United States Patent [19]

Allen et al.

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[45] **Dec. 24, 1974**

[54] **METHOD OF MINING MINERAL**

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[52] **U.S. Cl.** **299/11,** 61/45D, 299/31

[51] **Int. Cl.** **E21c 27/24**

[58] **Field of Search** 299/11, 31, 32, 33

[56] **References Cited**

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[57] **ABSTRACT**

The invention is concerned with a system of mining mineral in which a self-propelled mining machine, having mineral cutting and collecting means, travels along a mineral face, from which it extracts and collects mineral, substantially parallel to a line of self-advancing mine roof supports. The path of travel of the mining machine is defined at one side by means connected to said roof supports and at the other side by the mineral face exposed by the mining machine as it extracts mineral therefrom. The mine roof supports are advanced behind the machine and towards the mineral face by an amount which is a fraction (e.g. half) of the thickness of the web of mineral removed from the face by the mining machine. Roof supporting extension bars of the supports may then be advanced towards the mineral face to provide roof support in the vicinity thereof. The mining machine then flits back along a path defined by the path defining means and said path defining means is then advanced towards the mineral face, by pressure fluid ram means, by the same amount as said advance of the supports. The supports are then further advanced, so that the total advance thereof is equal to the total thickness of the web of mineral removed by the mining machine, following which the path defining means is further advanced by the same amount as said further advance of the supports. This cycle of operations is then repeated after the roof supporting extension bars have been retracted if they have not automatically been pushed back by the advance of the supports towards the mineral face.

1 Claim, 7 Drawing Figures

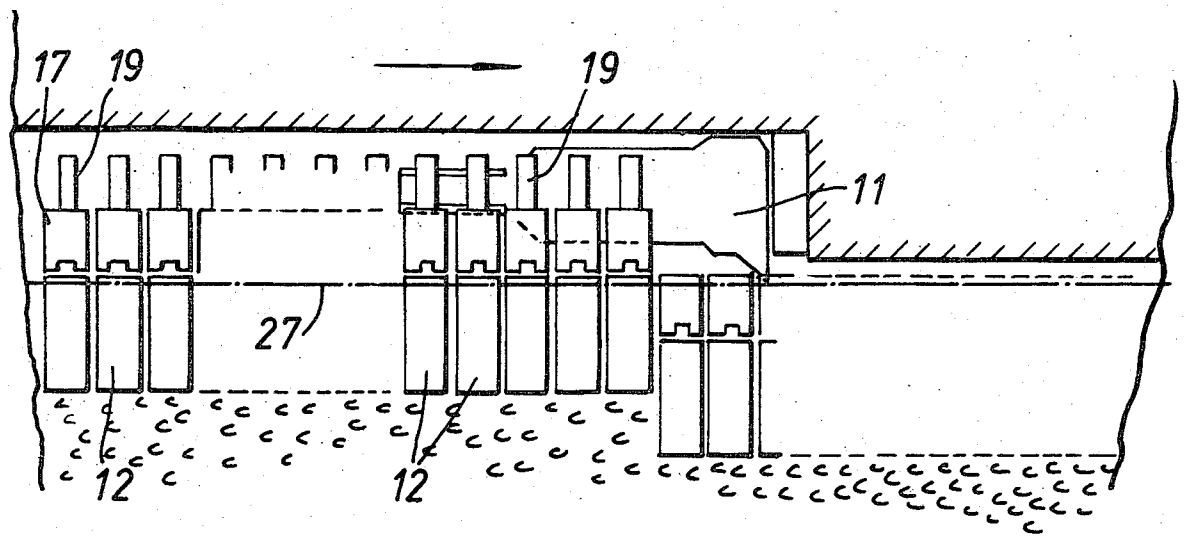


FIG. 1.

