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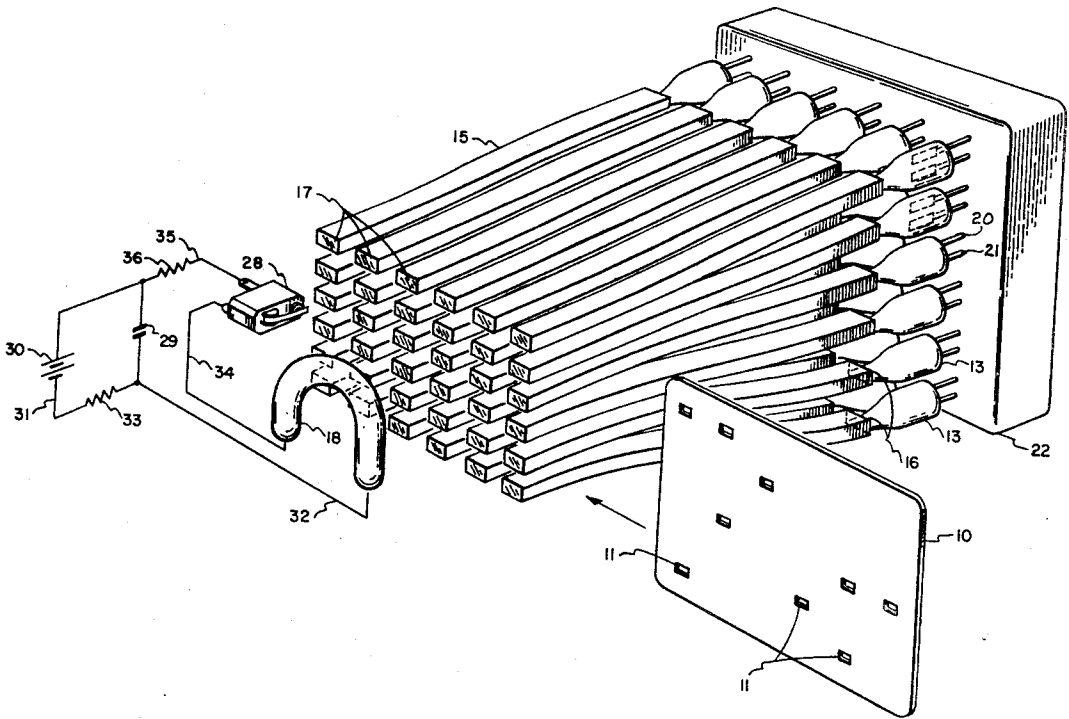
[54] **ARRANGEMENT FOR READING, RECORDING
AND STORING INFORMATION**
6 Claims, 5 Drawing Figs.

