June 12, 1951 L. M. KELSO 2,556,653

CONTROL FOR FEEDING DEVICES

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FIG. 1.

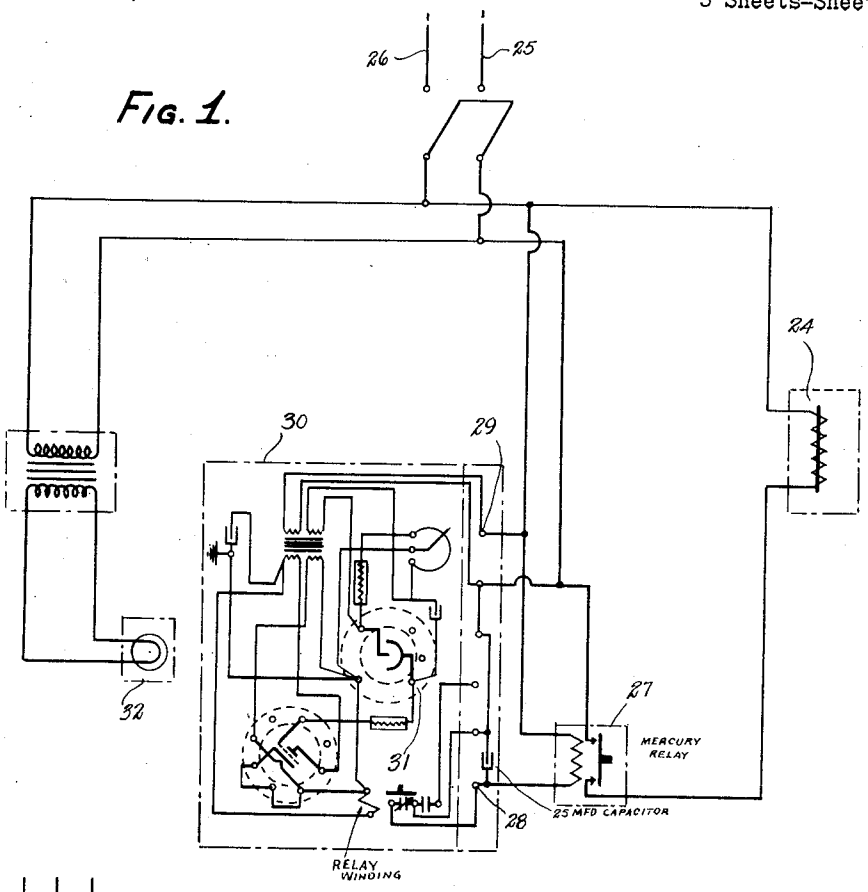


FIG. 2.

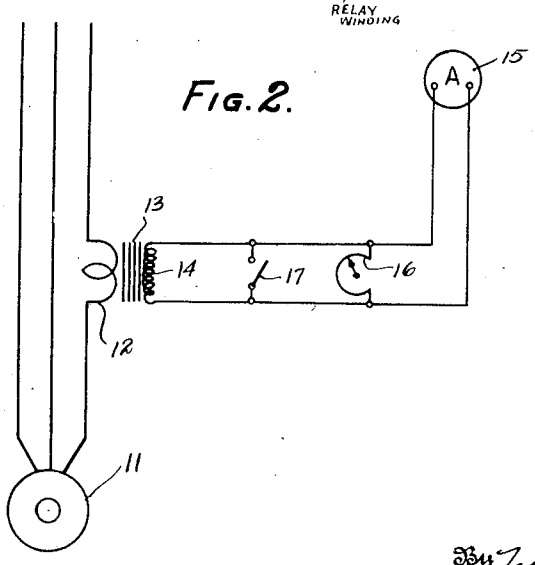
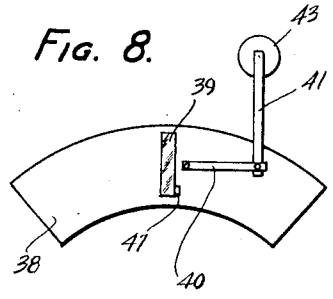


FIG. 8.



