ABSTRACT: A tap block assembly for connecting one or more circuits to a common conductor by the insertion of a conductive plug. All components are captured between upper and lower molding halves which are secured together. A plurality of plug positions are provided in which the plug makes electrical contact with two respective circuits and a common conductor.
TAP BLOCK ASSEMBLY

This invention relates to tap block assemblies, and more particularly relates to a novel inexpensive tap block in which two different circuits of a plurality of circuits can be connected to a common conductor by insertion of a conductive plug.

Tap blocks are well-known, and are used in connection with electrical apparatus, such as a switchgear, to establish convenient test points for testing various circuits of the apparatus. Thus, each individual circuit, when tested, should be connected to a common bar which might supply test potential. Frequently, two or more circuits should be tested at the same time. The present invention provides a novel means to permit the connection of two circuits to a common conductive bar, with a plurality of locations made available in the tap block for a respective plurality of pairs of circuits which are to be connected together.

Accordingly, a primary object of this invention is to provide a novel tap block which permits the connection of two circuits to a common conductive bar.

Another object of this invention is to provide a novel tap block which has a plurality of plug positions corresponding to respective pairs of circuits.

Another object of this invention is to provide a novel tap block which is inexpensive, rugged and reliable.

These and other objects of this invention will become apparent from the following description taken in connection with the drawings in which:

FIG. 1 is a perspective diagram of the tap block of the invention with the upper and lower casings separated from one another to show the disposition of components on the lower base.

FIG. 2 is an exploded perspective drawing of the lower base and components of FIG. 1.

FIG. 3 is a perspective view of the bottom of the upper base of FIG. 1 along with selected components exploded away therefrom.

FIG. 4 is a top view of the tap block of FIGS. 1 to 3 with the upper molding removed.

FIG. 5 is a cross-sectional view of FIG. 4 taken across section line 5-5 in FIG. 4.

FIG. 6 is a cross-sectional view of FIG. 4 taken across section line 6-6 in FIG. 4.

FIG. 7 shows a side view of a typical plug which is used with the tap block of the invention.

FIG. 8 is a cross-sectional view of FIG. 4 taken across section line 8-8 in FIG. 4, with a plug in channel 80 corresponding to tap position 1.

FIG. 9 is similar to FIG. 8 and shows the plug in channel 86 corresponding to tap position 7.

FIG. 10 is a cross-sectional view of FIG. 4 taken across section line 10-10 in FIG. 4 with a plug in channel 81 corresponding to tap position 2.

FIG. 11 schematically shows the layout of the terminals of the test circuits on the bottom of the tap block as seen from the top of the block.

FIG. 12 schematically illustrates an application of the tap block of the invention.

Referring now to the drawings, the tap block assembly consists of an upper insulation housing 20, a lower insulation housing 21, a common conductive bar 22, a bypassing leaf spring 23 and a plurality of pairs of generally J-shaped conductive contact clips, arranged in seven rows, and shown as contact clips 24, two 27, 28-29, 30-31, 32-33, 34-35, and 36-37. These various components are captured between the upper housing and lower housing when the two are secured together as by rivets 40 and 41 (FIGS. 4 and 5).

The configuration of the interior surface of the lower housing is best seen in FIGS. 1 and 2, as well as FIGS. 4 to 6, 8 and 9, and consists of a generally flat surface having eight raised areas extending from 1 to 51. As shown best in FIGS. 1 and 2, there are two flat depressed regions 55 and 56 which each contain openings for receiving the ends of the J-shaped contact clips 25 to 36. The depth of depressed regions 55 and 56 is less than the diameter of the round wire which forms the various J-shaped clips so that the clips protrude above the upper surface of lower housing 21. The long leg of each of the lower housing to form terminals to which electrical connection can be made, as shown schematically in FIG. 11. The short ends of each of the clips is disposed in adjacent openings which may also extend through the bottom of the lower housing, in order to fix the entire clip in position on the bottom housing. Note that the contact clip 37 is disposed at an angle to the axis of the other clips, as will be later described. Clearly the various clips can be easily loaded into the bottom housing.

The conductive bar 22 and biasing spring 23 are then disposed above embossments 45 to 52, and are held in position by the configuration of the upper housing 20. This is most clearly shown in FIG. 3 where the upper housing 20 is shown as having a central elongated recess 60 which receives spring 23. Recess 60 has a central depression therein which receives extending cup 62 of bowed spring 23, thereby to accurately position spring 23 within recess 60.

