

[54] **COAL PLANER AUTOMATIC REVERSING DEVICE**

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[58] Field of Search 299/1, 34, 43

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[57]

ABSTRACT

A coal planer having an elongated stationary main body, forward and rear sections with a gate side drive frame extending between these sections along one side thereof, upper and lower portions to said main body, and a coal planer body extending along said one side for longitudinal motion. A drive chain extends along said frame on said one side to drive said coal planer body, with driver units coupled to drive said chain including a ranging arm towards said rear section and a return wheel towards said front section. A conveyor trough is operatively coupled to and driven by said chain. On the upper portion is a magnet. A plurality of reed switches on said conveyor trough are disposed so as to magnetically couple to said magnet as they pass before said magnet. Reversal means are operatively coupled to said reed switches and to said driver units.

3 Claims, 5 Drawing Figures

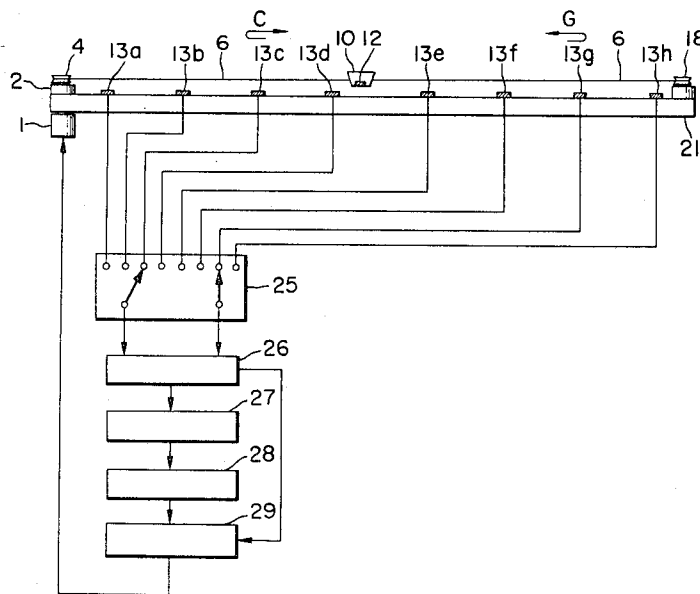
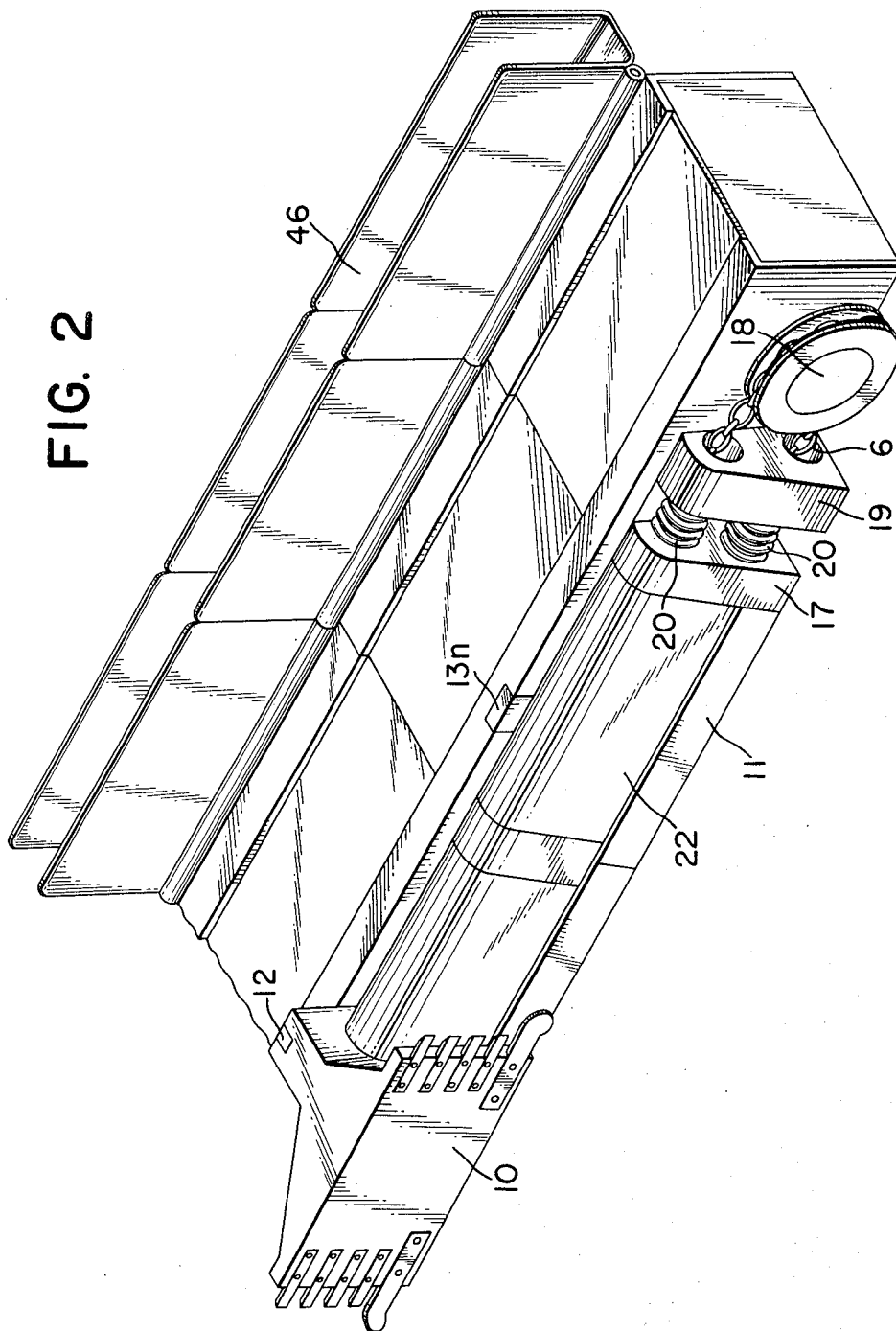