Inventor
Lawrence M. Kelso,

By McMorrow, Berman and Davidson
Attorneys

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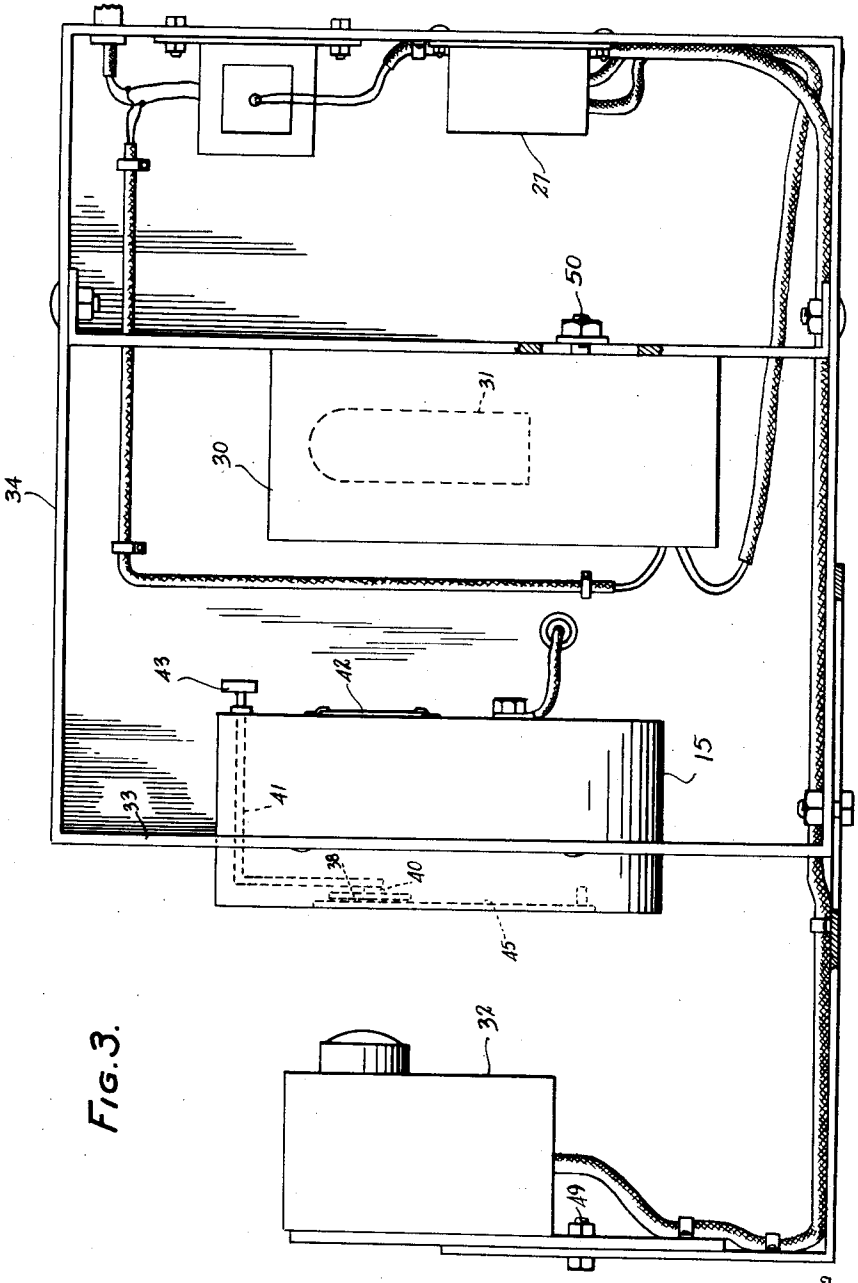


FIG. 3.

Inventor
Lawrence M. Kelso,

By McMorrow, Berman and Davidson
Attorneys

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FIG. 4.

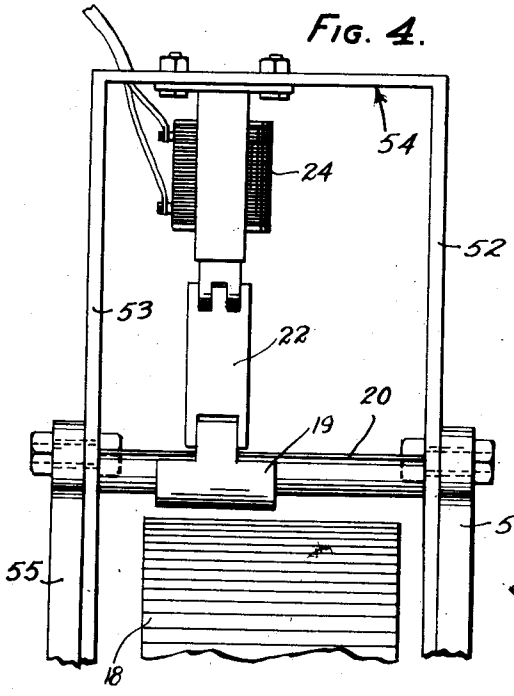


FIG. 5.

