July 14, 1964 M. K. TAYLOR 3,140,553

MAGNETICALLY OPERATED SIGN

Filed Aug. 21, 1961 3 Sheets-Sheet 1

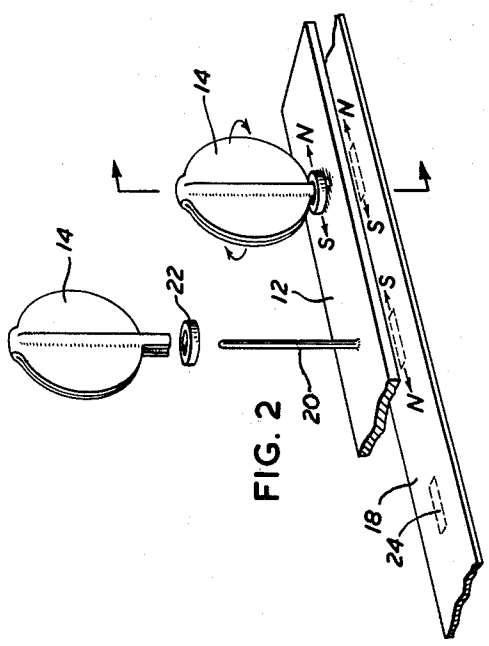


FIG. 2

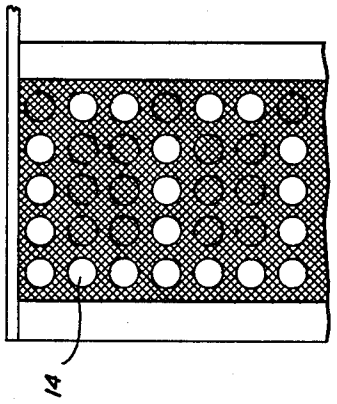


FIG. 4

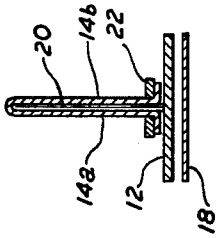


FIG. 3

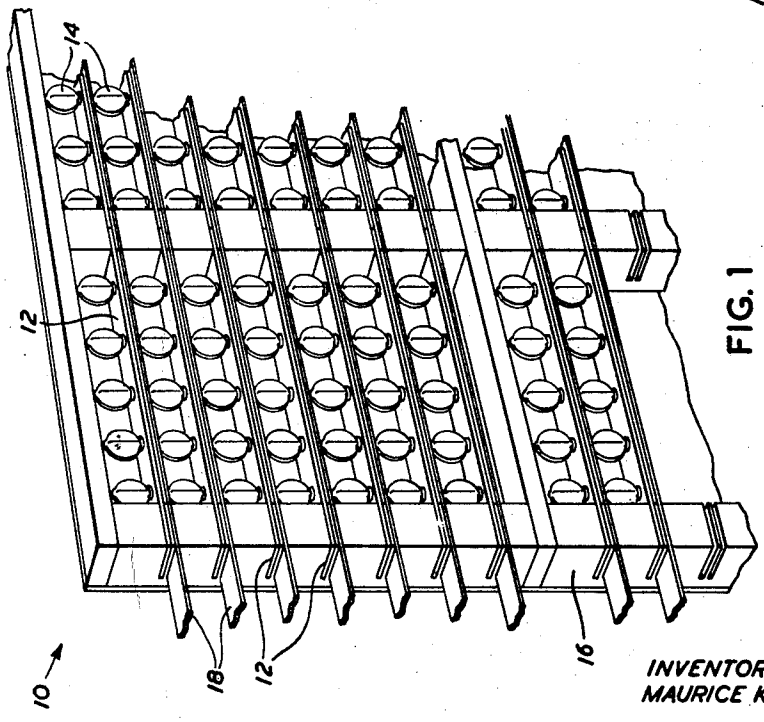


FIG. 1

