

Dec. 13, 1966

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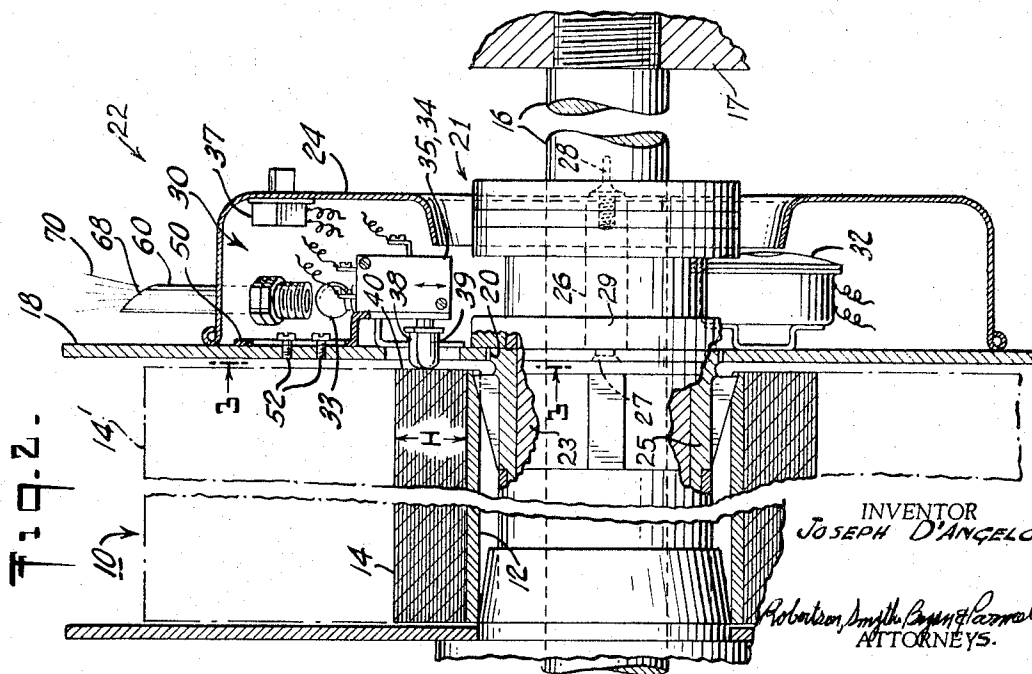
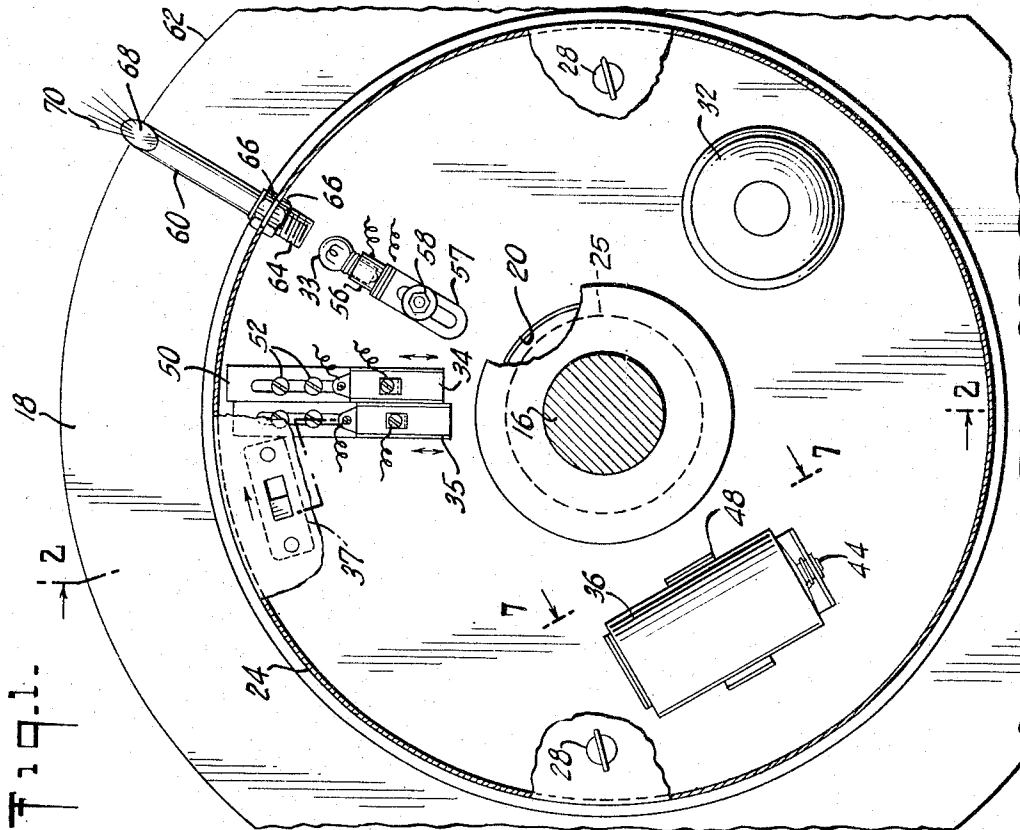
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REEL MOUNTED PORTABLE SUPPLY WARNING APPARATUS HAVING

