

[54] MAGNETIC DISCBOARD

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[52] U.S. Cl. **340/373, 340/378 R**

[51] Int. Cl. **G08b 5/24**

[58] Field of Search **350/373, 378 C**

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Primary Examiner—Harold I. Pitts

Attorney, Agent, or Firm—Robert B. Crouch

[57]

ABSTRACT

A magnetic display device of the type wherein magnetized discs are selectively moveable within closely spaced openings or chambers in a laminated panel, the panel including a pair of magnetized sheets with their magnetic poles similarly disposed, openings extending through both sheets, and a bipolar magnetized disc positioned within each opening for rotation and shuttle movement under the influence of a selectively applied magnetic field, and non-magnetic cover sheets secured to opposite surfaces of the magnetic sheets. A light panel is mounted on the rear surface of the laminated panel. Shuttling of the discs with a magnetic stylus from the rear, a position of rest (erase state) to the front (write state) exposes a ray of light in each chamber. The display of individual characters is achieved by the forward and rear movement of the individual discs in each chamber. When the discs are in the rear (erase state), they block the rays of light coming through the rear panel. This is easily accomplished since the diameter of the chambers in the rear is smaller than the diameter of the front chambers. However, when the discs are in the (write state) forward position, the ray of light from each chamber is free to travel to the front panel. This then presets (in the dark) a pattern of characters in the form of small dots of light.

