

July 9, 1963

A. SKROBISCH
VARIABLE EXHIBITOR

3,096,594

Filed June 17, 1960

2 Sheets-Sheet 1

FIG. 1

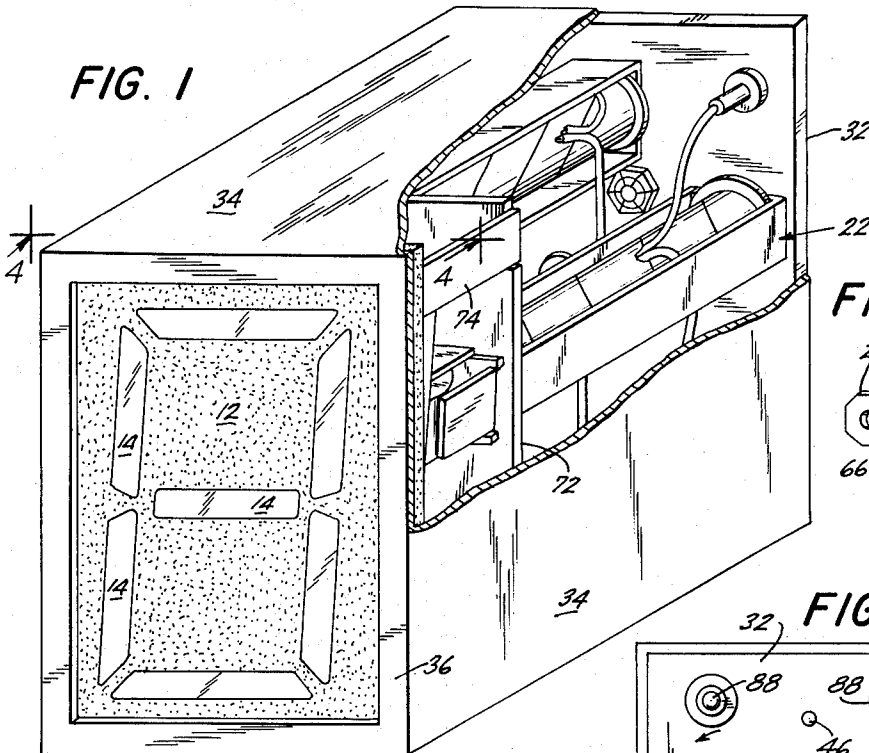


FIG. 3a

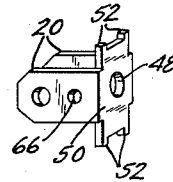


FIG. 2

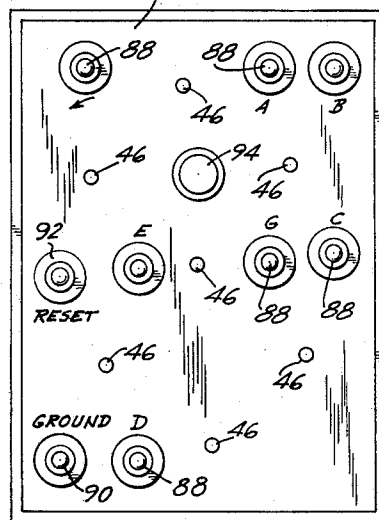


FIG. 1a

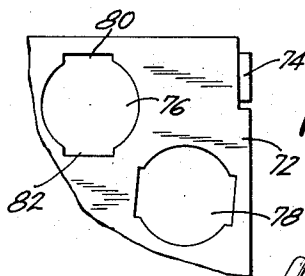
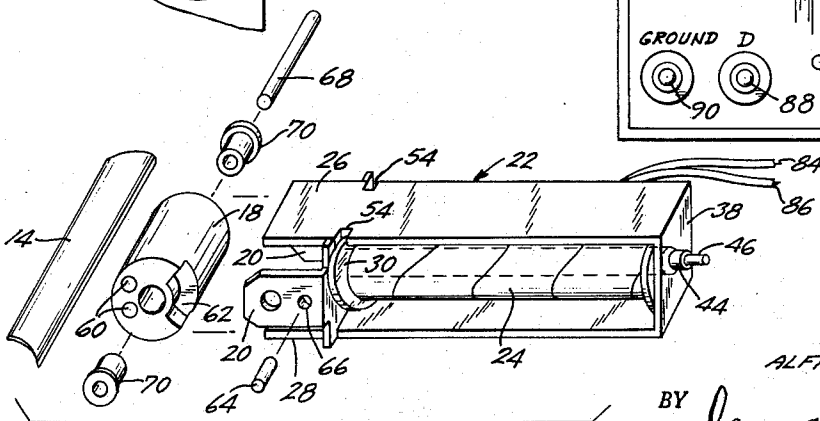


