Nov. 15, 1966 J. CARNEGIE ET AL 3,285,015

MINING APPARATUS

Filed Nov. 19, 1962 3 Sheets-Sheet 1

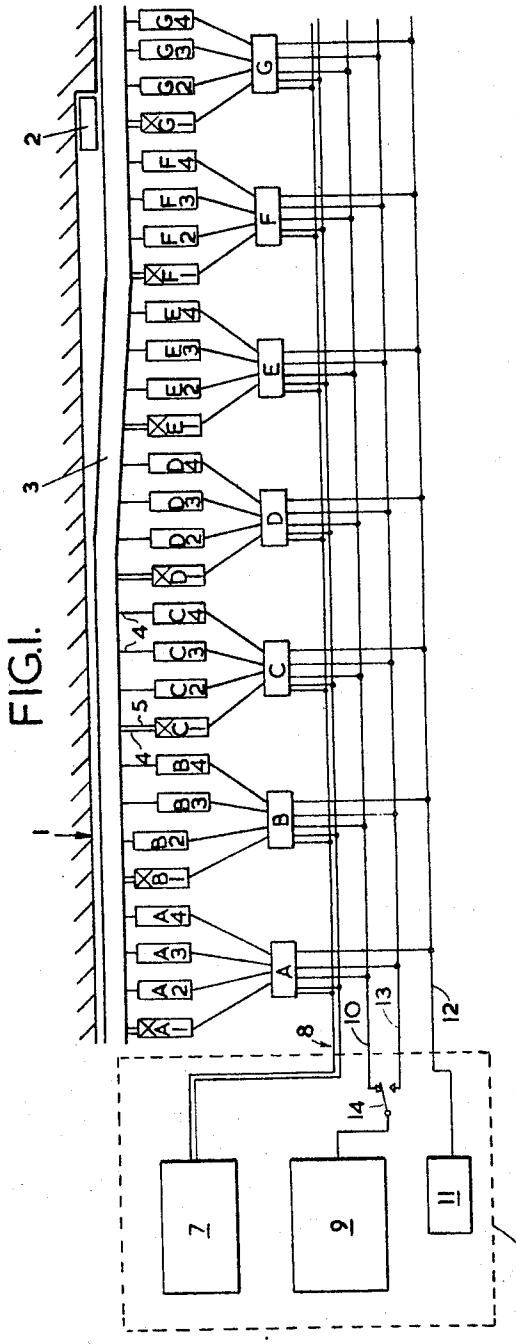

FIG. 1.

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Filed Nov. 19, 1962 3 Sheets-Sheet 2

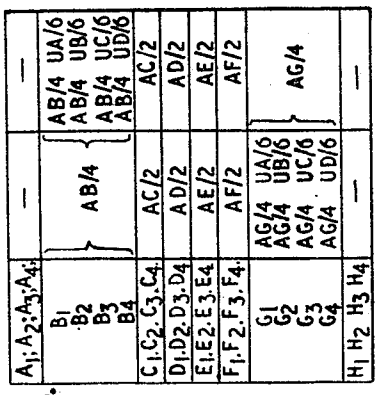

FIG. 3.

