

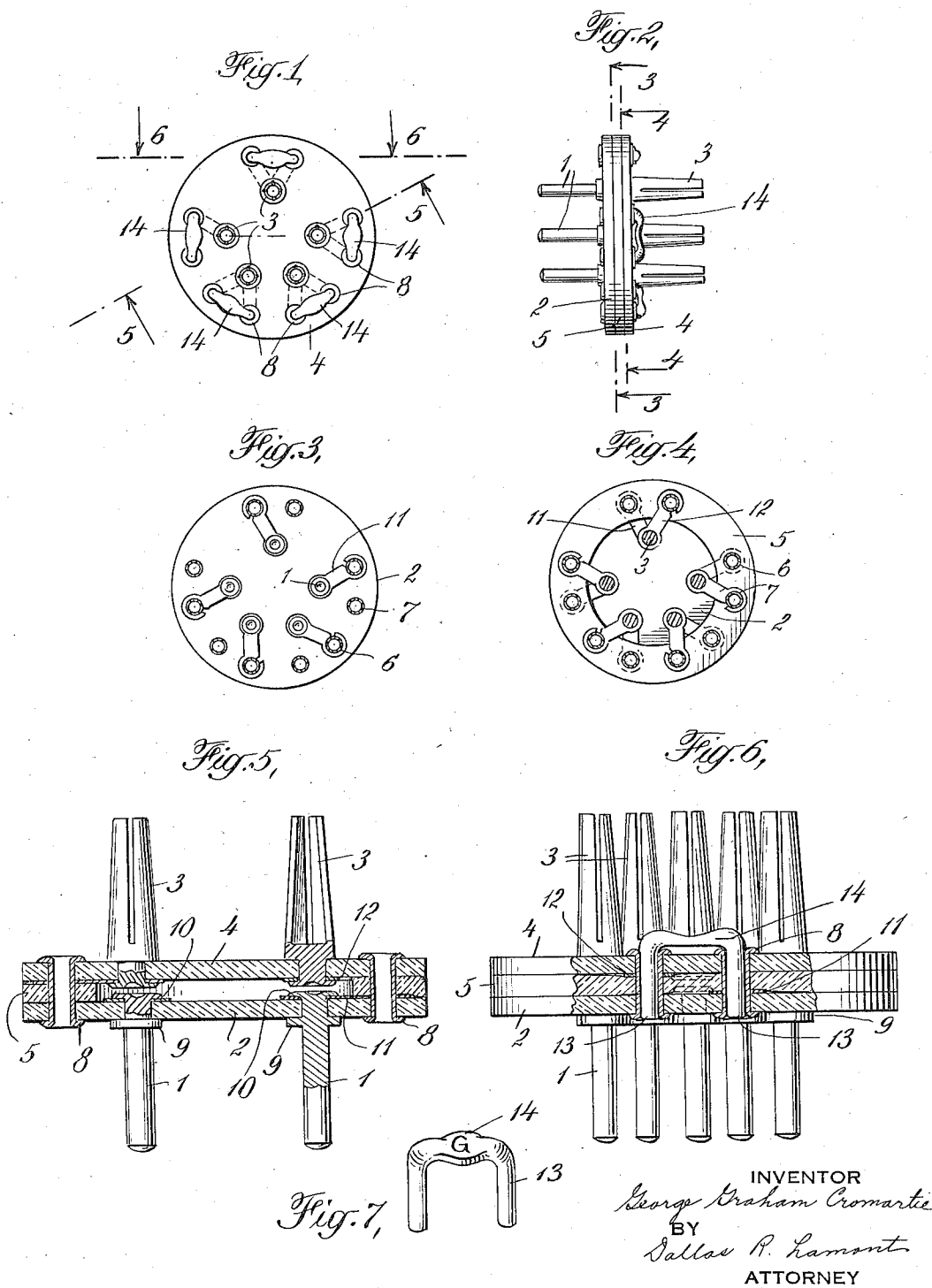
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G. G. CROMARTIE

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ELECTRICAL CONTACT APPARATUS

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ELECTRICAL CONTACT APPARATUS

George Graham Cromartie, Maplewood, N. J., assignor to Best Manufacturing Company, Irvington, N. J., a copartnership

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The present invention relates to electrical contact apparatus by means of which electrical contact can be selectively established or broken, as desired, between the respective contact members of two banks of such members, and the invention has to do particularly with such an apparatus or device for use in conjunction with vacuum tubes in a manner described more fully below.

