Jan. 12, 1960 F. W. HUMPHNER 2,920,681

SOLENOID CONTROL AND TAPE FORMING MACHINE

Filed May 11, 1955 2 Sheets-Sheet 1

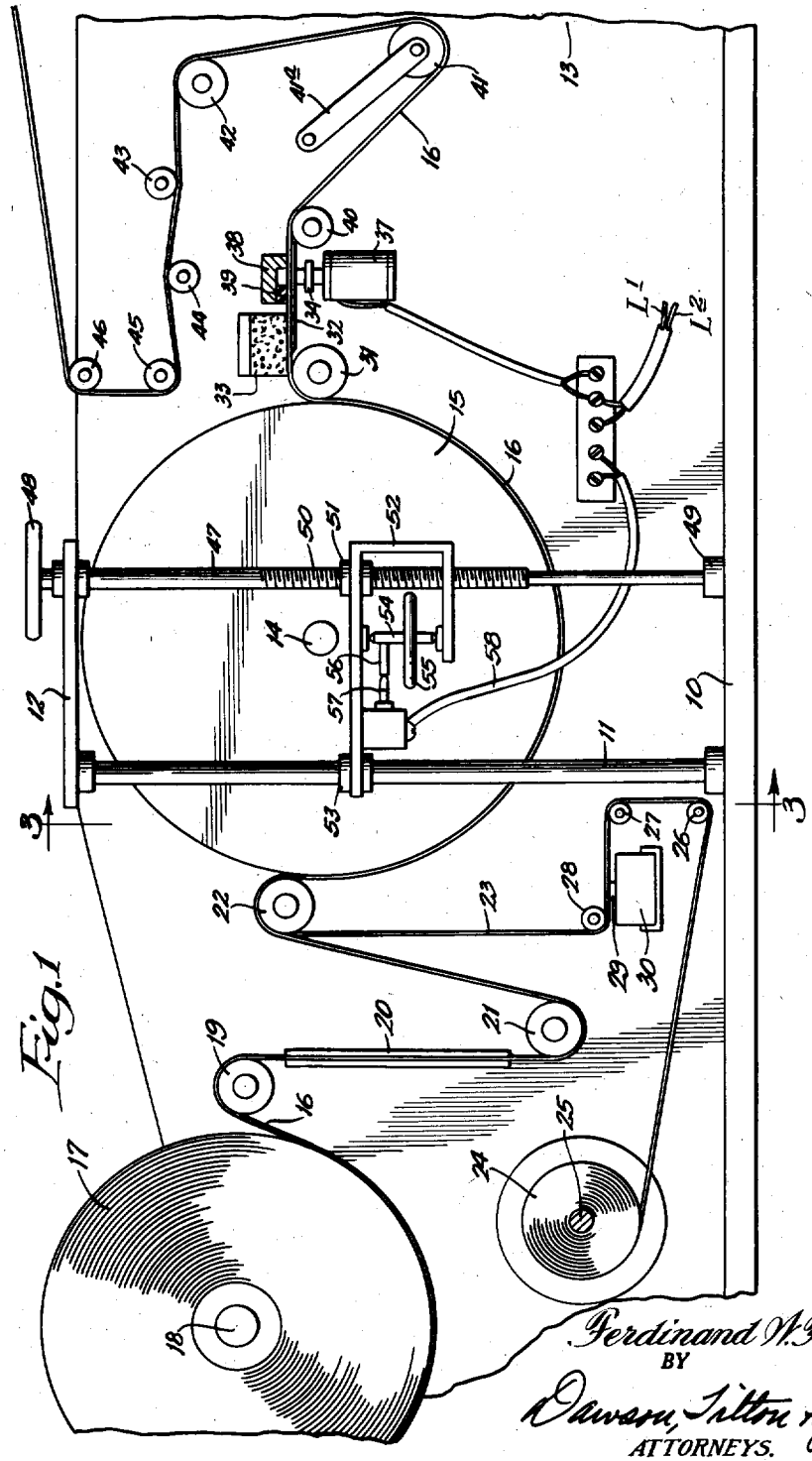


Fig. 1

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Filed May 11, 1955 2 Sheets-Sheet 2