3 Claims, 6 Drawing Figures

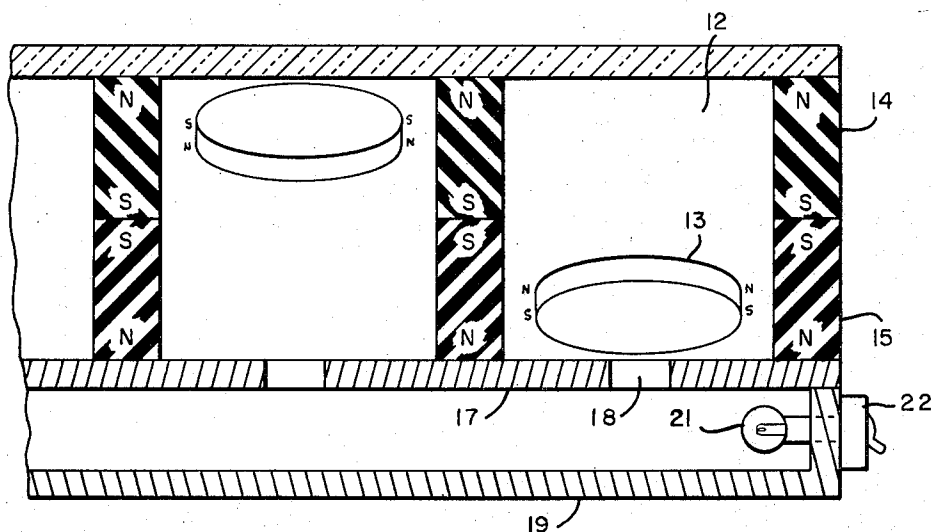


FIG. 1

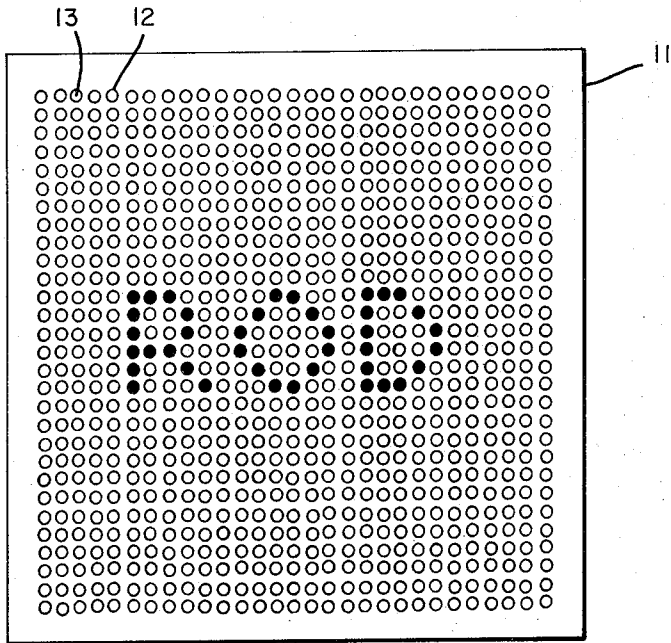


FIG. 1a

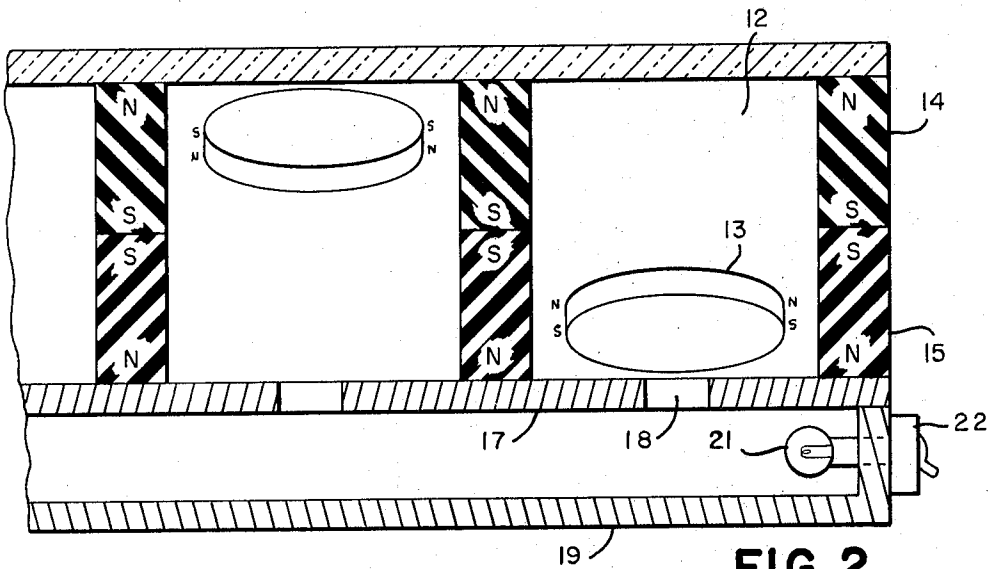
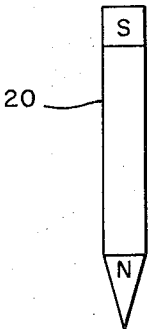


FIG. 2

MAGNETIC DISCBOARD

BACKGROUND OF THE INVENTION

This invention relates to a honeycomb magnetic display device wherein individual magnetic discs or metal slugs rotate under an electromagnetic force induced by either an external magnetic stylus or through a wire matrix.

DESCRIPTION OF PRIOR ART

Display devices, nonmagnetic, magnetic, and electromagnetic are well known in the art.

Magnetic display systems can be grouped into the following major categories:

1. Those using a magnetic stylus to bring a magnetic element into view, such as the C.R. Tate U.S. Pat. No. 3,036,388 as U.S. Pat. No. Re. 25,822 on 07/20/65, W. J. McDonald U.S. Pat. No. 3,103,751, J. R. Herzog U.S. Pat. No. 2,853,830, and R. P. Dingwall U.S. Pat. No. 3,426,453.
2. Those using electromagnetic force to rotate and display a magnetic slug, such as: J. R. Knight U.S. Pat. No. 3,036,300, J. M. Cunnen, U.S. Pat. No. 3,162,849, and M. K. Taylor U.S. Pat. No. 3,140,553.
3. Those using magnetic stylus or electronic circuitry to open or close a chamber to show light, such as: J. H. Todt U.S. Pat. No. 3,186,115, and C. W. Jacob U.S. Pat. No. 3,210,757.

The foregoing advantages and features of this invention will be more apparent with the detailed description of its working principles and its fabrication techniques as illustrated in the accompanying illustrations.

ILLUSTRATIONS

FIG. 1 is a plan view of the magnetic discboard

FIG. 1a is the magnetic stylus.

FIG. 2 is an elevation view in section of a preferred embodiment of the present invention.

FIG. 3 is an exploded view in perspective of another embodiment of the invention showing its three functional layers, covers and a panel of rear light.

FIG. 4 is a cross section of the embodiment of FIG. 3

FIG. 5 is further embodiment of a monomagnetic device with a plurality of cavities instead of holes.