FIG. 2



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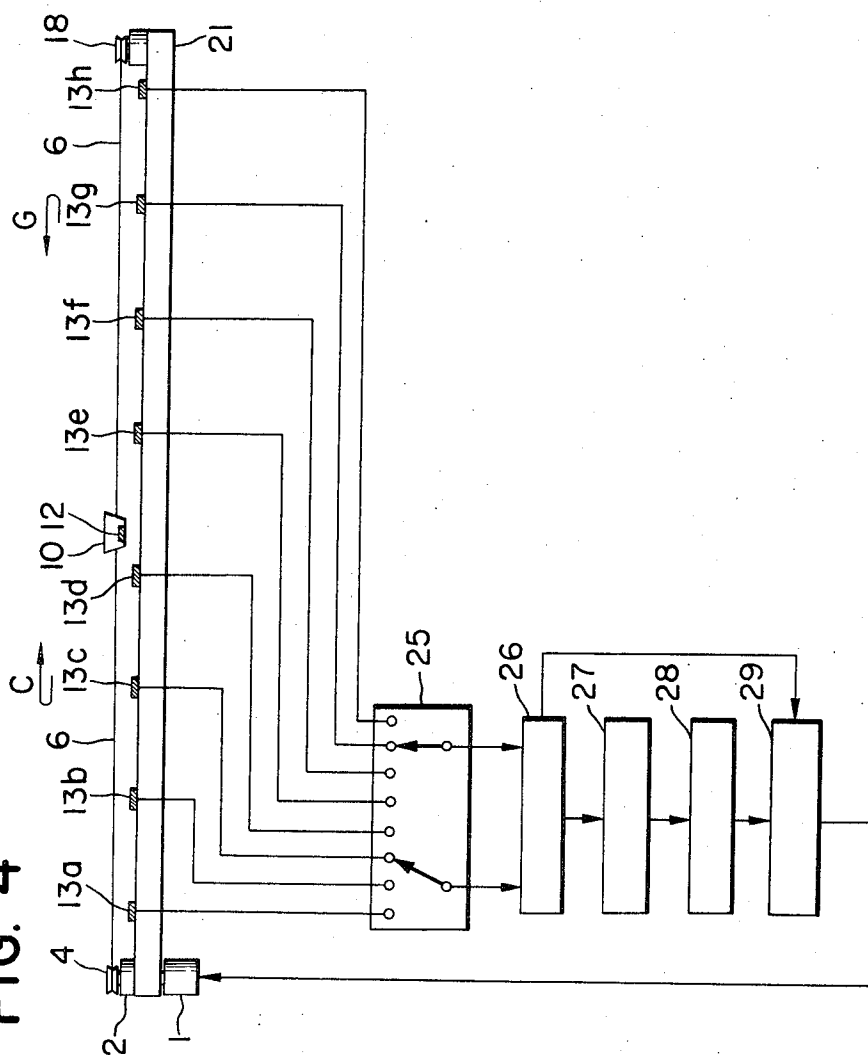
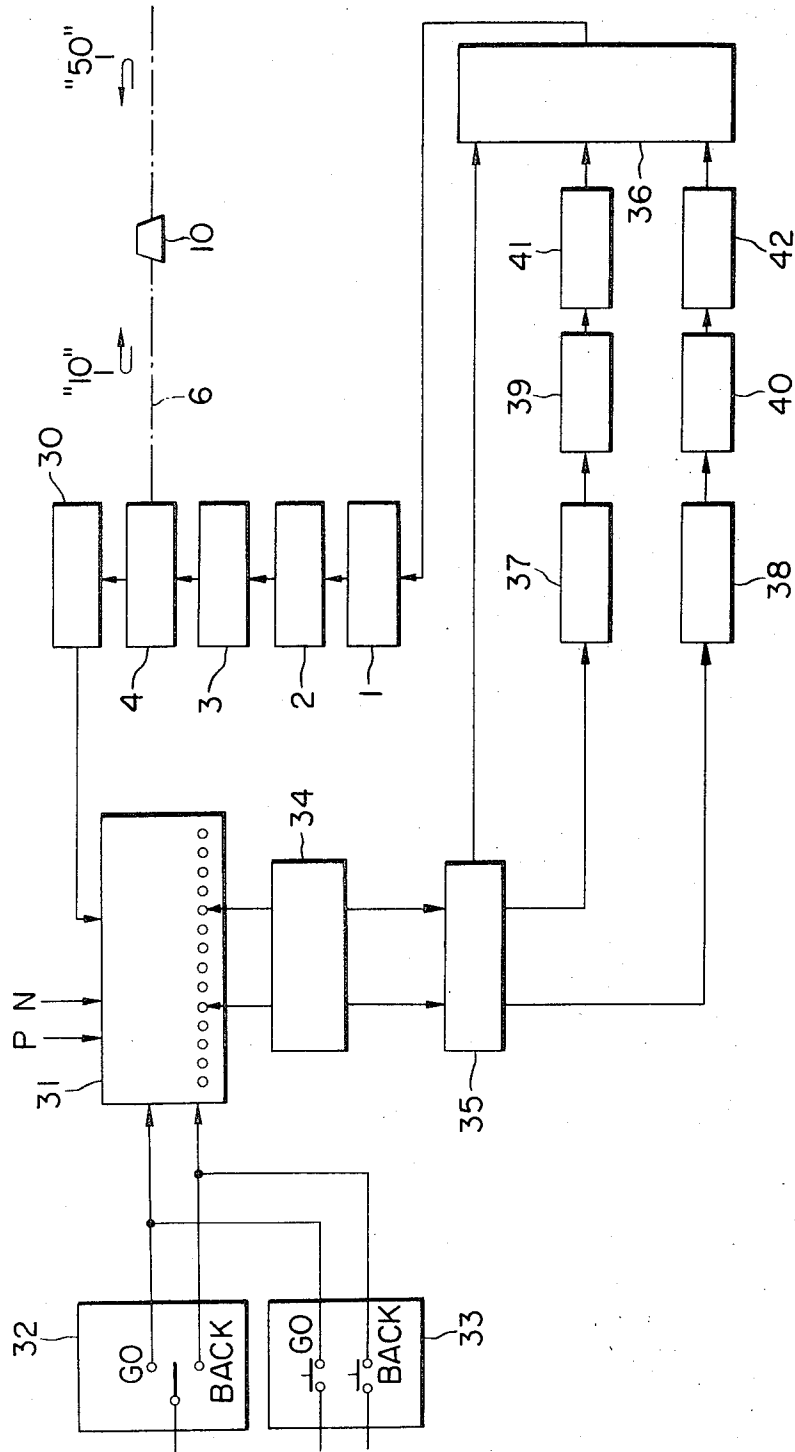