The conductive bar 22 is then disposed within recess 60 with its opposite ends pressed away from shelves 70 and 71 by spring 23. Conductive bar 22 is then provided with an extending terminal 72 to which electrical connection may be made, with terminal 72 passing through slot 744 (FIG. 3) in one wall of the upper housing 20. The upwardly turned lip 73 of terminal 72 is located in slot 74 of upper housing 20 to easily load and locate the conductive bar 22 in the upper housing 20 and facilitates entrance of a plug 90, as will be shown in connection with FIG. 7. Terminal 72 then has a downwardly lanced section or tang 75 which can engage contact clip 37, as shown in FIG. 5. Tang 75 may be eliminated in some applications if contact between conductive bar 22 and contact 37 is not desired on removal of plug 90. Note that spring 23 presses bar 22 toward the embossments 45 to 52 on lower housing 21.

Upper housing 20 is further provided with seven slots 80 to 86 which define seven plug connection locations for the tap block assembly. Note that the seven slots are aligned with their end walls above contact clip pairs 24-25, 26-27, 28-29, 30-31, 32-33, 34-35 and 36-37, respectively, to hold the clips in position when the housing halves 20 and 21 are assembled. Clip 37 is held in position in lower housing half 21 by bending one leg thereof, as shown.

The various channels 80 to 86 then serve to receive plugs, such as plug 90, shown in FIGS. 7 and 10. Plug 90 consists of a conductive shaft 91 which is secured in an insulation handle 92. Plug 90 is dimensioned so that it fits within the channels 80 and 86, it will form an electrical connection between the pairs of contact clips disposed to show the channel, and to the contact bar 22. Conductive bar 52 only rests against shelf 70 or 71 if plug 90 is inserted and carrier 80 on only one shelf, depending on plug location. For example, if plug 90 is slowly inserted into slot 80 as shown in FIG. 8, the action will be to cause the conductive bar 22 to pivot around prong 75 and contact 37 or embossment 52 until the left end hits shelf 71. Conductive bar 22 is then forced to pivot around this end and ledge 71 by the complete insertion of the plug. The right-hand end of the conductive bar never hits ledge 70, but should have slight clearance. Now turning to FIG. 9, if the plug is slowly inserted in slot 86, the conductive bar is forced to pivot on embossment 45 until the right end of the conductive bar hits ledge 70. Continued insertion of the plug causes the conductive bar to pivot around this right end and ledge 70. The left-hand end of the conductive bar never hits ledge 71, but has slight clearance.

In operation, the various contact clips are connected to respective circuits which are to be monitored. The two circuits connected to a pair of contact clips may be separate circuits which are to be simultaneously connected. In making the connection, the circuits are to be made to the conductive bar which may be connected to a source of potential which will complete the circuit to the various individual circuits connected to the various contact clips.
When the plug 90 is not inserted into the tap block, section 75 of conductive bar 22 is pressed against contact 37. Simultaneously, the other end is pressed against embossment 45. Thus, on withdrawal of plug 90 from the tap block, electrical connection is automatically made between conductive bars 22 and contact 37. Obviously, by changing the location of the lanced section 75, electrical connection can be made with contact 25, 29 or 33. This is done so that on removal of the plug, an electrical circuit will be maintained between conductive bar 22 and a contact. By omission of lance 75, complete disconnection of all contacts is made when the plug is removed.

When plug 90 is inserted into any of channels 80 to 86, the contact bar will be raised, and tang 75 disengages contact clip 37. The plug will also engage and electrically connect conductive bar 22 and the two contact clips beneath the plug shaft 91. Thus, in FIG. 8, the plug 90 is inserted in channel 80. The diameter of shaft 91 is such that the bar 22 (rotating around edge 71) is moved upwardly against the force of spring 23, with contact clips 24 and 25 (and their respective circuits) being connected to one another and to contact bar 22. If it is desired to always make connection with contact 37 whenever the plug 91 is removed, it is necessary to make the printed circuit board with dotted connection between contacts 36 and 37 as shown in FIG. 11. If this making of connection to contact 37 is unimportant in the short interval of time when plug 91 is being withdrawn, the phantom connection shown in FIG. 11 may be omitted.

