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SOLENOID-ACTUATED AIR CYLINDER

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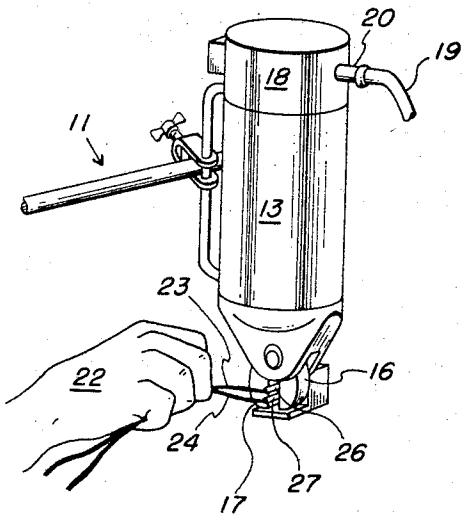


FIG. 1

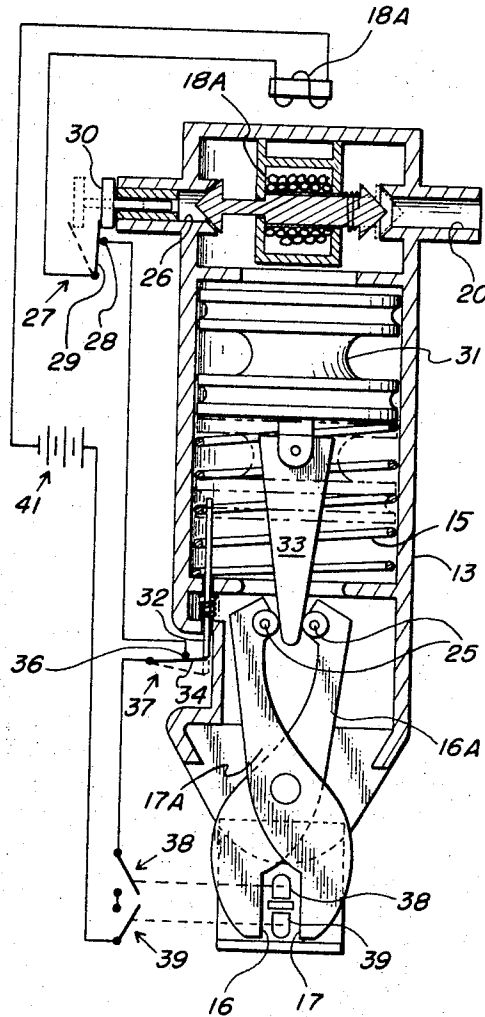


FIG. 2

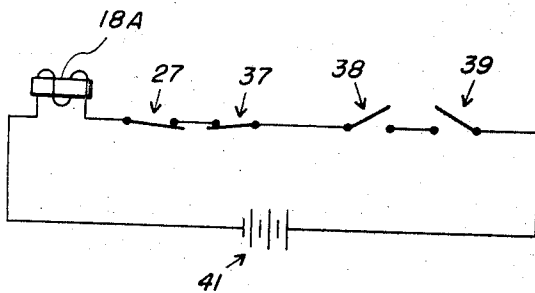


FIG. 3

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## SOLENOID-ACTUATED AIR CYLINDER

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5 Claims

### ABSTRACT OF THE DISCLOSURE

A solenoid-actuated air cylinder coupled to a pair of crimping jaws for crimping work placed therein having a solenoid-actuated valve coupling air under pressure to the air cylinder mechanism for actuating the air cylinder's piston; the solenoid being actuated by applying electrical power to it; a switch in series with the solenoid mechanically coupled to the piston for opening at the top of the piston's stroke, deactivating the solenoid and thereby closing the pressurized gas supply and opening and allowing a discharge through an exhaust port; a second switch coupled to the exhaust port in series with the first switch for holding the solenoid in an inactivated position during the exhaust cycle of the cylinder; another switch in series with the first and second switches for insuring proper positioning of the work prior to the actuation of the solenoid in operation of the air cylinder.

The present invention relates to a solenoid-actuated air cylinder and more particularly to a solenoid-actuated air cylinder having a hold-off mechanism for the prevention of recycling prior to the air cylinder's pistons full return stroke.

According to the invention, a solenoid-actuated valve applies gas under pressure to an air cylinder mechanism for the actuation of the air cylinder's piston. The solenoid is actuated by applying electrical power to it from any convenient source. At the top of the piston's stroke, a switch is opened which deactivates the solenoid, closing the pressurized gas supply and opening and allowing a discharge through an exhaust port. Another switch is coupled to the exhaust port, holding the solenoid in an inactivated position during the exhaust cycle of the cylinder. This prevents any inadvertent recycling by the operator before the air cylinder has had a chance to completely exhaust. After the exhaust cycle is completed, the second switch automatically closes, allowing the solenoid to be actuated from its initial source.

One extremely useful embodiment of the present invention lies in its use as a pressing machine. In this instance, the solenoid is initially actuated by placing the work to be pressed within a pair of crimping jaws which are coupled to the piston of the air cylinder. A switch can be conveniently located for closing by the work to be pressed which will insure proper positioning of the work prior to the actuation of the solenoid and operation of the air cylinder.

An object of the present invention is the provision of a solenoid-actuated air cylinder which cannot be recycled until it is completely exhausted.

Another object is to provide a pressing machine which cannot cycle unless the work is properly positioned within the pressing jaws.

A further object of the invention is the provision of a pressing machine which is inexpensive and simple to manufacture, and requires a minimum of maintenance and adjustment.

Still another object is to provide a pressing machine which is light in weight and requires a minimum of space.

Yet another object of the invention is the provision of

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a pressing machine which requires a minimum of skill to correctly operate.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a pictorial representation of the preferred embodiment of the present invention.