FIG. 5



COAL PLANER AUTOMATIC REVERSING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a coal planer automatic reversing device and the control mechanism thereof.

BRIEF DESCRIPTION OF THE PRIOR ART

Conventionally in the drive of the coal planer, the switchman outside the coal face operates the switch according to audible signals sent from the face workers inside the face. In this method, the switchman outside the coal face can not see the actual position of the coal planer moving inside the face, and he must operate the switch solely depending upon the signals sent by the look out man of the coal planer. Accordingly, a timely switch operation occasionally fails, when signals from the inside of the face are delayed or should such signals not reach the switchman. The delay in the switch operation results in the collision of the coal planer with the coal mining machine, the main gate end or the return gate end, and such collision frequently causes accidents and tear of the coal planer's driving chain.

OBJECTS OF THE INVENTION

Accordingly, an object of this invention is to provide a device for indicating a position of automatically reversing the coal planer, which, for overcoming the above defects, is capable of automatically stopping the coal planer either at the main gate end or at the return gate end or at a predetermined spot other than these ends; automatically reversing said coal planer at a given interval; and indicating an actual position of the coal planer moving in the coal face.

Another object of this invention is to provide a coal planer automatic reversing device, so that when the coal planer arrives at a given position, it automatically stopped by the operation of a switch mechanism, subsequently an electric motor is automatically reversed by the actuation of a time and a delay-relay, and an addition and subtraction preset counter indicates the position of the coal planer body, and by such arrangements, manpower and the number of the machine are minimized, so, said device is effective.

These and other objects of this invention will be apparent from the following descriptions of the invention with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view mainly showing a ranging type of coal planer driving unit on the gate side for driving the coal planer and the vicinity thereof, relating to this invention;

FIG. 2 is a perspective view mainly showing a return wheel unit and its vicinity located opposite to the unit of FIG. 1;

FIG. 3 is a perspective view showing an I bolt to be attached to the rear side of the coal planer and a coal planer chain;

FIG. 4 is a plot of an electric device illustrating a way of operation; and,

FIG. 5 is a plot of an electric device according to another embodiment, with a way of operation being shown.

DETAILED DESCRIPTION OF THE INVENTION

Shown at 1 is an electric motor, a shaft of which is

connected to a coal planer reduction mechanism 2 of a known type such as gears.

These driving units are mounted on a gate side drive frame and rotate a coal planer driving wheel 4 by way of a ranging arm 3. Said ranging arm 3 has an upper portion rotatably mounted on an end of the reduction mechanism 2. Numeral 5 is a hydraulic jack giving a tension to a coal planer chain 6, said hydraulic jack having a cylinder fixed to a machine frame 7 and a piston rod 44 fitted in said cylinder. Said piston rod 44 has an end pivoted through a pin 43 to a coupling member 9 attached to the periphery of the ranging arm 3, by which a shaft 8 of the coal planer driving wheel is journaled.

