Jan. 30, 1968 D. WINROW 3,365,824

MAGNETICALLY OPERATED DISPLAY OR INDICATING DEVICE

Filed June 1, 1966 2 Sheets-Sheet 1

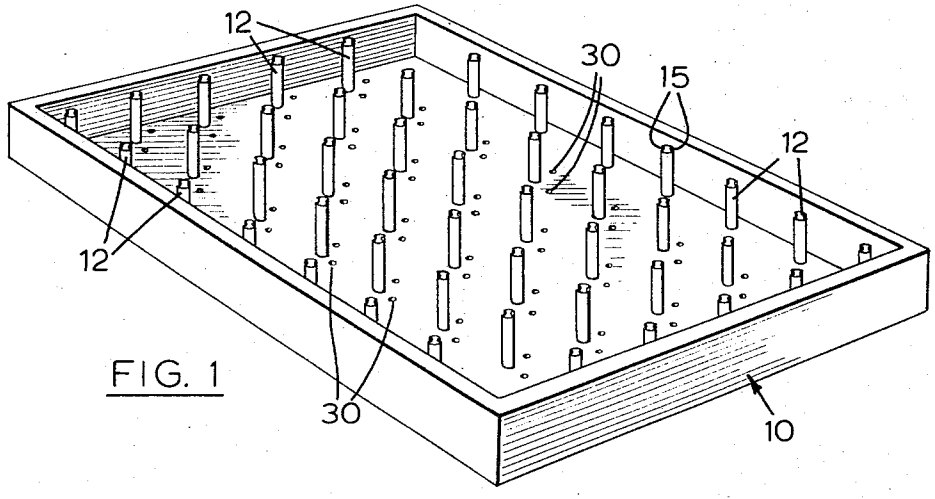


FIG. 1

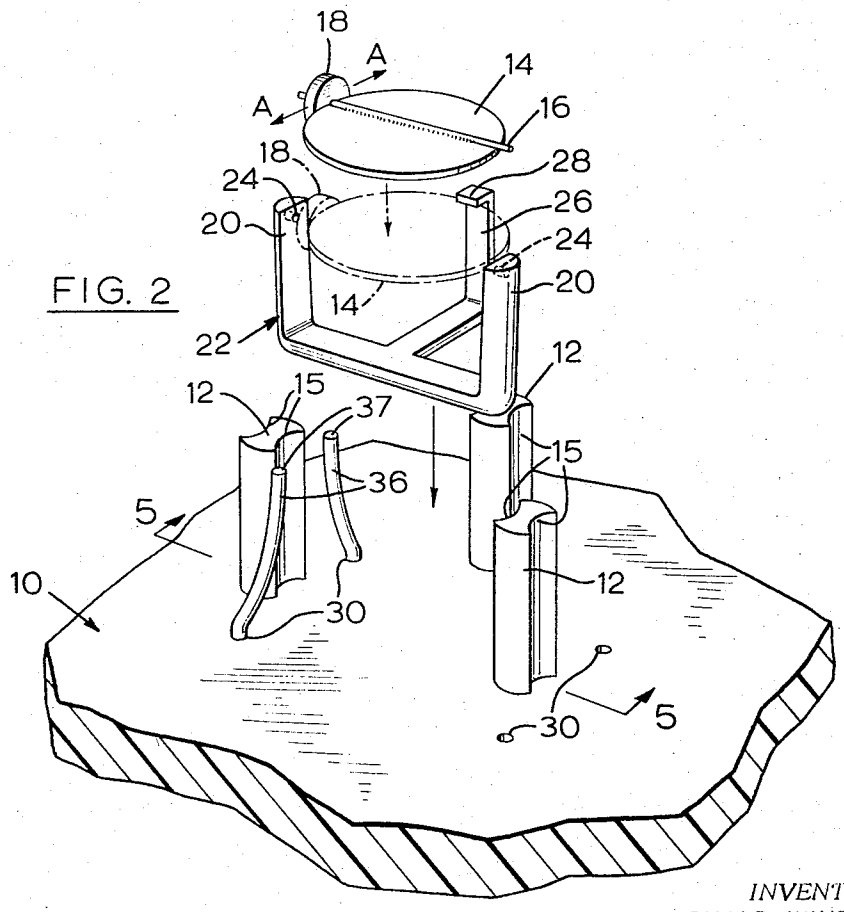


FIG. 2

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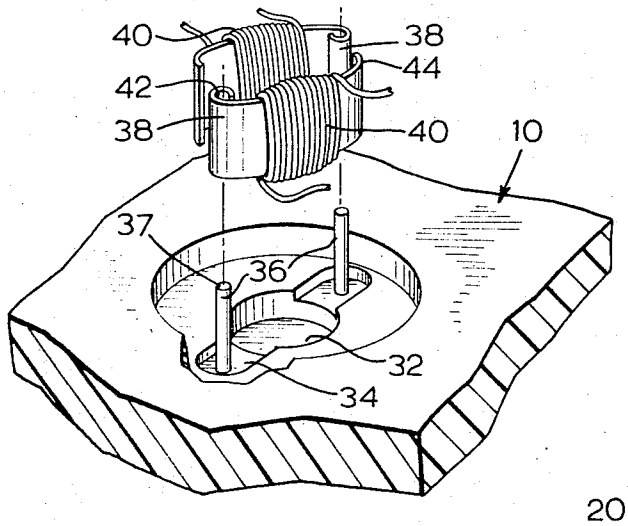


FIG. 3

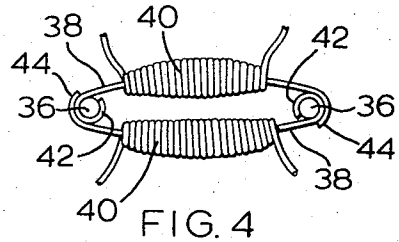


FIG. 4

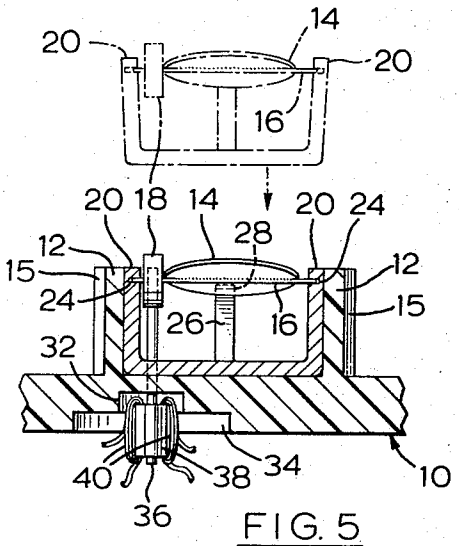


FIG. 5

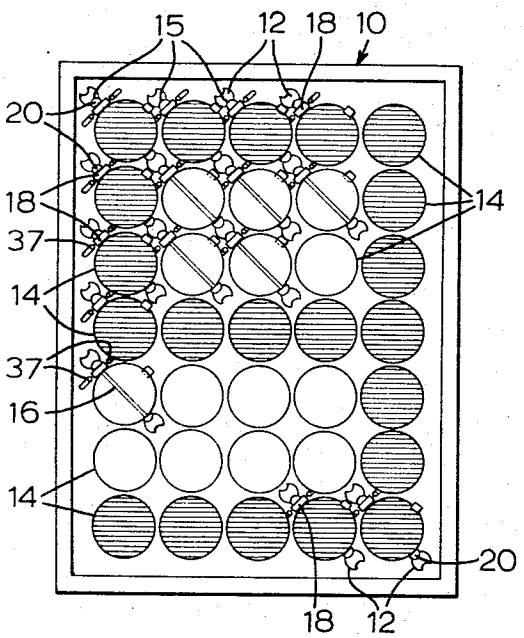


FIG. 6

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MAGNETICALLY OPERATED DISPLAY OR INDICATING DEVICE

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Continuation-in-part of application Ser. No. 342,057, Feb. 3, 1964. This application June 1, 1966, Ser. No. 554,472

10 Claims. (Cl. 40—28)

ABSTRACT OF THE DISCLOSURE

A number of magnetically actuable rotatable elements having two alternatively displayable contrasting surfaces are mounted in an array visible in a viewing direction. Rotatably mounting the elements on projections extending outwardly from a base member in the viewing direction allows for large display surfaces on the elements relative to the area of the array allocated for such elements.

This invention relates to magnetically actuated signs of the type disclosed in my United States Patent No. 3,140,553 and in my United States application 534,273, filed Feb. 14, 1966; a continuation-in-part of application 342,057, filed Feb. 3, 1964, now abandoned.

In these cases, an array of rotatably mounted elements is provided, each element carrying a magnet which defines a magnetic axis at an angle to the rotational axis, and two contrastingly colored surfaces, alternatively displayable by alternative orientations of said element. Corresponding to each element, is means, exterior thereto, for selectively providing one or another magnetic field designed to display, respectively, one or the other of said contrasting surfaces, whereby, through the combined appearance of the elements in the array, a design or indicia is displayed.

