United States Patent [19]

Frenyo et al.

[11] **3,785,703**

[45] **Jan. 15, 1974**

[54] **COAL PLOW WITH INDIVIDUALLY PIVOTED BLADES**

[75] Inventors: **Pal Frenyo; Karl-Heinz Hafer; Reimund Karkutt,** all of Bochum; **Willi Gormann,** Wanne-Eickel; **Walter Pelka,** Gelsenkirchen, all of Germany

[73] Assignee: **Gebr. Eickhoff Maschinenfabrik und Eisengresserei mbH,** Bochum, Germany

[22] Filed: **Jan. 31, 1972**

[21] Appl. No.: **222,076**

[30] **Foreign Application Priority Data**

Mar. 19, 1971 Germany ..... G 71 10 531.2

[52] **U.S. Cl.** **299/34,** 299/80, 299/91

[51] **Int. Cl.** **E21c 35/12**

[58] **Field of Search** 299/34, 36, 37, 42, 299/43, 67, 80, 88, 91

[56] **References Cited**

UNITED STATES PATENTS

3,675,971	7/1972	Frenyo	299/34
3,118,657	1/1964	Löbbe	299/34
3,342,529	9/1967	Heyer et al.	299/34
3,361,480	1/1968	Heyer et al.	299/34
3,445,138	5/1969	Löbbe et al.	299/34

FOREIGN PATENTS OR APPLICATIONS

1,103,765	2/1968	Great Britain	299/34
1,205,475	11/1965	Germany	299/34

Primary Examiner—Werner H. Schroeder
Attorney—T. H. Murray et al.

[57] **ABSTRACT**

A coal plow that can be moved lengthwise in opposite directions along a coal face has an axle projecting horizontally from its mining side. A tool supporting member is mounted on the axle for rocking parallel to the guide beam of the plow. At each end of the supporting member there is a plurality of independent blade holders disposed in a row extending upwardly beside the beam. The lowest blade holder in each row supports a bottom plow blade for engagement with the foot wall of the mine. Cutter blades have inner ends secured to the rest of the holders and have outer ends projecting toward the adjacent ends of the guide beam. Each of these holders is hinged to the supporting member on a substantially vertical axis so that the outer ends of the blades can swing laterally away from the guide beam.

