April 9, 1963 W. H. BARRETT 3,084,920

PUSHING DEVICES FOR MINE CONVEYORS

Filed Feb. 27, 1961 2 Sheets-Sheet 1

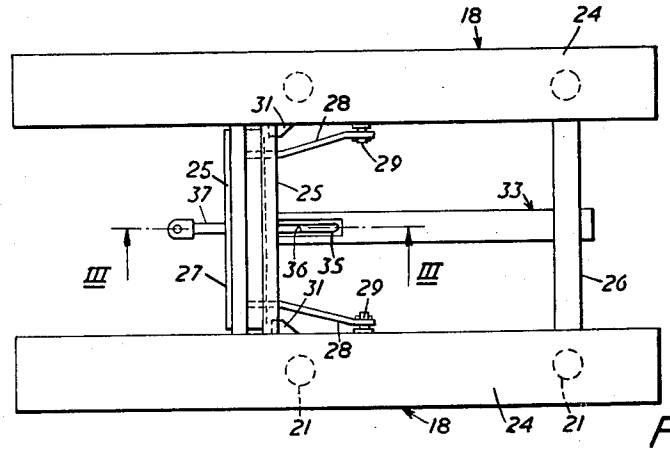


FIG. 1.

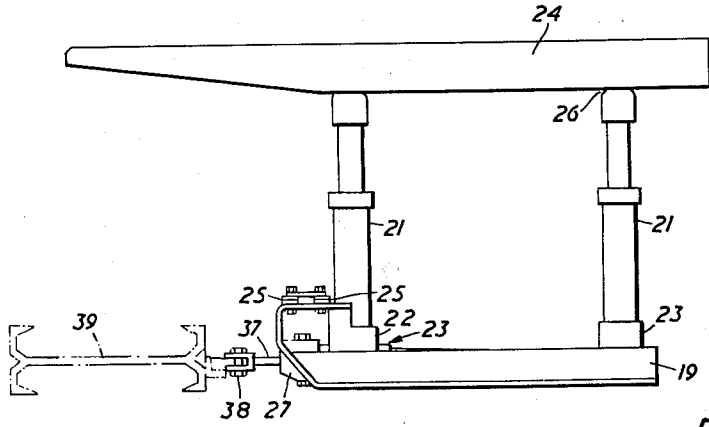


FIG. 2.

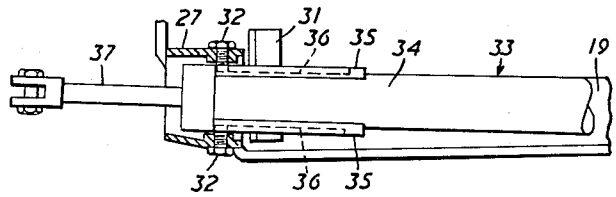


FIG. 3.

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PUSHING DEVICES FOR MINE CONVEYORS

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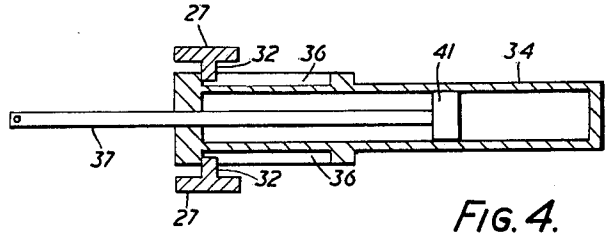


FIG. 4.

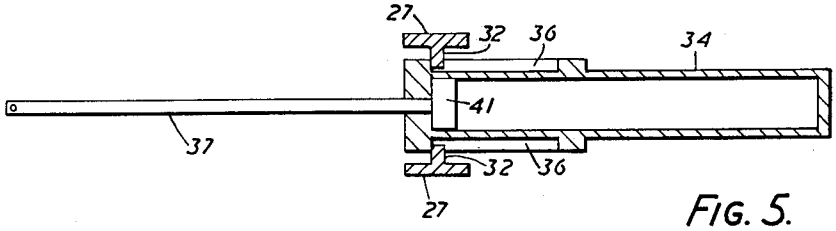


FIG. 5.

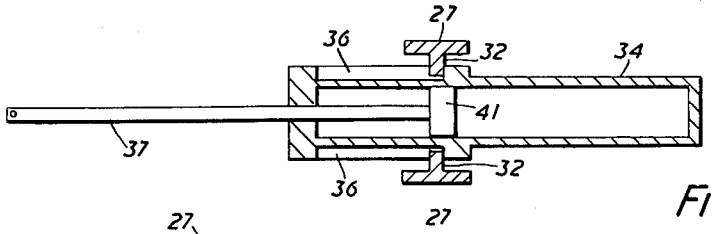


FIG. 6.

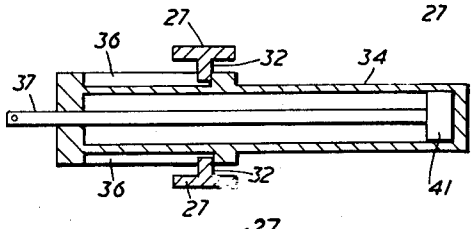


FIG. 7.

