May 10, 1966 R. G. BOWMAN 3,250,031

DISPLAY UNIT FOR SCOREBOARDS OR THE LIKE

Filed Feb. 12, 1963 4 Sheets-Sheet 1

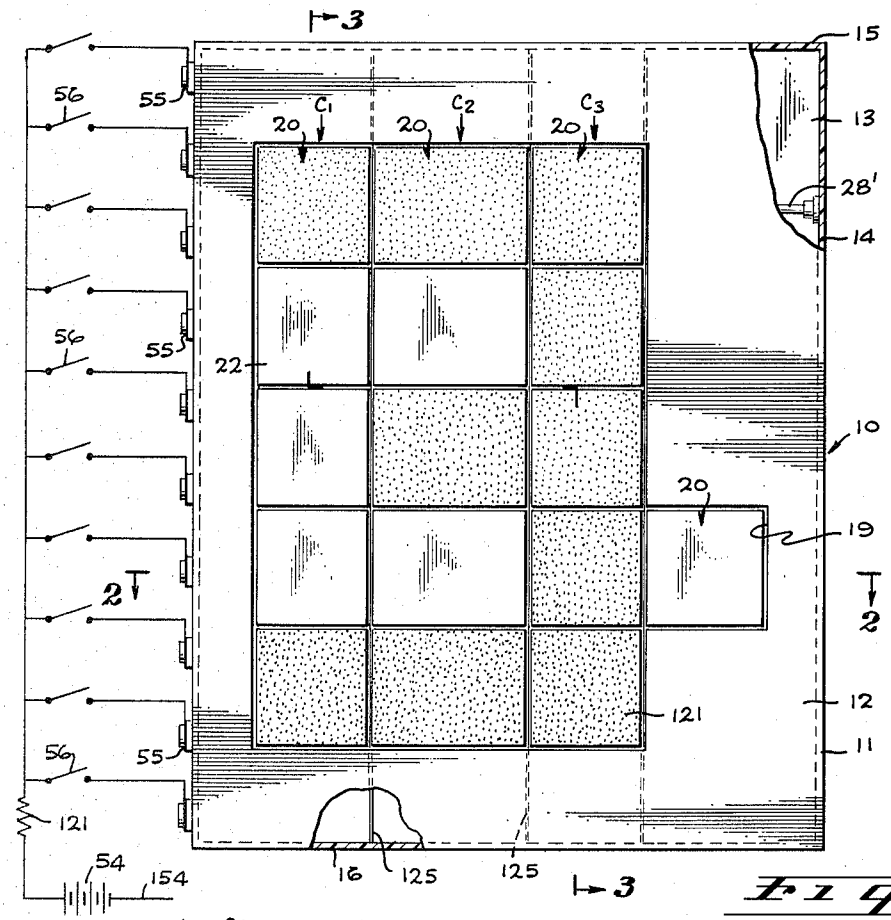


Fig. 1

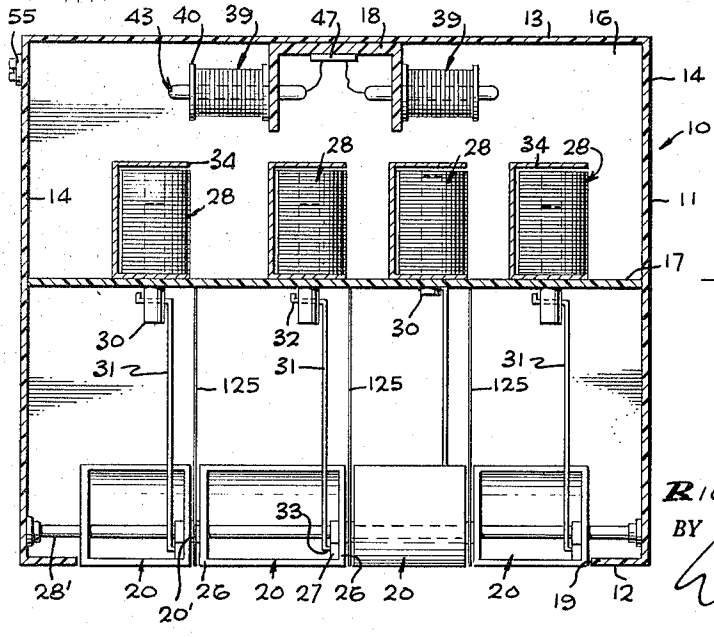


Fig. 2

INVENTOR.
RICHARD G. BOWMAN
BY William P. Green
ATTORNEY

May 10, 1966 R. G. BOWMAN 3,250,031

DISPLAY UNIT FOR SCOREBOARDS OR THE LIKE

