United States Patent [19]

Wu

[11] **3,900,717**

[45] **Aug. 19, 1975**

[54] **APPARATUS FOR SCANNING RAISED INDICIA**

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[73] Assignee: **RCA Corporation,** New York, N.Y.

[22] Filed: **Dec. 18, 1973**

[21] Appl. No.: **425,935**

[52] **U.S. Cl.** ..... **235/61.11 C;** 235/61.11 A

[51] **Int. Cl.** **G06k 7/04**

[58] **Field of Search** ..... 346/74 E, 74 CH; 235/61.11 A, 61.11 C; 340/149 A

[56] **References Cited**

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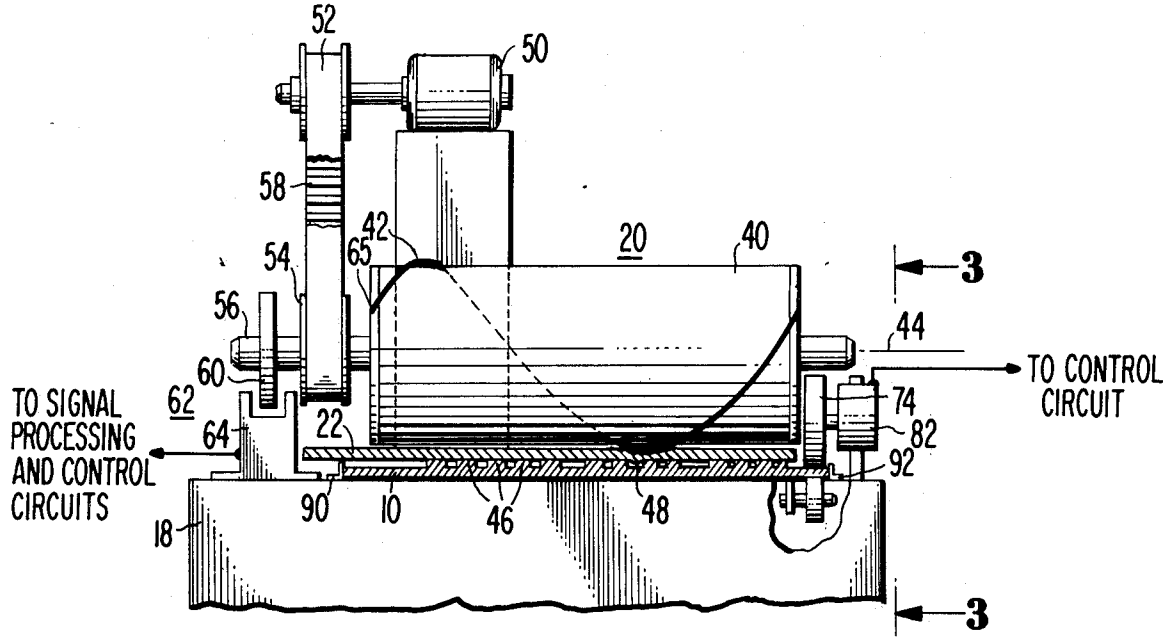
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Primary Examiner—Stanley M. Urynowicz, Jr.
Attorney, Agent, or Firm—Raymond E. Smiley; Edward J. Norton

[57] **ABSTRACT**

Raised indicia, such as exists on a bank or gasoline credit card, is scanned by apparatus which includes an elongated transducer placed over the credit card along the line to be read and a drum bearing a raised helix placed over the transducer. The transducer is of the type which provides a signal when sufficiently compressed at any point along its length. As the drum is rotated, the raised helix depresses points seriatim along the transducer toward the card surface. Where raised portions of the credit card along the scan line exist, the transducer is compressed sufficiently to produce a signal.

