Nov. 30, 1954 J. C. SPROUL 2,695,774

WEDGE-TYPE MINING MACHINE WITH STEERING MEANS

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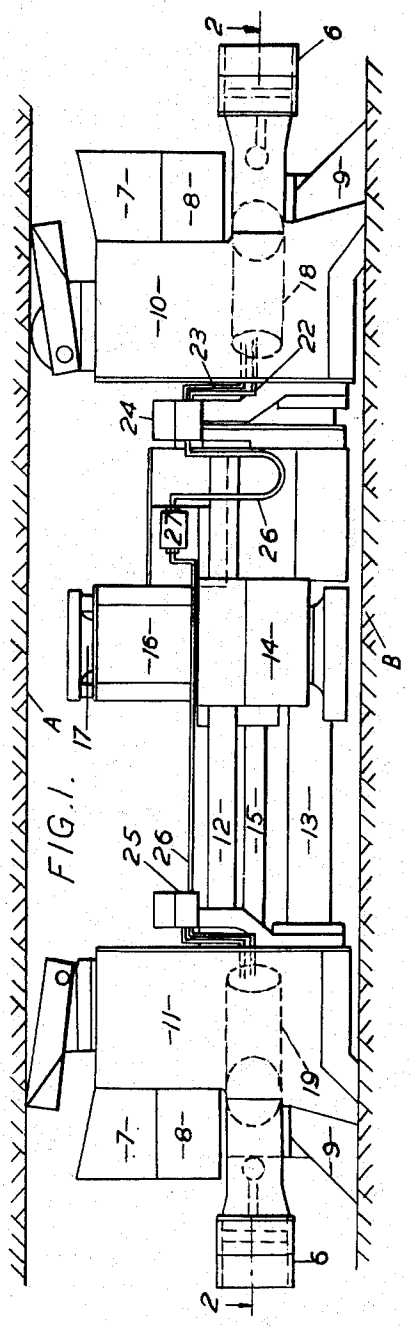

FIG. 1.

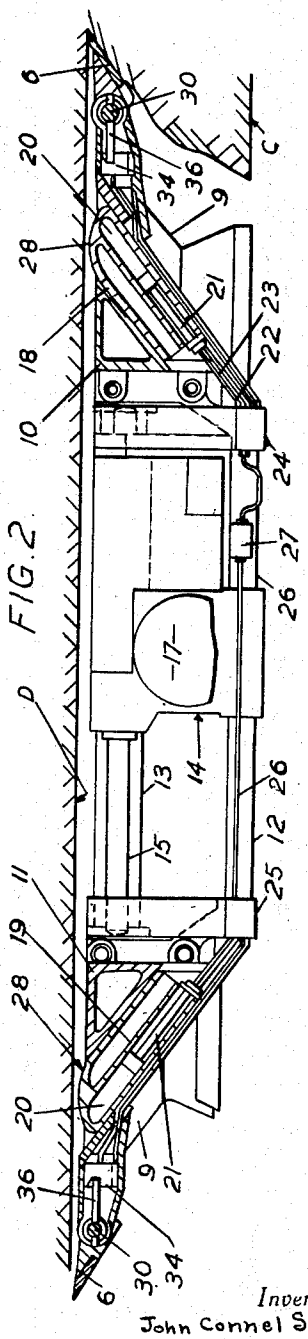

FIG. 2.

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FIG. 3.

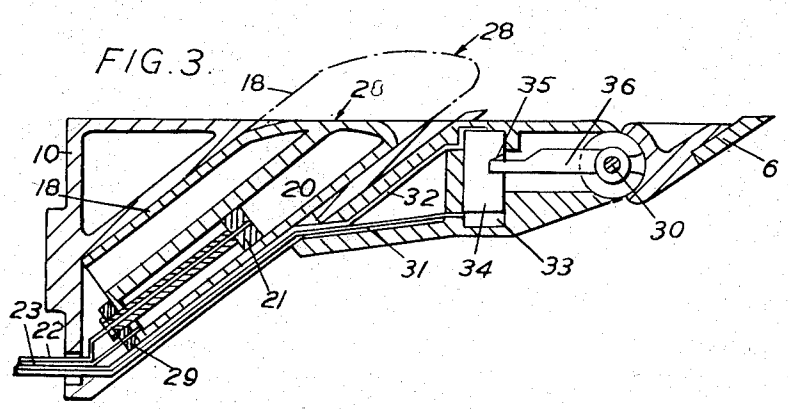


FIG. 4.