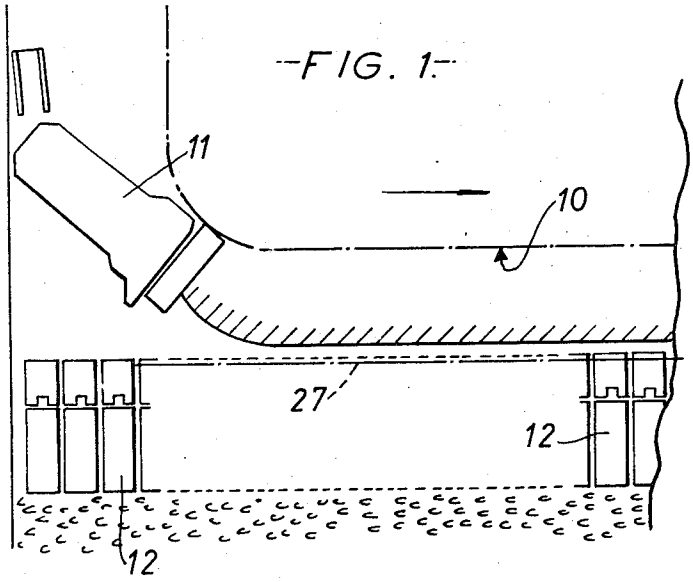


FIG. 2.

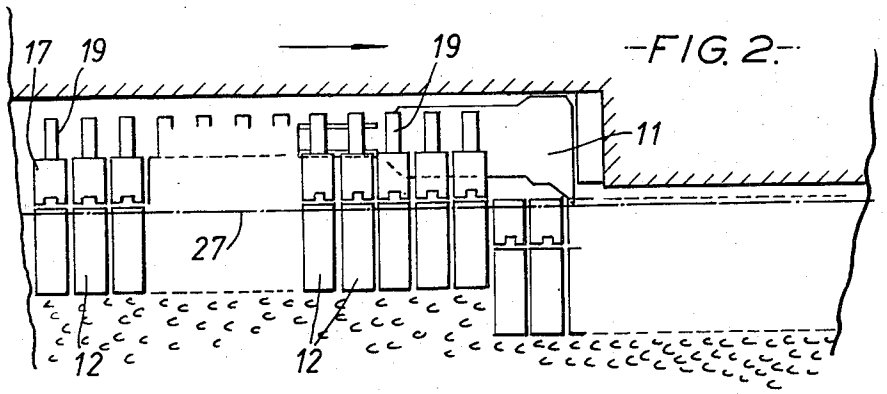
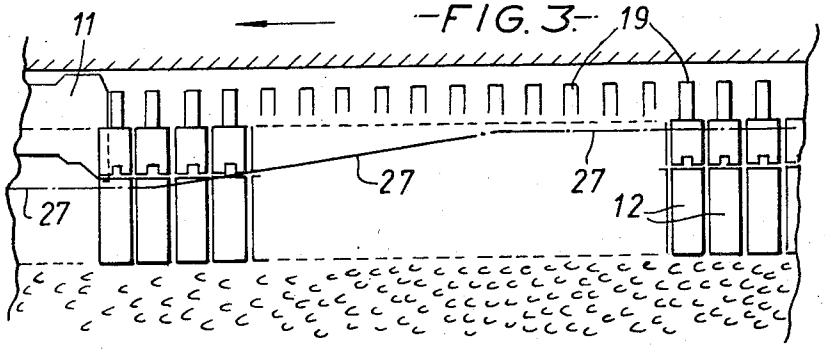


FIG. 3.



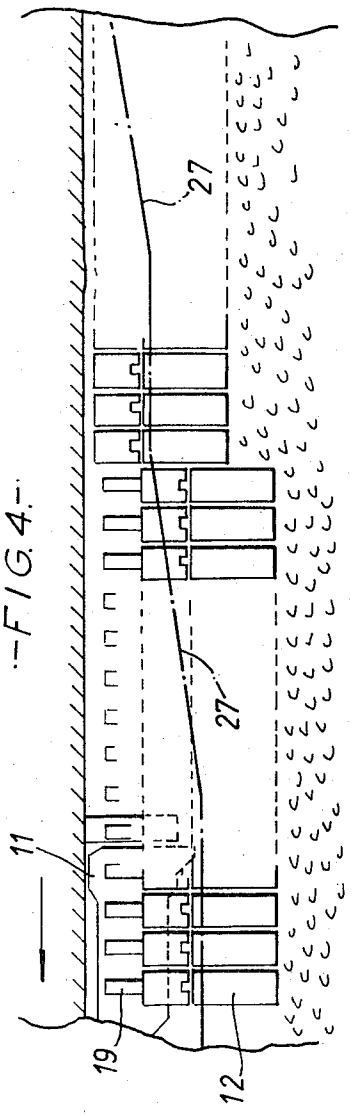


FIG. 4.

