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METHOD AND APPARATUS FOR CONSTRUCTION OF AN
ELECTROMAGNETICALLY OPERATED SIGN

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2 Sheets-Sheet 1

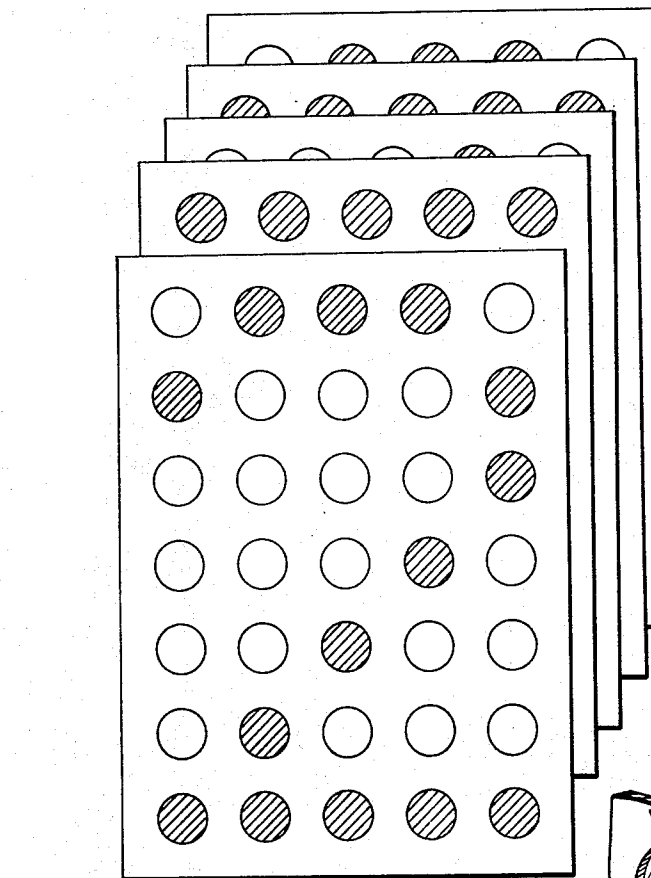


FIG. 1

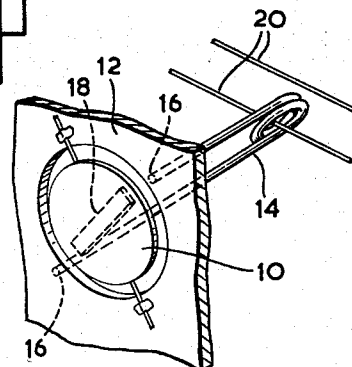
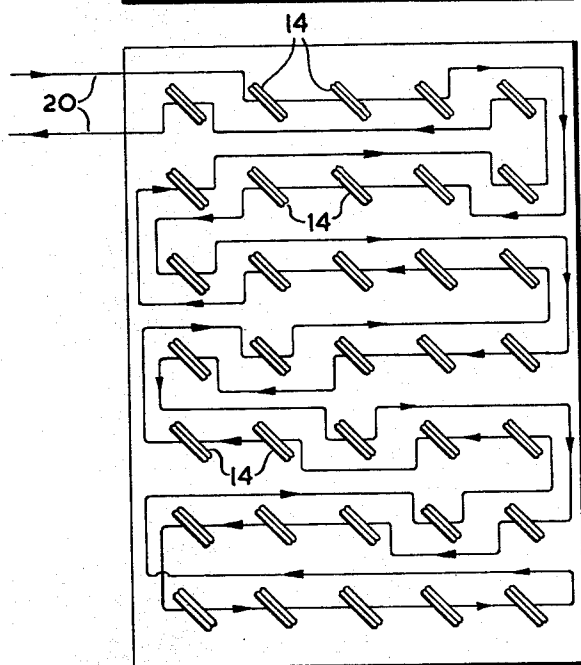


FIG. 3

FIG. 2

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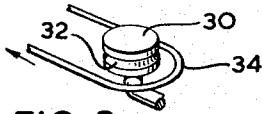
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METHOD AND APPARATUS FOR CONSTRUCTION OF AN ELECTROMAGNETICALLY OPERATED SIGN

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8 Claims. (Cl. 40—28)

This invention relates to a method and apparatus for use in the construction of an electromagnetically operated sign containing an array of individual, reversible, indicia-forming elements having contrasting appearance on reverse sides.

