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AUTOMATIC STOP MECHANISM FOR COLLAPSIBLE TUBE MACHINES

Filed May 22, 1931

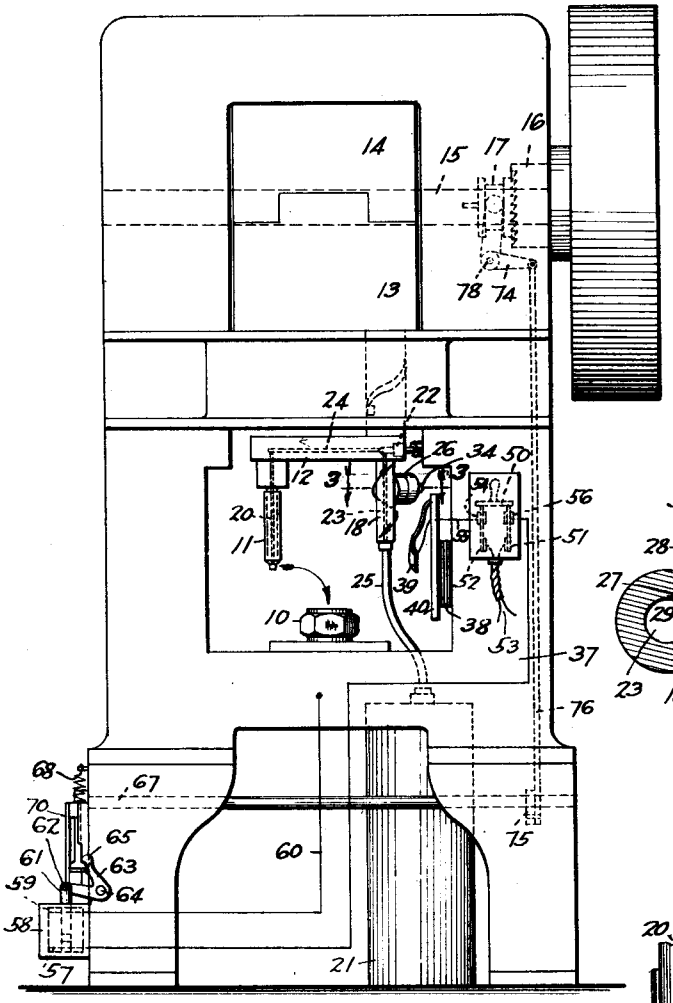


Fig. 1

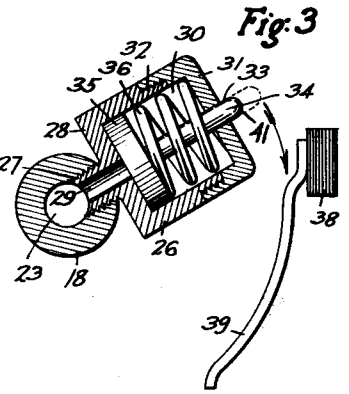


Fig. 3

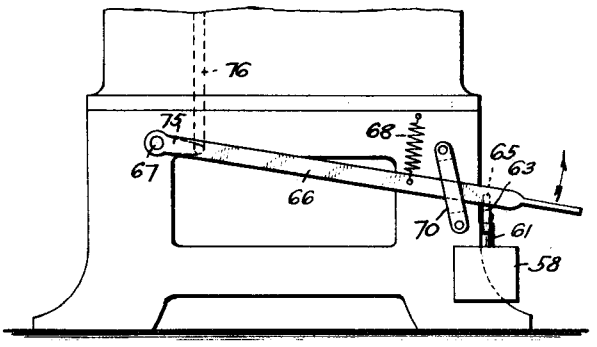


Fig. 2



Fig. 4

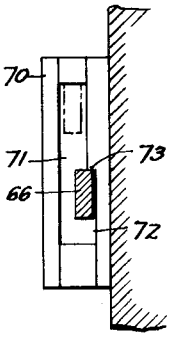


Fig. 5

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UNITED STATES PATENT OFFICE

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AUTOMATIC STOP MECHANISM FOR COLLAPSIBLE TUBE MACHINES

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This invention relates to means for halting the operation of presses which extrude collapsible tubes from comparatively thick coin-shaped metal discs.