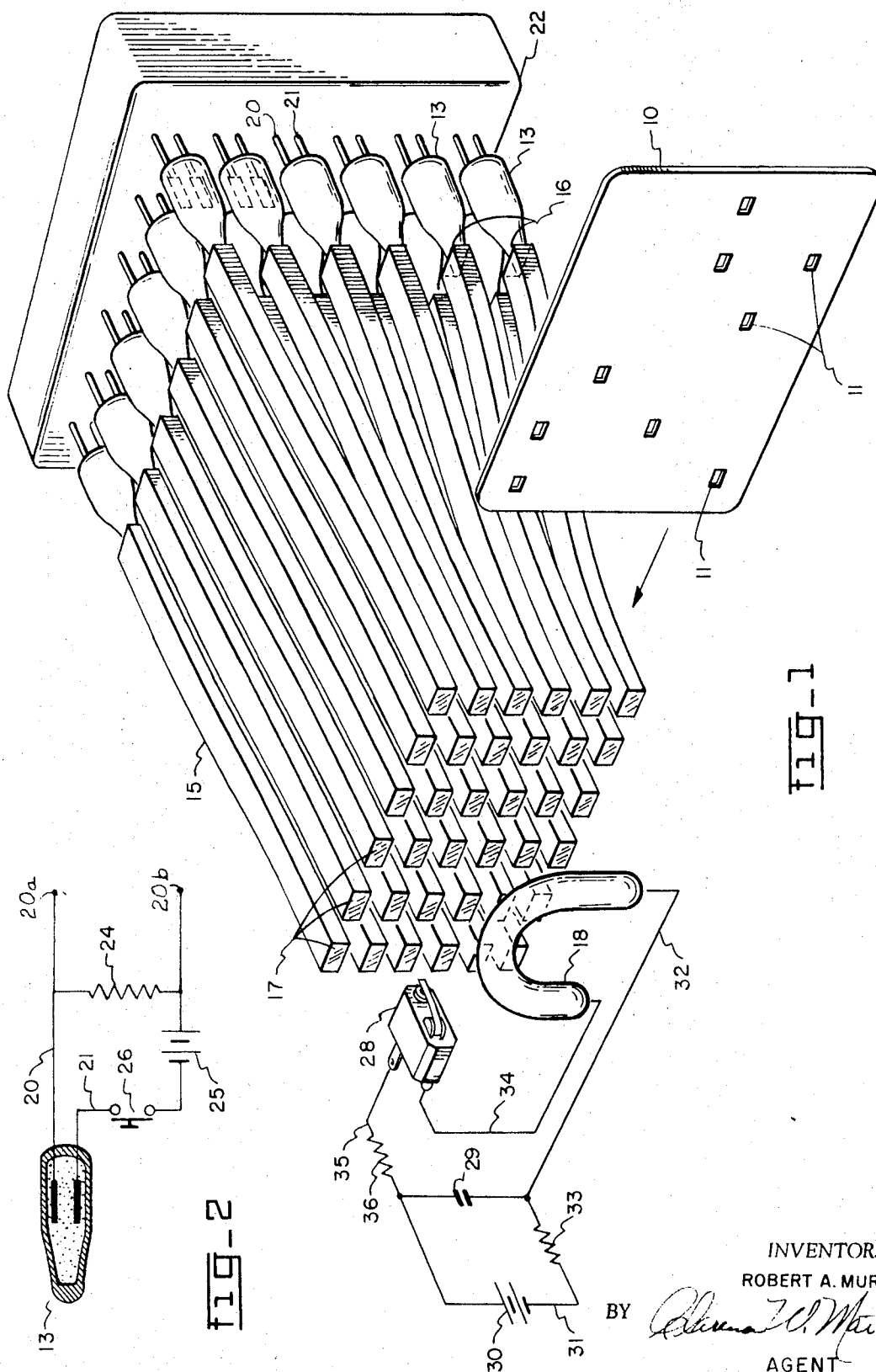
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159, 158; 313/100

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ABSTRACT: Use of a glow discharge device as a low cost yet reliable element of a perforated media reader is disclosed. In such a reader there is a glow lamp for each channel or code position and a bias voltage higher than the sustaining voltage but lower than the ignition voltage is applied to each lamp. Exposure of the lamps through a perforated record member to a pulsed source of radiant energy then results in selected ones of the glow lamps igniting and remaining on subsequent to the disappearance of the radiant energy source pulse. Thus, the glow lamps provide storage of the information and there is no need for auxiliary storage equipment.





