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Fulton

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[54] **LABEL WRITING APPARATUS**

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Related U.S. Application Data

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[52] **U.S. Cl.** **307/117,** 317/124

[51] **Int. Cl.** **H01h 36/00**

[58] **Field of Search** 250/234, 236, 555, 570; 307/117; 317/124; 335/206, 207, 205

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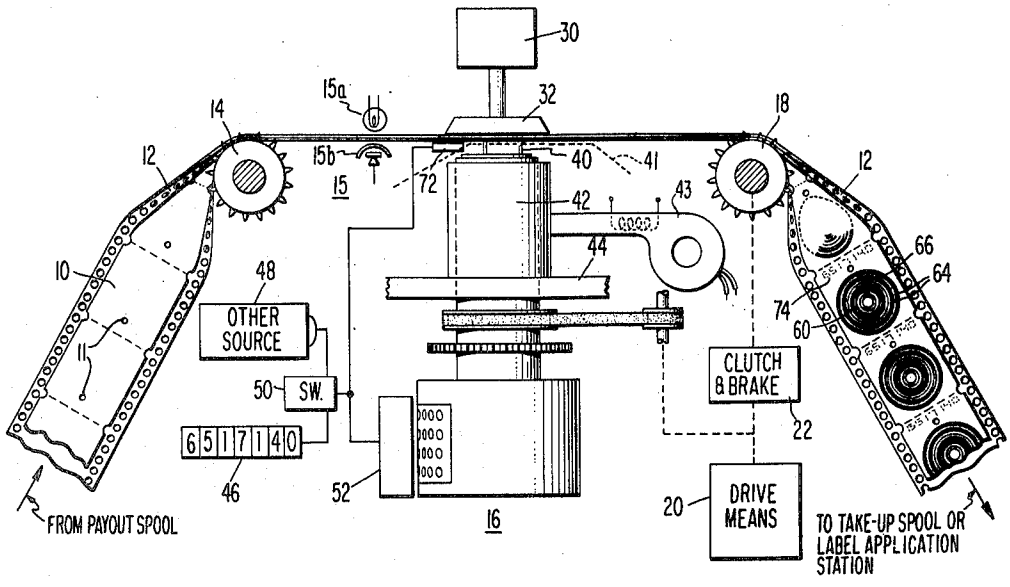
[57] **ABSTRACT**

A rotatable assembly includes a plurality of writing devices which are selectably moveable into and out of writing position. As the assembly rotates, the writing devices in the writing position describe concentric patterns on a recording medium. The selective movement of the writing devices may be controlled by an array of sensing elements such as light sensors. These may be located on the assembly and may be selectively energized, as the assembly rotates, in response to a smaller stationary group of energy emitting elements located next to the assembly.