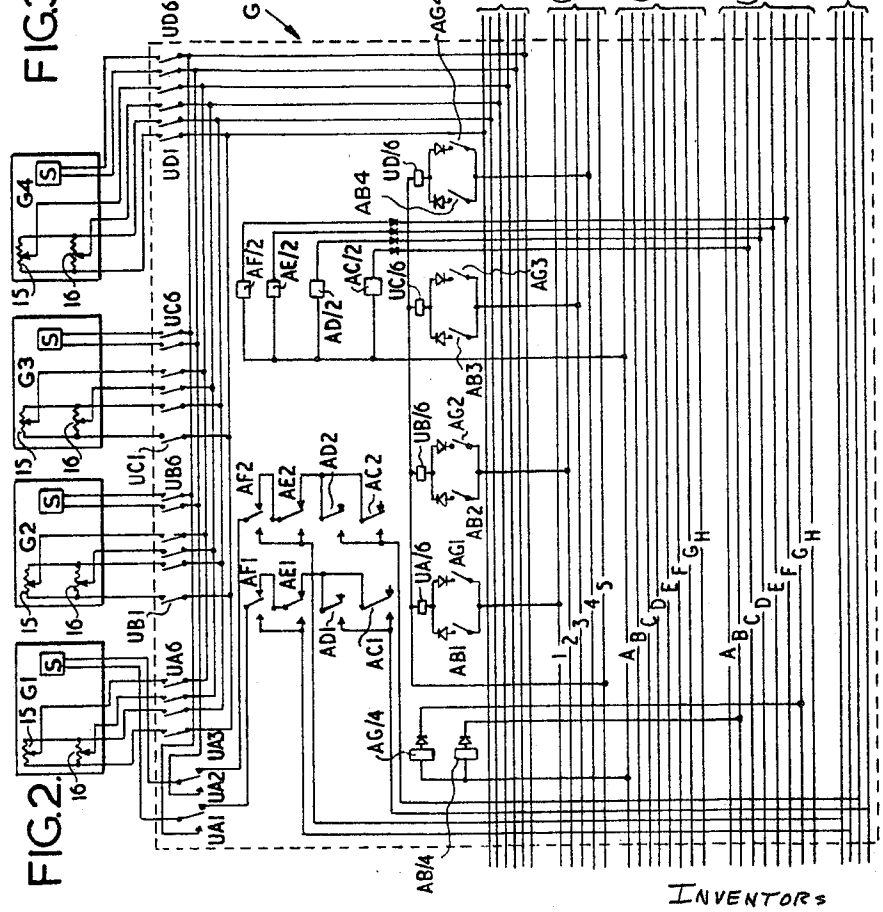

FIG. 2.

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MINING APPARATUS

Filed Nov. 19, 1962 3 Sheets-Sheet 3

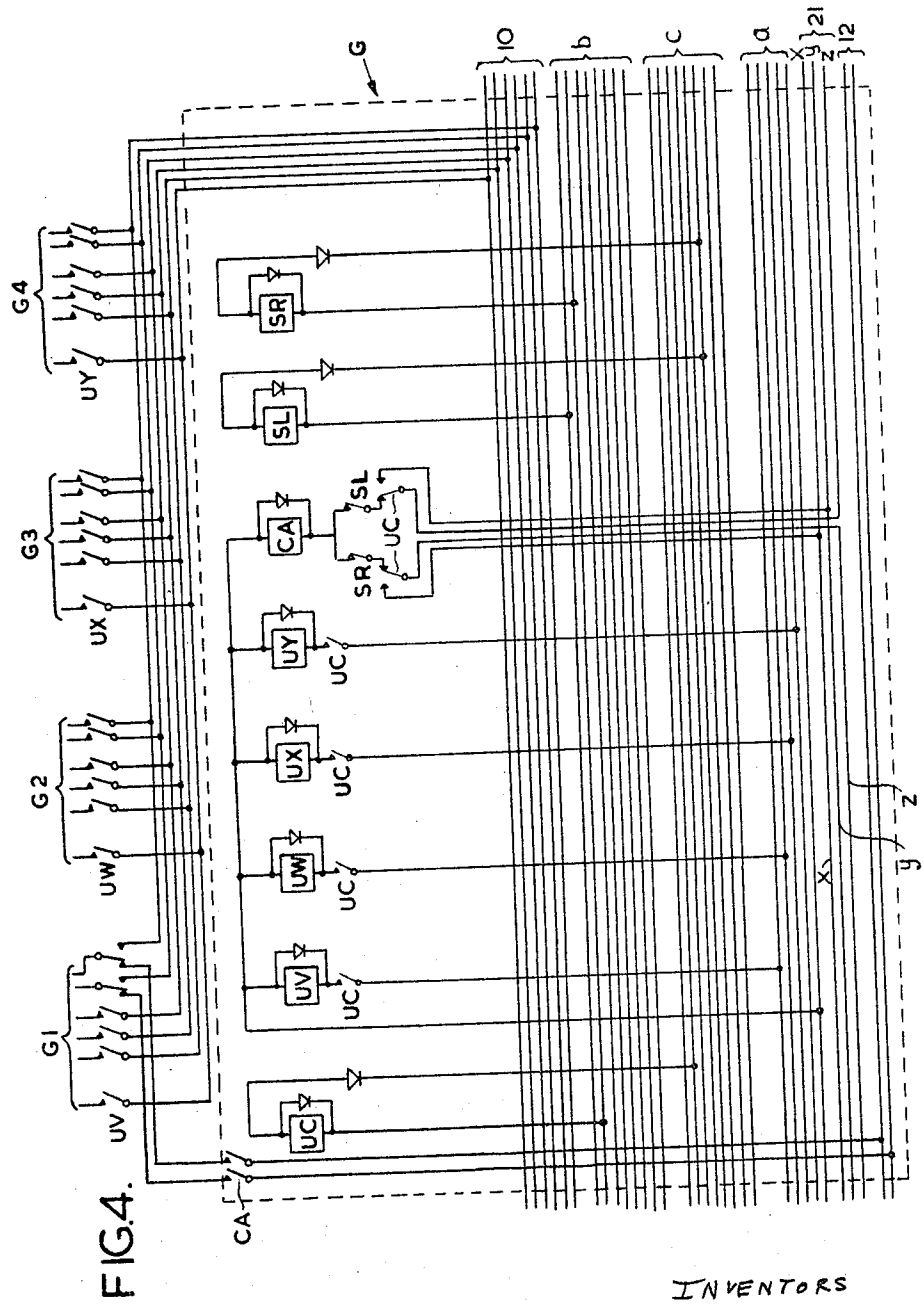

FIG.4.

