Nov. 19, 1968 S. DRUBNER 3,411,391

APPARATUS FOR AUTOMATICALLY DISPENSING AND CUTTING SELECTED LENGTHS OF STRIP MATERIAL

Filed Dec. 1, 1966 3 Sheets-Sheet 1

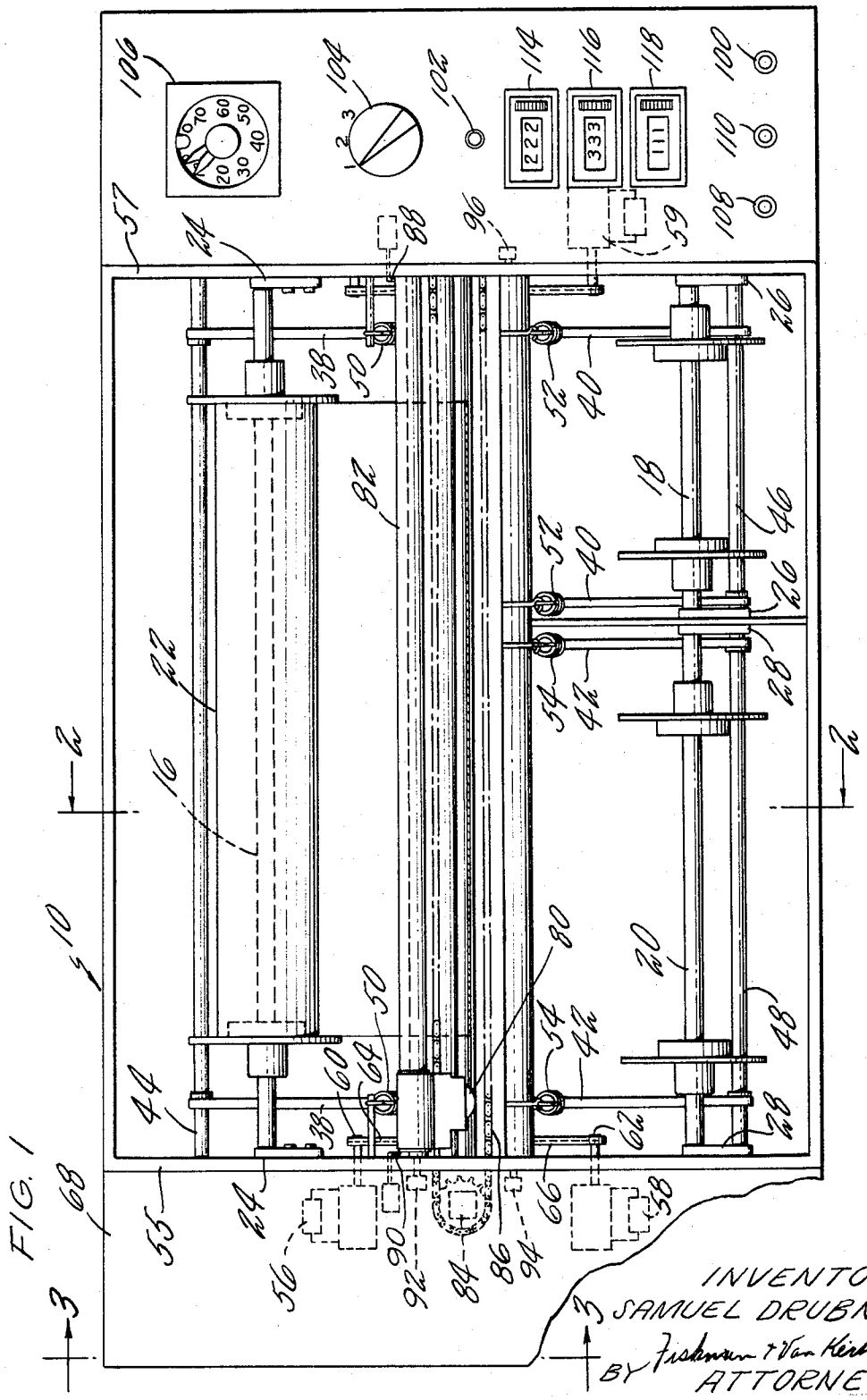


FIG. 1

INVENTOR
SAMUEL DRUBNER
