ABSTRACT: A component assembly for electrical numerical display comprising a respective U-shaped housing for each respective numerical display tube which is arranged behind a transparent cover disk. There is also provided at least one stationary circuit board having contact track means leading to contact terminals, the current-conducting track means being disposed in at least one plane of the circuit board and the contact terminals being situated along and in proximity to a housing wall at the opposite side of the cover disk and extending transversely to the plane of the circuit board. The U-shaped housings are constructed to be arranged in a row to form a module or assembly of such housings and for the application thereto of closure plates. These closure plates are equipped with protruding retaining spring means which in cooperation with flanged edge means of the housing and the closure plates permit the insertion and mechanical retention of the entire row of housings in a cutout or recess of the front plate of a suitable apparatus with which the assembly is used. Furthermore, a respective connection pin is mechanically and electrically coupled with the associated contact terminal of each current-conducting track, this connection pin extending transversely through the aforementioned housing wall and being mechanically retained thereat.
FIG. 1

FIG. 2

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ASSEMBLY FOR ELECTRICAL NUMERICAL DISPLAY

BACKGROUND OF THE INVENTION

The present invention relates to an improved component assembly for the electrical numerical display of indicia, typically for numerical readout, and comprises a respective substantially U-shaped housing for each respective numerical display tube which is disposed within a transparent cover disk or plate. Furthermore, the component assembly of the invention comprises at least one stationary circuit board in at least one plane of which there are arranged current-conducting track means which lead to contact terminals extending along the region of a housing wall which is disposed transverse to the plane of the circuit board and situated opposite to the cover disk.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide an improved design and construction of the components used for electrical numerical displays which can be assembled together into a module or component assembly and to insert such into the front plate of an apparatus with such components can be easily exchanged, while at the same time permitting an increase of the mutual spacing of the input and output connections to the circuit board with constant external dimension of the housing or the circuit board. It is another significant object of the present invention to provide an improved component for electrical numerical display wherein a plurality of such can be easily assembled together in side-by-side relationship to form a package or module of such components, the assembly operation being capable of performance easily and quickly as well as any requisite dismantling thereof, and wherein the size dimensions can be kept to a minimum while still effectively housing the circuit components or other hardware therein.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the component housings which can be arranged in a row in side-by-side relationship and constructed for mounting thereto suitable closure plates further contemplates the features of protruding resilient elements, specifically retaining blade springs at the closure plates which in cooperation with flanged edges of the housing and the closure plate facilitate the insertion and mechanical retention of the entire row of housings in a recess or cutout portion of a front plate of an apparatus with which the housing components are employed. Additionally, according to further aspects of the invention, each respective contact terminal of the associated current-conducting track means is mechanically electrically coupled with a connection pin extending transversely through the aforementioned housing wall and mechanically retained therein, wherein for each circuit board there are provided two respective parallel rows of connection pins.

The invention proposed herein which incorporates connection pins as herein discussed, in contrast to known numerical display devices or similar electrical equipment of this type, renders possible an arrangement of the input and output connections at a greater mutual spacing from one another while maintaining unchanged the dimensions of the housing. This is especially desirable when the connection with the connection pins is undertaken mechanically by means of the so-called Termintor or Wirewrap technique. The connection pins are advantageously inserted into the housing wall and flexed within the housing towards the associated circuit board. The ends of these flexed or bent connection pin legs pierce through the circuit board at the region of the associated respective contact terminal of each associated current-conducting track means and are coupled therewith. It is advantageous if the connection pins are arranged in two parallel rows and are inserted into the rear wall of the housing in such a way that upon placing in a row a number of these housings into a package or module all of the rows of connection pins display the same spacing from one another. Furthermore, the contact terminals of the conduction tracks likewise can be arranged in two rows. The connection leg portions of the connection pins of the first row are connected, for instance with the outer row of contact terminals and the corresponding longer connection legs of the connection pins of the second row are then, for instance, connected with the inner row of contact terminals.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic side view of a preferred embodiment of numerical display component designed according to the teachings of the present invention;

FIG. 2 is a sectional view of the numerical display component depicted in FIG. 1, taken substantially along the line II--II thereof and showing at each side in exploded illustration the closure plates in plan view;

FIG. 3 is a front view of the numerical display device with the closure plates mounted thereat;