It is necessary or desirable in certain instances to open the vacuum tube circuits in radio sets and other apparatus. For instance, in the testing of defective vacuum tubes or circuits, it is frequently desirable to open the grid circuit, or the filament circuit, or the plate circuit and to place a measuring instrument in that circuit. Also, in connecting a phonograph reproducer or "pick-up" into a radio set the vacuum tube circuits must be opened at one point or another. In the modern design of radio sets and like apparatus, the circuit wiring is practically entirely enclosed and is very difficult of access. Also, the circuit wiring is so extensive and complicated that any attempt, by one not particularly skilled, to open circuits or otherwise tamper with the wiring is likely to result in damage. The present invention provides means for opening any of the vacuum tube circuits without necessity of disturbing the permanent wiring. The invention effects such provision by simple means which can be safely used by an unskilled person and which can be operated in much less time than would be required to make a change in the permanent circuit wiring.

An apparatus embodying the present invention may comprise, for example, a plurality of primary contact members insulated from each other and adapted to make contact with a plurality of electric circuits. For instance, the apparatus may comprise a plurality of post-type contacts mounted on an insulating base and arranged after the manner of the contacts provided on a vacuum tube base, so that the apparatus can be introduced into a vacuum tube socket to make contact with the several terminals of the vacuum tube circuit. These primary contact members of the apparatus are connected respectively to primary switch terminals, the several switch terminals also being insulated from each other. The apparatus further comprises a plurality of secondary contact members mounted on an insulating support, insulated from each other, and being, for instance, in the form of socket-type contacts adapted to receive the contacts of a vacuum tube. These secondary contact members are connected respectively with a plurality of secondary switch terminals as are the primary members described above. The apparatus is completed by the provision of manually operated switch members adapted to open and close circuit

between the primary and secondary switch terminals. Each switch member serves to establish or break electrical connection between one set of switch terminals, and the closing of one switch therefore establishes connection between one primary contact member and one secondary contact member. The respective switch members are actuated independently so that any desired combination of connections may be established.

The invention will be described further by reference to the accompanying drawing, wherein Figure 1 is a plan view of an apparatus embodying the invention; Figure 2 is a side elevational view of the apparatus of Figure 1; Figures 3 and 4 are transverse sectional views taken on the planes indicated respectively on Figure 2 as 3-3 and 4-4; Figure 5 is a longitudinal sectional view taken on 5-5 of Figure 1; Figure 6 is an elevational view showing the details of a switch member and the switch terminals; and Figure 7 is a perspective view of a preferred form of switch member.

The apparatus as here shown comprises a plurality of post-type primary contact members designated by the reference numeral 1, these contacts 1 being so spaced and arranged as to fit a standard vacuum tube socket. Primary contact members 1 are mounted in a base member 2 of insulating material, as shown. A plurality of secondary contact members 3, corresponding in number and arrangement to contact members 1, are mounted in a base member 4 of insulating material. The secondary contact members are, as shown, socket-type contacts adapted to receive contact posts of the kind provided on the bases of vacuum tubes. Insulating base member 2, which carries the primary contact members 1, and insulating base member 4, which carries the secondary contact members 3, are mounted face to face with an insulating plate or annular disk 5 interposed between them as shown. Thus, each primary contact member 1 is insulated from all of the others, each secondary contact member 3 is insulated from all of the others, and all of the primary contact members 1 are insulated from all of the secondary contact members 3. In the use of the device for testing vacuum tubes, vacuum tube circuits, and the like, and in other uses described below, the vacuum tube is removed from its socket and the device is placed in the socket with the primary contact members 1 in engagement with the socket terminals. The vacuum tube may then be placed in secondary contact members 3, where it operates the same as though it were placed directly in the vacuum tube socket.

Primary switch terminals 6 and secondary switch terminals 7 are provided in conjunction with the respective primary and secondary contact members 1 and 3. In the embodiment here

shown these switch terminals assume the form of metal sleeves extending through insulating disks 2, 4 and 5 spun over at their exterior ends as indicated at 8 to thereby hold them rigidly in position in the insulating disks, whereupon they also serve the purpose of clamping the several disks together.

Each primary contact member 1 extends through disk 2, being held in position in disk 2 by reason of shoulder 9 and the retaining spun over portion 10 which engage with the opposite sides of the disk, as shown. A flat metal connecting strip 11 is fitted over the end of each contact member 1, lying adjacent the inner face of the insulating disk 2 as shown, and at its opposite end is fitted over a primary switch terminal 6. Thus, each primary contact member 1 is in permanent electrical connection with a corresponding primary switch terminal 6 through the medium of the connecting strips 11. Likewise each secondary contact member 3 is connected to a corresponding secondary switch terminal 7 by means of connecting strips 12. The metal sleeves which constitute switch terminals 6 and 7 are preferably spaced about the periphery of the insulating disks so that each switch terminal lies adjacent its corresponding contact member, thus minimizing the length of the connecting strips 11 and 12.