ROTATION CONTROLLED FLASHING SIGNAL

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3 Sheets-Sheet 1



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FIG. 3.

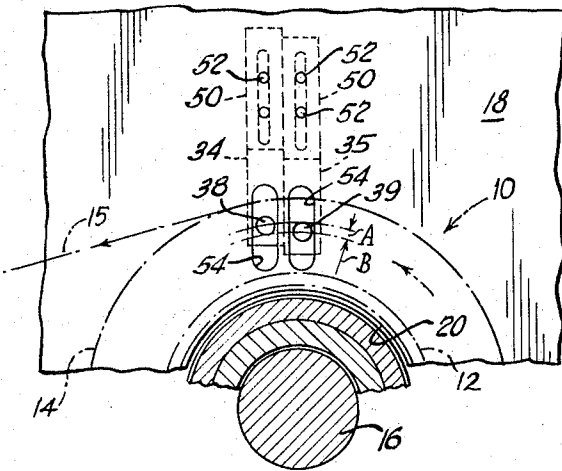


FIG. 7.

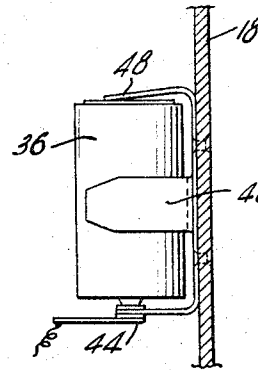


FIG. 4.

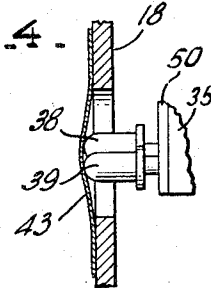


FIG. 5.

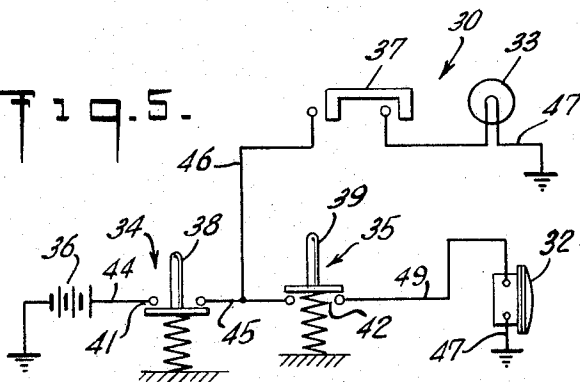
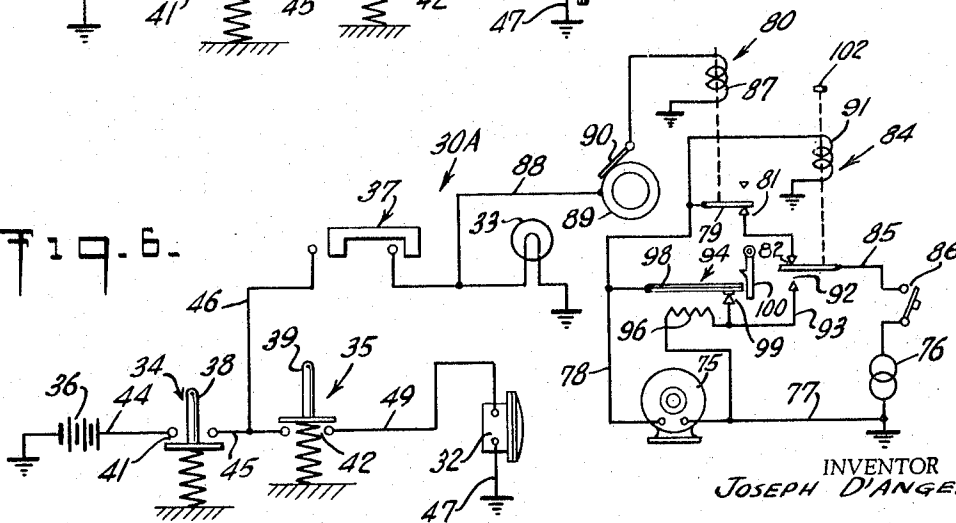