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United States Patent Office 3,285,015 Patented Nov. 15, 1966

3,285,015

MINING APPARATUS

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Filed Nov. 19, 1962, Ser. No. 238,587
Claims priority, application Great Britain, Nov. 21, 1961, 41,622/61
10 Claims. (Cl. 61—45)

This invention relates to mining apparatus including a series of roof support units spaced along the working face of a mine and connected to a conveyor which extends along the working face. Such apparatus is advanceable towards the working face by causing at least some of the roof support units to push the conveyor forwardly relative to the support units and then moving the roof support units up to the advanced conveyor as is disclosed, for example, in the application of Wesley H. Barrett, Serial No. 92,076, filed February 27, 1961 and now Patent No. 3,084,920.

The present invention provides roof support control apparatus suitable for a roof support assembly which includes a series of advanceable roof supports at least some of which have conveyor advancing means, the apparatus including means for selecting a roof support for an advancing operation and which selects for operation the conveyor advancing means of another roof support when a roof support is selected for an advancing operation.

The operating signal may be conveyed by means common to a number of roof supports, the selecting means acting to select a roof support to receive an operating signal.

The selecting means may include means for selecting a group of roof supports and further means for selecting a roof support in a selected group, the further means including parts each common to a roof support in each group.

The selecting means, when a roof support is selected for an advancing operation, may select for operation the conveyor advancing means of a roof support on one side of the roof support selected for an advancing operation and the conveyor advancing means of a roof support on the opposite side of the roof support selected for advancing operatiin, the apparatus including further means for operating either selected conveyor advancing means. When a roof support is selected for an advancing operation, the selecting means may close a switch in a circuit to the conveyor advancing means of a roof support on one side of the roof support selected for an advancing operation, open a switch in a circuit to prevent operation of the conveyor advancing means of another roof support on the said one side, close a switch in a circuit to the conveyor advancing means of a roof support on the opposite side of the roof support selected for an advancing operation, and opens a switch in a circuit to prevent operation of the conveyor advancing means of another roof support on the said opposite side.

Alternatively, the selecting means, when a roof support is selected for an advancing operation, may select the conveyor advancing means of a roof support on one side of the roof support selected for an advancing operation and also selects for an advancing operation a roof support on the opposite side of the roof support whose conveyor advancing means is selected to the other roof support selected for an advancing operation the apparatus including means for operating either selected roof support.

Three embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings of which,

FIGURE 1 shows a diagrammatic view of a roof support assembly according to one embodiment,

FIGURE 2 shows part of the electrical circuit of a roof support assembly according to the second embodiment,

FIGURE 3 shows a table of operation of a junction box and,

FIGURE 4 shows part of the electrical circuit of a roof support assembly according to the third embodiment.

With reference to the accompanying drawings, FIGURE 1 shows a roof support assembly including a series of roof support units spaced along the working face **1** of a coal mine. These roof support units are arranged in a number of groups A, B, C, and so on. Each group has four roof support units, each of which is indicated by its group letter and its number within that group, for example A1, A2, A3, A4 and so on. Seven groups and therefore twenty eight roof support units are shown in the drawing. The drawing also shows a coal cutting machine **2** which is moving from left to right. As the cutting machine **2** moves along the working face **1**, the working face **1** is advanced and it is necessary to move the roof support units forward.

A coal conveyor **3** extends along the working face **1** and lies between the working face **1** and the roof support units. Each roof support unit is connected to the conveyor **3** by a hydraulic jack **4** which can be contracted by hydraulic pressure to pull its roof support unit up to the conveyor **3**. The first roof support unit in each group, that is unit A1, B1 and so on, is also connected to the conveyor **3** by a further jack **5** which can be extended by hydraulic pressure to push the conveyor **3** forwardly relative to the roof support unit.

