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[54] VISUAL DISPLAY BOARD

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[21] Appl. No.: **255,787**

Related U.S. Application Data

[63] Substitute for Ser. No. 867,271, Oct. 17, 1969, abandoned.

[52] **U.S. Cl.** ..... **40/28 C**, 35/66

[51] **Int. Cl.** **G09f 11/00**

[58] **Field of Search** ..... 40/28 C, 37; 35/66

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[57] **ABSTRACT**

A visual display device with a multi-apertured front side. The apertures are the forward ends of a plurality of passages in the visual display board in which a plurality of respective movable members cause a character to be displayed responsive to the positions of the movable members.

2 Claims, 10 Drawing Figures

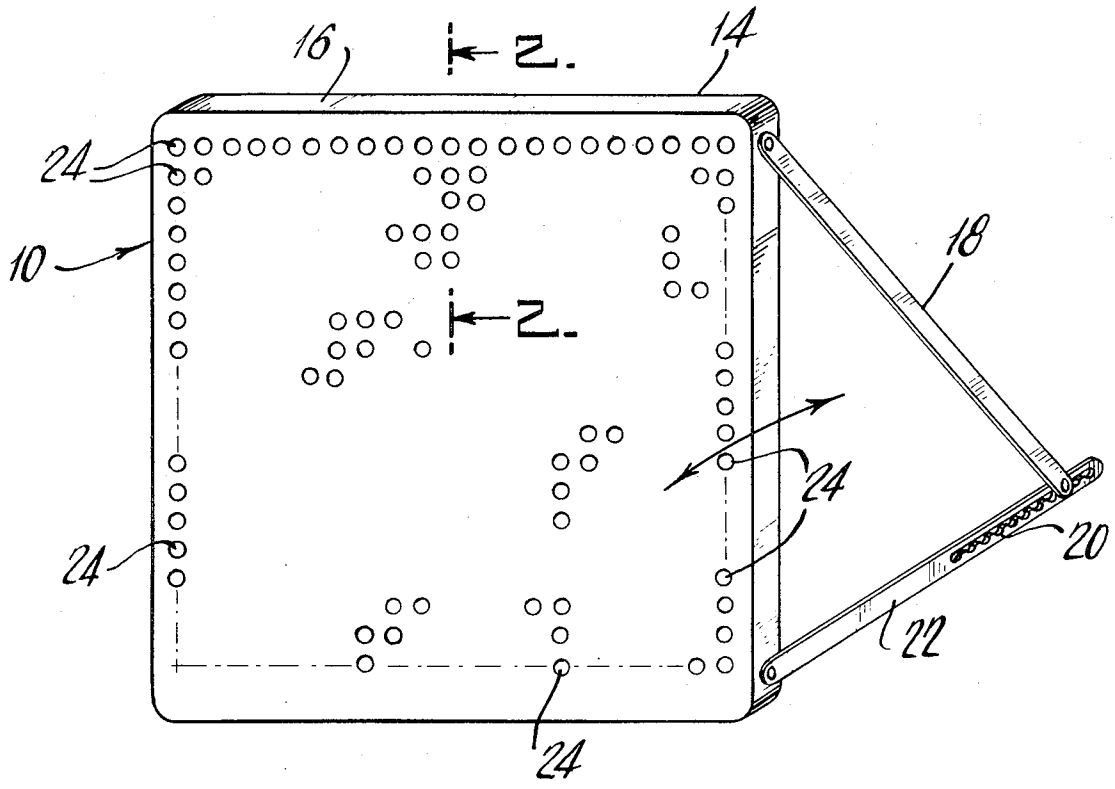


Fig. 1.

