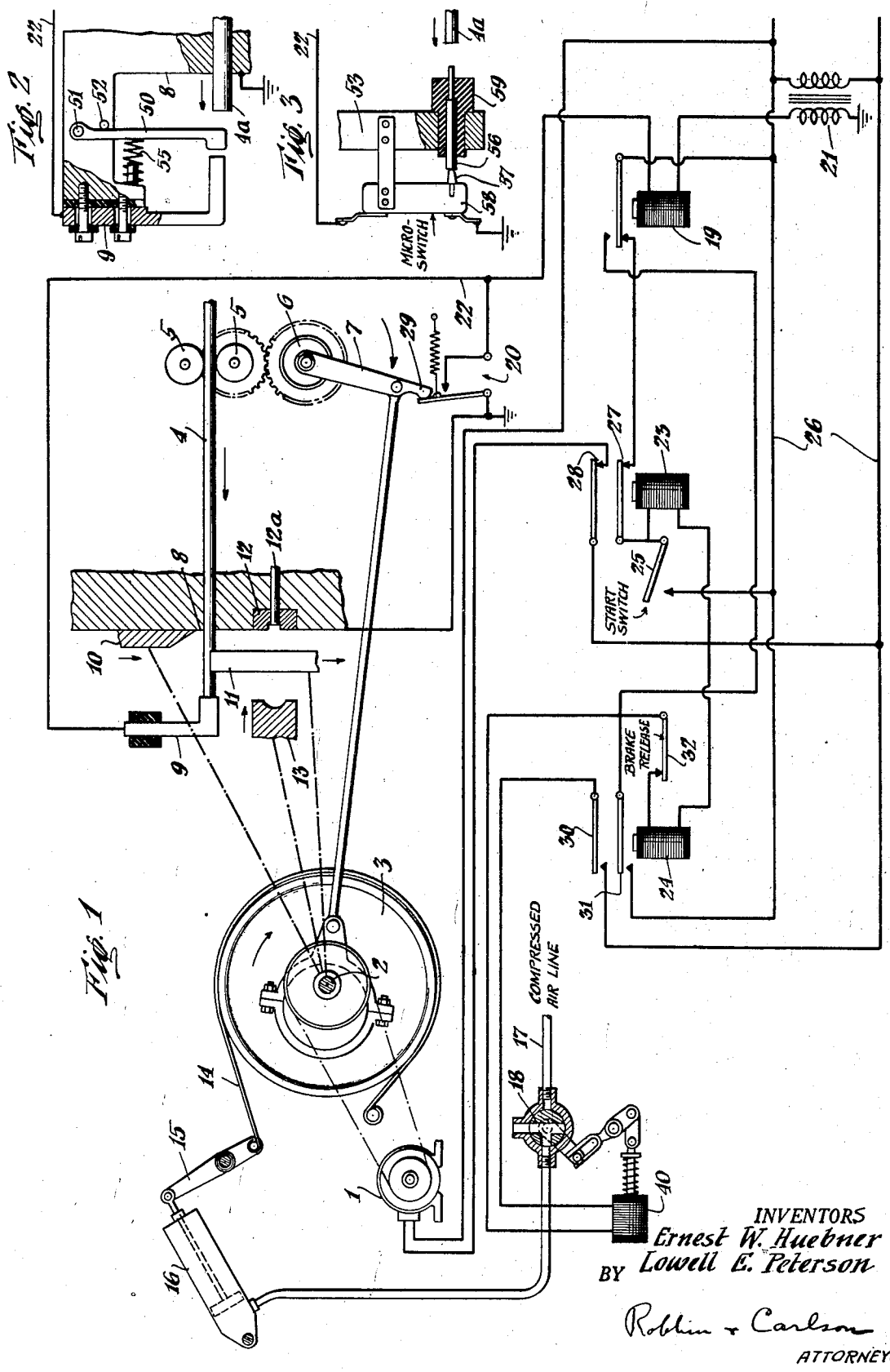
Dec. 12, 1944. E. W. HUEBNER ET AL 2,364,716

PROTECTIVE SYSTEM FOR HEADING MACHINES

Filed Feb. 3, 1943



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Patented Dec. 12, 1944

2,364,716

UNITED STATES PATENT OFFICE

2,364,716

PROTECTIVE SYSTEM FOR HEADING MACHINES

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Application February 3, 1943, Serial No. 474,598

5 Claims. (Cl. 10—11)

This invention relates to protective systems for machines, particularly for metal heading machines.

An object of the invention is to improve protective systems for machines.

Other objects of the invention will be apparent from the description and claims.

In the drawing:

Figure 1 is a diagram of the protective circuit together with a diagrammatic illustration of the operating parts of a heading machine with which it is associated;

Figure 2 illustrates a modification of part of the machine; and

Figure 3 shows a further modification.

