United States Patent

[11] **3,622,760**

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[54] **ENCODER MEMBER READER**
8 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **235/61.11E,** 178/17 D, 250/219 DC
[51] **Int. Cl.** **G06k 7/00**
[50] **Field of Search** ..... 235/61.115, 61.11; 340/149; 178/17; 250/219 ID, 219 I, 219 DC

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ABSTRACT: A device for reading an encoded card is disclosed which includes a chamber for receiving a card encoded by a predetermined pattern of holes, a radiant energy source including a plurality of light source elements, and a radiant energy detector including a plurality of light-sensitive elements, both of which are synchronously moved by screws across opposite sides of the card to effect scanning and produce signals responsive to the particular code and provide information corresponding to the code. The screws are driven by motor-driven gears, and the direction of rotation is reversed by an axially movable rod with a cam surface that positively operates a motor reversing switch.

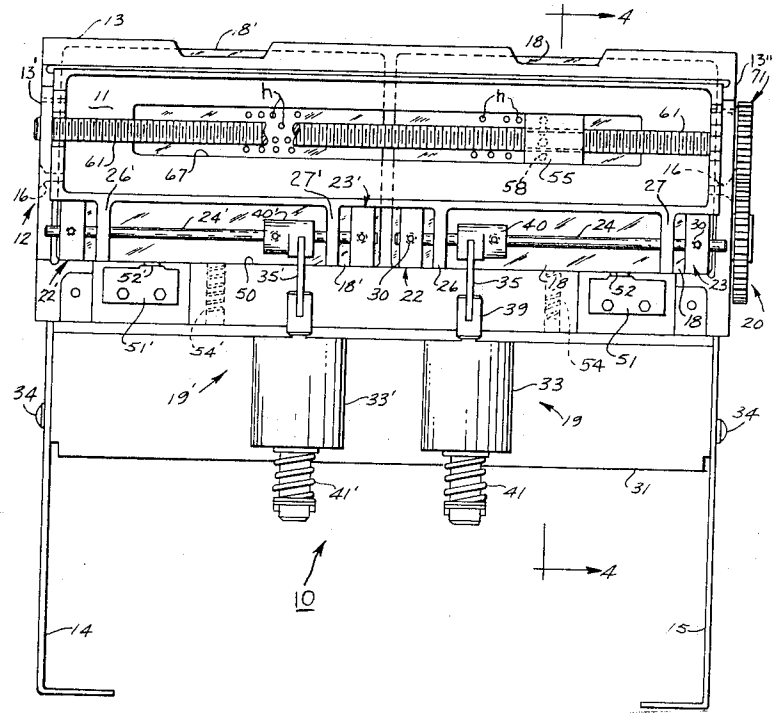
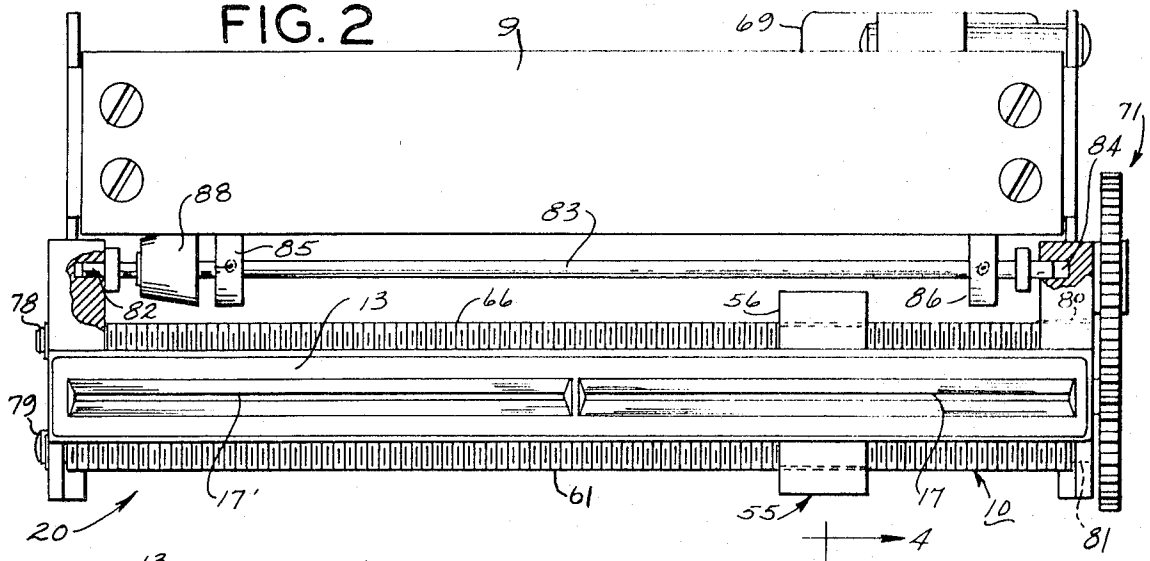