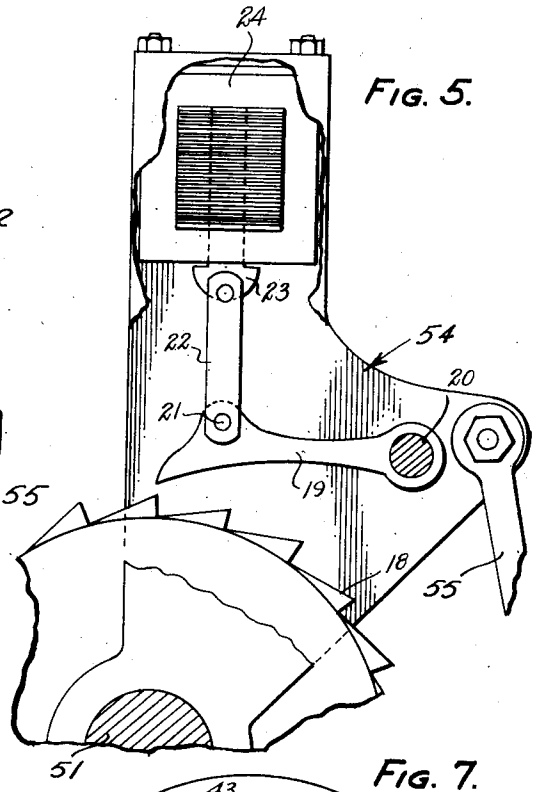


FIG. 6.

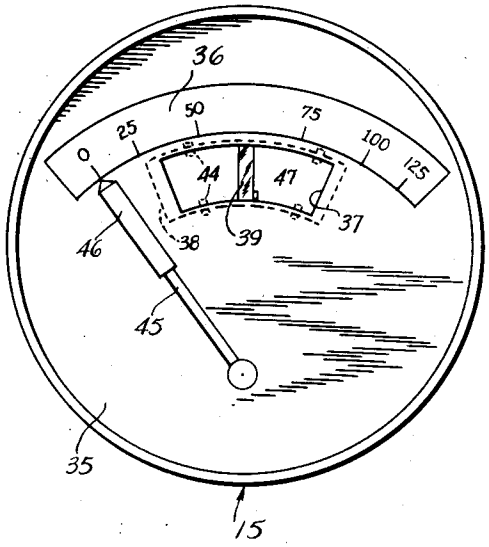
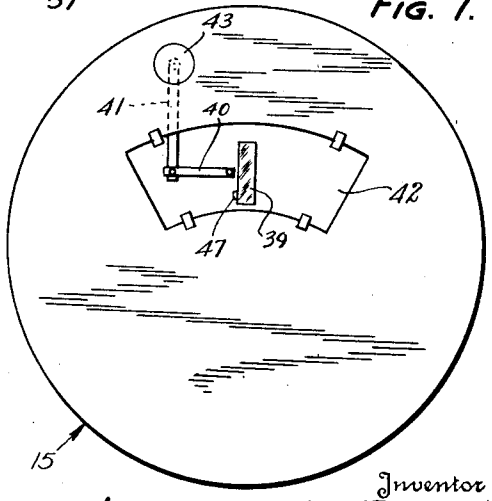


FIG. 7.



Inventor
Lawrence M. Kelso,

By McMorrow, Berman and Davidson
Attorneys

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UNITED STATES PATENT OFFICE

2,556,653

CONTROL FOR FEEDING DEVICES

Lawrence M. Kelso, Rocky Ford, Colo.

Application December 6, 1946, Serial No. 714,592

1 Claim. (Cl. 241—35)

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This invention relates to feeding devices for pulverizing roller mills and the like and more particularly to a control device for automatically engaging or disengaging the pawl of a conventional differential clutch mechanism employed in a feeding machine for pulverizing roller mills in accordance with the magnitude of the load on the prime mover employed for actuating the crushing mechanism.