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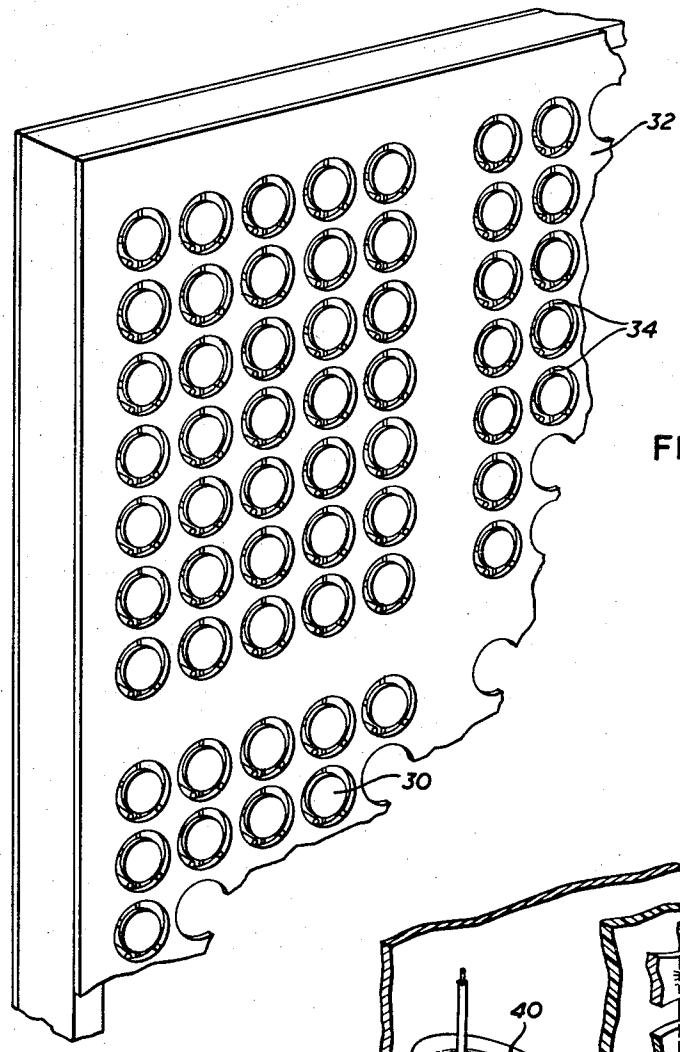


FIG. 5

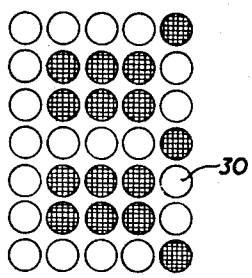


FIG. 7

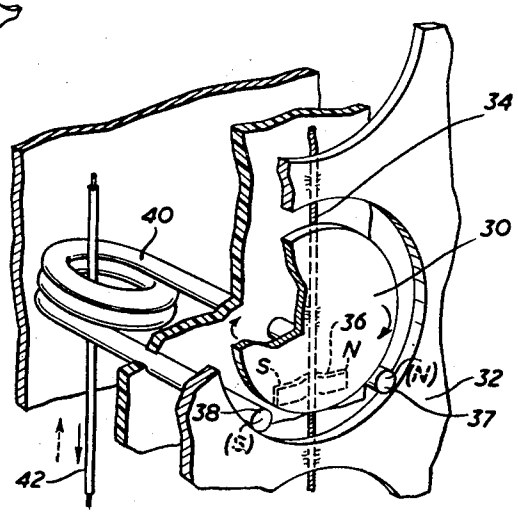


FIG. 6

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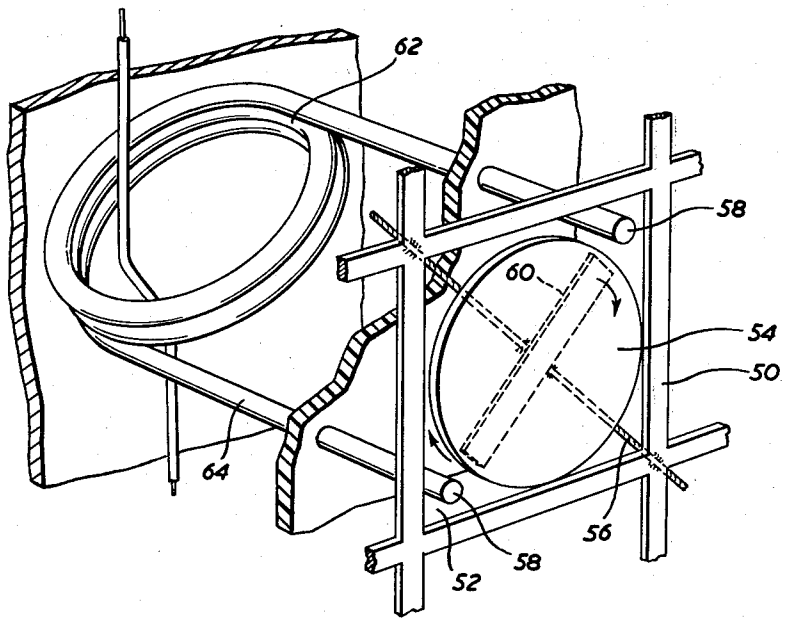