In prior designs, in accord with the above applications and patents, the element is rotatably mounted in a ring whose circumference is in the plane of the array, that is, perpendicular to the mean viewing direction. Since the ring is stationary and does not contribute to the appearance of the array, the appearance of the design or indicia displayed, is impaired by the percentage of the gross display area which is not covered by the elements.

It has been found that by replacing the ring with a pair of projections on each side of an intended element location, such projections extending generally in the viewing direction, between which a rotatable element is rotatably mounted, that the ratio of the total area of the contrasting surfaces to the gross display area, may be increased.

In a preferred embodiment of the invention: the assembly, removal and replacement of the rotatable elements, is achieved and facilitated by providing that they are individually rotatably mounted in U-shaped members, independently of the sign. The U-shaped members are then mounted on the sign, by providing for each element, two projections which are attachable to the two uprights of each U, to mount the rotatable element in the array.

In both the general and the preferred form, referred to above, an additional operational advantage is achieved from the replacement of the ring, as a means for holding the rotatable element by the posts. In view of this, if desired, the magnetic element may be located axially beside the contrasting surfaces (but rotatable therewith) and the magnetic field means may be placed in close

proximity thereto, thus producing higher magnetic torque and better operating characteristics.

FIGURE 1 is a perspective of a part of a module in accord with the invention;

FIGURE 2 shows the means for mounting one element of a module;

FIGURE 3 shows the arrangement of the means for actuating one of the elements;

FIGURE 4 is an end view of the energizing means for the pole forming members;

FIGURE 5 is a section along the lines **5—5** of FIGURE 2; and

FIGURE 6 is a front view of a 5–7 module in accord with the invention.

In the drawings a module or sub-array will be arranged to present 35 elements arranged in 5 columns and 7 rows, generally in a plane, with the direction perpendicular to the plane being considered the viewing direction. The module will be sufficient to form one letter, numeral, character or design and will with similar modules, as discussed in my Patent 3,140,553, go to make up a sign or display device. The module includes a base **10**, preferably of plastic and comprising on opposed sides of each intended element position, a projection **12** extending outwardly therefrom in the viewing direction, and preferably molded as part of the base **10**.

Although in the disclosure and the claims herein, it is set out that there are two projections for each rotatable element position, it should be realized that it does not follow that there are twice as many projections as elements. The reason is that a single projection may serve as one of the pair, corresponding to one, or usually two rotatable elements.

Preferably, in each of the projections **12**, in a direction facing the other projection corresponding to an element position, is a groove with the roots of facing grooves **15** parallel.

Each rotatable element comprises a circular disc **14** which is oppositely colored on opposite sides. The disc **14** is mounted on a pin or shaft **16** which extends along a disc diameter and projects on each side thereof. A magnet **18** is mounted on the shaft, at one side of the disc but adjacent thereto. The magnet **18** may be of any desired type to provide a magnetic polar axis at an angle to and preferably perpendicular to the pin or shaft **16** as indicated by the arrows A—A of FIGURE 2.

The pin or shaft **16** is rotatably mounted adjacent the free ends of the uprights **20** of a resilient U-shaped member **22**. The U-shaped member **22** is provided, in the mutually facing portions of such uprights, with wells **24** to receive the ends of the pin or shaft **16** and is dimensioned so that in its normal attitude, it would prevent the insertion or retraction of a disc shaft to or from such wells but wherein the uprights **20** of shaft **16** may be sprung apart to allow insertion of the ends of shaft **16** in the wells **24**, after which the uprights **20** are released to retain the shaft **16** in position. The uprights **20** are, on the sides remote from one another, shaped to be received in the grooves **15** but are, in their normal attitude, sloped outwardly as indicated in the dotted portion of FIGURE 5, to be biased inwardly by the roots of groove **15** with the bias supplying the frictional force to hold the element in position.

The above described method of removably holding the U-shaped members in position by friction, may be replaced by any other means of removably attaching the U-shaped member to the projections on the sign. However, for practicability and economy, the projections seem the best method of attaching the uprights and the frictional method seems the best method of effecting such attachment.

The U-shaped member **22** and pin or shaft **16** are so designed, that the disc **14** and shaft **16** still pivot freely (together) even when the uprights **20** are biased inwardly by the groove roots.