A main object of the invention is to provide a novel and improved automatic controller for the feeding mechanism of a pulverizing roller mill, said controller being simple in construction, easy to install and reliable in operation.

A further object of the invention is to provide an improved electronic control device for operating a conventional pawl and ratchet type clutch mechanism for a pulverizing roller mill feeding machine, said control device being relatively inexpensive to manufacture, easy to maintain and readily adjustable in accordance with a substantial range of operating conditions.

Further objects and advantages of the invention will become apparent from the following description and claim, and from the accompanying drawings, wherein:

Figure 1 is a circuit diagram showing the electrical connections of a feed control device according to the present invention.

Figure 2 is a circuit diagram showing the electrical connections of the ammeter employed in the feed control system of this invention.

Figure 3 is a side elevational view showing the physical arrangement of parts employed in the system illustrated in Figures 1 and 2.

Figure 4 is a front elevational view showing the method of connecting the clutch pawl member to the pawl-controlling solenoid armature according to the present invention.

Figure 5 is a side elevational view of the structure shown in Figure 4.

Figure 6 is a front view of the ammeter of Figure 2.

Figure 7 is a back view of the ammeter of Figure 2.

Figure 8 is a front detail view of the adjustable means on the ammeter for predetermining the release point of the feed mechanism in terms of a desired load on the pulverizing roller mill motor.

Referring to the drawings, 11 designates the motor employed for driving the mechanism of a pulverizing roller mill, the motor and the pulverizing mechanism being conventional per se. Connected in series with a feed wire of the motor

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11 is the primary 12 of a current transformer 13, the secondary 14 thereof being connected to an ammeter 15. Shunting ammeter 15 is a rheostat 16 so that a desired division of current may be obtained as between the ammeter 15 and rheostat 16. A switch 17 is connected so as to provide a shunt for ammeter 15 at times, said switch being manually operated and being closed when motor 11 is started to prevent an excessive current surge through the ammeter.

The mill feeding mechanism comprises a ratchet drum 18 keyed to the pulverizer shaft 51 which is actuated by a pawl 19. Pawl 19 is pivotally mounted on a shaft 20 which is parallel to shaft 51 and is carried by the two arms 52 and 53 of a yoke member 54, said two arms being journaled on shaft 51. The yoke member 54 is oscillated back and forth by links 55, 55 connected by cranks and reduction gearing, not shown, to the driving motor 11. The means for oscillating yoke member 54 is conventional. When said pawl is lifted out of engagement with said teeth the feed mechanism is no longer driven by its motor and no feeding of material into the mill occurs. Pawl 19 is connected at 21 to the lower end of a link 22. The upper end of link 22 is connected to the armature 23 of a solenoid 24 carried by the top bar element of yoke 54. When solenoid 24 is deenergized, as when the mill is not receiving enough material for best operation and the loading of motor 11 is below its desired value, pawl 19 is engaged with drum 18 so that normal feeding of material into the mill takes place. When solenoid 24 is energized however, pawl 19 is lifted out of engagement to stop the feeding action.

Solenoid 24 is connected to the power lines, indicated at 25 and 26, through the contacts of a slow releasing relay 27. Relay 27 may be of a type similar to type BFT manufactured by Durakool, Inc., of Elkhart, Indiana. This relay closes its contacts quickly responsive to energization thereof but requires a time period of about three seconds to open its contacts upon deenergization thereof.

The operating winding of relay 27 is connected across the control terminals 28 and 29 of a photoelectric relay 30, connected as shown in Figure 1, which may be similar to type CR 7505–K2 manufactured by the General Electric Company of Schenectady, N. Y. This relay 30 is a standard commercial photo-electric relay and includes a photocell 31 which is normally energized by a suitable light source 32 and is arranged so that the controlled device 27 will be energized upon

interruption of the beam of light which is emitted by source 32 and which is normally incident upon photocell 31. Thus, relay 27 is deenergized as long as the light beam is uninterrupted. When an interruption of the beam occurs, relay 30 causes energization of relay 27, which in turn closes its contacts and energizes solenoid 24.

