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W. R. AIKEN

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SIGNALLING DEVICE

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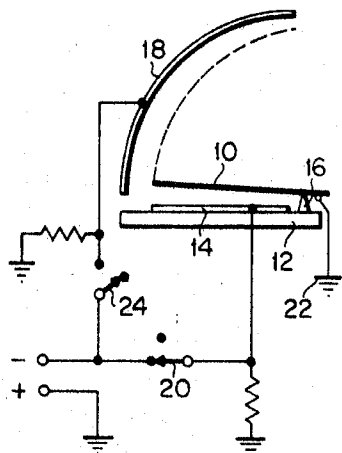


FIG. 1

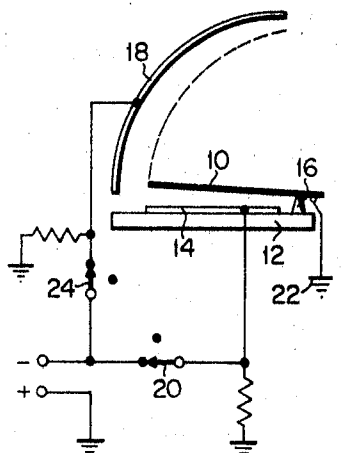


FIG. 2

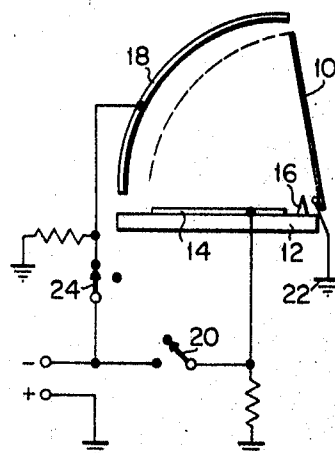


FIG. 3

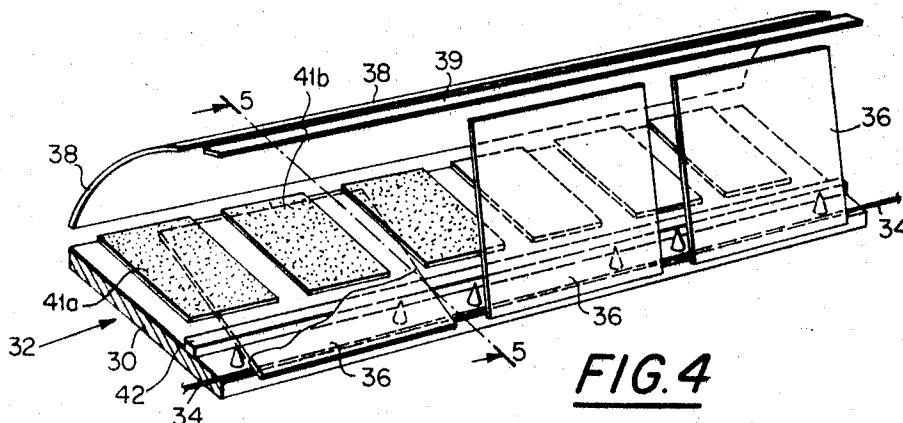


FIG. 4

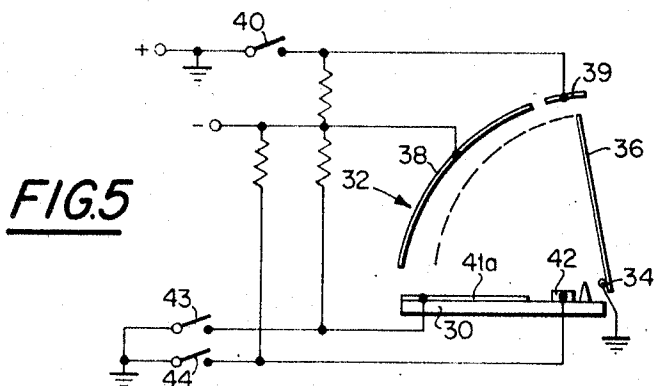


FIG. 5

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SIGNALLING DEVICE

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ABSTRACT OF THE DISCLOSURE

A signalling device having a vane hingedly mounted for movement between a concealed and a display position, provided with a base electrode arranged adjacent said vane in its concealed position and an arched electrode adjacent the intended path of movement of an outer edge of said vane. Means is provided which is normally effective to establish a vane-attracting electrostatic field between the base electrode and the vane and which is operable to abolish said field; and means is also provided which is operable to establish a vane-attracting electrostatic field between the vane and the arched electrode so that forces may simultaneously be exerted upon the vane which endeavor to move it in opposite directions. Removal of the vane-attracting potential from the base electrode operates to raise the vane dependably into its exposed position. The base electrode may be subdivided into relatively spaced sections which have their own control switches to provide additional control facilities for the device.