Each roof support unit comprises a sole beam resting on the ground and to which the jack or jacks are connected. The sole beam carries two or more hydraulically operable telescopic upright props which carry a roof bar (neither the props nor the roof bars are shown). By extending the props the roof bar is urged against and supports the roof.

The props and jack or jacks of each roof support unit can be connected to a fluid pressure conduit and a return conduit (not shown) which supply all the units. The supply of hydraulic fluid to the props and jack or jacks is controlled by electro-hydraulic valves. By actuating the electro-hydraulic valve or valves of each roof support unit, the props of the unit can be extended or contracted, the jack **4** can be contracted to pull the unit up to the conveyor or the further jack **5** (if provided) can be extended to push the conveyor forward relative to the roof support unit.

The electro-hydraulic valves are controlled from a control console **6** located at any convenient position along the working face **1** or at one end of the working face **1**. For each group of roof support units, there is a junction box and these are lettered A, B, C, and so on. Within the control console **6** is an address selector **7** which can send a signal through wires **8** to any selected junction box. Each junction box contains a number of relays which are actuated by signals from the address selector **7**. The address selector **7** can connect the props and jacks **4** of any roof support unit to a sequence control **9** through wires **10**. Both the sequence control **9** and a conveyor advance control **11** are located in the control console **6**. The address selector **7** can connect the jack **5** of a roof support unit to the conveyor advance control **11**.

The address selector **7** when sending a signal to a group junction box to actuate its relays to connect any of the roof support units of that group to the sequence control **9** also connects the first support unit of the next

four groups (in the direction of travel of the cutting machine 2) to the conveyor advance control 11. For example, when the address selector 7 is actuating the relays in junction box B to connect any of the roof support units of group B to the sequence control 9, the address selector 7 also connects the first roof support units of each of groups C, D, E and F to the conveyor advance control 11 by actuation of the appropriate relays in junction boxes C, D, E and F. Similarly, when any of the roof support units in group C are connected to the sequence control 9, the first roof support units of each of groups D, E, F and G are connected to the conveyor advance control 11.

The sequence control 9, when connected to a roof support unit by the address selector 7, can send signals to that unit to operate the electro-hydraulic valves and cause the props to lower, the jack 4 to contract and the props to rise again to cause the roof bar to again support the roof.

The conveyor advance control 11, when connected to the first roof support unit of a group by the address selector 7, can send a signal to that unit to operate an electro-hydraulic valve to extend the jack 5 to push the conveyor 3 forwardly relative to the unit.

The address selector 7 is arranged for manual or automatic operation according to the wish of the operator. In manual operation, the operator operates the address selector 7 to select, for example, roof support unit B3 to be connected to the sequence control 9. This selection also causes the roof support units C1, D1, E1 and F1 to be connected to the conveyor advance control 11, which causes hydraulic fluid under pressure to be admitted to the jacks 5 of the roof support units C1, D1, E1 and F1 in an extending sense so that the conveyor 3 is pushed forwardly relative to the roof support units C1, D1, E1 and F1.

The operator then actuates the sequence control 9 which then sends signals along the wires 10 to actuate the electric-hydraulic valves of the roof support unit B3. The electro-hydraulic valves are actuated in such a way that the props first contract to lower the roof bar, the jack 4 contracts to pull the roof support unit B3 up to the conveyor and the props then extend to force the roof bar against the roof so as to again support the roof. This sequence of operation is known as a roof support unit advancing operation.

The conveyor 3 assumes the position shown in FIGURE 1 in which the jack 5 of roof support unit C1 is fully extended and the jacks of roof support units D1, E1 and F1 are extended by successively smaller amounts. Advance of the conveyor 3 in this manner is known as "snaking."

When the roof support unit B3 has finished its advancing operation, the operator then operates the address selector 7 to select roof support unit B4 and actuates the sequence control 9 to cause roof support unit B4 to perform an advancing operation. This selection of roof support unit B4 also causes roof support units C1, D1, E1 and F1 to be connected to the conveyor advance control supply 11.

The roof support units are advanced one by one by the operator. When roof support units in group C are selected for an advancing operation, roof support units D1, E1, F1 and G1 will be connected to the conveyor advance control supply 11, and so on along the face.

In automatic operation, the address selector 7 selects each roof support unit in turn for an advancing operation and thus automatically selects conveyor advance in the four groups following the group in which the selected roof support unit is located. While a roof support unit is selected the sequence control 9 and the conveyor advance control 11 are actuated. Thus the roof support units and the conveyor are automatically advanced step by step along the working face of the mine.