7 Claims, 6 Drawing Figures



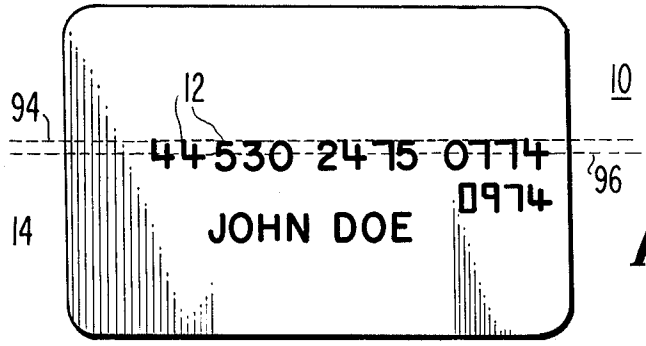


Fig. 1

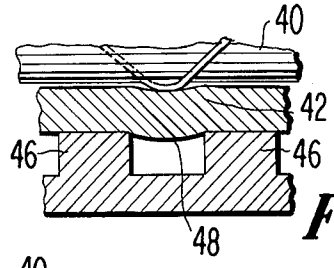


Fig. 6

Fig. 2

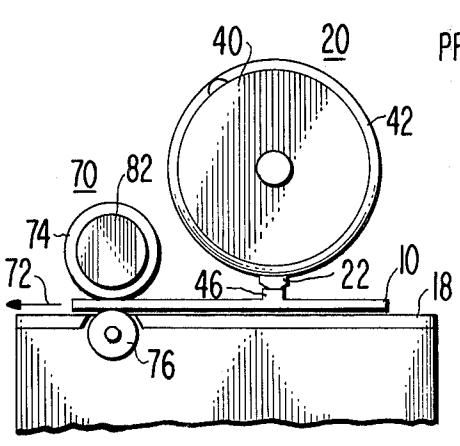


Fig. 3

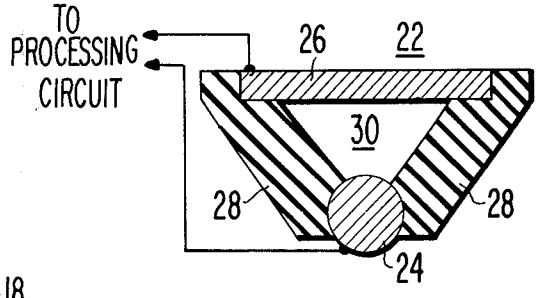


Fig. 4

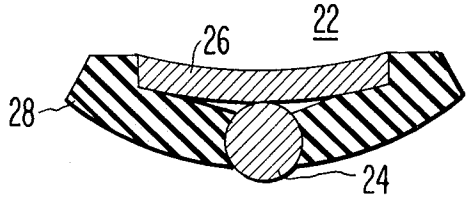


Fig. 5

APPARATUS FOR SCANNING RAISED INDICIA

BACKGROUND OF THE INVENTION

Many credit cards in common use have the credit card number and other identifying data raised above the remainder of the card. A number of low-cost electrical readers have been developed utilizing a plurality of finger-like elements which are passed over the raised indicia. Because of the small size of the indicia and the relatively small height that the indicia are raised above the card, the finger-like elements must be very tiny and require very sensitive adjustment.

SUMMARY OF THE INVENTION

Scanning apparatus for reading raised indicia includes an elongated transducer means positioned along the line of indicia to be read and means adapted to serially depress points along the transducer, the transducer being of the type that when compressed greater than a given amount, produces a signal. The amount of depression is such that only where raised indicia is located will the compression be greater than the given amount.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a standard credit card having raised numerals;

FIGS. 2 and 3 are front and right side elevations, respectively of a scanning apparatus useful in practicing the invention;

FIG. 4 is a cross-section of a transducer used in the apparatus of FIGS. 2 and 3;

FIG. 5 is a cross section of the transducer of FIG. 4, which has been compressed sufficiently to cause contact between its two conductors; and

FIG. 6 is an enlargement of a portion of FIG. 2 illustrating a transducer being depressed.

DETAILED DESCRIPTION

In FIG. 1, a standard credit card **10** has raised indicia in the form of embossed numerals **12** raised above a generally planar surface **14.** The numerals **12** may be of a font style such as the Farrington 7B adaptable to be machine read. Additional embossed characters, such as the name of the card holder, John Doe, and the expiration date, 09 74, may also be present.