BY Fishman & Van Kirke
ATTORNEYS

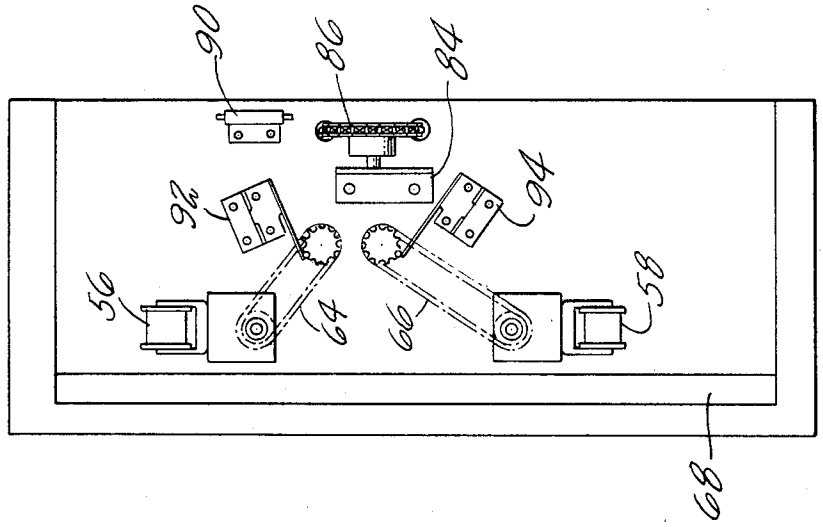

90
86
84
92
94
56
64
66
58
68

FIG. 3

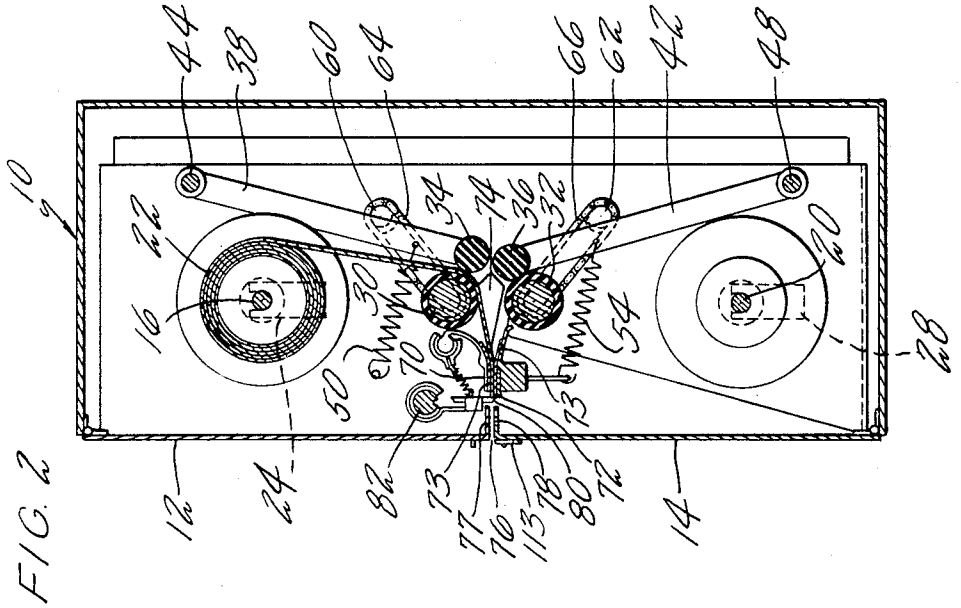

44
38
60
64
66
62
42
48
10
22
34
74
36
32
40
16
30
54
28
50
70
73
12
24
82
73
77
70
113
78
80
72
14