In drawings which illustrate a preferred embodiment of the invention:

FIGURE 1 illustrates at least the top row of the elements of an array in forming the numerals 2, 3, 4, 5, 6;

FIGURE 2 illustrates the wiring for one of the indicia "2" to be formed by the array;

FIGURE 3 illustrates in part the mounting and operation of a single "indicia-forming" element;

FIGURE 4 illustrates apparatus used in the wiring of the array;

FIGURES 5 and 6 are schematic illustrations of part of the apparatus of FIGURE 4;

FIGURE 7 illustrates a step in the wiring of the energization means for the indicia-forming elements; and

FIGURE 8 shows a detail of the mounting for wires used with the apparatus of FIGURE 4.

In FIGURE 1 is shown a sign wherein a variety of selectable indicia may be displayed and comprising thirty-five reversible indicia-forming elements, individually electromagnetically actuable to expose one or the other of a pair of contrasting surfaces. Such a sign, in practice, will usually comprise many more elements than the thirty-five shown and be capable of indicating a wide variety of words, figures or both, and the construction and operation of such sign is described in Canadian Patent No. 641,350, issued May 15, 1962.

Such a sign comprises an array of units of the type shown in FIGURE 3, and each unit comprises an indicia-forming element 10 having opposed sides finished in contrasting colours rotatably mounted on a frame 12. A magnet 18 is mounted on the element with its poles on opposite sides of the axis of rotation of element 10. An energizable electromagnet 14 is provided, mounted on the frame and having its pole pieces 16 located to magnetically affect the poles of the element magnet 18. The electromagnet pole pieces 16 are, of course, located and/or the sign is designed (as shown in Canadian Patent No. 641,350, issued May 15, 1962) to provide that one of the contrasting surfaces of the indicia-forming elements shall face outwardly in each of its alternative rest positions. For each individual indicia element desired, an electrical conductor 20 is located adjacent an extent of each electromagnet 14 to energize it, and, of course, the polarity of the current in the conductor 20, and the location of the strands of such conductor relative to the electromagnet determines the polarity of the electromagnet pole pieces 16. Thus, assuming the two wire strands shown in FIGURE 3 are part of the same wire, in the design of the device, they will carry current in the opposite directions. It follows that the polarity of the energization of the element 10 shown, in relation to adjacent elements, could be reversed either by a reversal of the direction of current in the conductor 20 or by the interchange of the strand outside the loop with the strand inside.

FIGURE 1 shows the indicia-forming elements properly oriented to form the number 2. In this arrange-

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ment the proper selection of the individual polarity of the energizing wires for the pole pieces provides the proper combinations of light and dark elements to create the numeral appearing on the array corresponding to each wire.

As indicated in FIGURE 2, the desired numeral 2 may be provided by providing a conductor, in effect doubled upon itself, to provide a bight at the end remote from the two free ends which are for connection to a power source. The electromagnet 14, whether straight, U-shaped or helicoidally looped, as shown, provides an extent for location adjacent the conductor 20, and the location and the sense of electric current travel relative to such extent determines the polarity of the electromagnet.

One of the preferred forms of the electromagnet 14 is the helicoidal loop; and in FIGURE 2, where the winding of the loops to produce a numeral 2 is shown, it is seen that by providing a doubled conductor 20, extending from the free ends to the bight in the conductor and taking the two strands of the conductor 20, now representing opposed directions of current travel, and row by row placing one strand, representing current travelling in one direction, inside the loops of those electromagnets which are in the 2 to produce elements of one contrasting colour (leaving the other strand outside the loop) and reversing the procedure for the elements of the loop, which should simultaneously form the other contrasting colour, then on energization of the conductor the elements will assume the desired orientation to produce the desired numeral.

It will be noted from FIGURE 1, showing the top row of elements in the array arrangements for the numerals 2 to 6, that a separately arranged conductor is required for each numeral or letter which the array is to portray.

This invention deals with means of and a method for correctly locating the conductor inside or outside the helicoidal loops for the selective production of the desired indicia, and for example only this means and method in this application is demonstrated relative to five numerals 2 to 6, and thus five conductors, independently related to the individual helicoidal loops, are shown. However, it will be understood that in practice an element-forming portion of an array will normally be designed to produce at least the ten digits and sometimes the twenty-six letters or more indicia, if desired, wherein the method of the invention requires an individual conductor for each indicia.