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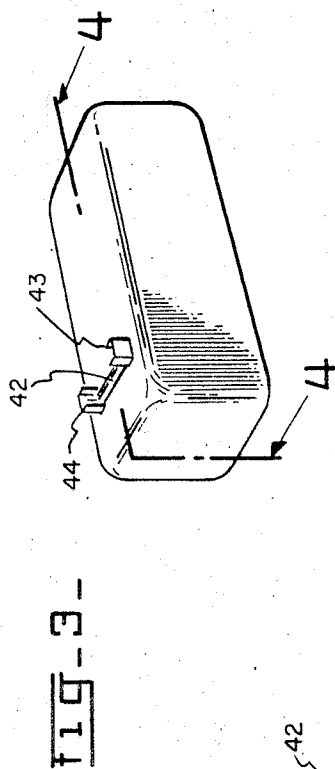
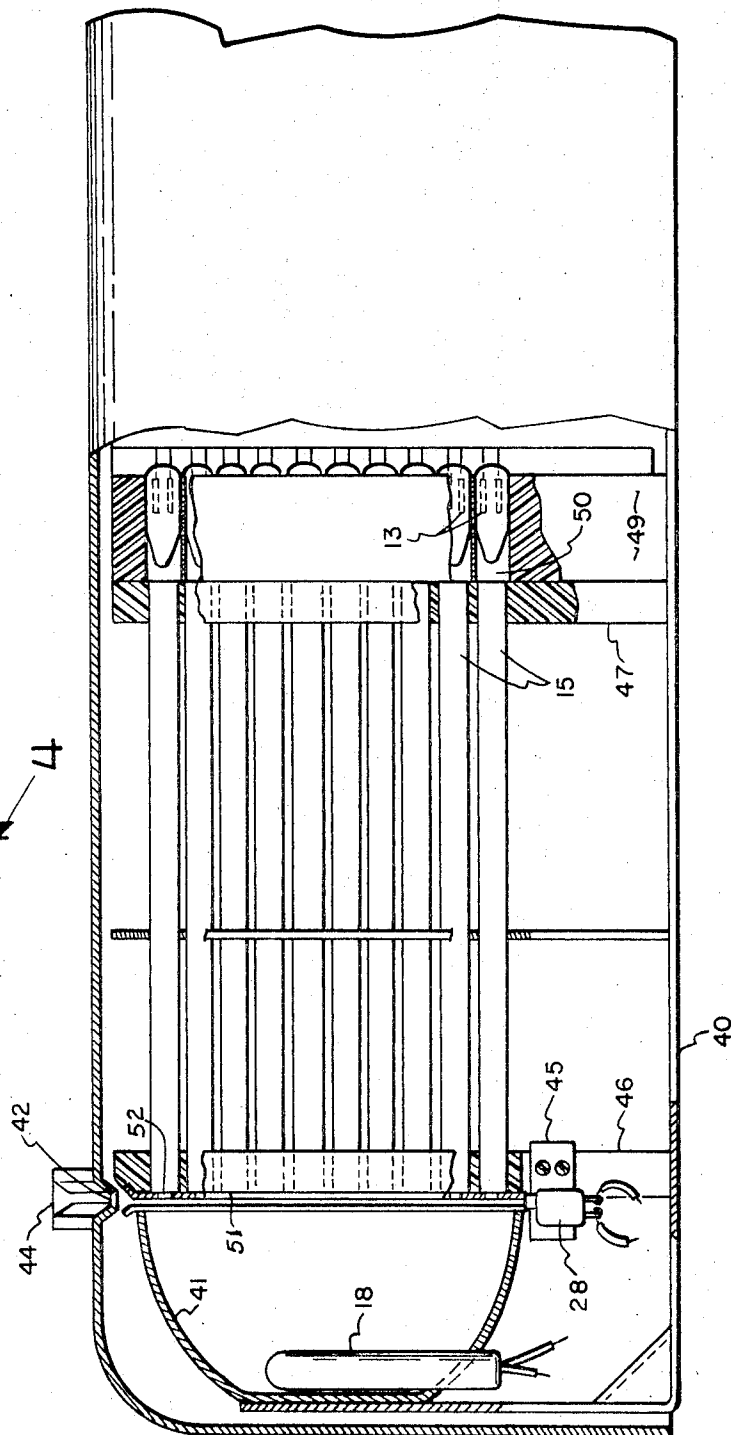