FIG. 6.



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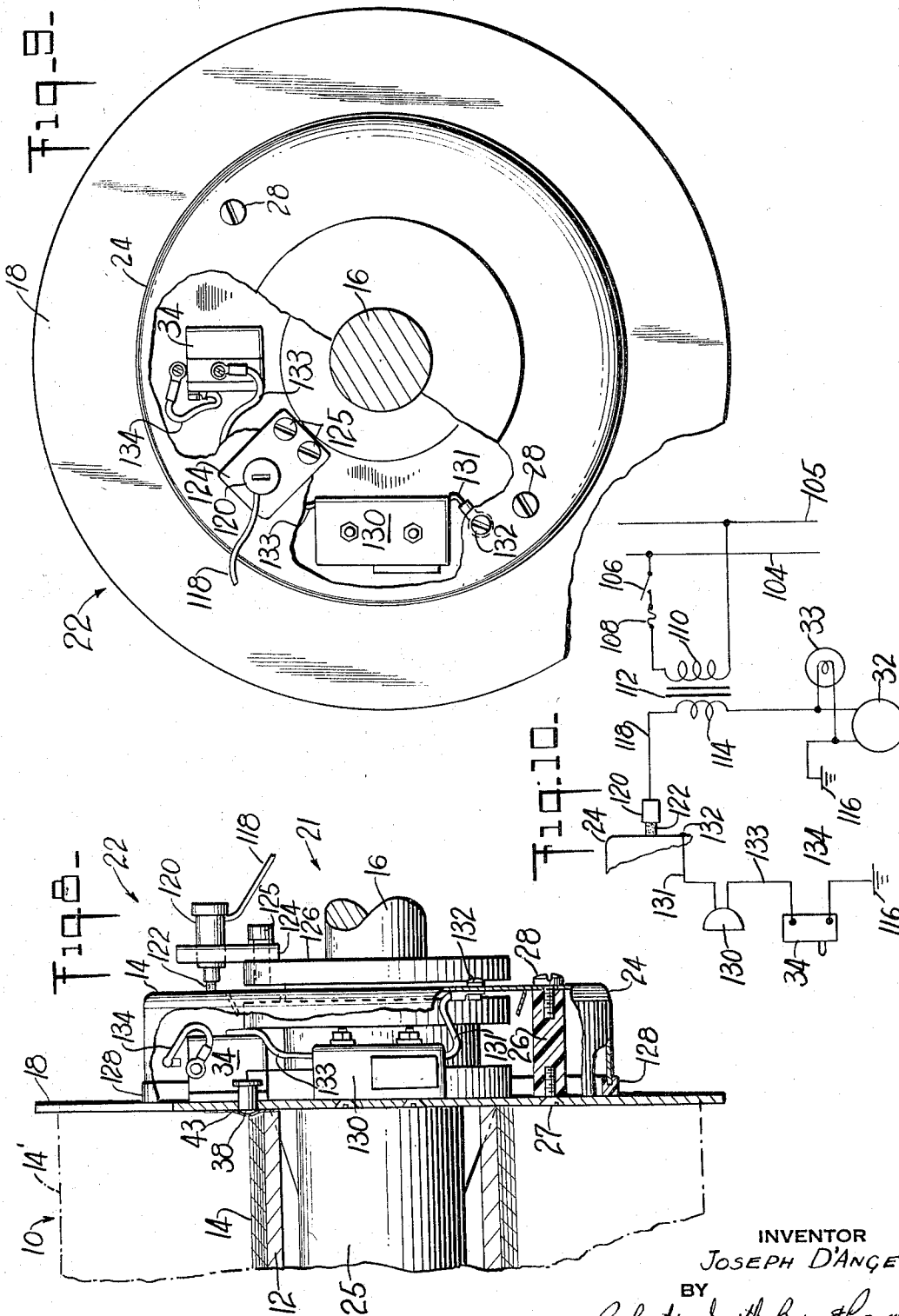
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3 Sheets-Sheet 3