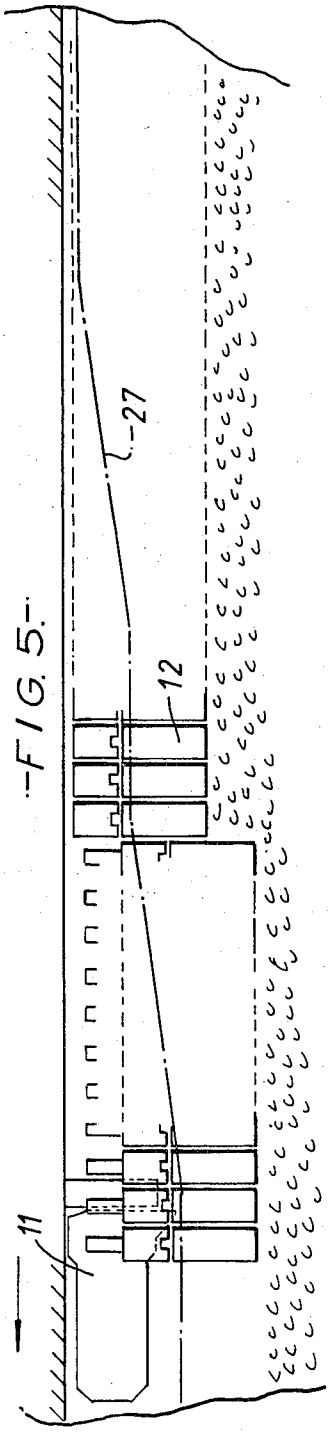
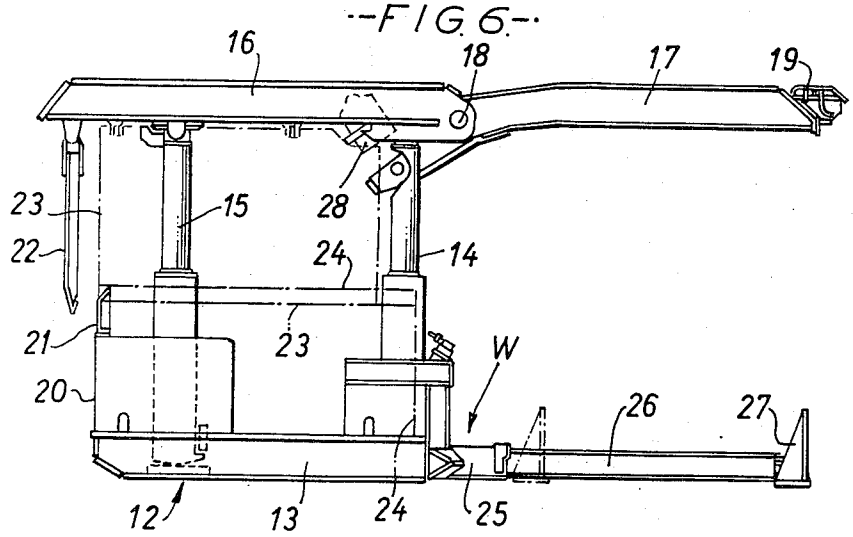
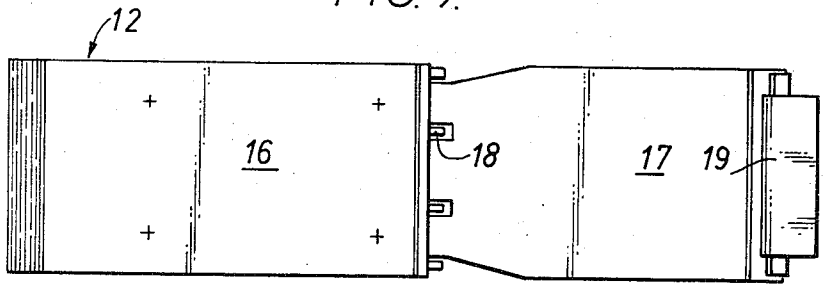


FIG. 5.