The coal planer body 10 includes a rear through-hole 23 receiving an I bolt 24 (refer to FIG. 3) therein, and, said coal planer chain 6 is connected to opposite ends of the I bolt. A magnet 12 is provided at an upper end contacting with a conveyor trough 21; and a number of pawls 45 one on a front side of the coal planer body.

When the driving units on the gate side are actuated to rotate the chain wheel 4, said coal planer body 10, along with the coal planer chain 6, is guided by a guide plate 11 and a cover plate 22 to advance or retract against the face. 13a through 13g are a group of reed switches or near-by switches respectively disposed the planer body 10 along said side drive frame between the ranging arm 3 and a return wheel 18, both of which are positioned to one side of the conveyor trough 21 contacting with the magnet 12 on the upper face of the coal planer body 10. Said near-by switches are housed within non-magnetic metallic boxes, respectively, and hence the magnetic force of the magnet 12 buried in the coal planer body 10 effectively acts on said group of near-by switches 13a, etc., and thereby the actuation of these switches are ensured. Furthermore, with a view to either preventing deterioration of insulation resulting from the ingress of water, or protecting said switches from being harmed due to vibrations and external impacts, a water-resistant and insulative compound is filled in said non-magnetic metallic boxes to thereby fix said switches therein.

Said group of near-by switches 13a etc., are disposed on the conveyor trough 21 spaced from each other a desired distance. The connection of these switches is such that output terminals of respective near-by switches 13a, 13b, 13c, 13d, . . . 13n are firstly connected to relevant terminals of a reversal position selection switch 25, then to a stop relay 26 disposed on the electric motor 1, a timer or a delay relay 27, a reverse-power relay 28, and finally to an electromagnetic switch 29.

In operation of the near-by switches, an operator must preset reversing points of the coal planer body by the reversal position selection switch 25.

FIG. 4 shows that said reversal position selection switch 25 is set to the near-by switches 13c and 13g as to cause the coal planer body 10 to automatically reverse between both points C and G.

Now, returning to FIG. 1, reference numeral 14 is a shock absorber made of a resilient material such as rubber or synthetic resin and movably provided on the side of the ranging arm 3 through a plurality of springs 16 interposed between said absorber and a coal planer chain guide 15 for guiding the coal planer chain 6. 17 is another shock absorber (refer to FIG. 2) movably

provided on the side of a return wheel 18 through a plurality of springs 20 interposed between a coal planer chain guide 19 and said shock absorber. 21 is a conveyor trough; 22 is a cover plate; and 46 is a spill plate serving to prevent coal on the conveyor trough 21 from being dropped to the skid of the self-advancing support and serving as a cable duct as well.

Operation of the coal planer automatic reversing device will be described.

When the coal planer body 10 arrives at the point C (refer to FIG. 4) on the conveyor trough 21, the switch 13c senses the magnetism of the magnet 12 of said coal planer body 10, and the stop signals from the stop relay 26 are applied to the electromagnetic switch 29, whereby the rotation of the electric motor 1 is caused to stop.

Although the electric motor 1 is stopped, a force may be given to said electric motor 1 to cause a reverse rotation thereof during a short period since the coal planer body still continues the slight reciprocal motion in the retracting or advancing direction due to the inertia until it completely stops. This will act as an impact on the reduction mechanism 2, resulting in the cause of trouble. To eliminate the trouble, the delay relay 27 is provided so as to apply signals to the reverse-power relay 28 for the period since the motor has been stopped until the coal planer body 10 becomes completely stationary. When the signals are fed from the reverse-power relay 28 to the electromagnetic switch 29, said switch is connected to the side of the reversal drive, so that the electric motor 1 is rotated to actuate the coal planer body 10 in the reverse direction by way of the reduction mechanism 2.

When the coal planer body 10 arrives at the point G and the magnet 12 is brought into contact with the nearby switch 13g on the point G, the same operation as described above is repeated, thus continuous mining is carried out.