5 Claims, 5 Drawing Figures



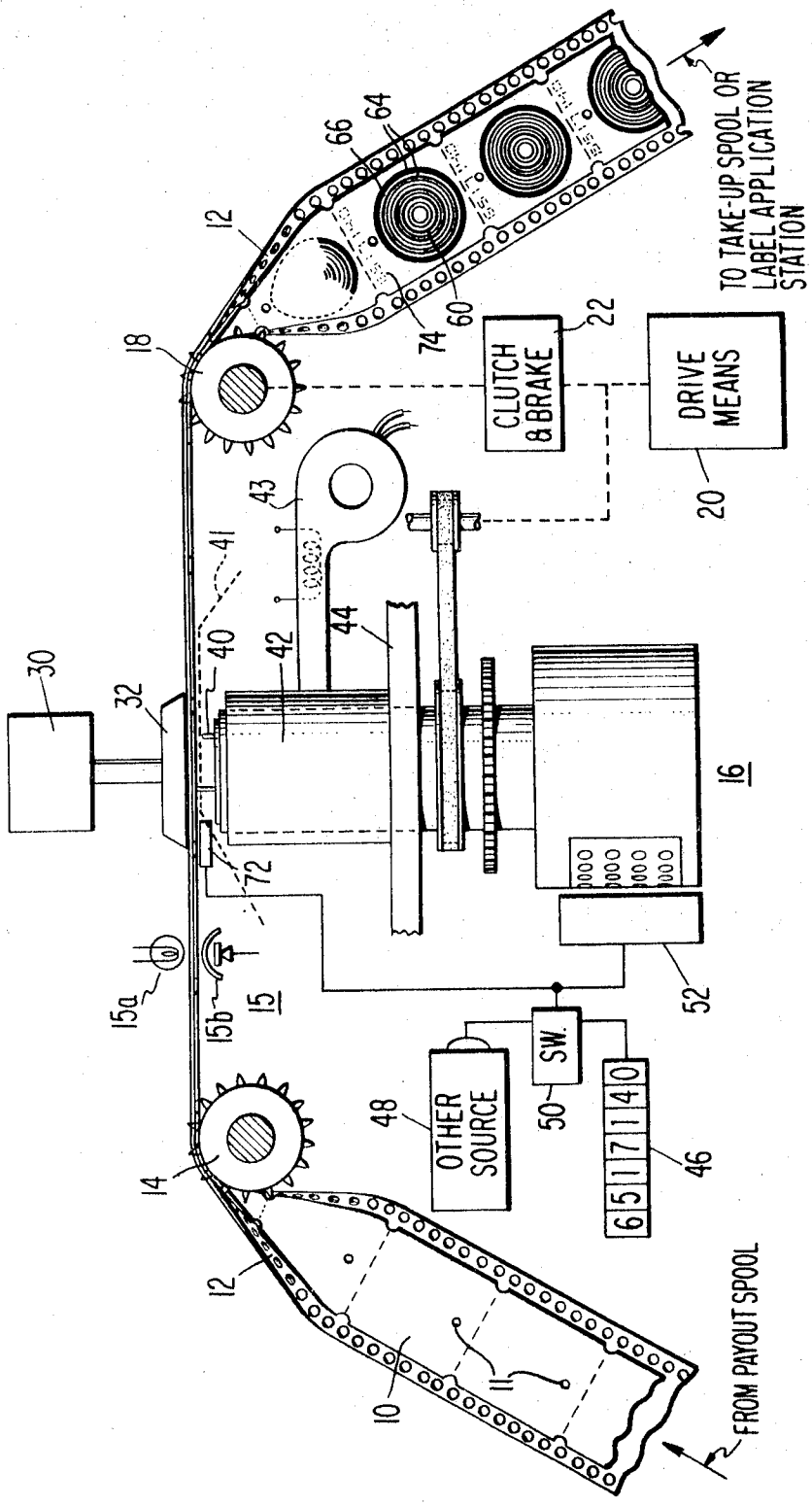

TO TAKE-UP SPOOL OR LABEL APPLICATION STATION
CLUTCH & BRAKE
DRIVE MEANS
OTHER SOURCE
SW.
FROM PAYOUT SPOOL
12
18
22
20
43
41
40
42
44
30
32
16
72
15a
15b
15
52
48
50
46
14
10
11
60
64
66
74

Fig. 1

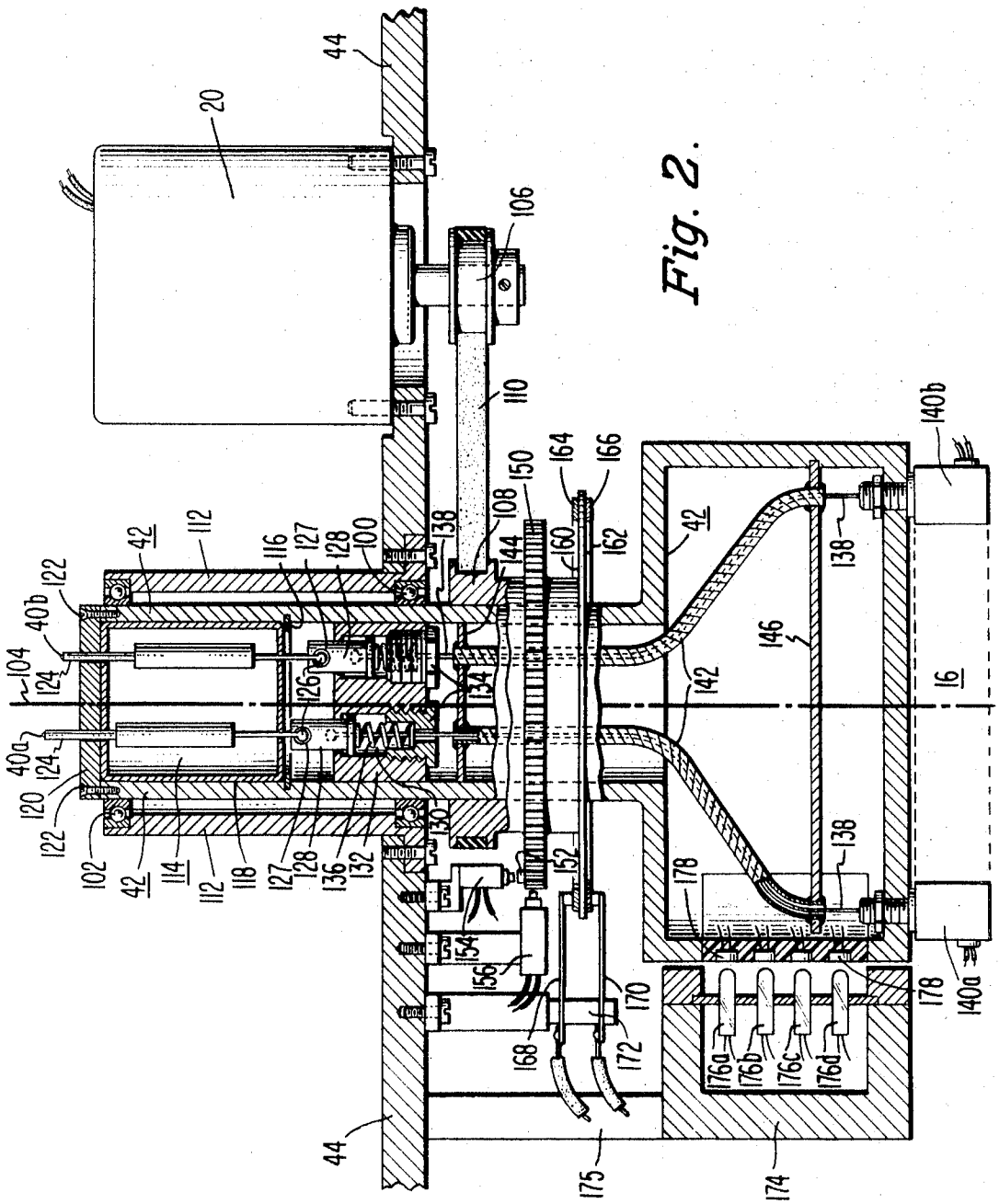

20
44
106
110
108
150
164
166
160
162
144
138
42
112
116
127
128
100
122
40b
104
124
126
134
146
142
16
140b
140a
40a
120
102
114
118
130
132
136
152
154
156
168
170
172
175
174
176a
176b
176c
176d
178

Fig. 2.