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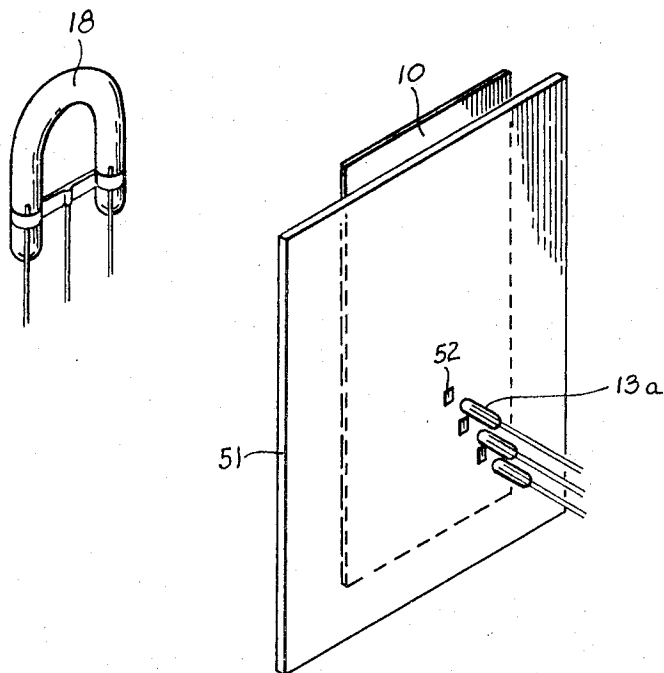


Fig. 5.

ARRANGEMENT FOR READING, RECORDING AND STORING INFORMATION

This invention pertains to a means for obtaining information, and in particular to a device for reading, recording and storing information from coded punch cards or the like.

The arrangement of this invention is of general scope in the field of data reading, recording and storing devices, and is especially adapted for use in gathering information from punched data cards. This may be in connection with time keeping where personnel at a place of business are given small punched cards provided with apertures in predetermined patterns to give an indication such as a number. In checking in and out of work, the personnel will insert these cards into a machine, which extracts the information so that the time of coming and going can be noted. In the past, this has been done through a device that includes mechanical probes which pass through the openings in the punched card to complete a circuit at such locations, which thereafter is translated into a suitable signal. Of course, where there are no openings through the card the circuit will not be completed, and hence the coded information can be extracted by virtue of the selective action that takes place.

One of the principal disadvantages of this is that it takes a certain amount of time for the mechanical elements to pass through the openings in the punched card to complete the circuit and then to return so that the card can be removed from the device. This time is cumulative when there are many persons to use the same machine in checking in and out of a factory, for example, and can result in a considerable delay. This may be incompatible with requirements that employees be able to leave or enter the place of business within a set period of time. Also, in the event that the card should be mutilated or bent, the mechanical feelers may not be in proper registry with the holes in the card and the device will not operate properly.

The device of this invention provides a new approach to the reading, recording and storing of data through the ionization of gas in an enclosed envelope, such as in a neon lamp or bulb by means of a radiant energy signal. The device includes an array of the lamps arranged in positions to correspond to the locations for all possible punched holes in the cards, and opposite these lamps is a flash tube. The punched card is interposed between the bank of lamps and the flash tube, at which time the flash tube is pulsed. This allows light to pass through the card where the apertures appear, while at other locations the light is blocked. Therefore, the light where the holes are formed in the card will strike the corresponding lamps, but will not impinge upon the others. All of the lamps are maintained at a bias voltage greater than their maintenance voltage and less than their ignition voltage. When the radiant energy strikes the lamps, they will be triggered so as to go on and remain on. This will occur for certain ones of the lamps as determined by the pattern of openings through the card, while the other lamps remain off. The result is usable information corresponding to the lamps that go on, and this information is stored as long as the voltage is maintained across the tubes, and can be read out into a suitable circuit to record the data from the card. The lamps are extinguished by interrupting the bias current after the information has been used.

An object of this invention is to provide an improved reading, recording and data-storing device.

Another object of this invention is to provide a rapid means of reading and storing data appearing on a punched card.

A further object of this invention is to read and record data utilizing light signals and gas filled envelopes as memory devices.

