on a conveyor frame at the foot of the front of the machine frame and advanceable and retractable with respect to the machine frame, the top of the front of the conveyor being spaced from the mine floor in any position of the conveyor, a pusher plate pivotally mounted at its rear edge along the top of the front of the conveyor about a pivot axis correspondingly spaced from the mine floor, and means in the conveyor frame below the conveyor for rocking the pusher plate between a first position downwardly and forwardly inclined to a second position in which the front edge of the pusher plate is raised substantially above such pivot axis and in turn above the top of the front of the conveyor to permit mineral loading of the conveyor thereby, such rocking means for example including in the conveyor frame a hydraulic cylinder and ram assembly and a rocking support lever secured to such conveyor frame, an underside pivot on the pusher plate underside, and a link extending forwardly to the underside pivot and pivotally connected at a common pivot at its rear end to both said ram and support lever and at its forward end to said underside pivot to provide an operative connection below the conveyor between the ram and pusher plate.

This invention relates to mining machines of the self-advancing type, and provided with forwardly mounted rotary cutting means capable of being urged forwardly with respect to the frame of the machine so as to remove mineral from a face in the path of the machine.

According to the present invention, a mining machine of the type referred to comprises a conveyer transversely mounted at the foot of the front of the frame of the machine, means in the machine frame for advancing and retracting the conveyor with respect to the frame, a pusher plate pivotally mounted by its rear edge only along the top of the front of the conveyor, and means in the conveyor frame for rocking the pusher plate about its pivot axis between a position in which the plate inclines downwardly and forwardly from its rear edge to its front edge and a position in which the front edge of the plate is raised to a height substantially above the pivot axis.

When mineral removed by the cutting means lies on the floor in front of the machine, and the cutting head is raised clear of the floor, the conveyor can be advanced with respect to the machine frame, with the pusher plate inclining downwardly from the top of the front of the conveyor so that its front edge rests on the floor. The advance of the pusher plate with the conveyor thus causes the plate to be forced underneath the mineral lying in front of it. The plate is then swung upwardly to lift the quantity of mineral now resting on it, until the mineral slides from the plate on to the conveyor. The plate is then lowered to contact the floor again, for the advancing of it (with the conveyor) to be repeated, and also the upward swinging of the plate, as often as is

necessary to remove whatever amount of material has accumulated in front of the machine.

By this use of the pusher plate, the machine is able to advance the cutting means directly into the bottom of the face to be worked, instead of first having to drive its way through accumulated mineral, with consequent avoidance of power waste through churning through the material, and the use of this power for mere conversion of the material to still smaller size, as is particularly undesirable when the mineral is coal.

Advantageously, and particularly so when the machine has hydraulically powered means for positioning the cutting means in relation to the face to be worked, and likewise if the cutting means is driven by hydraulic motor, the rocking means for the pusher plate are hydraulically operated. Thus, a hydraulic cylinder disposed substantially horizontally in the frame of the conveyor and having a ram extending forwardly lengthwise of the conveyor may have the ram pivotally connected to the rear end of a link extending forwardly to a pivot on the underside of the pusher plate, the rear end of the link being connected, at its pivotal connection with the ram, to a rocking support lever, upstanding or depending from the conveyor frame, the link providing an operative connection below the conveyor between the ram and the pusher plate. Generally, two such operating mechanisms suffice for a pusher plate co-extensive in length with the transverse conveyor.

When the cutting means is operating on any part of the face not immediately above floor level, the conveyor, with the pusher plate downwardly inclined in front of it, can be set at fully advanced position, to enable much of the material to fall directly on to the conveyor as it is detached from the face. In due course, the pusher plate can be swung upwards, to discharge on to the conveyor such material as has fallen on to it in its advanced position. With repeated forward advance of the conveyor and swinging of the plate, the floor can be cleared of accumulated material as the whole area of the face has been completely removed by the cutting means from the position occupied by the machine, so that the machine itself can be advanced to a new position, and the cutting head advanced once more directly into the bottom of the face. Because the floor can be kept substantially free from loose material in the path of the machine, and, with the hydraulic operation described above, by means included in the general control devices used by the operator for effecting the entire operation of the machine, the operator has a clear view of the whole space in front of the machine, so that his control of the progressive positioning of the machine and its cutting means is much simplified.

The invention will now be further described with reference to the accompanying drawings in which

FIGURE 1 is a longitudinal view of a self-advancing mining machine incorporating a pusher plate;

FIGURE 2 is a plan view of the pusher plate and associated conveyor;

FIGURE 3 is a section on the line III—III of FIGURE 1;

FIGURE 4 is a section on the line IV—IV of FIGURE 2, to a larger scale, and

FIGURES *5a*, *5b*, *5c*, *5d*, and *5e* show various positions of the pusher plate in use.

In FIGURE 1, a mining machine **1** generally of the type described in our patent application Ser. No. 398,954, filed Sept. 24, 1964 and now Patent No. 3,306,663, has a frame **2**, carried by two transverse beams **3** secured at their ends towards the front and rear on two parallel elongated base members **4** extending in the lengthwise direction of the machine, to carry the machine by a wide span from the supporting surface **5**. Lengthwise of the

machine is a tubular torque shaft **6**, to which is secured at its forward end an arm **7** having slideways **8** for a carrier **9** for a cutting drum or head **10** bearing picks (not shown) and rotatable about an axis parallel to that of the shaft **6**. The carrier **9** is moved along the arm **7** by means of a chain **11**, so that the cutting head **10** may effect cutting in a direction dependent on the position to which the arm is set, e.g., the vertical position shown. Again, by rotation of the torque shaft **6** (by means not shown), the cutting head **10** can effect cutting over an arc. In front of the machine, and supported by a frame **12**, is a transverse conveyor **13** which feeds cut material to a conveyor **14** alongside the machine.