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3,292,170

REEL MOUNTED PORTABLE SUPPLY WARNING APPARATUS HAVING ROTATION CONTROLLED FLASHING SIGNAL

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4 Claims. (Cl. 340-259)

This application is a continuation-in-part of application Serial No. 352,828, filed March 18, 1964.

The invention relates to supply roll run-out warning apparatus for automatically providing a warning or control signal a short time period prior to the moment when a supply roll of sheet material will run out. More particularly this invention relates to such apparatus which is positioned adjacent to one end face of a supply roll of sheet material and which provides a signal when the depth of the sheet material still remaining wound on the supply roll has become reduced to a predetermined level.

In many types of existing automatic machines which handle, process or utilize large quantities of sheet material, this sheet material is supplied from a large roll which contains the sheet material as a continuous web wound upon a hollow core. This sheet material may be any type of thin flexible web material, for example, such as paper, cellophane, plastic film, foil, package wrapping material, and the like. The hollow core of the roll is supported on a spindle shaft in the machine and the roll is held in position against a cheek plate at one end of the shaft. As the material is fed into the machine, the diameter of the roll decreases so that a progressively diminishing depth of the sheet material remains wound on the core.

As soon as the roll has run out, the machine is stopped by the operator, and the empty core is removed from the support shaft and is replaced by a full roll. In many applications the machine operator joins the leading end of the new roll to the trailing end of the existing web of material, for example, as by the use of pressure-sensitive adhesive tape. Then he restarts the machine and runs it slowly until the joined region of the web has been fed completely through the machine, at which time the machine is sped up to its normal feed rate.

If the operator's attention is diverted, for example, he may be in charge of several machines, then it is possible for the supply roll in one machine to run out before he has an opportunity to see it and stop the machine. Thereafter, he must laboriously thread the leading end of the web of sheet material from the new roll through the machine. This hand threading operation wastes substantial time. Moreover, if the sheet material is being used in conjunction with other material or product, for example, as in a packaging machine, then there may occur substantial wastage of product during the interval between run-out of the material and shut-down of the machine for reloading. Also, there is the problem that occasionally the end face of the new roll of material and cheek plate are not positioned on the support shaft firmly abutting against one another so that proper feeding of the sheet material does not occur, causing edge jamming or improper overlapping of the sheet material in the machine.

Among the many advantages of the illustrative embodiments of the present invention are those resulting from the fact that the supply roll run-out warning apparatus provides a warning signal at an appropriate time period in advance of the run-out of the sheet material and then subsequently provides a signal indication that the run-out time is near at hand. Thus, the operator's attention is alerted by the initial signal and he prepares to slow

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down and stop the machine for reloading when the second signal occurs.

In addition one of the embodiments of this warning apparatus is adapted to be used to shut down the operation of the machine in the event that the operator does not take appropriate action as the supply roll is just about to run out.

In another embodiment of this apparatus the warning signal device is external of the supply roll and automatically stops when the operator stops the rotation of the roll to reload.