Fig. 2

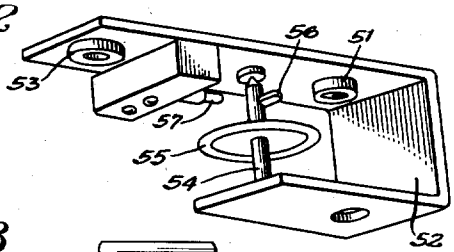


Fig. 6

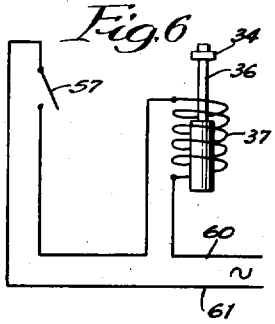


Fig. 3

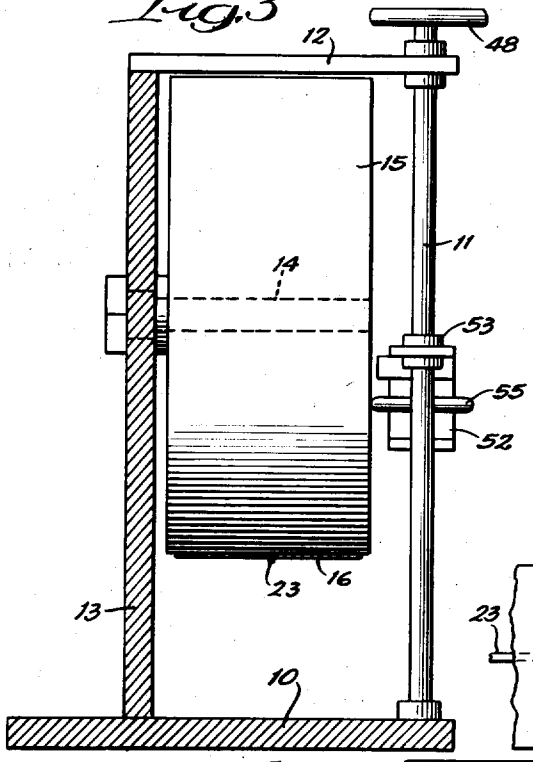


Fig. 4

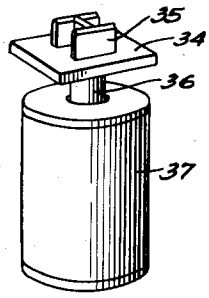


Fig. 5

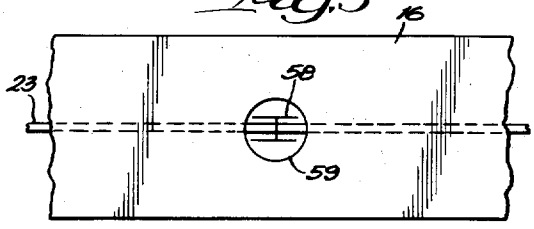
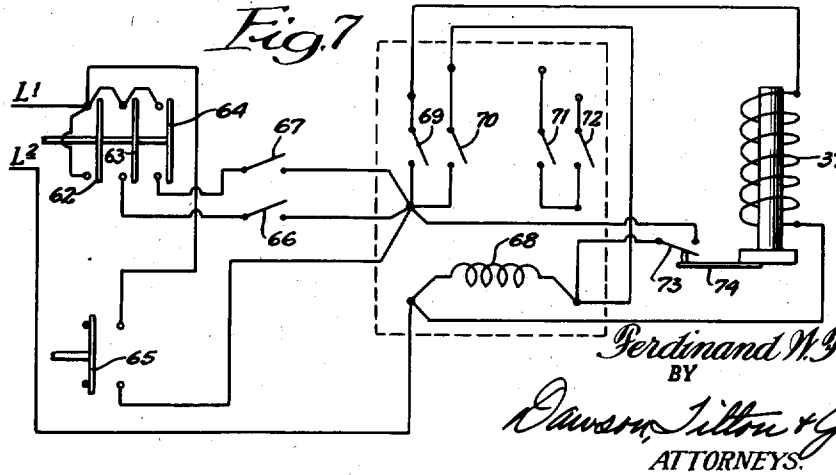