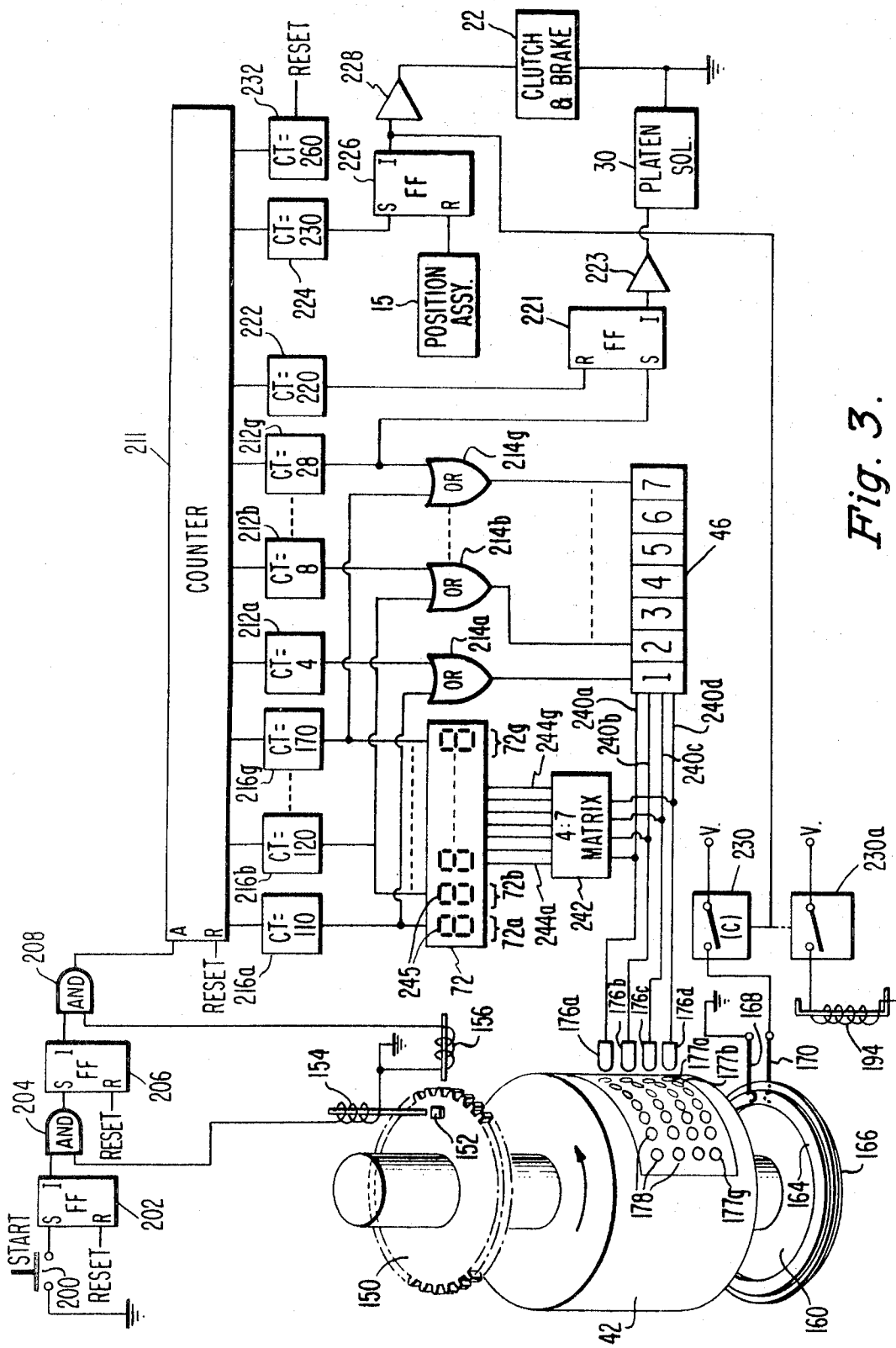

START
RESET
AND
FF
COUNTER
CT= 260
CT= 230
CT= 220
CT= 28
CT= 8
CT= 4
CT= 170
CT= 120
CT= 110
OR
4:7 MATRIX
CLUTCH & BRAKE
PLATEN SOL.
POSITION ASSY.
1 2 3 4 5 6 7

Fig. 3.

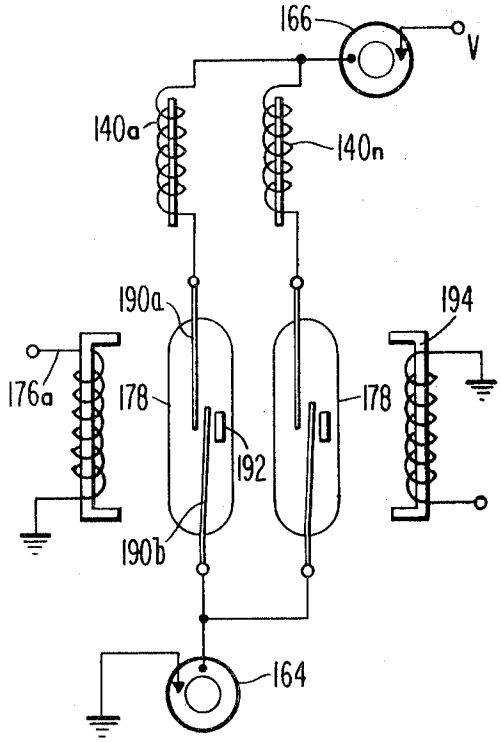

166
V
140a
140n
190a
194
176a
178
178
192
190b
164

Fig. 5.

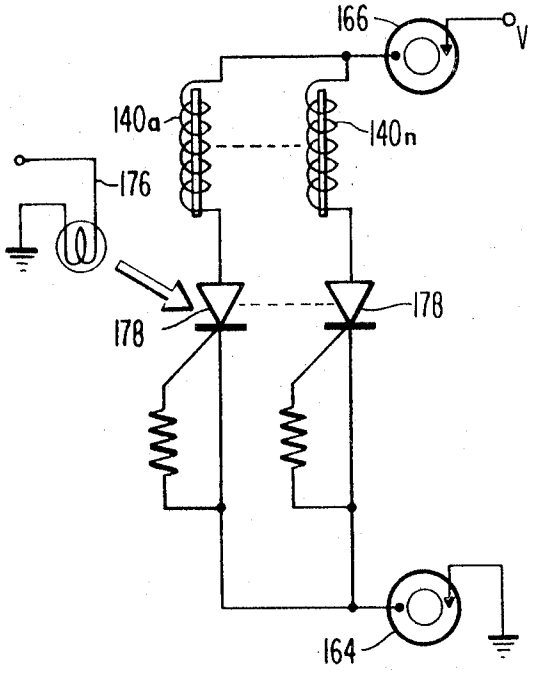

166
V
140a
140n
176
178
178
164

Fig. 4.