FIG. 3



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ATTORNEYS

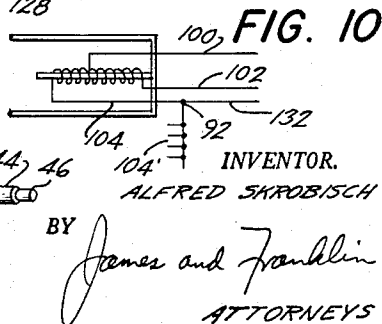
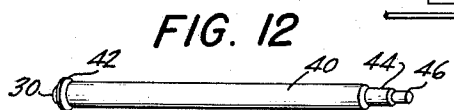
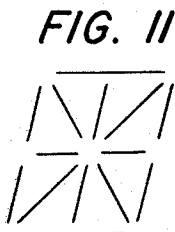
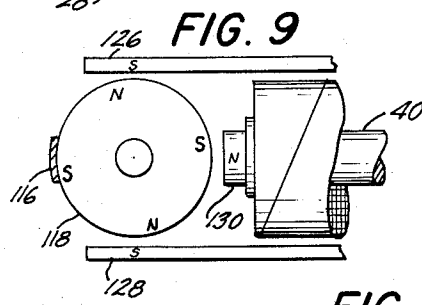
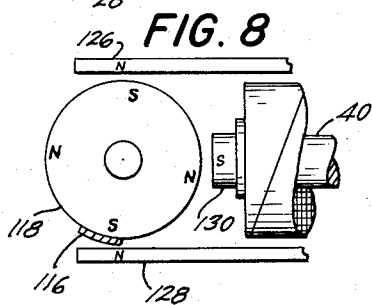
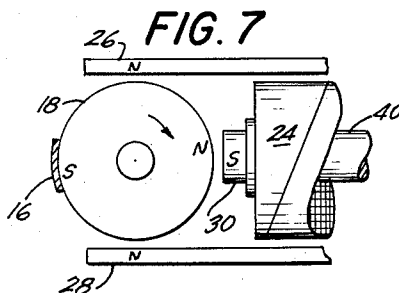
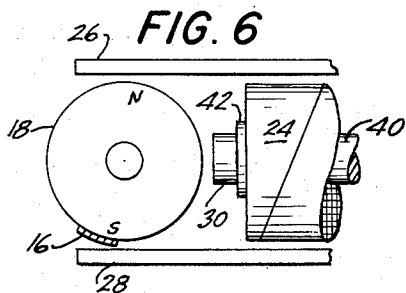
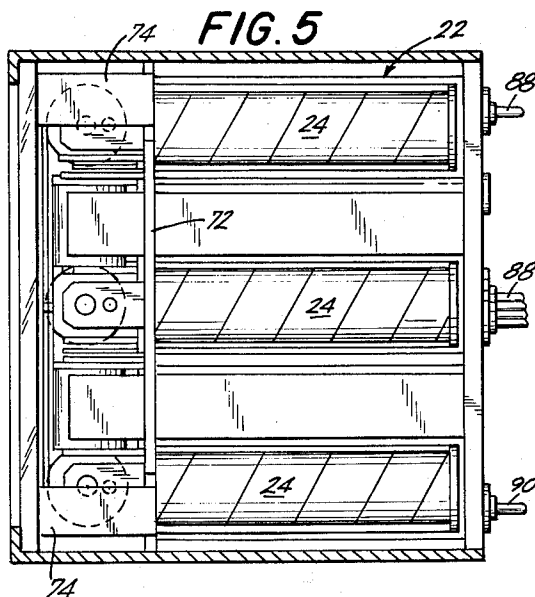
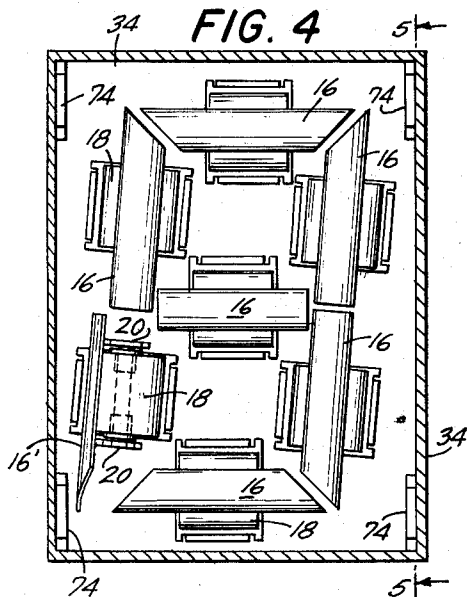
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3,096,594

