This invention is concerned with electronic and electrical apparatus comprising a plurality of related circuits, including condensers, resistors, transistors and/or other components, disposed either individually or in sub-assemblies, together with their line conductor connections and other parts by which the several circuits are assembled into a unitary apparatus.

This invention provides that components of electronic or electrical apparatus shall be mounted or disposed, either separately or in selected sub-assemblies, upon two or more lamellar component-carrier units which are capable of being disposed and detachably fixed in relatively spaced parallel arrangement by suitable structural members, there being a further carrier unit which constitutes a common distribution-board or panel, and the elements on each of the component-carrier units being connected to said distribution-board unit by flexible conductors which are anchored to edges of the respective units in such manner that when the apparatus is disassembled these units may be spread out in common planar arrangement with the component-carrier units extending outwardly from the distribution-board unit.

The several lamellar carrier units may be of annular form so that when assembled in coaxial parallel arrangement, they enclose collectively a three-dimensional space in which, for example, a battery, or an instrument such as a gyroscope, or other component of the apparatus, may be mounted or housed.

The component-carrier units preferably carry printed circuits which include the necessary elements such as resistors, condensers and the like and upon which other components are rigidly mounted. The conductor connectors may be single wires or, preferably, they may be in the form of flexible strips in which a number of conductors, having differently colored insulation for ease of identification, are arranged side by side and bonded together by a suitable plastic medium in ribbon form.

The conductor strip connectors are anchored to the carrier-component units to which they belong only on one substantially straight edge of the unit, or where the unit is of circular form, only at one point of the edge thereof, in order that the unit may be folded outwardly about the anchorage edge or point when the several units are spread out on disassembly.

An embodiment of the invention as applied to an electronic apparatus including, in addition to a number of component circuits, such bulky objects as a battery and one or more gyroscopes, is illustrated in the accompanying diagrammatic drawings to which reference is made in the following detailed description. In said drawings, FIG. 1 is a perspective view of the apparatus as a whole seen without the cover envelope, and FIGS. 2 and 3 are respectively an axial section and an underside plane thereof; the section of FIG. 2 is taken on the line II—II of FIG. 3. FIG. 4 is an "exploded" view showing several parts of the apparatus in disassembled condition, and FIG. 5 is a sectional view of one of the component-carrier units shown separately.

The particular apparatus illustrated comprises six component-carrier disc units, respectively indicated at A, B, C, D, E and F, a circular distribution-board unit G and a circular base-plate H which incorporates an axially disposed cylindrical casing H2 which is conveniently used to accommodate a gyroscope indicated at J; the base-plate also carries three angularly spaced mounting lugs H3. The disc C is a screening disc not shown in FIG. 4.

Each of the component-carrier discs A, B and D to F bears in the form of a printed circuit such of the circuit elements as lend themselves to inclusion in that form, other related components, such as the elements shown in FIG. 5, where K is an inductance, L a transistor and M a resistor, being rigidly mounted to the discs. Each of said discs A to F has a central circular aperture as shown in FIG. 5, and all the discs are supported in parallel arrangement by tubular distance-pieces N, the length of which determines the spacing necessary to accommodate the dimensions of elements mounted on the discs. The distribution-board unit G is fixed co-axially with the discs A to F.

Metal or other support strips P are disposed longitudinally about the edges of the assembled discs and the base-plate, the strips P being notched to receive the edges of the discs and so to provide fixed axial location of the latter.

The elements of the circuit and other components upon the respective discs are connected to the distribution-board disc G by separate flexible strips Q of conductors each of which is anchored at one end to the unit G and at the other end to the notched edge of the respective disc A to F to which it relates. Connections between elements on different discs are made through the distribution-board disc G, and the arrangement is such that, after removal of the distance-pieces N and the strips P, the whole of the apparatus borne by the component-carrier discs A, B and D to F may be spread out in common planar relationship with the distribution-board disc G in the manner shown in FIG. 4, the unit G occupying the central position and the flexible strip connectors Q radiating therefrom to the several discs A to F. When so disassembled, ready access is afforded to all components and parts of circuits, parts may be replaced or replaced with the minimum disturbance of the circuits or inter-connections between sub-assemblies on different discs, and the task of initial wiring is greatly simplified and cheapened.

The central apertures of the discs A to F and the tubular distance-pieces N, provide a central space for housing the battery R.

Test points for testing the apparatus in its assembled condition may be provided on the distribution-board disc G. Protection of the circuits and components against environmental damage may be obtained by coating the same with a thin layer of a protective material, such as silicon rubber, which may be peeled off to permit attention to a faulty component and subsequently restored by a local repair.

The whole assembly may be sealed within a cylindrical container S which is secured by setscrews S2 to tapped holes in the unit G, whilst the skirt of the container fits around the rim of the base-plate H.

What we claim as our invention, and desire to secure by Letters Patent is:

1. In an electronic or electrical apparatus employing components disposed upon at least three lamellar component-carrier units, the invention comprising: means for demountably fixing said component-carrier units in relatively spaced parallel arrangement, a common distribution-board unit, flexible conductor means physically and electrically connecting the components on each of said component-carrier units directly to said distribution-board, said conductor means being anchored to the edges of its respective component-carrier unit to permit said com-
ponent-carrier units to be positioned in a common planar arrangement with respect to said distribution-board unit, and outwardly thereof, on removal of said fixing means from its operative relationship with said component-carrier units.

2. An electronic or electrical apparatus as set forth in claim 1, wherein said component-carrier units are annular in form, said carrier units being coaxially aligned when fixed in spaced parallel arrangement to enclose collectively a three-dimensional space suitable for housing a component of the apparatus.

3. An electronic or electrical apparatus as set forth in claim 1, wherein said fixing means includes support strips, said strips being notched to engage the edges of said units for locating said units in axial alignment.

4. An electronic or electrical apparatus as set forth in claim 1 wherein said units are circular and are provided with peripheral notches for receiving said conductor means.

5. An electronic or electrical apparatus as set forth in claim 4, further comprising: a circular base-plate disposed in parallel relationship with said units and having the same external shape and size with respect thereto, means for attaching the base-plate to said fixing means, and a cylindrical container enclosing the whole and attached to the rim of said base-plate.

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