Yet another object of this invention is to provide a means for obtaining data from a punched card without requiring precise registry of the openings in the card with the operative portion of the device.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawing in which:

FIG. 1 is a perspective view, partially schematic, illustrating the general components of one embodiment of the invention;

FIG. 2 is a wiring diagram of the circuit associated with one of the neon tubes;

FIG. 3 is a projection showing the housing and the guides for the punched cards;

FIG. 4 is a longitudinal sectional view taken along line 4-4 of FIG. 3; and

FIG. 5 is a projection, partially exploded, to show an alternate embodiment of the invention.

With reference to the drawing, the device of this invention may be used in securing data from a coded punched card, such as the card 10 of FIG. 1. This card has a plurality of apertures 11 positioned on the card in a coded fashion in order to indicate information, such as alpha-numerics or the like. Thus, the pattern of card 10 may be varied on other cards with the openings 11 being provided in other vertical or horizontal positions.

The device of the invention includes a battery of envelopes 13 filled with an ionizable gas such as neon. Other suitable gases, such as argon, xenon and krypton, also may be used. The lamps or bulbs 13 correspond in number to the total possible number of holes which may be punched in the card 10. In the card illustrated, there are six spaces horizontally and vertically where the card could be punched with openings, giving a total of 36 locations for apertures on the card 10. In any particular instance only six of these will be punched, if a one-out-of-six code is used, as shown in the card 10 in FIG. 5, there may be more though, if a permutational code is used as shown in the card 10 of FIG. 1. In view of the 36 possible places for openings in the card 10, the battery of lamps 13 includes six of the tubes 13 in either direction, or a total of 36 lamps.

Due to the volume occupied by commercially available neon lamps, the bank of lamps 13 necessarily presents a frontal area greater than that of the card 10. However, in front of the bulbs 13 are radiant energy-transmitting rods, or light pipes, 15, which may be made from thermoplastic methyl methacrylate resin known as Lucite. This material has the ability of transmitting light through a curvilinear path. The rods 15 have ends 16 adjacent the neon lamps 13 and are formed to have opposite ends 17 corresponding exactly in position to the possible punched openings that may be formed in the card 10. Each rod 15 extends to a single lamp 13. Therefore, the rods 15 provide an arrangement that will transmit light to the individual neon lamps from an area corresponding in size and nature to the card 10.

In the use of the device, the card 10 is positioned adjacent the ends 17 of the light pipe 15. At this time, an energy source, such as a flasher tube 18, is pulsed to create a light flash. This light falls upon the ends 17 of the pipes 15 only where the openings 11 have been formed on the card 10. Consequently, light will be transmitted selectively to the lamps 13 corresponding in location to the openings 11 when the card is positioned in front of the ends of the pipes and the light is flashed.

The neon bulbs 13 are all maintained with a predetermined bias voltage lower than their ignition voltage, but greater than their maintenance voltage. For example, if the neon lamps have an ignition voltage of 200 volts and a maintenance of 50 volts, they may have a bias voltage across the anode and cathode of 150 volts.

As noted above, when the tube 18 is pulsed, light energy will selectively strike certain ones of the neon lamps. When the light impinges upon a bulb 13 it dislodges electrons from the cathode, triggering a self-maintaining avalanche so that the bulb will ignite. The bulb will remain on because of the bias voltage, which is greater than the maintenance voltage for it. Hence, the light from the flasher 18 will ignite predetermined neon bulbs, which remain on after the flash of light has subsided. They will remain on until the bias current is removed. Thus, once the card is positioned adjacent the ends 17 of the rods 15 and the light is flashed, the appropriate neon bulbs will stay on even after the light flash has terminated and the card has been removed.

The information resulting from the selective ignition of the neon bulbs may be determined at taps 20a, 20b, and is used in any desired manner to read out the information. Hence, as illustrated in FIG. 1 the neon bulbs 13, through their leads 20 and 21 from the anode and cathode, are connected into a control device 22, which may be any suitable means to display or store information, to control any process or apparatus, etc.

