Jan. 3, 1967 D. WINROW 3,295,238

SIGN ELEMENT

Filed Oct. 28, 1964

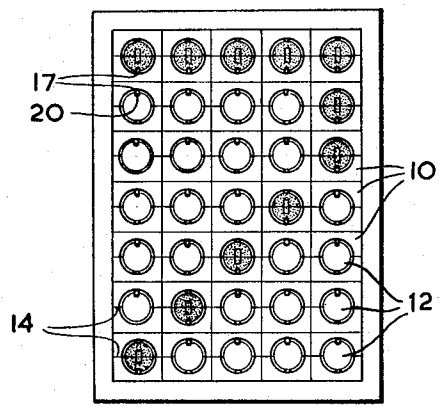



FIG. 1

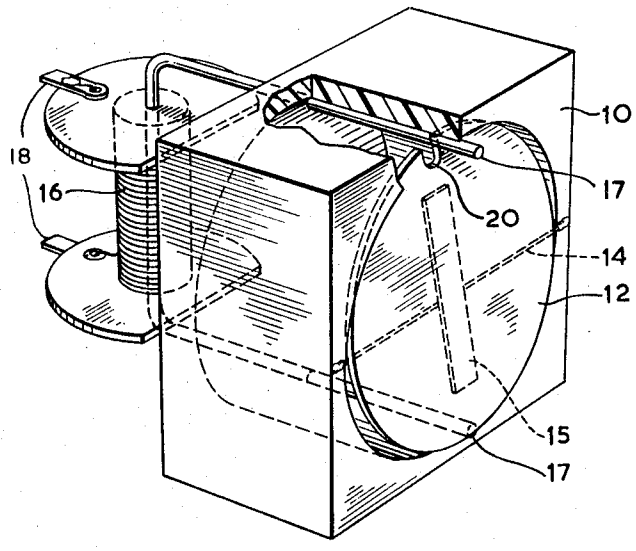



FIG. 2

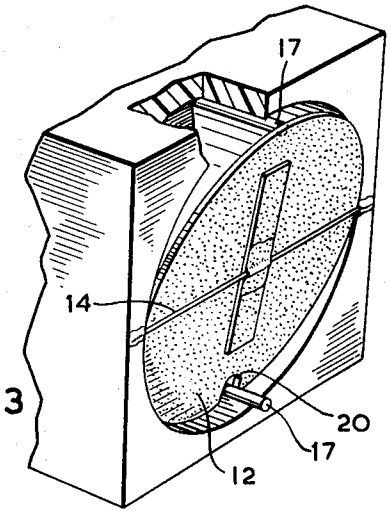



FIG. 3

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# SIGN ELEMENT

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3 Claims. (Cl. 40—28)

This invention relates to an improvement in the design of signs of the type described in Canadian Patent No. 641,350, dated May 15, 1962, wherein a number of magnetically controlled rotatably mounted indicia-forming elements are provided in an array and each element is provided with two surfaces arranged to contrast with each other. The magnetic control is achieved by providing the indicia-forming element with a permanent magnet and mounting near each indicia-forming element, magnetic pole pieces in a location where end will attract or repel the poles of the permanent magnet. By controllably reversing the polarity of the pole pieces the indicia-forming element may be reversed in orientation to change the colour or appearance of the surface displayed by it, and the combination of a number of such elements in an array, independently controllable, is used to produce indicia which convey information.

However, it will be noted that each time such poles are reversed, the indicia element will tend to rotate in one sense or the other to its new position of rest. Thus, a series of rotations may take place, which may, in common designs of the apparatus, be all in the same sense; and if the indicia element is mounted on a filament whose ends are stationary, the build-up of torsion in the filament may at some point oppose and resist a rotation of the elements under magnetic force and prevent the proper rotation thereof and therefore cause faulty portrayal of information by the sign.

To prevent this, the indicia-forming element and mounting are provided with stop means limiting the range of rotation of the indicia-forming element to less than 180° in each direction, with the stop means located so that the indicia element surfaces are displayed substantially to their best advantage, one in each limit position. Because of the limit on rotation, each rotation of the indicia-forming element must be the reverse of the preceding one and therefore no cumulative torsion can be built up in the supporting filament, whereby a continued sequence of operations may be assured.