Among the further advantages of the embodiments of the invention as shown are those resulting from the fact that the warning apparatus mechanically senses the end face of the wound sheet material in the supply roll so that when the diameter of the roll is reduced below certain predetermined limits then a signal is provided. This mechanical sensing of the end face of the roll renders the apparatus capable of operating with all kinds of rolls of sheet material regardless of the characteristics of the material, that is, whether it is opaque or pellucid, conductive or non-conductive, and so forth. Also, this apparatus is adapted to be included conveniently as part of the cheek plate assembly so as to rotate with the supply roll as the web is payed off from the roll.

Furthermore, during loading of a new supply roll into a machine this warning apparatus provides an indication showing when the end face of the new supply roll and the cheek plate have been positioned in the desired closely adjacent relationship and also providing a warning when they have not been properly positioned.

In certain illustrative embodiments of the invention as described herein the apparatus provides both a visual and an audible signal at an adjustable period prior to run-out. Then at a later adjustable period just prior to run-out the audible signal ceases but the visual signal continues so as to aid in identifying which one of several machines is about to run out of its supply of material.

It is an object of this invention to provide supply roll run-out warning apparatus convenient and easy to use in a wide variety of different applications and reliable in operation.

In this specification and in the accompanying drawings are described and shown illustrative embodiments of the supply roll run-out warning apparatus of this invention, and various modifications thereof are indicated, but it is to be understood that these are not to be construed as exhaustive nor limiting of the invention, but on the contrary are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the many ways of applying this invention in practical use.

The various objects, aspects, and advantages of the present invention will be more fully understood from a consideration of the following specification in conjunction with the accompanying drawings, in which:

FIGURE 1 is a sectional view of the supply roll run-out warning apparatus, and this view includes fragmentary portions of the cover;

FIGURE 2 is an axial sectional view of the supply roll, its support shaft and the cheek plate together with the warning apparatus, this view being taken along the line 2-2 of FIGURE 1;

FIGURE 3 is an elevational view of a portion of the inner surface of the cheek plate, being a view taken along the line 3-3 of FIGURE 2 and showing the roll sensing means;

FIGURE 4 is an enlarged view of a portion of FIGURE 2;

FIGURE 5 is a schematic circuit diagram of one embodiment of the invention;

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FIGURE 6 is a schematic circuit diagram of another embodiment of the invention for automatically shutting down a machine just prior to run-out of its supply roll;

FIGURE 7 is a view of the battery and its mounting, a detail view taken along the line 7-7 of FIGURE 1;

FIGURE 8 is an axial sectional view of a modified embodiment of the supply roll run-out warning apparatus;

FIGURE 9 is an end elevational view of the apparatus with portions of the cover shown broken away; and

FIGURE 10 is a schematic circuit diagram of the apparatus shown in FIGURES 8 and 9.

Referring to the drawings in greater detail, it is noted that the supply roll, which is generally indicated at 10 in FIGURES 2 and 3, includes a tubular core 12, for example, of heavy stiff cardboard, and a wide web of sheet material 14 which is tightly wound upon this core 12. In this illustrative example the sheet material 14 is shown as being a wound web of plastic sheet packaging material, for example, cellophane, but it is to be understood that this sheet material may be any one of a great variety of different sheet materials, as discussed in the introduction further above. The original full diameter of the supply roll 10 is indicated in FIGURE 2 by a dash and dot outline at 14'. As shown in FIGURE 3, during utilization of this roll, the web of material 14 is fed from the roll along a path 15 into an automatic machine, for example, such as a wrapping machine, and the whole supply roll 10 including its core 12 rotates about a support shaft 16 as the material pays off from the roll.

In order to hold the supply roll the shaft 16 is mounted on a frame member 17. A large circular flat cheek plate 18 (FIGURE 1) has a central hole 20 (FIGURES 1 and 2) fitting around a core holding assembly 21 on the shaft 16, said assembly including a sliding tube 23 and a rotating tube 25. This cheek plate 18 forms part of a cheek plate assembly 22 including an annular housing cover 24 which is attached to the plate 18 by means of a pair of mounting posts 26 (FIGURE 2) rigidly affixed to the plate 18 as by screws 27. The cover 24 is removably secured to the mounting posts 26 by fastening means 28 (FIGURE 1) shown as a pair of thumb screws. The cheek plate assembly 22 is suitably attached onto a flange 29 of the revolving sleeve 25 so that the whole assembly 22 is free to rotate with the supply roll 10.