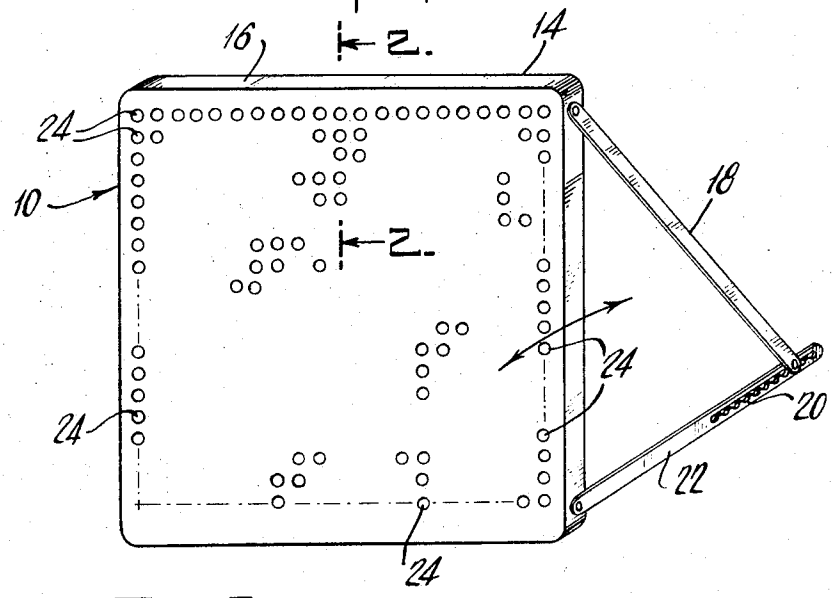


Fig. 2.

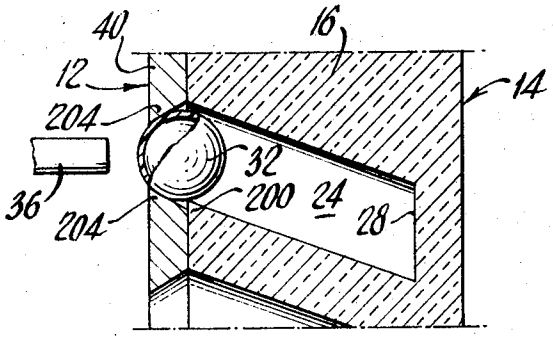


Fig. 3.

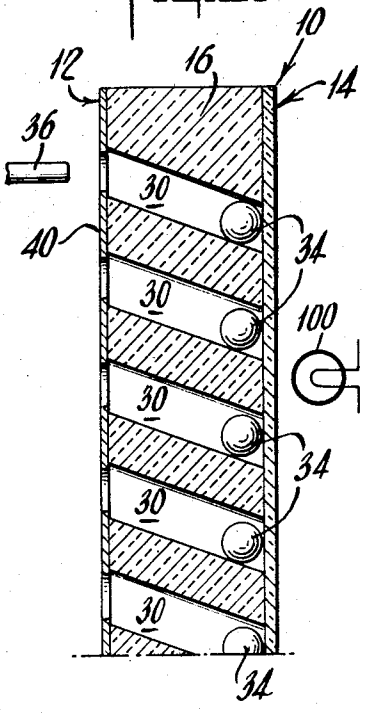
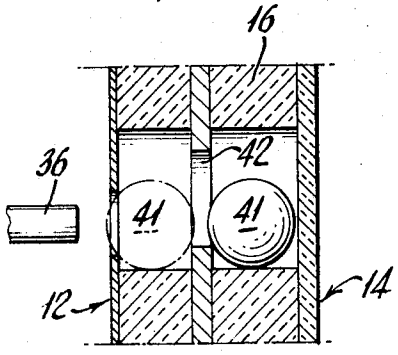


Fig. 4.



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Fig. 5.

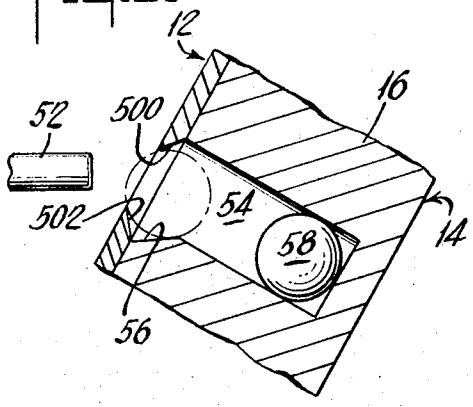


Fig. 6.

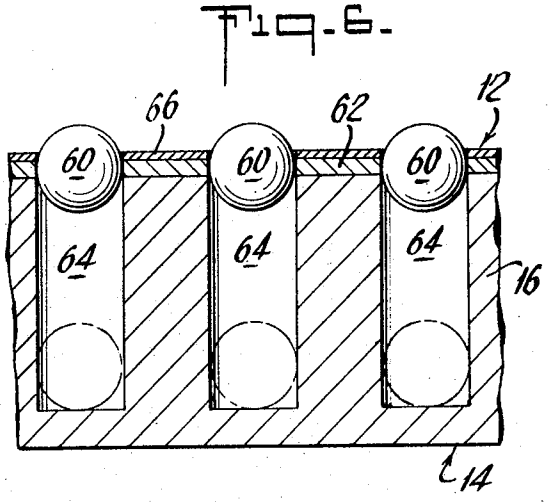


Fig. 7.