Care must be taken in the location of the stop means so that the indicia-forming element cannot reach a position where the force applied by the magnetic pole pieces, and intended to reverse the position of the indicia-forming element, will tend to drive the indicia-forming element in the wrong sense against a stop. This is avoided by locating the stop means so that, with either polarity, throughout the allowed range of movement, the resultant force exerted by said pole pieces on said element magnet poles is in one direction. Preferably this is achieved by locating the stop means so that, at either end of said range, a magnet element pole is at the closest location it can assume to one pole piece and at the farthest location it can assume from the other pole piece. Again, in a preferred form this is achieved by locating the pole pieces so that the plane including them, and parallel to the axis of rotation of the indicia-forming element, has one magnet pole located on one side thereof and the other magnet pole located on the other side thereof throughout the range of movements of the magnet element.

Preferable the members forming the pole pieces for controlling the indicia-forming elements act as the stops for limiting rotation of such elements and are located to intercept during rotation a portion of the indicia-forming element.



In drawings which illustrate a preferred embodiment of the invention:

FIGURE 1 shows a sign-forming element made up of 35 indicia-forming elements in accordance with the invention, and

FIGURES 2 and 3 show an indicia-forming element and the mounting therefor with the indicia-forming element assuming opposed positions in the two views.

In relation to FIGURE 1, for a full description of the operation of such an indicia-forming sign, reference should be made to Canadian Patent No. 641,350, dated May 15, 1962.

In FIGURE 2 is shown a mounting frame **10** for the indicia-forming element **12**, having a cylindrical bore therethrough, at the front end of which is the indicia-forming element **12** mounted to rotate partially in the bore by a filament **14**, which extends diametrically across the bore and is attached to the element **12** and is non-rotatably attached at each end to the frame **10**. A permanent magnet **15** in flat strip form, providing poles at opposed ends, is mounted so that the poles of magnet **15** preferably define an axis extending transverse to the direction of the filament **12**.

Magnetic pole pieces **17** are formed by the ends of a U-shaped permanently magnetizable magnetic member, mounted by means not shown to have the free ends of the U projecting along diametrically opposed side locations in the cylindrical bore into proximity with the indicia-forming element **12**, and the pole pieces preferably define a line approximately transverse to the filament **12** with the bight of the U projecting rearwardly of the frame.

An electric winding **16** on the bight of the U is provided with two terminals **18**, which terminals are adapted to be provided with reversible electric current to polarize the pole pieces **17** in either sense as desired, to repel and attract the poles of the magnet **15** on the indicia-forming element to cause its rotation.

In accordance with the invention, it will be appreciated that the indicia-forming elements **12** need not be circular, but may assume any form (for balance, preferably symmetrical about filament **14**) and that the frame **10** may be of different structural form also.

In accordance with the invention, the preferred means of limiting the rotation of the indicia-forming elements **12** to slightly less than 180° is to utilize the pole pieces **17** as stops for the elements **12**.

Thus, in the preferred embodiment, the circular indicia-forming element is made of a diameter to strike the pole pieces **17**, but a portion is cut-out at **20** on one side of the element to allow passage of the pole piece to which the cut out portion is adjacent.

It will be noted that the pole pieces **17** are both located outwardly of the axis joining the poles of magnet **15**. The result is that the pole of magnet **15** adjacent the cut-out **20** is, in either of the limiting positions shown in FIGURES 2 or 3, displaced inwardly with respect to the adjacent pole piece **17**. Thus the energization of the pole pieces **17**, to repel the adjacent poles of magnet **15**, exerts magnetic force in the same direction on both indicia-element magnet poles and causes rotation of the indicia-forming element **12** in the direction which moves cut-out portion **20** inwardly, since by rotating in this sense both poles of magnet **15** are moving away from the pole pieces **17** which repel them and toward the pole pieces **17** which attract them. Thus, in either limit position of the indicia-forming element **12**, the axis of the poles of magnet **15** is displaced angularly from the axis of the pole pieces **17** in the direction of rotation permitted by the pole pieces **17** acting as

stops. Thus, on the energization of pole pieces **17** to repel adjacent poles of magnet **15**, rotation of the indicia-forming element will always tend to and will take place away from the stops, while succeeding rotations will always be the reverse of those just preceding, whereby continued operations do not accumulate torsion in filament **14**.