As shown in Figure 3, the ammeter 15 is interposed in the path of the light beam which is emitted by source 32 and which is directed toward the photocell 31 of photoelectric relay 30. The ammeter may be mounted in a wall 33 of a suitable housing 34 containing the control relays 30 and 27. Ammeter 15 has a face portion 35 provided with a scale 36 and formed with an arcuate window 37. The rear wall of the ammeter housing is formed with a similar window aligned with window 37. Adjustably mounted on the inner surface of face member 35 is an arcuate plate 38, slidably supported for arcuate movement by guide lugs 44 secured to member 35. Plate 38 has a transparent window 39 radially arranged with respect to scale 36. The position of window 39 may be adjusted by a manually operable linkage comprising a first arm 40 pivotally connected to plate 38 at one end and pivotally connected at its other end to the depending portion of an angular second arm 41, the horizontal portion extending through and being journaled in the rear wall of the ammeter housing. A knob 43 is connected to said horizontal portion of arm 41 for rotating said arm to adjust the position of plate 38. Ammeter 15 is provided with an indicating needle 45 having an end portion 46 of enlarged width. When the load current of the pulverizer motor 11 reaches a value corresponding to the setting of transparent window 39, needle 45 swings to this position and portion 46 blocks the passage of light through said transparent window. The light beam from source 32 which has been passing through the window to the photocell 31 is thus interrupted. This causes the relay device 27 to be energiezd which in turn energizes solenoid 24 whose armature 23 immediately raises pawl 19 out of engagement with drum 18, halting the feed of material to the pulverizing mill. Since relay 27 is slow-releasing, a time period must elapse between the time when needle 45 swings back as the load current decreases and no longer interrupts the light beam and the time when the contacts of relay 27 open to deenergize solenoid 24. This insures that the pulverizer load will decrease below the predetermined desired value before feeding of material to the crusher is resumed.

Plate 38 carries a stop lug 47 adjacent window 39 which extends forwardly through window 37 and projects beyond face 35 a sufficient distance to prevent enlarged portion 46 of pointer 45 from swinging past obscuring position with respect to window 39 when a heavy overload occurs.

Adjustment of the desired load limit on motor 11 is made by moving plate 38 arcuately to a position wherein window 39 is radially aligned with the scale value corresponding to the desired maximum load current. Further adjustment to meet unusual conditions may be made by adjusting rheostat 16 to change the percentage division of current passing through the ammeter and said rheostat. The scale calibration of the ammeter depends, of course, on the adjustment of rheostat 16.

The arcuate window in the rear wall of the ammeter housing is covered by an arcuate pane of glass 42 to protect the ammeter against the entry of dust and dirt.

The light source 32 is adjustably secured by a bolt 49 and the photo-electric relay unit is adjustably secured by a bolt 50, bolts 49 and 50 being aligned with the pivotal axis of pointer 45 so that the source 32 and photocell 31 may be angularly adjusted to follow the adjustment of window 39.

While a specific embodiment of a feed controlling device for crusher mills and the like has been described in the foregoing description it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore it is intended that no limitations be placed on the invention other than as defined by the scope of the appended claim.

What is claimed is:

A system for controlling the feeding device of a pulverizing mechanism in accordance with the magnitude of the load on the prime mover of said mechanism comprising a source of energization, a rapid contact slow release relay having its input electrically connected to said source of energization, a normally deenergized solenoid having its armature connected to said feeding device to disengage the latter in response to the energization of said solenoid, means electrically connecting the winding of said solenoid to the output of said relay for energizing said solenoid in response to the energization of said relay, a photo-electric relay including a photo-electric cell and a beam of light normally incident on said photo-electric cell, means electrically connecting said photo-electric cell to the operating winding of said first named relay to energize the latter in response to the interruption of said beam of light, and manually adjustable means disposed intermediate said beam of light and said photo-cell for deenergizing the latter in response to select loads on said prime mover, said last named means comprising a current measuring instrument including an indicating scale and a pointer, there being an arcuate aperture in the face of said instrument below said scale for the passage therethrough of said beam of light, said pointer traversing said aperture in response to variations in the load on said prime mover, and means slidably supported within said instrument for restricting the passage of light through said aperture to an area below a select current indication, whereby as said needle traverses said area, the beam of light will be interrupted, said last named means comprising an arcuate plate underlying said arcuate aperture and mounted within said instrument for sliding movement along an arcuate path, there being a transparent window provided in said plate intermediate its ends and arranged radially with respect to said indicating scale.

LAWRENCE M. KELSO.

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