In FIGS. **2** and **3,** card **10** is positioned on a reference surface **18** of a scanning device **20.** Above card **10** is an elongated transducer means **22,** which is fixed relative to reference surface **18.**

Transducer **22,** as best seen in cross-section in FIG. **4,** comprises a first elongated electrical conductor such as a circular wire **24** normally spaced from a second elongated electrical conductor such as a thin plate **26,** by elastomeric material **28,** which is bonded to the two conductors. Additionally, the ends of the transducer may be sealed capturing within the hollow space **30** a gas such as air. The transducer is normally positioned with conductor **24** closer to the upper surface of credit card **10.** As illustrated in FIG. **5,** the two conductors may be compressed together at any point along their length by means to be described. When the compressive force is released, the two conductors spring back to resume the position illustrated in FIG. **4,** due to forces provided by material **28** and/or the compressed gas in chamber **30.** An alternate form of transducer may comprise a tube containing only a gas which, when increased in pressure due to the compression of the tube, acts on a pressure-to-electrical transducer. It should be noted in connection with FIG. **5** that when conductor **26** is depressed, it is bowed slightly to form a convex surface in cross section. This shape provides lateral stability to the transducer. The cross section of the upper conductor is elongated laterally also to provide a preferential motion of the transducer normal to the drum surface (i.e. toward card **10**).

Returning to FIGS. **2** and **3,** a means for depressing transducer **22** is provided in the form of a drum **40** having a one-turn raised helix **42,** which may be a wire, a portion of which is imbedded in the drum. Drum **40** is rotatable about an axis **44,** which is parallel to transducer **22.** Axis **44** is at a fixed distance from reference surface **18,** positioned such that as drum **40** is rotated, helix **42** depresses transducer **22** a sufficient amount for conductors **24, 26** to make contact only where raised indicia **46** are located. At all other locations, where no indicia is located, such as that shown in the vicinity of region **48,** conductor **26** will be depressed toward conductor **24,** but the two will not be forced into contact. See FIG. **6** showing an enlargement of portion **48** of FIG. **2.**

Drum **40** is rotated by a drive means such as a motor **50** via pullies **52** and **54,** attached to the motor **50** and drum shaft **56** respectively, and toothed belt **58** coupled therebetween. Also attached to shaft **56** is one member **60** of timing means **62.** The other member **64** of the timing means is attached to reference surface **18.** Timing means **62** may, for example, comprise a notched-wheel **60** and a light-diode arrangement **64,** or any of a number of other commonly available devices and means (not shown) for processing the signals derived therefrom to determine the angular position of drum **40** and therefore, in effect, the position of raised helix **42** along transducer **22,** which is being depressed. In a conventional manner, timing means **62** may be provided with a means for providing a special signal to indicate when the drum is at some specific angular position, such as when the left most point on the helix designated **65** is in contact with transducer **22.**

Referring to FIG. **3,** a means **70** is provided to incrementally move card **10** in a direction normal to the scanning direction and tangential to the drum surface as indicated by arrow **72.** Means **70** comprises a drive wheel **74** and idler wheel **76** positioned above and below card **10,** respectively. A rotary solenoid **82,** attached to plate **18,** may be intermittently activated (by means not shown) to incrementally advance card **10** a desired amount each time the solenoid is energized.

In operation, a card **10** is inserted into scanner **20** guided by a card guide means **90, 92,** until it is in contact with wheels **74, 76.** Then, drum **40** is caused to rotate by motor **50.** Motor **50** may be manually energized or energized by some automatic means (not shown), which senses the presence of card **10.** The special signal produced by timing means **62,** when drum **40** is at a specific angular position, may be used to energize solenoid **82** to incrementally move card **10.** If the cards to be used by the sensing apparatus all have account numbers **12** (see FIG. **1**) printed in the same vertical location, the card could be manually positioned using mechanical stops so that the upper portion of the numerals **12** are under transducer **32,** as indicated by dashed line **94,** FIG. **1.** Alternately, solenoid **82** rapidly may incrementally advance the card until a sensing system (not shown) indicates the position indicated by