The supply roll run-out warning apparatus 30 is enclosed in the annular space between the plate 18 and cover 24, with parts of this warning apparatus 30 being mounted on the back surface of the plate 18 and with other parts mounted on the inner surface of the cover 24.

Inviting attention also to FIGURE 5 it is noted that the warning apparatus 30 includes an audible signal device 32, shown as an electric horn, an indicator light bulb 33, first and second roll-end-face sensing switches 34 and 35, a source of electrical energy 36, shown as a battery, and a suitable on-off switch 37, for example a slide-type switch. The contacts of the first switch 34 are normally closed while those of the second switch 35 are normally open. It is noted that these switches are actuated by first and second sensing plungers 38 and 39, respectively, and the first plunger 38 is located at a greater distance from the axis of the roll than the second plunger.

In operation, when the end face 40 (FIGURE 2) of the supply roll is properly positioned in closely adjacent relationship with the cheek plate 18, then the plungers 38 and 39 are depressed by the end face 40 so that the contacts 41 (FIGURE 5) of the switch 34 are open and the contacts 42 of the switch 35 are closed. For clarity of illustration, as will be understood, FIGURE 2 shows more space between the end face 40 and the cheek plate 18 than is normally present when the supply roll is properly positioned. The switches 34 and 35 are of the short-travel actuation type wherein a small displacement of the plungers 38 and 39 will open or close these switches, for example, they are shown as microswitches.

As shown in FIGURE 4, the ends of the plungers

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38 and 39 are covered by a flexible diaphragm cover 43 which is secured to the inner surface of the cheek plate 18 so as to provide a smooth surface for the sheet material to pay out past these plungers. Also, the plungers themselves are of relatively large diameter with smoothly rounded ends toward the roll-end-face 40, thus avoiding any snagging of the edge of the sheet material 14.

If the supply roll 10 is not positioned sufficiently closely adjacent to the cheek plate 18 when the machine is being loaded, then the contacts 41 remain closed, and the light 33 remains on. The circuit for energizing the light 33 is traced from a terminal 44 of the electrical source 36 through the now-closed contacts 41, through a lead 45 and a lead 46 to the on-off switch 37 and thence to the light 33, with a return circuit through a "ground" connection 47 to the plate 18. It is noted that the battery 36 is in a holder 48 which serves to provide a ground connection to the plate 18 for one terminal of the battery with the other terminal 44 being insulated from the plate 18.

When the new supply roll is properly positioned snugly adjacent to the cheek plate 18, then the contacts 41 are opened and the light 33 goes out.

During operation of the machine utilizing the sheet material 14, as the depth H of the material is reduced below the position of the end of the first plunger sensing means 38, then this plunger is released to close contacts 41, turning on the warning light 33. The horn 32 is also turned on at this same moment through its connection 49, because the contacts 42 are still being held closed by the end face of the roll 10. Thus, a combined audible and visual signal is given, at an appropriate time, for example two minutes before run-out.

Later at an appropriate period, for example one minute before run-out, when the depth H of the material 14 is diminished below the position of the end of the second plunger sensing means 39, then the second switch 35 is released so that its contacts 42 are opened to shut off the horn 32. However, the visual signal 33 advantageously remains on so as to attract attention to the roll which is nearing run-out.

The switches 34 and 35 are mounted on individual brackets 50 held by clamp screws and lockwashers 52 so that the respective positions of the switches can be adjusted for adjusting the plungers 38 and 39 along generally radially extending elongated openings 54. In this way the radial spacing A between the two plungers and the radial distance B between the second plunger and the outer surface of the core 12 are adjusted so as to provide the desired predetermined time periods for the respective signals which are adjusted in accordance with the thickness of the sheet material 14 and its rate of payout, so as to provide adequate warning.