FIG. 2



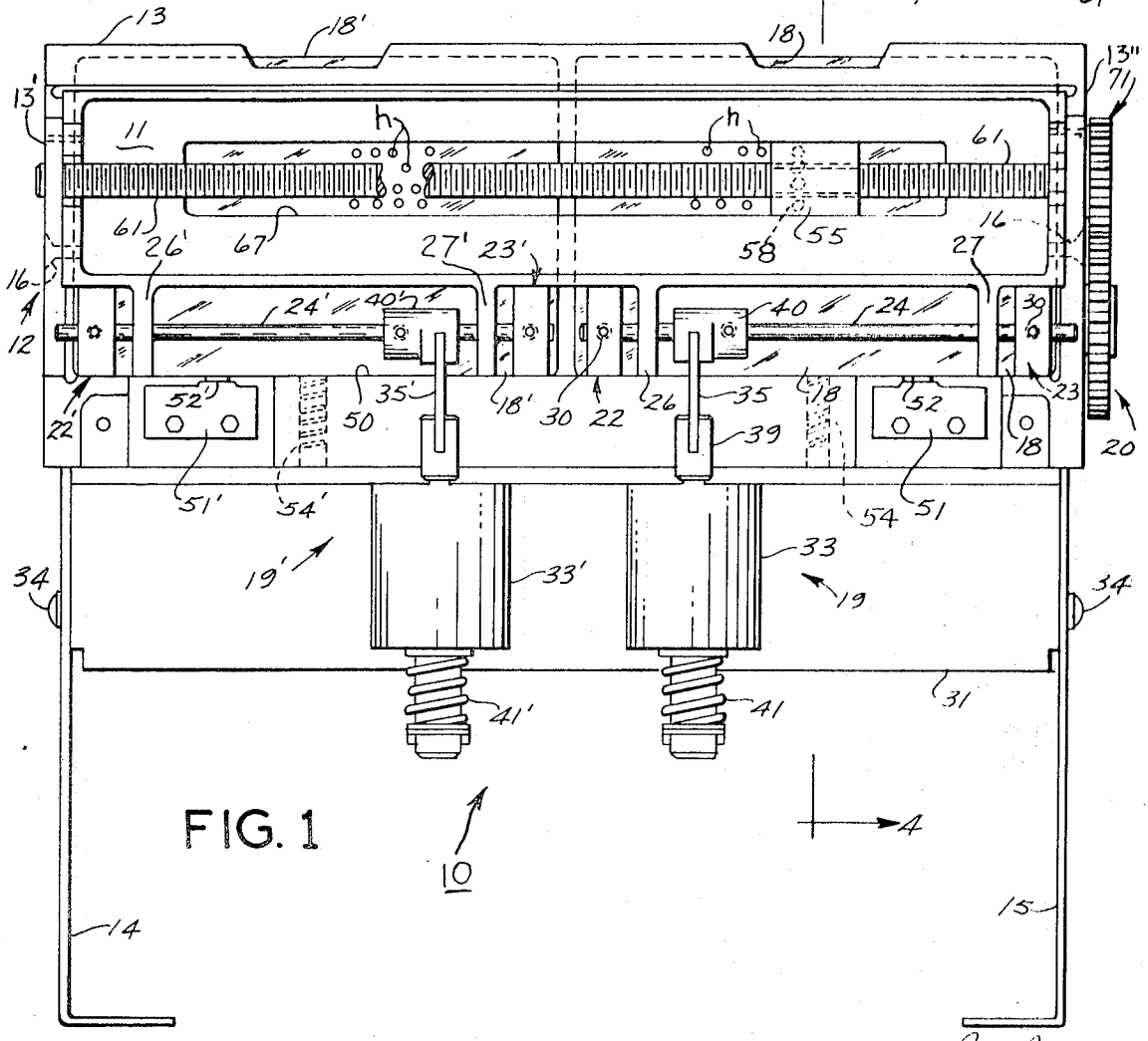


FIG. 1

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