line 94 on card 10 is under transducer 22. In any case, as drum 40 is rotated, helix 42 serially depresses points along transducer 22. At all points where raised indicia 46 is located, contact will be made between conductors 24 and 26 (see FIG. 5). At all other points, no contact will be made. The signals generated by opened and closed contacts in transducer 22 and the timing signals by timing means 62 may be utilized by suitable electronics (not shown) to store the location of raised indicia along line 94 of the card. After the drum 40 is rotated somewhat less than one revolution, the entire line of numerals 12 will be scanned along scan line 94. (Less than one revolution is required to scan the card since a one-revolution helix is illustrated and since the numerals on the card do not extend the width of drum 40.) After the scan of line 94 is complete, signals from timing means 62 will cause solenoid 82 to energize incrementally advancing card 10 so that the position of the card designated line 96 will be under transducer 22. The speed of card advance and of drum rotation may be designed such that card advance will have occurred before the helix is positioned over the left most numeral 4 on card 10. Thereafter, the next revolution of drum 40 causes the scan of line 96. This process of scanning and incrementally advancing the card continues until the row of numerals 12 has been scanned a predetermined number of times. Thereupon, the aforementioned electronics may process the signal received to determine what account number is contained on the card. The details of the signal processing are well-known to those skilled in the art, and since the signal processor forms no part of this invention, it will not be further discussed.

It is, of course, possible to speed up the scan by having an N turn helix and N transducers 22, each extending one Nth of the distance across the region occupied by transducer 22, as illustrated.

While the invention has been described as suitable for reading a credit card, it is also suitable for scanning other articles bearing raised indicia. In the specification and claims, when the transducer and drum are described to be over the credit card, the gravitational orientation of various elements is not being referred to, rather, merely their relationship with one another.

What is claimed is:

1. Scanning apparatus for reading raised indicia comprising, in combination:

elongated transducer means of the type which produces a signal in response to being compressed at least a given amount at any point along its length, positioned along a line to be read of said raised indicia; and

means adapted to serially depress points along the length of said transducer means, said depression being of an amount such that said transducer means is compressed at least said given amount only at points where said raised indicia is located, whereby said signals produced by said transducer means will be indicative of said raised indicia.

2. The combination as set forth in claim 1, wherein said transducer means comprises two electrically conductive members normally spaced apart, but which, when compressed at least said given amount, are in contact, one of said conductive members being relatively nearer said raised indicia, the other of said conductive members being relatively nearer said depressing means.

3. The combination as set forth in claim 2, wherein said two conductive members are spaced apart by an elastomeric material.

4. The combination as set forth in claim 2, wherein one of said conductive members is elongated in a direction lateral to that in which said transducer lies and wherein said means for depressing points along said transducer causes, the lateral center of said one conductive member to be depressed a greater amount than the lateral ends thereof, whereby stiffness is provided to said transducer.

5. The combination as set forth in claim 1, wherein said means adapted to serially depress points along the length of said transducer means comprises a rotatable drum member and means for rotating said drum, said drum having along its cylindrical surface a raised element in the shape of a helix, said drum being positioned above said transducer means such that, as said drum is rotated, said helix depresses points along said transducer an amount such that only where said raised indicia is located said transducer will be compressed at least said given amount.

6. Apparatus for reading raised indicia on indicia bearing cards comprising, in combination:

elongated transducer means positioned over a line of said indicia, said transducer means comprising first and second electrically conductive members normally spaced apart, but compressible so that the two conductors make contact, the first conductor being nearer said line of indicia;

rotatable drum member having along its cylindrical surface a raised element in the shape of a helix, said drum being positioned above said transducer means such that as said drum is rotated, said helix depresses points along said second conductor towards said first conductor a sufficient amount such that only where said raised indicia is located, contact will be made between the conductors; and

means for rotating said drum whereby contact between the two conductors caused by compression between said helix and said raised portions, as said helix scans along said transducer means, is indicative of the presence of said raised indicia.

7. The combination as set forth in claim 6 further including means for moving said card being read incrementally in a direction normal to that in which said elongated transducer means lies, said incremental motion occurring during the time said line of indicia is not being scanned.

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