FIG. 2

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APPARATUS FOR AUTOMATICALLY DISPENSING AND CUTTING
SELECTED LENGTHS OF STRIP MATERIAL
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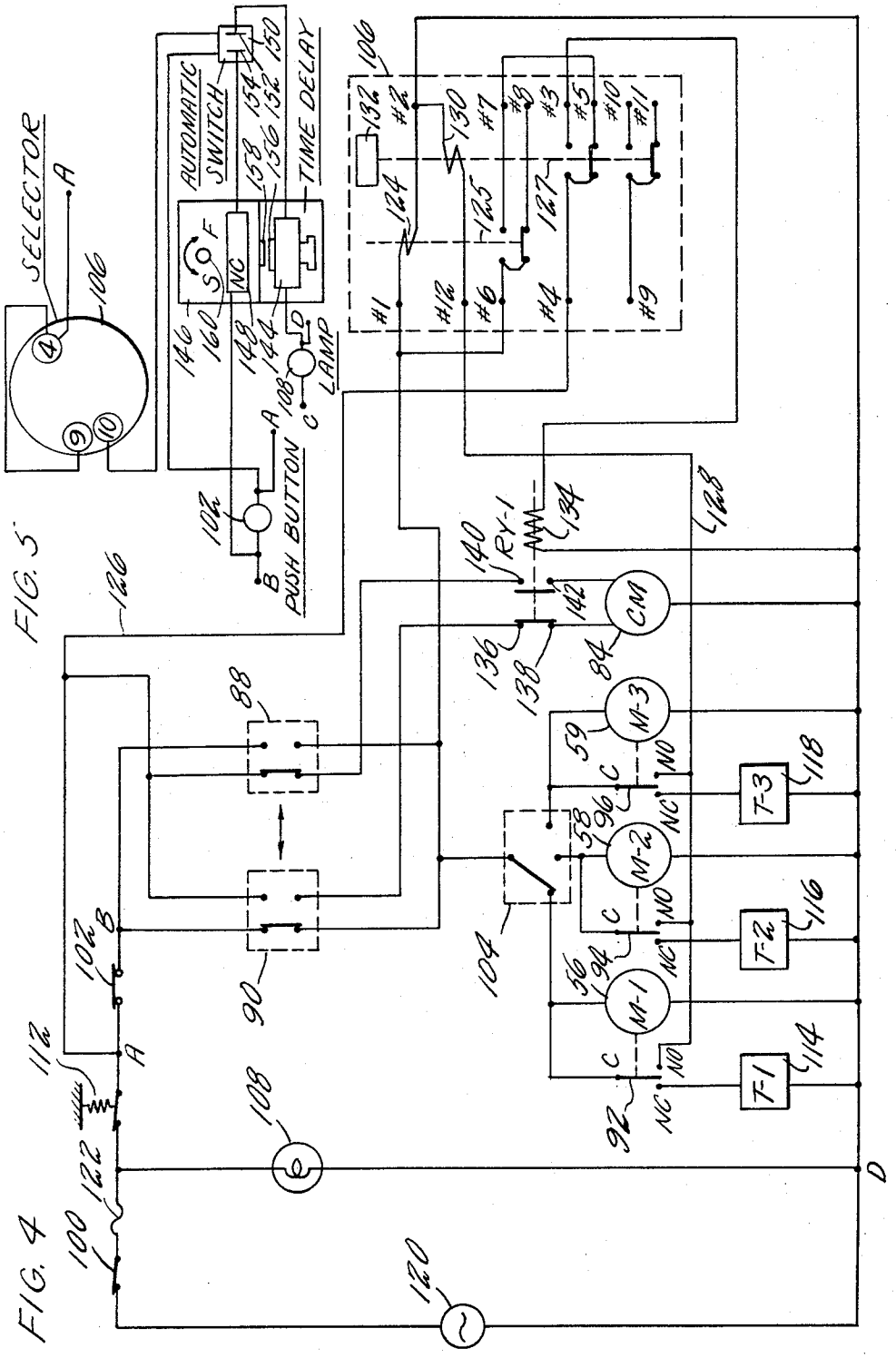


FIG. 5

FIG. 4

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3,411,391

APPARATUS FOR AUTOMATICALLY DISPENSING AND CUTTING SELECTED LENGTHS OF STRIP MATERIAL

Samuel Drubner, Waterbury, Conn., assignor to American Photocopy Equipment Company, Evanston, Ill., a corporation of Illinois

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8 Claims. (Cl. 83—242)

This invention relates to the automatic dispensing of materials. More particularly, the present invention is directed to the dispensing of preselected lengths of paper and/or film material from rolls. Accordingly, the general objects of the present invention are to provide new and improved methods and apparatus of such character.