Associated with the transverse conveyor **13** is a pusher plate **15** as shown in FIGURES 2 and 4. The pusher plate is pivotally mounted by its rear edge **16** along the top of the front **17** of the transverse conveyor **13** and having its front edge **16A** sitting on the floor. Two hydraulic cylinders **18** are disposed substantially horizontally in the conveyor frame **12** and rams **19** extend forwardly lengthwise of the machine and are each pivotally connected to the rear of a link **20** each extending forwardly to a pivot **21** in a bracket **22** secured to a vertical plate **23** which is welded to a substantially horizontal plate **24** on the underside of the pusher plate. The rear of each link **20** is connected, at its pivotal connection with its ram to a rocking support lever **25**, upstanding from the conveyor frame **12**. Two further rams **26** are secured to the machine base members **4** and to the rear of the conveyor **13**.

The base members **4** are provided with longitudinal guides **27** (FIGURE 3) screwed to longitudinally welded strips **28** along each outer vertical wall **29**. The transverse conveyor **13** is provided with two side arms **30** through which it is secured to the machine. Each side arm **30** is provided with an aperture **31**, near its end remote from the conveyor to receive a pivot pin **32** having a flange **33** externally of the side arms **30** and, internally of the side arms a slide **34** of H section fitting between guides **27**. Thus, the transverse conveyor **13** and attached pusher plate **15** are guided during advancing or retracting of the rams **26** by the slides **34** and guides **27** and the conveyor **13** and pusher plate **15** may be raised or lowered about the pivot pin **32**.

The machine frame **2** is provided with self-propelling and steering mechanism **35** as described in our co-pending patent application Ser. No. 398,954.

With reference to FIGURES *5a*, *5b*, *5c*, *5d*, and *5e*, to begin cutting operations on a substantially plane mineral face **36** the mineral **37** is first removed with the transverse conveyor **13** and pusher plate **15** in retracted position as shown in FIGURE *5a*. When for example a 6 inch cut has been effected after the cutting head **10** has been raised clear of the floor the conveyor **13** and pusher plate **15** are advanced with respect to the machine frame **2** by means of the rams **26** with the pusher plate **15** inclined downwardly from the top of the front **17** of the transverse conveyor **13** so that its front end **16A** sits on the floor. Thus the pusher plate is forced under the mineral **37** lying in front of it. The rams **19** are then actuated to swing the plate upwardly, as shown in FIGURE *5b*, to lift the quantity of material **36** resting on it until the mineral slides from the pusher plate **15** onto the conveyor **13**. The conveyor is then retracted towards the machine frame by reverse operation of the rams **19** and the pusher plate is then lowered to contact the floor again, as shown in FIGURE *5c*. The cutting head **10** is then lowered and a further 6 inch cut taken from the face **36** and the conveyor and pusher plate advanced as shown in FIGURE *5d*. Again material is removed by actuation of the rams **19**, not shown. With a heading **38** thus removed it is possible to advance the conveyor and pusher plate with the machine moved to its horizontal position and the full 12 inch of material **39** removed from the remainder of the face above the heading, which falls onto the pusher plate and/or conveyor and can be raised by actuation of the rams **19** of the pusher plate to allow the remaining cut material to slide onto the conveyor, without the need to further advance (or retract) the conveyor **13** and pusher plate **15**.

What I claim is:

1. A self-advancing mining machine provided with a machine frame, rotary cutting means forwardly mounted of the machine frame capable of being urged forwardly, a conveyor transversely mounted on a conveyor frame at the foot of the front of the machine frame, means in the machine frame for advancing and retracting the conveyor with respect to the machine frame, the top of the front of the conveyor being spaced vertically from the mine floor in any position of the conveyor, a pusher plate pivotally mounted at its rear edge along the top of the front of the conveyor about a pivot axis correspondingly spaced from the mine floor, and means in the conveyor frame below the conveyor for rocking the pusher plate about its pivot axis between a first position in which the pusher plate inclines downwardly and forwardly from its rear edge to its front edge and a second position in which the front edge of the pusher plate is raised to a height substantially above the pivot axis.

2. A self-advancing mining machine as in claim **1**, provided with a machine frame, rotary cutting means forwardly mounted of the machine frame capable of being urged forwardly, a conveyor transversely mounted on a conveyor frame at the foot of the front of the machine frame, means in the machine frame for advancing and retracting the conveyor with respect to the machine frame, a pusher plate pivotally mounted at its rear edge along the top of the front of the conveyor, and means in the conveyor frame below the conveyor for rocking the pusher plate about its pivot axis between a first position in which the pusher plate inclines downwardly and forwardly from its rear edge to its front edge and a second position in which the front edge of the pusher plate is raised to a height substantially above theh pivot axis, wherein the rocking means for the pusher plate includes a hydraulic cylinder and ram assembly disposed substantially horizontally in the frame of the conveyor, a pivot on the underside of the pusher plate, a link extending forwardly to that pivot, the ram extending forwardly to the rear end of the link, a rocking support lever secured to the conveyor frame, the rear end of the link also being connected, at its pivotal connection with the ram to the rocking support lever, the link providing an operative connection below the conveyor between the ram and the pusher plate.

3. A mining machine as in claim **2**, wherein two such means for rocking the pusher plate are provided for a pusher plate co-extensive in length with the transverse conveyor.

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