Fig. 7



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SOLENOID CONTROL AND TAPE FORMING MACHINE

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5 Claims. (Cl. 154—1.7)

This invention relates to a solenoid control and tape forming machine. The invention is applicable to various types of machines equipped with parts actuated by solenoids or electrical means, but the invention is particularly useful in connection with a tape-forming machine or a machine in which tape is combined with a draw cord or filament. The invention is also particularly useful in connection with the stamping of a filament-equipped tape with inks, or the like, for preventing adhesion of the imprinted area.

An object of the present invention is to provide, in a machine in which a solenoid-operated part is employed for cutting or stamping tape or otherwise acting upon the stock fed through the machine, means for actuating the solenoid periodically, while at the same time providing mechanism whereby the period of actuation may be varied even though the machine is in operation. A further object is to provide, in a machine equipped with a solenoid-actuated part and with a switch-equipped circuit for controlling the solenoid, means for closing the switch at selected periods while varying said periods through mechanism which may be actuated while the machine is in full operation. A still further object is to provide in such a machine structure means for actuating the solenoid-controlled part either manually or automatically or through the operation of impulse means controlled by the movement of cartons, machine parts, etc. Other specific objects and advantages will appear as the specification proceeds.

The invention is shown in an illustrative embodiment, by the accompanying drawings, in which—

Figure 1 is a broken side view in elevation of apparatus embodying my invention; Fig. 2, a perspective view of a switch-actuating part; Fig. 3, a vertical sectional view, the section being taken as indicated at line 3—3 of Fig. 1; Fig. 4, a perspective view of the solenoid-actuated cutter which may be employed; Fig. 5, a plan view of a filament-equipped tape strip in which the tape has been acted upon by the cutter; Fig. 6, a schematic view of a wiring layout which may be employed; and Fig. 7, a schematic view of another form of wiring layout which may be used.

In the apparatus shown in Figs. 1 to 5, inclusive, 10 designates a base on which is mounted a fixed frame standard 11 carrying a top frame member 12. The base carries a side wall 13.

Mounted centrally of the machine on the shaft 14 is a drum 15, to which is fed a tape strip and a filament strip. The paper strip 16, which may be gummed paper, is fed from the roll 17 mounted on the shaft 18. The tape 16 extends over the guide roller 19 and thence downwardly through the guide tube 20 under the roller 21. The tape then extends upwardly over the roller 22, where it meets and is combined with the moistened filament or cord 23.

The cord or filament 23 is fed from the roll 24 carried by the shaft 25. The cord passes around the rollers 26, 27 and 28 in such a manner that the cord or filament engages the moistening wick 29 supported within the liquid tank 30.

When the moistened filament 23 meets the gummed surface of the tape 16 and is pressed there-against as it passes over the roller 22, the two members are united and the members are held in this position together as the adhesive slightly dries by the broad periphery of the drum 15. The combined tape and filament leaving the drum 15 passes over the roller 31 and from thence over a platen 32. I prefer to mount a sponge rubber or other presser device 33 over the tape 16 as it moves onto the platen 32, so that the tape is firmly held during the subsequent cutting operation. The platen 32 is apertured to receive the head of a die 34, which is shown in greater detail in Fig. 4. The die 34 is equipped at its upper side with a cutter 35 which, in the illustration given, is in the shape of the letter H. It will be understood that the cutter may be of any desired shape, and further that instead of employing a cutter, the die may consist of an imprinting stamp, or any other desired machine part. The die 34 is carried by a solenoid plunger 36 extending within the solenoid windings 37.