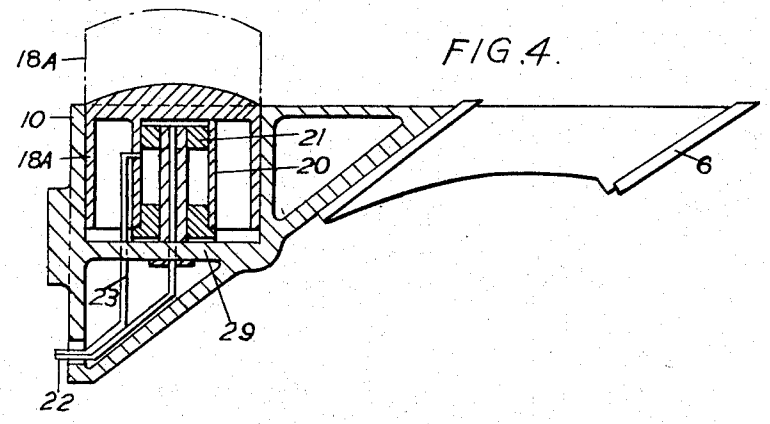
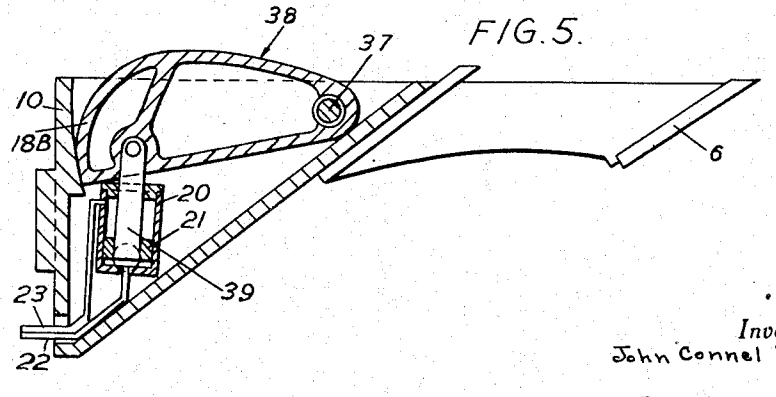


FIG. 5.



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WEDGE-TYPE MINING MACHINE WITH STEERING MEANS

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7 Claims. (Cl. 262—8)

This invention relates to mining machines belonging to a previously proposed type having a cutter head adapted, when the machine is used in a coal mine, to wedge off coal from a coal seam in the advance of the machine by splitting the coal chisel-wise along a plane behind and approximately parallel to the face of the seam. Where, as is usually desirable, the machine is double-ended—that is to say, is designed to work in each of its two directions of travel—there are two such cutter heads.

The cutter head may incorporate two or more superposed chisel-like cutters arranged to strip from the face at different levels, these cutters having edges which are co-planar, or approximately so.

More especially, the invention is applicable to mining machines of the type stated having means for propelling themselves along the face of a coal or other mineral seam, the propelling means comprising a pressure-fluid cylinder-and-ram propulsion unit co-operating with a pressure-fluid jack anchorage unit and the arrangement being such that a main component incorporating the head or heads moves longitudinally relative to the anchorage unit during propulsion and can turn laterally about the anchorage unit as axis.

In use of a mining machine of the type stated, it is desirable that the machine should work in a direction more or less parallel to the face of the coal or other mineral seam. Nevertheless, the varying conditions of any seam tend to cause variations in the depth at which the machine cuts into the face.

The object of the present invention is to make provision whereby the mining machine can be steered so that the cutter head can be maintained at an appropriate depth of cut.

Accordingly, the invention comprises a mining machine of the type stated having a movable steering presser near the leading end of the machine and another movable steering presser near the trailing end of the machine, each of said pressers being adapted to come against the face newly cut in the mineral seam by the cuter head and to thrust or withdraw in order to cause lateral turning of the machine, and steering means under the control of an operator for controlling the movements of the pressers.

In general, the invention will be applied to double-ended machines, and when it is so applied the pressers are preferably arranged in the cutter heads at opposite ends of the machine, each presser being located in proximity to the associated cutter or cutters.

The steering pressers may be individually under the control of pressure-fluid cylinder-and-plunger units.

Each presser may be movable at an inclination or at right angles to the length of the machine and desirably presents to the face of the seam a pressure surface which is substantially parallel to the length of the machine. In this event, each of the two pressers may be slidably mounted on a cutter head or other part of the machine, and each of them may incorporate a pressure-fluid cylinder containing a plunger anchored to the cutter head or other part.