LABEL WRITING APPARATUS

This is a division of application Ser. No. 238,241, filed Mar. 27, 1972, now U.S. Pat. No. 3,757,349, issued Sept. 4, 1973.

BACKGROUND OF THE INVENTION

Systems are known which utilize binary encoded labels comprising concentric rings in alternating colors (usually black ink on white background) to identify the articles to which they are attached. Apparatus must be provided to prepare such labels on demand. In the prior art, such apparatus has included the use of electrophotographic techniques wherein an electrofax type paper is charged and then portions selectively discharged to form the concentric pattern which is then developed in a toner. Such apparatus is not free from problems associated with the toner chemical employed. Other apparatus employs patterned light applied to a paper, but the paper has proven expensive.

SUMMARY OF THE INVENTION

Apparatus for producing a pattern of concentric annuli on a recording medium comprises a means having an axis normal to the recording medium and having a plurality of writing means selectively able to be placed in writing condition to produce the concentric pattern, each writing means when in said writing condition being located at a different radial distance from said axis. Means coupled to said writing means are also included which are responsive to the signals indicative of patterns to be recorded for placing corresponding ones of said writing means in writing condition. There is also a means for creating relative motion between said recording medium and said means having an axis about said axis for creating on said recording medium a binary pattern in the form of concentric annuli.

A preferred form of the invention includes a selectable energy emitting means and a means movable past the energy emitting means comprising a plurality of energizable loads and a plurality of sensing means, each coupled to a different one of said loads, and a means for serially moving said energy sensing means past said energy emitting means. Means responsive to the passage of each of said energy sensing means past said energy emitting means and to a source of signals causes the energization of said energy emitting means during the passage of selected energy sensing means, whereby the corresponding loads are energized.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic showing of a label printer employing the present invention;

FIG. 2 is an elevation view, partially in cross-section of the print station of the FIG. 1 apparatus;

FIG. 3 is a block circuit diagram of elements within block 52 and elsewhere in the label printer of FIG. 1;

FIG. 4 is a schematic circuit diagram of one embodiment of an energy emitting means and energy sensing means utilized in the apparatus of FIG. 1; and

FIG. 5 is a schematic circuit diagram of another embodiment of an energy emitting means and energy sensing means utilized in the apparatus of FIG. 1.

DETAILED DESCRIPTION

FIG 1 shows a strip of blank labels 10 on a perforated

wax material carrier 12, a portion being tilted for viewing. This strip extends from a spool (not shown) past an idler sprocket pulley 14, a position sensing assembly 15, a writing station 16 and a power driven sprocket pulley 18 to a take-up spool (not shown). At its output end, a portion of the carrier 12 is also tilted so that the printed labels are visible. Idler sprocket 14 maintains frictional tension on carrier 12 while a conventional drive means 20, mechanically coupled through a conventional clutch and brake assembly 22, may be adapted to intermittently rotate the drive sprocket 18 in a manner to be described. The label carrier is thereby held taut between the two sprocket pulleys.

Position sensing assembly 15 comprises a light source 15*a* and light sensitive device 15*b* respectively, positioned on opposite sides of lables 10. The assembly senses the passage of holes 11 in labels 10 and may be connected to clutch and brake 22 to properly position labels for printing at writing station 16.

In the writing station 16, a motion creating means such as a rotary solenoid 30, under command of signals to be described, forces a platen 32 against the label carrier 12, thereby forcing a label 10 against a plurality of writing means 40 (which in a preferred form of the invention comprise ball-point pens) contained in a rotating pen housing 42. The pen housing is rotatably mounted to the same frame 44 (only a small portion of the frame is shown) to which a number of the other elements are attached. The pen housing may be continuously driven by a suitable motor. For example, the drive means 20 which drives sprocket pulley 18 may also be used to drive the pen housing.

As will be described more fully in connection with FIG. 2, certain ones of pens 40 are raised into engagement with a label 10 while others of the pens 40 are retracted from the printing position. Conventional pens will not write "upside down" (pen tip elevated). Pens such as described in U.S. Pat. NO. 3,425,779, issued Feb. 4, 1969, to P.C. Fisher et al., however, have a pressurized fluid chamber and can thus write with the pen tip elevated above the fluid chamber. As an alternative, the entire printer of FIG. 1 may be turned upside down or writing means 40 may be stylii and there may further be included at writing station 16 an inked ribbon 41 (shown in phantom) located between stylii 40 and labels 10. In this alternative embodiment, the raised stylii cause ink to be transferred from ribbon 41 to label 10. And yet another alternative, heated stylii 40 may be used with heat sensitive label stock 10. The heat may either be applied to each stylus individually or heat may be applied to housing 42 by a blower heater 43 heating all stylii. Then those stylii 40 which are in engagement with the label 10 cause it to darken in the shape of dark circles 64. Further, writing means 40 may be light producing devices which may be selectably turned on or off. Then label stock 10 maY be light sensitive and there may be included a developing station (not shown).