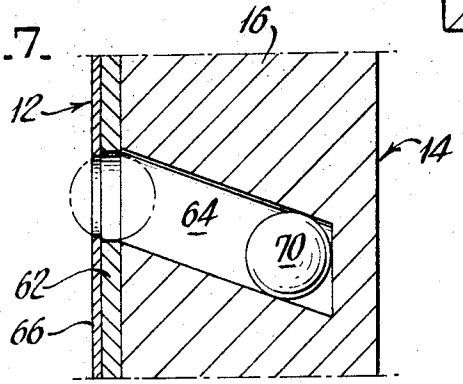


Fig. 8.

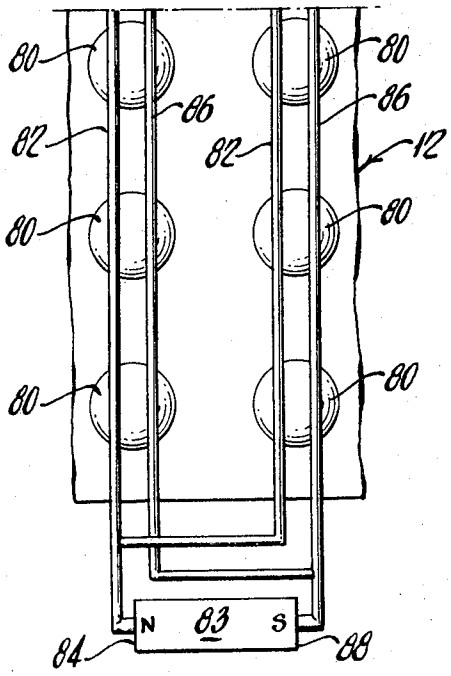


Fig. 9.

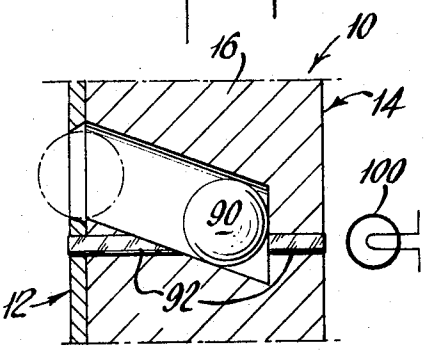
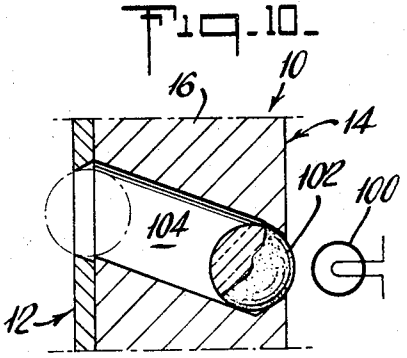


Fig. 10.



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VISUAL DISPLAY BOARD

BACKGROUND OF THE INVENTION

The present invention relates to a visual display device, and more particularly, to a multi-apertured display device.

Visual display devices find wide conventional use when a series of characters or messages are to be visually displayed. These devices may sit on a desk in a horizontal, vertical, or angular position or may be larger in size and used as a blackboard. Display devices are also used as novelty items, and find wide application in educational and industrial institutions.

Prior art display devices tend to be cumbersome and complex in nature and frequently difficult to operate. One type of more modern visual display device has a matrix array of passages containing a ball in each passage which is moved from a non-visible to a visible position by fluid action directed at the balls. Control valves are utilized with the passages whereby successive selected groups of the valves are operated to displace successive groups of the balls to visible positions defining successive characters. However, these fluid or air-actuated devices are relatively expensive and incur operating difficulties. Further, these devices are frequently not operated by writing on the display board, but by writing on an auxiliary writing board. Such an arrangement is cumbersome in nature.

An object of the present invention is to provide an improved visual display device.

Another object of the present invention is to provide a visual display device which is relatively simple in construction.

Still another object of the present invention is to provide a visual display device which is relatively simple to operate.

Another object of the present invention is to provide a display device in which the characters are displayed by writing on the display surface.