In preferred form of the invention, means are provided for limiting the rotation of the rotatable elements to less than 180°. Preferably this comprises a post **26** formed by a member projecting outwardly from the centre of the cross-bar of the U and perpendicular thereto, while roughly parallel to the general plane of the base, and then curving outwardly from the base in the mounted orientation of the U-shaped member to a free end having a detent **28** directed inwardly toward the intended disc position with the post **26** and detent **28** dimensioned to provide a stop preventing rotation of disc **14** thereby, in either direction. Alternatively, if desired, the post **26** with detent **28** thereon may be formed as a part of the base **10** rather than as a part of the U-shaped member **22**.

There has thus been discussed, a device wherein an array of magnetically actuable elements (discs **14**) are provided, which are adapted to produce desired indicia or designs when selectively oriented. The individual elements are, by their and the base design, easily mounted, dismounted and replaced.

Because only the discs **14**, the ends of the uprights **20** of the U-shaped member of projection **20**, and of the detent **28** appear in the array, in the viewing direction, the ratio of the area displayed by the contrasting surfaces (i.e., the sum of the disc areas) to the total area encompassed by the array, is higher than in prior signs wherein a ring about the magnetically actuable sign is located in the plane of the array. Moreover there has been provided, a sign where the disc and its U-shaped mounting member, are easily mounted, dismounted and replaced, an important factor in signs having a large number of elements.

For simplicity of illustration in FIGURE 6, some of the elements **16, 12, 20, 18, 37, 14**, etc., have been omitted from some of the thirty-five element positions, although these elements in fact appear at all positions. The arrangement of these elements is shown best in the upper three rows of the left hand three columns.

The means for actuating the magnetically actuable elements will now be described.

When viewed in the display direction, the base **10** is provided (corresponding to each magnetically actuable element) with bores **30** passing therethrough on each side (in the viewing direction) of the magnet position.

It should be noted that the line joining a pair of bores **30** does not pass through the centre of the rotatable disc, but rather (approximately) through the position (projected on the base in the viewing direction) of the magnet **18**, at an angle to and preferably perpendicular to the direction of shaft **16**.

On the side of the base **10**, remote from the array, a recess is provided for each such pair of bores. The recess comprises a deeper circular well **32** concentric with the midpoint between the bores on the remote side of the base **10** from the array. Combined with the deeper recess is a shallower oval recess **34** having its longitudinal axis extending along the line joining the bores **30** and having its periphery curving about and outwardly of each of the bores. Corresponding to each of the discs **14** are a pair of rod-like pole forming members **36**, each of which is adapted to extend through a bore **30** to project on both sides of the base **10** and to be held at position therein by any desired means. In the preferred form of the invention, such pole pieces are retained frictionally, and in addition, the bores **30** are spaced wider than the desired spacing of the poles **37** (at the array end of the members **36**) at the magnet **18** on the magnetically actuable disc **14**. Thus the rod-like members **36** are bent inwardly from the array end of bores **30** to form poles **37** at the desired spacing. Rearward of the base **10** a pair of flux permeable members **38** couple the rodlike members **36**.

These are described in detail in my copending application Ser. No. 534,273. The two flux permeable members **38** are each in the form of a "6" with the loop **42** of the "6" shaped to be received on the rod-like member **36** and the extent adjacent the free end **44** of the "6" on its concave side, shaped to clip onto a loop of the other similarly shaped element. Thus the flux permeable members **38** are provided with energizing windings **40**. They are assembled by placing the loop **42** of a flux permeable member on each pole piece, rearward of the base **10** relative to the array and clipping the concavities of each flux permeable member clip **38** about the loops of the other. The inter-clipped pairs of flux permeable members **38** are then moved into the wells with the flux permeable members **38** being received in the oval wells and the windings received in the circular well **32**.

Because of the arrangement of the mounting for the rotatable members projecting outwardly from the base it will be noted that the magnetic element **18** may be placed axially at the end of the disc **14** instead of on the disc **14** as in previous designs, thus the poles may be brought closer to the magnet, whereby better torque may be obtained.

I claim:

1. In a magnetically operated sign wherein there is provided an array of magnetically actuable elements which are rotatably mounted to provide, in two alternative orientations, contrasting surfaces; each of said magnetically actuable elements being provided with a magnetic field forming member, rotatable therewith, said elements being arranged to be selectively rotatably actuable by fields external to the element being actuated, to display one or the other of the contrasting surfaces; means for mounting said elements comprising:

a mounting base for the elements;

a pair of projections extending outwardly from said base corresponding to each of said rotatable elements;

grooves in each of such pair of projections facing the other projection of said pair and having parallel mutually opposing roots;

a U-shaped member of resilient material wherein the U-shaped uprights diverge, but are shaped to be received within said grooves with said uprights biased inwardly by the roots of said grooves;

a magnetically actuable element with contrasting sides mounted in said U-shaped member on a rotation shaft extending between said uprights to be rotatable relative to said U-shaped member when said uprights are so inwardly biased; and

means for selectively magnetically actuating said magnetically actuable elements.