In the form shown, there is provided for correctly connecting the conductors to the loops a frame 22 having a pair of spaced parallel walls 24 and 26 extending upwardly therefrom. Metal shanks 22 are swingably and preferably rotatably mounted in and projecting between and through such walls, each shank 22 having an end 28 projecting at right angles to the axis of the shank. Each projecting end 28 rotatably mounts a spool 30 thereon, and each such spool 30 carries a peripheral groove 32 thereon, which is adapted to receive a bight 34 formed in a conductor 20 therein and to position the two individual strands of conductors adjacent the bight therein corresponding to indicia-forming elements at locations numbered "2", "3", "4", "5", and "6", with the two individual strands of a conductor in spaced relationship to one another at the two locations where they meet spool 30. The shanks 22 are substantially parallel and their axes are substantially located in a plane. Thus, it will be noted that when the axes of such spools 30 are all directed upwardly from the shank, then the locations 35, where all such strands meet groove 32, will also substantially be in a plane (as illustrated in FIGURE 5); while if such spools are rotated to be located at a substantial angle (less than 180°) to the above orientation, then on each spool 30 rotated, the respective locations 35, where the two strands of a conductor meet a groove 32, will be

displaced from each other when viewed along lines perpendicular to such plane. Moreover, and regardless of the sense of orientation, if the angular displacement of each spool axis from the vertical direction is the same, then the locations 35, where the strands meet the spools, are located in two parallel lines (see FIGURE 6). The shanks 22, between the upstanding walls 24 and 26, are provided with shoulders 36 extending on opposite sides of the axis of rotation of the shank 22 on which they are mounted, and the shoulders 36 are so oriented relative to the spools 30 that when the locations 35, where the strands meet groove 22 adjacent said bights 34, are located in a common plane, the shoulders 36 extend in opposed directions generally parallel to said plane, but so that when one shoulder 36 is depressed relative to its counterpart and such plane, then the locations 35, where strands meet the corresponding groove 22, are displaced relative to one another and to such line. The aligned shoulders and locations may be viewed in FIGURE 5 and the displaced shoulders and locations are shown in FIGURE 6.

Resilient means are provided to return the shanks 22 to the position where the locations 35 are located in a common plane (horizontally in the drawings) when there is no deflecting pressure on shoulders 36. In the preferred embodiment, the resilient mounting shanks 22 are provided by rubber elastic members 48, connected at one end non-rotatably to a support 40 and at the other end to the end of the shank 22 remote from the bight-holding end.

In the direction from the walls 24 and 26 in which the bight-holding end projects, there is provided at a reasonable spacing to allow manipulation of conductors extending from the spools thereto a binding post 42 to assist in the manipulation of the conductor 20.

In operation, the invention provides a means whereby the conductor 20 in a group may be applied to a given helicoidal loop with the correct polarity.

A comb-like member 44 is provided for each individual position in the array shown in FIGURE 1, and the arrangement of the tines of the comb is characteristic of the polarities desired for each shank 22 and helicoidal winding. On the comb-like member 44 a tine 46 is provided, adapted to bear on and deflect one or the other of shoulders 36 of each shank 22. Thus, in the embodiment shown, a tine 46 is provided for the upper left corner element in the array for each of the five indicia depicted in FIGURE 1 to deflect the bight of

Conductor (the conductors are numbered below to correspond to the numeral to be portrayed by the corresponding conductor):

2	-----	White.
3	-----	Black.
4	-----	White.
5	-----	Black.
6	-----	White.

For polarity when threaded through the helicoidal loop to provide—

Thus, although the polarities are arbitrarily selected, it will be seen that "left-hand" tines may be used to produce black indicia elements and "right-hand" tines to produce white indicia elements or vice versa.

In the use of the device a comb 44 is provided corresponding to each "position" in the array designed to correspond to the desired polarity for each conductor at the position. It will be noted that with the type of wiring used in FIGURE 2, where the directions of each strand are reversed at the end of each row, the combs 44 for consecutive rows must be oppositely designed, so that, with the apparatus shown on the second row of the array, a "left-hand" tine will produce white indicia and a "right-hand" tine will produce black indicia.

To commence threading the loops the conductor, start-

ing from one of the free ends, is looped alternately through the bight-holding members and about the binding post.

Combs 44 corresponding to each element in the array, starting with either the upper left or lower right element as shown in the drawings, are then applied to the bearing areas on the shanks in turn and in the order that the conductors, beginning from the free end and moving toward the bight, meet the helicoidal loops and the shanks 22 are correspondingly deflected by each comb 44 being maintained in the deflected position by the sloping sides of the comb tines. Thus, for each comb 44 one selected strand of each conductor 20 is deflected upwardly and its counterpart downwardly. The upwardly deflected strands may then be manually (or otherwise) gathered and the loop of the helicoidal electromagnet 14 threaded thereon to surround the displaced strands. As a result, for each conductor 20 and each element in the array a strand is on the outside and a strand is on the inside of the helicoidal loop and together these strands will apply the desired polarity of energization to the electromagnet 14 when energized. As each electromagnet member 14 is so threaded, it may then be moved to the vicinity of the binding post. The comb 44 may then be withdrawn and the rubber torsion members 48 will then return the shanks 22 to their neutral position. A new "comb" 44 may then be applied corresponding to the next position in the array and a new loop threaded onto the gathered strands to provide for the second position in the array, and so on. With the loops all threaded in position, the bights at the binding post 42 may be cut to provide individual conductors corresponding to each numeral or letter to be portrayed. The electromagnets 14 (taking care that the mounting is in the correct polarity) may then be mounted on the frame, and the free ends of its conductors arranged for connection in the electrical energization circuit.