5 Claims, 3 Drawing Figures

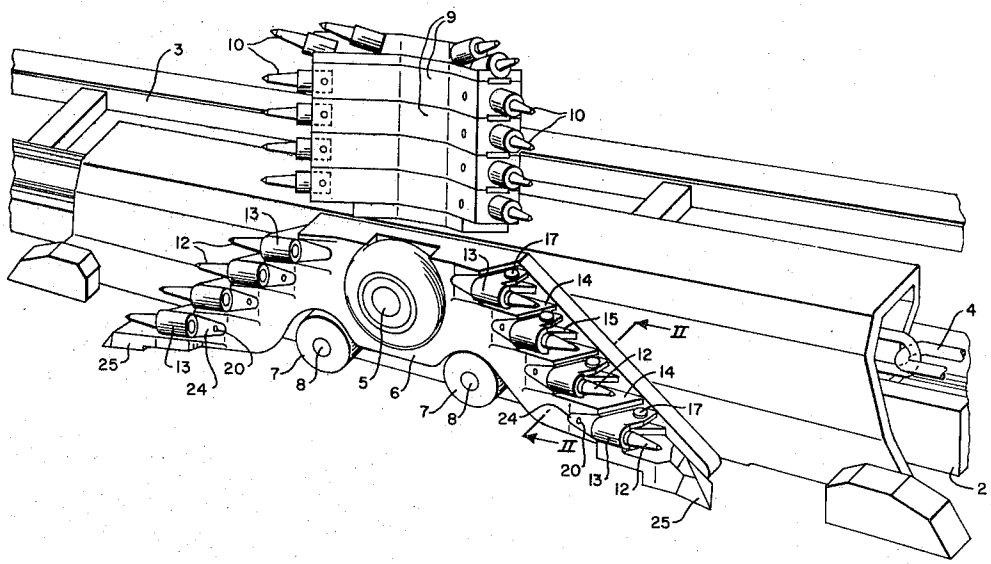
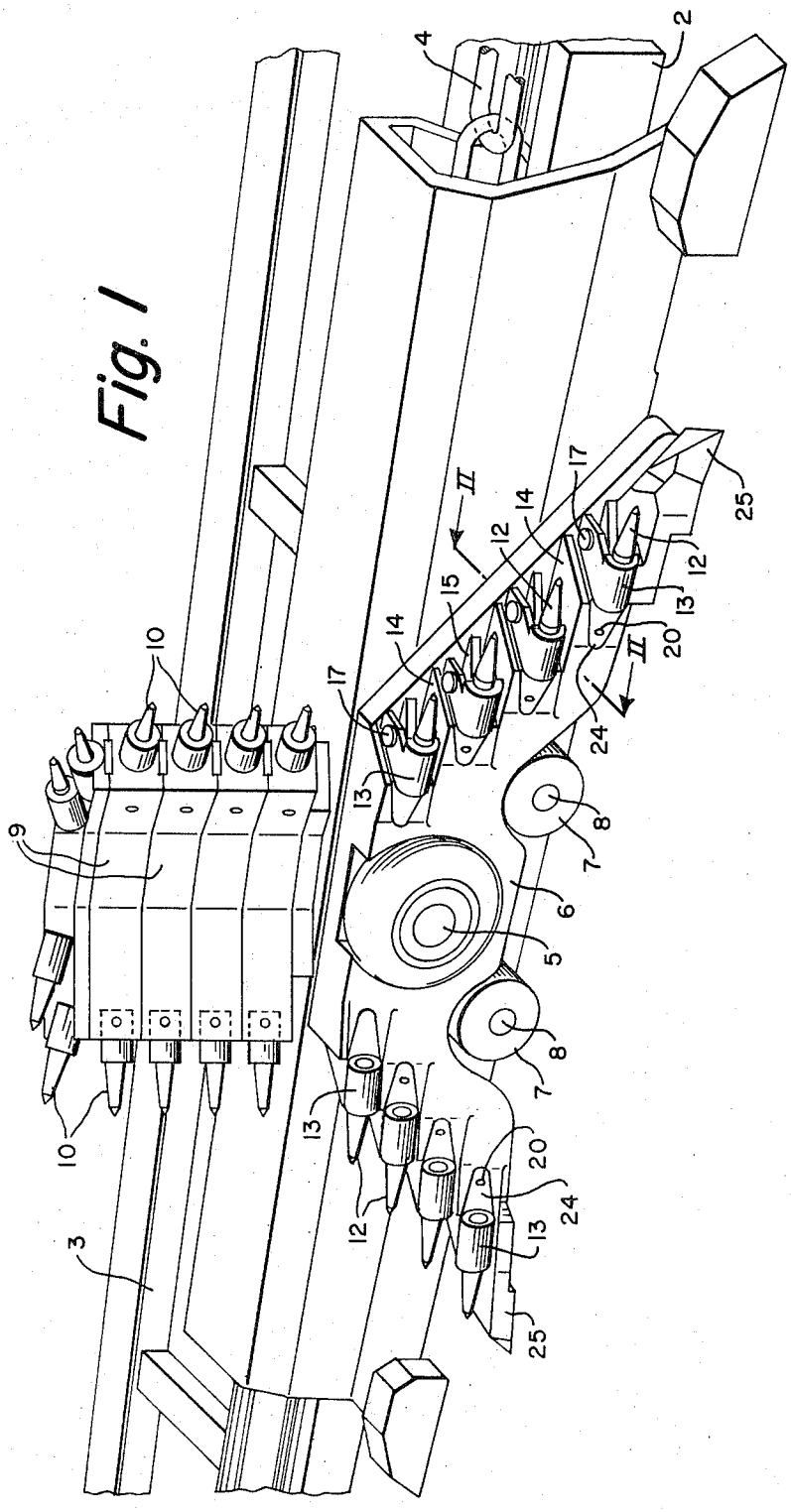