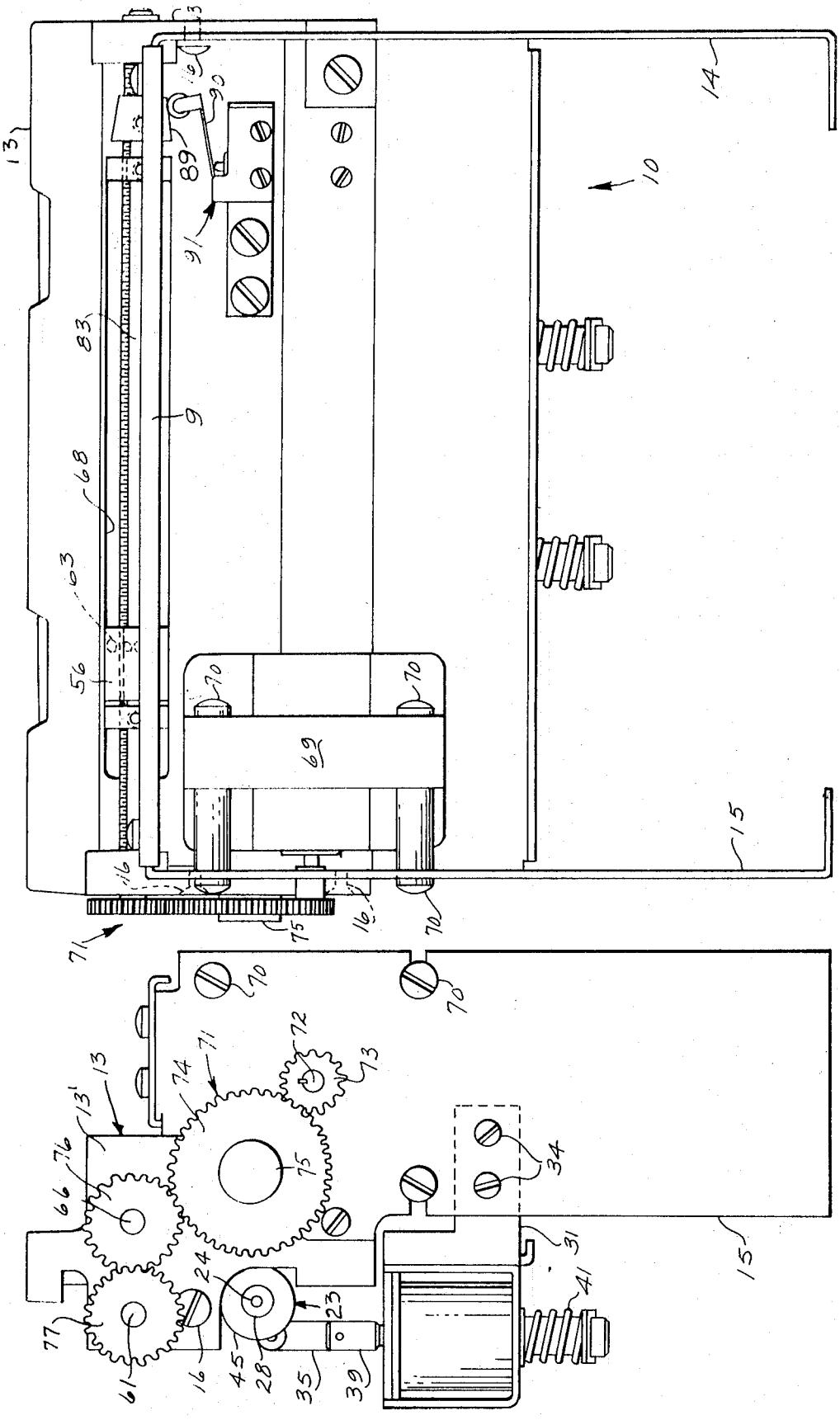

13
14
10
89
91
83
9
68
63
56
70
69
15
16
75
71
72
73
74
13'
76
66
24
23
45
28
35
39
77
61
34
31
41