The indicator light 33 is mounted in a socket 56 (FIGURE 1) adjustably secured to the cheek plate 18 by a slotted bracket 57 held by a clamp screw and lock washer 58. A transparent plastic rod 60 serves as a visual indicator signal device by transmitting light from the bulb 33 out through the perimeter of the cover 24 to a position where the light can readily be observed beyond the rim 62 of the plate 18. This rod 60 is rigidly attached to the cover 24 by a threaded sleeve 64 and a pair of jam nuts 66. The bulb 33 is adjusted to be aligned with the axis of visual signal 60 and the outer end 68 of the rod is beveled to enhance the visibility of the light signal 70 which issues therefrom. A suitable material for this rod 60 is methyl methacrylate, e.g. "Lucite."

As the cheek plate assembly 22 rotates, the light signal is clearly visible; not only is the end of the rod 60 illuminated, but also the light flashes onto nearby portions of the machinery as the assembly 22 rotates.

As mentioned above, the light 33 remains on until a new roll is properly loaded onto the shaft 16. In the event that the shaft 16 is to remain empty for a while,

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then the switch 37 may be turned off so as to save the battery.

The warning apparatus embodiment 30A of FIGURE 6 is similar to that shown in FIGURES 1-5, and corresponding reference numerals are used for elements performing corresponding functions in the two systems. In addition, the system of FIGURE 6 automatically shuts off the main drive motor 75 for the machine which is utilizing the sheet material 14, in the event that the operator does not happen to take appropriate action prior to run-out of the supply roll. The motor 75 has one side connected to an appropriate source of electrical power 76 by means of a power line 77. The other side of this motor is connected by a line 78 to a movable armature 79 of a relay 80 which has a normally closed set of contacts 81 completing the circuit through the contacts 82 of a holding relay 84 to a line 85 and main switch 86 to the source 76.

In operation when the horn 32 is energized, the solenoid coil 87 of the relay 80 is energized so as to move its armature 79 and open the contacts 81. The circuit for energizing the coil 87 is traced from the switch 37 through a lead 88 to a slip ring 89 on the cover 24 and thence through a brush 90 which is connected to the coil 87.

As soon as the relay contacts 81 are opened, the holding coil 91 of relay 84 is de-energized so as to open the contacts 82 and to close the contacts 92, thus completing a circuit through a lead 93 to a thermal time-delay relay 94 for maintaining the motor 75 energized. This time-delay relay 94 includes a resistance heater 96 and a bi-metal armature element 98 with a pair of normally closed contacts 99. After an appropriate delay period, for example a minute and a half, the armature 98 moves to open the contacts 99, and a mechanical latch 100 latches the armature 98 in its open position so as to stop the motor 75. When the operator wishes to re-start the motor 75 he raises the control 102 so as to re-close the holding relay 84 and then releases the latch 100.

The pay-out warning apparatus of FIGURES 8-10 is similar to that shown in FIGURES 1-7, and corresponding reference numerals are used for elements performing corresponding functions. A buzzer 32 and a warning light 33 are mounted on the frame of the machine at a location to make them readily heard and seen. These are energized from alternating current supply lines 104 and 105 through an on-off switch 106 and a fuse 108 connected to the primary 110 of a step-down transformer 112. This electric power may be at any suitable voltage, for example 230 volts, 60 cycles.

The secondary 114 supplies a low voltage, for example such as 6.3 volts, and the secondary circuit extends from a common ground or return connection 116 through the buzzer 32 and light 33 in parallel to one side of the secondary. The other side of the secondary is connected through a lead 118 to an electrical brush assembly 120 including a carbon brush 122 which engages the outer surface of the revolving annular housing 24. This housing 24 is electrically conductive, and insulating support means isolate this housing 24 from the remainder of the supply roll. The switches within this housing control the warning signal through the brush 122, as will be explained below.

As shown in FIGURE 8, this brush assembly 120 is held by a stationary bracket 124 secured by screws 125 to the end 126 of the core holding assembly 21. The housing 24 is held by a plurality of insulating stand-off posts 26 which are rigidly secured to the cheek plate 18. To assure that the housing 24 is firmly supported and insulated from the cheek plate 18, its rim is covered by an insulating channel 128 which bears against plate 18.

Within this housing is a supply-roll sensing switch 34 and a mercury switch 130 which are mounted upon the cheek plate 18 and are connected in circuit in serial

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relationship with the cover 24 and brush 122. A lead 131 from one side of the switch 130 is secured by a screw 132 to the housing 24. From the other side of this mercury switch 130 a lead 133 is connected to one terminal of the sensing switch 34, and the other terminal is connected through a lead 134 to a ground point 116 providing a return circuit through the machine frame.