VARIABLE EXHIBITOR

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Filed June 17, 1960, Ser. No. 36,984

7 Claims. (Cl. 40—28)

This invention relates to segmental readout devices, and more particularly to an improved device which eliminates the need for lamps.

Readout devices or variable exhibitors are used for stock quotation boards, computers, and the like. For this purpose the readout device may be digital, showing the ten numbers from 1 through 0. More complex readout devices are provided which will display the letters of the alphabet as well as the numbers.

Some readouts cover the entire front face area of each unit with a large number of tiny lamps which are selectively lighted to outline the desired alpha-numeric character. There is also a segmental system which, in the case of a digital readout, employs seven strip lamps arranged to provide the numeral 8 when all of the lamps are lighted, and the other numerals when some only are lighted. This requires only seven circuits, but all of these lamp systems have the difficulty that lamps burn out, and the absence of a single segment will cause the readout to display wrong numbers. Moreover, a lamp readout is difficult to read in a well lighted room or outdoors. In some cases where the installation is subject to vibration or shock, the lamps constitute a delicate element subject to filament breakage.

The primary object of the present invention is to generally improve segmental readouts by the provision of mechanical segments instead of lamps.

Other objects are to provide a simple mechanism for mechanically moving the segments; to provide one which requires only negligible power to operate the same; which eliminates the need for a restoring spring for the segment; which is rugged and shock proof; and which is so compact that a large group of such "movements" or mechanisms may be nested together to form a unit for the display of a single character. Still another object is to provide the mechanism in variant forms, one of which responds to sustained current, and another of which responds to a momentary pulse of current.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the segmental readout elements, and their relation one to another, as are hereinafter more particularly described in the following specification.

The specification is accompanied by drawings in which: FIG. 1 is a perspective view of a segmental readout embodying features of my invention, with a part of the casing broken away;

FIG. 1-A is a fragmentary view showing one corner of a mounting plate forming a part of the mechanism of FIG. 1;

FIG. 2 is a rear view of the readout shown in FIG. 1; FIG. 3 is an exploded perspective view of one of the movements operating one of the segments;

FIG. 3-A shows a bearing yoke separated from its magnet.

FIG. 4 is a vertical section taken immediately behind the front window of the readout, or approximately in the plane 4—4 of FIG. 1;

FIG. 5 is a vertical section taken just inside one of the side walls of the casing, in the plane 5—5 of FIG. 4;

FIGS. 6 and 7 are explanatory of the operation of one form of the invention;

FIGS. 8 and 9 are explanatory of the operation of another form of the invention;

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FIG. 10 is a wiring diagram for FIGS. 8 and 9;

FIG. 11 shows how 14 instead of 7 segments may be used for alpha-numeric characters; and

FIG. 12 shows the center core used in the magnetic movement of FIG. 3.

Referring to the drawing, and more particularly to FIGS. 1 and 4, the segmental readout or variable exhibitor comprises a front window 12 with an array of elongated openings 14 corresponding to the segments needed to make up any one of a number of desired characters. For a digital readout seven segments are adequate, as here shown. The device further comprises a corresponding number of elongated white flags shown at 16 in FIG. 4. These are movable toward or away from the openings 14 shown in FIG. 1 to either exposed or concealed position. In FIG. 4 the flag 16' has been moved away from the window (not shown) to concealed position, while the remaining flags are in exposed position and thus display the numeral 9. It will be understood that with all of the flags exposed, the numeral 8 will be displayed, as suggested in FIG. 1, and that by a selective movement of the different flags, any of the ten numerals from 1 to 0 may be displayed.

