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FLEXIBLE PUSHER PLATE FOR BORING TYPE MINING MACHINE

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3 Sheets-Sheet 2

Fig. 2

Fig. 3

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FLEXIBLE PUSHER PLATE FOR BORING TYPE MINING MACHINE

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This invention relates generally to boring type mining machines arranged to cut a plurality of contiguous bores in the seam of coal or the like and more particularly to pusher means for deflecting the cuttings into the conveyor of such machines.

It has heretofore been customary to provide boring type mining machines with a laterally extending pusher plate at opposite sides of the machine and to the rear of the boring heads so as to aid said boring heads in sweeping the cuttings inwardly toward the center of the machine in position to be gathered by a conveyor. The outer edges of these pusher plates are usually of arcuate form to fit the bore patterns of the boring heads adjacent the mine floor while the machine is in operation, thus preventing escape of the cuttings rearwardly along the ribs of the bores. However, in order to afford maneuverability of the machine in the mine, as for instance when withdrawing the machine from the working face, means have been provided for collapsing the pusher plates toward the machine, which means has heretofore usually consisted of various linkage arrangements providing inwardly and upwardly swinging movement of the pusher plates. In some instances the outer ends of the pusher plates have been provided with a single flaps of rubber belting material but these flaps have proved inefficient because they are too limber to do an effective job, and are often torn from the adjacent steel plates while maneuvering the machine.

In addition, the provision of flexible rubber extensions at the ends of the pivotally mounted pusher plates tends to interfere with the telescopic swinging movement of the pusher plates with respect to lapping pusher plates fixed on the machine frame.

The principal object of the present invention is to provide an improved form of flexible pusher plate of sufficient flexibility to permit maneuvering of the machine, but sufficiently stiff to withstand the heavy pressures thereon during the cutting operation.

A further object of the invention is to provide an improved form of pusher plate, including a yieldable outer portion thereof which pusher plate is so mounted on the lower horizontally extending trimmer bar that the said plate is fixed on and movable vertically with the trimmer bar, thus eliminating the complications inherent in swinging the pusher plate upwardly and inwardly with respect to the trimmer bar, as in previous conventional constructions.

The invention can best be understood by reference to the accompanying drawings in which:

Figure 1 is a side elevation view of a mining machine constructed in accordance with the present invention;

Figure 2 is an enlarged, fragmentary detail section taken along line 2—2 of Figure 1, but with the cutter chain removed from the lower trimmer bar.

Figure 3 is a view similar to Figure 2, but showing the lower trimmer bar and the adjacent pusher plate in elevated position.

Figure 4 is a detailed perspective view of one form of pusher plate, with the adjacent sprocket wheel of the trimmer bar omitted;

Figure 5 is a section taken along line 5—5 of Figure 4;

Figure 6 is a detail perspective view of another form of pusher plate;

Figure 7 is a sectional view taken along line 7—7 of Figure 6;

Figure 8 is a detail perspective view of another form of pusher plate;

Figure 9 is a sectional view taken along line 9—9 of Figure 8;

Figure 10 is a fragmentary horizontal section of the form of pusher plate shown in Figures 6 and 7, to illustrate how the flexible portion of the plate will deflect while passing a fixed abutment; and

Figure 11 is a section similar to Figure 10, but showing how the flexible portion of the plate will deflect when moved endwise toward a fixed abutment.

Referring now more particularly to details of the embodiment of the invention shown in the drawings in Figure 1, the numeral 10 refers generally to a boring type mining machine, having a frame 11 mounted on crawlers 12 and a conveyor 13 mounted on the frame with an open throat 13a at the front of said frame. An auxiliary frame 14 is supported on frame 11 by jacks 16 and 17 in such a manner that the auxiliary frame 14 can be elevated or tilted in varying directions, as usual, relative to the main frame 11. An upper trimmer bar 19 and lower trimmer bar 21 are mounted on the auxiliary frame by jacks 18 which permit vertical adjustment of said trimmer bars. In the form of trimmer bars shown herein, said bars each consist of chain guides for an endless cutter chain 22.

A pair of cutter heads 23 are rotatably mounted as usual on laterally spaced axes on auxiliary frame 14 so as to cut contiguous bores in advance of the machine.

Referring now to Figs. 2 and 3, the flights 32 of conveyor 13 extend to a point adjacent the throat 13a in position to receive and carry away the cut and dislodged material from a position just behind the lower trimmer bar 21. The latter bar has an extension 37 at its end on which is rotatably mounted chain sprocket 26. The cutter head 29 on auxiliary frame 14 has a short cutter chain detector 27 about which the chain is passed after leaving sprocket 26.