FIG. 1 shows a honeycomb section 11 formed from a permanently magnetized laminated board provided with a multiplicity of openings 12 and covered with a transparent lamina and attached to a panel of light. Each opening or chamber 12 contains a magnetic disc 13 with contrastingly colored faces. Since as illustrated in FIG. 2 the brightly colored faces of the magnetic discs are opposite in polarity (South) to the outer surface of the upper magnetic layer (North) and to the outer surface of the lower magnetic layer (North), it is possible, with the aid of a magnetic stylus (write side=North pole) to display alphanumeric characters on the face of this magnetic discboard. As the magnetic stylus is passed over the board, the individual discs shuttle and rotate forward to present their brightly colored faces to view. This presents a uniform and reliable row of characters. In FIG. 1, the characters are formed by discs (13) displaying their brightly colored faces in the write position, while all other discs are in the rear (erase) position showing their dark faces to the viewer. These characters ("T" and "R") in ambient light ap-

pear as white dots against a dark background. However, in the dark, with the rear panel light switched on, these same characters appear as dots of light against a dark background. FIG. 2 shows a cross-sectional view of a preferred embodiment of a disc board wherein the honeycomb section is formed from two magnetized sheets 14 and 15 positioned adjacent each other with similar magnetic poles in proximity with each other. A series of openings 12 extends through both magnetized sheets and a bipolar disc 13 is positioned in each opening. A non-magnetic transparent cover sheet 16 is positioned on the outer surface of the lower sheet 15. The backing sheet is formed of non-magnetic, opaque material and is provided with a series of openings 18, each of which is smaller in diameter than and positioned in line with an opening 12. A light panel which includes a cover 19, a source of light such as bulb 21, and a switch 22 is attached to the outer surface of the backing sheet. When the light is on and the disc in the erase position, the opening 18 is blocked by the disc and no light is transmitted therethrough. When the disc is in its write position, the opening 18 is clear and light is transmitted through openings 18 and 12, around disc 13 and through cover sheet 16.

FIG. 3 shows two different layers of magnetic material 24 and 25 sandwiched to the wire matrix 23, whose vertical coordinates 32 and horizontal coordinates 31 permit electrical sensing of one disc at a time or a whole row of discs at one time. This wire matrix could be replaced with printed circuitry, one coordinate on each of the inner surfaces of magnetic layers 24 and 25. Significantly, it is important to point out that opening 13 in layer 24 is equal in diameter to the diameter of opening in the spacer matrix. However, these diameters are larger than the diameter of opening 29 in layer 25. Now, since discs 33 are equal in diameter, it is easy to see that with the aid of a magnetic stylus, 20, disc 33 in FIG. 4 with its S-pole facing the N-pole of layer 25 can be shuttled and rotated to face cover 26, showing its brightly colored face to the viewer. When, disc 33 is in the write state it permits the light to come through chamber 14 from the back light panel 19. In this position, disc 33 is in a latching position with its N-pole facing the S-pole of magnetic layer 24, while its S-pole is attracted and held in position (flush against the transparent cover 26) by the N-pole of magnetic layer 24.

Once again, by using the S-pole of magnetic stylus 20, we can erase and shuttle disc. In this position, as it is clear from the illustration (FIG. 4), disc 33 covers and blocks chamber 13, thereby preventing any light to pass through. This is the erase state. In this position, the n-pole of disc 33 faces the S-pole of the upper magnetic layer 24, while its S-pole rests on the N-pole of magnetic layer 25. BOTH positions are stable and reliable.

Writing or erasing of discs (characters), is easily accomplished by a magnetic stylus 20. It is quite apparent that this invention can be used in the dark and in ambient light very effectively. As can be seen from the illustration, unlike previous magnetic displays, this invention is easily fabricable and quite economical. The fabrication technique of this device itself constitutes one of the claims of this invention.

FIG. 5 shows an embodiment in which openings 36 are drilled or otherwise formed in a magnetized sheet 35 to form a series of chambers in which are located

the bipolar discs 37. A transparent cover sheet 38 is placed on the upper surface of the sheet 35 to close the openings and contain the discs therein.