In certain types of machines for operating on metal stock, it is of considerable importance to insure that an appropriate length of raw metal stock be fed into the machine before each operation. In the making of small parts such as rivets, etc., from metal rod, wire, strip, tubing, special sections and the like, for example, the rod is fed into the machine by feed rollers until it reaches a stop. The end section of the rod is then cut off by the machine and carried to a heading position where cooperating die members come together to press the cut-off section of metal rod into the desired shape.

If the feeding rollers fail to feed in a sufficient length of metal to the machine, a section which is too short may be cut off and carried to the dies. There is then insufficient metal to completely fill the stationary die during the coining operation and it is found that the coined piece may not sufficiently fill the die to be held therein by friction when the movable punching die is retracted. If this occurs, the formed piece may stick to the punching die and remain attached to it. When the next rod section is brought between the dies, this will result in an excess of metal between them and is liable to result in die breakage or damage to the machine. It, therefore, becomes of considerable importance to insure that the required length of rod stock be measured and cut off for each operation.

The present invention relates to a protective system for stopping the machine whenever an insufficient length of rod stock is fed to the machine.

Referring to Figure 1, the operating parts of the machine necessary for an understanding of the invention are shown and include an electric motor 1 for driving the machine, a shaft 2 driven thereby and a flywheel 3 on the shaft. The rod stock 4 is fed into the machine by a pair of feed rollers 5 driven by a one way clutch 6 which in turn is driven by a rocker arm 7 linked to shaft 2 of the machine. Thus as the arm 7 oscillates back and forth it advances the rod 4 during its motion in one direction, the rod remaining stationary during the return motion of the arm.

The rod 4 is fed through an opening in the operating face 8 of the machine until it reaches stop member 9 whereupon a cutter 10 cuts off the end section of the rod and an arm 11 carries the cut off section to a position between stationary die 12 and movable die 13, which then come together to coin the rod section into the desired rivet or other product. During normal operation, the coined rivet remains in the stationary die 12 when the punching die 13 is retracted and the piece is then ejected from die 12 by mechanical plunger 12a or other means such as compressed air.

According to the present invention a brake band 14 is provided on the outer rim of flywheel 3 to stop the machine. The brake is operated by a lever 15 controlled by compressed air cylinder 16 supplied from a compressed air line 17 under control of valve 18, operated by solenoid 40.

Stop member 9 is insulated from the rest of the machine. The protective circuit comprises a normally energized protective relay 19 under joint control of a cam operated switch 20 and a circuit through rod 4 and stop member 9. The energizing circuit for relay 19 extends from transformer secondary winding 21 through relay 19, then through normally closed contacts of switch 20 to ground. A second energizing circuit is possible in parallel with switch 20 via conductor 22, stop member 9 and rod 4 to ground in the machine frame whenever rod 4 is in contact with stop member 9.

Relay 19 has "front" and "back" contacts, the front contacts being in the holding circuit for a motor control relay 23 which controls the energizing circuit for electric motor 1. The back contacts of relay 19 close an operating circuit for valve control relay 24 which controls the energization of solenoid operated valve 18. Other features of the system will be apparent from the following description of the operation of the machine.

With the machine in the position shown the energizing circuit for relay 19 is closed and hence the front contacts of this relay are closed. To operate the machine, the operator closes starting switch 25 momentarily to close the energizing

circuit for motor control relay 23 from A. C. power line 26. Relay 23, in operating, closes a holding circuit for itself through its contacts 27 and the front contacts of relay 19. It also closes the energizing circuit for motor 1 through contacts 28 thus starting the machine in operation.

As shaft 2 rotates, rocker arm 7 oscillates back and forth advancing rod 4 on each travel in the direction of the arrow. The arm is adjusted to have a small amount of overtravel so that rod 4 reaches stop 9 shortly before arm 7 reaches the end of its travel. The operating arm of switch 20 is disposed in the path of travel of the end 29 of arm 7 which functions as a cam to momentarily open switch 20 for a short interval during which arm 7 is at the extreme of its travel. At this time, if the feeding mechanism is functioning properly, rod 4 will be in contact with stop 9 and thereby provide a parallel holding circuit for relay 19 independent of switch 20. However, should rod 4 fail to be in contact with stop 9 at this time due to failure of the feeding mechanism or for any other reason, the holding circuit for relay 19 will be broken through both parallel paths and relay 19 will release.

Release of relay 19 closes the back contacts of this relay, thereby closing an energizing circuit through valve controlling relay 24 which thereupon operates closing an energizing circuit for solenoid 40 which operates valve 18 through contacts 30 and a holding circuit for itself through contacts 31. The solenoid valve immediately operates to supply compressed air to cylinder 16 and tighten the brake band thus applying the brake to stop the machine. The machine is stopped almost instantaneously so that no serious damage can occur.