Filed Feb. 12, 1963 4 Sheets-Sheet 2

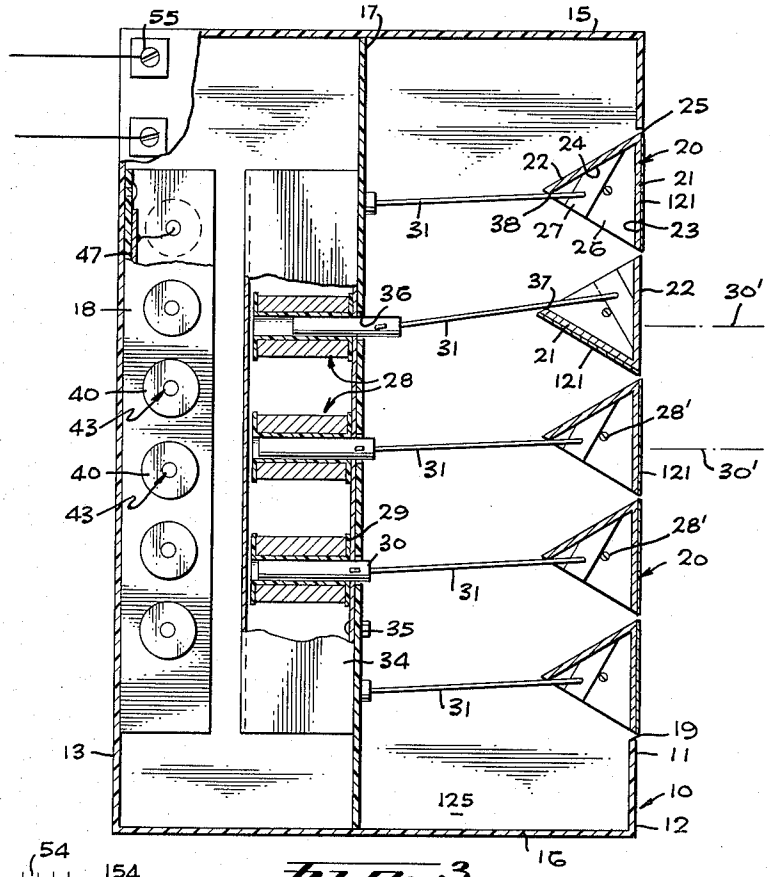


Fig. 3

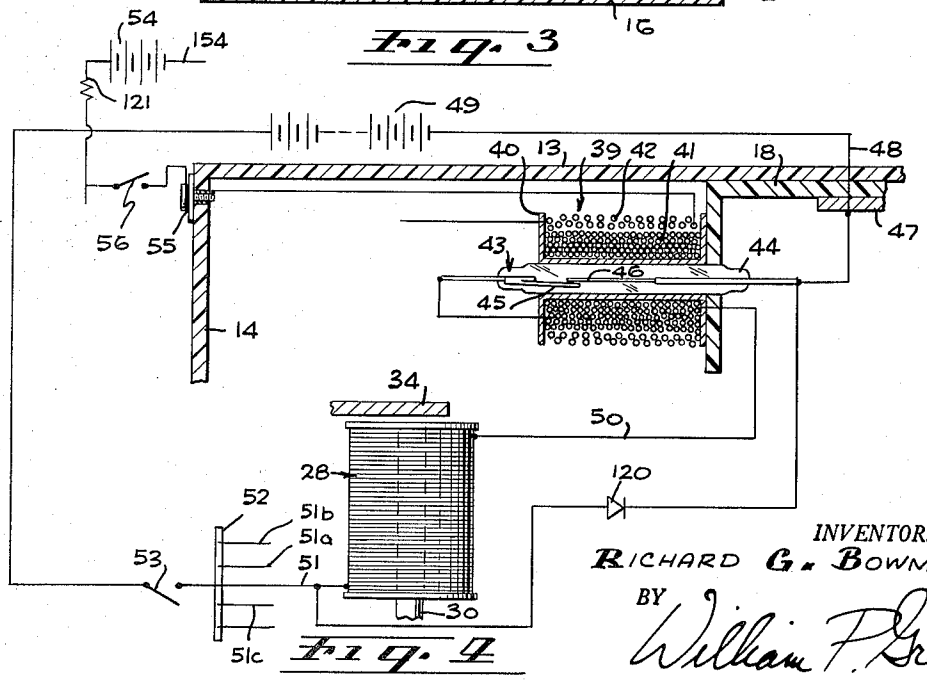


Fig. 4

INVENTOR.
RICHARD G. BOWMAN
BY
William P. Green
ATTORNEY

May 10, 1966 R. G. BOWMAN 3,250,031

DISPLAY UNIT FOR SCOREBOARDS OR THE LIKE

Filed Feb. 12, 1963 4 Sheets-Sheet 3

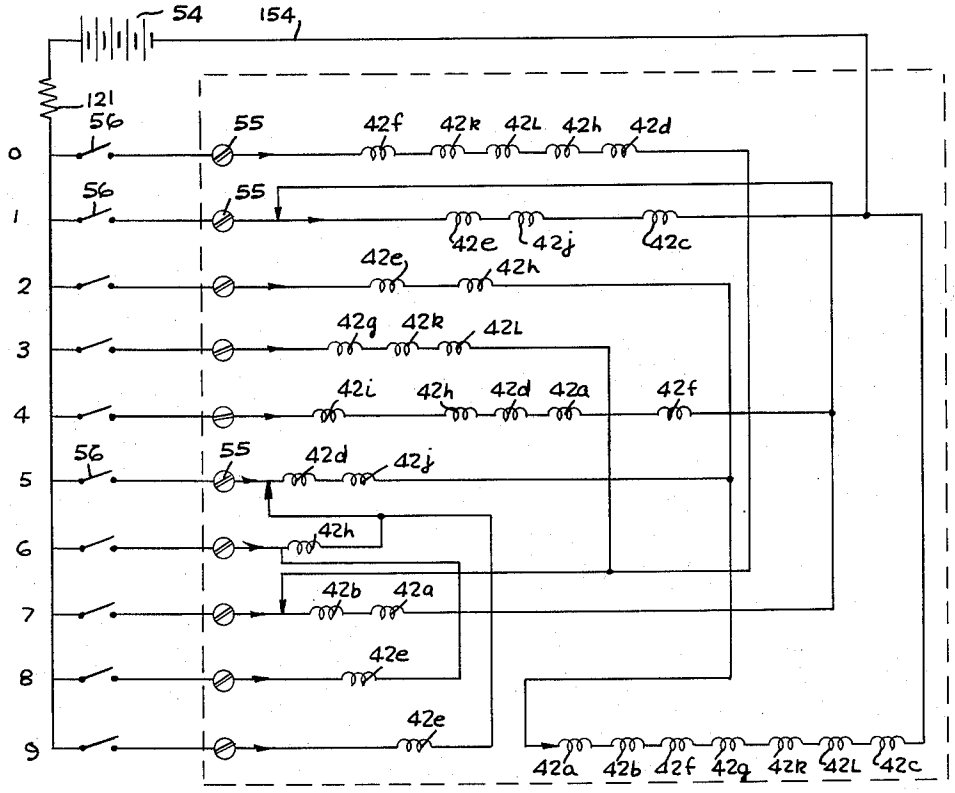