In the mechanism here shown the movement for each flag comprises a rotor 18, which is mounted for rotation between bearings 20. There is also a means generally designated 22 (FIGS. 1 and 3) which, when electrically energized, causes the rotor to rotate, preferably less than 90 degrees, and the flag 16 is mounted on the rotor and extends in the direction of the rotor axis.

The preferred movement for the flag is a magnetic movement, and in one form of the present invention the movement resembles that disclosed in my Patent 2,836,773 issued May 27, 1958 and entitled "Electrically Controlled Magnetic Movement."

Referring to FIG. 3, there is an electromagnet coil 24 having a core made of ferrous material which may be temporarily, but not permanently, magnetized. When it is magnetized the complete core has two spaced poles 26 and 28 which are of like polarity, and a single pole located at 30 (at the left end of coil 24, as viewed in FIG. 3) which is of opposite polarity.

Referring now to FIG. 6, the like poles 26 and 28 are disposed diametrically of the axis of rotation of rotor 18, and the pole 30 is disposed at one end of a diameter transverse to the diameter of the like poles. The rotor 18 is a permanent magnet. In FIG. 6 the electromagnet has not been energized, and the rotor positions itself as shown, that is, across the poles 26 and 28, because that is the natural "keeper" position. The soft iron stator then is acting as a keeper for the permanent magnet 18.

In FIG. 7 the electromagnet coil 24 has been energized, and in the particular case shown the poles 26 and 28 become north poles, while the pole 30 becomes a south pole. Thus the poles are so related that the rotor turns about but somewhat less than 90 degrees from the position shown in FIG. 6 to that shown in FIG. 7, with the north pole of the rotor repelled by the north pole of the stator, and attracted by the south pole of the stator. The motion of the rotor is preferably limited to an amount less than 90 degrees, which is adequate to move the flag to either exposed or concealed position, as is indicated by the flag 16 on rotor 18.

In FIGS. 6 and 7 it will be observed that the complete core 26, 28, 30 of the electromagnet is generally E shaped, with the center bar shorter than the top and bottom bars, and with the coil 24 positioned around the center bar between the top and bottom bars. The E is horizontally elongated, so that the core and the coil 24 are long and slender in horizontal direction. This facilitates nesting a considerable number of these movements together in

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closely spaced collateral relation, to form the complete readout for a single character.

In the particular structure here employed the front wall of the unit is a glass or transparent window coated on the rear with a black matte finish, except for the seven openings 14 which are left transparent. It will be understood that an opaque plate might be employed with seven slots cut physically therethrough, but the transparent plate has the advantage of being dust proof.

The rear wall 32 is preferably made of insulation material and acts as a terminal board for the readout. The side walls 34 are preferably made of sheet metal, and if desired a single piece of sheet metal, typically aluminum, may be drawn to provide the front wall 36 and the side walls 34, the front wall then being cut away to leave only a narrow frame as shown. However, it may also be bent up out of flat sheet metal, and brazed or soldered at the meeting corner edge. The front window 12 is dropped into the case through the open rear end. The assembly of seven magnetic movements is then pushed into the case through the open rear end.

The construction of a single magnetic movement may be described with reference to FIG. 3. A strip of ferrous material is bent to U shape to provide poles 26 and 28 which are integrally connected at 38. The center core is a rod which is preferably stepped in diameter, as shown in FIG. 12. In FIG. 12 the rod 40 is upset at 42 to provide a small collar. It is reduced in diameter at the rear end 44, and further reduced to leave only a slender locating pin at 46. This rod 40 is slid through the center hole 48 (FIG. 3A) of a U-shaped bearing yoke. The yoke is non-magnetic, being made of brass, aluminum or other non-ferrous material. The yoke is separately shown in FIG. 3-A, and comprises two spaced bearings 20 which are bent forward from a cross plate 50. The latter has upwardly and downwardly projecting lugs 52 at its four corners.

Reverting to FIG. 3, the poles 26 and 28 are inwardly notched as shown at 54 to receive the lugs 52, thereby anchoring the bearing yoke in position. The center core or rod 40 is slid through the bearing yoke and the coil 24, and the reduced end 44 of the rod passes through a mating hole in the end 38 (FIG. 3). The part 44 is upset or riveted by a special tool which locks the assembly together without altering the thin locating pin 46.