Still another object of the present invention is to provide a relatively simple writing instrument which will cause a series of characters or messages to be displayed.

Another object of the present invention is to provide a visual display device which is relatively sturdy.

Still another object of the present invention is to provide a relatively inexpensive visual display device.

Another object of the present invention is to provide a fairly attractive visual display device.

Still another object of the present invention is to provide a display device which may be disposed in either a horizontal, vertical, or angular position.

Another object of the present invention is to provide a visual display device in which the characters or messages to be displayed are easily seen.

Still another object of the present invention is to provide a visual display device comprising a matrix array of passages with movable members therein, but not utilizing fluid or air pressure to move these members.

Another object of the present invention is to provide a visual display device comprising a matrix array of passages.

In accordance with a feature of the present invention, the movable members are magnetically attractable and the activator or writing member is magnetized and attracts the movable members from a rearward to a forward position when the activator member is brought to the front of the display plane. In this manner, as the operator moves the writing member or magnet, a message or figure is traced.

As another feature of the present invention, the movable members may initially be located in the forward positions and may be pushed backward from those positions, with the aid of gravity, by use of a suitable activator member such as a common writing pencil. This feature is significant in view of availability of such writing members.

In accordance with still another feature of the present invention, the movable member will be held and fixed in either its forward or rearward position. This may be accomplished in accordance with several principles of the present invention. The forward end of the passage may be constructed so as to permit the movable member or ball to just pass over a retaining edge and rest against a pair of lips defined on the front surface of the display. In accordance with still another embodiment of the present invention, a bevel type arrangement may be utilized where the bottom portion of the front end of the passage will have the movable member or ball rest on the beveled edge.

Still other embodiments illustrate the principles of the present invention. A perforated multi-apertured magnetic sheet may overlay the display plane with the apertures aligned with the front ends of the plurality of passages. These magnetically attractable movable members or balls, when brought from their rearward to their forward position, will be held there by the magnetic attraction between the sheet and balls.

In still another embodiment of the present invention, two sets of strips are affixed to the display plane with the sets of strips overlapping the forward ends of the passages, and separated from each other by slightly less than the diameter of the movable ball so that both contact the ball when in its forward position. One set of strips is connected to a North pole while the other set of strips is connected to a South pole, and when the magnetically attracted ball is brought to its forward position, it will be held between the two magnetized strips.

Still another embodiment of the present invention which maintains the ball in its forward position, comprises a hurdle located in the passage which is jumped by the ball when brought to its forward position. The hurdle acts as a backstop preventing the ball from sliding back to its rearward position. Other arrangements may be devised by those skilled in the art to permit the ball or movable member to be held in both its forward and rearward positions.

The initial position of the balls may be either forward or rearward. When rearward, the passage may preferably be displaced in a downward or somewhat vertical direction so that the force of gravity maintains the ball in the rearward position. The magnetically attractable ball may be then drawn to its forward position by a suitable magnetic writing member abutting the front of the display plane.

After a character is displayed, the movable members may be reset to their initial position. When the movable members initially are at their rearward positions and are drawn to the front by a magnetic writing member, they may be returned to their original position by either

physically pushing each back; by a magnet placed at the back or rear of the display device to attract the balls to the rearward positions; or by physically tilting the display device causing the balls to fall back to their initial rearward position.

In still other embodiments of the present invention, the initial positions of the balls are forward and they are pushed or repelled to the rearward position selectively by a properly operated writing member. In order to reset the display device, the balls are brought forward by tilting the display device; or magnetically attracting the balls to their forward positions.

In accordance with the principles of the present invention, the display plane may be either horizontally, vertically or angularly disposed without affecting the effectiveness of the present display device. This versatility is extremely desirable, and the display device may be mounted in a type of holder which permits the display plane to be disposed in any desirable direction.

As still another feature of the present invention, the character, message, or figure written may be easily displayed. The display surface may be of one color and the balls of another, which when attracted to the front surface clearly shows the character displayed. Further, when the balls are reset from the forward position to a rearward position, the passages themselves may be of a color which contrasts with the color of the display plane thus providing another method of displaying the written character. Still other embodiments will be described in more detail in the following detailed description.

Another feature of the present invention relates to the use of a light source located at the rear of the display device which is associated with the relative positions of the movable balls and will project the character, message, or figure written. Suitable materials used for the rear and front sides and body of the display device and for the movable balls will enable the written characters to be displayed.