A plurality of independently actuated switch members 13, shown in Figures 6 and 7, are provided to operate in conjunction with the respective switch terminals 6 and 7. Each switch member 13 consists of a generally U-shaped piece of electrically conducting material the legs of which are of diameter such that they fit snugly within the sleeves which constitute the switch terminals 6 and 7. The leg portions of the switch members 13 are spaced apart a distance equal to the distance between the respective primary and secondary switch terminals 6 and 7, so that each switch member 13 can be placed, as shown in Figure 6, with one of its leg portions in a primary switch terminal 6 and the other in the corresponding secondary switch terminal 7, thereby closing circuit between corresponding contact members 1 and 3. The portion of the switch member 13 which spans the distance between the switch terminals is preferably flattened out as indicated at 14 so that it can be gripped conveniently to effect manual removal of the switch member from its terminals or introduction of the switch thereinto. When switch member 13 is in position in switch terminals 6 and 7, as shown in Figure 6, one pair of contact members 1 and 3 are thereby placed in electrical connection. Switch members 13 may be provided in cooperation with each pair of switch terminals 6 and 7 which are provided on the apparatus so that, by introducing or removing the switch members 13 as desired any one or any group of the secondary contact members 3 may be placed in electrical connection with the corresponding primary contact members 1. If it is desired to permanently interconnect any secondary contact member 3 with its corresponding primary contact member 1, it will be understood that the removable switch member 13 may be substituted by a permanent connection between the switch terminals which may conveniently assume the form of a connecting strip lying on the face of the insulating disk and extending between the switch terminals that it is desired to connect permanently.

In the use of the apparatus here shown, the apparatus is placed in a vacuum socket, after the

vacuum tube has been removed, with the primary contact members 1 in contact with the terminals of the socket. The tube is then replaced by inserting it into the secondary contact members 3. If all of the removable switch members 13 are in place in the switch terminals 6 and 7, all of the vacuum tube circuits are closed and the tube will operate as though it were seated directly in the vacuum tube socket. The switch members 13 may be identified by suitable marking; e. g., the switch member shown in Figure 7 is marked "G" signifying that it controls the grid circuit. If it is desired to open the grid circuit of the tube, the switch member 13 which is marked "G" is removed by merely lifting it out of its switch terminals 6 and 7. This is an extremely quick and simple operation which can easily be performed by a novice, which requires but a moment's time, and which avoids any tampering with permanent circuit wiring.

Switch terminals 6 and 7 are preferably of such size as to receive a standard size cord tip in the same way as they receive the switch members 13. Thus, after the circuit is opened by withdrawal of a switch member 13, a measuring instrument, a phonograph reproducer, or any other device, can be connected into the opened circuit by merely inserting the cord tips of such device into the terminal sleeves 6 and 7 which have been vacated by removal of the switch member 13.

The specific embodiment of the invention here shown is adapted for use in connection with vacuum tube circuits. It will be understood that the invention is not limited to this particular use. It is applicable to the selective connection of a plurality of circuit members of any kind with a plurality of other circuit members. The apparatus may be made up as a one-piece unit, as shown herein, but is not necessarily so made. If desired, it may be made in two or more parts. For example, the primary contact members 1, together with their supporting insulating disk 2, might be made up as a separate unit connected by wires to the remainder of the apparatus which comprises the secondary contact members 3, the switch terminals 6 and 7 and switch members 13. Or, for example, both the primary contact members 1 and the secondary contact members 3 may be provided as separate units mounted on their respective insulating bases, while the switch terminals 6 and 7 and switch members 13 are mounted on a separate insulating support whose only function is that of a switch bank. It will also be understood that the specific form of switch terminals and switch members shown herein may be varied. So, also, if desired, the number of secondary contact members may not always be the same as the number of primary contact members, and certain switch terminals may be connected to a plurality of contact members instead of to only one member as in the embodiment here described. The modifications suggested just above are illustrative of various forms which the apparatus of the invention may assume, and it is understood that variations from the specific apparatus shown may be made within the scope of the invention as defined in the claims appended hereto.

