April 17, 1962 H. HERRMANN 3,030,087

VIBRATING PLOWING TOOL

Filed July 9, 1958

Fig.1

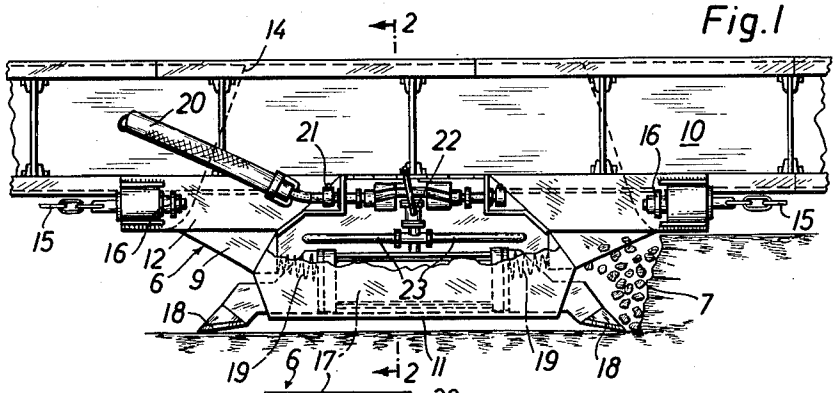


Fig.2

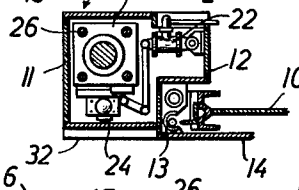


Fig.3

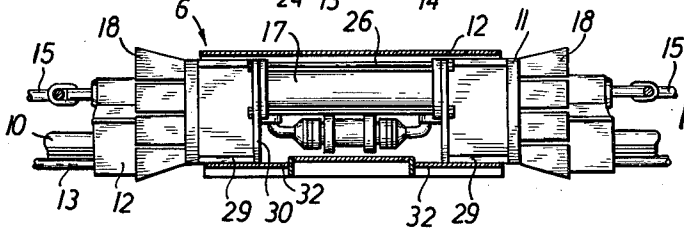


Fig.4

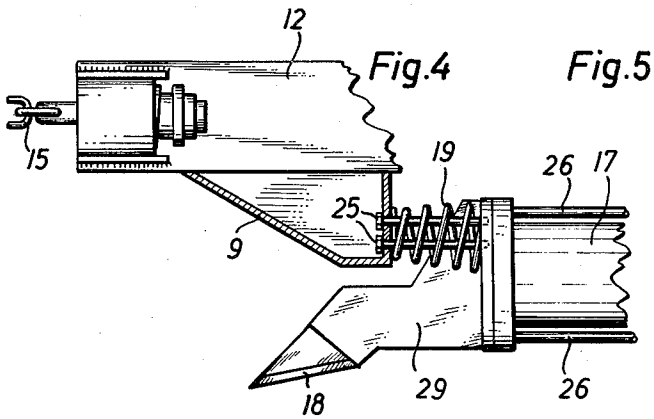
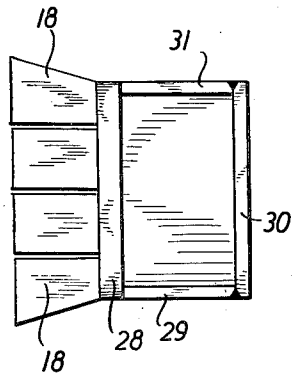


Fig.5



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VIBRATING PLOWING TOOL

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5 Claims. (Cl. 262—15)

The present invention relates to plows useful, for example, in the mining of minerals such as hard coal. More particularly, the invention relates to plows such as are used in the mining of mineral values with long face mining planers such as is described in Patent 2,691,514, issued October 12, 1954, to the assignee of Wilhelm Lobbe.

It is known to activate plows of the type to which the invention particularly relates with vibration imparting devices. According to the known procedure, the plow which is pulled in the customary manner along the coal face is at the same time vibrated in its longitudinal direction so that it alternately lifts itself away from the coal face in opposition to the advancing force and then strikes the working face. Such an activated plow has become known as a "rapid getter." It is suitable in particular for the mining of very hard coal which is otherwise obtained only with the use of explosives.

A primary object of the present invention is to provide a vibrated plow which gives improved performance over that of heretofore known plows.