While not limited thereto in its utility, the present invention has been found to be particularly well suited for dispensing and cutting paper and photographic film accurately to any desired preset length. In various arts; for example lithography, engraving, silk screening, and duplica ing; an automatic roll dispenser is an invaluable tool. In the aforementioned arts, substantial savings may be realized if the papers and photographic films employed can be purchased on rolls. However, in the prior art, when roll paper or film was acquired, problems were encountered in improper cutting of such paper or film to the desired lengths and accidental exposure of the film. In conjunction with the improper cutting, since it was formerly done manually, a substantial amount of scrap resulted.

In the photographic and printing arts, experience has shown that a plurality of different width papers and photographic films must be kept on hand in precut standard sizes to provide the desired flexibility. Most operations in these arts employ many different sizes of films and papers, and these sizes will be selected from the commercially available widths. Roll film of the desired widths may be purchased from the manufacturers in 100 or 200 foot rolls. However, in the prior art, apparatus was not available which would store roll film or paper of a plurality of widths and automatically dispense and cut preselected lengths of the desired width without accidental exposure and improper cutting, both of which resulted in wasteful scrap, and with a minimum of labor and attention.

In addition to the aforementioned deficiencies, prior art devices for dispensing material in the form of strips or sheets generally possessed several additional inherent deficiencies. For example, the prior art devices generally did not provide for automatic repeating and cutting. That is, in order to provide for the continual dispensing of one preselected length, it was generally necessary for the operator to remain at the machine and manually recycle the apparatus. Also, prior art devices have not contained counting mechanisms for keeping a continuous record of the amount of material dispensed, and thus it was common in the prior art to manually count the number of pieces cut from the roll or dispensed. Such manual counting is most unsatisfactory for keeping account of the number of sheets dispensed at any one time and in total over a period of time, especially when material of more than one width is involved.

The present invention overcomes the aforementioned disadvantages of the prior art by providing a completely automatic dispenser for materials which may be stored on rolls. The present invention dispenses and cuts materials, such as paper or photographic film, accurately to any desired preset length. In a preferred embodiment, the present invention comprises a plurality of dispensing rolls and means for drawing material off a selected one of the dispensing rolls. The equipment operator will select the

desired material width (roll) and preset a counter to the desired length of material which is to be dispensed. When operation is initiated, the counter will be supplied with signals commensurate with increments of material drawn off the selected dispensing roll. The counter totals these increments of length and, when they equal the preselected length to be dispensed, a cutter is energized and will move transversely of the material to sever the piece of material from the roll. After the cutter has traversed the material and severed the preselected length, it will automatically be deenergized and the electrical connections thereto altered so that, upon the next cycle, the cutter will sever the length of material drawn from the roll while traveling in the opposite direction. Means are also provided so that the operation will automatically repeat itself.

It is, therefore, an object of the present invention to provide for the automatic dispensing of material.

It is another object of the present invention to automatically dispense pieces of material of a preselected length.

It is yet another object of the present invention to dispense and cut to a preselected length material which may be stored on rolls.

It is also an object of the present invention to provide for the automatic recycling of apparatus which dispenses and cuts to a desired length sheets of material.

It is a further object of the present invention to automatically and accurately cut material to a desired preset length.

It is still another object of the present invention to provide for the automatic dispensing of material of a selected width from apparatus which stores such material in a plurality of widths.

These and other objects of the present invention may be accomplished by the apparatus depicted in the accompanying drawing. In the drawing, which shows a preferred embodiment of the present invention and from which the various advantages of the present invention will become apparent to those skilled in the art, like reference numerals refer to like elements in the various figures and:

FIGURE 1 comprises a front view, with front covers removed, of a preferred embodiment of the present invention.

FIGURE 2 is a side view of the apparatus of FIGURE 1 taken on line **2—2** of FIGURE 1.