Fig. 5

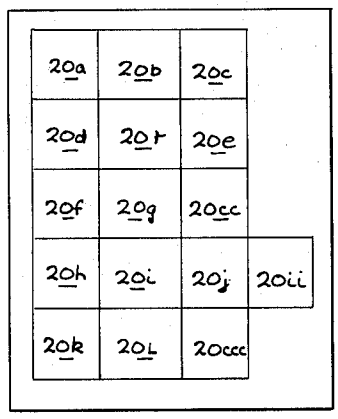


Fig. 6

INVENTOR.
RICHARD G. BOWMAN
BY
William P. Green
ATTORNEY

May 10, 1966 R. G. BOWMAN 3,250,031

DISPLAY UNIT FOR SCOREBOARDS OR THE LIKE

Filed Feb. 12, 1963 4 Sheets-Sheet 4

Fig. 10

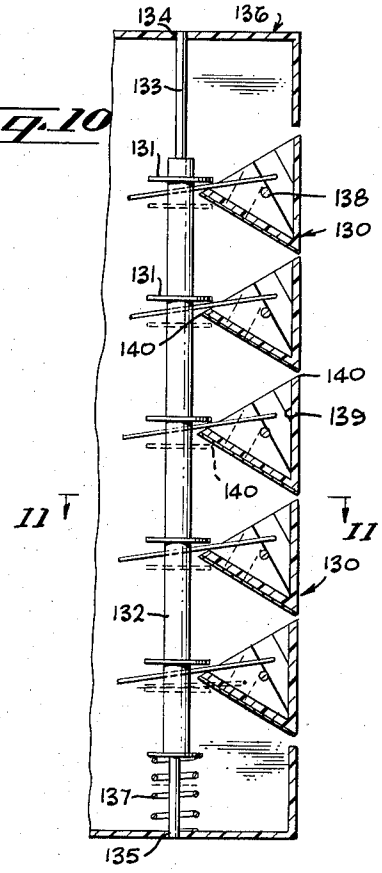
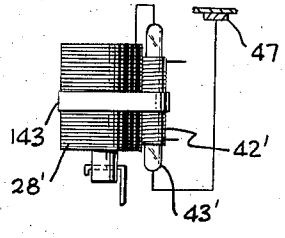