2. In a magnetically operated sign wherein an array of magnetically actuable elements are rotatably mounted, to provide in two alternative orientations, contrasting surfaces; each provided with a magnetic field forming member, rotatable therewith, said elements being arranged to be selectively rotatably actuable by a field external to the element to display one or the other of the contrasting surfaces, whereby a variable display may be provided in a viewing direction relative to said array; means for mounting said elements comprising:

a mounting base for the elements;

a pair of projections extending on the viewing direction from said base arranged on opposed sides of the intended position in the array of each of said rotatable elements;

a U-shaped member of resilient material;

a magnetically actuable element with contrasting sides and a magnetic field forming member, rotatably mounted in said U-shaped member;

means co-operating between each upright of said U, and such pair of projections to provide a mounting of said uprights on said projections.

3. In a magnetically operated sign wherein an array

of magnetically actuable elements are rotatably mounted, to provide, in two alternative orientations, contrasting surfaces each provided with a magnetic field forming member, rotatable therewith, said elements being arranged to be individually selectively rotatably actuable by a field external to the element, to display one or the other of the contrasting surfaces, whereby a variable display may be provided in a viewing direction relative to said array; means for mounting said elements comprising:

a mounting base for the elements;

a pair of projections extending in the viewing direction from said base on each side of the intended position of each of said rotatable elements;

grooves in said projections running longitudinally thereof facing the other projection of said pair;

a U-shaped member, shaped so that the uprights of said U may be received in said facing grooves;

means for retaining said U-shaped member in position when said uprights are received in said grooves; and

a magnetically actuable element with contrasting sides, mounted in said U-shaped member, to be rotatable when said uprights are inwardly biased.

4. In a magnetically operated sign, wherein an array of magnetically actuable elements are rotatably mounted, to provide in two alternative orientations, contrasting surfaces each provided with a magnetic field forming member, rotatable therewith, said elements being arranged to be individually selectively rotatably actuable by a magnetic field external to the element, to display one or the other of the contrasting surfaces; means for mounting said elements, comprising:

a mounting base for the elements;

a U-shaped member;

a magnetically actuable element with contrasting sides, mounted in said U-shaped member;

means for mounting said U-shaped member with the uprights thereof projecting outwardly from said base; said magnetically actuable member being rotatably mounted in said U-shaped member when the latter is so mounted; and

means for selectively magnetically actuating said magnetically actuable elements.

5. In a magnetically operated sign, wherein there is provided an array of elements each rotatably mounted to provide, in alternative orientations, contrasting surfaces, each of said elements being provided with a magnetic field forming member rotatable therewith, said elements being arranged to be individually selectively rotatably actuable by a field, external to the element, to present one or the other of the contrasting surfaces; means for mounting said elements comprising:

a mounting base for the elements;

a pair of projections extending from said base on opposed sides of the intended position of each of said rotatable elements;

grooves in each of the pair of posts facing the other post and having parallel mutually opposing roots;

a U-shaped member of resilient material;

means for mounting said U-shaped member in said grooves; and

an element having contrasting sides mounted in said U-shaped member to pivot therein.

6. A device as claimed in claim 1, wherein a member extends outwardly from the cross-bar of the U, and outwardly beside the disc locus to provide a stop to limit rotation of the rotatable element therepast in either direction.

7. A device as claimed in claim 4 wherein a member extends outwardly from the cross-bar of the U, and outwardly beside the disc locus to provide a stop to limit rotation of the rotatable element therepast in either direction.

8. A device as claimed in claim 2 wherein a member extends outwardly from the cross-bar of the U, and outwardly besides the disc locus to provide a stop to limit rotation of the rotatable element therepast in either direction.

9. A device as claimed in claim 3 wherein a member extends outwardly from the cross-bar of the U, and outwardly beside the disc locus to provide a stop to limit rotation of the rotatable element therepast in either direction.

10. A device as claimed in claim 5 wherein a member extends outwardly from the cross-bar of the U, and outwardly beside the disc locus to provide a stop to limit rotation of the rotatable element therepast in either direction.

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