In the specific illustration given, there is supported above the platen 32 a female die member 38 equipped at its lower side with a resilient pad 39, formed of sponge rubber or similar suitable material for gripping the tape as the same is acted upon by the die 34. The tape 16, after leaving the platen 32, passes over a series of rollers 40, 41, 42, 43, 44, 45 and 46 leaving the machine, or a portion of the machine, as illustrated best in Fig. 1.

In the foregoing mechanism, I provide means for varying the period of operation of the cutter or part 34, and such period may be varied even while the machine is continuing in full operation. As shown best in Fig. 1, I provide a control shaft 47 provided at its top with a control wheel 48 and having a lower end rotatably supported within the base stud 49. The shaft 47 is threaded at 50 and engages an internally threaded nut 51 carried by a movable bracket member 52. The bracket member 52 has at one end a sleeve 53 slidably engaging the standard 11, and it has an inner U-shaped portion in which the nut 51 is secured. Between opposed horizontal portions of the U-shaped portion 52 is mounted a stem 54 carrying a horizontal disk 55. The disk 55 is preferably equipped at its outer periphery with a rubber tire or resilient ring for engagement with the side wall of the drum 15, so that as the drum 15 rotates, it produces simultaneous rotation of the disk 55 and the stem 54 on which it is mounted. The stem 54 is equipped with a laterally-extending arm 56 adapted to engage during at least one revolution thereof a switch member 57 and upon actuation of the switch plunger 57, the switch is closed so as to complete the circuit leading to the solenoid 37. A flexible cord 58 leads from the switch 57, so that the bracket 52 may be raised and lowered during the vertical adjustment of the wheel or disk 55. As the disk 55 moves toward the center of the side wall of the drum 15, the speed of rotation of disk 55 is reduced, while as the disk 55 is moved toward the outer periphery of the drum side 15, the speed of rotation of the disk 55 is correspondingly increased.

Operation

In the operation of the apparatus, the paper 16 and the filament 23 are fed forwardly, as described, the filament being moistened by the wick 29 and the two parts are brought together and a firm union is formed as they are held together about the lower edge of the drum 15. The united structures, as they pass over the platen 32, are acted upon by the die or part 34. The part may consist of a die cutter of any desired shape, or of a device for

imprinting ink or other material over the gum or adhesive to provide a non-adhesive spot, or the element may form any other desired treating operation upon the stock or tape being fed through the machine. If desired, there may be two or more solenoids equipped with die parts for printing, cutting, or otherwise treating the sheet material passing there-over.

The period of operation of the solenoid and the part **34** carried thereby is varied by rotating the wheel **48**, which will thus cause the bracket **52** to move upwardly or downwardly carrying the disk **55** slidably along the outer side wall of the drum **15**. The drum **15** is rotated by a motor or other mechanism at a desired constant speed, and as it rotates, the disk **55** is rotated to bring the arm **56** against the plunger **57** for closing the switch and the circuit of the solenoid **37**. It will be understood that the stem **54** may be equipped with a plurality of arms **56** or with a single arm, and further it will be understood that one or a plurality of switch plungers **57** may be employed. As the wheel **48** is rotated to move the bracket **52** downwardly, the speed of the disk **55** is increased and the die part **34** operates more rapidly. As the bracket **52** is moved upwardly toward the center of the drum **15**, the disk **55** rotates more slowly and the period of operation of the part **34** becomes less frequent. In these operations, the machine need not be stopped, but may continue in full operation as the wheel **48** is rotated to vary the period of actuation of the solenoid-controlled part **34**.

The structure is particularly useful in a factory having continuous line production, as, for example, where cartons are moved in a continuous line over long periods of time and where, by reason of the change in size of the box or length of the tape, etc., it is desired to change the period of actuation of the part, this may be accomplished through the planetary principle shown in which the two elements are moved in cooperation with a microswitch.