FIG. 8

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United States Patent Office 3,140,553 Patented July 14, 1964



3,140,553

# MAGNETICALLY OPERATED SIGN

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4 Claims. (Cl. 40—28)

This invention relates to a sign and the elements therefor wherein selectable characters may be formed from individually selectable indicia forming members and to a method of conveying information.

The common form of such a sign is to provide an array of electric bulbs sufficient in width and depth that they may be individually switched on or off to indicate, as a group, words, designs or characters.

Such signs have been a constant maintenance problem due to bulb failure resulting in imperfect signs and requirements for constant attention and replacement of bulbs.

It is an object of this invention to provide a sign which specifically avoids the use of bulbs and the problems associated therewith and generally provides a sign whose operation is certain, generally free of running faults and not demanding of constant maintenance.

A sign according to this invention comprises a frame within which a plurality of writing elements each having more than one face of contrasting colours is mounted for rotation about an axis of rotation to display the faces thereof as desired in a display panel. Selected ones of the contrasting faces are displayed whereby a continuous line of faces of like colour can be set amid faces of a contrasting colour to make a sign or the like in the display panel. Each of the writing elements carries a magnetic member polarized to provide north and south poles having a magnetic axis at an angle to the axis of rotation of the writing element. Means for creating a magnetic field of force of predetermined polarity with which the magnetic member of the writing elements can align to present a predetermined one of the faces of each of the elements in the elements in the display panel is provided to form the continuous line of faces of a like colour amid faces of contrasting colour as above mentioned. The invention will be clearly understood after reference to the following detailed specification read in conjunction with the drawings.

In the drawings,

FIGURE 1 shows an array of writing elements defining a part of a display panel in accordance with one embodiment of the invention;

FIGURE 2 is a perspective view of two of the writing elements, the magnetic members associated therewith and the magnetic field producing device;

FIGURE 3 is a partial cross-section of a writing element and magnetic member taken along the line 3—3 of FIGURE 2;

FIGURE 4 is a view of a part of a character produced by the array of FIGURE 1 viewed from the viewing location;

FIGURE 5 shows an array of writing elements in accordance with an alternative embodiment of the invention;

FIGURE 6 is a view of one of individual writing elements, the magnetic member associated therewith, and the field producing means of FIGURE 5;

FIGURE 7 is a view of a part of a character produced by the array of FIGURE 5 viewed from a viewing location;

FIGURE 8 is a view of an alternative mounting for the writing elements shown in the array of FIGURE 5.

In FIGURE 1 is shown a frame **10** provided with a series of horizontal shelves **12** on which are mounted



flat writing elements **14**. The opposite sides of the flat elements are of contrasting colours, for example, black and white.

The vertical side members **16** of frame **10** are horizontally slotted just below the location of each shelf **12** to allow passage beneath each shelf of a tape **18**.

Referring now to FIGURE 2, it will be seen that each shelf **12** carries a series of preferably regularly spaced upwardly projecting posts **20**. Each writing element **14** comprises a pair of flat plates **14***a*, **14***b* stamped from a single piece of sheet metal and folded about the joining strip to be parallel to one another. The inner facing surfaces are formed to provide opposed grooves which extend substantially from the junction of the plates to the diametrically opposed side of the plates. The post **20** is of small enough diameter to extend loosely up to contact what will be the top of the groove and thus support the element which is thus freely rotatable about the post. It will be seen that for conveying information through the array of elements the rotation axis should be approximately perpendicular to the line of sight.

As shown in FIGURE 2, the free sides **14***a*, **14***b* of the plate are joined by a magnetized ring **22** encircling projecting tabs thereof. The ring **22** is at least partially made of magnetic material and arranged to have a north and a south pole north and south joined by a magnetic axis extending transversely of, or in azimuth relative to, the axis of rotation of the writing element.