In such presses, it is customary to squeeze the disc into a female die, by means of an elongated cylindrical male die or plunger tapered at its lower end, whereupon the comparatively soft metal of the disc flows or squirts upwardly out of the female die and around the male die, thereby forming a thin walled tube. The squeezing operation just described is known as "extrusion".

After the tube has been thus extruded on to the male die, it becomes necessary to remove the tube from the plunger. This is accomplished, customarily, by means of a blast of air, for example, in the manner shown in my co-pending application for patent for extruding machine, Serial No. 336,368, filed January 31st, 1929. It happens occasionally that the air blast does not discharge or dismount the extruded tube from the male die, preparatory to the extrusion of the next tube. When this occurs and the press continues to operate, the machine attempts to extrude the next disc over the tube already on the male die, resulting not only in the destruction of both tubes but in serious danger of jamming the machine or of breakage and damage thereto.

My invention contemplates the provision of means for preventing any further extruding operation of the machine, should the blast of air fail to dismount or discharge the extruded tube from the male die or plunger, and for completely halting the machine before the plunger can extrude the next disc. My invention further contemplates the provision of simple, positive, and efficient electrically and mechanically operated means for disengaging the clutch which operates the machine, whereby the movement of the plunger is stopped without material loss of time and independent of the inertia of the heavy moving parts and sufficiently in advance of the contact of the plunger with the female die to insure against damage to the tube retained by the plunger.

The various objects of my invention will be clear from the description which follows, and from the drawings, in which,

Fig. 1 is a front elevation of an extruding press for collapsible tubes to which my invention has been applied.

Fig. 2 is a side elevation of the lower part of the press showing the tripping or clutch moving mechanism.

Fig. 3 is a horizontal section and partial top plan view of the air operated switch or contact member, taken on the line 3—3 of Fig. 1, showing also the inclined stationary contact rail.

Fig. 4 is a vertical section of the male die showing an extruded tube in position thereon ready to be dismounted, and

Fig. 5 is a vertical section of the clutch tripping lever, of the guide therefor, and of the means for normally maintaining the lever in the position which maintains the clutch in operation.

In that practical embodiment of my invention which I have illustrated by way of example, slugs or discs of the proper shape and size are deposited in suitable means, not shown, preferably in the form of a well-known hopper, and are fed in succession to the female die 10. The male die or plunger 11 is supported by the oscillatory arm 12 which is in turn carried by the lower toggle member 13 of the press. Said toggle member 13 is suitably connected to the toggle member 14, both being operated in a well known manner on the rotation of the shaft 15, which is operatively connected to said toggle members and which is continuously rotated by continuously rotating means, indicated diagrammatically as 16 and deriving its power from a motor or other suitable source of power not shown. A suitable clutch as 17 is interposed between the driving means 16 and the shaft 15, and is normally in the position shown in Fig. 1, wherein the power means 16 is operatively connected to the shaft. The clutch 17 is of well known construction not necessary to be shown or described in detail, it being understood that when the clutch member is moved toward the left, as viewed in Fig. 1, out of engagement with the power source 16, rota-

tion of the shaft 15 and operation of the machine ceases, and when moved back in the other direction, operation of the machine continues.

It will further be understood that as is customary in collapsible tube extruding presses, the arm 12 is oscillated as by means of a suitable cam slot and pin indicated in Fig. 1 to bring the plunger 11 vertically above the female die 10 during the downward movement of the plunger into the female die to perform the extruding operation, and thereby moves the plunger alternately in opposite directions in the path indicated by the arrow of Fig. 1. After the slug or disc has been extruded to form a tube upon the plunger, said plunger is swung back along the indicated path into the position in which the tube extruded thereon may be discharged therefrom, all as is well known.

A suitable opening or passage as 20 extends through the plunger through which an air blast is delivered to discharge the tube from the plunger. The passage 20 communicates with a similar passage 23 in the member 18 depending from the arm 12 as through the connecting passage 24. Air may be supplied to the opening 23 and thence to the opening 20 as by means of the air tube 25 leading to a suitable source of air, such as a tank 21, or pump, compressor, or the like.