Referring now to FIG. 2, the seven locating pins of the seven movements are shown, and it will be seen that they correspond to the midpoints of the seven segments shown in FIG. 1.

Reverting to FIG. 3, the rotor 18 may be made up of three discs, in which case the center one is the permanent magnet referred to in connection with FIGS. 6 and 7. The side discs may be made of plastics material or non-magnetic material, and simply increase the length of the rotor. These discs may be hollowed by drilling, as indicated at 60, to balance the rotor for the added weight of the flag 14 which is cemented to the rotor. The flag may be substantially longer than the rotor.

A part of the rotor is cut away, as shown at 62, to act as a motion limiting stop in cooperation with a stop pin 64 which is secured in a hole 66 in bearing yoke 20, as by means of soldering, welding, or a force fit. The rotor is carried on a pin 68 which passes through bushings 70 received in the ends of the rotor. The ends of pin 68 are held in the bearings 20, thereby completing the assembly of one magnetic movement. The reason the bearing yoke is made of a non-ferrous material is in order not to spoil the desired magnetic circuit explained in connection with FIGS. 6 and 7.

The seven movements are mounted in position between the terminal plate 32 at the back, and a mounting plate 72 (FIG. 1) which is located a short distance back of the front window. This distance is determined by four spacer arms 74 located at the four corners of plate 72. Referring to FIG. 1-A, the plate 72 has seven openings, each

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of the character shown at 76 and 78. The opening 76 is used when the flag or segment is horizontal, and the opening 78 is used when the flag or segment is vertical. In the present case the vertical segments are tilted slightly, and the opening 78 is correspondingly tilted. It will be understood that an assembled magnetic movement of the type shown in FIG. 3 may be slid rearwardly through opening 76, with the top pole received in the recess 80, and the bottom pole received in the recess 82. The same applies to opening 78, but with the poles at the sides. The movement is slid back until the bearing yoke reaches the front of plate 72. The back plate or terminal plate 32 receives the locating pins of the seven movements.

FIG. 3 shows flexible wire leads 84 and 86 coming from coil 24. These are connected to appropriate terminals or soldering lugs on the back plate 32, such terminals being shown at 88, 90, and 92 in FIG. 2. There are seven terminals 88, and nine terminals in all. The seven terminals 88 are used one for each coil. The terminal 90 may be used as a common return or ground for all of the coils. The ninth terminal 92 is not needed for the readout as so far described, but is used in connection with a modified form of the invention to be described later.

The part 94 is optional. It is a threaded mounting stud for securing the particular readout in position in an installation. The usual installation requires a series of such readouts.

In the arrangement so far described the flags all assume a normal or rest position in which they are concealed or moved away from the openings. Thus the readout is cleared and shows no numeral. It may be mentioned that the front of the mounting plate 72, and all other parts of the mechanism which may be exposed through the segment openings, are colored dull black, so that the openings themselves appear black along with the rest of the front wall surface when the flags do not show. The flags themselves are a reflective or glossy white, and are conspicuous when they appear in the window openings.

As so far described seven circuits are needed, there being seven leads to each readout coming from suitable control circuitry or so-called "logic box." The energization of any of seven conductors leading to the seven terminals 88 moves a corresponding flag to exposed position, and the circuits are all completed by a common return to the terminal 90. The flag shows as long as the circuit is closed, and disappears when the circuit is opened. The return movement does not require a restoring spring, and takes place because of the magnetic action described in connection with FIG. 6. The permanent magnet flips back from the position shown in FIG. 7 to its keeper position across the poles 26, 28 as shown in FIG. 6, whenever the electromagnet is de-energized. The mechanical operation is exactly as though each rotor were provided with a restoring spring.

In some cases it may be desired to energize the magnetic movement by a momentary pulse of current instead of maintained current. For this purpose two changes are made which may be described with reference to FIGS. 8, 9, and 10. In FIG. 10 it will be seen that the magnet coil is divided by a center tap and a lead 100. One end lead is shown at 102, and another at 104. A switch could be used to connect either lead 102 or 104 into circuit, thereby energizing one coil in one direction, or the other coil in the opposite direction, with a resulting reversal of the polarity of the electromagnet.