FIG. 2 is a schematic representation of the working parts of the embodiment of FIG. 1; and

FIG. 3 is a schematic representation of the electrical circuit of the embodiment of FIGS. 1 and 2.

Referring to FIG. 1, a mounting bracket 11 carries air cylinder 13. Air cylinder 13 is coupled to crimping jaws 16 and 17. Solenoid-actuated valve 18 is connected to pressurized gas supply hose 19. An operator's hand 22 is shown holding two pairs of wires 23 and 24 with splice caps 26 and 27 on the ends thereof entering into the space between jaws 16 and 17.

Referring to FIG. 2, a solenoid-actuated valve 18 is shown schematically with solenoid 18A external thereto. Exhaust port 26 is mechanically coupled via cap insert 30 to switch 27 having a stationary contact 28 and a movable contact 29. Solenoid-actuated valve 18 couples intake port 20 to air cylinder 13 in the position shown in solid lines. Piston 31 within air cylinder 13 has push rod 32 and actuating rod 33 coupled to one end thereof. Actuating rod 33 is in slidable contact with rollers 25 which are rotatably carried by jaw arms 16A and 17A. Push rod 32 is physically positioned for opening contact 34 when piston 13 is at the end of its stroke. Quiescently, contact 34 is making contact with stationary contact 36 of switch 37. Switches 38 and 39 are positioned in the rear of the space defined by jaws 16 and 17. Switches 38 and 39 are connected in series with solenoid winding 18A and battery 41.

Referring to FIG. 3, battery 41 is connected in series with solenoid winding 18A and switches 27, 37, 38 and 39.

### Operation

Referring now to FIGS. 1, 2 and 3, switches 37 and 27 are quiescently closed and switches 38 and 39 are quiescently open as shown. When pieces to be pressed or crimped, such as splicing caps 26 and 27 as shown in FIG. 1, are inserted between jaws 16 and 17, they will abut switches 38 and 39, close their contacts, and actuate solenoid 18A. It can be seen that only if both splicing caps are fully inserted will both switches 38 and 39 be closed, which is necessary for actuation of solenoid 18A, since they are in series with solenoid 18A and battery 41.

Assuming that switches 38 and 39 are closed by inserted work, solenoid 18A will then be actuated by current from battery 41 to open intake port 20 which supplies pressurized gas to piston 31. Piston 31 will then be forced downward, closing jaws 16 and 17. At the end of the piston stroke, push rod 32 will open switch 37, inactivating solenoid 18A. When this happens, intake port 20 is closed, allowing cylinder 13 to exhaust through exhaust port 26.

Exhaust port 26 is mechanically coupled to contact 29 of switch 27 by cap insert 30, opening switch 27 and holding solenoid 18A in an inactivated condition during the return travel of piston 31. This is necessary since once piston 31 begins its return stroke, switch 37 will close again, which would result in a recycling of air cylinder 13 since solenoid 18A would be reactivated. Hence, switch 27 serves to hold solenoid 18A in an inactivated condition

during the return stroke of piston 31, i.e., as long as the air cylinder is being exhausted. This will give the operator sufficient time to remove the work before switch 27 is closed again, which will result in switches 38 and 39 being opened, and the equipment is ready for the next cycle of operation.

It should be understood of course that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A solenoid-actuated air cylinder comprising:
  - an air cylinder having a piston therein and a compressed gas port;
  - an electrical power source;
  - a solenoid-actuated valve coupled to said electrical power source, said solenoid-actuated valve connecting said compressed gas port with a pressurized gas supply for supplying a pressurized gas to said compressed gas port and actuating said piston;
  - circuit breaking means mechanically coupled to said piston for interrupting electrical current flow between said solenoid and said electrical power source;
  - a second circuit breaking means in serial relationship with said electrical power source and said solenoid; and
  - coupling means in operable relationship with said exhaust means, said coupling means coupling said exhaust means and said second circuit breaking means for interrupting electrical current flow between said solenoid and said electrical power source during an exhaust through said exhaust valve.
2. A pressing machine comprising:
  - a pair of pressing jaws, at least one of said pair of pressing jaws being movable;
  - an air cylinder having a piston therein and a compressed gas port, said piston being mechanically coupled to said pair of pressing jaws and operable to close said pressing jaws upon actuation thereof;
  - actuating means mounted in proximity to said pressing jaws and responsive to proper alignment of work to be pressed between said pressing jaws for actuating said air cylinder piston;
  - said actuating means comprising at least one electrical switch, said electrical switch connecting an electrical power source to a solenoid-actuated valve, said solenoid-actuated valve connecting said compressed gas port with a pressurized gas supply for supplying

a pressurized gas to said compressed gas port and actuating said piston.

3. The pressing machine of claim 2 and further including:

circuit breaking means mechanically coupled to said piston for interrupting electrical current flow between said solenoid and said electrical power source.

4. The pressing machine of claim 2 wherein:

said solenoid-actuated valve includes an exhaust means; a circuit breaking means in serial relationship with said at least one electrical switch; and

coupling means in operable relationship with said exhaust means, said coupling means coupling said exhaust valve and said circuit breaking means for interrupting electrical current flow between said solenoid and said electrical power source during an exhaust through said exhaust valve.

5. The pressing machine of claim 2 and further including:

a first circuit breaking means mechanically coupled to said piston for interrupting electrical current flow between said solenoid and said electrical power source; an exhaust means in said solenoid-actuated valve; a second circuit breaking means in serial relationship with said at least one electrical switch; and

coupling means in operable relationship with said exhaust means, said coupling means coupling said exhaust means and said second circuit breaking means for interrupting electrical current flow between said solenoid and said electrical power source during an exhaust through said exhaust means.

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