The advancing operation described progresses from left to right. The installation shown in FIGURE 1 can also be operated to advance from right to left when the cutting machine 2 is moving from right to left. For right to left operation, when groups C, D, E and F are selected for conveyor advance, roof support units of group G must be selected for advance. In other words, when groups C, D, E and F are selected for conveyor advance, for left to right operation roof support units B1, B2, B3 and B4 must be selected for advance in that order and for right to left operation roof support units G4, G3, G2 and G1 must be selected for advance in that order.

For this purpose the sequence control 9 can be connected to a further set of wires 13 and a switch 14 connects the sequence control 9 either to the wires 10 or to the wires 13. Each junction box includes a duplicate set of relays to connect the electro-hydraulic valves for actuating the props and the jacks 4 to the wires 13 and the address selector 7 actuates these duplicate relays for a roof support unit in a group when the main relays are selected in the corresponding roof support unit in the fifth group to the left are actuated. For example, the duplicate relays for roof support unit G3 are actuated when the main relays for roof support unit B3 are actuated together with the conveyor advancing relays of groups C, D, E and F.

Thus for left to right advance, switch 14 is operated to connect the sequence control 9 to wires 10 and for right to left advance switch 14 is operated to connect the sequence control to wires 13. The address selector 7 can select roof support units in a left to right sequence or in a right to left sequence as desired.

Instead of providing a duplicate set of relays in each junction box, the main set of relays may be provided with rectifiers so that they are responsive to current of one polarity for left to right operation and responsive to the reverse polarity for right to left operation. Such an arrangement will now be described with reference to FIGURE 2 which shows the electrical circuit of junction box G with its connections to the address selector 7, the sequence control 9 and the conveyor advance control 11.

Associated with each roof support unit G1, G2, G3 and G4 is a unit selection relay UA/6, UB/6, UC/6 and UD/6 respectively. Each of these relays operates 6 contacts, for example relay UA/6 operates contacts UA1, UA2 . . . UA6. Contacts UA1 and UA2 are connected, when relay UA/6 is not actuated, to a conveyor advancing circuit as will be described later. When relay UA/6 is actuated, contacts UA1 and UA2 connect solenoid valves S of roof support unit G1 to the relevant wires 10 connected to the sequence control 9. When relay UA/6 is not actuated, contacts UA3, UA4, UA5 and UA6 are open and when the relay is actuated they connect potentiometers 15 and 16 on roof support unit G1 to the sequence control 9. These potentiometers 15 and 16 indicate to the sequence control 9 the extension of the jacks and also the hydraulic pressure in the props so that the operator can see the condition of the roof support unit selected.

In the remaining three roof support units of group G, that is units G2, G3 and G4, contacts 1 to 4 are normally open and when the relay is actuated they connect the potentiometers 15 and 16 on the relevant roof support unit to the sequence control 9. Contacts 5 and 6 are also normally open and when the relay is actuated they connect solenoid valves S of the relevant roof support unit to the sequence control 9 through the relevant wires 10.

The solenoid valves S are in fact two electro-hydraulic valves with rectifiers arranged so that when current of one polarity is supplied to the valves one of the valves is actuated and when current of the reverse polarity is supplied to the valves, the other valve is actuated. Such

an arrangement is described by either of the examples illustrated in the complete specification of our copending U.S. application Serial No. 279,714, filed May 13, 1963, now Patent No. 3,198,083. When alternating current is supplied both valves are actuated. The valves S therefore have four states:

(1) Neither valve actuated;
(2) One valve actuated;
(3) The other valve actuated, and
(4) Both valves actuated.

These states are arranged to control the prop lowering, unit advancing and prop raising sequence on each unit, and on the first unit of each group they also control the conveyor advance.

The address selector **7** can be considered as being in two sections **17** and **18**. Section **18** selects the group and section **17** selects the required roof support unit within the group. The wires **8** connecting the address selector **7** to the junction box G can be considered as being divided into three parts *a*, *b*, and *c*. Part *a* is associated with section **17** and parts *b* and *c* are associated with section **18** of the address selector **7**.