On the member 18, which oscillates and reciprocates with the plunger, is mounted the cylindrical switch member support 26, as by means of the threaded connection 27. In one end 28 of the support 26, is provided the passage 29, communicating with the interior 30 of the support. The other end of the support is closed as by means of the cover 31, screw-connected thereto as at 32, and having an opening 33 therein for the passage of the piston rod 34. Said rod serves as the movable contact member of a switch which, on the proper occasion, closes a circuit to a member which throws the clutch to halt the machine. The piston 35 is secured to the inner end of the piston rod, and is normally maintained in its innermost position, as by means of the spring 36 interposed between the cover 31 and the piston.

A blast of air is admitted to the opening 20, when the plunger 11, together with the tube thereon, are in the position indicated in Fig. 1, which I will term the dismounting position, as by means of a suitably operated valve 22 interposed in the air supply pipe 25.

It will be understood that the air blast also exerts pressure on the piston 35 but such pressure is normally insufficient to move the piston outwardly against the action of the spring 36. The air blast increases, however, and becomes sufficient to overcome the pressure of the spring when the passage 20 is obstructed by an undischarged tube.

Secured to the frame 37 of the machine and insulated therefrom as by means of the insulation 38 is the stationary spring contact member or rail 39, carried by the support 40. Said rail is of such shape and is so arranged in the inclined path of movement of the end 41 of the piston rod 34 during its normal movement and when it is in its innermost position, that it does not touch the rail, as shown in Fig. 3.

As has been indicated, the rod is in its normal or innermost position when the blast of air passing through the pipe 25 is allowed to emerge from the passage 20 and to dismount the tube. When, however, the tube closes the passage 20 so that the air blast is not free to escape through the plunger, then the pressure of the unreleased air blast passing through the passage 29, acts upon the piston 35, and moves said piston against the action of the spring 36, causing the rod end 41 to assume the dotted line position of Fig. 3, wherein said rod projects further out of the cylinder than it does in its normal position. The rod end, therefore, then becomes so arranged that the rail 39 is in its path when the plunger movement is continued.

When the machine, in the normal course of its operation, then starts to move the arm 12, the plunger 11 and the member 18 from the dismounting position to the extruding position, the rod end 41 contacts with the rail 39, and closes a suitable circuit to disengage the clutch 17 from the power source 16, thereby halting the machine and preventing the extrusion of the next slug or disc. The various mechanical and electrical connections to the clutch will now be described.

A suitable control switch such as the knife switch 50, having a switch blade pivoted at the terminals 51 and 52 may be secured to the frame 37, to control the automatic clutch shifting devices. The pivot terminals 51 and 52 are supplied with current through a suitable source such as the wires 53. One of the other terminals of the switch as 54 is connected, as by means of the lead 55, to the supporting arm 40 for the contact member 39, while the other terminal 56 is connected to one terminal as 57 of the solenoid or electromagnet 58. The other terminal 59 of the solenoid is grounded to the machine as by means of the lead 60. Operating axially in and serving as the armature for the solenoid, is the soft iron member 61, to one end of which as 62 is connected the bell crank lever 63, pivoted to the frame of the machine as at 64. The end 65 of the bell crank lever engages a lever which operates the clutch 17, said operating lever being illustrated as in the form of a foot lever 66, pivoted to the frame of the machine as at 67, and normally pulled upwardly by means of the spring 68. For

maintaining the lever 66 normally in its operative position as shown in Fig. 5, and for guiding said lever in its upward movement under the action of the spring 68 to disengage the clutch, a guide member as 70 is secured to the machine, said member having an opening as 71 therein for the passage of the operating lever. One face of said opening is recessed or enlarged at its lower part as at 72, thereby providing a shoulder 73, against which the lever 66 is pulled under the urge of the spring 68, and upward movement of the lever thereby normally prevented.