FIG. 4 is a side view showing details of the resilient components or members of the closure plate inserted in the front plate of an apparatus with which the numerical display components are employed;

FIG. 5 is a side view of the other side of the numerical display component of FIG. 1;

FIG. 6 is a sectional view of the numerical display component depicted in FIG. 5, taken substantially along the line III--III thereof and

FIG. 7 is the rear face or end of the various forms of numerical display components shown herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, in FIG. 1 there is shown an exemplary embodiment of a component used for the electrical numerical display or readout which will be seen to comprise a substantially U-shaped housing which is closed at its front end by the transparent cover disk or plate 2. A suitable numerical display tube 3 is mounted with a plate member 41 situated transverse to a circuit board 5', display tube 3 being electrically coupled in any suitable fashion with the current conducting tracks 51' of the circuit board 5'. The current conducting tracks or track means 51' of the circuit board 5' will be seen to lead to suitable contact terminals 52' which are electrically coupled with appropriate connection pins 6 piercingly extending through the rear housing wall 15.

By referring to FIGS. 2 and 3 it will be recognized how the closure plates 11 and 11' can be assembled together with such a numerical display component 9. More specifically, it will be recognized that both the display component 9 and the closure plates 11, 11', are provided with appropriate projecting pins or cams 13 and mating receiving recesses 13', as shown. Hence, the four positioning cams 13 of the closure plate 11, for instance arranged at the four corners thereof, can engage with four respective appropriately configured recesses 13' provided at the confronting face of the housing 1 of each numerical display component, and in like fashion, the other cover plate 11' can be provided with four corner-arranged recesses 13' which receive projecting cams or pins 13 at the opposite situated and confronting face of this housing 1 of such numerical display component. Additionally, there are provided threaded through passage holes 103' and 103 at the cover plates 11 and housing 1, respectively, as shown, which receive two conventional connection screws (now shown) which may interconnect a plurality of such components into a module or numerical display package. In FIG. 3 the numerical
readout device thereof displays the digit 4. A numerical display package or module may consist of one or a number of these components 9 which are assembled together in side-by-side relationship, as previously explained, with the aid of the aforementioned positioning pins 13 and recesses 13', with two respective appropriate retaining blade springs 8 and the like arrangement at each end of the respective closure plates 11 and 11'.

FIG. 4 shows details of the retaining mechanism for a component assembly at a recess or cutout 40 of the front plate 10 of any suitable apparatus with which the numerical display component may be used, the retaining mechanism being shown for instance in the form of the blade springs 8 mounted at the associated closure plate 11. Both blade springs 8 which are secured to the appropriately constructed pins 13 and recesses 13' of the corresponding closure plate 11 are constructed at their front end in such a way that, in cooperation with the flanged edges or edge portions 101 of the closure plate 11 and the entire assembly of these components 9, such component module can be inserted in a substantially rectangular opening 40 of the front plate 10 of the apparatus in proper position and mechanically fixedly retained thereat in such proper position. This can occur independently of the material thickness of the front plate 10.

FIG. 5 illustrates the numerical display component 9 as viewed from the second side and FIG. 6 is a sectional view along the section line III-III of FIG. 5. It will be seen that the substantially U-shaped housing 1 which is covered with the transparent cover disk or plate 2, contains the numerical display 3 which, in turn, is arranged at the circuit plate 41 and is electrically coupled with the conducting tracks thereof. The circuit board 5, which extends parallel to the previously considered circuit board 5' and transverse to the circuit board 41, contains at least at one plane thereof current-conducting track means 51 which lead to suitable repetitive contact terminals 52, the latter of which again may be arranged in two convenient planes. Metallic connection pin members 6 are inserted in the rear wall 15 of the housing 1. Once again, the ends 61 of the connection pins 6 which are situated within the housing 1, as best shown by referring to FIG. 6, are flexed or bent and electrically connected, if inserted in the bores 50 of the contact terminals 52 of the current-conducting track means 51, which, as mentioned above, can have the contact terminals 52 arranged in two substantially parallel rows. Furthermore, it will be recognized that the flexed ends or edge portions 61 of the connection pins 6 are of different length, with the flexed leg portion of the row of connecting pins leading to the closer situated row of contact terminals being shorter and the other respective leg portions of the other row of connecting pins leading to the inner situated row of contact terminals being longer. Furthermore, the leg portions or ends 61 of these connection pins 6 can be, for instance, soldered or otherwise electrically connected with the corresponding connection terminals 52. The connection pins 6 themselves are introduced into appropriately formed openings 16 provided at the rear wall 15 of the housing 1 and are rigidly mechanically retained therein. At the rear side of the circuit board 41, there is mounted an operable component 7 which, depending upon the manner of connection of the current-conducting tracks, are electrically coupled at one of both sides of the circuit board 5 and 5' with their associated current-conducting track 50 or 51 respectively. Furthermore, a circuit plate 42 can be provided to afford the necessary transverse connection of both circuit boards 5 and 5'. The preceding current-conducting tracks of the circuit boards 5 and 5' as well as the current-conducting tracks of the circuit board or plates 41 and 42, which are generally electrically coupled with one another, are arranged in such a fashion that these respective current-conducting tracks of these various circuit boards are perpendicular to one another and can be easily electrically connected with one another by soldering for instance. Furthermore, the circuit boards 5 and 5' which are disposed in parallelism with one another will be seen to extend transversely with respect to the other circuit boards or plates 41 and 42.