FIGURE 3 is a side view of the apparatus of FIGURE 1 taken along line **3—3** of FIGURE 1.

FIGURE 4 is a schematic representation of the control circuitry for the preferred embodiment of FIGURE 1.

FIGURE 5 is a schematic representation of means which may be incorporated in the circuitry shown in FIGURE 4 to provide for automatic recycling.

Referring now to FIGURE 1, the apparatus shown has been designed for the dispensing of paper or photographic film. Accordingly, the apparatus includes a light proof cabinet indicated generally at **10**. As may best be seen from FIGURE 2, the upper and lower portions **12** and **14** of the front of cabinet **10** are respectively hinged to the top and bottom of the cabinet so that they may be opened to facilitate loading of the apparatus. Within the apparatus, roll film of three widths may be stored on dispensing rolls **16**, **18**, and **20**. In FIGURES 1 and 2, a roll of photographic film **22** is shown stored on dispensing roll **16** only. For easy loading of the film onto the dispensing rolls, rolls **16**, **18** and **20** sit in grooves in respective pairs of bearing blocks **24—24**, **26—26**, and **28—28**.

As may best be seen from a simultaneous consideration of FIGURES 1 and 2, the leading end of the film from dispensing roll **16** is disposed against an associated

rubber drive roll **30**. A second similar rubber drive roll **32** is provided for roll **20**, and a third similar rubber drive roll adjacent to and coaxial with drive roll **32** is provided for roll **18**. The film on each of the rolls **16** and **20** is held against each of drive rolls **30** and **32**, respectively, by pressure rolls **34** and **36**. A similar pressure roll adjacent to and coaxial with pressure roll **36** is provided for the drive roll associated with roll **18**. The pressure rolls are spring loaded against the drive rolls in the manner to be described below. Pressure roll **34** is supported at each end by pressure roll support arms **38—38**, the pressure roll associated with roll **18** is supported at each end by support arms **40—40**; and pressure roll **36** for dispensing roll **20** is supported by arms **42—42**. The support arms for the pressure rolls for dispensing rolls **16** (pressure roll **34**), **18** and **20** (pressure roll **36**) are respectively pivotably mounted on lateral support rods **44**, **46** and **48**. Support rods **44**, **46** and **48** are rigidly attached to walls of cabinet **10**. Pressure roll support arms **38—38**, **40—40** and **42—42**, as noted above, are spring loaded to hold their respective pressure rolls against their associated rubber drive rolls. This spring loading, which is accomplished by springs **50—50**, **52—52** and **54—54**, holds the leading edge of the film from each dispensing roll against its respective drive roll so that, when the drive roll is energized in the manner to be described below, material will be drawn off the dispensing roll. Springs **50**, **52** and **54** extend between holes in the support arms and retaining elements affixed to the interior of cabinet **10**. As can best be seen in FIGURE 1, the above-described structure is contained within a main chamber defined by end walls **55** and **57**.

Considering now FIGURES 2 and 3 together, rubber drive rolls **30** and **32** are respectively driven by motors **56** and **58**. Motors **56** and **58** directly drive respective sprockets **60** and **62** which in turn, by means of chain drives **64** and **66**, engage sprockets on the ends of drive rolls **30** and **32**. Motors **56** and **58** are mounted on end wall **55** and extend into end compartment **68** (see FIGURE 1) of cabinet **10**. The motor drive shafts extend through openings in wall **55** into the main chamber to the sprockets **60** and **62** and associated chains **64** and **66**. Accordingly, when either of motors **56** or **58** is energized, its respective drive roll will be driven and material will be drawn off the dispensing roll associated with the motor which has been energized due to the pull exerted on the material by the drive roll when the material is held against the drive roll by the pressure roll.

As film is drawn off a dispensing roll, for example dispensing roll **16** of FIGURE 2, it passes between drive roll **30** and pressure roll **34** and is directed to a slot defined by guide plates **70** and **72** via a film separator **74**. The slot defined by guide plates **70** and **72** is covered at both the top and bottom by a felt or plastic liner pad **73**. The purpose of the felt or plastic pad is to prevent scratching of the film. After leaving the slot defined by plates **70** and **72**, the material passes through a slot **76** defined by inwardly directed lips **77** and **78** on doors **12** and **14** and out of the machine.