It will be understood that there is enough play in the lever pivot 67 to permit a slight lateral movement of the lever 66 in the opening 71, sufficient to shift the lever toward the right as viewed in Fig. 5, and to bring the upper edge of said lever into contact with the shoulder 73, when it is desired that the clutch 17 be shifted to its engaged position and that the machine operate continuously. The slight play in the pivot 67 also permits the lever to be removed or released from the shoulder 73 by the bell crank lever 63 at the proper time. The pivot shaft 67 is connected to the bell crank lever 74 as by means of the crank 75 and the link 76. The bell crank lever 74 in turn is pivoted as at 78, one arm thereof being suitably connected to the clutch 17 whereby rotation of the bell crank lever 74 in the proper direction engages or disengages the clutch.

The operation of the clutch shifting mechanism will now be described. As has been previously indicated, when the air admitted through the pipe 25 fails to discharge the tube on the plunger 11, the increased pressure of the air blast, which would ordinarily be released and lowered by the discharge of the tube and the consequent freeing of the opening 20, has its only outlet through the passage 29, thereby exerting sufficient force upon the piston 35 to overcome the action of the spring 36 and to move the piston rod 34 outwardly of and further beyond the cover 31. Such movement of the piston rod brings the end of said rod into position to contact with the rail 39, when the arm 12 and the parts carried thereby are swung and lowered toward the extruding position. When the piston rod contacts with the rail, the circuit to the solenoid 58 is closed, whereby the solenoid is energized and the armature 61 attracted. The bell crank lever 63 is thereby rotated in a counter-clockwise direction, as viewed in Fig. 1, carrying the lever 66 downwardly and toward the left away from the shoulder 73 and positioning said lever toward the left at the bottom of the opening 71 owing to the normal resiliency in the pivot connection 67. The spring 68 which exerts greater force than the solenoid is now free to swing the lever 66 about its pivot upwardly to the top of the opening 71, thereby rotating the lever in a counter-clockwise direction as viewed in Fig. 2. The shaft 67 is thereby rotated as is the crank 75, which raises the link 76 and rotates the bell crank lever 74 in a counter-clockwise direction and thus shifts the clutch 17 into its non-operating position.

The machine is thereby automatically halted, and further descent of the male die 11 to extrude the next tube is prevented. The operator may now manually remove the tube sticking on the die, thereby again freeing the passage 20 and allowing retraction of the piston rod to break the circuit to the solenoid. The machine can again be started, by merely pushing down upon the end of the lever 66 against the action of the spring 68 and then moving said lever slightly laterally, that is, toward the right, as viewed in Fig. 5, allowing said lever to engage the shoulder 73 and to be held against said shoulder by the action of the spring 68. The lever 66 remains in the position indicated, in which position the bell crank 74 has been rotated to shift the clutch 17 into operating position, until said clutch is again tripped by the failure of the machine to discharge the extruded tube from the plunger automatically.

It will be seen that I have provided simple, positive and efficient means, not likely to get out of order or out of adjustment, for automatically preventing damage to the extruded tube and to the machine and for halting the machine when the extruded tube is not properly discharged therefrom.

It will be understood that while I have shown and described a certain specific embodiment of my invention, I do not intend to limit myself thereto, but intend to claim my invention as broadly as may be permitted by the state of the prior art and the scope of the appended claims

I claim:

1. An automatic stop for a machine for extruding collapsible tubes comprising means for extruding a tube, a clutch for controlling the movement of the extruding means, means for conducting a blast of air to the extruding means for discharging an extruded tube from the extruding means, a movable contact member responsive to an air blast, means for supporting said member, said supporting means being provided with an air passage communicating with the air conducting means, a spring in said supporting means normally maintaining the member in its innermost position, said member being moved into its outermost position by the air blast against the action of the spring when the passage of air through the extruding means is obstructed, and said member forming the movable contact member of a normally open circuit, a stationary contact member arranged to contact with the movable contact member, only when said movable member has been moved into its outermost position, electrically

operated means operatively connected to the clutch for rendering said clutch inoperative to move the extruding means, and a circuit to said electrically operated means closed by the contact of said movable member and said stationary contact member.

2. In a tube extruding press, a movable plunger on which tubes are extruded and discharged in succession and having an air passage therein, means for conducting air to the passage for dismounting the extruded tube from the plunger, a clutch operatively connected to the plunger, a movable contact member in spaced relation to, and arranged to move with the plunger and normally non-responsive to the air stream supplied to the plunger unless the extruded tube is not discharged from the plunger, a stationary contact member normally out of the path of the movable contact member, but in said path when the movable member responds to the pressure of the air stream, electrically operated means for operating the clutch to render the clutch ineffective to move the plunger, and a circuit including the contact members for energizing the electrically operated means.