Tapes **18** are arranged to extend through slots in the side members **16** below each shelf in which the writing elements **14** are supported. Each tape **18** carries a magnetized area **24** polarized north and south to correspond to each writing element in the shelf **12** above so that it can be moved under the shelf **12** to a predetermined location to create a magnetic field of force under each element **14** with which the magnetic axis of the overlying magnetic ring **22** can align to present one or other of the contrasting faces of the writing elements toward the viewing location. The orientation of the magnetic areas is such as to turn the black or the white area toward the viewing location. Since the polarities of the areas are individually selected, when this has been done and the tapes are positioned beneath each shelf the elements are selectively orientated to portray, through black and white contrast the lettering or design determined by the magnetized areas on the tape. In FIGURE 4 the elements are shown portraying the letter B.

It will readily be seen that unless it is desirable to actuate two rows of elements **14** by a single tape **18**, all magnets **22** attached to elements **14** must be on the same sides thereof, i.e., all above or all below so that each magnet **22** will fall principally within the magnetic field of only one magnetic area **24**.

It will be understood that the rotatable elements could be three or more sided to have a corresponding member of alternative orientations, so that, with a tape having areas provided with as many orientations a wide variety of effects can be produced.

In FIGURES 5–8 is shown an alternative method of rotatably mounting the indicia forming elements and an alternative method for rotating them. From FIGURES 5 and 6 it will be seen that the writing elements **30** are flat and suspended in apertures in a display board **32** by a thin filament **34** (by "filament" I include "thread" or "wire") that extends diametrically across the element and attaches at each side to the board by gluing or otherwise. The filament **34** is selected to allow substantially free rotation of the element thereon without noticeable torsion effects. It will be seen that for conveying information through the array of elements to the axis of

rotation should be approximately perpendicular to the line of sight.

Attached to one side of the writing element 30 is a magnet 36 being north at one end and south at the other, the north-south axis extending flatwise of the element and transversely of, or in aximuth relative to, the rotation axis. Two poles 38 of a permanent magnet 40 extend to the space between the element 30 and the board 32 but in such a location as to be clear of the element 30 during rotation.

The permanent magnet 40 is made of a permanently magnetizable steel such as carbon or chrome steel. It must have as high a remanent flux as possible but must be easily magnetized and demagnetized.

The magnetic member 36 carried by the writing member 30 is of a material such as cuinico or cunife, vicalloy, or alcomax which is not substantially demagnetized by magnetizing flux produced by the permanent magnet 40.

In use, the polarity of the pole pieces 37 and 38 of the permanent magnet 40 are varied at will to change the direction of the magnetic field within which the magnet 36 is located whereby to cause the magnet 36 to align with the magnetic field of the permanent magnet and present one or other of the faces of the reading member 30 for view. As indicated above, these faces are of contrasting colours and by appropriate selection a sign can be made.

The polarity of the magnetization of the permanent magnet 40 is changed at will by the passage of a short pulse of current through the wire 42. If the current is passed in one direction, the polarity will be as indicated. By passing the current in the opposite direction, the opposite polarity can be achieved and the writing disc will turn through 180°. Thus it is a simple matter to permanently magnetize the wire coil 40 and set the reading element 30 according to the polarity of the magnetization. No maintaining current in the wire 42 is necessary. The sign therefore, consumes very low energy. The suspension thread 34 of the writing element 30 shown in FIGURE 6 is attached to the back of the magnetic member 36 that is carried by the reading disc 30 and is clear of the disc with the exception of the width of the magnet, whereby to obtain a long torsional length for the suspension filament. The thread is preferably of the multi-filament nylon yarn coated with flexible opaque paint to prevent the deterioration of the nylon by the action of light. Other threads, of course, may be used, such as silk, but coated nylon has proven quite suitable.

A single wire 42 may be connected through a series of loops 40, or in fact all the loops 40 in the array, to provide the correct orientation of all the elements to represent a certain symbol on energization of the wire 42. Thus as many wires 42 may be led through the loops as there are characters to portray.

In contrast, much fewer wires can be led through the loops and electrical switching means may be provided for reversing the direction of current flow in a wire rather than changing wires for each different character.

In the alternative form of the invention shown in FIGURE 8, the board is replaced by a lattice work 50 defining square spaces 52 for the writing elements 54 which remain circular. The suspension filament 56 is then extended diagonally across the space 52, providing a much longer torsion extent. There is, thus, much less chance in this embodiment of the torsion of the suspension filament 56 interfering with the operation of the device. In this embodiment, the poles 58 of the permanent magnet 62 are placed in the diametrically opposed corners of the spaces which lie between the filament attachment corners. The magnet 60 attached to the writing element 54 may be extended diametrically across the element providing for greater magnet torque.