Fig. 1



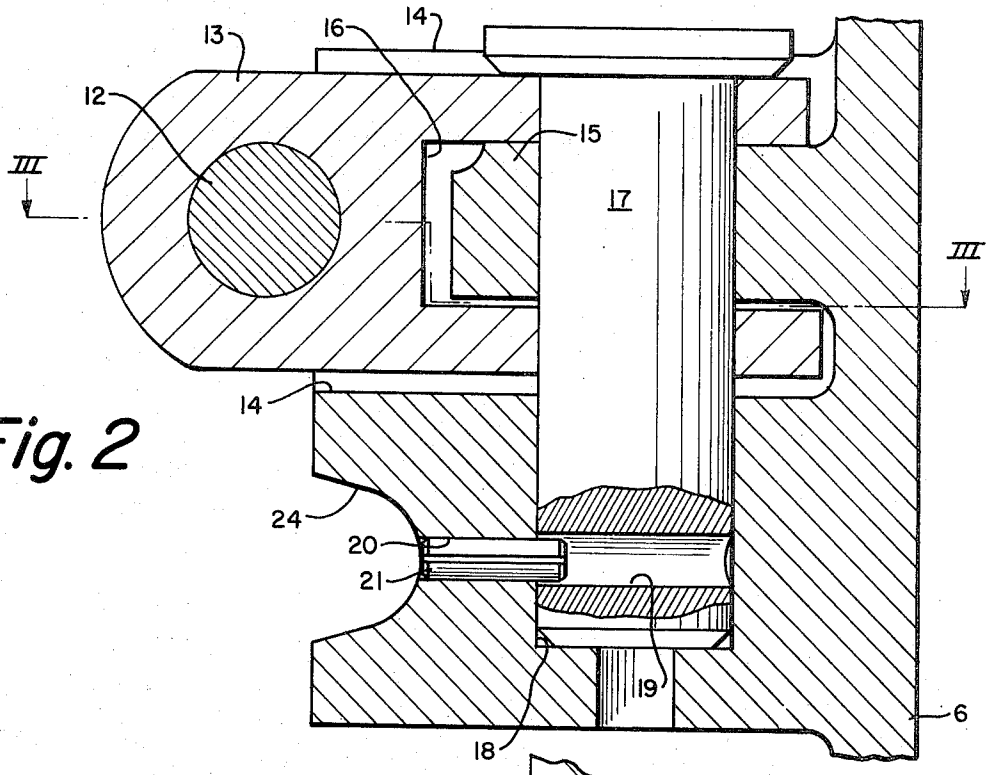


Fig. 2

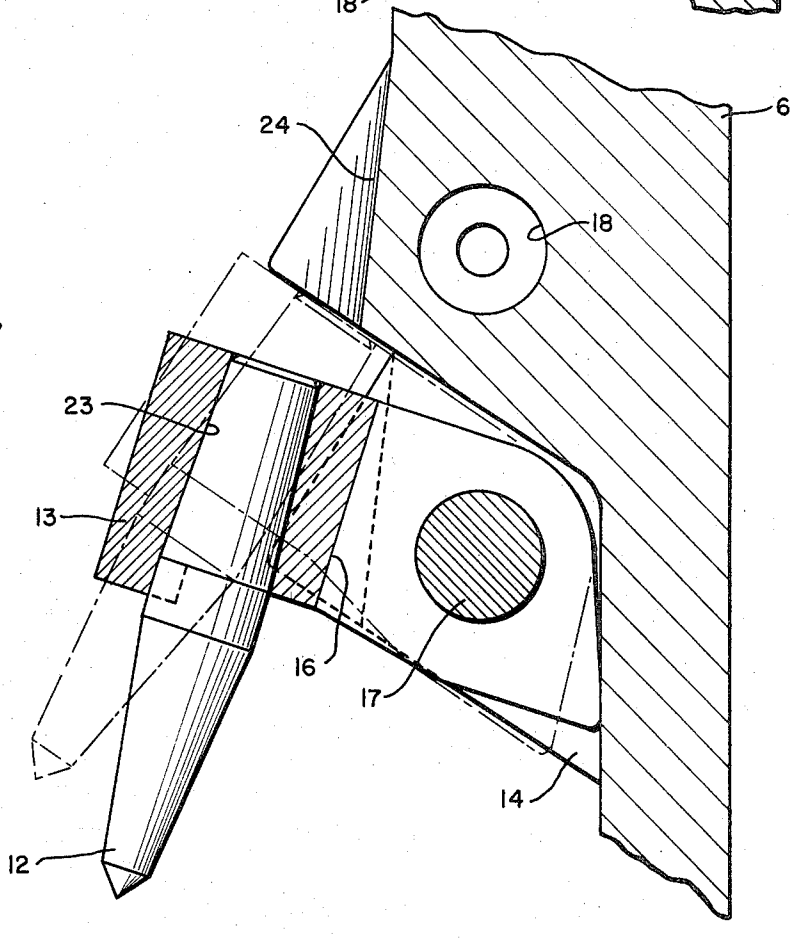


Fig. 3

COAL PLOW WITH INDIVIDUALLY PIVOTED BLADES

Coal plows are known which have a tool holder that can pivot about a vertical axis and that is provided with a front plate supporting cutting blades. The plate can be adjusted vertically relative to the tool holder in order to adjust the bits or blades so that the working level of the plow can be adjusted without changing the cutting depth of the blades. This adjustment is made by means of a hydraulically operated lifting cylinder. When the direction of travel of the plow is reversed, the blades that are at its trailing end are removed from the working face but the rear bottom plow blade slides on the foot wall or mine floor as before and increases the great friction forces during the plow's travel. Furthermore, it is problematical whether the bottom plow blades are capable of penetrating the foot wall only with the use of the pressure cylinder, since this adjusting motion must always be undertaken while the plow is stationary. Particularly with a harder foot wall, it is necessary to remove the rock that is packed under the bottom plow blade more or less extensively, since the adjusting action of the pressure cylinder can never be greater than the weight of the plow body, including the weight of the empty conveyor trough. Loading the plow cross pieces will not suffice in such cases to direct the bottom blade into the hard foot wall.