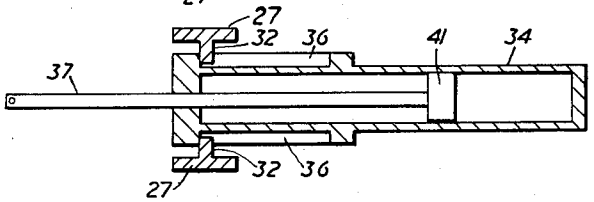


FIG. 8.

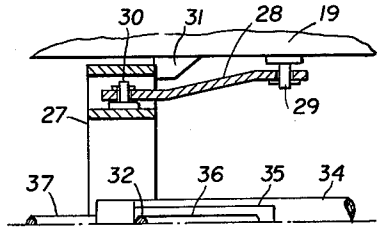


FIG. 9.

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# PUSHING DEVICES FOR MINE CONVEYORS

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8 Claims. (Cl. 262—1)

This invention relates to pushing devices for a conveyor at the face of a mine where coal is stripped by traversing a plough along the face in front of a flexible conveyor, the pressure on which caused by the pushing devices is used to hold the plough against the coal face. The pushing device is broadly of the known kind comprising a push-pull jack mounted on a strut which may either be a simple strut arranged to be jammed between the floor and roof of the mine or a roof support unit arranged to be extended between the floor and roof, the jack being connected to the conveyor for advancing same when the strut is fixed and for advancing the strut by pulling on the conveyor when the strut is free. Such pushing device will hereinafter be referred to as a pushing device for the purpose specified.

In using such a pushing device on a plough face, it is important not to advance the strut so close to the conveyor that the jack is unable to contract through the distance by which the adjacent section of the conveyor is pushed back when the plough traverses in front of the pushing device. The required limit to contraction of the jack during the advance of the strut is automatically provided, in accordance with the invention, by a lost-motion mounting of the jack between the strut and the conveyor which provides an extent of free longitudinal movement during hydraulic operation of the jack which is not less than the effective depth of the plough through which the conveyor sections are pushed back.

The invention is illustrated in the drawings accompanying this specification, of which:

FIGURE 1 is a plan view of an abutment strut formed as a roof support unit having a push-pull jack with a lost-motion mounting;

FIGURE 2 is a side elevation of the unit shown connected to a conveyor;

FIGURE 3 is a part sectional view of the jack mounting on the line III—III of FIGURE 1;

FIGURES 4 to 8 are sequence diagrams showing the operation of the push-pull jack;

FIGURE 9 is a detail view in plan and partly in section showing one of the linked connections between the yoke on which the push-pull jack is mounted and one of the floor bars of the roof support unit.

The roof support unit comprises two extensible and contractable parallel frames **18** each having a floor bar **19**, two telescopic props **21**, mounted in sockets **22**, **23** on the floor bar, and a cantilever roof bar **24** carried by the heads of the props **21**. The frames **18** are connected by two pairs of transverse spring steel strips **25** which are secured at their ends to raised front portions of the floor bars **19**, and by a transverse spring steel strip **26** which is held at each end between the head of the rearmost prop **21** and the roof bar **24**.

A yoke **27** extends transversely between the floor bars **19** beneath the front steel strips **25**, and it is connected by links **28** to pins **29** which are fixed on the inner sides of the floor bars **19**. FIGURE 9 shows the connection at one side of the yoke provided by a link **28** which is pivoted at its forward end on a pin **30** fixed in the yoke **27**, and which is pivoted at its rearward end on the pin **29**. The connection at the other side of the yoke is similar. There is sufficient play in the pivoted connections of the links **28** on the pins **29** and **30** to enable the yoke **27** to move a small distance and away from engagement with abutments **31** which are fixed on the inner sides of the floor bars **19**. This end play is merely to enable a forwardly acting load on the yoke **27** to be taken in tension by the links **28** while a rearwardly acting load on the yoke **27** is sustained directly by the abutments **31** on the floor bars **19**. The end play referred to is so small that it can be disregarded in the operation sequence hereinafter described. Two screws **32** are fixed on a vertical axis at the centre of the yoke **27** to locate a double-acting push-pull hydraulic jack **33**. The jack **33** comprises a cylinder **34** having plates **35** fixed on its upper and lower sides, while longitudinal slots **36** in the plates **35** receive the inner ends of the screws **32** to form a pin and slot lost-motion mounting for the cylinder **34**. The jack **33** has a piston rod **37** extending forwardly into pivotal engagement at **38** with the side of a flexible conveyor **39**. The opposite ends of the slots **36** form stops which permit longitudinal movement of the cylinder **34** in the yoke **27** through a distance which is not less than the effective depth of the plough through which the conveyor **39** is pushed rearwardly upon traverse of the coal plough (not shown) on the face side of the conveyor. The jack **33** can pivot about the screws **32** to allow for the pivotal connection **38** with the conveyor **39** being off-centre with respect to the roof support unit.



It is to be understood that a number of roof support units of the kind described will in use be spaced side by side along the coal face with their jacks **33** acting in thrust against the conveyor **39** to maintain cutting pressure of the plough on the coal face.