Part *b* has eight wires A to H and part *c* also has eight wires A to H. Any given group is selected by a connection to one wire in part *b* and one in part *c*; there are 64 such combinations and hence provision for 64 groups. For group G as shown, the two terminals of a D.C. power source are connected to wire A of part *b* and to wire G of part *c* respectively. All relays which are connected across these wires will then be energized; this will include relay AG/4 in junction box G, shown in FIGURE 2, and also relays in the five junction boxes adjacent to junction box G. These relays and their function will now be described by reference to FIGURES 2 and 3 and for an understanding of their operation it is convenient to examine one junction box (G), and consider which relays are energised as the addresses of the roof support units are selected in sequence. Relays AB/4 and AG/4 are controlled by part **18** of the address selector **7**, and they carry contacts which prepare the circuits for unit selection relays UA/6, UB/6, UC/6 and UD/6. These four unit selection relays carry contacts which select the individual unit as described above, and are controlled by section **17** of the address selector **7**. Section **17** of the address selector **7** includes a polarity reversal switch **19** and a line selector **20**. In part *a*, all four unit selection relays UA/6 . . . UD/6 are connected to the fifth wire of part *a* and relay UA/6 is also connected (when contact AB1 or AG1 is closed) to the first wire of part *a*. The other three relays UB/6, UC/6 and UD/6 are similarly connected. The contacts on relays AG/4 and AB/4 are connected to unit selection relays UA/6, UB/6, UC/6 and UD/6 through rectifiers; those associated with AG/4 are wired in such a direction that any of the unit selection relays are energised only when the polarity switch **19** is as shown, and those associated with AB/4 are wired in the reverse sense so that any of the unit selection relays can only be operated when the switch **19** is in the reverse position to that shown.

Four conveyor advance relays AC/2, AD/2, AE/2 and AF/2 are connected to wire A of part *b* and to wires C, D, E and F of part *c* respectively and will therefore be actuated when any one of groups C, D, E and F respectively is selected by the address selector **7**. Relays AC/2 and AD/2 when actuated close normally open contacts AC1, AC2 and AD1, AD2 respectively and relays AE/2 and AF/2 switch contacts AE1, and AE2 and AF1, AF2 respectively from one line to another. Contacts AC1, . . . AF1, and AC2 . . . AF2 connect the conveyor advance control supply **11** through wires **12** and contacts UA1 and UA2 to solenoid valves S of roof support unit G1 for operating its conveyor advancing jack **5**.

Operation of the relays can now be followed from the table of FIGURE 3. The centre column lists those relays energized, for the address selection given in the left hand column, when proceeding from left to right (i.e. from A1 to H4), and the right hand column gives the same information when proceeding from right to left (i.e. from H4 to A1). It will be noted that in each case, the action is such as to give conveyor advance during the time the preceding four groups are selected, followed by the roof support unit advancing operation. When operating from right to left, this advancing operation takes place in units G4, G3, G2 and G1, when the address selection is B4, B3, B2 and B1. To avoid confusion to the operator supplementary contacts on switch **19** would be arranged to ensure that correct indications were given on any component of the address selector used to display the address.

In other words, in manual operation and for left to right operation, the operator selects the group required, for example group G, by operating parts *b* and *c* to send a signal along wire A of part *b* and wire G of part *c* to actuate relay AG/4. The operator selects the first roof support unit of the group by operating the polarity reversal switch **19** and the line selector **20** so that a signal of positive current is sent along line **5** of part *a* through relay UA/6 and through the rectifier and now closed contact AG1 to return along line **1** of part *a*. Relay UA/6 is thus actuated and the sequence control **9** is connected through wires **10** to roof support unit G1. The sequence control **9** is now operated to actuate solenoid valves S of roof support unit G1 and cause roof support G1 to perform an advancing operation. The operator then operates the line selector **20** and sequence control **9** to advance roof support unit G2 and so on. When each roof support unit is selected, the operator can see what is the position of the jack or jacks and the fluid pressure in the props since the potentiometers **15** and **16** send the necessary signals back to the sequence control **9**. After group G, the operator then selects group H and so on.

When any roof support unit in group G is selected in left to right operation, conveyor advance in the four groups to the right of G is also selected and is actuated by the conveyor advance control **11**.

For right to left operation, in order to select group G the operator energises the wires in parts *b* and *c* corresponding to group B, and this selection actuates relay AB/4 in junction box G. The polarity reversal switch **19** is reversed and the line selector **20** is operated to send a positive signal through line **4** of part *a* to now closed contact AB4, through the rectifier and the relay UD/6 and along line **5** of part *a* back to the polarity reversal switch **19**. Relay UD/6 is thus actuated and signals can be sent from the sequence control **9** to roof support unit G4. The operator then selects roof support unit G3 and so on. After operation of group G by selection of group B with the polarity reversal switch **19** reversed, the operator selects group A to operate group F. When any roof support unit in group G is operated in right to left operation, i.e. by selection of group B, conveyor advance in groups C, D, E and F is also selected.

Means are available for operating groups A, B, C, D and E in right to left operation by the use of additional wires in part (*b*) of cable **8**.