There also are coal plows in which a joint connects the guide beam and the tool holder so that the latter can be rotated a limited amount and direct its cutting blades, which are located at both ends, alternately into working position. Since the joint consists of a pin that is on a plane of the guide beam inclined at 45° relative to the working face of the coal, and in which the tool holder also is moved, the cutting blades have a horizontal motion as well as a vertical motion with each adjusting motion of the tool holder. Thus, they penetrate more deeply into the working face and into the foot wall at the leading end of the plow while they are removed from the working face and also from the foot wall at the trailing end.

Moreover, the prior art includes coal plows in which pivoted blade supports can be rotated by the cutting pressure against stops that limit their rotary motion. With such cutters, their axes of rotation are in a plane parallel to the working face but inclined at approximately 45° to the foot wall. Thus, the inclined axis are arranged so that they diverge downwardly, which makes it possible to swing the blade carriers away from the working face. However, two motion components are also produced here, due to the oblique position of both axes of rotation. One component is directed horizontally and the other vertically. The blades of the plow thus execute a motion toward the foot wall simultaneously with the motion that causes them to dig deeper into the working face. Working face cutting conditions and wall penetration depth of the bottom blade therefore are dependent upon each other with such a coal plow, but this dependency is undesirable when only the level of the working bottom plow blade is to be adjusted in order to separate the coal cleanly from the foot wall for example, or the suppress climbing motion of the face conveyor or the plow.

Furthermore, it has been sugested that a coal plow be provided with a horizontal axle projecting toward the working face. The cutting blades in this case are mounted on both ends of the tool holder that is

mounted on the horizontal axle and are held by members that can pivot to a limited extent about axes parallel to the plane of the working face but inclined in a downwardly diverging manner toward the foot wall. With a plow designed in this manner, the working position of the bottom plow blade can be changed independently of the cutting depth of the cutter blades above it. This invention is directed to an improvement on such a plow.

It is among the objects of this invention to provide a coal plow, in which the blades are supported individually, in which they can be swung independently of one another horizontally toward and away from a working face of coal, in which they can be adjusted vertically as a group independently of their horizontal adjustments, and in which the blades can be changed easily underground.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a perspective view;

FIG. 2 is an enlarged fragmentary vertical section taken on the line II—II of FIG. 1; and

FIG. 3 is a fragmentary horizontal section taken on the line III—III of FIG. 2.

Referring to FIG. 1 of the drawings, a coal plow has a body formed from a long guide beam 1 that moves along the floor or foot wall of a coal mine passage substantially parallel to a long working face of coal. The side of the beam facing the working face is called the mining side herein, and the opposite side of the beam is called the conveyor side. The guide beam is guided in its travel by a guide rail 2 that is mounted beside a coal conveyor 3 of conventional form. The guide beam is pulled back and forth along the guide rail by a chain 4 in a well-known manner.

Projecting from the mining side of the guide beam is a horizontal axle 5, on which a heavy tool-supporting member 6 is mounted for rocking motion parallel to the beam. Below the supporting member at opposite sides of the axle there are stops mounted on the guide beam to limit tilting of the supporting member on the axle. Each stop may be a cam 7 that can be adjusted around a shaft 8 projecting from the guide beam. If desired, these stops could be located above the supporting member. Rigidly mounted on top of the central portion of the guide beam are superimposed blocks 9, which support bits 10 that are inclined toward the working face. They are adjustable toward and away from that face.

At each end of the supporting member there is a row of cutter blades 12. These rows are inclined and diverge downwardly in a substantially vertical plane perpendicular to the axis of axle 5. In accordance with this invention, these blades are separately connected by individual blade holders 13 to the supporting member 6. For this purpose, the opposite ends of the supporting member are inclined upwardly toward each other and are provided with steps 14, with one blade holder located above each step. The supporting member is provided with a projection 15 extending laterally over each step, preferably from a wall closing the inner ends of the steps, and each blade holder has a horizontal slot 16 in its inner end that receives one of the projections as shown in FIG. 2. The projection and the portions of the blade holder above and below it are provided with aligned vertical openings, in which there is a substantially vertical pivot pin 17 that has a head engaging the

top of the holder. The pin extends down into a vertical passage **18** in the underlying step and is provided with a passage **19** extending diametrically through it in line with a passage **20** extending from the pin out through the tool-supporting member to its mining side. This second passage frictionally receives a locking pin **21** that projects into pin passage **19** to hold the pivot pin in place. Whenever it is desired to remove the pivot pin, the locking pin, which is shorter than the diameter of the pivot pin, is driven into the pivot pin passage. The pivot pin then can be removed with the locking pin inside of it.