--FIG. 6--



--FIG. 7--



METHOD OF MINING MINERAL

This invention is for improvements in or relating to mineral mining systems.

According to the present invention there is provided a system of mining mineral in which a self-propelled mining machine having cutting and collecting means travels along a mineral face substantially parallel to a line of mine roof supports and in a path defined, at one side, by means connected to said mine roof supports and at the other side by the mineral face exposed by said mining machine, and in which the mine roof supports are advanced behind the machine and towards the mineral face by an amount which is a fraction (e.g. half) of the thickness of the web of mineral removed from the face by the mining machine.

The expression "self-propelled" were used in this specification, in relation to the mining machine, is intended to mean a machine which incorporates its own driving motor and is propelled by traction with a surface of the mine working e.g. the floor.

In one preferred sequence the mine roof supports are advanced (e.g. by pressure-fluid ram means incorporated in them) behind the mining machine and towards the mineral face by an amount which is a fraction (e.g. half) of the thickness of the web of mineral removed from the face by the mining machine, roof supporting extension bars of the support are advanced towards the mineral face to provide roof support in the vicinity thereof, the mining machine makes a return journey along the path defined by said path defining means, said path defining means is advanced, by pressure-fluid ram means, towards the mineral face, by the same amount as said advance of the supports, the supports are further advanced so that the total advance thereof is equal to the total thickness of the web of mineral removed by the mining machine, and the path defining means is further advanced by the same amount as said further advance of the supports.

Following the further step in the advance of the supports, the extension bars will be retracted if they have not automatically been pushed back by the advance of the supports towards the face.

Shield means may be provided to prevent flushing of mineral into the rear and/or sides of the supports during the advancing thereof. This is important where it is not possible to extend the roof-engaging structure or canopy of the supports laterally to prevent flushing of mineral into the sides of the supports.

The invention will be further described, by way of example, as applied to a particular system of shortwall mining. In the following description reference is made to the accompanying semi-diagrammatic drawings in which:

FIGS. **1** to **5** inclusive are diagrams illustrating the sequence of operations in the mining system,

FIG. **6** is a side elevation of one of the several roof supports used in the system shown in FIGS. **1** to **5**,

FIG. **7** is a plan view of the support shown in FIG. **6**.

Referring first to FIGS. **1** to **5** of the drawings, the reference numeral **10** indicates the mineral face from which a web of material is removed and collected by the self-propelled mining machine **11** each time it travels along the face from left to right, no mineral being mined from the face when the machine flits therealong from right to left. The mining machine **11** may be

mounted on wheels or endless tracks. For simplicity of description it will be assumed that the web of coal or other mineral removed from the face, during each run of the machine from left to right, has a thickness of 10 feet.

A plurality of roof supports **12** are arranged along the face in side-by-side relationship.

Each of these roof supports (see more particularly FIGS. **6, 7**) comprises a base **13** having mounted on it a pair of front hydraulically extensible props **14** and a pair of rear hydraulically extensible props **15.** These props support on their upper parts a canopy **16.** A cantilever roof-engaging member **17** is pivotally connected to the canopy at **18.** The cantilever roof-engaging member **17** has slidably supported in it an extension bar **19,** which may be of conventional form, for supporting the forward area of the roof adjacent the face as hereinafter described.

At its rear the support is provided with anti-flushing shields **20, 21** and **22** which extend from top to bottom of the support.

The support is also provided with anti-flushing side shields which extend substantially from the top to bottom of the support on both sides thereof. These side shields comprising upper and lower plates **23** and **24** which overlap. The side shields prevent mineral flushing into the sides of a support when it is advanced relatively to one of its neighbouring supports.