When relay 19 is released, it also opens the holding circuit for relay 23 through its front contact thus releasing relay 23 which opens the motor circuit.

When the trouble has been remedied, the brake can be released by momentarily opening "brake release" switch 32 to release relay 24 and release the solenoid valve to close the compressed air line and open an exhaust port on the valve, permitting release of the compressed air in cylinder 16. Switch 25 can then be momentarily closed to restart the motor.

It is sometimes necessary or desirable to complete the electric circuit independent of the rod or wire being fed into the machine. This is the case, for example, when insulating materials, such as Bakelite and other plastics, are being worked upon.

Figures 2 and 3 show arrangements suitable for such cases. In Figure 2 a small contact arm 50 is hinged or pivoted at 51 to the machine frame and is grounded to it. The free end of arm 50 has a contact which is normally held spaced from stop member 9 by a spring 55. A stop pin 52 limits the spacing. When the rod stock 4a strikes the free end of arm 50 it moves it into contact with stop 9 to connect it and conductor 22 to ground.

In Figure 3 a plunger 56 is supported to slide in an insulating bushing 59 mounted on a bracket 53 on the frame. The end of the plunger is in contact with the push button 57 of a "micro-switch" 58. When rod 4a depresses the plunger, the micro-switch is operated to connect ground to conductor 22.

While specific embodiments of the invention have been described, it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. In a machine fed with conductive rod stock wherein the end of the rod is fed into said machine and a stop member stops the travel of said rod when a predetermined length of rod has entered the machine whereupon the end of said rod is cut off, the combination with said machine of a relay and an energizing circuit therefor, said energizing circuit having two parallel branches, one of said branches passing through said rod and stop in series, a switch in the other of said branches, and a cam on a cyclically operating part of said machine engageable with said switch to open the same during that part of the machine cycle in which said rod is normally against said stop before being cut off, and a brake operated responsive to the release of said relay to stop said machine whenever said relay circuit is broken by said cam operated switch (when a parallel holding circuit for said relay has not been established by said rod having engaged said stop).

2. In a machine fed with conductive rod stock wherein the end of the rod is fed into said machine and a stop member stops the travel of said rod when a predetermined length of rod has entered the machine whereupon the end of said rod is cut off, the combination with said machine of a relay and an energizing circuit therefor, said energizing circuit having two parallel branches, one of said branches passing through said rod and stop in series, a switch in the other of said branches, and a cam on a cyclically operating part of said machine engageable with said switch to open the same during that part of the machine cycle in which said rod is normally against said stop before being cut off, a compressed air operated brake for said machine and a solenoid-operated valve in the air supply line therefor, and an operating circuit for said valve passing through "back" contacts of said relay.

3. In a machine fed with conductive rod stock wherein the end of the rod is fed into said machine and a stop member stops the travel of said rod when a predetermined length of rod has entered the machine whereupon the end of said rod is cut off, the combination with said machine of a relay and an energizing circuit therefor, said energizing circuit having two parallel branches, one of said brances passing through said rod and stop in series, a switch in the other of said branches, and a cam on a cyclically operating part of said machine engageable with said switch to open the same during that part of the machine cycle in which said rod is normally against said stop before being cut off, a compressed air operated brake for said machine and a solenoid-operated valve in the air supply line therefor, and an operating circuit for said valve passing through "back" contacts of said relay, an electric motor driving said machine and an energizing circuit therefor controlled by the "front" contacts of said relay.

4. In combination, a driving motor, a rod feeding mechanism driven thereby and a rod advanced by said mechanism, a stop engaged by the end of said rod to stop the travel of said rod whenever a predetermined section of rod has been advanced and a cutter for cutting off the end of the said rod to permit a further section of rod to be advanced, a relay and an energizing circuit therefor, said energizing circuit having two parallel branches, one of said branches passing through said rod and stop in series, a switch in the other of said branches, and a cam driven by said motor for opening said switch during a portion of each oper-

ating cycle in which said rod end is normally in engagement with said stop, a brake for said driving motor and an energizing circuit therefor passing through "back" contacts of said relay.

5. In combination, a rod, a feeding mechanism therefor, a stop engaged by said rod for limiting its travel, and operating mechanism for performing operations on the end of said rod including means for cutting off the end of said rod to permit a further portion of said rod to be fed into engagement with said stop, a power shaft driving said feeding and operating mechanism, a relay, an energizing circuit therefor having two parallel conductive paths, one of said paths including said rod and said stop in series therein, the other of said paths including a switch, and a cam driven by said shaft and engaging the operating arm of said switch to open the same for a portion of each cycle of operation of said mechanism during which said rod is normally in engagement with said stop, a brake for said power shaft, a brake operating mechanism therefor, and a control circuit for energizing said brake operating mechanism closed by the "back" contacts of said relay on release of said relay.

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