Although the revolution of the electric motor 1 is momentarily interrupted due to the actuation of the nearby switch 13a, the coal planer body 10 further advances across the stop point by virtue of the travelling inertia of said coal planer body.

Consequently, the coal planer body 10 comes into collision with the resilient shock absorber 14 disposed on the stationary member. The travelling inertia of the coal planer body 10 is absorbed by the plurality of the springs 16 interposed between the shock absorber 14 and the coal planer chain guide 15, whereupon the coal planer body 10 is caused to completely stop. Accordingly, there is no fear of causing a collision of the coal planer body with the driving unit on the gate side or the chain guide on the return gate end to tear on the coal planer chain which has been encountered due to such collision.

The shock absorbers used in this embodiment are made of a solid material of an elastic rubber or elastic synthetic resin, and needless to say, the shock absorber 14 of the present invention is not limited to a solid material but may be replaced by an air-cushion type or the like according to the mode of practice.

FIG. 5 shows a plot of an electric device according to another embodiment of this invention, in which numeral 30 is a pulse generating device attached either connected coaxially with the coal planer driving wheel 4 or disposed on a transmission element, for example, gear shaft, a cam shaft, a pulley shaft or the like, which

is transmitting an equivalent number of rotation to the revolution of the shaft of the coal planer driving wheel, said pulse generating device oscillating pulses proportional to the number of rotation of the coal planer driving wheel 4. Pulses produced from the pulse generating device 30 are applied to an addition and subtraction preset counter 31. In said counter 31, pulses are subtracted in case of advancing the coal planer and added in case of retracting said coal planer, whereby said preset counter 31, in association with a direction selection device 32, continuously indicates the position of the coal planer 10. 33 is a counter adjusting button to adjust a difference between the actual position of the coal planer 10 and the indication of said preset counter 31, if it is caused by trouble on the machine, for example, the tear on the coal planer chain 6. 34 is a reversal position selection device, which determines reversing points of the coal planer body 10 so as to permit said coal planer to automatically reverse at desired positions. When the preset value set by means of the reversal position selection device 34 becomes coincident with the value indicated as the real position of the coal planer, the signals are fed to a stop commanding device 35, and then fed to a reversing electromagnetic switch 36 so as to turn said switch to the off-position, thereby stopping the coal planer.

Subsequently, signals are fed to an opposite directional signal receiving unit 37 or 38, then applied, and thereafter through a delay-relay 39 or 40, to the reversible electromagnetic switch 36, whereby the switch 36 is closed to automatically move the coal planer 10 in the opposite direction.

In FIG. 5, the reversal positions of the coal planer are given to the points "10" and "50" on the addition and subtraction preset counter 31, and thereby the coal planer body 10 is automatically reversed between the points "10" and "50" nearby the face. Numeral 42 is a retracting signal generating unit.

When the electric motor 1 is actuated, the rotary power of said motor 1 is transmitted through the reduction mechanism 2 and the ranging arm 3 to the coal planer driving wheel 4, whereupon the coal planer body 10 is caused to advance or retract against the face by the coal planer driving unit on the gate side or the coal planer driving equipment on the return side. Simultaneously with the advancing or retracting movement of the coal planer body 10, the pulse signals proportional to the number of rotation of the driving wheel 4 are oscillated from the pulse generating device 30 installed coaxially with said driving wheel 4. When the pulse signals are oscillated in succession by said pulse generating device 30 and the moving direction device 32 indicates a "retracting movement" (back), said addition and subtraction preset counter 31 effects addition of pulse signals until the aggregated value reaches to "50". When the value reaches to "50," the coincident signals are fed from said counter 31 to the stop commanding device 35 through the reversal position selection device 34, and then fed to the reversible electromagnetic switch 36 to turn said switch to the off position, whereby the rotation of the electric motor 1 is interrupted and the retracting movement of the coal planer body is stopped also.

Meanwhile, simultaneously with the stop of the coal planer body 10, signals are fed from the stop commanding device 35 to the advance signal receiving unit 37,

by which the signals for advancing the coal planer are produced to actuate the delay circuit 39.