Plate **72** is a cutting blade, and a cutting wheel **80** is positioned adjacent the end of the slot defined by plates **70** and **72**. Wheel **80** is supported from a guide rod **82** and, as may best be seen from FIGURES 1 and 3, is chain driven by means of a motor **84** and chain drive **86**. When film is being dispensed, wheel **80** is held against one of two limit switches **88** and **90** located adjacent the oposite ends of guide rod **82**. In the manner to be described below, when a preselected length of film has been dispensed from the selected dispensing roll, cutting wheel **80** will be driven along rod **82** until it makes contact with the other limit switch at which time the cutter will be deenergized.

Referring again to FIGURE 3, a pair of microswitches **92** and **94** are shown in end compartment **68**. Microswitches **92** and **94** are actuated, through their respective arms and rollers, by sprockets in end compartment **68** on the ends of drive rolls **30** and **32**. A third microswitch **96** in an end compartment defined by wall **57** is actuated by a sprocket on the drive roll associated with dispensing roll **18**. Accordingly, as the selected material is drawn off its dispensing roll, a microswitch associated with that dispensing roll will be repeatedly operated and thus a series of pulses commensurate with increments of movement of the dispensing roll will be generated. Restated, operation of either of motors **56**, **58**, and an additional motor **59** for accomplishing the drawing of material off dispensing roll **18**, will cause the repeated operation of respective microswitches **92**, **94** and **96**.

Referring again to FIGURE 1, the controls for the embodiment of the present invention being described are located on a panel on the front of cabinet **10** to the side of doors **12** and **14**. These controls comprise an on-off or main power switch **100**, a start button **102**, a roll selector switch **104** and a strip length selector **106**. Also mounted on the front panel are a pilot light **108** and a fuse holder **110**. One or more series connected electrical interlock switches, not shown on FIGURE 1 but indicated at **112** on FIGURE 4, will be mounted so as to be opened if pivotable light shield **113** (see FIGURE 2) is positioned to block opening **76**. As will be explained in greater detail below, the interlock switches insure that the machine will not be operated when shield **113** is in its blocking position thus providing a feature to prevent jamming of the machine. The indicator portions of three totalizers **114**, **116** and **118** may also be mounted so as to be visible from the front of the apparatus. The totalizers, which are manually resettable, while not necessary for operation, provide a convenient indication of the total amount of material drawn from each of the dispensing rolls over a lengthy period of intermittent operation of the equipment and also a check of the amount of film used per day or per job as well as a check of the amount of film originally on a full roll.

The operation of the length selector **106** will be described in detail below with particular reference to FIGURE 4. Selector **106** may comprise a pulse counter such as is available from Automatic Timing and Controls, Inc. or such as a HZ170 series counter available from the Eagle Signal Division of the E. W. Bliss Company. Element **106** is actually a combination relay and pulse counter with the pulse counter portion comprising a stepping solenoid which moves in stepwise fashion to count down to zero from a preset total count. When the counter has stepped back to zero, a switch will be tripped mechanically to deenergize a holding relay thus terminating operation of the equipment and returning the counter indicator to the previous preset value. However, as noted above, and as will be explained in connection with the explanation of FIGURES 5 and 6, the cycle can be automatically repeated on a continuous basis. The dial on element **106** will, of course, be calibrated in inches, feet, or any other desired value.

Referring now to FIGURE 4, the operation of the electrical portion of the present invention will be described. The equipment will be connected to a standard alternating current source **120**. Upon the closing of main power switch **100**, current will flow through fuse **122** and pilot light **108** thus providing an indication that the equipment is on. If shield **113** is open as shown in FIGURE 2, interlock switch **112** will also be closed. Thus, when start button **102** is momentarily depressed, current will be delivered, via a pair of closed contacts in limit switch **90**, to terminal No. **1** of selector **106**. The contacts of limit switch **90** which are shown as being closed are normally open contacts which, due to the fact that the cutter has been driven fully to one side of its guide rail **82**, will be forced closed. If the cutter were at the other end of guide rail **82**, the contacts of limit switch **90** shown open would be closed and the closed contacts would be open; and the closed contacts of switch **88** would be open and the open