It will be understood that the dimensions of the operating parts may be varied to give almost any desired control. As stated, with any given diameter of wheel or drum, minute adjustment can be made within cuts. The change can be made while the machine is in motion, or, if desired, by stopping the machine, lifting the wheel or switch assembly away from the drum, and adjusting the screw to bring the bracket and disk carried thereby to the desired position.

While the machine may comprise multisides, I prefer to employ a single side wall **13** with open end bearings on one side only, so that the tape and filaments can be readily threaded upon the rollers, etc.

In Fig. 5 is shown a portion of the tape **16** having the filament **23** attached thereto and an H cut **58** formed therein. The solenoid-actuated device comprises a cutting die which may be equipped with an inking device to help locate where the die cut is made. It is desired to employ a fast-drying type of ink consisting of alcohol, dye and shellac, and the size and shape of the spot may vary widely. The imprinted spot is useful in that it covers the gum on the tape and renders it nonadhesive with respect to the particular spot formed. The spot is indicated as encircling the H cut **58**, and is designated by the numeral **59**.

It will be understood that any suitable electric circuit may be employed. In Fig. 6, there is provided an extremely simple circuit, comprising the leads **60** and **61** and including the switch **57** which is closed by the rotation of the disk **55**, as heretofore described. If desired, a more complex circuit may be provided, as illustrated in Fig. 7. In this structure, I provide three selector switches which are effective for rendering the circuit useful for manual operation or for impulse operation or automatic operation. For example, in the structure shown, I provide a switch **62** which is effective for rendering the circuit adapted for manual operation, a switch **63** useful for impulse operation in controlling the solenoid, and finally a switch member **64** effective for rendering the circuit

adapted for automatic operation. In the manual operation of the apparatus, the manual switch **65** is effective. In the operation of the impulse circuit, I provide that a switch **66** is adapted to be closed by impulse mechanism such as, for example, electric eye mechanism operating with moving cartons or parts passing a given point. In other words, a moving part of the carton or other object carried thereon is effective in actuating the impulse switch in accordance with known devices, whereby the cutter die or part **34** will be set into operation at the desired moment when the carton reaches a station, etc.

In the operation when the automatic switch **64** is closed, the switch **67** is caused to operate periodically and in timed relation to a moving part such as the drum **15** in the driving of the disk **55**, but the period of operation may be varied, as heretofore described, by the manipulation of the wheel **48** and the threaded shaft **47** carried thereby. In the operation of the circuit, I prefer to employ a relay **68** which is effective in preventing full current flow during portions of the operation where energizing of the solenoid is not required, while at the same time preventing the plunger or ram of the solenoid from being hung up and jamming the machine.

In the specific wiring layout set out in Fig. 7, the operation may be described as follows: When either of the operating switches **65**, **66** or **67** are closed, as selected for the desired type of operation, current will flow through line **1** to a common terminal of a two-pole, double throw 115 volt, 60 cycle, relay, with two normally closed contacts designated as switches **69** and **72**. There are two normally closed contacts designated as switches **70** and **71**. The current flows through switch **69** to energize solenoid **37**, since line **2** from a source of current is a continuous connection to solenoid **37** from the common terminal of relay coil **68**. The action of solenoid **37** at full stroke will close the normally open switch **73** by activator arm **74**, thus causing a by-pass of the current to energize coil **68** and operate the relay. As the relay closes, switches **69** and **71** are open, and switches **70** and **71** will close. This action breaks the current to solenoid **37**, causing it to drop free from the tape **16**.

To hold the relay in the above position as long as operating switch, either **65**, **66** or **67** as selected, is closed, a connection from the terminal of switch **70** is made to coil **68** to permit by-pass of the current to keep the relay coil energized and thus prevent repeat action of the solenoid **37** should the operating switches be held down. As soon as an operating switch—either **65**, **66** or **67** as selected—is opened, then relay coil **68** is denergized and circuit switches returned to normal for the next cycle.