For automatic operation, left to right operation is achieved by the address selector selecting each roof support unit in turn from left to right for advance and this selection automatically selects conveyor advance in the succeeding four groups. The sequence control **9** and conveyor advance control **11** are automatically actuated when a roof support unit is selected for advance.

Automatic right to left operation is achieved by reversing the polarity reversal switch **19** and altering the line selector to actuate roof support units of a group in the order four, three, two and one instead of the order one, two, three and four. For this purpose the address selector circuits are of known type capable of selecting in sequence

in either direction. Examples of such circuits are relay rings capable of impulsing in either direction, or stepping switches with twin ratchet drive, the ratchets driving in opposite directions and either being selected at will.

In the embodiments described with reference to FIGURE 1 and FIGURES 2 and 3, selection of a roof support for an advancing operation caused the selection of four conveyor advancing means on one side of the roof support and also the selection for an advancing operation of a roof support on the opposite side of the selected conveyor advancing means to the other roof support selected for an advancing operation. Which roof support was actually advanced depended upon whether the series of roof supports was being advanced from left to right or from right to left. In the embodiment now to be described with reference to FIGURE 4 of the accompanying drawing, selection of a roof support for an advancing operation causes the selection for operation of four conveyor advancing means on one side of the roof support and four conveyor advancing means on the opposite side of the roof support. Which four conveyor advancing means are operated depends upon whether a left to right or a right to left advance of the series of roof supports is taking place. In all embodiments, the conveyor advancing means operated are in advance, relative to the direction of travel of the advancing sequence, of the roof support actually advanced. Apart from this difference, the embodiment to be described with reference to FIGURE 4 is similar to the embodiment described with reference to FIGURE 2. Where possible like reference numerals and letters are used in FIGURE 4 to indicate parts similar to parts shown in FIGURE 2.

With reference to FIGURE 4, which similarly to FIGURE 2 shows the various connections in junction box G, relays UC, UV, UW, UX and UY correspond to relays AG/**4**, UA/**6**, UB/**6**, UC/**6** and UD/**6** respectively in FIGURE 2. A relay CA is connected between a line common to relays UV, UW, UX and UY and a line *z* which passes through each junction box. Between relay CA and the adjacent junction box F in the line *z* are two relay contacts SR and UC in series and between relay CA and the adjacent junction box H in line *z* are two relay contacts SL and UC in series. Actuation of the relay UC causes the UC contact in series with the SR contact to break connection with the SR contact and make a connection with a line *x* which is connected to each junction box, and causes the UC contact in series with the SL contact to break connection with the SL contact and make a connection with a line *y* which is connected to each junction box.

Relay SL is connected to the same lines in parts *b* and *c* of the address selector **7** as relay UC in junction box L and relay SR is connected to the same lines as relay UC in junction box B. Lines *x*, *y* and *z* form part of a conveyor advance direction selector **21** whose function will be described later.

When no roof support has been selected for an advancing operation, the condition of the circuit of junction box G is as shown in FIGURE 4. To select a roof support in junction box G for an advancing operation, relay UC and then the appropriate relay UV, UW, UX or UY are operated by a proper selection of lines in parts *a*, *b* and *c* of the address selector **7**. Operation of relay UC also causes line *z* to be broken in junction box G, one part of line *z* being brought into communication with line *x* and the other part of line *z* being brought into communication with line *y*. Also contact is broken between line *z* and relay CA in junction box G.

Also, operation of relay UC in junction box G results in operation of relay SL in junction box B and relay SR in junction box L. Therefore, contact is broken between relay CA in junction box B and the part of line *z* connected to line *x* by junction box G. Also, contact is broken between relay CA in junction box L and the part of line *z* connected to line *y* by junction box G. Therefore one part of line *z* brings one side of each relay CA in junction boxes C, D, E and F into communication with line *x* and the other part of line *z* brings one side of each relay CA in junction boxes H, I, J and K into communication with line *y*.

Thus when a roof support in junction box G has been selected for an advancing operation, a signal will have been applied to the bottom line of part *a* of the address selector **7**, to which line the relays CA are connected. If the circuit is completed through line *x*, the relays CA in junction boxes C, D, E and F will be operated and if the circuit is completed through line *y*, the relays CA in junction boxes H, I, J and K will be operated. Operation of relay CA in a junction box closes two contacts CA to bring the conveyor advance control supply **11** into communication with the first roof support of the group through lines **12**. Thus if advance is taking place from left to right, the line *y* will be used to complete the circuit to the relays CA and if the advance is taking place from right to left, line *x* will be used to complete the circuit to relays CA so that the conveyor will always be advanced at a position further along the working face of the mine than the position reached by the advance of the roof supports.