3. An automatic stop for a collapsible tube extruding machine controlled by a clutch, comprising a movable contact member responsive to the predetermined increased pressure of an air blast, a spring maintaining said member normally out of contact making position, a stationary contact member, and an electrically operated member electrically connected to said contact members and operatively connected to the clutch for disengaging said clutch when said contact members are in contact, the movable contact member being projected into position to engage the stationary contact member during part of its movement when the pressure of the air blast becomes sufficient to overcome the action of the spring.

4. In a machine for extruding collapsible tubes, wherein an extruded tube is discharged from the machine by an air blast, a clutch controlling the operation of the machine, a spring-pulled lever operatively connected to the clutch for shifting the clutch into and from operating and non-operating positions, means for maintaining the lever in the position wherein the clutch operates the machine, and means for moving the lever to throw the clutch into non-operating position comprising an electrically operated member operatively connected to the lever, and means responsive to the tube-discharging air blast for energizing the electrically operated member on the failure of the air blast to discharge the tube.

5. In a machine for extruding collapsible tubes, wherein an extruded tube is discharged from the machine by an air blast, a clutch controlling the operation of the machine whereby the machine is halted in one position of the clutch and operated in another position of the clutch, and means for moving the clutch into the position wherein the machine is not operated on the failure of the air blast to discharge the tube comprising a spring-pressed contact member movable by the air blast when the pressure of said air blast exceeds a predetermined amount, a second contact member normally out of contact with the air blast responsive contact member, an electrically operated member operatively connected to the clutch for moving the clutch, and a circuit to said electrically operated member for energizing said member, said circuit being normally opened by the contact members until the air blast fails to discharge the tube and being then closed by the relative movement of said contact members into contact with each other.

6. An automatic stop for extruding machines provided with a clutch, and including a plunger having an air passage for the reception of an air blast to discharge the article extruded on the plunger, and means for moving the clutch, interposed between the clutch and the plunger, and operated by the air blast on the failure of the air blast to discharge the tube from the plunger comprising a normally open electrical circuit including a contact rail and a contact member movable toward the rail for closing the circuit, said movable contact member being moved toward contact-making position by the excess pressure of the air blast on the failure of the blast to discharge the tube, and an electrically operated member in the circuit and operatively connected to the clutch for operating the clutch.

7. An automatic stop for extruding machines, provided with a plunger having an air passage therethrough to discharge a tube extruded on the plunger by an air blast through the passage, and provided further, with a clutch, comprising an electrically operated member operatively connected to the clutch for moving the clutch when the air blast fails to discharge the tube from the plunger, and means for energizing said member comprising an electrical circuit including a switch, the movable member of the switch being responsive to the air blast only when the tube is not discharged and being otherwise unresponsive thereto.

8. An automatic stop for a tube-extruding machine provided with a clutch, including a clutch-operating electrically operated member, an electric circuit for energizing said member, and a normally open air blast responsive switch in the circuit for closing the circuit to the electrically operated member and thereby moving the clutch to halt the machine when a tube is not discharged by the machine.

9. An automatic stop for a tube-extruding machine, provided with a clutch and adapted

to discharge a tube by an air blast, including electrically operated means for moving the clutch, said means including a normally open switch closed by and responsive to the increase in pressure of the air blast when the extruded tube is not discharged from the machine.

10. An automatic stop for a tube-extruding machine provided with a clutch and provided with a plunger having a passage through which an air blast is delivered to discharge the extruded tube from the plunger, comprising an electrically operated member operatively connected to the clutch for shifting the clutch, a switch member in the circuit to the electrically operated member, said switch member being movable with the plunger and normally spring-pressed to open the circuit, and movable independently of the plunger by the excess pressure of the air blast into a position wherein on the continuation of its movement with the plunger, the circuit is closed.