It will be appreciated that the normal walkway, for miners, between the front legs or props **14** and the rear legs or props **15** is obstructed by the plates **23** and **24.** To overcome this problem and provide a walkway for miners the base **13** of the support may be extended forwardly so as to provide a walkway at W.

It will be appreciated that the manner in which the side shield plates **23** and **24** overlap ensures that they will maintain a complete side shield, from top to bottom of the support, without interferring with the raising and lowering of the canopy **16** in the normal way.

A double-acting support advancing ram (not shown) is housed in the box-section beam **25** which is incorporated in the base **13** of the support. At its forward end the ram is provided with means **26,** which is guided in beam **25,** for connecting it to a section of rail or the like **27** which extends along the mineral face, the several sections of rail, associated with the several supports, being hinged or pivoted together on a vertical axis. The rail **27** serves as an anchorage for advancing each support, in the well known way, and also as a guide or path defining means for the mineral mining machine **11.**

The operation of the system will now be described in more detail with reference to FIGS. **1** to **5** of the drawings.

FIG. **1** shows the mining machine **11** in position to remove a web, **10** feet in thickness, from the face.

In FIG. **2** the mining machine has proceeded partway along the face and the roof supports **12** behind it have been advanced **5** feet by retracting their rams, which had previously been extended, and using the rail **27** as an anchorage. It will be noted that at this stage the mining machine path or track is, at least, partially protected by the cantilever roof-engaging member **17.** It will be appreciated that when one support is being advanced it is temporarily released from between floor and roof, the rail **27** being held firmly by the other supports. To provide roof support close up to the face the

roof extension bars **19** of the supports are advanced as shown in FIG. **2.**

When the mining machine has completed its journey to the right it makes an idle return journey to the left along the path defined by the rail **27** and the rail is snaked or advanced behind it towards the mineral face i.e. from the position shown in chain lines to the position shown in full lines in FIG. **6.** This is effected in two stages. Firstly, the rail is advanced by **5** feet, as shown in FIG. **3,** by extending the advancing rams. The rams are then retracted so as to draw the supports up to the rail as shown at the right hand side of FIG. **4.** Finally, the rail is advanced by a further **5** feet, as shown at the right hand side of FIG. **5,** by extending the rams. Thus, the system is left in a condition for the mining machine to make a further operative run along the face from left to right.

Conveyor means is, of course, provided for carrying away the mineral as it is removed from the face by the mining machine.

A pressure-fluid ram **28** may be provided for applying the bar **17** to the roof.

The machine **11,** which at its forward end has a shearer drum and gathering arm loader base, also has a discharge conveyor at its rear end. This discharge conveyor may be used to discharge the mined mineral into a trough-like conveyor along the mineral face which may replace the rail **27** under certain mining applications.

We claim:

1. A method of mining mineral from a mineral face which comprises the following steps:

positioning a line of self-advancing mine roof supports along and spaced from said mineral face, each of said roof supports having an extensible and retractable roof supporting extension bar, a section of a path defining means and a double-acting pressure-fluid ram means for advancing the support and for advancing said section of the path defining means, the sections of path defining means of the line of supports collectively defining with said mineral face a path parallel to the mineral face,

driving a self-propelled mining machine, which incorporates its own driving motor and is propelled by traction with a surface of the mine working, along said path so that said mining machine removes a web of mineral from the mineral face,

operating said pressure-fluid ram means to advance the mine roof supports in turn behind the mining machine and towards the mineral face by an amount which is a fraction (e.g. half) of the thickness of the web of mineral removed from the face by the mining machine,

advancing said roof supporting extension bars of the supports towards the mineral face to provide roof support in the vicinity thereof,

driving the mining machine on a return journey along said path,

operating the pressure-fluid ram means of each support to advance the path defining means thereof towards the mineral face by the same amount as said advance of the supports,

operating the pressure-fluid ram means of each support so as to advance the supports further so that the total advance thereof is equal to the total thickness of the web of mineral removed from the mineral face by the mining machine, and

operating the pressure-fluid ram means of each support to advance the path defining means thereof further by the same amount of said further advance of the supports.

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