In FIG. 9, the plug is shown in channel 86, thereby raising bar 22 (which rotates around edge 70) connecting contact clip 36 and maintaining contact with bar 22. FIG. 10 shows plug 90 in channel 81, connecting contact clips 26, 27 and bar 22.

Thus, it can be seen that electrical connection can be made between the common conductive bar 22 and any given pair of contact clips. This is shown schematically in FIG. 12.

Insertion of plug 90 in any groove 80 to 86 makes two circuits which may be of different resistances, different reluctances or different capacitances, or any combination thereof.

Referring to FIGS. 6, 4 and 10, it will be seen that on insertion of plug 90, electrical contact is made between conductive bar 22 and front contacts 24, 26, 28, 30, 32, 34 or 36 before electrical contact is made to rear contacts 25, 27, 29, 31, 33, 35 or 37. On withdrawal of the plug, electrical contact between rear contacts and conductive bar is broken before electrical contact with front row. This is important in some applications.

Although this invention has been described with respect to particular embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and, therefore, the scope of this invention is limited not by the specific disclosure herein, but only by the appended claims.

We claim:
1. A tap block assembly comprising, in combination:
   a. an upper housing half comprising a generally flat insulation member having an upper surface and a lower surface;
   b. a lower housing half comprising a generally flat insulation member having an upper surface and a lower surface;
   c. means for securing said upper and lower housing halves together with said lower surface of said upper housing half adjacent said upper surface of said lower housing half;
   d. at least first and second parallel rows of pluralities of spaced electrical contacts extending through cooperating openings in said lower housing half, said first and second parallel rows of contacts extending transversely across said upper surface of said lower housing and having exposed regions extending above said upper surface of said lower housing; pairs of contacts of said first and second pluralities of contacts aligned in a direction perpendicular to said transverse direction;
   e. a conductive elongated, generally flat bar disposed above the plane of said first and second rows of electrical contacts; said upper housing having a recess in the lower surface thereof for receiving said generally flat conductive bar; support means on said lower surface of said lower housing for engaging said conductive bar and holding said conductive bar spaced from said plurality of contacts;
   f. a biasing spring disposed between the bottom of said recess and said generally flat conductive bar for biasing said conductive bar toward said upper surface of said lower housing;
   g. a plurality of channels formed between said upper surface of said lower housing and said bottom surface of said upper housing; said plurality of channels extending in said perpendicular direction and respectively aligned with each of said pairs of contacts of said first and second rows; and
   h. conductive plug means insertable in any of said channels for making electrical contact between said conductive bar and a respective pair of said contacts, and for raising said conductive bar against said biasing means.
2. The tap block assembly of claim 1 wherein each of said plurality of contacts have a generally J-shape having a bottom portion and two extending legs; one of said legs being longer than the other of said legs and serving as the terminal of said contact and extending beyond the bottom of said lower housing; each of said legs of each of said contacts received in respective openings in said lower housing; said bottom portions of said J-shaped contacts of each of said first and second rows extending along respective common, parallel axes.
3. The tap block of claim 1 wherein said conductive plug, upon connection to said tap block, initially contacts said first row of contacts and initially separates from said second rows of contacts.
4. The tap block of claim 1 wherein said upper surface of said lower housing has a first and second depressed region therein; said first and second rows of contacts disposed in said first and second depressed regions, respectively.
5. The tap block of claim 1 wherein said biasing spring comprises an elongated bowed leaf spring.
6. The tap block of claim 1 wherein said conductive bar has a perpendicularly extending terminal arm which extends beyond the periphery of said upper housing; and a tang extending from said terminal arm for engaging one of said plurality of contacts when said conductive bar is seated against said support means.
7. The tap block of claim 4 wherein each of said plurality of contacts have a generally J-shape having a bottom portion and two extending legs; one of said legs being longer than the other of said legs and serving as the terminal of said contact and extending beyond the bottom of said lower housing; each of said legs of each of said contacts received in respective openings in said lower housing; said bottom portions of said J-shaped contacts of each of said first and second rows extending along respective common, parallel axes.
8. The tap block of claim 4 wherein said upper surface of said lower housing has a first and second depressed region therein; said first and third rows of contacts disposed in said first depressed region; said second and fourth rows of contacts disposed in said second depressed region.