Still another feature of the present invention relates to the ease with which a complete character may be printed on the front of the display device. A magnetic character or message may be placed on the display plane thereby drawing selected magnetically attractable movable balls to the display plane to display the message. The display device may be used time and again without deterioration in its quality of performance nor in the quality of character or symbol described.

FIGURES

FIG. **1** is a front perspective view of the display device of the present invention.

FIG. **2** is a partial cross-sectional view through lines **2—2** of FIG. **1** showing an embodiment of the present invention.

FIGS. **3–5** and **7–10** are partial cross-sectional views similar to FIG. **2** showing additional embodiments of the present invention.

FIG. **6** is a cross-sectional view of the display device shown in FIG. **1** when in a horizontal direction.

DETAILED DESCRIPTION

For the sake of clarity, the present invention presents a number of features and embodiments which may be utilized independently or in conjunction with the others. It has been estimated that the total number of combinations and permutations presented by the various embodiments of the present invention amount to well over 1,000. It may thus be understood that a detailed description of all these embodiments is clearly impractical and impossible. Thus, the specific embodiments and features will be described, some in conjunction with others and some independently. It is to be understood, of course, that where embodiments are not shown together but are capable of being utilized together, they are intended to so be and to be included in the description of this invention.

As described above, and in accordance with the principles of the present invention, several embodiments for a visual display device are set forth. A display device **10** has a front side **12**, a rear side **14**, and a body **16**. The body may be constructed of any convenient material, such as plastic, glass, or any other suitable non-magnetic material, and need be modified only as suggested in various embodiments to be described. In fact, where magnetic principles are not employed, the body **16** can be a combination of suitable metals. One end of a support arm **18** is attached to and pivoted about the top portion of the rear side of the display device **10** while the other end is connected in a notched slot **20** permitting that end of the arm to slide and rest in any of the slot positions enabling the display device to be disposed in the corresponding direction. Slot **20** is formed on a base support member **22** having one end pivotally connected to the lower portion of the rear side **14**. The base support member **22** is placed on a table or on a floor depending upon the size of the display device utilized.

A matrix array of apertures illustratively numbered **24** enables a figure, curve, character, or message to be written and displayed on the display plane which forms part of the front side **12** of the display device **10**. The matrix array of apertures **24** is actually the matrix array of the forward ends of a plurality of passages or recesses disposed from the front side **12** towards the rear side **14** of display device. In several embodiments, the passages extend from the front to the rear sides, while, in others, the passages do not pass through the entire body **16** and will be recessed. FIGS. **2** and **3** illustrate these two variations, where in FIG. **2** a passage is shown having its forward end **26** located at the front side **12** of the display device and its rearward end **28** recessed from the forward end **26**. In FIG. **3**, the passage **30** traverses the entire body **16** of the display device from the front side **12** to the rear side **14**.

While FIGS. **2** and **3** present a vertical orientation for the display device, it is to be understood that other orientations are contemplated by the present invention. In particular, in FIG. **5**, the display device rests at an angle, while in FIG. **6**, the display surface rests in the horizontal plane. These figures will be described in further detail hereinafter.

In accordance with the principles of the present invention, a movable member is located in each passage illustratively numbered as **32** in FIG. **2** and **34** in FIG. **3**. These movable members preferably are balls or cylindrical structures. As a feature of the present invention, ball **32**, which is illustrative of the movable members shown in the other figures of the present invention,

may comprise a magnetically attractable material such as iron or iron filled plastic with or without a plastic coating. The rest position for ball **34**, as shown in FIG. **3**, is at its rearward position. It remains there due to the force of gravity because of the angular displacement of the passages **30**. When "writing" with the embodiment of FIG. **3**, an activator member **36**, which is magnetized, is brought in front of the front side **12** of the display device **10**, and the balls **34** will be attracted to it. The balls attracted will be selected and dependent upon the position of writing member **36**. Thus, as member **36** is moved along the front side **12** of the display device **10**, its motion will be traced by the movement of balls **34** attracted from the rearward to their forward positions.

This writing or tracing action may be accomplished by several alternative embodiments of the present invention. For example, the front side **12** may be made of an opaque material **40** having a first color. The balls **34** are also opaque and of a second color which preferably contrasts with the color of opaque material **40**. Thus, as the activating member **36** writes on the display surface, selective balls are brought forward and will protrude through the apertures out of the front surface **12** and trace out the motion of magnetic writing member **36**. In this embodiment, the magnetic attraction between writing member **36** and balls **34** causes the movable balls to change their positions from the rearward to the forward position.