The outer end of each blade holder **13**; that is, the end remote from the guide beam or nearest the working face, supports the inner end of a cutter bit or blade **12.** The outer end of the cutter blade extends in the general direction of the adjacent end of the guide beam, but it is inclined laterally away from it. The connection between the blade and its holder preferably is formed by providing the outer end of the holder with a substantially horizontal tapered passage **23** through it that receives the tapered inner end portion of the blade. The blade can be removed readily from the holder for sharpening or replacement by driving it forward out of the holder passage. If the portion of the supporting member **6** behind the holder would interfere with striking the inner end of the blade to remove it, the supporting member is provided with a recess **24** directly behind the blade for receiving a mandrel or the like for engaging and driving the blade. The bttom blade holder **13,** in addition to carrying a cutter blade **12,** also is provided with a plow blade **25** that will dig into the foot wall of the mine as the plow is moved along the guide rail **2.**

It will be seen that as the plow is moved forward in either direction, the plow blades at the front or leading end of the tool-supporting member will engage the coal face and be swung backward, which will cause the front or outer ends of the blades to swing away from the guide beam and dig into the coal face. The blade holders will swing back against the steps. On the other hand, the blades at the opposite end of the plow will merely drag along the working face and the foot wall, since their outer ends are swung toward the guide beam until the inner ends of the blade holders engage the adjacent wall of the supporting member which closes the inner ends of the steps and is inclined to substantially the same extent as the row of blades.

When the tool-supporting member **6** is tilted on its axle, all of the blades are moved in a plane parallel to the working face, those at the front moving down a short distance and those at the back rising. At the same time the blades swing laterally on nearly vertical axes, those at the front digging into the coal and those at the back retracting. Consequently, the blade adjustments can be only vertical and only horizontal. Cutter blades **12** can cut into the working face the same distance, regardless of how much or how little the bottom plow blade **25** digs into the foot wall. The two motions or cutting operations are independent of each other. Since each blade holder is independently supported it is easier to change blades than if all were connected together, alghough all blades at either end of the plow could be mounted on a common vertical holder if desired.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. In a coal plow, the combination with a guide beam adapted to be moved lengthwise along a coal face and having a mining side and a conveyor side, an axle projecting horizontally from the mining side of the beam, and a supporting member mounted on said axle for rocking thereon parallel to the beam; of a plurality of blade holders at each end of said supporting member disposed in a row extending upwardly beside said beam, a plurality of steps at opposite ends of said support member, said blade holders in each row being independent of one another and diverging in a substantially vertical plane perpendicular to the axis of said axle, said blade holders being disposed such that one of said holders is disposed above one of said steps, a bottom plow blade secured to the lowest blade holder in each row, cutter blades having inner ends secured to the rest of said holders and having outer ends projecting towards the respective adjacent ends of said beam, a projection extending over each step for hinging each holder to said support member, pivot pins for joining said holders to said projections on a substantially vertical axis, and surfaces on said steps for supporting said holders such that the outer ends of the blades can swing laterally away from said beam and that the holders can swing back against said steps for support thereby.

2. In a coal plow as recited in claim **1** wherein each of said blade holders being constructed with a substantially horizontal slot receiving one of said projections and said cutter blades being secured to the ends of said blade holders remote from said beam.

3. In a coal plow as recited in claim **1,** the ends of each blade holder remote from said beam being provided with a substantially horizontal passage therethrough receiving the adjoining cutter blade, and the mining side of said supporting member having a recess therein behind each of said passages to provide access thereto.

4. In a coal plow as recited in claim **1,** each step having a vertical passage receiving the lower end of one of said pivot pins and having a lateral passage extending from the vertical passage out through the mining side of said supporting member, the pin in said vertical passage being provided with a diametric passage aligned with said lateral passage, and a locking pin frictionally held in the lateral passage and projecting into the pivot pin passage, the locking pin being shorter than the pivot pin passage and drivable into it to permit the pivot pin to be removed.

5. In a coal plow as recited in claim **1,** said blade holders being provided with stop faces for engaging vertical surfaces of said supporting member to limit the pivotal movement of the holders.

* * * * *