Fig. 8



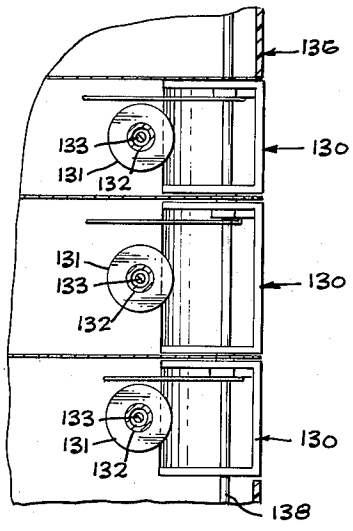


Fig. 11

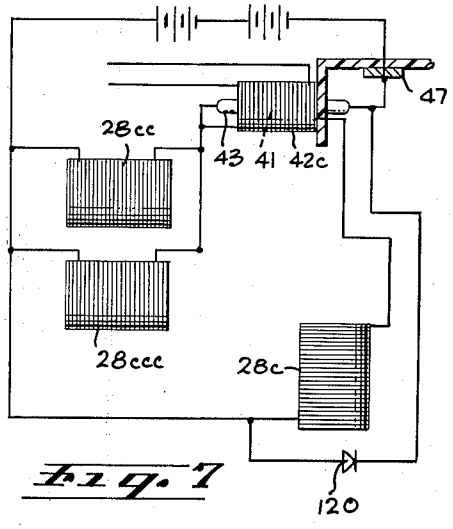


Fig. 7

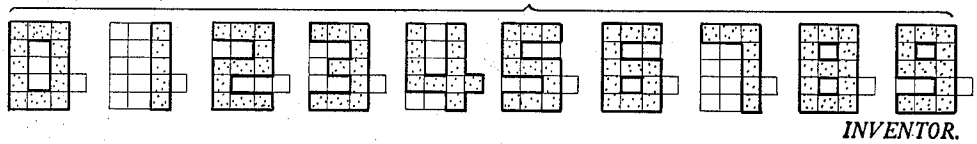


Fig. 9

INVENTOR.
RICHARD G. BOWMAN
BY
William P. Green
ATTORNEY

United States Patent Office 3,250,031 Patented May 10, 1966

3,250,031

DISPLAY UNIT FOR SCOREBOARDS OR THE LIKE

Richard G. Bowman, 7652 Bella Vista, Los Angeles, Calif.

Filed Feb. 12, 1963, Ser. No. 257,922
3 Claims. (Cl. 40—28)

This invention relates to an improved display unit for use in scoreboards or other signs, and adapted to selectively form any of the different numerals 0 to 9, or if preferred to form other desired indicia such as letters or the like. Some features of the display units have been disclosed in my co-pending application Serial Number 257,890, filed February 12, 1963, on "Alpha Numerical Type Display System," which covers an overall scoreboard arrangement in which a display unit embodying the present invention may be employed.

A major object of this invention is to provide an alpha numerical type multiple condition display unit which is structurally much simpler and less expensive than prior expedients intended for the same purpose, and yet which forms a display pattern having improved legibility as compared with such prior devices. A display unit embodying the invention is capable of forming numerals or other patterns which can be read very effectively from large distances either in an indoor artificially illuminated situation, or on an outdoor field where the natural illumination by sunlight is so great as to prevent conventional light bulb type alpha numerical units from being read satisfactorily.

In a device embodying the invention, the different numerals or other display patterns are formed by different arrangements of a plurality of individual components or display elements, each forming only a part of the overall pattern. In this connection, a particular object of the invention is to provide a system in which a minimum number of such component elements will produce all of the different numerals from 0 to 9, and will do so with the disclosed increase in legibility as compared with prior devices. For this purpose, I preferably employ an arrangement including three parallel columns of elements capable of forming all of the numerals but the numeral four, with one added element being provided for use in conjunction with the others in forming a four. To enable the formation of all of the numerals 0 through 9 with this small number of components, I find it highly desirable that the elements in the center one of the three rows be substantially wider than the elements in the other two main rows. This relative widening of the center row of component elements is presently considered to be a highly important feature of the invention, for maximizing legibility of the formed numerals, and minimizing the number of individual elements required.

Further features of the invention relate to the operational characteristics of the individual component display elements, that is, the manner in which these elements are converted between predetermined actuated and released conditions, to form the various numerals or other patterns of which the overall assembly is capable. These individual elements desirably take the form of movable two condition parts, preferably pivotally mounted, and adapted to be actuated by individual solenoids between their actuated and released conditions. Associated with individual ones of the solenoids, I find it desirable to employ separate control relays, which for best results include reed switches having individual holding coils and triggering coils. The triggering coils of the relays are connected together in appropriate patterns to form all the various numerals which are to be written. In one form of the invention, the solenoids for actuating the display elements serve themselves as the holding coils, to thus perform a dual function and reduce the number of windings required in the apparatus.

The above and other features and objects of the invention will be better understood from the following description of the typical embodiments illustrated in the accompanying drawings in which:

FIG. 1 is a front view, partially broken away, of a numerical display unit constructed in accordance with the invention;

FIG. 2 is a horizontal section taken on line **2—2** of FIG. 1;

FIG. 3 is a vertical section taken on line **3—3** of FIG. 1;

FIG. 4 is an enlarged fragmentary horizontal section illustrating the manner in which one of the reeds and its associated coils are connected together;

FIG. 5 is a circuit diagram representing the manner in which the various trigger coils are connected together;

FIG. 6 is a front view similar to FIG. 1, but having letters applied to the different individual display elements for use in relating the trigger coils of FIG. 5 to their associated display elements;

FIG. 7 is a circuit diagram illustrating the manner in which three of the solenoids are controlled by a single reed switch;

FIG. 8 is a view representing fragmentarily a variational form of the invention;

FIG. 9 is a view representing the manner in which all of the numerals 0 through 9 may be written by the device;

FIG. 10 is a vertical section through a variational form of the invention; and

FIG. 11 is a horizontal section on line **11—11** of FIG. 10.