contacts of switch 88 would be closed to deliver current through switch 88 to terminal No. 1 of selector 106. Current supplied to terminal No. 1 of selector 106 via limit switch 90 will pass through a solenoid or clutch coil 124 in selector 106 and thence, via terminal No. 2 of selector 106, back to source 120. Current flow through solenoid 124 moves switch 125 to cause opening of the normally closed circuit between terminals Nos. 6 and 8 of the selector and close the circuit between terminals Nos. 6 and 7. Terminal No. 7 is tied to terminal No. 5 and, through normally closed contacts of switch 127, to terminal No. 4. Terminal No. 4, via conductor 126, is connected to the line side of start button 102. Thus, the momentary closing of start button 102 energizes coil 124 which is latched in the energized position by the completion of the circuit between terminals Nos. 6 and 7 of selector 106 so that the system remains operative when start button 102 is released to open. Latching of solenoid 124 also establishes a path for current flow, via selector switch 104, to one of drive roll motors 56, 58 or 59. Thus, as shown in FIGURE 4, motor 56 will be energized by current delivered over conductor 126, contacts Nos. 4, 5, 7 and 6 of selector 106 and switch 104.

As motor 56 drives drive roll 30, the normally closed contacts of microswitch 92 (see FIGURE 3) will be periodically opened and the normally open contacts periodically closed. In a manner well known in the art, each time the normally closed contact of switch 92 is opened the current to totalizer 114 is interrupted and totalizer 114 registers a count. Similarly, each time the normally open contacts of switch 92 are closed, a current pulse will be supplied to terminal No. 12 of selector 106 via conductor 128. The current pulse delivered to terminal No. 12 will pass through coil 130 of the stepping solenoid in selector 106 thereby causing the manually preset counter mechanism 132 to step down one count.

During the time that motor 56 is causing material to be drawn off dispensing roll 16, cutter motor 84 will be deenergized. However, when counter 132 has counted down to zero, a mechanical switch 127 will be momentarily tripped and then reset to the position shown in FIGURE 4 to momentarily open the normally closed circuit between terminals Nos. 4 and 5 of selector 106 and close the circuit between terminals Nos. 3 and 4. The opening of the circuit between selector terminals Nos. 4 and 5 deenergizes motor 56. The momentary closing of terminals Nos. 3 and 4 permits a pulse of current to flow through solenoid 134 of a cutter motor relay RY–1. Relay RY–1 is of the type such as Potter and Brumfield GM11A wherein the initiation of the current pulse primes a pawl of a ratchet and pawl mechanism and the termination of the pulse releases the pawl to actuate the ratchet, and actuation of the ratchet closes an open switch and opens a closed switch. Thus the current pulse through RY–1 causes switching of the contacts of the switch associated therewith so that contacts 136 and 138 are opened and contacts 140 and 142 are closed. The direction in which cutter motor 84 will run is determined by which pair of contacts of relay RY–1 are closed. When the contacts shown open in FIGURE 4 are closed by the pulse through solenoid 134 of relay RY–1, current will flow through cutter motor 84 via the normally closed contacts of limit switch 88. The cutter motor will thus be energized and will drive the cutter the length of guide rod 82 until it contacts limit switch 88 opening the normally closed contacts of limit switch 88 and deenergizing motor 84. The movement of the cutter off of limit switch 90 allows limit switch 90 to return to its normally closed position from the normally open position shown in FIGURE 4. For the next cycle, presuming for the moment manual recycling, counter 132 will be automatically reset to the previously selected length with the resetting of switch 12, or a new setting can be selected. In either event, a repeat operation of the machine occurs when start button 102 is again momentarily pushed, and counter 132 will again count down to zero. When counter 132 has counted down to zero, relay RY–1 will again be energized and the contacts will be switched back to the state shown in FIGURE 1 wherein 136 and 138 are closed and 140 and 142 opened thus altering the connection to motor 84 such that motor 84 will be supplied through the normally closed contacts of limit switch 90 and will run in the opposite direction.