It will be seen that proper operation is assured by locating the pole pieces **17** (which act as the stop means) so that, with either polarity of stop means **17** throughout the range of movement of element **12**, the resultant force exerted by pole pieces **17** on the poles of magnet **15** is in one direction. This is achieved, in the preferred embodiment, by arranging the contact of pole pieces **17** with the contacting side of element **12** so that, at either end of said range, a pole of magnet **15** is at the closest location it can assume to one pole piece and at the farthest location it can assume from the other pole piece. Again, in the preferred embodiment, this is achieved by locating the pole pieces **17** so that the plane including them and parallel to the axis of rotation of the indicia-forming element **12** has one pole of magnet **15** located on one side of such plane and the other pole of magnet **15** located on the other side of said plane within the range of movement of the magnet element.

FIGURE 2 shows the indicia-forming element **12** in one limit position, and FIGURE 3 shows the indicia-forming element in the opposite limit position. In operation, with the indicia-forming element **12** in the position indicated in FIGURE 2, if the winding **16** is energized to create in pole pieces **17** a repulsive force to the respectively nearer poles of magnet **15**, the indicia-forming element **12** is consequently rotated counter-clockwise (looking from left to right along the filament axis). The indicia-forming element **12** is, as a result, rotated to the position indicated in FIGURE 3 and stopped there as a result of the contact between the outer end of upper pole piece **17** and the indicia-forming element **12**.

As a result of further energization of the winding **16**, with a polarity opposed to that of the first energization, the polarity of the pole pieces **17** is reversed and the indicia-forming element is rotated clockwise (looking from left to right along the filament axis) to the position in FIGURE 2, where the rotation is stopped by the contact between the indicia-forming element **12** and the lower pole piece **17**.

It will be noted that each rotation is just less than 180° and is the reverse of the previous one, so that no torsion is built up in the filament. It will be noted that such reversal is assured by providing that in each limit position the indicia-forming element **12** is stopped so that the poles of magnet **15** and the axis between them are asymmetrical with respect to the axis and location of the pole pieces **17**, the asymmetry being arranged so that the repulsive force between adjacent magnetic poles and pole pieces is in the direction wherein the stop members permit rotation; hence rotation under such repulsive (and attractive) force can only take place in the desired direction.



The array shown in FIGURE 1 may be considered as built up from frames **10** or, alternatively, the frame **10** shown in FIGURE 2 may be considered as part of a unitary frame for a large number of elements, as shown in FIGURE 1.

What I claim as my invention is:

**1.** In an indicating unit for a sign assembly, wherein an indicia-forming element having an axis of rotation and two surfaces of contrasting appearance is rotatably supported on a frame therefor, and a magnet adapted to respond to an applied magnetic field is mounted on said element with a pole on opposed sides of said axis; the provision of stop means arranged and constructed to limit the range of rotation of said element to less than 180°, said surfaces being so arranged on said element that one surface is displayed at one end of said range of rotation and the other surface is displayed at the other end of said range of rotation; a pair of pole pieces connectible to an electric current to assume opposed and reversible polarities, and located to provide, with either polarity, that, throughout said range of rotation, the resultant force exerted by said pole pieces on said element magnet poles is in one direction; said element and said pole pieces being so designed and located that one portion of said element contacts one pole piece on rotation in one direction and the other pole piece on rotation in the other direction whereby said stop means are thereby constituted.

**2.** In an indicating unit as claimed in claim **1**, wherein said pole pieces are so located that, at either end of said range, an element magnet pole is at the closest location it can assume to one pole piece and at the farthest location it can assume from the other pole piece.

**3.** In an indicating device as claimed in claim **2**, wherein said element is mounted on a filament and rotatable with an intermediate part thereof and wherein the ends of said filament are non-rotatably attached to said frame.


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