FIG. 5

FIG. 3

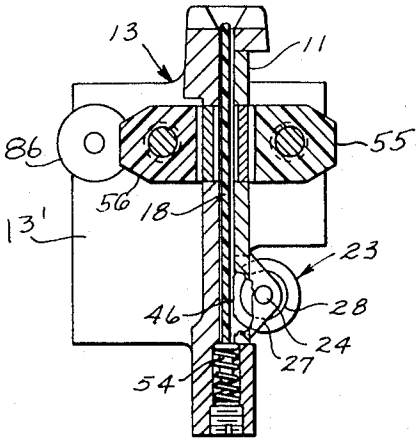


FIG. 4

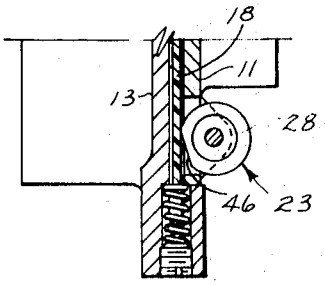


FIG. 8

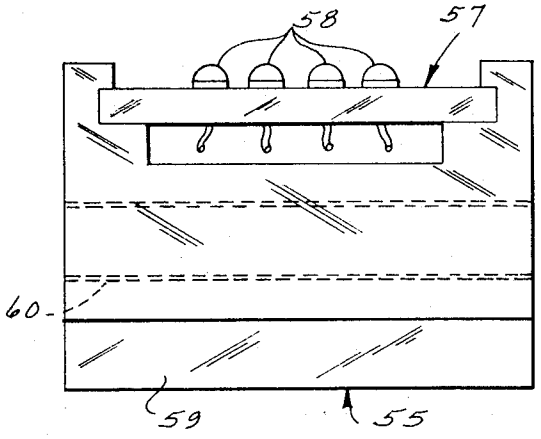


FIG. 6

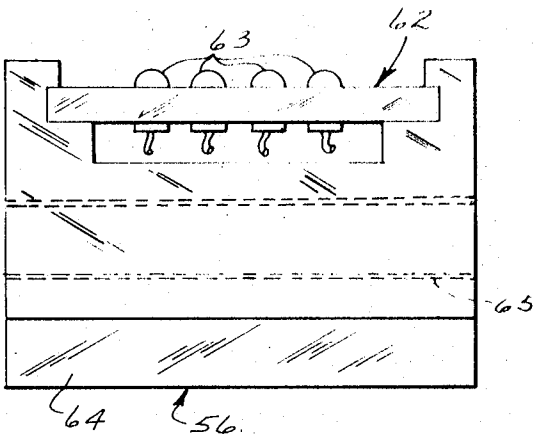


FIG. 7

FIG. 9

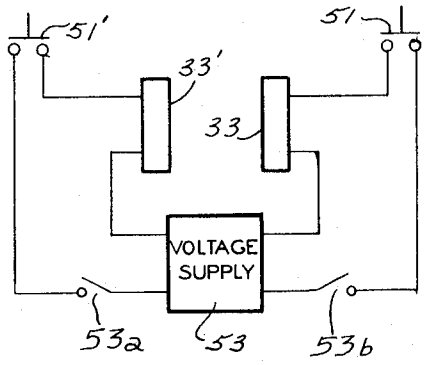
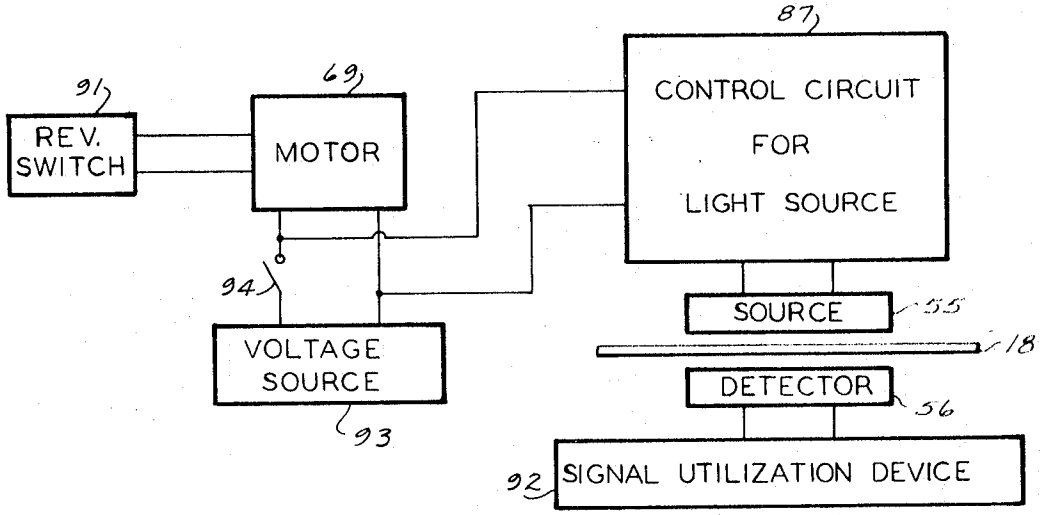