This and other objects are attained according to the invention in the manner described hereinafter with reference to the accompanying drawings. In the drawings:

FIG. 1 is a plan view of a plow according to the invention and employed in combination with a conveyor;

FIG. 2 is a cross-section taken along line 22 in FIG. 1;

FIG. 3 is an elevation view of the plow device shown in FIG. 1, a portion of the device being broken away in order to better disclose the structure;

FIG. 4 is a plan view on an enlarged scale of a portion of the device shown in FIG. 1, and again a portion of the structure is broken away in order to better disclose the construction of the device; and

FIG. 5 is a plan view of a plowing tool and supporting structure therefor, which is suitable for use in combination with the device of the invention.

The invention provides a mining tool comprising a plow assembly 6 and advancing means for advancing the plow assembly along a path. The advancing means can be a chain 15 secured to each end of the plow assembly 6 and operatively engaged with a drive means (not shown) suitable to advance the plow assembly longitudinally of the chain 15.

The plow assembly includes a base member, a working tool, such as the working tools or plow cutting tools 18, for engaging and plowing material, and a vibration generating means for vibrating the working tool in the direction of the path along which the assembly moves. The vibration generating means is secured to the working tool, and is movably secured to the base member so that it can move in respect thereto in the direction of the path traversed by the plow assembly in response to the movement of the chain.

A distinctive feature of the mining tool of the invention is the mounting of the vibration generating means so that it is movable with respect to the base member. In a preferred embodiment of the invention, this mounting is by way of precompressed springs which are disposed with their axis extending in the direction of the path traversed by the assembly, and are positioned between the vibration generating means and the base member. The working tool can be fixably secured to the vibration generator.

Desirably, the advancing means is joined to the plow assembly 6 by springs 16 so that transfer of vibration from the vibration generator to the advancing means is inhibited.

Referring now to the details of the drawings, the mining tool of the invention is shown in the drawings in combination with a long face mining planer such as is described in the aforementioned Patent 2,691,514. The mining planer is disclosed with its conveyor 10 parallel to and adjacent the mine working face 7. Disposed on the working face side of the conveyor 10 is the plow assembly 6 which is connected at its ends through springs 16 with chain 15. The chain is operatively connected with drive means (not shown) suitable to move the plow assembly longitudinally of the conveyor so that the plow working tools engage the mine working face loosening and tearing material therefrom. Thus, the working tool is arranged for working in the direction of the path along which the tool is moved by the chain 15.

The plow assembly 6 comprises a housing or base member 12, a vibrating device in the form of pneumatic inertia engine 17 and the plow tips or working tools 18. As can be best seen in FIG. 5, the working tools 18 are mounted on a support formed by the assembly bar 28, a lower plate 29, upper plate 31, and end plate 30. The end plate 30 is fixedly secured to the engine 17 by bolting 26, and the resulting assembly of the engine and working tools is mounted on springs precompressed and positioned longitudinally of the path traversed by the plow assembly and between the engine-working tool assembly and the base member 12. Brackets 9 extend outwardly from the base member 12 and receive the springs in a bolting relationship. The brackets are bolted to the working tool support end plate 30 to assure proper positioning of the spring.

As can be best seen in FIG. 3, where the front plate 11 of the housing 12 is removed in order to better set forth the construction of the mining tool, the engine-working tool assembly via lower plates 29 is supported on and slidably engages the bottom plate 32 of the housing 12. The slidable mounting and the spring mounting of the engine-working tool assembly on the base member render the working tool longitudinally movable in the direction of the working path in response to vibration of the engine and permit the improved results characteristic of the invention.

The plow assembly is provided with piping for the pneumatic inertia engine including air intake piping 23, shut off valve 22, and quick disconnects 21 which are provided for connecting a flexible hose 20. The flexible hose 20 is from the compressed gas source, and can be connected on either side of the plow assembly depending upon convenience. In a preferred embodiment of the invention the housing 12 extends longitudinally of the engine 17 and closely fits about the engine. With such construction, the gas discharge 24 of the engine 17 can preferably be arranged to discharge exhaust gas from the engine into the housing. This gas will contain some lubricant, and due to its deposition within the housing, lubrication will be provided for the slidably engaging surfaces of the housing and the working tool engine assembly. Moreover, discharging exhaust gas in this manner will cause a current of gas from the neighborhood of the engine to without the plow assembly and this will tend to prevent infiltration of small size material which might interfere with operation of the mining tool.