An upright pusher plate body 33 of sheet metal is fixed, as by bolts 31 along the outer end of the trimmer bar 21, with an inner extension 33a at one side of the conveyor throat 13a. Also mounted on hub 39 is a plate 35 which overlaps pusher plate 33 and covers the gap between hub 39 and pusher plate 33 when the trimmer bar 21 is in its lower position. A flexible lateral extension of pusher plate 33 extends for cooperating relation with the rib 36 of the seam of coal and is secured to the pusher plate body by bolts 35. The construction of pusher plate 33 is shown in greater detail in Figs. 4 and 5 where it is seen that the flexible extension consists of two lapped sheets 34a and 34b of flexible material such as rubber belting. A spacer 41 spaces the two flexible sheets. In the form shown, the flexible extension is made from a single length of flexible material folded over the top to provide greater stiffness for said extension. The side edges of the two sheets 34a and 34b may both contact the adjacent rib 38 cut by the boring head 23, with considerable stiffness, due to the upper fold, and yet providing a sufficient degree of flexibility to the lower portion of the extension.

Figs. 6 and 7 show a variant form of the flexible extension differing chiefly in that the two folded sheets
34a and 34b have their outer edges jointed together by suitable means such as a line of bolts 36. One sheet would bear against the rib 38 while the other sheet would act to stiffen the otherwise relatively limber lower portion of the flexible extension.

Figs. 8 and 9 illustrate still another variant form of flexible extension in which a pair of spaced flexible sheets 37, 37 are disposed intermediate the metal pusher plate body 33 and an outer rib-engaging element 42, preferably of a high abrasion-resistant metal. The sheets 37 may or may not be made of one piece folded over inasmuch as the shorter overhang length of flexible material together with the stiffening effect of securing the outer edges may not require the added stiffness provided by the upper horizontal fold.

In use, the pusher plate structures hereinafore disclosed will fit snugly to the rib during the forward or mining cycle, then will yield during the reverse or retreating cycle, as indicated in Figure 10, when the mining machine may not stay on a central course with respect to the room mined; and then will yield laterally as the mining machine forces itself toward the rib as when a turn or crosscut is initiated, as indicated in Figure 11. Thus, Figures 10 and 11 show that the yieldably flexible pusher plate extension is capable either of flexure or of a bellows-like collapsing action when the outer edges of the flexible extension encounters an immovable or fixed abutment on an adjustment rib.

It will be noted further from the above description that the improved form and arrangement of pusher plates is fixed to and movable vertically with the lower trimmer bar 21, thus eliminating the necessity for more complicated linkage means heretofore employed for rocking the pusher plates upwardly and inwardly on the outer ends of the trimmer bar.

Although I have shown and described a certain embodiment of my invention, it will be understood that the invention is not limited to the exact construction shown and described herein, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a multiple boring machine having a frame, a plurality of boring heads rotatable on said frame for cutting contiguous bores in advance of the frame, a horizontally disposed trimmer bar adjustable vertically of the frame rearwardly of the paths of rotation of the boring heads between a floor level approximately tangential to the maximum vertical diameters of said boring heads to positions substantially above said floor level, and an upright rigid pusher plate fixed on and adjustable vertically with said trimmer bar, said pusher plate including a flexible extension projecting laterally beyond the end of the trimmer bar and having an arcuate outer edge adapted to engage the arcuate rib formed by the adjacent boring head adjacent the floor, said extension consisting of a pair of flexible sheets formed of a single length of material folded downwardly in a general U-shape along its upper edge.

2. In a multiple boring machine having a frame, a plurality of boring heads rotatable on said frame for cutting contiguous bores in advance of the frame, said frame having a material removing conveyor with a loading throat at the front of said frame adjacent the floor level, a horizontally disposed cutter-chain carrying trimmer bar adjustable vertically of the frame rearwardly of the paths of rotation of the boring heads between a floor level approximately tangential to the maximum vertical diameters of said boring heads to positions substantially above said floor level, said trimmer bar and guide sprockets fixed on the opposite ends of said trimmer bar and upright rigid pusher plates fixed on said trimmer bar at opposite sides of said conveyor throat for vertical adjustment with said trimmer bar and guide sprockets, each of said pusher plates having a flexible laterally projecting extension fixed thereon for straight line vertical adjustment therewith, said extension having an arcuate outer edge adapted to engage the arcuate rib of the bore formed by the adjacent boring head adjacent the mine floor.

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