Alternatively, each presser may be angularly movable about a pivotal mounting on a cutter head or other part of the machine and may present an inclined pressure surface to the new face of the seam. In this event, each presser may be linked to a cylinder-and-plunger unit on the associated cutter head or other part.

Examples illustrative of the invention will now be

described with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 is an elevation of a coal mining machine in which one example of the invention is incorporated, and Fig. 2 is a corresponding sectional plan. The sectioning is on the line 2—2 of Fig. 1. Fig. 3 shows a portion of Fig. 2 to a larger scale.

Fig. 4 and 5 are views similar to Fig. 3 of other examples.

Referring to Figs. 1 and 2, these views show the invention applied to a double-ended coal-mining machine of the type stated having at each end a leading cutter **6** at an intermediate level and co-planar cutters **7**, **8** and **9** above and below it. The machine comprises two relatively movable main components, one of which may be called the frame and the other of which may be called the carriage. The frame comprises mainly the two cutter heads **10** and **11** and guide bars **12** and **13** which interconnect them. The carriage comprises mainly a propulsion cylinder-and-ram unit **14**, **15** and a central jack unit **16**, **17** serving as an intermittent anchorage, both of which units are hydraulic. The cylinder **16** of the jack unit is slidable vertically and is turnable about its vertical axis in the carriage structure, in which the propulsion cylinder is incorporated and which is guided by said bars **12**, **13**.

The arrangement is such that when the jack **16**, **17** is extended to anchor the carriage between the mine roof A and floor B, the propulsion unit is operated to advance the frame in one or the other direction to effect the cutting operation on the seam, whereas when the jack is released the propulsion unit is operated to advance the carriage, the frame meantime remaining stationarily idle.

The carriage is equipped with a self-contained hydraulic system comprising a motor-driven pump, an oil reservoir and appropriate conduits, but this apparatus is not shown in the drawing, being well known per se. The propulsion unit **14**, **15** and the jack unit **16**, **17** are both operated by this hydraulic system.

In the example, each of the two pressers **18** and **19** is mounted on the wedge head **10** or **11**, being operable there by a hydraulic cylinder-and-plunger motor unit **20**, **21**. The hydraulic unit of each of the pressers **18**, **19** is connected through pipes **22** and **23** and a controller **24** or **25** to the hydraulic system; the connections include a flexible pipe **26** to a branch **27** on the high-pressure side of the hydraulic system.

As shown in Figs. 2 and 3, each presser **18** or **19** comprises a hollow body slidably mounted in the head **10** or **11** arranged at a rearwardly outward inclination to the length of the machine and this body presents an end surface **28** which is rounded but in general lies substantially parallel to the length of the machine. The motor unit which operates each presser **18** or **19** comprises a hydraulic cylinder **20** formed in the hollow body and a plunger **21** anchored at **29** to the head **10** or **11**.

The controller **24** or **25** takes the form of a distributor valve which can be manipulated to connect the associated pipes **22** and **23** to pressure and exhaust, respectively, so that the appropriate presser **18** or **19** will be thrust out; or manipulated to close both pipes **22**, **23** and thus lock the presser against movement; or manipulated to open both pipes **22**, **23** to exhaust so that the presser is inactive and can freely withdraw.

Figs. 1 and 2 illustrate the machine being propelled from left to right. The original coal face is represented by C, in Fig. 2, and the new coal face is represented by D. Normally, with the machine working in the correct line of travel, the valves **24**, **25** are both set to lock both pressers **18** and **19**, so that they act as guides against the face D without thrusting against it and without withdrawing from it. If the operator desires to steer the machine deeper into the new face D (that is, further from the original face C) he manipulates the valves **24**, **25** so that during the next cutting stroke the leading presser **18** is thrust an appropriate amount and the trailing presser **19** is permitted to withdraw an equal amount. Seeing that the frame is then being advanced by the propulsion unit **14**, **15** and the carriage is anchored by the jack unit **16**, **17**, the machine will turn laterally, or swivel, about the jack as axis. It will therefore be manifest that the distributor valves and the associated hy-

draulic motor units constitute the steering means. It will also be manifest that either of the two distributor valves can be manipulated independently of the other, so that either of the two pressers can be thrust out while the other is permitted to withdraw or is locked.

If desired, a single controller might be provided for both pressers, the arrangement to be such that when the pressers come into operation to change the direction of the machine, the one presser is active, being forced to exert a thrusting action against the face of the seam, whereas the other presser is rendered inactive.