The sequence of operations will now be described with reference to FIGURES 4 to 8. The jack **33** is shown in FIGURE 4 with the piston **41** displaced from the rear end of the cylinder **34** through a distance which is at least equal to the depth of the plough. During coal cutting fluid pressure acts through the rear end of the cylinder **34** on the full area of the piston **41** and the piston **41** can yield in the cylinder **34** as the plough passes without bottoming on the rear of the cylinder **34**. As the coal face is advanced by successive traverses of the coal plough, the piston **41** advances towards the front end of the cylinder **34**, as shown in FIGURE 5, and at or before this stage is reached it is necessary to advance the roof support unit bodily. The full area of the piston **41** is therefore relieved of fluid pressure, and fluid pressure is applied through the front end of the cylinder **34** to the annular area of the piston **41**, causing the cylinder **34** first to travel forward until the screws **32** in the yoke **27** engage the rear ends of the slots **36** as shown in FIGURE 6. Continued application of fluid pressure then advances the roof support unit until the piston **41** bottoms on the rear end of the cylinder **34**, as shown in FIGURE 7. The roof support unit is then reset between the floor and roof of the mine after which fluid pressure on the piston **41** is reversed. This causes the cylinder **34** to travel rearwardly to the extent permitted by the engagement of the screws **32** in the slots **36** until the condition of FIGURE 8 is reached at which the screws **32** engage the forward ends of the slots **36**.

The piston **41** then lies at a distance from the rear end of the cylinder **34** which enables the conveyor **39** to yield as the plough passes in front of the roof support unit without causing the piston **41** to bottom on the rear end of the cylinder **34**.

It is thus seen that the lost-motion device formed by the screws **32** and slots **36** automatically provides the required amount of yielding travel of the piston **41** in the cylinder **34** when the roof support unit is fully advanced.

It is possible to advance each roof support unit in turn

without interrupting the operation of the coal plough, as the necessary thrust on the conveyor 39 can be substantially maintained by the jacks 34 of the roof support units adjacent the one unit being advanced.

I claim as my invention:

1. A pushing device for the purpose specified comprising a strut adapted to be fixed between the floor and roof of a mine, a double-acting jack having piston and cylinder members one of which is adapted for connection with a conveyor, and a mounting by which the other jack member is connected to the strut, said mounting comprising a lost-motion device arranged to provide between the limits of the lost-motion device free longitudinal movement of said other jack member with respect to the strut, said lost-motion device including two slots formed longitudinally on opposite sides of the jack cylinder, and two pins disposed on a vertical axis in longitudinally fixed relationship to the strut, said pins engaging the respective slots to form pivots about which the jack cylinder can turn as well as on which the jack cylinder can slide.

2. A pushing device for the purpose specified comprising extensible and contractable strut means adapted for interposition between the floor and the roof of a mine, a double-acting jack having telescopic piston and cylinder members, one of said telescopic members extending from the strut means and being adapted at its outer end for connection with a conveyor, and a lost-motion mounting by which the other of said telescopic members is located on the strut means, said lost-motion mounting including co-operable stop means disposed on the strut and on said other telescopic member in positions which are spaced longitudinally of the latter to determine the limits of free longitudinal movement of said other telescopic member with respect to the strut means.

3. A pushing device according to claim 2, wherein the lost-motion device includes guide means comprising two slots formed longitudinally on opposite sides of the jack cylinder, and wherein the co-operable stop means is provided respectively by the ends of the slots and by two pins disposed on a vertical axis in longitudinally fixed relationship to the strut, said pins coaxially engaging the respective slots to form pivots about which the jack cylinder can turn as well as on which the jack cylinder can slide.



4. In combination, a strut capable of fixture between two spaced surfaces, a double-acting piston jack, and means for mounting the jack on the strut, said mounting means including lost-motion means connecting the jack with the strut for relative displacement therebetween over an elongated path extending longitudinally of the jack and the lost-motion means including terminal stops interengageable at points spaced apart by a distance predetermined in relation to the stroke of the jack piston.

5. The combination according to claim 4 wherein said mounting means includes means on one of the strut and the jack defining a slot forming said path for the specified relative displacement therebetween, and means received in said slot and carried by the other of the strut and the jack, for slidable engagement in the slot, and for engagement with terminal stops at the ends of the slot.

6. The combination according to claim 5 wherein the jack includes a cylinder for the piston, said cylinder having the slot therein and the terminal stops at the ends of said slot.

7. The combination according to claim 5 wherein the other of said strut and said jack has a pivot pin thereon engaged in the slot for sliding movement therein, and for engagement with the terminal stops at the ends of the slot.

8. In combination, a strut capable of fixture between two spaced parallel surfaces, a double-acting jack having telescopic piston and cylinder members, and means for mounting the jack on the strut, said mounting means including lost-motion means connecting one of the piston and cylinder members with the strut for relative displacement therebetween over an elongated path extending longitudinally of the jack, and said lost-motion means including a stop element carried by one of the strut and the jack member, and terminal stops on the other engageable thereby at points spaced apart by a distance predetermined in relation to the stroke of the piston in the cylinder.

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