11. In an extruding machine for extruding collapsible tubes, said machine being provided with a clutch and provided with a plunger oscillatory about a vertical axis and having an additional vertical reciprocatory movement, and provided with a passage through which an air blast is delivered to discharge an extruded tube from the plunger, a solenoid operatively connected to the clutch for shifting the clutch into the position wherein operation of the machine is halted, a normally open switch for closing a circuit to the solenoid comprising a spring-pressed contact member arranged to move with the plunger in a predetermined path and normally maintained out of circuit-closing position, and responsive to the air blast to the plunger, only when an extruded tube is not discharged by said air blast, to move into position when the circuit is closed on further movement of the plunger, and a contact rail in the form of a spring arranged to engage the end of the movable contact member on the movement of the plunger and when the tube is not discharged.

12. The combination with a machine for extruding collapsible tubes, having a plunger movable in a given path as it moves toward and from the extruding position, and having a clutch controlling the operation of the machine, said plunger having an air passage through which an air blast at a given pressure is passed to discharge the extruded tube from the plunger, a piston arranged to be operated by the air blast on the increase of the pressure thereof, and arranged in spaced relation to the plunger and movable therewith in a path corresponding to the given path, a rod extending from said piston, a spring acting on said piston to maintain the rod in its normal position, said spring exerting greater force upon the piston than the force normally exerted thereon by the air blast of the given pressure, and a contact rail arranged out of the normal path of the end of the rod but in the path of said end when said end has been moved by the air blast.

13. An automatic stop for a tube-extruding machine provided with a plunger having a passage for the introduction of an air blast to discharge the extruded tube from the plunger, and having a clutch controlling the operation of the machine, comprising a stationary spring contact rail, a spring-pressed contact member movable with the plunger and responsive to the increased pressure of the air blast on the failure of the blast to discharge a tube from the plunger, yieldable means for normally maintaining the contact member out of contact-making position, said means yielding to said excess pressure of the air blast to permit the member to move into contact-making position with the spring contact member, a solenoid in the same circuit as said contact members, and means operatively connecting the solenoid to the clutch for moving the clutch into the position to halt the machine.

14. In a machine for extruding collapsible tubes, provided with a clutch for controlling the operation of the machine, a movable tube-extruding plunger having an air passage therethrough for the delivery of an air blast to the tube extruded on the plunger whereby the extruded tube is discharged from the plunger, a spring-pressed contact member, a support for said member movable with the plunger and having a passage communicating with the air blast passage whereby pressure on said member is normally exerted by said air blast insufficient to move the contact member into contact-making position, said member being forced into contact-making position by the air blast when the passage in the plunger remains obstructed by the extruded tube, a contact rail arranged to make contact with the contact member when said contact member is moved by the air blast, a solenoid in the same circuit as said contact member and said contact rail, a lever operatively connected to the clutch for moving the clutch, means for normally maintaining the lever in the position wherein the clutch operates the machine, means operatively connecting the solenoid to the lever to move the lever out of said position on the engagement of the contact member and the contact rail, and a spring for completing the movement of the lever into clutch-disengaging position.

15. In a machine for extruding collapsible tubes, provided with a clutch, a plunger having a passage for the delivery of an air blast to discharge a tube extruded thereon, an electrically operated member, a clutch-operating lever, means for operatively connecting the member to the lever for moving the lever, and a normally open circuit to the member

including a contact rail, and a contact member movable with the plunger and responsive to the increased pressure of the air blast resulting from the failure of the air blast to discharge the tube and thereby moved into position to make contact with the contact rail.

16. In a machine for extruding collapsible tubes, means for extruding a tube including a plunger having an air passage therein, means for reciprocating said plunger vertically and for oscillating said plunger about a vertical axis, a clutch for controlling said reciprocating means, means for supplying air to the air passage when the plunger is in tube-dismounting position, and means for disengaging the clutch for rendering the plunger inoperative on the failure of the air supplied to the plunger to discharge the tube thereon, comprising an air controlled contact member operatively connected to the plunger and movable therewith, into position to engage the stationary contact member when the tube on the plunger is not dismounted, a stationary contact member, an electrically operated member operatively connected to the clutch for disengaging the clutch when the circuit to the electrically operated member is closed by said contact members, and a normally open circuit to the electrically operated member closed on the contacting of the contact members.

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