As still another embodiment of the present invention, the above-described tracing may be accomplished by several other methods. For example, in FIG. **2**, the ball **32** normally rests in its forward position. The ball **32** is physically pushed from its forward position by non-magnetic writing member **36**. As may be clearly understood, as the writing member **36** is moved across the front surface of the display plane **12**, the corresponding balls move from their forward to their rearward positions. If the balls and the front surface are of the same color while the walls of the passage **24** are of a contrasting color, the motion of writing member **36** will easily be seen when the balls are displaced from their forward positions.

In FIG. **5**, the operation is similar to FIG. **2** with the exception that the display surface is tilted. Thus, a protruding ball is in its forward rest position. Preferably, it is not of a magnetically attractable material and is displaced from its forward position by pushing writing member **52** against the protruding portion of the ball. In this case, ball **50** may be the same color as the front surface **12** of the display device, and when moved from its forward to its rearward position, the visible walls of a passage **54**, which are a different color, trace the path of writing member **52**. Provision of such non-magnetically attractable ball and non-magnetized writing member **52** is desirable where the economics of manufacture are of prime consideration. Clearly, a pencil or common pen could be utilized to accomplish the desired writing action with the non-magnetic parts.

In accordance with still another embodiment of the present invention, the motion of the writing member may be traced by using a suitable light source **100** shown in FIGS. **3**, **9** and **10**. Thus, in the embodiment of FIG. **3**, the front surface **12** is made of an opaque material as is ball **34**. The rear side **14** and body **16** are made of a transparent or translucent type material such that when ball **34** is in a rearward resting position, light will shine through the aperture at the forward end of passage **30**. When the magnetic writing member **36** attracts ball **34** from its rearward to its forward position, light will be blocked from passing through the forward end (aperture) of the passage **30**. In this manner, as light is blocked from passing through selected apertures in the matrix array on the display surface **12** of the present invention, the motion of magnetic writing member **36** will be traced.

Light may also be displayed when the ball is in its forward position at the forward end of the passage. FIG. **9** illustrates this embodiment in which a fiber optic element **92** is disposed between the front side **12** and rear side **14**. When ball **90** is at the rearward position, the light passing through the fiber optic element **92** will be blocked (if ball **90** is made of an opaque material). When ball **90** is attracted to the front display surface **12** of the display device **10**, ball **90** will be removed from the fiber optic light path and light will pass through the fiber optic element **92** and project to the front display surface **12**. When ball **90** is fabricated of the same color material as the front display surface **12**, the array of lit fiber optic elements will trace the motion of the magnetic writing member which draws ball **90** from its rearward to its forward position.

Still another embodiment of "writing with light" is shown in FIG. **10** in which a transparent or translucent ball **102**, which is made of glass or plastic having a ferrite inclusion, is located at its rearward position and protrudes from the rear side **14** of the display device. The body **16** is made of a flat black type material, and the source of light **100** located behind the rear side **14** will not be reflected through the forward end of passage **104**. Use of flat black material for the body **16** prevents the reflection of light along the passage **104** due to its poor light reflecting properties. When a ball is attracted to its forward position by means of a magnetic writing member, as described previously, light travels up the passage **104** and is dispersed by the ball **102** thereby being visible from the front of the display board. In this manner, as the magnetic writing member, (which draws the balls of their forward position) is moved; its path of movement is traced.

In FIG. **2**, there is illustrated one technique for retaining balls in the forward position (either as an initial rest position or a temporary display position). Thus a retaining edge **200** is located at the bottom of the forward end of passage **24** and is so placed that the center of gravity of the balls **32** will pass to the left of edge **200** and be retained by means of lips **202** and **204** projecting in the apertures at the forward end of the passages. Other embodiments for maintaining the ball in the forward position (either as the initial rest position, or as the temporary display position) are described hereinafter.

In FIG. **4**, the ball **41** when moving from its rearward to its forward position will jump over a hurdle member **42** which is embedded in the body **16** of the display device and projects into the passage. After the ball **41** has jumped the hurdle **42**, a portion of the ball protrudes through the front side **12** of the display device while the rear side of the ball rests against hur-

dle 42. In FIG. 5, a bevel type depression 56 is made at the bottom of the forward end of passage 54 and will hold ball 58 while in its forward position. Further, lips 500 and 502 located at the forward end of the passages and projecting in and partially across the apertures also hold ball 58 in its forward position.