Loop 62 may have its plane disposed diagonally relative to the spaces 52 as shown and with the diameter of the pole 58 separation. This provides a much greater



loop aperture than with the horizontally disposed loop 40 of FIGURE 2 for the passage of a greater number of energizing wires.

Modifications, will, of course, be apparent to those skilled in the art. The arrangement of FIGURE 8, for example, could be developed further by providing pillars that extend from the back plate between which the reading discs could be suspended. The pillars would lie between pairs of poles 58 of adjacent indicia on diagonals. The construction would allow for wider and higher discs that could be octagonal instead of circular for even greater area without interference by fouling on the poles or on adjacent discs.

There are various ways of using the character setting wire 42 within the scope of the invention, for example, as described above, the wire carrying a current in a given direction is threaded through the coils 40 in a direction according to whether the black or white side of the disc is to be viewed. This wire would pass through the coil of all writing elements and a separate wire would be threaded for each character or letter desired. Alternatively, one could pass the wire 42 only through those discs which are white or characters represented by that particular wire. In addition, there would be a second wire called a reset wire that would turn all discs black. By pulsing current through the reset wire prior to pulsing current through the wire representing the desired character, the black background is maintained while the desired indicia are made white. A still further way, somewhat similar to the second one, would be to have a reset wire that would achieve a particular pattern of blacks and whites. A character wiring would be provided to render white those indicia which have been reset black and which, for this particular character, should be white, and to render black certain indicia which have been reset white.

Of the three methods, the third provides the greatest economy in labour on wiring up the character wires 42. The maximum number of wires per element is never more than ½ that required by method one and the average is between ¼ to ⅓ depending upon the character designs selected for display.

What I claim as my invention is:

1. A sign comprising a frame, a plurality of writing elements each having two faces of contrasting colours, each of said writing elements being mounted in said frame for rotation about its axis of rotation to display one face of each element at a time, each of said writing elements comprising a disc, opposed faces of said disc comprising said faces, the faces of said elements being adapted to at least partially define a display panel, a magnetic member carried by each of said writing elements with its long axis substantially parallel to the plane thereof and polarized to provide north and south poles at each of its ends and having a magnetic axis at an incline to the axis of rotation of said writing element, and means associated with each of said writing elements for creating a magnetic field of force of predetermined polarity with which the magnetic axis of said magnetic member of its respective writing element can align through rotation of said writing element to present a predetermined one of said faces of each of said elements for display in said display panel, whereby a continuous line of said faces of a like colour can be set amid faces of a contrasting colour to make a sign, said means for creating a field of force of predetermined polarity comprising a coil that terminates in spaced apart pole pieces and is made of a permanently magnetizable steel and an electricity conducting wire extending through said coil for changing the polarity of said pole pieces.

2. A sign as claimed in claim 1 having means for passing current through said wire in either direction to select the polarity of said magnetizing element as aforesaid.

3. A sign as claimed in claim 1 in which said means for

creating a field of force of predetermined polarity comprises a coil that terminates in spaced apart pole pieces and is made of a permanently magnetizable steel and a plurality of electricity conducting wires extending through said coil for changing the polarity of said pole pieces.

4. A sign comprising a frame, a writing element having two display faces, said writing element being mounted in said frame for rotation about an axis of rotation to display one face at a time, said writing element comprising a disk, opposed faces of said disk comprising, said display faces, a magnetic member carried by said writing element in proximity therewith and having its magnetic axis substantially parallel to the plane of the writing element, said magnetic member being permanently magnetized to provide north and south poles substantially at each of its ends and having its magnetic axis out of alignment with the axis of rotation of said writing element, means associated with the writing element for creating a magnetic field of force of predetermined polarity with which the magnetic axis of said magnetic member can align through rotation of said writing element to present a predetermined one of said faces for display, said means for creating a magnetic field of force of predetermined polarity comprising a permanently magnetizable element having spaced apart pole pieces, said permanently magnetizable element being fixed relative to the writing element to dispose the pole pieces substantially in the plane of the disk in display position, and said magnetic member carried by the writing element being oriented thereon with its magnetic axis extending substantially parallel to the direction of field of force produced by said means when the element is in display position, and means for reversing the polarity of the magnetic field of said means associated with the writing element for creating the magnetic field of force.



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