The schematic wiring diagram for one of the neon lamps 13 may be seen by reference to FIG. 2. The lead 20 connects to a resistor 24 and from that to a voltage source 25. The opposite terminal of the voltage source is connected through a switch 26 to the other conductor 21 that connects to the tube 13. The voltage source 25 maintains the bias voltage on the neon lamp 13, and the voltage, as noted above, is below the value sufficient to ignite the lamp. However, once the lamp has been triggered it will remain on until the circuit is interrupted by opening the switch 26. The latter element is actuated after the data from each card is utilized to ready the device for obtaining information from the next card. This circuitry, of course is incorporated in the device 22 shown in FIG. 1.

A variety of light sources may be used, with the flash of light obtained through mechanical shutter arrangements associated with a constant source of light or by means of a device that will give only a momentary light flash. Light in the visible spectrum may be used or it can extend into the ultraviolet and infrared ranges. Even radio frequencies can be utilized, with appropriate modification of the construction of the device of this invention, in triggering the lamps 13.

It is particularly satisfactory to use a xenon tube for the flasher 18, which is pulsed when the microswitch or photoswitch 28 is actuated. This may be accomplished by moving the switch arm by the card 10 when it is placed in front of the ends 17 of rods 15. The circuit of the xenon tube includes a capacitor 29, which is charged by voltage source 30. The conductor 31 connecting to the lead 32 includes a relatively large resistor 33. The lead 32 extends to one side of the xenon tube 18. The opposite side of the xenon tube is connected by conductor 34 to the switch 28 and from the switch by means of conductor 35 to the capacitor 29. A relatively small resistor 36 is in the lead 35.

When the switch 28 is closed by the action of the card 10, the capacitor 29 will discharge through the xenon tube, thereby igniting the tube to cause the flash of light. However, by the use of the large resistor 33 in the lead 31, only a trickle of current will flow after the capacitor has discharged. Therefore, the xenon tube 18 will remain off for a considerable period of time even with the switch 28 remaining closed once the initial flash has taken place. This will be a much greater length of time than will be required for removing the card 10 from the vicinity of the switch 28 to open it in almost any practical utilization of the invention. While this arrangement is satisfactory, other circuits may be used to cause the pulsing of the xenon tube 18.

It is necessary, of course, to assure that the card 10 will be properly aligned with the ends 17 of the light-transmitting rods 15 when it is interposed between the rods and the flasher 18. This can be accomplished by means of the arrangement shown in FIGS. 3 and 4. Here, there is a housing 40, at one end of which is positioned the xenon tube 18 in front of a reflector 41. A slot 42 is provided at the top of the housing 40, and inwardly and on either side of the slot are vertically extending guides 43 and 44. The microswitch 28 is at the bottom portion of the unit beneath the reflector and at the lower edges of the guides 43 and 44 adjacent a horizontal stop bar 45. The slot 42 and the guides are dimensioned so that the card may be inserted into the housing 40 and slid downwardly along a vertical path in front of the flasher tube 18. As soon as the card 10 is fully inserted and bottomed against the stop 45, it trips the switch 28 to close the circuit to the flasher 18. This gives automatic operation of the flasher by the insertion and positioning of the card 10.

The light-transmitting rods 15 are held by appropriate supports 46 and 47 in the housing 40 so that they are located, as

discussed above, immediately in front of the locations where the holes can be punched in the card 10. Of course, the supports 46 and 47 correlate the locations of the pipes 15 with the guides 43 and 44 and the stop 45, so that the card will always be aligned with the ends 17 of the rods when the flash takes place.

At the opposite ends 16 of the rods is a matrix block 49, which may be of plastic material, that amounts the battery of neon bulbs 13. There are openings 50 in the block 49 that receive the neon bulbs, positioning them at the ends 16 of the pipes 15. The bulbs 13 are held in a parallel relationship, and the cathode of each lamp, or bulb, is in the path of light that can be transmitted along the pipes 15.