FIGS. 6 and 7 illustrate still another embodiment of the principles of the present invention in which the balls 60 and 70, respectively, are held in their forward positions. In FIG. 6, the forward position is up while the rearward position is down, since the board is illustratively shown displaced in a horizontal direction. A perforated magnetic sheet 62, having apertures therein which align with the forward ends of passages 64, is placed over the front side 12. A thin non-magnetic facing material 66 which provides the desired color for the front side 12 is then placed over the perforated magnetic sheet 62. The non-magnetic facing 66 also has a plurality of apertures which also align with the front end of passages 64 and the apertures of the magnetic sheet 62. When magnetically attractable balls 60 and 70 are brought from their rearward to their forward positions, by a magnetic "writing" instrument, the magnetic sheet 62 maintains them in their forward position.

In FIG. 8, the balls 80 are held in their forward position by means of two sets of strips 82 and 86 spaced apart on the front side 12. The spacing between the sets of strips is less than the diameter of the balls and apertures so as to insure that the ball physically abuts against both the strips. One set of strips 82, which is a magnetically conducting material, is connected to a North side 84 of a magnet 83, while the other set of strips 86, similarly fabricated of magnetically conducting material, is connected to South side 88 of the magnet 83. The ball 80 may be of a ferrite or ferrite-filled material and when drawn to its forward position, will be held between the North and South poles. In this manner, ball 80 is firmly held in its forward position.

In order to reset the balls from either the forward to the rearward, or the rearward to the forward directions, several embodiments, in accordance with the principles of the present invention, may be employed. As an example, when the display is accomplished by the balls being in the forward positions, either physically pushing the balls to their rearward position, or tilting the display board will cause them to go from their forward display position to their rearward rest position. Similarly, when the initial non-display position is the forward, and the display position is accomplished when the balls are in their rearward positions, they are returned to their forward positions by either tilting the board or magnetically attracting the balls, to the front side 12. In this manner, the display device may be utilized repeatedly without deleteriously affecting the quality of the display.

While a number of specific embodiments of the principles of the present invention have been described and illustrated above, it is clear that many more may be designed by those skilled in the art in accordance with the teachings presented herein. Further, the specific embodiments should not be construed as limiting the present invention but merely as illustrating its operation. Further, the scope of the invention and protection obtained for the present invention should not be limited by these embodiments but should be accorded the scope to which it is entitled by this application.

What is claimed:

1. A display device comprising body means defining a plurality of passages, said body means having associated therewith an effective display plane located adjacent the forward ends of said plurality of passages, a movable member located in each of said plurality of passages, capable of moving in each of said plurality of passages between a first position and a second position and a writing member capable of being moved in front of said display plane for causing said movable members to move between said first and second positions responsive to the position of said writing member;

wherein said first position is a forward position and said second position is a rearward position and wherein said forward position is located in said display plane and said movable members are held in their respective forward positions when they are moved to their respective forward positions;

further comprising a stripping material placed upon said display plane, said stripping comprising at least one pair of strips affixed to the display plane with said pair of strips overlapping the forward ends of said passages, said pair of strips separated from each other by slightly less than the width of said movable member so as to contact said movable members in their respective forward positions, said material comprising magnetically conducting material, means for connecting a pole of a first type magnetic field to one of said pair of strips and a source of an opposite magnetic pole to the other of said pair of strips, said movable members comprised of magnetically attractable material whereby said movable members are held in their respective forward positions by the magnetic force between said two strips.

2. A display device comprising body means defining a plurality of passages, said body means having associated therewith an effective display plane located adjacent the forward ends of said plurality of passages, a movable member located in each of said plurality of passages capable of moving in each of said plurality of passages between a first position and a second position and a writing member capable of being moved in front of said display plane for causing said movable members to move between said first and second positions responsive to the position of said writing member;

wherein said body comprises a front side, a rear side and a light source disposed behind said rear side;

wherein each of a plurality of fiber optic elements are in alignment with a respective movable member when said movable member is in said rearward position, the front end of said fiber optic element terminating at said front side, said movable member comprising opaque material blocking light from being projected to said front side when said movable member is in said rearward position and allowing light to pass through a fiber optic element when said respective movable member is moved from said rearward to said forward positions.

* * * * *