To describe first of all the structural aspects of the form of the invention shown in FIGS. 1 through 7, attention is at the outset drawn particularly to FIGS. 1, 2 and 3. As seen in these figures, the display unit **10** includes a hollow rectangular housing **11** having parallel typically vertical front and rear walls **12** and **13**, parallel vertical opposite side walls **14**, and parallel horizontal top and bottom walls **15** and **16**. All of these walls of the housing may be formed of a suitable rigid resinous plastic material, such as polystyrene. Also, a vertical partition **17** of this same plastic material may be mounted in fixed position within the housing, parallel to and approximately midway between front and back walls **12** and **13**, with thin vertical partitions **125** extending parallel to side walls **14** at the forward side of partition **17**. To the back wall there may be mounted a non-conductive vertically extending resinous plastic member **18** of the channel shaped cross sectional configuration illustrated in FIG. 2. Parts **17**, **18** and **125** may be secured to the engaged walls of the housing in any suitable manner, as by an appropriate cement or adhesive, or may be molded integrally with the other walls insofar as possible.

Front wall **12** is planar and contains an opening **19** of the configuration illustrated in FIG. 1. At the location of this opening, there are mounted for viewing through the opening sixteen individual numeral components or display elements **20**, arranged in three vertical columns C_1, C_2, and C_3, with one additional element **20** being provided to the right of the column C_3. Each of the individual elements **20** has two selectively exposable display faces of identical size and shape, and all of these faces of the various elements are complementary in forming together a composite display pattern which substantially completely fills the opening **19** formed in front wall **12** of the housing. As will be apparent from FIG. 1, the display faces of the individual elements **20** are desirably all of rectangular configuration, and in the case of each of the elements except those in the center column C_2 should for best viewing be square in shape. The faces of the elements **20** in the center column C_2 are wider horizontally than the other

elements, and preferably wider than they are high, to have the illustrated elongated rectangular shape. For best results, the horizontal width of the viewing faces of elements **20** in the center column is between about one and one-fourth and one and one-half times (preferably approximately one and one-third times) the width of the other elements **20**, and the height of the elements **20** in center column C_2.

As seen best in FIG. 3, the two rectangular or square display faces of each individual element **20** are formed at **21** and **22** on two planar walls **23** and **24** which are disposed at a 60° angle A to one another, and meet along a horizontal edge **25**. Walls **23** and **24** are connected together at the opposite sides of the individual element **20** by two parallel vertical side walls **26** having integrally formed ribs **27** at their inner sides. The elements **20** may be formed of resinous plastic material, such as a polystyrene, injection molded to the illustrated and discussed configuration. All of the elements **20** which are aligned in any particular horizontal row are mounted by a common horizontal shaft **28'** (FIG. 1) for pivotal movement between two different positions in which the two display faces **21** and **22** respectively are positioned for viewing and aligned with and flush with the outer surface of front wall **12**. For instance, the upper element **20** in FIG. 3 is positioned with its surface **21** exposed, while the next to top element **20** in that figure has its second surface **22** exposed. The five shafts **28'** for mounting the five rows of elements **20** for their discussed pivotal movement extend through horizontally aligned apertures in the side walls **26** of elements **20**, and in partitions **125**, and are connected at their opposite ends to side walls **14** of the housing. Elements **20** may have short boss portions **20'** at their opposite sides engaging partitions **125**. The surfaces **22** of elements **20** are desirably of a neutral or background color such as white, while the surfaces **21** are of a different and highly contrasting color for forming composite numerals on the background defined by such of the surfaces **22** as are in a particular instance visible. The numeral forming surfaces **21** may be of a reflectorized material, typically formed by applying an adhesive sheet of plastic tape **121** containing a multitude of glass beads to surfaces **21**; or may if desired consist merely of paint having appropriate visual characteristics.

Each of the elements **20** is actuable between its two discussed display conditions by an associated solenoid **28** which may be wound upon an insulative spool **29** containing an armature **30** of magnetic material which is movable by the solenoid along a horizontal axis toward and away from the associated element **20**. Each armature **30** is connected by a rigid link **31**, typically formed of wire, to one of the side walls **26** of element **20**, at the location of increased thickness rib **27**. The connection between link **31** and each of the elements **30** and **20** is a pivotal connection, which may be made by turning the opposite ends **32** and **33** transversely through passages formed in parts **30** and **20** respectively.

The solenoids **28** associated with each of the different columns C_1, C_2 and C_3 are mounted within a common vertically extending channel **34** formed of magnetic material, such as a suitable magnetically soft steel, with the spools **29** of the solenoids being cemented or otherwise secured in position within the associated channel **34**, and with the various channels being secured to partition **17** by bolts **35** or otherwise (FIG. 3). Armatures **30** extend through apertures **36** in one of the two flanges of the associated channels **34**, and are freely movable forwardly and rearwardly within their spools.