The present invention relates to adjustable signs or signalling devices of the type employing relatively movable components to display or conceal an identifying mark, such as a warning inscription, a number, a colored area and the like. More particularly, the present invention relates to signalling devices, of the type referred to, wherein the relative movement of the mark-displaying and concealing components is accomplished by the repelling and/or attracting effect of electrostatic fields. In devices of this type a sheet or vane is supported for movement from a position wherein it is concealed from view to a position wherein it is exposed to view, and the movement of the vane is effected by applying electric charges to the vane and/or suitably placed electrodes which attract and/or repel the vane from one position into the other, and vice versa. Such signalling devices are described in my U.S. Patent No. 3,089,120 for a Signalling Device.

Devices of this type are assembled into groups of vertically superposed horizontal rows of juxtaposed units, or expressed differently into groups of juxtaposed vertical columns of superposed units, and adjustment of selected ones of the assembled units to positions wherein they expose one of their surfaces to view may be employed to form large letters, numbers and like symbols as disclosed in my above mentioned U.S. Patent No. 3,089,120.

To operate so many units individually presents a problem. To provide individual switches for all the electrodes in each of the many assembled units is costly and results in apparatus of great complexity, with a correspondingly high incidence of failure or misoperation of one or the other unit. Arrangements have therefore been devised wherein movement of the vane of each unit to its fully exposed position depends upon the state of energization or activation of several differently placed electrodes, and wherein all electrodes of one set in a horizontal row of units and all the electrodes of a different set in a vertical column of units are conductively connected for control by common switches: in other words, for each horizontal row of units one switch is provided for the control of the state of energization of all the first mentioned electrodes

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in said row; and for each vertical column of units one switch is provided for the control of the state of activation of all the secondly mentioned electrodes in said row. Such an arrangement makes it possible to activate selectively any or all of the units with a relatively small number of switches, namely one for each column and one for each row of the assembly so that the number of switches required for operation of the assembly equals the number of columns plus the number of rows of the assembly. Such an arrangement for the control of composite signalling devices of the type here under consideration is described in my U.S. Patent No. 3,304,549 for a Composite Signalling Device. In arrangements of the type disclosed in said patent, the preferred manner of providing a plural-electrode control for the actuation of the signalling vane of a display unit is to arrange control electrodes laterally adjacent the intended path of movement of the vane, and another control electrode above the path of movement of the vane; and by applying a first vane-attracting charge to said laterally placed electrodes, a vane is conditioned to rise dependably into its display position if and when a second vane-attracting charge is applied to the electrode above the path of movement of said vane. While the described arrangement provides dependable performance, with a minimum of switches, of the many units comprised in composite signalling devices of the type referred to, the vanes in the resultant assemblies are spaced noticeably from each other because room must be provided between adjacent vanes for the lateral electrodes and for whatever space is necessary to avoid excessive sparking between the vanes and their lateral electrodes when the latter are being charged. This does not only increase the apparent bulk of the assemblies, it reduces the clarity and legibility of the symbols formed by activated units of the assembly in that it reduces the contrast between activated and unactivated units. Hence, if the display surfaces of the vanes were chosen to be black, the necessary spacing between adjacent vanes would impart a greyish appearance to the displayed surfaces of the activated vanes when viewed at a distance, which reduces the clarity of the established symbols.

It is an object of the present invention to provide a multi-electrode signalling unit of the type described which permits close juxtaposition with other units of its type, without impairment of its dependability of operation.

It is another object of the invention to provide a multi-electrode signalling unit, of the type described, which is especially suited for composite signs of the type referred to, and which may dependably be operated by cross switching systems, without requiring the interposition of laterally placed electrodes between adjacent units.

Still another object of the invention is to provide a signalling unit of the type described, which is dependable in its response to the application to charges on its multiple movement-controlling electrodes, and wherein the vane once actuated will dependably return to its position of rest upon appropriate manipulation of the proper control mechanism.