The pneumatic inertia engine may be of conventional construction including for example a double acting cylinder apparatus having a freely moving double piston disposed therewithin. By suitable control means, such

as an auxiliary double acting control piston slide similarly disposed within a control cylinder housing, intake air may be alternately directed via one side of the control piston slide to one side of the main piston and via the other side of the control piston slide to the other side of the main piston. As a result, the main piston will be air driven back and forth within the main cylinder causing the desired vibration to be translated through the cylinder housing to the directly connected working tools **18**.

The interconnection between the plow assembly **6** and the conveyor **10** whereby transverse movement of the plow assembly is inhibited and positioning of the plow is maintained is generally similar to that described in the aforementioned Patent 2,691,514. Thus, as can be seen in FIG. 2, a base plate **14** attached to the lower portion of housing **12** is provided for assisting in positioning of the plow assembly, a base plate **14** gliding under conveyor **10** to prevent uplifting of plow assembly **6** from its normal position. Also, as can be seen in FIG. 2, a planer or plow guide tube **13** is disposed along the mining tool intermediately conveyor **10** and the housing **12**, tube **13** being connected for instance to conveyor **10**. Desirably, as is seen in FIG. 2, the housing is formed with a recess so that it fits closely about the planer or plow tube **13** and the adjacent side of the conveyor **10** and conveniently permits sliding of the housing along the tube to take place with ease.

Thus, as can be seen from the drawing taken with the above description thereof, the invention provides a mining tool suitable for vibrating working tools, arranged for travel in the direction of the working path, i.e. back and forth in line with the direction in which the work tools are advanced. Due to the slidably mounting and also the spring mounting of the working tools and vibrating means, this vibration is attained without vibrating substantially the entire plow assembly. Moreover, such vibration as is transferred from the working tool vibrator assembly to the entire plow assembly is to a considerable measure taken up by the springs **16** which interconnect the plow assembly with the chain **15**, so that vibration of the working tools is effected without substantially transmitting the vibration to the chain **15**.

The precompressed springs **19** are preferably selected so that the vibration is substantially restricted to the working tool-engine assembly and is not transmitted to any considerable extent to the entire plow assembly. For this purpose, guide pins **25** are fixedly positioned onto the end walls of the engine housing, their free ends being slidably received within bearing apertures of brackets **9** and being retained against disengagement at their outermost limit by suitable flange means. Springs **19** are disposed over guide pins **25** in precompressed condition between the adjacent corresponding walls of bracket **9** and engine **17**. Thus, under spring compression caused by engine vibration, guide pins slide into bracket **9** via said apertures, their return movement being effected by compression force of the springs **19**. As a consequence, the vibrating motion is substantially absorbed by springs **19** so that it does not pass onto base member **12**. Guide pins **25** prevent radial displacement of springs **19** as well as displacement of the engine **17** and the working tools **18** out of their desired longitudinal path of travel.

I claim:

1. A mining tool comprising a plow assembly adapted to be advanced along a path for extraction of minerals adjacent said path, said assembly comprising a housing, a working tool for working in the direction of said path, support means for supporting the working tool slidably mounted within said housing, and a pneumatic inertia engine for vibrating the working tool in the direction of said path disposed within said housing and fixedly connected to said working tool, said engine having its gas discharge positioned in said housing.

2. A mining tool according to claim 1 in which said pneumatic inertia engine is of the type discharging lubricant in its gas discharge and in which the gas discharge of the engine is positioned in said housing to lubricate the sliding of said support means.

3. A mining tool according to claim 1 in which said support means is resiliently connected to said housing.

4. A mining tool according to claim 3 in which said support means includes a guide pin fixedly secured to said pneumatic inertia engine and slidably secured to said housing, said guide pin having disposed therealong spring means capable of being compressed by movement of said pneumatic inertia engine and working tool with respect to said housing.

5. A mining tool according to claim 4 in which said pneumatic inertia engine is positioned with its axis extending in the direction of said path and in which said housing surrounds said inertia engine along its intermediate portion and being provided with a guide pin and spring means at each of its opposed end portions.

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