The delay circuit 39, after a given interval, feeds signals to the advance signal generating unit 41. Said advance signal generating unit 41, upon receiving the signals, causes the reversible electromagnetic switch 36 to close, whereby the electric motor 1 is reversed.

With the reverse revolution of said electric motor 1, the coal planer body 10 is caused to advance in the opposite direction to the point 10 at the gate side. In this case, since the direction selection device 32 indicates advance, said addition and subtraction preset counter 31 makes a subtraction of signals so as to obtain the preset value "10." When the value of signals comes to "10," coincident signals are fed to the reversal position selection device 34 from said counter 31. Then, said signals are fed to the stop commanding device through said reversal position selection device 34, and at the same time, signals are fed to the reversible electromagnetic switch 36, whereupon the electric motor 1 stops and the advancing movement of the coal planer body 10 is interrupted.

Various changes and modifications in details may be made without departing from the spirit or the scope of the appended claims.

What is claimed is:

1. A coal planer comprising:

- a. an elongated stationary main body, forward and rear sections with a gate side drive frame extending between these sections along one side thereof, upper and lower portions to said main body, a coal planer body extending along said one side for longitudinal motion;
- b. a drive chain (6) extending along said frame on said one side to drive said coal planer body, with driver units coupled to drive said chain including a ranging arm (3) towards said rear section and a return wheel (18) towards said front section, a conveyor trough (21) operatively coupled to and driven by said chain;
- c. a magnet (12) on said upper portion a plurality of reed switches (13a, 13b, . . . 13n) on said conveyor trough disposed so as to magnetically couple to said magnet as they pass before said magnet;
- d. reversal means operatively coupled to said reed switches and to said driver units including a settable reversal position selection switch (25) and a stop relay (26) coupled to said driver means;
- e. longitudinal guide means on said coal planer body (11, 22) including an elongated aperture (23) in said guide means, ends on said drive chain (6) an elongated bolt (24) connecting said ends and passing through said aperture (23) and, front and rear shock absorbing means (20, 16) at said forward

and rear sections to receive said coal planer body when it reverses travel directions, whereby by setting said settable reversal position selection switch (25) upon a preselected one of said reed switches passing before said magnet (12) said reversal means will cause said driver units to reverse the travel of said chain towards the rear section reversing the travel direction of said coal planer body.

2. A coal planer comprising:

- a. an elongated stationary main body, forward and rear sections with a gate side drive frame extending between these sections along one side thereof, upper and lower portions to said main body, a coal planer body extending along said one side for longitudinal motion;
- b. a drive chain (6) extending along said frame on said one side to drive said coal planer body with driver units coupled to drive said chain including a ranging arm (3) towards said rear section and a return wheel (18) towards said front section, a conveyor trough (21) operatively coupled to and driven by said chain;
- c. longitudinal position locating means on said coal planer including position selection means; and,
- d. reversal means operatively coupled to said longitudinal position locating means coupled to said driver means, whereby by setting said position selection means, said reversal means will cause said driver units to reverse the travel of said chain towards the rear section reversing the travel direction of said coal planer body.

3. A coal planer as defined in claim 2 said longitudinal position locating means further comprising:

- a pulse generating device connected coaxially with a coal driving wheel or disposed on a transmission element transmitting an equivalent number of rotation to the revolution of said driving wheel;
 - an addition and subtraction preset counter connected to said pulse generating device; and,
 - a direction selection device associated with said addition and subtraction preset counter;
- said pulse generating device oscillating pulses proportional to the number of revolution of said coal planer driving wheel and feeding said pulses to said addition and subtraction preset counter associated with said direction selection device, and
- said addition and subtraction preset counter being adopted to effect a subtraction in case of advancing the coal planer, to thereby indicate thereon a point of reversing the coal planer, and to effect an addition in case of retracting said coal planer, to thereby indicate thereon a point of reversing said coal planer.

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