Each element **20** is so dimensioned that its forward edge portion **25** is heavy enough to normally return the element **20** to the position in which its face **22** is exposed, and in doing so to pull the associated link **31** and armature **30** forwardly to the position of the next to top assembly in FIG. 3. This swinging gravitationally induced movement of element **20** is limited by engagement of link **31** with rear edge **37** of wall **23**. Upon energization of any of the solenoids **28**, the armature in that solenoid is pulled rearwardly, to swing element **20** to a position in which its face **21** is visible, with this swinging movement being limited by engagement of the rear edge **38** of wall **24** with link **31**. To properly position the parts for this extremely simple type of motion limiting action in which link **31** halts swinging movement in both directions, the pivotal axis of each rod **28'** is preferably located somewhat above the horizontal axes **30'** of the associated solenoids **28** and armatures **30**, with the links **31** being connected to parts **20** at the locations illustrated. This renders unnecessary any extra webs, stops or other devices to limit the total rotation of the display element to a desired 120°. Thus, a simple molded plastic display part may be both operated and limited in its movement by a formed wire link attached to a soft iron armature, which may itself be a small cylinder made by cutting off a section of stock and drilling one hole for the wire link to pass through.

For controlling the pattern in which elements **20** are actuated, there are mounted to the two webs of insulative rear channel element **18** (FIG. 2) two vertical series of control assemblies **39**. Each such assembly includes a plastic insulative spool **40** having an inner many turn holding coil **41**, and having wound about coil **41** an outer triggering coil **42** of fewer turns. The spools **40** are cemented to the webs of element **18**, and through each spool there passes a reed switch **43** (FIG. 4), suitably cemented or otherwise secured in place, and including a sealed glass envelope **44** containing two normally open reed contacts **45** and **46**. Contacts **45** and **46** are magnetically actuable to closed position upon energization of trigger coil **42**, by field produced by the coil, and are retainable in such closed condition by sustained energization of holding coil **41**. The contacts **46** of all of the various reed switches **43** are connected to a common vertically extending terminal bar **47**, desirably by soldering to that bar, with the bus **47** being connected by a lead **48** to one side of a power source **49**. The other contact **45** of each reed switch is connected to one end of the holding coil **41** about that switch, with the other end of the same holding coil being connected by a lead **50** to an associated one of the solenoids **28**. The second ends **51**, **51***a*, **51***b*, **51***c*, etc. all of the various solenoids, I in turn connect it to a common bus-bar or terminal **52**, which is connected through an erase switch **53** to the second side of power source **49**. Thus, so long as switch **53** is closed, holding current is available to all of the coils **41**, and actuating crurent is available to all of the coils **28**, upon closure of the corresponding reed switches **43**.

For initially triggering reed switches **43** to closed condition to form appropriate patterns on the face of the display unit, the various triggering coils **42** are connected to a second power source **54** in different predetermined patterns associated with 10 different terminals **55** carried by the housing. 10 different control switches **56** are connected to terminals **55** in a manner to close the circuit to each of the terminals when the corresponding switch **56** is closed. When the upper switch **56** of FIG. 5 is closed, the apparatus writes a 0, while closure of the second switch causes the apparatus to write a 1, etc. through the numeral 9 which is written by closure of the lowermost switch in FIG. 5.

To clarify the manner in which the various trigger coils are interconnected within the display unit, reference is first made to FIG. 6 in which the different display elements **20** of the device are designated separately as elements **20***a*, **20***b*, **20***c*, **20***d*, **20***r*, **20***e*, **20***f*, **20***g*, **20***cc*, **20***h*, **20***i*, **20***j*, **20***ii*, **20***k*, **20**L, and **20***ccc*. The trigger coils **42** associated with these various display elements **20***a*, **20***b*, etc. are designated in FIG. 5 as coils **42***a*, **42***b*, **42***c*, etc. As will be apparent, the energization of coil **42***a* closes the circuit to the solenoid for actuating element **20***a*; the energization of trigger coil **42***b* causes actuation of display element **20***b*, etc. Element **20***r* may be a

dummy, or a part constructed like the other elements **20** but not free for movement from its normal position in which the neutral face of that part is exposed, since it is found unnecessary when writing numbers to ever actuate the particular element designated **20***r* in FIG. 6 to a display condition. With regard to the trigger coil **42***c*, it is noted that this single coil may control the three elements designated **20***c*, **20***cc*, and **20***ccc* in FIG. 6, since these are always actuated together. For this purpose, two solenoids **28***cc* and **28***ccc* (FIG. 7) for actuating the elements **20***cc* and **20***ccc* may be connected in parallel with solenoid **28***c* (for actuating element **20***c*) and its holding coil **41**, so that all three solenoids are under the control of a single trigger coil **42***c* and a single reed switch **43**. Similarly, the two elements **20***i* and **20***ii* may be controlled by a single trigger coil **42***i* of FIG. 5.

I find it desirable to connect across each of the solenoids **28** (or **28***c*), and its associated holding coil **41** and reed switch **43**, a diode **120**, typically of the semi-conductor type, operable to provide a short circuit path across the coils and reeds during de-energization of the coils. This shunts out the voltage induced by de-energization, and thus prevents high voltage arcing of the reed contacts to greatly lengthen their useful life.