As each of the pens is at a different radial distance from the pen assembly rotational axis, the result of rotating the pen housing is a series of concentric annuli of varying widths on the finished labels 60 as shown on the right in FIG. 1. On labels 60, the black areas 64 represent marks made by the pens. The combination of alternating black circles 64 and white circles 66 (the white circles are the background color of the label material 10) form a binary pattern which may be "read"

by optical label scanning equipment (not shown). Information concerning which pens are to be raised into writing position and which lowered out of writing position are determined by input signals supplied by thumbwheel switches **46** (seven of which are shown displaying the No. 6517140) or some other source of data **48**, such as a meat weighing scale. Signals from one or the other source are coupled via manually operable switch **50** to electronic circuitry **52** which is in proximity with rotating housing **42**. The switch is shown only schematically in FIG. **1** and, in practice, may consist of multiple elements leading to multiple conductor cables.

The output of switch **50** is also coupled to a printing means **72** located adjacent pens **40** and opposite labels **10**. Printing means **72** may be adapted to print human readable information **74** on the labels **10** corresponding to the information binarily encoded by the pens. While many types of printers could be employed if space permits, one very compact commercially available printer employs heatable electrodes in the shape of a standard seven segment numeric indicators, one indicator for each character to be printed. Then, by applying power to heat certain ones of the segments and by utilizing heat sensitive paper for labels **10**, when platen **32** is lowered forcing the blank lables stock into selected pens **40** and printing means **72**, human readable characters and binary information are applied to the label concurrently.

FIG. **2**, which is a cross section of writing station **16**, shows rotating pen housing **42** mounted in bearings **100** and **102** for rotation about axis **104**. Motor **20** rotates the pen housing and therefore the parts contained within it, by means of the belt **110** which engages pulleys **106** and **108**. Motor **20** is attached to frame **44** as is the stationary cylindrical housing **112** in which bearings **100** and **102** reside.

A pen assembly cassette **114** resides within housing **42** and rests on lugs **116**. The cassette comprises a plastic housing **118** which contains a plurality of pens **40** hereinafter termed **40***x* (where *x* represents letters *a*, *b*, *c*, etc.) only two of which, **40***a* and **40***b*, are shown. The cassette is held in place by a cover **120** removably secured to the pen assembly **42** by a plurality of fastening means **122**. As cover **120** contains a plurality of precisely machined bores through which various ones of pens **40***x* protrude, the writing end of each pen is accurately positioned with respect to axis **104**, each pen thereby being positioned at a different radial distance from axis **104**. For this reason, cassette **114** is a relatively inexpensive device which can be removed and discarded when the pens are about to run out of ink.

A spherically shaped element **126** is located at the end of each pen opposite from writing end **124**. Each element **126** may be inserted in, and removed from, a cavity **127** in a resilient slider member **128**. Each slider **128** resides in a counterbore **130** in a member **132**. Slider **128** is held within member **132** by a threaded capscrew **134**. A compression spring **136** extending between a bore in the capscrew and slider **128** urges the slider and therefore pen **40***x* upward as illustrated in FIG. **2**. Attached to each slider **128** is a wire **138** which extends to an associated solenoid **140***x* (where *x* represents the letters *a*, *b*, *c*, etc. only two of which, **140***a* and **140***b*, are shown) which control the movement, respectively, of pens **40***a* and **40***b*. Surrounding each wire **138** is a sleeve **142**. Each of the sleeves extends between a plate **144** and a plate **146**. The sleeves are bonded to the two plates. This arrangement provides proper guidance for wires **138** while preventing binding or kinking. Solenoid **140***a* is illustrated in the de-energized position and therefore pen **40***a* is in writing position (see FIG. **1**) while solenoid **140***b* is in the energized position therefore retracting its associated pen **40***b* away from the writing position. Of course, the arrangement could be reversed by having tension springs **136** rather than compression springs. Then the solenoids would be adapted to push the pens into writing position.

A 96 tooth timing gear **150** is attached to pen housing **42**. A stuD **152** is mounted on the timing gear. Magnetic pickup device **154**, which is positioned close to the outer edge of the upper surface of the gear, produces an output pulse each time the stud **152** passes this device (once each gear revolution). Magnetic pickup device **156**, which is positioned close to the edge of gear **150**, produces an output pulse in response to each gear tooth passing (96 pulses per gear revolution). A slip ring assembly **160** is also attached to rotating pen housing **42**. The slip ring assembly comprises a non-conducting material **162** supporting two conductive rings one, **164**, on its top surface and the other, **166**, on its bottom surface. Contactor **168** and **170** which are in slidable contact with conductive rings **164** and **166**, are secured to insulator **172** which is coupled to plate **44**.

A housing **174** is secured to plate **44** by means of a plurality of studs **175** (only one of which is shown). Housing **174** contains a plurality of energy emitting means, such as light emitting diodes **176***a*, *b*, *c* and *d*. The diodes **176***a*, *b*, *c*, *d* are positioned opposite a plurality of energy sensing means **178**, which in this example may be photo silicon controlled rectifiers (SCR). The photo SCR's are attached to pen housing **42**. While there are only four light sensors **178** shown in the FIG. **2** crossection, there is one such sensor for each solenoid **140***x* as illustrated for example in FIG. **3**.

In FIG. **3**, which shows the electrical interconnection among the various elements of the apparatus, a momentary start switch **200** is coupled to the set (S) input terminal of a first flip-flop **202**. The one output terminal of flip-flop **202** and magnetic pickup **154** are connected, respectively, to two inputs of AND gate **204**. The output terminal of AND gate **204** is coupled to the S terminal of second flip-flop **206**, the one output terminal of which is connected as one input to AND gate **208**. The second input to AND gate **208** is from magnetic pickup **156**. The output terminal of AND gate **208** is connected to the advance (A) terminal of a counter **211**. Counter **211** is of conventional design. Upon receipt of a pulse at its A input terminal, its count is incremented by **1**.

A number of decoders CT are connected to the counter. Each produces a pulse in response to a different count. For example, decoder **212***a* produces an output pulse in response to a count-of-4 reached by counter **211** (this is indicated by the legent CT = 4 within block **212***a*). Similarly, decoder **212***b* produces an output pulse when the counter reaches a count-of-8. The output terminal of decoder **212***a* is connected to an OR gate **214***a*, the output terminal of the latter is connected to switch position **1** of digit switch assembly **46**. The output terminal of decoder **212***b* is connected through OR gate **214***b* to switch position **2**. In a like manner, other decoders (not shown) are connected to the various other switch positions of switch assembly

46. The count at which a particular pulse is produced for activating a particular switch may be determined by multiplying the switch number (the number in each of the seven blocks which comprise switch 46) by four. Thus, for example, the count-of-28 decoder 212*g* activates switch position 7; the count-of-24 decoder (not shown) activates switch position 6, and so on. The output terminal of decoder 212*g* is also coupled to the S input terminal of third flip-flop 221.

The count-of-220 decoder 222 is connected to the reset (R) terminal of flip-flop 221. The I output terminal of flip-flop 221 is coupled to platen solenoid 30 via amplifier 223. Count-of-230 decoder 224 is coupled to the S input terminal of fourth flip-flop 226. Position assembly 15 is coupled to the R terminal of flip-flop 226. The I output terminal of the flip-flop is coupled to clutch and brake assembly 22 via power amplifier 228, and to the control (C) input of an electronic switch 230. Switch 230 couples a source of potential, V, to slip ring 166 (see also FIG. 2). Slip ring 164 is coupled to a source of reference potential such as ground. Count-of-260 decoder 232 produces a RESET pulse which is coupled to the reset (R) terminals of counter 211, flip-flop 202 and flip-flop 206.

The output terminals of the decoders 216*a* through 216*g* are connected respectively to second input terminals of OR gates 214*a* through 214*g* and are also connected respectively to the various character assemblies which make up printing element 72. Thus, for example, the output terminal of element 216*a* is coupled to one end of each of the 7 segments of alphanumeric character 72*a*. Likewise, the output terminal of element 216*b* is coupled to one end of each of the 7 segments of character 72*b* and so on.

The switch assembly 46, shown only schematically in FIG. 3, may take any one of a number of forms. As a very simply example, at each position there may be a rotary switch which manually can be set to any one of the 10 decimal digits 0–9. If it is desired to print a label which represents, for example, the No. 6517140 (as shown in FIG. 1) then the rotary switch at the leftmost position hereinafter termed position 1 would be set to the number 6, the rotary switch at the next position would be set to the number 5 and so on. The four lines 240*a* through 240*d* are effectively wired to the switches in parallel; however, they carry the binary code only of the switch position which is activated by an electrical signal from one of OR gates 214*a* through 214*g*. For example, if switch position 1 is set to the decimal digit 6, then when OR gate 214*a* applies an energized pulse to switch position 1, the binary code for 6, that is, 0110 (0 on line 240*a*, 1 on line 240*b* and so on) will appear on the four lines 240*a*, *b*, *c*, *d*. The circuits for accomplishing this are simple and may include normally disabled gates connected between each switch position and lines 240*a*, *b*, *c*, *d*. Each gate effectively isolates its switch position from the four lines until that gate is enabled by a signal from a decoder. Since only one such gate can be turned on at a time, only one switch position can connect to lines 240*a*, *b*, *c*, *d* at a time.

Of course, the above is representative only. As already mentioned, 46 may be a scale and have rather than manually operated knobs at each position, gearing or other mechanical translating means for converting the weight registered on a scale to the setting of the respective switch positions. As another alternative, the input to the four lines 240*a*, *b*, *c*, *d* may be directly from a computer (which may be the other source 48 of FIG. 1) via the switch 50 of FIG. 1. Neither the source nor the switch (which would include four poles for the four lines 240*a*, *b*, *c*, *d* in this embodiment) are shown in FIG. 3 in the interest of keeping the drawing simple.

The four lines 240*a*–240*d* are connected to a 4:7 matrix encoder. The latter translates the four bit code it receives to a seven bit code on its seven output lines 244*a*–244*g*. These seven lines are connected, in parallel, to all of the alphanumeric indicators. For example, line 244*a* may be connected to the bottommost horizontal segment of all indicators; line 244*b* (not legended but located immediately to the right of line 244*a*) may be connected to the lower leftmost segment of all indicators, and so on. Each line is connected to the end of a segment opposite that to which the signal from a decoder CT is applied. Thus, if a segment receives a signal from a decoder at one of its ends and at the same time receives a signal from one of the lines 244*a*–244*g* at its other end, that segment heats up. The particular voltages involved are arbitrary and, for example, one voltage may actually be at ground and the other some positive or negative level V.

The four lines 240*a*–240*d* are also connected to four energy emitting devices 176*a*–176*d*. It arbitrarily may be assumed that when one of lines 240*a*, *b*, *c*, *d* carries a signal representing a 1, the energy emitting device connected to that line is activated and when one of lines 240*a*, *b*, *c*, *d* carries a signal representing a 0, the one of energy emitting devices 176*a*, *b*, *c*, *d* connected to that line remains unenergized.

In FIG. 4, where the relationship between one embodiment of the light emitting defices 176*a*, *b*, *c*, *d* and light sensing devices 178 is shown, each photo SCR 178 is connected in series with a load to be energized such as a pen Difting solenoid 140*x*, there being two, 140*a* and 140*b*, shown. Alternately, the load may be a pin point light source producing a very narrow beam for each writing means 40*x* and which is selectively turned on. Finally, the load may be a heating coil surrounding each writing device 40*x*. In the latter two examples, writing means 40*x* are axially stationary. A common terminal of each pen lifting solenoid is connected to slip ring 166. The cathode terminal and triggering terminal of each photo SCR 178 are, respectively, directly and resistively coupled to slip ring 164. Therefore, whenever a light emitting diode 176*a*, *b*, *c*, *d* (only 176*a* being illustrated in FIG. 4) is energized at a time when the diode is opposite a photo SCR 178, that photo SCR will be made conductive causing its corresponding solenoid 140 *x* to be energized. The photo SCR's, once placed in a state of condition, will remain conductive until such time as power is removed from slip ring 166. This may be accomplished by opening normally closed switch 230 (FIG. 3).

FIG. 5 shows another method for transferring information from a stator to a rotor. In this figure, the energy emitting devices 176*a*, *b*, *c*, *d* (only 176*a* being illustrated) are electromagnets rather than light emitting elements. The energy sensing units 178 are reed relays rather than light sensors. Each relay 178 includes two contacts 190*a* and 190*b* and a small permanent magnet 192. In these commercially available devices, magnet 192 does not have sufficient energy to close contacts 190*a* and 190*b* but does have sufficient energy to hold them closed when they have been initially closed by an electromagnet 176*a*, *b*, *c*, *d*. Each of the reed relays is

connected to a different one of pen lifting solenoids **140***x*. Here again, as in FIG. **4**, one side of each pen lifting solenoid **140***x* is connected to slip ring **166**. Also, one terminal of each reed relay **178** is connected to slip ring **164**.

Unlike the photo SCR's of FIG. **4**, the reed relays are not made non-conductive merely by opening a line carrying a voltage. Rather, an auxiliary electromagnet **194** is required. This electromagnet is polarized in a direction opposite that of electromagnets **176***a*, *b*, *c*, *d*. In such a case, a normally open switch **230***a* (FIG. **3**) is coupled to electromagnet **194** while voltage V is coupled directly to contactor **170**. Therefore, when switch **230***a* is closed, and consequently power is applied to electromagnet **194**, the electromagnetic energy in permanent magnets **192** is offset by the energy produced by solenoid **194** so that all relays which are energized will become de-energized. The flux produced in electromagnet **194** is insufficient to energize non-selected relays. The alternate arrangement of FIG. **5** is useful particularly when a load drawing a large current is utilized.

In operation, pen housing **42** may be constantly rotated by drive means **20** (see FIGS. **1–3**). When it is desired to print a label, the information to be printed on the label is set up in digit switches **46** or some other information source. Then switch **200** (FIG. **3**) is momentarily depressed, setting flip-flop **202** and thereby priming AND gate **204**. When the lug **152** on timing gear **150** rotates past magnetic pickup **154**, AND gate **204** is enabled and flip-flop **206** becomes set. The timing relationship between the rotational position of timing lug **152** and magnetic pickup **154** is such that the timing lug passes magnetic pickup device **154** just prior to the time that the first column **177***a* of devices **178** is about to pass the column of sensors **176***a*, *b*, *c*, *d*. With flip-flop **206** set, the 1 output primes AND gate **208**. Now each time a tooth on timing gear **150** passes pickup **156**, AND gate **208** becomes enabled and applies a pulse at the A input of counter **211**. The counter initially is reset to 0 and each pulse produced by gate **208** increments the count by 1.

When counter **211** reaches a count of **4**, indicating that four gear teeth have passed magnetic pickup **156**, a pulse is emitted from decoder **212***a*. The timing is such that when count of four decoder **212***a* is enabled, the first column **177***a* of energy sensors is positioned to receive the energy from the energy emitting devices **176***a*, *b*, *c* and *d*. If at this time switch **1** of bank **46** is set to the decimal number **6**, the signals present on the four lines will cause a corresponding number of the elements **176***a*, *b*, *c*, *d* to become energized. For example, if the signals represent decimal digit **6** (binary 0110 reading from *a* to *d*), then devices **176***b* and **176***c* will become energized and devices **176***a* and **176***d* will remain off.

The associated energy sensing devices (those in the first column **177***a*) will become and remain energized. In the case of photo SCR's illustrated in FIG. **4**, those which light strikes (the second and third ones in column **177***a* in this example) will be made conductive and will remain conductive until the voltage is interrupted at switch **230**, an event to happen much later in the printing cycle. In the case of the reed relays of FIG. **5**, those which are opposite electromagnets **176***a*, *b*, *c*, *d* will be placed in the closed position. In any event, any pen-lifting solenoid **140***x* associated with an energized energy sensing device in column **177***a* will be energized. When a pen-lifting solenoid is energized, its associated pen **40***x* will be retracted downward away from the writing position, such as pen **40***b* (FIG. **2**). There is one pen-lifting solenoid and one pen associated with each energy responsive unit **178**.

As pen housing **42** continues to rotate, counter **211** continues to advance such that when the counter has reached a count of eight, the second column **177***b* of energy sensing devices will be opposite energy emitting devices **176***a*, *b*, *c*, *d*. The action described previously is repeated for the second switch of assembly **46**. If that switch has been set to decimal digit **4**, the four lines carry the code 0100, and emitter **176***b* becomes energized. In like fashion, as each of the other columns of energy sensing devices **178** passes, a proper count in the counter will cause certain of energy sensing devices **176***a*, *b*, *c*, *d* to be energized. Thus, for example, when the counter reaches a count of **28**, which will occur when the last column **177***g* of energy sensing devices **178** is opposite energy emitting devices **176***a*, *b*, *c*, *d*, the pulse emitted from device **212***g* via OR gate **214***g* will cause certain outputs from switch position **7** of switch assembly **46** to be energized. The resulting signals via devices **176***a*, *b*, *c*, *d* will energize certain ones of the last column **177***g* of energy sensing devices **178**. At a count **28**, all pens will be set up in accordance with information contained in switch assembly **46** for the printing of a label. That is, some pens such as pen **40***b*, FIG. **2**, will be retracted from the printing position by solenoids **140***x* while others such as **40***a* will be urged upward into printing position by springs **136**. Then printing may be commenced. Therefore, a pulse from device **212***g* coupled to flip-flop **221** causes that flip-flop to become set which in turn energizes platen solenoid **30**. Energized platen solenoid **30** causes platen **32** (FIG. **1**) to be forced downward, thereby forcing a blank label **10** into engagement with the various ones of pens **40** which are not retracted, and into printing electrode assembly **72**. Therefore, as housing **42** continues to rotate for the next two revolutions, ink from pens **40***x* or from stylii **40***x* and ribbon **41**, FIG. **1**, will be applied to a blank label **10** to produce a label similar to finished labels **60**. Alternately, heated stylii **40***x* will cause the circular information to appear on heat sensitive labels **10**.

While the pens are drawing the binary information on a label, the numeric equivalent of that number is being applied to the heat sensitive label through heating electrode assembly **72**. At a count of **110**, decoder **216***a* produces a pulse which is coupled to the digit position labeled **72***a* and also through OR gate **214***a* to position **1** of switch **46**. As mentioned previously, the output terminal of decoder **216***a* is coupled to one end of each of the 7 bar segments which make up digit position **72***a*. Likewise, the output lines **244***a* through **244***g* are each coupled to the other end of a different one of the electrode segments.

In this way, current will pass through certain ones of the segments which form the shape of the numerical equivalent of the information being drawn by pens **40***x*. Thus, if switch position **1** of switch assembly **46** contains the numeral **6**, current passes through all segments of number **72***a* except the uppermost segment and the uper right segment. In a like manner, at a count of 120, various segments of digit position 72*b* are heated and so on, so that at a count of **170**, certain ones

of digit position **72***g* would be heated applying the last digit to the heat sensitive paper label.

In a practical application, conditions may be such that the pulses produced by the various decoders **216***a* through **216***g* are too short in time to provide the necessary heating to printing assembly **72.** In this case it would be a simple matter to add additional devices such as integrators between the various decoders **216***a*–**216***g* and printing device **72** to ensure that pulses of sufficient duration are produced.

At a count of **220,** when the pen housing **42** has made two complete revolutions [(count of 220 − count of 28) ÷ 96 gear teeth/revolution = 2] with platen solenoid **30** energized, decoder **222** will produce a pulse resetting flip-flop **221** and thereby de-energizing the platen solenoid. At a count of **230,** element **224** produces a pulse setting flip-flop **226** and thereby engaging clutch and brake assembly **22.** The engaged clutch and brake assembly **22** causes label strip **12** to be advanced moving the completed label out of printing station **16** (FIG. 1), and moving the next label into that printing station.

The clutch and brake assembly is de-energized when position assembly apparatus **15** detects an aperture **11** in one of the labels and causes flip-flop **226** to be reset. Reset flip-flop **226** causes clutch and brake assembly **22** to be de-energized and therefore stop label movement. Flip-flop **226,** when energized, also causes electronic switch **230** to be opened or switch **230***a* to be closed (depending on whether the system of FIG. 4 or FIG. **5,** respectively, is used).

Interrupting the voltage to photo SCR's causes them to be rendered non-conductive and this restores all pens **40***x* to their upward position. Likewise, applying a voltage to electromagnet **194** causes all reed relays **178** (FIG. **5**) to be restored to their open position, causing all pens to be restored to their upper position.

At a count of **260,** decoder **232** produces a RESET pulse. This RESET pulse resets the counter to a count of zero and resets each of flip-flops **202** and **206,** thereby preparing the printer to print the next label when start button **200** is once again depressed.

While the apparatus for transferring command signals from stationary elements to moving elements has been described in terms of a label maker, it has widespread use whenever signals must be transferred to a movable member. The number of energy emitting means and energy sensing means illustrated is arbitrary. The ideal number of each will depend on the task to be performed.

What is claimed is:

1. In combination:

means responsive to a signal for emitting energy;

movable means comprising a plurality of energizable loads and a like plurality of energy sensing means, each coupled to a different one of said loads;

means for creating relative motion between said energy emitting means and said movable means for causing said emitting means to be presented serially opposite the different ones of said sensing means; and

signal producing means coupled to said emitting means for causing said emitting means to be energized while opposite certain of said sensing means, said certain of said sensing means being responsive to energy emitted by said energy emitting means for causing said loads with which they are coupled to become and remain energized.

2. The combination as set forth in claim **1,** wherein said movable means is responsive to a reset signal for causing said energized loads to become unenergized and further including means producing said reset signal only after said emitting means has been presented opposite each of said plurality of energy sensing means.

3. The combination as set forth in claim **2** wherein said energy emitting means is an energizable light emitting source and wherein said energy sensing means are light sensing means responsive to light from said light emitting source for entering a state of conduction and where there is further included an energy source coupled between said light sensing means and said loads wherein when one of said light sensing means is made conductive, the one of said loads coupled thereto becomes and remains energized until said reset signal is produced.

4. The combination as set forth in claim **1** wherein said motion creating means creates rotary motion between said energy emitting means and said movable means and wherein said movable means are responsive to a reset signal for causing said energized loads to become unenergized and further including means producing said reset signal only after said emitting means has been presented opposite each of said plurality of energy sensing means and thereafter said movable means has made at least one complete revolution relative to said emitting means.

5. A plurality M of selectable energy emitting means;

movable means comprising a plurality N of energizable loads and a like plurality of energy sensing means, each sensing means being coupled to a different load, where M and N are integers and N is greater than M;

means creating relative motion between said energy emitting means and said movable means for serially presenting groups of M energy sensing means opposite said M energy emitting means so that in a group each of said sensing means is opposite a different emitting means;

means energizing selected ones of said emitting means while each of said groups is opposite said emitting means for activating the ones of said sensing means opposite said selected emitting means for causing said loads coupled thereto to be energized.

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