51'
51
33'
33
VOLTAGE SUPPLY
53a
53
53b

FIG. 10


87
CONTROL CIRCUIT FOR LIGHT SOURCE
91
REV. SWITCH
69
MOTOR
94
VOLTAGE SOURCE
93
SOURCE
55
18
DETECTOR
56
92
SIGNAL UTILIZATION DEVICE

ENCODER MEMBER READER

BACKGROUND OF THE INVENTION

This invention relates to encoded member readers and has particular, but not exclusive, applicability to an encoded member reader of the optical type.

Some prior art readers had relatively complicated and expensive scanning mechanisms in order to obtain accurate and reliable operation. For example, in some such devices complicated drive means for accurately moving the encoded member were required. In some cases, one side of an encoded member was flooded with light from a light source and a light detector was used to produce signals corresponding to the indicia on the card. In some such cases, there was the possibility that extraneous light from the light source would sporadically reach the detector and provide an erroneous signal.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved encoded member reader which substantially overcomes the above-mentioned disadvantages.

Another object is to provide an encoded member reader having a scanning mechanism which is accurate in operation and simple in construction.

Another object is to provide an encoded member reader having improved drive means for scanning a stationary member to be read.

Still another object is to provide a scanning mechanism which substantially obviates erroneous output signals without complicated enclosure means.

These and other objects and advantages of the invention will become apparent from the following description and accompanying drawings.

In accordance with one aspect of the present invention, an encoded member reader is provided which includes a radiant energy source, detector means responsive to the radiant energy of the source, and means for moving the source and the detector concertedly across opposite sides of an encoded member to be read.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of an encoded member reader in accordance with the present invention,

FIG. 2 is a top view of the reader of FIG. 1,

FIG. 3 is a right end view of the reader of FIG. 1,

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 1,

FIG. 5 is a right side view of the reader as viewed in FIG. 3,

FIG. 6 is an enlarged top view of the radiant energy source of FIG. 1,

FIG. 7 is an enlarged top view of the detector shown in FIG. 5,

FIG. 8 is a fragmentary view similar to FIG. 4, but with parts broken and with the holddown wheel shown rotated,

FIG. 9 is a schematic diagram of the electrical control for the holddown mechanism of the reader of FIG. 1, and

FIG. 10 is a schematic diagram of the electrical control for the reading mechanism of the reader of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and more particularly to FIGS. 1–5, an encoded member reader **10** is shown including a housing or frame **12** having a pair of opposed housing portions or sides **11** and **13** connected together and to a pair of opposed end supports or plates **14** and **15** by a plurality of screws **16**. As seen in FIGS. **2** and **5**, a support or brace **9** is connected between plates **14** and **15**. The sides **11** and **13** provide chambers or slots **17** and **17'** adapted to receive a pair of encoded members or cards **18** and **18'** (FIG. 1) such as credit cards, identification cards, or the like. The reader **10** includes a pair of like card holddown mechanisms, indicated generally at **19** and **19'**, and an indicia reading or code detection mechanism, indicated generally at **20**.