Referring now to FIG. 8, the rotor 118 is permanently magnetized with four poles, there being two diametrically related north poles, and two diametrically related south poles displaced from the north poles by 90 degrees. The rotor then assumes either of two keeper positions indifferently. For the moment let it be assumed that the stator is de-energized in both FIGS. 8 and 9. In such case the rotor will remain in the position shown in FIG. 8, if left there, or in the position shown in FIG. 9, if left there. Thus the flag 116 will remain in either the concealed

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position of FIG. 8, or in the exposed position of FIG. 9, when no current is supplied to the electromagnet.

If now the rotor was in the position shown in FIG. 9, and the stator then is polarized by a brief pulse of current in proper direction to produce the polarity shown in FIG. 8, with the north poles at 126 and 128, and the south pole at 130, the rotor will flip from the position shown in FIG. 9 with the flag exposed, to the position shown in FIG. 8 with the flag concealed. The rotor remains in this concealed position unless and until a pulse of current is supplied in opposite directions to oppositely polarize the stator. Thus, if a pulse of current polarizes the stator as shown in FIG. 9, with south poles at 126 and 128 and a north pole at 130, the rotor flips from the position shown in FIG. 8 with the flag concealed, to that shown in FIG. 9 with the flag exposed, and it there remains.

It will be understood that for this operation the important thing is the change of polarization of the stator, which could be accomplished while using a single coil instead of the two coils shown in FIG. 10, by using a switching arrangement to actually reverse the direction of the current through the coil. However, the necessary wiring and switching is obviously far simpler when using a divided coil (two coils) as shown in FIG. 10.

Moreover, the circuitry is additionally simplified by assuming that in all practical cases a displayed digit may be cleared from the readout completely before displaying another digit, and in such case a common conductor may be used to clear all of the flags when the digit is to be changed. Thus in FIG. 10 the conductor 102 may be one of seven conductors for displaying any or all of the seven flags. The conductor 104, and six others like it, suggested by the connections 104', may come to the common terminal 92 previously referred to, and this may be connected by a single conductor 132 to the logic box which controls the readouts. In such case the operation will be much as previously described for FIGS. 6 and 7, except that a brief pulse of current through appropriate ones of the seven conductors is sufficient to set up the digit, which then remains displayed until a brief pulse of current sent to terminal 92 clears the entire digit (or a whole row of digits).

As so far described the readout has seven segments for the display of digits. However, it may be mentioned that the use of magnetic movements and mechanical segments, instead of lamps, is not limited to digits. FIG. 11 shows one possible array of fourteen segments instead of seven segments. By using these fourteen segments, alphabetic as well as numeric characters may be displayed. It will be understood that there are fourteen flags operated by fourteen magnetic movements with fourteen leads running to a suitable control or logic box. In addition, there is a common return, for operation as in FIGS. 6 and 7, or both a common return and a clearing conductor for operation as in FIGS. 8 and 9.

It is believed that the construction, method of assembly, and method of operation of my improved segmental readout, as well as the advantages thereof, will be apparent from the foregoing detailed description. The readout is devoid of lamps, with their problem of burn out. The magnetic movements here employed are simple, rugged, compact, and require only negligible power to operate the same. No restoring springs are needed, nor latching mechanism, the operation being wholly magnetic. The rotors are balanced, and therefore maintain position despite vibration or shock, and are not subject to breakage under such circumstances, as would be a lamp filament. The entire rotor may be and preferably is one piece of barium ferrite molded to shape, except for the flag. The operation may be based either on sustained current, or on a momentary pulse of current.

The flags may be normally exposed instead of normally concealed. The current could be normally on instead

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of normally off, to show no number. Then deenergization of some or all coils will expose the flags and show a desired number.

Other arrangements are possible, even with current normally off as at present. Thus, the flags may be black and the interior behind the windows may be white, thereby showing a white number when the flags are turned aside (concealed), instead of showing a white number when the flags are exposed. Similarly, the front panel may be white, and the flags white and normally exposed, and the interior may be black behind the windows. When the flags are turned away from the windows the black interior is exposed, thereby showing a black number on a white background.

It will be understood that while I have shown and described my invention in preferred forms, changes may be made in the structures shown, without departing from the scope of the invention as sought to be defined in the following claims. In the claims the reference to the flag being white is not intended to exclude other desired color contrast between the flag on the one hand and the front window or panel on the other. The reference to the front having elongated openings is intended to include either a true opening or a transparent material for the opening.