These and other objects of the present invention will be apparent from the following description of the accompanying drawing which illustrates certain preferred embodiments thereof and wherein:

FIGURE 1 is a diagrammatical side elevation of a signalling unit constructed in accordance with my invention;

FIGURES 2 and 3 are side elevations similar to FIGURE 1, illustrating different operational positions of the device;

FIGURE 4 is a fragmentary perspective of a row of modified embodiments of the invention; and

FIGURE 5 is an end elevation of the device illustrated in FIGURE 4.

In accordance with my invention I provide for multi-electrode control of the vane of a signalling device of the type referred to, a base electrode below the vane in its concealed position and a second electrode of preferably arched conformation above the intended path of movement of the outer edge of said vane, and I make arrangements for applying a charge to said electrodes that pulls said vane in opposite directions, rather than aid each other in effecting the desired movement of the vane. Thus, I apply an attracting charge to said arched top electrode which would in itself be effective to move the vane to its desired display position, but is prevented from doing so by application of an attracting charge to said base electrode, which latter holds the vane in its concealed position against the attracting charge on said arched top electrode. In this manner I obtain for the display vanes of signalling units of the type here under consideration a two-electrode control which requires no space-consuming lateral electrodes and which is thoroughly dependable in operation both in raising and in lowering the selected display vane. As long as I maintain a vane-attracting potential at said base electrode, the vane is maintained in concealed position even when it is conditioned for operation by placement of a vane-attracting potential upon the arched top electrode as the first step in effecting movement of the vane. Upon withdrawal of the vane-attracting potential from the base electrode as the second step in the control of the vane position—which may occur simultaneously with the first step—the vane is released to follow the pull exerted upon it by the attracting field established by the arched top electrode and swings into display position. From this display position the vane is dependably returned by reapplication of a vane-attracting potential to the base electrode.

First having reference to FIGURE 1, the device of the invention comprises a signalling vane 10 of sheet material, such as metal foil or plastic or paper of predetermined conductivity. Said vane is hingedly mounted adjacent the front edge of a horizontally disposed base 12 of insulating material for swinging movement from a reclined, substantially horizontal position adjacent said base, wherein it is concealed from view (FIGURE 1), to a raised substantially vertical position wherein the front surface of said vane is exposed to view (FIGURE 3). Supported upon the upper surface of the base 12 is an electrode 14, and contact between said electrode 14 and the vane 10 is prevented by appropriately placed spacer beads such as indicated at 16. Suitably supported adjacent the path of movement of the outer edge of the vane 10 is an electrode of preferably arched conformation 18 which may be arranged to increase in width from its bottom toward its top edge in a direction parallel to the axis of rotation of the vane, and/or may be arranged to approach the path of movement of the outer edge of the vane in the direction from its horizontal toward its vertical position, as shown in the illustration (FIGURES 1, 2, 3 and 5). Initially, a potential, producing a vane-attracting electrostatic field, is applied to the base electrode 14 as indicated by the closed switch 20 which connects the base electrode to a source of negative potential while the vane is connected to ground as indicated at 22. To condition the device for operation, i.e., for movement of the vane into its display position, a vane-attracting potential is applied to the arched electrode above the path of movement of the vane. This may be accomplished by closure of an initially open switch 24 (FIGURE 2) that connects the arched electrode 18 to the source of negative potential. For the time being this remains without noticeable effect upon the position of the vane because of the pre-existing field of attraction between the vane and the base electrode. Opening of the initially closed switch 20, however, as the second step in the control of the vane releases the vane for immediate

response to the electrostatic field set up between said vane and the arched top electrode, and said vane swings dependably into a raised position to a point wherein the gap between its free outer edge and the curved top electrode is at a minimum. Depending upon the size of said gap and the relative values of the voltages applied to the electrodes, closure of switch 20 may be arranged to return the vane immediately to its reclined, substantially horizontal position. Thus, an immediately responsive two-electrode control is obtained in the signalling device of my invention without need for laterally placed control electrodes, and the described device lends itself therefore exceptionally well for assembly into closely grouped composite signalling devices, such as shown in my hereinbefore mentioned U.S. Patent 3,304,547, that may be controlled by cross switching arrangements. In composite display devices of this type, it may be desirable, however, to provide yet another electrode adjacent to, but separated from, the upper edge of the arched electrode. Upon energization with a vane-attracting potential this added electrode acts as a memory and retains the vane in its raised position, even after a vane-attracting potential has been reapplied to the base electrode. Such a reapplication of a vane-attracting potential to the base electrodes of a row of juxtaposed signalling units, without effecting return rotation of the raised vane, may be desirable and even necessary in cases where the vanes of supposedly idle units in the same row should be prevented from moving into display position when units above or below the supposedly idle units are conditioned for operation by the application of vane-attracting potentials to all the arched electrodes in the columns of superposed units to which the supposedly idle units belong.