In the construction according to Figs. 1 to 3, the machine has an auxiliary device to facilitate the work of steering. The leading cutter **6** on each head **10** or **11** is angularly adjustable about a pivot **30** under the control of the associated distributor valve **24** or **25**. As shown, hydraulic pipes **31**, **32** lead from each of these valves to opposite ends of a small hydraulic unit, namely a transverse hydraulic cylinder **33** containing a plunger **34**. A notch **35** in this plunger is engaged by an arm **36** extending from the cutter **6**. Thus, by appropriate manipulation of either distributor valve, the leading cutter can be adjusted to or from the new coal face D.

Referring now to Fig. 4, in the example therein shown a presser **18A** is a slidably mounted body with a curved pressure surface and movable at right angles to the length of the machine. In other respects, the construction is substantially similar to Fig. 3 and therefore the same reference numbers are again used to indicate corresponding parts.

Referring to Fig. 5, in the example therein shown a presser **18B** is an arm that is angularly movable about a pivot **37** on a cutter head **10** (or **11**) and it presents a curved pressure surface **38** which in general lies at an inclination to the length of the machine. In this example also the position of the presser is controlled from the associated distributor valve **24** or **25** through pipes **22**, **23** and a hydraulic cylinder-and-plunger unit **20**, **21**. In this example, the plunger rod **39** is pivotally connected at opposite ends to the plunger and presser respectively.

In the foregoing general description of the mining machine according to Figs. 1 and 2 only brief particulars are given. The machine is described in fuller detail in our patent specification numbered 144,745, now Patent No. 2,626,139.

I claim:

1. A mining machine for working along a mineral seam in a mine to cut a new face, said machine comprising a main component having a leading end and a trailing end, anchorage means located between said ends for anchoring between the floor and roof of the mine, said main component being movable lengthwise relative to said anchorage means and laterally turnable about said anchorage means as axis, face cutters at the leading end of said main component, propelling means interconnecting said anchorage means and said main component, laterally movable front and rear steering pressers on said main component, said pressers being located between the anchorage means and the leading and trailing ends, respectively, and both of said pressers being at the same side of the machine, namely the side adjacent the new face, and steering means under the control of an operator for thrusting said pressers against and withdrawing them from said new face, selectively, in order to steer the machine.

2. A mining machine according to claim 1 in which each of the steering pressers is an arm that is pivotally mounted on said main component, said arm having a curved pressure surface, and in which said arm is linked to a cylinder-and-plunger motor unit on the main component for thrusting out and withdrawing the arm.

3. A mining machine according to claim 1 in which said face cutters include one that is laterally adjustable and adjacent to the front steering presser, the machine also including an auxiliary device to facilitate the work of steering, said device comprising a motor unit on said main component connected to said laterally adjustable cutter and under the control of the operator for adjusting said cutter in relation to said presser.

4. A mining machine for working in both directions along a mineral seam in a mine to cut a new face, said machine comprising a frame having at opposite ends oppositely directed cutter heads to serve as a leading cutter head and a trailing cutter head respectively according to the direction of working of the machine, and longitudinal guides between said heads, a hydraulic anchorage jack unit carried by said guides for anchoring between the floor and roof of the mine, said frame being movable lengthwise relative to said anchorage unit and laterally turnable about said unit as axis, face cutters on said heads, a hydraulic cylinder-and-ram propelling unit inter-connecting said anchorage unit and said frame, laterally movable front and rear steering pressers on said heads, both of said pressers being at the same side of the machine, namely the side adjacent the new face, hydraulic motors on said heads applied to said front and rear pressers for thrusting said pressers against and withdrawing them from said new face, selectively, and hydraulic control means connected to said units and to said motors to control the operation thereof in order to advance and steer the machine both of said pressers being available for action in either direction of working of the machine.

5. A mining machine according to claim 4 in which the steering pressers are arms that are pivotally mounted on the leading and trailing heads, respectively, each of said arms having a curved pressure surface, and in which each of said arms is linked to a hydraulic cylinder-and-plunger motor unit on the associated head for thrusting out and withdrawing the arm.

6. A mining machine according to claim 4 in which each of the steering pressers is a body slidably mounted in the associated cutter head and in which said body is combined with the hydraulic motor unit for thrusting out and withdrawing said body, said motor consisting of a cylinder incorporated in the slidably mounted body, a plunger mating with the cylinder and fixed to said cutter head, and pressure-fluid conduits between said motor and the hydraulic steering means.

7. A mining machine according to claim 4 in which face cutters on each of the cutter heads include one that is laterally adjustable and adjacent to the associated steering presser, the machine also including an auxiliary device to facilitate the work of steering, said device comprising a hydraulic motor unit connected to said laterally adjustable cutter and under the control of the operator for adjusting said cutter in relation to the associated presser.

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