The holddown mechanism **19** includes a pair of axially spaced wheel members or rollers **22** and **23** mounted on a shaft **24** which is supported for rotation in bearing support members **26** and **27** that are shown integral with housing side **11**. The rollers **22** and **23** each include a hub **28** secured to shaft **24** by fastening means shown as setscrews **30** in FIG. **1**; only hub **28** of roller **23** is shown in the drawings (FIGS. **3**, **4** and **8**). The shaft **24** is driven by a solenoid **33** through a link **35**. The solenoid **33** is connected to a mounting plate **31** that, in turn, is connected between end supports **14** and **15** by screws **34**. The link **35** is pivotally connected at one end to a solenoid armature **39** and at the other end to a collar **40** that is fixedly connected to the shaft **24** such as by a set screw or the like to thereby effect concerted rotation of collar **40** and shaft **24**. A solenoid bias spring **41** biases the rollers **22** and **23** through the link **35** to the "open" position, i.e., a position in which an encoded card **18** can be freely inserted past the rollers **22** and **23**. Each of the rollers **22** and **23** includes a resilient peripheral member or tire **45** formed, for example, of a suitable rubber, such as of the neoprene or buna N-type, and which may have, for example, a durometer reading of **50**. Each tire has a chordal surface or flat portion, such as indicated in FIGS. **4** and **8** at **46**, which permits complete insertion of a card **18** when the flat surface **46** is parallel to housing sides **11** and **13** and internal walls thereof, and the plane of card **18**. When the solenoid **33** is energized after a card **18** is disposed in the slot **17**, the arcuate portion of the tires **45** engages and urges the card downwardly against a bottom wall **50** (FIG. **1**) of the housing side **13**, which wall forms the bottom of the slot **17**.

The holddown mechanism **19'** is shown for illustration as being identical to the above-described mechanism **19** in construction and operation, except that it cooperates with the encoded card **18'**, and corresponding parts are identified by like numerals but with prime marks associated therewith. In view of this, the description of the parts of only the holddown mechanism **19** is deemed necessary.

The holddown mechanism **19** is actuated by a switch **51** mounted to the housing **12** adjacent to the wall **50**, such as by means of screws. As seen in FIG. **1**, switch **51** is shown as a push button switch having an actuating button **52** which is engaged by the bottom edge of card **18** when inserted into slot **17**. Similarly, a switch **51'** having an actuating button **52'** adapted to be engaged by a card **18'** is connected to operate holddown mechanism **19'**. FIG. **9** shows a circuit diagram, for purpose of illustration, in which a voltage supply source **53** is connected to energize the solenoids **33** and **33'** upon the closing of switches **51** and **51'** when manual switches **53***a* and **53***b* are closed.

As seen in FIG. **4**, housing side **13** is provided with an opening which receives a spring **54** that is engaged and compressed by the card **18** when the card is inserted into slot **17** and when the holddown mechanism **19** is operated. Spring **54** urges the card upwardly when the holddown mechanism is deenergized to release the card and permit easy manual retraction thereof. A spring **54'** for card **18'** is shown in phantom in FIG. **1**. Housing side **13** also includes opposed parallel integral end flanges **13'** and **13''**.

The reading mechanism **20** is adapted to "read" or convert the code on both of the cards **18** and **18'** into electrical signals, such as digital signals which contain information corresponding to the indicia on the cards. Each of the cards **18** and **18'** will be assumed to have a code or indicia consisting of a predetermined pattern of marks or holes *h* (FIG. **1**). Such holes or indicia may be thin areas or other areas which readily transmit the radiant energy of source **55**, at least more readily than other areas of the card. The cards **18** and **18'** may be a suitable plastic material, such as a plurality of plastic layers with the indicia such as holes in one or all layers of the card.

Mechanism **20** is shown including a source **55** of radiant energy and a detector or sensor **56** responsive to the radiant energy of source **55**, mounted for movement on opposite sides of the housing **12**. While various types of radiant energy sources can be used, the source **55**, also seen in FIG. **6**, is

shown for illustration as including a diode light source member 57 secured in a slot of a support member 59 and having four spaced individual sources 58. Diode light source elements 58 are well known and commercially available. For example, one type is a gallium arsenide diode producing a non-coherent light in the infrared or near infrared portion of the light spectrum. The support 59 may be made of any suitable material, for example, of a suitable plastic material. Support 59 is provided with a threaded hole 60 which receives a rotatable screw 61 (FIG. 1). The detector or sensor 56, as seen in FIG. 7, is shown including a light responsive member 62 having four sensors or photodiodes for example, silicon photocells 63 responsive to the light from light sources 58. The member 62 is secured in a support 64 made, for example, of plastic and provided with a threaded hole 65 which receives a rotatable screw 66 (FIG. 2). The support 59 of the source 55 and the support 64 of the detector 56 are guided for reciprocating movement by the walls of openings or slots 67 (FIG. 1) and 68 (FIG. 5) provided in the housing sides 11 and 13, respectively. The slots 67 and 68 prevent rotation of the source 55 and detector 56 so that they move linearly along the slots in response to rotation of the screws.