I claim:

1. Electrical contact apparatus of the class described which comprises a base of insulating material, a plurality of primary contact members carried on said insulating base, a corresponding number of primary switch terminals secured to said base, permanently connected flat metal strips lying adjacent one face of said insulating base

and connecting the respective primary contact members with the corresponding primary switch terminals, an insulating member placed adjacent said connecting strips as insulation therefor, a second insulating base, a plurality of secondary contact members carried by said base, a plurality of secondary switch terminals affixed to said base, flat metal strips lying adjacent one face of said insulating base for connecting said respective secondary contact members with the corresponding secondary switch terminals, said second insulating base being placed against said insulating member so that an assembly unit having the primary and secondary contacts exposed at its respective faces is formed, said switch terminals extending through the two insulating bases and the intermediate insulating member and serving as clamping means therefor, and independently actuated switch members for selectively controlling the connections between the said primary and secondary switch terminals.

2. Electrical contact apparatus of the class described which comprises a base of insulating material, a plurality of primary contact members carried on said insulating base, a corresponding number of primary switch terminals secured to said base, permanently connected flat metal strips lying adjacent the inner face of said base and connecting the respective primary contact members with the corresponding primary switch terminals, a second insulating base, a plurality of secondary contact members carried by said base, a plurality of secondary switch terminals affixed to said base, flat metal strips lying adjacent the inner face of said base for connecting said respective secondary contact members with the corresponding secondary switch terminals, an insulating member interposed between the inner faces of said insulating bases to thereby insulate from each other the electrically conducting parts carried by the respective base members, said switch terminals being in the form of hollow sleeves extending through the three insulating members and serving as clamping means therefor, and switch members consisting of rods of conducting material bent into a generally U-shaped configuration, the rod portions forming the legs of said switch members being of such size and so spaced that they fit within said switch terminals and bridge the distance between adjacent primary and secondary switch terminals.

3. Electrical contact apparatus of the class described which comprises a base of insulating material, a plurality of primary contact members carried on said insulating base, a corresponding number of primary switch terminals secured to said base, permanently connected flat metal strips lying adjacent the inner face of said base and connecting the respective primary contact members with the corresponding primary switch terminals, a second insulating base, a plurality of secondary contact members carried by said base, a plurality of secondary switch terminals affixed to said base, flat metal strips lying adjacent the inner face of said base for connecting said respective secondary contact members with the corresponding secondary switch terminals, an insulating member interposed between the inner faces of said insulating bases to thereby insulate from each other the electrically conducting parts carried by the respective base members, and said switch terminals being in the form of hollow sleeves extending through the three insulating

members and serving as clamping means therefor, and switch members for interconnecting adjacent primary and secondary switch terminals which consist of substantially parallel rod portions adapted to fit closely within said switch terminals and being connected by a flattened portion shaped to be conveniently gripped by hand and of such length that the spacing of the rod portions of said switch is equal to the spacing between adjacent primary and secondary switch terminals.

4. Electrical contact apparatus of the class described which comprises a plurality of primary post-type contacts arranged on an insulating base in such manner as to engage with the contacts in a vacuum tube socket, whereby the apparatus may be inserted into a vacuum tube socket, a plurality of secondary socket-type contacts arranged on another insulating base and extending oppositely from said post-type contacts so that upon introduction of said primary contacts into a vacuum tube socket the secondary contacts extend outwardly from the socket and are adapted to receive contacts arranged as on a vacuum tube base, said group of primary contacts and said group of secondary contacts being supported out of direct contact with each other, sleeve-type switch terminals in electrical connection with the respective primary and secondary contacts, said switch terminals being arranged in pairs about the periphery of the supporting bases, each pair comprising one primary switch terminal and one secondary switch terminal, and independently actuated means for effecting electrical connection between the members of any pair of switch terminals, said switch terminals extending through the bases and acting as clamps for securing the bases together.

5. Electrical contact apparatus of the class described which comprises a laminated base, a plurality of primary post-type contacts arranged on said base in such a manner as to engage with the contacts in a vacuum tube socket, whereby the apparatus may be mounted upon a vacuum tube socket, a plurality of secondary socket-type contacts carried by the base and extending oppositely from said post-type contacts so that upon introduction of said primary contacts into a vacuum tube socket the secondary contacts extend outwardly from the socket and are adapted to receive contacts arranged as on a vacuum tube base, insulating means provided between said group of primary contacts and said group of secondary contacts, sleeve type switch terminals in electrical connection with the respective primary and secondary contacts, each of said switch terminals extending completely through the insulating base and anchored on opposite sides thereof to hold the base together, said switch terminals being arranged in pairs about the periphery of the supporting insulating base with the adjacent terminals of adjacent pairs being spaced a distance from each other different from the spacing of the respective pairs, each pair of terminals comprising one primary and one secondary switch terminal, and independently actuated means for effecting electrical connection between the members of any pair of said switch terminals, said means comprising substantially parallel interconnected rods of conducting material of such size and so spaced that they fit within said switch terminals of said respective pairs.

GEORGE GRAHAM CROMARTIE,