FABRICATION TECHNIQUES

The magnetic layer is formed barium ferrite ($\text{BaFe}_{12}\text{O}_{19}$) powder mixed with polyvinyl material in a quantity of a minimum of 25 percent by weight and is produced in roll form, 9 inches wide and 20 mils thick. This can be laminated to a 30 mil, nonmagnetic, spacer (or prefabricated wire matrix) in the manner shown in the illustration; that is, the S-pole of the magnetic layer is laminated to the spacer. This lamina is punched with a pattern of holes (100 mils center to center, 10 holes to a linear inch) whose diameter is 75 mils. After this, another sheet of the same magnetic material (9 inches by 20 mils thick,) is laminated to the first lamina with its N-pole facing the spacer. After this has been completed, a transparent cover, 10 mils thick, is laminated to the outer surface of the magnetic layer. Now, this new lamina is put under another die and punch unit with 50-mil diameter pins. The lamina is punched with the magnetic layer on top of the device. This not only provides smaller holes than the magnetic layer and spacer but, *most important and highly innovative*, it leaves the cut-outs (magnetic discs 20 mils thick and 50 mils in diameter) right in the lamina. Thus, in one operation, we have fabricated and assembled our magnetic elements into the display board. It is assumed here that before laminating the second layer of magnetic material to spacer, one side (South pole) of magnetic layer is appropriately coated with a bright color, preferably white, to contrast with the black color of magnetic layer.

It is important to note that this technique provides no waste material. In addition, no magnetic elements (discs) are lost or distorted.

After the lower magnetic layer has been punched and the discs are all in their respective chambers, another transparent cover is laminated to the outer surface of magnetic layer. This essentially completes the fabrication techniques of the current invention. However, it is important to attach a simple panel of electric light to the back of transparent cover.

What is claimed is:

1. A magnetic display device including a pair of magnetized sheets positioned parallel to each other with their magnetic poles similarly disposed, a series of spaced openings extending through each of said sheets, a bipolar magnetic disc positioned within each opening for rotation about a lateral axis of the opening and movement along the longitudinal axis of the opening, and a nonmagnetic cover sheet secured to each magnetized sheet, the cover sheet secured to one magnetized sheet being transparent while the cover sheet secured to the other magnetized sheet is rigid and is provided with a series of holes smaller in diameter than said discs, the holes being aligned with the openings.
2. The display device of claim 1, where a panel of electric light with a simple switch is laminated to the back of the display, thereby making it possible to use it in the dark as a pattern of alphanumeric characters written in lights.
3. Magnetic display device of claim 1, wherein the rigid cover sheet is made of steel making the device more durable and stable and, hence, acceptable for use in public schools as a replacement for the chalkboard.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,825,927 Dated July 23, 1974

Inventor(s) Renold R. Passien

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Sheet 2 of the drawings should appear as shown on the attached sheet.

Signed and sealed this 19th day of November 1974.

(SEAL)

Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

PATENTED JUL 23 1974

3,825,927

SHEET 2 OF 2

FIG. 3

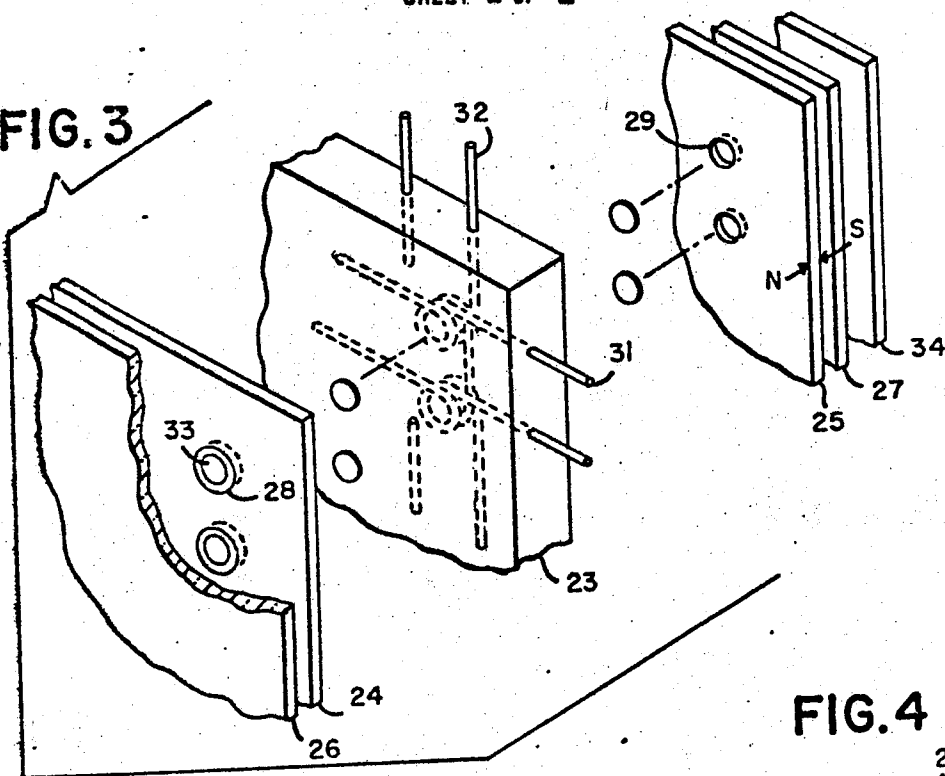


FIG. 4

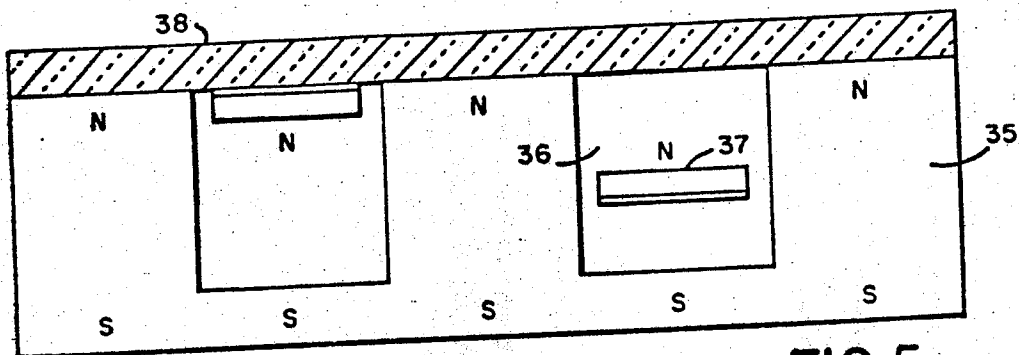
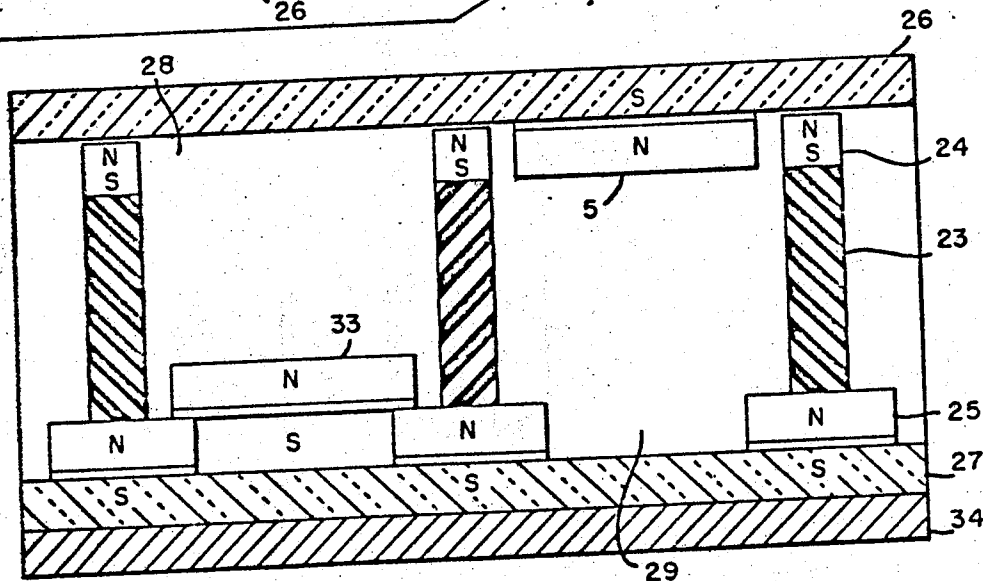


FIG. 5