The diode light source 55 is adapted to be energized by a suitable control circuit 87, as seen in FIG. 10, which may include, for example, a source of direct current for energizing each of the light sources 58. The photocells 63 of detector 55 are connected in a circuit such as a signal utilization circuit 92 which may include a circuit for producing signals, for example, signals responsive to changes in the resistance of the photodiodes 63 due to the light from sources 58 intermittently reaching the photodiodes during scanning of the encoded cards 18 and 18'.

When the cards 18 and 18' are locked in position by the holddown mechanisms 19 and 19', the patterns of encoded holes are accurately positioned relative to the source 55 and detector 56 within the openings 67 and 68. The source 55 and detector 56 are, of course, aligned with respect to each other such that as they move past an encoded card, light from a light source element 58, as the source passes a hole in the card, strikes the photodiode 63 opposite that source element, and a pulse is produced in the utilization circuit 92. The indicia shown for illustration in FIG. 1 includes holes at four different vertical levels spaced apart the same distance as the light sources 58 and the photodiodes 63 so that there is a source and diode for each level.

An electric motor 69 secured to end plate 15 by screws 70 effects rotation of screws 61 and 66 through a gear mechanism 71. Motor 69 has a shaft 72, as seen in FIG. 3, to which is connected a drive gear 73 coupled to drive a relatively large gear 74 that is connected for rotation in a bearing 75 in an end portion of housing side 13 (FIG. 5). Gear 74 is engaged with a gear 76 fixed to the right end of screw 66, as viewed in FIG. 1. The gear 76 is engaged with a gear 77 fixed to screw 61. The left ends of screws 61 and 66, as viewed in FIG. 2, are provided with bearing 78 and 79 in the left end flange 13'. The right ends of the screws are provided with bearings 80 and 81 in the right flange 13''. In this way, the motor 69 rotates the screws 61 and 66 in synchronism.

Referring again to FIG. 2, a rod 83 extends parallel to the screws 61 and 66 and is mounted for limited lateral or axial movement in a pair of openings 82 and 84 in the ends of the housing flanges 13' and 13''. A pair of abutments 85 and 86 are fixed to rod 83 adjacent the opposite ends thereof and in the path of movement of the light detector 56. Also connected to rod 83 is a switch operating member 88 having an inclined surface at 89, as seen in FIG. 5, which is engaged by a resiliently urged switch actuating arm 90 of a motor winding reversing, push button switch 91. Whenever the detector 56 engages and moves one of the abutments 85 or 86 a predetermined distance, the rod 83 and member 88 also move to close or open switch 91 and effect a reversal of the direction of rotation of the motor 69. The motor 69, as seen in FIG. 10. is connected to reversing switch 91 and a voltage source 93 through a switch 94 shown for purpose of illustration as a manual switch.

In operation, when an encoded card 18 is manually inserted into chamber 17, it readily passes the flat surface 46 of the holddown rollers 22 and 23 and actuates switch 51 to effect energization of solenoid 33 to actuate holddown mechanism 19. Rollers 22 and 23 of mechanism 19 are rotated in a direction to engage and urge the card 18 downwardly, the round portion of the tires 45 resiliently urging the card against the surface 50 to thereby firmly hold or lock the card in place. FIG. 4 illustrates the card 18 inserted into slot 17 just before actuation of the solenoid 33. FIG. 8 illustrates the card 18 in its locked position after energization of solenoid 33'. When a second card 18' is inserted into chamber 17' the holddown mechanism 19' operates in similar manner to lock card 18' in its predetermined location.

With the encoded cards 18 and 18' accurately located in the chambers 17 and 17', the switch 94 (FIG. 10) is operated to start the motor 69 so that the rotor rotates in one direction to rotate screws 61 and 66 through gear mechanism 71. The screws 61 and 66 are suitably threaded to move the light source 55 and detector 56 along the slots 67 and 68 in a direction which is dependent upon the direction of motor rotation, as determined by the condition or position of the motor reversing switch 91. As the light source 55 and detector 56 move past the cards, pulses are produced in circuit 92 (FIG. 10) for example, each time the light from a source 58 strikes a photocell 63 a pulse may be produced in circuit 92. A series of signals corresponding to the particular code on encoded cards 18 and 18' may be transmitted to a suitable signal utilization device for storage, decoding, printing or the like, as desired.