Now FIG. 7 shows the rear face of the housing 1 of the component 9 of the invention. The connection pins 6 are arranged in two respective rows for each circuit board 5 and 5' and, as mentioned previously, are fitted so as to be secure in appropriate recesses or openings provided at the rear housing wall 15. The totality of these connection pins 6 are arranged in a gridlike configuration in columns and rows and possess the same spacing from one another, as shown. These connection pins 6, for instance, can be inserted into a suitable plug. However, it is also possible to connect the connection pins 6 by means of the so-called Termi point or wirewrap method with connection wires, resulting in minimum spacing of the connection pins 6. The housing 1 and/or the closure plates 11 and 11' can be, for instance, formed of a suitable plastic which advantageously is inflammable or difficult to combust. The connection pins 6 can also be cast or molded at the housing wall 15. If a number of these components are arranged next to one another at a front plate, then the closure plates of the component assembly may be constructed without flanges 101, 101' at their contacting side.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

What we claim is:

1. A component assembly for the electrical indication of suitable indicia, typically for numerical readout comprising a respective substantially U-shaped housing for each numerical display tube, a transparent cover disk carried by said housing, a numerical display tube located behind said transparent cover disk, at least one stationary circuit board provided with a plurality of current-conducting track means in at least one plane of such circuit board, said housing possessing a housing wall disposed opposite said cover disk and extending substantially transversely with respect to said stationary circuit board, respective contact terminals electrically communicating with said current-conducting track means and situated adjacent said transversely extending housing wall, said track means on the housing side of said housing, said track means on the housing side being connected together to form a plurality of said housings to be arranged in side-by-side relationship in a row and for attachment of said track means thereto, flanged edge means, and retaining spring means provided for said track means which in cooperation with said flanged edge means and said track means permit insertion and anchoring of a row of such housings forming a component assembly at a recess of a front plate of an apparatus with which said component assembly is employed, and a respective connection pin member piercingly extending transversely through said housing wall and rigidly connected thereto and mechanically coupled in electrical conducting relationship with the respective contact terminals of each current-conducting track means.

2. The component assembly for the electrical indication of suitable indicia, typically for numerical readout as defined in claim 1, wherein each of said connection pin members is provided with a flexed connection leg portion which is bent within said housing towards said circuit board, each said flexed connection leg portion having a free end which piercingly extends through said circuit board and is electrically connected with an associated contact terminal of said current-conducting track means.

3. A component assembly for the electrical indication of suitable indicia, typically for numerical readout as defined in claim 2, wherein said housing wall is provided with throughpassage openings for receiving said connection pin members.

4. A component assembly for the electrical indication of suitable indicia, typically for numerical readout as defined in claim 3, wherein two substantially parallel rows of said con-
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5. A component assembly for the electrical indication of suitable indicia, typically for numerical readout as defined in claim 4, wherein said contact terminals are arranged in two rows at said circuit board at the region of said housing wall to define an inner row and an outer row of such contact terminals, said connection pin members being arranged in two rows, one row of said connection pin members having their connection leg portions leading and connected with the outer row of contact terminals and the other row of connection pin members possessing longer connection leg portions leading to the inner row of contact terminals and being electrically connected therewith.