We claim as our invention:

1. Roof support control apparatus adapted to control a roof support assembly which includes a series of advanceable roof supports at least some of which have associated therewith conveyor advancing means, the control apparatus comprising: selecting means coupled with said supports and operable to sequentially select the roof supports for an advancing operation and to simultaneously with each roof support selection select for operation a conveyor advancing means associated with a nonselected roof support, whereby the conveyor is automatically advanced at a position further along the working face from a roof support which is being advanced.

2. Apparatus according to claim **1** including signal conveying means common to a number of roof supports and coupled with said selecting means for conveying an operating signal from said selecting means to a selected roof support.

3. Apparatus according to claim **2** wherein the selecting means includes means for selecting a group of roof supports and further means for selecting a roof support in a selected group, the further means including parts each common to a roof support in each group.

4. Apparatus according to claim **1** wherein said selecting means includes means for selecting for operation one conveyor advancing means associated with a roof support on one side of said selected roof support and another conveyor advancing means of a roof support on the opposite side of said selected roof support, said apparatus including further means for operating either of said selected conveyor advancing means.

5. A mine support control system comprising in combination: a plurality of support members; roof support moving means associated with each of said members; a conveyor; a plurality of conveyor moving means each respectively associated with one of said support members; and selection and control means coupled with said members operable to sequentially select for operation one of said support members and its associated support moving means and to simultaneously with the selection of each support member to select one of said conveyor moving means associated with a nonselected one of said support members.

6. A mine support control system comprising in combination: a plurality of groups of support members; roof support moving means associated with each of said members; a conveyor; a plurality of conveyor moving means each respectively associated with one of said support members in each of said groups; and selection and control means coupled with said members operable to select for operation one of said support members and

its associated support moving means and one of said conveyor moving means, said selection and control means including address selector means, sequence control means, and conveyor advance control means.

7. A control system in accordance with claim 6 wherein said address selector means includes means operable to connect one of said groups to said sequence control means and to connect each of the said ones of said support members in a plurality of adjacent groups having a conveyor moving means associated therewith to said conveyor advance control means.

8. A control system in accordance with claim 6 wherein said selection and control means includes means for controlling the direction of advance by signals from said selector means to said support members.

9. Roof support control apparatus adapted to control a roof support assembly which includes a series of advanceable roof supports at least some of which have associated therewith conveyor advancing means, the control apparatus comprising: selecting means coupled with said supports and operable to select a roof support for an advancing operation and to select for operation a conveyor advancing means associated with a nonselected roof support, said selecting means including means for selecting for operation one conveyor advancing means associated with a roof support on one side of said selected roof support and another conveyor advancing means of a roof support on the opposite side of said selected roof support; means for operating either of said selected conveyor advancing means including first, second, third and fourth switches; means responsive to selection of said selected roof support to close said first and third switches and to open said second and fourth switches; said first switch being in circuit with the conveyor advancing means of a roof support on one side of the roof support selected for an advancing operation, said second switch being in circuit with and adapted when opened

to prevent operation of the conveyor advancing means of another roof support on the said one side, said third switch being in circuit with the conveyor advancing means of a roof support on the opposite side of the roof support selected for an advancing operation, and said fourth switch being in circuit with and adapted when opened to prevent operation of the conveyor advancing means of another roof support on the said opposite side.

10. Roof support control apparatus adapted to control a roof support assembly which includes a series of advanceable roof supports at least some of which have associated therewith conveyor advancing means, the control apparatus comprising: selecting means coupled with said supports and operable to select a roof support for an advancing operation and to select for operation a conveyor advancing means associated with a nonselected roof support, said nonselected roof support and associated conveyor advancing means being on one side of said selected support, said selecting means including means operable upon selection of said selected support to select another roof support on the side of said nonselected roof support opposite to said first-mentioned selected roof support; and means for operating either selected roof support.

References Cited by the Examiner

UNITED STATES PATENTS

3,097,829	7/1963	Seddon	61—45.2
3,120,105	2/1964	Kibble et al.	61—45.2

FOREIGN PATENTS

781,643	8/1957	Great Britain.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,285,015 November 15, 1966

James Carnegie et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, lines 3 to 5, for "James Carnegie, 15, Copt Elm Close, Charlton Kings, England, and David Gurney Arnold Thomas, The Cottage, Deerhurst Walton, England" read -- James Carnegie, Charlton Kings, England and David Gurney Arnold Thomas, Deerhusrt Walton, England, assignors to Dowty Technical Developments Limited, Brockhampton, Cheltenham, England, a British company --.

Signed and sealed this 12th day of September 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents