

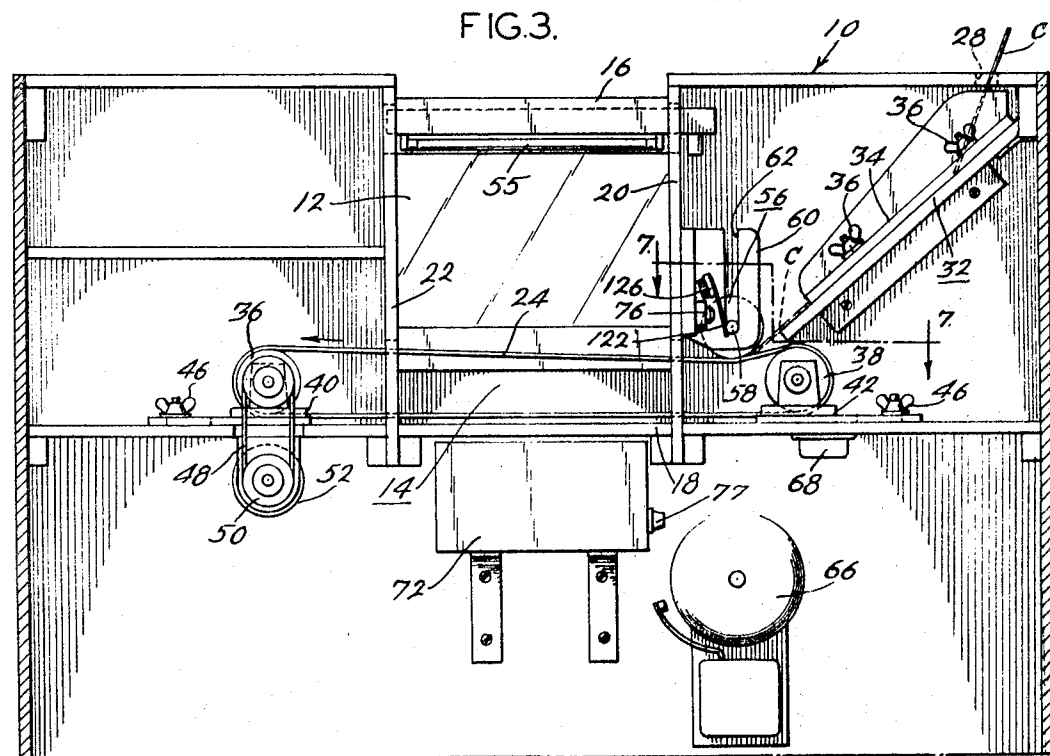
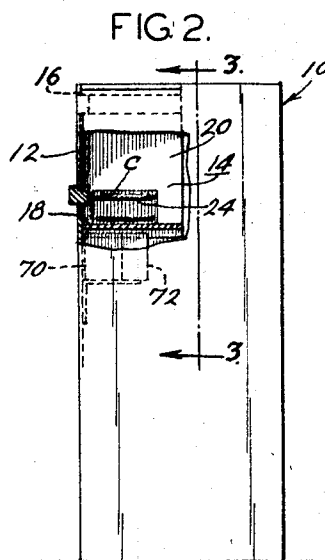
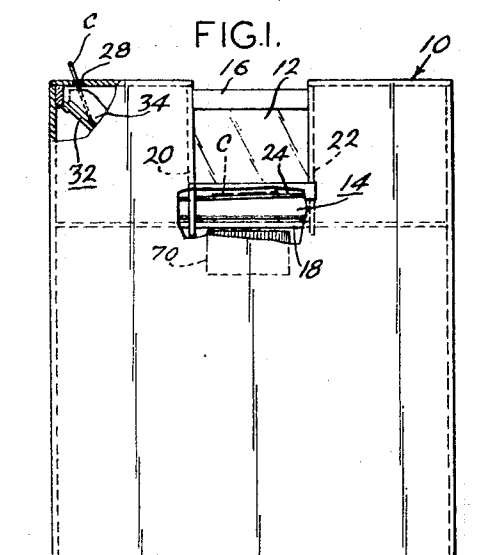
Sept. 16, 1969

M. H. SMITH
CARD-LIKE OBJECT WITH INVISIBLE INDICIA AND APPARATUS
FOR DETECTING AND DISPLAYING SAME

3,466,775

Filed June 2, 1966

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

FIG. 4.

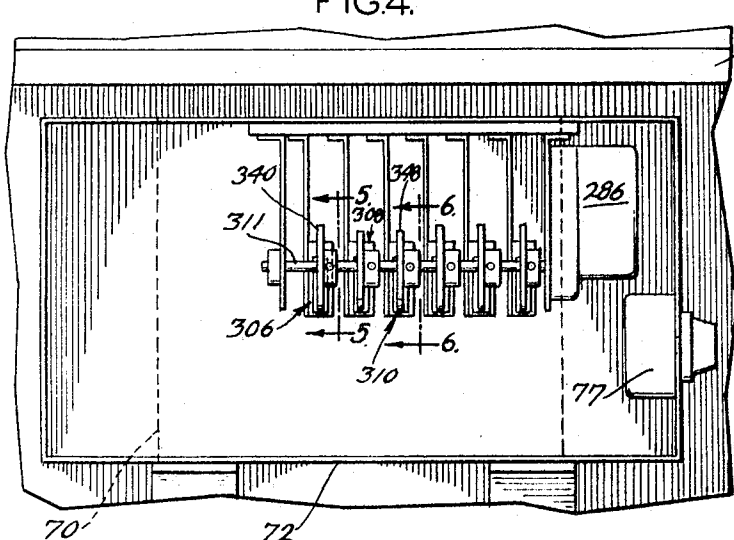


FIG. 5.

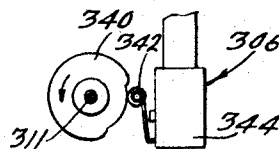


FIG. 6.

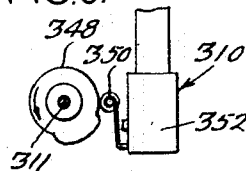
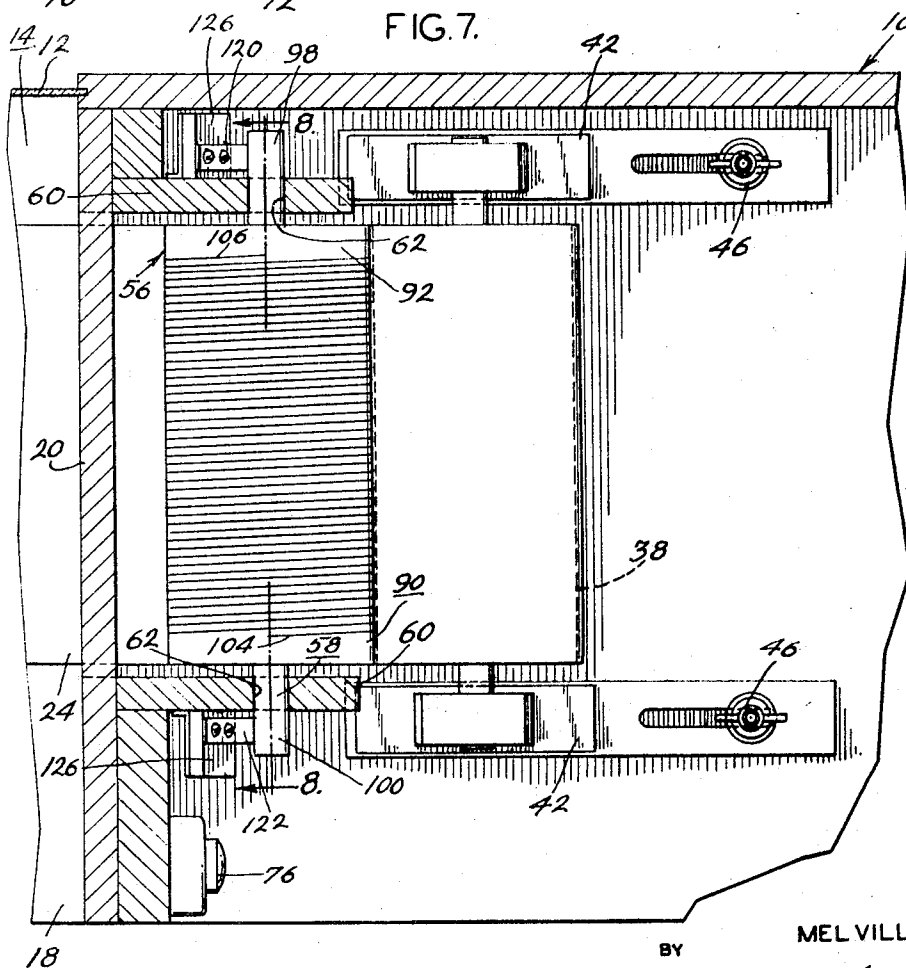


FIG. 7.



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Filed June 2, 1966

3 Sheets-Sheet 3

FIG. 8.

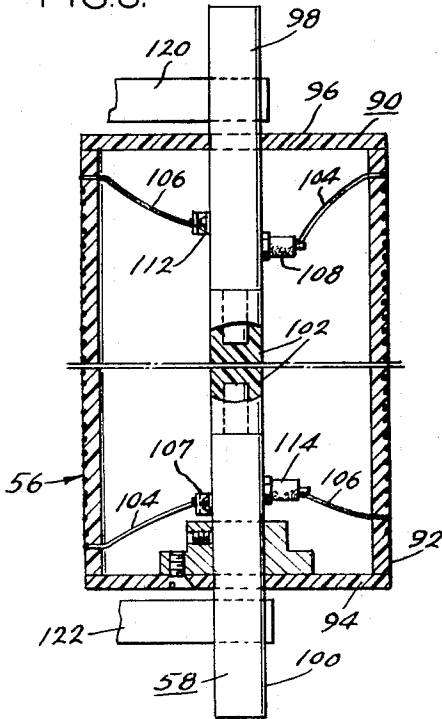


FIG. 9.

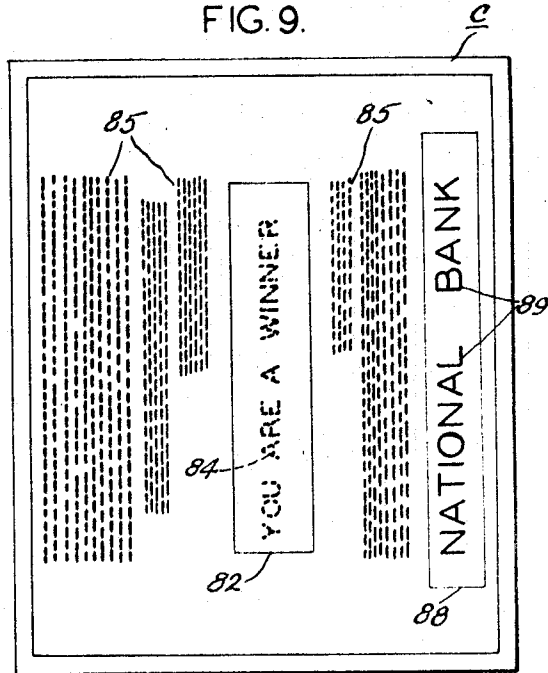
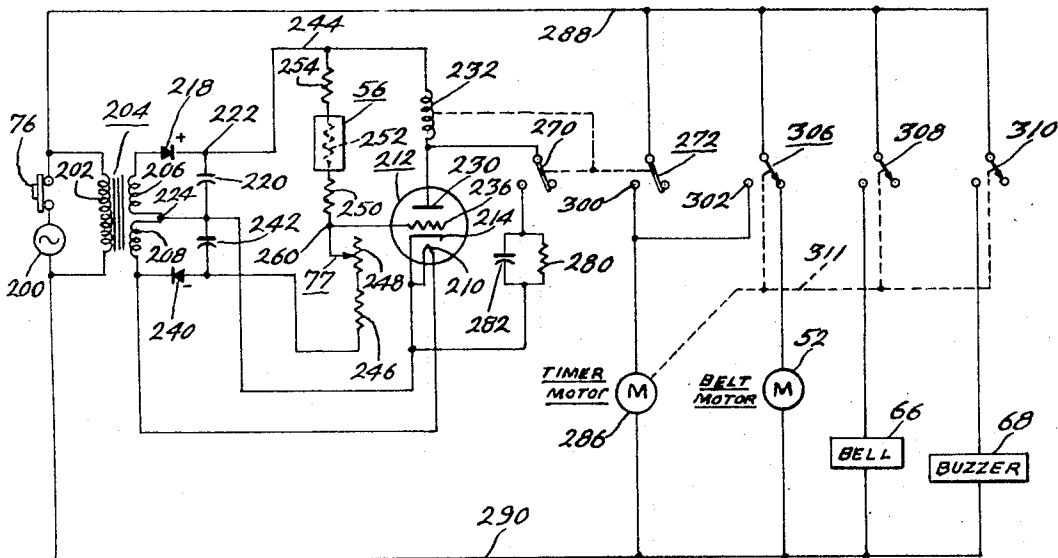


FIG. 10.



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3,466,775

CARD-LIKE OBJECT WITH INVISIBLE INDICIA AND APPARATUS FOR DETECTING AND DISPLAYING SAME

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Int. Cl. G09f 11/14

U.S. Cl. 40—52

2 Claims

ABSTRACT OF THE DISCLOSURE

A secret-message detecting and display apparatus usable for commercial promotional activities in which cards are distributed to prospective customers, few of which are winning cards having both electrically-conductive indicia and normally-invisible ultraviolet-responsive indicia thereon. Conveyor means receive the cards and move them along a predetermined path where conductivity-detecting means sense those cards having electrically-conductive portions and produce electrical control signals for arresting the winning card in a position in which it can be viewed and where it is irradiated with ultraviolet light to reveal its secret message. Preferably, the control signals simultaneously operate an audible alarm for calling attention to the presence of the winning card.

This invention relates to cards or card-like objects bearing normally invisible indicia capable of being rendered visible when exposed to a developing agency, and to apparatus for detecting and selecting such a card-like member for display with the writing thereon rendered visible while discriminating against other card-like members of similar appearance which do not bear invisible indicia.

The card-like member and detection and display apparatus which are the subject of the present invention are particularly advantageous when used in certain types of promotional activities such as the following. To draw potential customers to a particular business establishment, cards or card-like objects may be distributed to a large number of prospective customers together with advertising material, which may be printed on the card-like member itself, informing the prospective customers that a certain small number of card-like objects contain a secret message indicating that the bearer is a winner to whom a prize of some sort will be awarded, and that if the prospective customer will bring the card-like member to the business establishment in question his card will be developed to render visible any invisible message thereon so as to determine if the bearer is in fact a winner. For example, such a promotional scheme may be utilized in connection with the opening of a branch bank, which distributes such promotional cards to prospective depositors; the prospective depositors then bring their cards into the bank where they are inserted in an apparatus which automatically detects a winning card and displays the winning card, with its normally invisible writing rendered visible. For example, the message may say: "You Are a Winner."

The present invention provides a special form of card-like object as well as detecting and displaying apparatus which make possible the performance of such a promotional activity, the card-like object and the apparatus being relatively simple and inexpensive and yet reliable for the intended purpose.

The invention in one aspect makes use of a card or card-like object comprising a substrate having thereon normally-invisible indicia, which may be in the form of a written message, and having at least one surface portion which is of electrically conductive material. Prefer-

ably the invisible indicia comprise a message in invisible ink indicating that the bearer is a winner, which message can be rendered visible by exposing it to ultraviolet light, and preferably the substrate is of a material of low electrical conductivity and the surface portions of electrically conductive material are in the form of characters printed thereon in electrically conductive ink. For example one word of a visible message printed on the card may be in electrically conductive ink, the remainder of the visible message being printed in ordinary non-conductive ink having the same appearance as the conductive ink. The above-described card constitutes a winning card and is normally identical in appearance with a large number of other cards which are not winners, and which do not have on them the invisible writing or the electrically conductive surface portion.

The distributed cards, which include some unidentified winning cards, are normally taken by their bearers to the establishment conducting the promotional activity, where they are inserted one at a time into apparatus, constructed in accordance with the invention in one aspect, for automatically detecting and displaying winning cards. In this apparatus the inserted cards move automatically onto a conveyor and are acted upon by conductivity-detecting means which produces an electrical control signal only for cards having the identifying electrically-conductive portions, which are the same cards which have the normally-invisible writing on them also. Downstream of the conductivity-detecting means the cards are exposed to a developing agency, which preferably comprises ultraviolet light, to render visible the normally-invisible writing on winning cards. The electrical control signal generated by the conductivity-detecting means are applied to a control circuit to arrest the motion of the cards in a position in which the developed, normally-invisible message is visible to an observer, and preferably also to operate an alarm which indicates that a winning card has been detected.

In its preferred form, the apparatus in accordance with the invention utilizes guide means for receiving the card-like objects in sequence and for feeding them onto the upper run of a substantially horizontal endless-loop conveyor belt. The conductivity detector preferably comprises a roller having a pair of spaced-apart electrical conductors thereon which is positioned to bear against and roll over the card-like objects on the belt in such manner that if the electrically-conductive indicia indicative of a winning card are present the latter conductors will be bridged by these indicia and an electrical circuit thereby completed to produce control signals indicative of the presence of a winning card. Preferably also, the apparatus is enclosed in a cabinet serving as a masking enclosure and covering the working apparatus, except for a viewing chamber in which a window is provided and within which chamber the winning card is arrested while it is irradiated with ultraviolet light to render its normally-invisible message visible to an observer by way of the window. In a preferred form, the alarm and the arresting of a winning card occur only temporarily for a time sufficient to draw the attention of observers and to permit observation of the winning card, after which the alarm automatically terminates and the cards on the belt resume motion. All cards are preferably automatically dumped at the end of the upper run of the conveyor.

As a further feature to enable the equipment to operate properly despite variations in moisture on the card due for example to differences in humidity, a manually-adjustable sensitivity control is preferably also provided on the apparatus, to permit adjustment of the voltage applied to the control circuit when the roller conductors are not bridged by electrically-conductive indicia.

Other objects and features of the invention will be more readily comprehended from the following detailed description, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a front view of apparatus in accordance with the invention for detecting and displaying normally-invisible writing on card-like members;

FIGURE 2 is an end view of the apparatus of FIGURE 1;

FIGURE 3 is an enlarged sectional view taken along lines 3—3 of FIGURE 2;

FIGURE 4 is an enlarged fragmentary view of a portion of the apparatus of FIGURE 3 showing a cam box and the contents thereof, with the cover removed;

FIGURE 5 is a fragmentary view taken along lines 5—5 of FIGURE 4 showing one cam-operated switch;

FIGURE 6 is a fragmentary view taken along lines 6—6 of FIGURE 4 showing another cam-operated switch;

FIGURE 7 is a sectional view of a portion of the apparatus taken along lines 7—7 of FIGURE 3;

FIGURE 8 is a sectional view of a contacting roller constituting a portion of the apparatus shown in FIGURE 7, taken along lines 8—8;

FIGURE 9 is a plan view of a card bearing certain normally-invisible writings and having electrically-conductive indicia thereon, in accordance with the invention in one aspect; and

FIGURE 10 is an electrical schematic diagram showing one form of electrical circuitry suitable for use in the apparatus shown in FIGURE 3.

Referring now to the particular embodiment of the invention shown in detail in the drawings, one and particularly to FIGURES 1 and 2, there is provided an opaque, open-backed cabinet 10 having a transparent window 12 at the front through which one may view the interior of a viewing chamber 14 formed by top and bottom walls 16 and 18 and sides walls 20 and 22. A horizontally running conveyor belt 24 runs through the lower portion of the viewing chamber so that the upper surface of the top run of the conveyor belt is readily visible by way of the window. A card receiving slot 28 is provided in the top of the cabinet into which unidentified cards such as C are dropped. Non-winding cards pass in sequence through the viewing chamber on the conveyor belt, and no developed message appears thereon and no alarm is sounded. However, when a winning card is dropped into the slot a bell and a buzzer are sounded to attract the attention of observers and the conveyor belt is stopped with the winning card in the viewing chamber, where the normally-invisible message appears on the card in developed, visible form. Shortly thereafter the alarm ceases and the belt resumes operation.

Referring to FIGURE 3 particularly, it will be seen that the inserted card C is received by a downwardly-slanted chute or guideway 32 having guiding side flanges or rails such as 34, which preferably may be adjusted laterally with respect to each other to accommodate different sizes of cards after loosening wing nuts such as 36. The guideway 32 deposits each card on the upper surface of the upper run of horizontally-disposed endless-loop conveyor belt 24, which passes around a driver roller 36 and an idler roll 38. The tension of the belt may be adjusted by sliding either or both of the roller mounts 40 and 42 of rollers 36 and 38, respectively, which mounts are clamped in the desired position by means of wing nuts such as 46. Driver roller 36 is rotated by means of a belt 48, which in turn is driven from the pulley 50 rotated by motor 52. Cards from guideway 32 are therefore loaded on the upper run of conveyor belt 24 and carried thereby through the viewing chamber 14 and thence to the opposite ends of the conveyor belt where they fall off and may be collected and disposed of in any manner. A plurality of ultraviolet light sources such as 55 are mounted at the top of the viewing chamber so as to direct ultraviolet light downwardly upon the cards on the belt and render

visible any normally-invisible message thereon. Preferably the cabinet shields the eyes of viewers from direct ultraviolet light rays.

A conductivity-detecting roller 56 is mounted so as to bear against the upper surface of the upper run of conveyor belt 24 near its input or upstream end, and in a position such that the cards from guideway 32 are delivered at a downward slant to the region of contact between conductivity-detecting roller 56 and belt 24. The details of roller 56 will be described in detail with particular relation to FIGURES 7 and 8, but is here noted that the axle 58 of roller 56 is disposed at right angles to the conveyor belt and restrained against substantial translational motion in a horizontal plane by means of a pair of vertically-slotted support frames such as 60 secured to the cabinet at opposite ends of the roller. The slots 62 in the support frames 60 permit roller 56 to descend freely sufficiently far that at least a portion of its weight is supported by conveyor belt 24, and accordingly substantial pressure is provided between the roller 56 and the cards which are delivered to the conveyor belt and pass beneath roller 56.

Suitable audible alarm means in the form of a bell 66 and a buzzer 68 are mounted to the cabinet, as are an electrical control box 70 and a cam box 72, the latter boxes containing electrical and mechanical elements which respond to a control signal generated by conductivity-detecting roller 56 to control actuation of bell 66 and buzzer 68 and also to control motor 52 so as to stop and start the conveyor belt. A power switch 76 is provided for turning the apparatus on and off and a manually-adjustable sensitivity-control knob 77 is mounted on the exterior of cam box 72 for adjusting the sensitivity of the control circuit as described hereinafter in detail.

One possible form of card in accordance with the invention, suitable for use in the apparatus described herein, is shown in FIGURE 9 and represents a so-called winning card. Preferably the card comprises a rectangular substrate of low electrical conductivity having a portion 82 inscribed with normally invisible indicia, which are preferably in the form of a written message 84. The card may also have visible printed advertising matter 85 thereon, and in addition has a region 88 containing electrically-conductive indicia which may also be in the form of advertising or instructions to the use of the card. In this example the electrically-conductive indicia are in the form of the words "National Bank," as indicated at 89.

The normally-invisible message 84 may be applied to the cards by means of a rubber stamp inked with conventional invisible ink which is rendered visible by irradiation with ultraviolet light. Such materials are well known in the art. The advertising material is printed in ordinary nonconductive ink, while the high-conductivity indicia are printed with an electrically-conductive ink.

While in this example the invention is described with respect to a rectangular card, it will be understood that in other embodiments the card may have other shapes and in fact objects such as slips of paper, pieces or blanks of plastic material or other card-like objects may be utilized instead.

Referring now again to FIGURE 3, the card C of the type shown in FIGURE 9 is dropped into slot 28 with the side bearing the electrically-conductive indicia uppermost. As before described, the card slides down chute or guideway 32 onto conveyor belt 24 and passes under conductivity-detecting roller 56, so that the electrically-conductive indicia are presented to the roller 56 as the card passes beneath it.

Referring particularly to FIGURES 7 and 8, the roller 56 may comprise a hollow cylindrical shell 90 made up of a cylindrical portion 92 and a pair of circular end plates 94 and 96 cemented thereto. The shell is mounted for rotation by means of an axle 58 made up of two electrically-conductive end portions 98 and 100 and an electrically non-conductive central portion 102, as of plastic for exam-

ple, which electrically insulates the two end portions 98 and 100 from each other. Wound on the outer cylindrical surface of hollow shell 90 in helical form are a pair of parallel conductors 104 and 106, which may be uninsulated wires, conductor 104 being conductively connected at one end to a contact terminal 107 which in turn makes electrical contact with axle portion 100. The other end of conductor 104, after passing to the interior of shell 90, is secured to a contact 108 mounted on axle portion 98 but insulated therefrom. The other conductor 106 has one end thereof conductively secured to terminal 112, which is in turn electrically connected to axle portion 98. The opposite end of conductor 106, after passing into the interior of shell 90, is secured to a terminal 114 mounted on but insulated from axle end portion 100.

Accordingly it will be appreciated that the roller is so constructed that axle portion 98 is electrically connected to the conductor 106 which is wound helically along substantially the entire length of shell 90, while axle portion 100 is electrically connected to conductor 104 which is wound helically along substantially the entire length of shell 90, the two conductors being closely spaced from each other. Conductive contacting springs 120 and 122 maintain electrical contact to axle portions 98 and 100 as the roller rotates, each of the latter spring contacts being mounted at its opposite end to a suitable terminal such as 126 in FIGURE 3, the latter two terminals being mounted on the cabinet and electrically connected to the control circuit in electrical control box 70.

Referring to the electrical schematic diagram of FIGURE 10, in which the belt motor 52, conductivity-detecting roller 56, bell 66, buzzer 68, power switch 76 and sensitivity control 77 correspond to the elements of the same number of FIGURE 3, a source of alternating voltage 200 such as the ordinary 115 AC power line is connected by way of an on-off power switch 76 to the primary 202 of a power transformer 204. Transformer 204 has a pair of secondary windings 206 and 208, the latter of which constitutes a filament winding which is connected directly across the filaments 210 of a vacuum tube 212 to heat the cathode 214 thereof. Tube 212 in this case is a vacuum tube triode, such as the type 6CW4.

Secondary winding 206 has connected across it a diode rectifier 218 and a filter capacitor 220, so as to produce at junction point 222 a half-wave rectified, partially-smoothed positive supply voltage. The two secondary windings 206 and 208 are connected in series with each other and their interconnection 224 is connected directly to the cathode 214 of tube 212.

The supply voltage at junction point 222 is applied to plate 230 of tube 212 by way of relay coil 232. Normally, conduction does not take place between the plate and cathode of tube 212 because the tube is held cut off by a negative biasing potential applied to the grid 236 thereof. The latter negative biasing potential is derived by means of a diode rectifier 240 having its cathode directly connected to the lower end of transformer secondary 208 and a smoothing capacitor 242 connected between the upper end of secondary 208 and the anode of rectifier 240. The anode of rectifier 240 is also connected to the positive voltage supply line 244 by a resistance divider arrangement comprising, in order starting with the anode of rectifier 240, a first fixed series resistor 246, a variable resistor 248, a second fixed resistor 250, the equivalent resistance between the conductors of roller 56 as represented by the broken-line resistor 252, and a third fixed resistor 254. The grid of tube 212 is directly connected to the interconnection 260 between fixed resistor 250 and variable resistor 248.

Under usual conditions, in the absence of high conductivity indicia bridging the conductors of conductivity-detecting roller 56, the value of the equivalent resistance 252 of roller 58 is very high so that the bias voltage applied to grid 236 is substantially the full negative value produced at the anode of rectifier 240 despite the inter-

vening resistance of resistors 246 and 248. However in some instances, due for example to high humidity conditions, a card having no electrically-conductive indicia thereon may nevertheless present a sufficiently lowered resistance between the conductors of roller 56 that the voltage at grid 236 becomes sufficiently high to permit some degree of conduction in tube 212. Any such tendency, however, may be counteracted by moving downwardly the slider of variable resistor 248 to decrease the value of resistor 248, thereby making the reference bias voltage applied to grid 236 sufficiently negative to maintain the tube cut off despite high humidity conditions.

When a winning card having the above-described identifying conductive indicia thereon passes under roller 56, the resultant sharp decrease in the value of the equivalent resistance 252 causes the potential of grid 236 to move sharply positive and to turn on tube 212 strongly. The resultant strong current through relay coil 232 closes a pair of normally-open switches 270 and 272 associated with coil 232. Such operation of switch 270 connects the parallel combination of resistor 280 and capacitor 282 between plate and cathode of tube 212, while the operating of switch 272 connects a timer motor 286 directly across the alternating voltage source 200 by way of AC lines 288 and 290.

Relay coil 232 remains operated so long as the conductive indicia on the card bridge the roller conductors, and for a short time thereafter due to the action of resistor 280 and capacitor 282. Thus when relay coil 232 is first activated and relay switch 270 closed, capacitor 282 is charged to the potential of the plate of tube 212, which is relatively low because of the high-conduction condition in tube 212; when the conductive indicia on the card have moved beyond roller 56 the grid of tube 212 resumes its cut off value and the potential of the plate tends to rise toward full supply voltage. However, this requires charging of capacitor 282, which requires a certain amount of time, and during this latter time charging current for capacitor 282 continues to flow through relay coil 232. The reason for this electrical delay will become apparent from the subsequent description herein. Resistor 280 is parallel with capacitor 282 allows the charge on capacitor 282 to leak off when relay switch 270 is opened.

Timer motor 286, which may be entirely conventional in design, has one terminal connected to AC supply line 290 and the other terminal connected to normally-open contact 300 of relay switch 272. The latter terminal of timer motor 286 is also connected directly to the normally-open contact 302 of cam-actuated single-pole double-throw microswitch 306. The timer motor and the cam-actuated switch 306 driven thereby, as well as additional cam-actuated switches such as 308 and 310, are mounted on cam box 72, as shown particularly clearly in FIGURE 4. The cams are all mounted to a common shaft 311 which is rotated by the timer motor, the timer motor running so long as it is supplied with AC input power.

FIGURE 5 shows one possible arrangement for the cam-actuated switch 306, which comprises a cam 340, a cam follower 342 and a single-pole double-throw microswitch 344 operated by the cam follower. FIGURE 5 shows the cam in the position shown in the FIGURE 10 schematic, for which the belt motor 52 is operated. FIGURE 6 shows another of the cam switches such as 310, which similarly comprise a cam 348, a cam follower 350 and a single-pole double-throw microswitch 352 operated by the cam follower. The arrangement of cam-operated switch 308 may be like that shown in FIGURE 6.

Referring now again to FIGURE 10, the operation not thus far described is as follows. All switches are shown in the positions which they occupy when the apparatus is operating but before a card is inserted therein. If a

non-winning card is inserted into the apparatus, nothing in the circuit is changed and the card moves along the belt and is dumped at the opposite end. As mentioned previously, a winning card containing electrically-conductive indicia activates relay coil 232 so that switches 270 and 272 are closed. Initially belt motor 52 continues to run as previously, because of the position of switch 306, but upon the closing of switch 272 timer motor 286 begins to run and, due to the action of resistor 280 and capacitor 282 described above, continues to run until the winning card is in the viewing chamber, at which time cam-operated switch 306 is switched from the position shown to its opposite position in which it is connected to contact 302. This arrests the belt motor by opening the circuit thereto, and supplies operating current to timer motor 286 to keep it running even after relay coil 232 has become deactivated and relay-operated switches 270 and 272 have returned to their normally-open positions. Continued operation of timer motor 286 causes cam 340 of FIGURE 5 to turn until it reaches the position in which switch 306 returns to its original position, thereby restarting belt motor 52 and stopping timer motor 286. Thus the belt automatically resumes motion after being arrested for the time required for cam 340 to rotate through the raised portion of its periphery.

Timer motor 286 also operates the cam-operated switches 308 and 310 to their alternate positions upon the detection of a winning card, so as to operate bell 66 and buzzer 68 to give an alarm that a winning card is present and will be presented in the viewing chamber. The duration of the alarm is determined by the time required for the cams such as 348 to rotate through the raised portions of their periphery. Since all of the cams are on the same shaft they are operated through one complete cycle and then arrested, due to the above-described control of the operation of timer motor 286. It will be understood that other types of alarms or attention-getting devices may be connected to other cam-operated switches controlled by the same cam shaft, and that the times at which the alarms or other effects are produced can be controlled as desired by appropriate design of the cams employed.

There has therefore been described an example of a novel form of card-like member and of a novel form of apparatus for detecting the presence of such a card, which is simple and reliable and provides automatically for the selective presentation of such a card in a viewing chamber, preferably together with automatic operation of appropriate alarms.

While the invention has been described with particular reference to one specific embodiment thereof in the interest of complete definiteness, it will be understood that it may be embodied in any of a variety of forms diverse from those specifically described without departing from the scope and spirit of the invention as defined by the appended claims.

I claim:

1. Apparatus for rendering visible and for displaying normally invisible writing present on particular card-like objects of a group, said particular card-like objects also having electrically-conductive indicia printed thereon, others of said group having neither said invisible writing nor said indicia thereon, comprising:

a conveyor belt forming a substantially horizontal endless loop having an upper and lower run;

controllable means for driving said belt;

guide means for receiving said card-like objects in sequence and for feeding them to said upper run of said conveyor belt;

a roller having a pair of spaced-apart electrical conductors thereon positioned to bear against and roll over said objects on said belt, said conductors being positioned to be bridged by said electrically-conductive indicia on those of said objects bearing such indicia;

a masking enclosure over said belt having a window therein for viewing of said objects at a viewing position downstream of said roller;

ultraviolet lighting means for irradiating said objects on said belt with ultraviolet radiations while said objects are in said viewing position;

electrical means connected to said conductors for applying a voltage between said conductors and for producing a control signal when said conductors are bridged by said indicia;

control means responsive to attainment of a predetermined value by said control signal for controlling said belt driving means to arrest said belt temporarily after a delay equal to that required for said objects to travel from said roller to said viewing position; and

alarm means responsive to said control signal for producing a temporary alarm indicative of the bridging of said conductors by said indicia and hence of the presence of a card-like member bearing said normally invisible writing.

2. Apparatus in accordance with claim 1, comprising means for applying a controlledly-variable reference voltage to said control means when said conductors are not bridged by said indicia, thereby to accommodate changes in conductivity of said card-like elements.

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EUGENE R. CAPOZIO, Primary Examiner

RICHARD CARTER, Assistant Examiner

U.S. Cl. X.R.

40-36; 235-61.11; 250-71; 340-149

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,466,775 Dated September 16, 1969

Inventor(s) Melville H. Smith

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 10, "secitonal" should read --sectional--;
line 32, "one" should be omitted; line 43, "Non-winding" should read --Non-winning--; line 58, "nus" should read --nuts--;
line 62, "roll" should read --roller--; line 69, "on" should read --onto--
Column 4, line 44, before "to" insert --as--; line 74, "ly-conducitve" should read --ly-conductive--
Column 7, line 5, "activities" should read --activates--

SIGNED AND
SEALED

MAY 26 1970

(SEAL)

Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

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