Whenever the sheet material 14 has been payed out to the level of a plunger 38, then this plunger becomes extended to allow closure of the switch 34, thus completing the circuit to actuate the audible and visual alarm signals 32 and 33. The mercury switch 130 is secured to the plate 18 so that it revolves with the whole cheek plate assembly 22 while the mercury within it is responsive to gravity to open and to close the warning circuit once each revolution. The resultant intermittent operation of the warning signals quickly attracts attention, even from a substantial distance. As soon as the machine is stopped, the operator can revolve the cheek plate assembly 22 into a position in which the mercury switch 130 is open, thus shutting off the warning signal.

In this way the operator can reload the roll 10 without the continuing annoyance of listening to the buzzer 32. After the new roll is loaded, in order to check whether it is properly seated against the cheek plate, he revolves the roll assembly around a half turn or more so that the mercury switch 130 will close. If the warning signal remains off, this means that the new roll is properly positioned and the machine is ready to start again.

From the foregoing it will be understood that the supply roll run-out warning apparatus described herein as illustrative embodiments of the present invention are well suited to provide the advantages set forth and that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense and that in certain instances some of the features of the invention may be used without a corresponding use of other features or may be modified into equivalent elements, all without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. Supply roll run-out warning apparatus for indicating that a roll of material is nearly all payed out from a roll comprising support means locatable near one end face of the roll, said support means being revolvable with the rolls as the material pays out, sensing switch means mounted on said support means responsive to the pay out of material beyond a predetermined amount, a signal device, a source of electrical power, a warning circuit interconnecting said source of power, said signal device and said sensing switch means, and gravity-responsive switch means mounted on said support means and revolving therewith and being included in said warning circuit for interrupting said circuit once during each revolution of said roll.

2. Supply roll run-out warning apparatus for indicating that a roll of material is nearly all payed out comprising a cheek plate having an inner face locatable near one end of the roll of material, said cheek plate being revolvable with the roll as the material pays out, sensing means exerting pressure inwardly from the inner face of said cheek plate against said end of the roll at a position spaced out from the inner limit of said roll, a housing secured to the outer face of said cheek plate in insulated relationship therefrom, said housing being electrically conductive and revolving with said cheek plate, a sensing switch within said housing, a gravity-responsive switch within said housing, a warning signal device, a source of electric power external to said housing, a stationary support near said housing, electrical brush means mounted on said support and in sliding contact with said housing, and circuit means interconnecting said warning device, said source of power, said brush means, said housing, said gravity-responsive switch, and said sensing switch

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in serial relationship for providing an intermittent signal when said sensing switch is actuated and said cheek plate is revolving.

3. Supply roll run-out warning apparatus for indicating that a roll of material is nearly all payed out from a roll comprising support means locatable near one end face of the roll, said support means being revolvable with the roll as the material pays out, sensing switch means mounted on said support means responsive to the pay out of material beyond a predetermined amount, a signal device external of said support means, a source of electrical power external of said support means, a housing surrounding said sensing switch means and being insulated from said support means, said housing revolving with said support means, a stationary electrical brush engaging said revolving housing, and a warning circuit interconnecting said source of power, said signal device, said electrical brush, said housing and said sensing switch means.

4. Supply roll run-out warning apparatus for indicating that a roll of material is nearly all payed out from a roll comprising support means locatable near one end face of the roll, said support means being revolvable with the roll as the material pays out, sensing switch means mounted on said support means responsive to the pay out of material beyond a predetermined amount, a signal device external of said support means, a source of electrical power external of said support means, a

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housing surrounding said sensing switch means and being insulated from said support means, said housing revolving with said support means, a stationary electrical brush engaging said revolving housing, a warning circuit interconnecting said source of power, said signal device, said electrical brush, said housing and said sensing switch means, and gravity-responsive switch means mounted on said support means and revolving therewith and being included in said warning circuit for interrupting said circuit once during each revolution of said roll.

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