It can be seen, therefore, that this invention provides a relatively simple, yet effective, means to extract information from a punched card in virtually an instantaneous manner. The neon tubes or other ionized gas-filled envelopes act as memory devices that store the information which they receive. The neon bulbs are ignited by transmitting radiant energy to them from a unit which is pulsed when the data card is inserted. There is no need for mechanical feelers to pass through the apertures in the cards to act as the means to extract the information from the cards. Hence, the device acts with extreme rapidity. Moreover, even if the card is somewhat mutilated or bent and the openings are not in perfect registry, sufficient light energy will be transmitted to the neon tubes to cause them to ignite. In fact, in order to protect the cards, they may be faced with sheets of transparent plastic or other suitable material so that the openings are closed except to the passage of light.

In some instances, the energy-transmitting pipes 15 may be omitted as shown in FIG. 5. Energy-receiving elements 13a are known which are smaller than the neon lamps 13 illustrated. Although shown as being longer than the length of the slots 52 in the card guide 51, the bulbs 13a are approximately the same length as the slots and lie directly behind the slots. The bulbs 13a may be miniaturized neon lamps or other envelope arrangements containing an ionizable gas. In this event, the cathodes of the neon lamps or the like will be positioned in alignment with the possible openings of the card and at the locations corresponding to the ends 17 of the pipes 15, as shown in FIG. 1. The effective operation of the invention is the same as described above.

While described in connection with the reading and storing of information from punched data cards, it should be understood that the invention can be used in other situations where intelligence or information is to be detected.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

I claim:

1. In combination with an object having opaque portions and selectively positioned radiant energy transmissive portions to provide information as a result of said positions, a device to determine such information comprising:

a plurality of lamps including electrode means and an ionizable gas, and being operable in response to application of an ignition voltage and remaining operative so long as said applied voltage is greater than a maintenance voltage;

means for applying a bias voltage to said electrode means below the ignition voltage and above the maintenance voltage thereof;

means for producing a beam of radiant energy of limited time duration, said last-mentioned means being positioned to normally direct said radiant energy against all of said electrode means, and where said object can be interposed between said lamps and said means producing a beam of radiant energy;

such that said radiant energy transmissive portions allow said radiant energy to be directed against predetermined ones of said electrode means and said opaque

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portions prevent said radiant energy from being directed against the remaining electrode means; and said radiant energy being sufficient alone to cause ionization of said gas in the vicinity of the biased electrode means against which it is directed, thereby triggering predetermined lamps into operation and said bias voltage maintaining said predetermined lamps operative thereafter.

2. A device as recited in claim 1 in which said object is movable to a predetermined position between said radiant energy beam and said plurality of lamps, and including means for automatically producing said radiant energy beam upon said movement of said object to said predetermined position.

3. A device for obtaining coded information comprising:

a bank of predeterminedly positioned lamps, each of said lamps containing an ionizable gas and having electrodes therein, and being operable in response to application of an ignition voltage and remaining operative so long as said applied voltage is greater than a maintenance voltage;

a light means adjacent said bank of lamps in light conductive relationship therewith for impinging light on said lamp;

means for biasing said electrodes of said lamps to a voltage intermediate the ignition voltage and the maintenance voltage of said lamps;

light from said means being sufficient alone to cause said biased lamps to ignite when impinged thereon;

guide means adapted to form a path for interposing between

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said light means and said bank of lamps a card having apertures therethrough in a predetermined pattern corresponding to particular ones of said lamps;

said guide means including means to position said card so that a path for light is provided for said predetermined ones of said lamps, and an obstruction to light is provided for the remainder of said lamps;

means for momentarily flashing said light means, whereupon said predetermined ones of said biased lamps are ignited and by means of said bias voltage remain ignited upon removal of said card;

control means responsive to the information represented by the ignition of said predetermined ones of said lamps; and means for reducing the bias on said predetermined ones of said lamps subsequent to said momentary flash of said light means and to a value below the maintenance voltage thereof.

4. A device as recited in claim 3 in which said lamps are neon tubes, each having an anode and a cathode therein, the cathodes of said lamps being in light-receiving relationship with said light means.

5. A device as recited in claim 3 in which said means for flashing said light means is operable by the positioning of the card to provide a path for light to said predetermined ones of the lamps.

6. A device as recited in claim 3 in which said light means includes a xenon tube.

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