Having reference to FIGURES 4 and 5, the reference numeral 30 designates a common base for a row of juxtaposed signalling devices 32, only three being shown in the illustration. Hingedly supported from a common hinge rod 34 adjacent the front edge of the base are the vanes 36, and arranged above the paths of movement of the outer edges of said vanes is a common arched electrode 38. Located adjacent, yet spaced from the upper edge of, said arched electrode 38 is a strip-shaped electrode 39 which may be common to all vanes in the row of signalling devices 32 and which acts as a memory in that it operates to retain the vanes in display position once they have been raised to this position. By nature of its size, location and/or the magnitude of the vane-attracting potential that may be applied thereto by closure of switch 40, said memory electrode 39 has the capability of retaining any one or all of the vanes 32, once they have been raised, in display position even though a vane-attracting field may exist between the arched electrode 38 and the raised vanes and a vane-attracting potential may be reapplied to the base electrode below the vane in its idle position. In accordance with my invention said base electrode may be divided into several separate sections controlled by separate switches to provide, for the individual units of a composite signalling device of the type referred to, additional control facilities which are common to all the units in a row or column of units.

Reverting to FIGURES 4 and 5, supported upon the base 30 behind each vane or flag 36 adjacent the rear edge of said base are two individual base electrodes 41a and 41b for each vane, and likewise supported upon said base 30, adjacent its front edge, is a strip-shaped electrode 42 that is common to all the vanes comprised in the row. As long as vane-attracting potentials are applied to any one of the bottom electrodes 41a, 41b and 42 of the individual signalling devices, none of their vanes 36 can rise into their display positions even though vane-attracting potentials are applied to both the arched top electrode 38 and the memory electrode 39. By conditioning selected ones of the vanes for operation by removal of the vane-attracting potentials from both their

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individual bottom electrodes 41a and 41b—which is accomplished by closing a switch 43 for each of said electrodes—removal of the vane-attracting potential from the common bottom electrode 42 by closing a switch 44, acts as a trigger causing said selected vanes to rise quickly into their display positions while all the others remain in their concealed positions. Return of all the activated vanes of the composite signalling device is accomplished by reapplication of a vane-attracting potential to one or several of the electrodes 41a, 41b and 42 and by deenergization of the common memory electrode 39. In this manner whatever sign or message was displayed by the composite signalling device of the invention, is quickly and dependably erased.

The electrode arrangement of my invention makes it possible to group electrostatically controlled signalling units closely together into compact display signs without impairment of their individual performance, in fact it improves their dependability and makes it possible to provide additional control facilities.

While I have explained my invention with the aid of certain preferred embodiments thereof, it will be understood that the invention is not limited to the constructional details given by way of example, which may be departed from without departing from the scope and spirit of the invention.

I claim:

1. A signalling device comprising a vane, means for mounting said vane for movement between a concealed and an exposed position, a first electrode insulated from said vane and located adjacent said vane in said concealed position thereof on the side opposite to the intended path of movement of said vane, a second electrode adjacent the path of movement of said vane between said concealed and exposed positions thereof, means for applying a vane-attracting potential to said

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second electrode, and means selectively operable for applying to and withdrawing from said first electrode a vane-attracting potential.

2. A signalling device comprising a row of juxtaposed vanes, means for mounting said vanes for movement between first and second positions, first electrodes located adjacent each of said vanes in said first positions thereof, a second strip-shaped electrode common to all said vanes located adjacent said vanes in said first positions thereof, a common third electrode located adjacent the path of the outer edges of said vanes, means for applying vane-attracting potentials individually to said first electrodes, means for applying vane-attracting potentials to said common second electrode, and means for applying a vane-attracting potential to said common third electrode.

3. A signalling device according to claim 2 wherein said first electrodes are subdivided into a number of separate sections, and including means for applying vane-attracting potentials individually to said sections.

4. A signalling device according to claim 2 including a common strip-shaped memory electrode located adjacent the edge of said third electrode remote from said first electrodes, and means for applying a vane-attracting potential to said memory electrode.

References Cited

UNITED STATES PATENTS

3,319,246	5/1967	Aiken	340—373
3,373,422	3/1968	Aiken	340—373

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CHARLES M. MARMELESTEIN, Assistant Examiner

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