In the operation of the solenoid **37** for forcing the cutter **35** upwardly through the tape **16**, I prefer to have the tape held momentarily stationary for the entry and return of the cutter **35**. I provide for this momentary stopping of the tape by causing the tape to be gripped by the sponge **33** or **39**, or by both, and this is accomplished by the upward movement of the member **37** which engages the support **32** and presses it upwardly to cause the tape to be gripped by either or both of the sponge elements **33** or **39**. To compensate for the stoppage of the tape, the roller **41** is mounted upon a pivotally supported arm **41*a***, which normally presses downwardly so as to supply tape stock ahead of the dies, and this supply of stock is available for use at the time the tape is stopped adjacent the sponges **33** and **39**, while at the same time not interfering with the continuous flow of tape which is being drawn from the machine. The dancer roll **41** thus normally keeps a sufficient amount of tape ahead of the dies to compensate for the interruption of the movement of the tape adjacent the dies without stopping the flow of tape from the machine.

In the machine thus provided, gummed tape is continuously united with a tear element or cord, and the tape is cut, imprinted, or otherwise treated, at spaced intervals, the intervals being variable at the will of the operator and

while at the same time providing for a continuous flow of tape through the machine.

While in the foregoing specification I have set forth a specific structure in considerable detail for the purpose of illustrating an embodiment of the invention, it will be understood that such details of structure may be varied widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. In tape forming apparatus, a frame, a tape supply roll rotatably mounted on said frame, a driven drum rotatably mounted on said frame and presenting a curved surface in the path of tape issuing from said roll, idler rolls rotatably mounted on said frame adjacent opposite sides of said drum to wrap tape about a portion of said curved surface, a filament supply roll on said frame, filament wetting means on said frame interposed between said filament supply roll and the one of said idler rolls first contacted by tape issuing from said tape supply roll, an apertured platen movably mounted on said frame, a resilient pad on said frame and engageable by said platen to clamp therebetween tape issuing from said drum, a cutting die reciprocally mounted on said frame and operative to pass through the aperture of said platen and engage cooperating die means to cut tape clamped between said pad and platen, an arm pivotably mounted at one end on said frame and carrying a roller at the other end for contacting tape issuing from said platen, a means actuated by said drum for reciprocating said cutting die.

2. The structure of claim 1 in which said means includes an electrical circuit equipped with a normally opened switch, said switch being closed by said drum at at least one point in the rotation thereof, said circuit including a solenoid carrying said cutting die on the armature thereof.

3. The structure of claim 2 in which the said switch is actuated by an arm carried by a disc-equipped stem, said stem being pivotally mounted on said frame with the disc thereof bearing against said drum.

4. The structure of claim 3 in which said disc bears against a flat surface of said drum and said stem is movably mounted on said frame to position said disc at different distances from the center of said flat surface.

5. In a device for providing a filament-equipped tape in a continuously issuing web with the tape cut at spaced intervals through said filament, a frame equipped with a rotatably mounted roll of tape, a drum rotatably mounted on said frame in the path of tape from said roll, a pair of idler rollers on said frame adjacent the periphery of said drum and operative to wrap tape about a substantial portion of the periphery thereof, said frame being equipped with a rotatably mounted filament roll, means for wetting filament issuing from said filament roll and positioned between said filament roll and the said path of tape whereby the filament from said filament roll is adapted to be united to said tape prior to engagement of said tape with said drum, a platen reciprocally mounted on said frame adjacent said drum in the path of filament-equipped tape issuing from said drum, a pair of resilient pads on said frame and above said platen and engageable by said platen, one of said pads also providing a female die above an aperture in said platen, a solenoid positioned below said platen and having a cutting die equipped-plunger adapted to pass through said aperture into said female die, an electric circuit for actuating said solenoid, said circuit including a switch responsive to the rotation of said drum, and a dancer roll mounted on said frame in the path of filament-equipped tape issuing from between said dies.

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