I claim:

1. An electrically operated variable exhibitor unit for the display of any desired one of a series of printed characters, said unit comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently energizable means for each flag to move the flag to either position, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor.

2. An electrically operated variable exhibitor unit for the display of any desired one of a series of printed characters, said unit comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently energizable means for each flag to move the flag to either position, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, said flag being

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mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, the core of said energizable means being E shaped with the center bar shorter than the top and bottom bars and with the coil of the electromagnet being disposed around the center bar between the top and bottom bars, the axis of rotation of said rotor being transverse of said bars.

3. An electrically operated variable exhibitor unit for the display of any desired one of a series of printed characters, said unit comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently energizable means for each flag to move the flag to either position, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, said electromagnet having two alternatively usable windings to magnetize the core in one polarity or the other, and said permanent magnet rotor having two approximately diametrically related north poles and two approximately diametrically related south poles angularly displaced from the north poles, whereby the flag remains in either concealed or exposed position following momentary energization of the electromagnet.

4. An electrically operated variable exhibitor unit for the display of any desired one of a series of printed characters, said unit comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently energizable means for each flag to move the flag to either position, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore and aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, said electromagnet having a single winding, and said permanent magnet rotor having a north and a south pole approximately diametrically related to the axis of rotation, whereby the rotor is self restoring to rest position when the electromagnet is not energized.

5. A variable exhibitor comprising a front window with an array of narrow elongated openings corresponding to

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line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently electrically energizable means for each flag to move the flag to either position, a casing around all of said means behind said window, and an insulation terminal board at the back of said casing with rearwardly projecting terminal pins connected to each of said means whereby the unit may be inserted or removed from the front by a single plug-in action, the parts of said assembly which are exposed through the openings, other than the flags, being black, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, the said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, each of said electromagnets having a horizontally elongated E shaped core with the center bar shorter than the top and bottom bars, said core being long and slender in horizontal direction, the coil of the electromagnet being disposed around the center bar between the top and bottom bars, and the axis of rotation of said rotor being transverse of said bars.

6. A variable exhibitor comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently electrically energizable means for each flag to move the flag to either position, a casing around all of said means behind said window, and an insulation terminal board at the back of said casing with rearwardly projecting terminal pins connected to each of said means whereby the unit may be inserted or removed from the front by a simple plug-in action, the parts of said assembly which are exposed through the openings, other than the flags, being black, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately diametrically of the axis of rotation and said opposite pole being disposed at one end of a diameter transverse to the diameter of the like poles, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates no more than 90 degrees, the said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, said electromagnet having two alternatively usable windings to magnetize the core in one polarity or the other, and said permanent magnet rotor having two approximately diametrically related north poles and two diametrically related south poles angularly displaced from the north poles, whereby the flag remains in either concealed or

exposed position following momentary energization of the electromagnet.

7. An electrically operated variable exhibitor unit for the display of any desired one of a series of printed characters, said unit comprising a front window with an array of narrow elongated openings corresponding to line-like segments needed to make up any one of a number of desired characters, narrow elongated white flags movable laterally relative to the openings to either exposed covering or concealed non-covering position, independently energizable means for each flag to move the flag to either position, each of said energizable means comprising a small-diameter permanent magnet rotor, means mounting the same immediately behind its respective opening for rotation about an axis parallel to said opening, a stationary elongated electromagnet disposed in fore-and-aft direction behind the rotor and having a core of material which may be temporarily but not permanently magnetized, said core when magnetized having two spaced poles of like polarity and a single pole of opposite polarity, said like poles being disposed approximately in the plane containing the axis of rotation and said opposite pole being disposed at one end of a di-

ameter which is transverse to the said plane, the poles of the rotor and the electromagnet being so related that when the electromagnet is energized the rotor rotates for a fraction of a revolution, said flag being mounted on the rotor and extending in the direction of the rotor axis for lateral arcuate movement with the rotor, the core of said energizable means being E shaped with the center bar shorter than the end bars and with the coil of the electromagnet being disposed around the center bar and within the end bars, the axis of rotation of said rotor being transverse of said bars.

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