After the source 55 and detector 56 pass by both cards 18 and 18', one of the abutments 85 or 86 (FIG. 2) is engaged and moved by detector 56 to actuate the reversing switch 91 and thereby return the light source 55 and detector 56 to the starting end of the reader 10. The holddown mechanism 19 and 19' may then be deenergized by switches 53*a* and 53*b* and the motor 69 deenergized such as by switch 94. The springs 54 and 54' (FIG. 1) then move the cards upwardly to facilitate removal thereof from the reader 10 by the operator.

Because the diode light sources 58 provide a narrow beam of light generally about the size of the code holes *h*, erroneous signals, due to any extraneous light, is substantially obviated and without complicated and expensive enclosures.

In view of the above, it is seen that the several objects of the invention are achieved and other advantageous results obtained.

As various changes could be made in the above-described constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. An encoded member reader comprising housing means including a pair of spaced sidewalls and adapted to receive between said walls at least one encoded member having a preselected pattern of areas providing indicia which transmit light energy to a greater extent than other areas of the encoded member, said walls having openings with at least portions thereof aligned with each other and with the indicia of an encoded member when disposed between said walls to be read, a pair of screw members mounted to said housing means on opposed sides of said walls for rotation and extending parallel to each other and to said walls, a source of radiant energy including first support means, and radiant energy emitting means connected to said first support means, said first support means being threadedly coupled to one of said screw members adjacent one of said wall openings for linear movement lengthwise of said one screw member in response to rotation of said one screw member, light responsive detector means including second support means, and radiant energy responsive means connected to said second support means,

said second support means being threadedly coupled to the other of said screw members adjacent the other of said wall openings for linear movement lengthwise of said other screw member in response to rotation of said other screw member, drive means for rotating said screw members for simultaneously linearly moving said source of radiant energy and said detector means along said wall openings, said detector means receiving light energy passing through said indicia from said source, and means for producing signals responsive to the light energy received by said detector means.

2. The encoded member reader according to claim 1 wherein said drive means includes gear means, and motor means for driving said gear means.

3. The encoded member reader according to claim 2 further including means including reversing switch means coupled to said motor means and responsive to a predetermined amount of movement of said source and detector means in one direction to effect rotation of said motor means to effect movement of said source and detector means in the opposite direction, said switch means including an axially movable rod extending parallel to said screw members, a switch actuating member on said rod, and means engageable with one of said support means for moving said rod to operate said switch actuating member.

4. An encoded member reader for producing signals corresponding to indicia on an encoded member comprising housing means including encoded member holding means for receiving said encoded member, and a reading mechanism, said reading mechanism comprising detector means for converting the code on said encoded member into electrical signals when said detector means is moved across a side of said encoded member, support means for supporting said detector means in a position adjacent said encoded member, screw means including an elongate screw member extending parallel to said side of said encoded member for moving said detector means across said encoded member, said support means being threadedly coupled to said screw member for linear movement lengthwise of said screw member in response to rotation of said screw member, driver means for rotating said screw member for linearly moving said support means, hence said detector, across said side of said encoded member, and elongate guide means carried by said housing parallel to said screw member for slidably engaging said support means and guiding said linear movement of said support means.

5. The encoded member reader according to claim 4 wherein said drive means includes gear means coupled to said screw means and reversible motor means for driving said gear means.

6. The encoded member reader according to claim 5 further including an axially movable rod extending parallel to said screw member, a reversing switch coupled to said motor means for reversing the direction of rotation of said motor means thereby effecting movement of said support means in an opposite direction, a reversing switch actuating member on said rod, and means engageable with said support means for moving said rod to operate said switch in response to a predetermined amount of movement of said support means in one direction.

7. The encoded member reader according to claim 4 wherein said detector means comprises a plurality of radiant energy responsive elements arranged to detect variations in radiant energy from said encoded member when said support member moves said detector means across said face of said encoded member.

8. The encoded member reader according to claim 7 including a radiant energy source concertedly movable with said detector means.

* * * * *