To now describe the operation of the apparatus of FIGS. 1 through 7, assume first of all that it is desired to write the numeral 0, as indicated in FIG. 9. To do this, the upper one of the switches **56** in FIG. 5 is closed, to pass an energizing current through coils **42***k*, **42**L, **42***d*, **42***f*, **42***h*, **42***a*, **42***e*, **42***j*, **42***c* and **42***b* before the current is returned to source **54** through lead **154**. This actuates all of the elements **20***k*, **20**L, **20***d*, **20***f*, **20***h*, **20***a*, **20***e*, **20***j*, **20***c*, **20***cc*, **20***ccc*, and **20***b*, to form the desired 0. Once the appropriate reeds have been triggered to closed conditon, they are held in that condition by passage of a holding current from the second power supply **49** through the reeds and their holding coils **41** and solenoids **28** (assuming that switch **53** is closed). The solenoids of course actuate the desired elements **20***a*, **20***b*, etc. to their active writing conditions, in the proper pattern for writing the numeral 0.

When it is desired to erase the numeral written, this may be done by momentarily opening switch **53**, to release the holding circuits. To write the numeral 1, the next to top switch **56** of FIG. 5 is closed, either before or after closure of switch **53**, so that a triggering circuit through coils *e*, *j*, and *c* is completed from power source **54**, to actuate the entire vertical column C_3 of elements **20**, and thereby write the desired numeral 1. Without tracing all of the other writing circuits individually in FIG. 5, it will be apparent that closure of the other switches **56** will energize such trigger coils as to write the numerals 2 through 9 respectively. The extra width of the elements **20***b*, etc. in the central column C_2 of such elements increases the legibility of the numerals, and enables them to be formed with a minimum number of elements. It is noted that the elements **20***i* and **20***ii* are used only for the numeral 4 with the latter of these serving to form the rightwardly projecting portion of that numeral.

The use of reed switches in the apparatus allows complete triggering of any display numeral by a single one ampere pulse of extremely short duration, say slightly over one millisecond. A resistor **121** (typically 33 ohms) may be connected into the power supply lead to the trigger coils to limit the intensity of the pulse. Once triggered the character remains displayed until reset (erased).

From a careful analysis of FIG. 5, it will appear that, in order to simplify the writing of the ten numerical characters, two basic trigger circuits may be employed. One of these is based on the numeral 1 (single vertical column) to which may be added other elements to form the numbers 7, 3, 4 and 0. The other basic trigger circuit includes the top, bottom and center horizontal rows to form by addition of extra display elements the characters 2, 5, 6, 8 and 9. This type of arrangement is desirable in order to reduce the cost of manufacture of the device. As an example, the numeral 7 is formed by adding triggering coils **42***a* and **42***b* to the basic numeral 1 which is triggered by coils **42***c*, **42***e* and **42***j*. The numeral 0 is formed by adding to the numeral 7 coils **42***k*, **42***e*, **42***b*, **42***f* and **42***d*, to make a complete loop from the 7.

FIG. 8 illustrates fragmentarily a variational arrangement in which the solenoids **28′**, corresponding to solenoids **28** of the first form of the invention, have their respective reed switches **43′** (corresponding to switches **43** of the first form of the invention) secured to the sides of the solenoids, as by taping at **143**. A trigger coil **42′** (corresponding to coils **42** of the first form) is wrapped about each reed switch, to initially actuate it to closed condition. The reed switch is connected in series with its corresponding solenoid **28′**, and is positioned close enough to the solenoid that, once the solenoid has been energized by initial triggered closing of the reed switch, the solenoid will thereafter serve itself as a holding coil acting to electromagnetically maintain the reed switch in closed condition. Thus, the necessity for a separate holding coil is eliminated. As in the first form of the invention, all of the holding coils and reeds may be connected in parallel to a holding current power supply (such as that represented at **49** in FIG. 3) and through a control switch. Also, the various trigger coils **42′** may be connected to a second power source, through individual triggering or control switches, in a pattern corresponding to that illustrated in FIG. 5. As in the first form of the invention, the reed which is associated with the solenoid which actuates element **20***c* of FIG. 5 may control also the solenoids associated with elements **20***cc* and **20***ccc*; and the reed switch associated with the solenoid which actuates element **20***i* of FIG. 5 may also control the solenoid associated with element **20***ii*. Except in the respects specifically discussed above, the form of the invention illustrated in FIG. 8 may be essentially identical with the first form of the invention.