Automatic recycling, for the continual dispensing of one preset length of material is, as noted above, a very useful operation which frees the operator from manually starting each cycle when a quantity of pieces of the same length are desired. Referring to FIGURE 5, automatic recycling is accomplished by using a relay 144 to operate a pneumatic time delay dashpot 146 which has a normally closed switch 148. In addition, terminal No. 4 of selector 106 is connected to terminal No. 9, and a double pole, double throw switch 150 is added to the system.

When switch 150 is actuated, pole 152 of switch 150 is connected between point A on one side of push button 102 and to one side of switch 148. The other side of switch 148 is connected to the other side of push button 102. Pole 154 of switch 150 is connected between one side of relay 144 and terminal No. 10 of selector 106. The other side of relay 144 is connected to point D on one side of lamp 108.

With switch 150 in its operating position, power is fed from point A to pole 154, then through normally closed switch 148 to point B and then to selector 104; the power also passes in parallel from point A to terminal No. 4 of selector 106. At the completion of a cycle of operation of paying off a preselected length of material, switch 127 is momentarily actuated to connect terminals No. 9 and No. 10 of selector 106. A pulse then passes from terminal No. 10 to pole 152 of switch 150 and then through relay 144 to point D. The pulse through relay 144 actuates plunger 156 to strike button 158 and open normally closed switch 148 thus interrupting the current to point B and releasing clutch 124 in selector 106.

After a time interval as determined by dashpot 146, switch 148 returns to its normally closed position and the power is restored to point B and thus to terminal No. 1 of selector 106 to initiate another cycle of operation. The time delay introduced by dashpot 146 can be increased or decreased by rotating selector 160 respectively counterclockwise (S direction) or clockwise (F direction). However, the time delay must be sufficient to allow cutting wheel 80 to traverse from one limit switch to the other limit switch before another cycle of dispensing operation is initiated.

While a preferred embodiment has been shown and described, various modifications and substitutions may be made without departing from the spirit and scope of this invention. Accordingly, it is to be understood that this invention has been described by way of illustration rather than limitation.

What is claimed is:

1. A dispenser for dispensing material in the form of strips of preselected length, said dispenser comprising:
- means supporting a roll of the material to be dispensed,
- means for drawing material off of the roll on said supporting means,
- means operatively connected to said drawing means for sensing the removal of incremental lengths of material off the roll and for generating a signal commensurate with each increment,
- counter means responsive to the signals generated by said sensing means for totaling said signals,
- means responsive to said counter means for providing signals indicative of coincidence between said totalized number of increments and said preselected length,
- means responsive to said counter means for terminating operation of said drawing means,
- cutter means for transversely severing said material,
- means for applying a first coincidence signal to said

cutter means to actuate said cutter means in a first direction to cut said material, and means responsive to the complete traversal of the material by said cutter means in a first direction for deenergizing the cutter means and altering electrical connections thereto whereby said cutter means will traverse the film in the opposite direction in response to another coincidence signal.

2. A dispenser for material as in claim **1** wherein said cutter means includes:

a cutting blade, the material being dispensed past said cutting blade; and

a cutting wheel, said cutting wheel being drawn past said cutting blade for severing said material.

3. A dispenser for material as in claim **1** including:

guide means for directing said material to said cutter means, said guide means including liner means for protecting said material.

4. A dispenser for material as in claim **3** wherein said liner means includes:

felt pad means.

5. A dispenser for material as in claim **1** wherein:

said means for drawing material off the roll includes a drive roll and a pressure roll for holding the material from the roll against said drive roll.

6. A dispenser for material as in claim **1** including:

a plurality of support means for a plurality of rolls of material to be dispensed;

drawing means for each roll of material for drawing material off of each roll of material;

means operatively connected to each of said drawing means for sensing the removal of incremental lengths of material off each roll and for generating signals commensurate with each increment; and

means for selectively actuating one of said drawing means to draw material off a selected roll.

7. A dispenser for material as in claim **6** including means for totalizing the material drawn off each roll.

8. A dispenser for material as in claim **1** including:

automatic repeating means for recycling said drawing means upon traversal of said cutter means.

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WILLIAM S. LAWSON, *Primary Examiner.*