Although helicoidally looped electromagnets 14 are shown, it will be seen that the same method of selective displacement of the conductor strands may be used, whatever the form of electromagnet, and that thereafter the selected strands may be gathered for proper association with the electromagnet used.

What I claim as my invention is:

1. In the construction of a sign made up of an array of individual, reversible, indicia-forming elements, contrastingly coloured on reverse sides, each controllable by the poles of an electromagnet, a plurality of wires for energization of said electromagnets, each wire corresponding to a desired pattern for the array, the method, of providing for the selective energization by each wire of said electromagnets comprising; providing a bight in each wire, whereby in the two strands of said wire on either side of said bight current travelling therein would be travelling in opposed directions, locating said bights in approximate alignment, selecting a given electromagnet for controlling a predetermined element in an array, selectively but concurrently displacing one strand of each of said wires in one direction, and the other strand of each of said wires in the other direction, said selection being chosen in the case of each wire to provide the desired polarity for each electromagnet to produce the pattern corresponding to the wire, gathering the strands of wires oriented in one of said directions and locating them on one side of at least one extent of said electromagnet and locating the other set of wires on the opposite side of said at least one extent.

2. Means for use in the construction of a sign, to be made up from an array of individual, reversible, indicia-forming elements, having opposed surfaces of contrasting appearance, controllable by the poles of an electromagnet and having a plurality of wires for selective energization of said electromagnet, each wire corresponding to and to be arranged to cause a desired pattern in said array; comprising: swingable means corresponding to each of said wires for mounting a bight formed therein,

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said swingable means being so designed that the portions of the two strands of each such wire at said mounting means are spaced from one another in a direction transverse to the swinging axes; said swingable means being so located that in one orientation of each such swingable means the parts of all said strands at said mounting means are aligned, and being swingable in either direction therefrom.

3. Means for gathering electric wires with individually selectable polarities, comprising: means for retaining a bight in each said wire with the strands thereof in spaced relation at the locations where they meet said retaining means, said means being mounted to allow assumption by said retaining means of either one of two positions where said pairs of locations are spaced in one and in another predetermined direction relative to each other.

4. Means as claimed in claim 3, wherein the location and mounting of said retaining means is such that when each of said retaining means is in one of said two positions, then said locations substantially define two substantially parallel lines.

5. A method for gathering electric wires with individually selectable polarities, comprising providing a bight in each wire, whereby in the two strands of said wire, adjacent said bight, current travelling therein would be travelling in opposite directions, selectively but concurrently displacing in one direction one extent of each of said wires, and gathering the wires displaced in said one direction.

6. Means for gathering a predetermined number of electric wires, comprising a shank for each such wire; a frame wherein said shanks are rotatably mounted substantially parallel to one another and in a common plane with one end projecting from said frame, means on each said projecting end for receiving a bight of such a wire thereon, with the locations where said two strands of each wire meet said bight mounting separated from one another, means for resiliently rotatably mounting said shanks to position such strand locations adjacent said bight in a common plane, said resilient mounting means allowing displacement of said shanks in either direction from their positions in said common line.

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7. Means for gathering a predetermined number of electric wires, comprising: a corresponding shank for each such wire; a frame wherein said shanks are rotatably mounted parallel to one another and in a common plane with one end projecting therefrom, means on each said end for receiving a bight of such a wire thereon, with the locations where the two strands of each said wire meet said bight mounting separated from one another, means for resiliently rotatably controlling said shanks to position such locations in a common plane, bearing surfaces on each of said shanks extending in opposed directions from the axis of said shank when said shanks are in said corresponding orientations.

8. For use in the construction of a sign made up of an array of individual, reversible, indicia-forming elements controllable by individual loops of helicoid form, magnetically energizable in one or in an opposite sense by wires threaded therethrough, carrying current in one or the other polarity, apparatus comprising: means for individually mounting bights of a plurality of wires, whereby with power applied to one of such wires current will flow in one direction through one strand of each of said wires and in the other direction through the other such strand, means for selectively but concurrently orienting said bights, so that for each wire a selected one of said strands adjacent said bight will be located in one direction and the other extent will be located in another direction, whereby the extents located in one of said directions may be gathered and the helicoidal loops threaded thereon.

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