FIGS. 10 and 11 illustrate another variational arrangement, including means for facilitating return of a number of actuated display elements **130** from their actuated positions to their released positions, upon opening of the erase switch **53** of FIG. 4. In FIG. 10, I have shown one of the vertical rows of display elements **130**, which may be identical with the elements **20** of FIGS. 1, 2 and 3, and which are solenoid actuated in the same manner as are elements **20**. When the solenoids associated with display parts **130** are energized, these parts are actuated to the broken line positions of FIG. 10, in which they engage a series of vertically spaced circular projections or rings **131**, carried by a vertical tube **132** which is mounted about a vertical guide rod **133** secured at its upper and lower ends **134** and **135** to the top and bottom walls of housing **136**. Rod **133** may be attached to the housing in a manner retaining this rod against any movement relative to the housing. Tube **132** and its rigidly carried rings **131** are spring urged upwardly by a coil spring **137** disposed about rod **133** beneath the tube. Rings **131** are spaced vertically apart distances corresponding exactly to the vertical spacing between the different horizontal pivot rods **138** by which elements **130** are mounted for swinging movement betwen their full line and broken line positions.

Spring **137** normally holds tube **132** and its ring **131** in the full line position of FIG. 10. The rings **131** are in this position so located as to be in the path of swinging movement which walls **139** of elements **130** follow upon energization of the associated solenoids, so that if any one of the elements **130** is actuated to its broken line position, the wall **139** of that element will engage the corresponding ring **131**, and thereby displace that ring and the connected tube **132** downwardly to the broken line position of those parts, against the tendency

of spring **137**. When the solenoid or solenoids are subsequently de-energized, spring **137** acts through parts **131** and **132** to impart an upward 'kick' to each of the engaged walls **139**, to thereby initiate the returning movement of all of the elements **130** in unison, and thereby prevent interference by one of the parts **130** with returning movement of another of these parts. That is, if all of the elements **130** return at the same time, from their broken line positions to their full line positions, the various corners **140** of the different elements cannot engage or interfere with one another.

As seen in FIG. 11, each of the three vertical columns of elements **130** has associated with it a return assembly **131–132**, mounted about an associated vertical rod **133**, and acting to impart initial returning movement to the elements **130** in that particular vertical row. The single right-hand element **21***ii* of FIG. 6 of course does not need a return unit. Spring **137** of each of the units **131–132** should be relatively weak, so that its force may be overcome by the pull exerted by a single one of the solenoids for actuating elements **130**, if only one solenoid and element **130** are in a particular instance actuated. Except in the respects specifically discussed, the form of the invention shown in FIGS. 10 and 11 may be considered as identical with that of FIGS. 1 through 7.

What is claimed as new is:

1. A display assembly including a plurality of display elements adapted to form together any of various different composite symbols, said individual elements being movable in different patterns between active display positions and inactive positions, a plurality of individual solenoids for separately actuating said elements between said active and inactive positions, individual armatures of magnetic material actuated by said solenoids and operable to shift said elements respectively between said positions, a plurality of individual magnetically actuated reed type switches for closing electrical circuits to different solenoids respectively, a plurality of individual triggering coils for actuating different ones of said reed switches respectively between open and closed positions, and means connecting said triggering coils together in a plurality of different multiple coil triggering circuits selectively energizable to actuate said elements in said different patterns.

2. A display assembly including a plurality of display elements adapted to form together any of various different composite symbols, said individual elements being movable in different patterns between active display positions and inactive positions, a plurality of individual solenoids for separately actuating said elements between said active and inactive positions, individual armatures of magnetic material actuated by said solenoids and operable to shift said elements respectively between said positions, a plurality of individual magnetically actuated reed type switches for closing electrical circuits to different solenoids respectively, a plurality of individual triggering coils for actuating different ones of said reed switches respectively between open and closed positions, means connecting said triggering coils together in a plurality of different multiple coil triggering circuits selectively energizable to actuate said elements in said different patterns, and individual holding coils, in addition to said triggering coils, for retaining said switches respectively in actuated positions, and connected into a plurality of different circuits, with said different solenoids respectively and their associated reed switches.

3. A display assembly including a plurality of display elements adapted to form together any of various different composite symbols and arranged in vertical columns of said elements, individual ones of said elements having first and second walls disposed at an angle to one another and visible respectively in predetermined active and inactive positions of the elements, means mounting said elements for pivotal movement about essentially horizontal axes between said active and inactive positions, solenoids for pivotally actuating said elements to one of said positions when energized and having armatures connected to said elements, said elements and armatures being constructed to return the elements to the other of said positions by gravity upon de-energization of the solenoids, a vertically movable vertically elongated tubular structure having a plurality of shoulders disposed essentially annularly thereabout adapted to engage respectively one of said walls of each of the elements in one of said columns and actuate said elements in said one column from said one position toward said other position, a vertical rod extending through said tubular structure and mounting it for said vertical movement, a coil spring disposed about said rod and urging said structure in an upward direction to actuate said elements toward said other position.

References Cited by the Examiner

UNITED STATES PATENTS

1,191,023	7/1916	Naylor	40—28
2,043,511	6/1936	Handley et al.	40—52
2,141,473	12/1938	Hubertz	40—28
2,814,893	12/1957	Aiken	40—28
3,096,594	7/1963	Skrobisch	40—28

FOREIGN PATENTS

625,049	6/1949	Great Britain.

EUGENE R. CAPOZIO, *Primary Examiner.*

JEROME SCHNALL, *Examiner.*

WENCELSO J. CONTRERAS, *Assistant Examiner.*