

Sept. 14, 1948.

F. W. CLAYDEN
ELECTRICAL TESTING DEVICE

2,449,057

Filed April 14, 1945

FIG. 1.

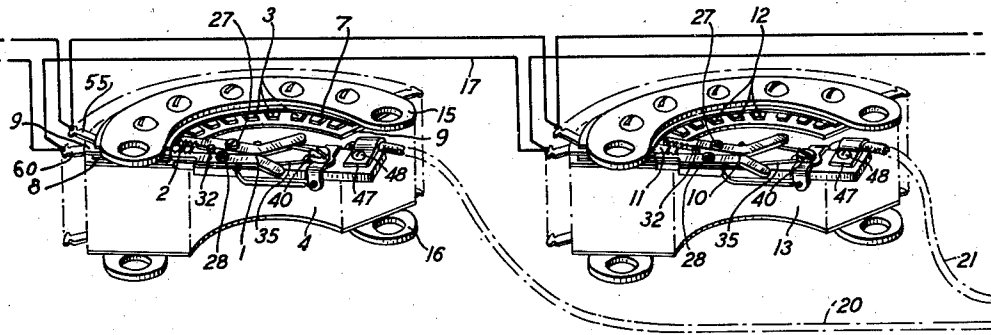


FIG. 2.

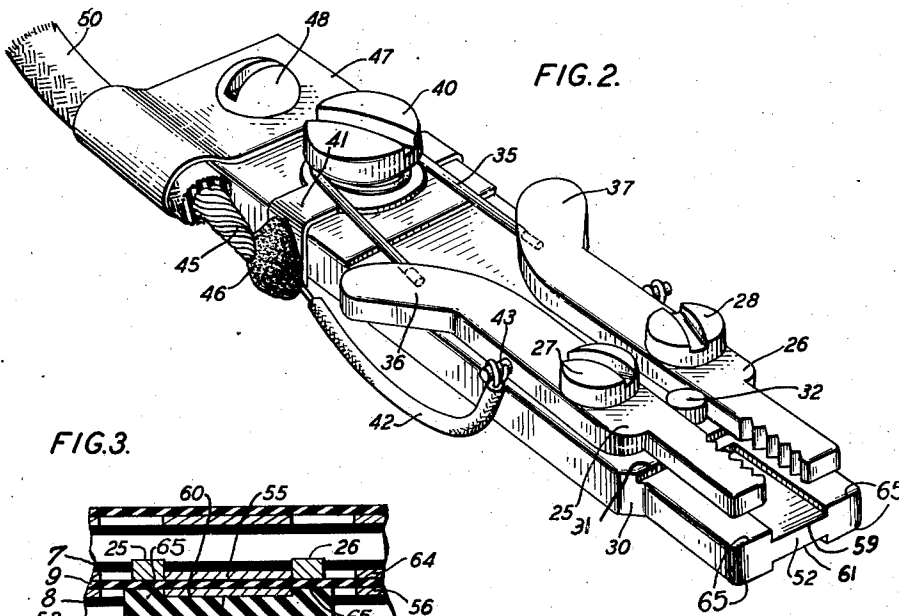


FIG. 3.

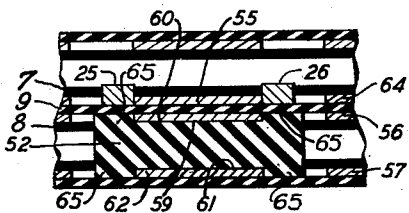
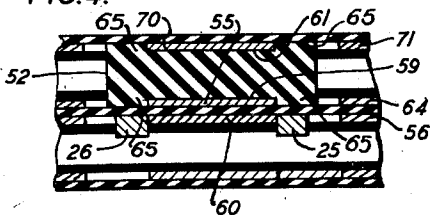


FIG. 4.



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2,449,057

ELECTRICAL TESTING DEVICE

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Application April 14, 1945, Serial No. 588,400

8 Claims. (Cl. 173-324)

This invention relates to electrical testing devices and particularly to tools for making conductivity tests on terminals.

An object is to simplify such tools and their manipulation in testing terminals.

Another object is to design such tools to prevent injury to terminals during the testing thereof.

Heretofore testing tools or clips have been provided having jaws normally closed by springs and which may be manually opened to grip wires or terminals for testing.

The present invention relates to such devices and a feature thereof is an arrangement of metal jaws for gripping terminals in testing and a guide member on which said jaws are mounted to accurately guide the jaws on the insertion over a terminal to be tested, in arrangements where a plurality of terminals are mounted in close proximity to each other.

Another feature is an arrangement of the guiding member so that the jaws can only engage the terminals on such portion thereof that are not employed as contacting surfaces and thus prevent said terminals from being marked or injured on their contacting surfaces.

Another feature is to arrange the guide member so as to guide the jaws to engage a particular terminal and prevent them from contacting with adjacent terminals while being thus guided.

The applicant's invention is particularly adaptable for use where terminals are arranged in layers in close formation in switching banks employed in automatic telephone systems and where the terminals have contact surfaces over which wipers are adapted to travel.

The invention has been illustrated in the accompanying drawings in which:

Fig. 1 shows two tools constructed in accordance with the applicant's invention applied for testing of terminals in separate terminal banks for the purpose of determining the continuity of the multiple wires between said terminals in said banks;

Fig. 2 is an enlarged perspective of one of the tools illustrated in Fig. 1 constructed in accordance with the applicant's invention; and

Figs. 3 and 4 show cross-sections of the tool applied to terminals in two different positions in terminal banks.

Referring now to the drawings and particularly to Fig. 1, the tool 1 constructed in accordance with the applicant's invention is applied to a terminal 2 in a layer of terminals 3 in the bank 4. An identical tool 10 is applied to test a ter-

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minal 11 in a layer of terminals 12 in a bank 13. Certain details of a suitable form of terminal bank are shown in the drawings. Terminals 3 of bank 4, for example, are arranged in a plurality of pairs of layers with the pairs of layers assembled on top of one another and bound together by end plates such as 15 and 16. The terminals of the pairs of layers are arranged around a portion of a circle with the terminals of one layer directly above the terminals of the other layer of the pair of layers but separated therefrom by a blank 9 which comprises a wide strip of insulating material. The pairs of layers are separated from each other by blanks 7 and 8 which comprise narrower strips of insulating material so that a portion of each terminal is exposed and may be engaged by switching and testing equipment.

In Fig. 1, for example, insulating blank 9 is substantially coextensive with the array of terminals 3, extending radially inward a sufficient distance to lend support to the individual terminals, while the insulating plates or blanks such as 7 and 8, do not extend inwardly for the full length of the terminals. Thus the terminals are exposed for mechanical and electrical contact. It should be noted that terminals such as 2 in bank 4 and 11 in bank 13 are connected by a conductor 17 and that similar multiple connections are provided for other corresponding terminals in the levels 3 and 12 while similar connections are also provided for other layers in the banks (not shown). The tools 1 and 10 may be connected by conductor 20 from tool 1 and 21 from tool 10 to any suitable recording apparatus, not shown, to indicate the conductivity over the conductor 17. Tools 1 and 10 may thus be applied to succeeding terminals in the levels 3 and 12 and succeeding levels for testing the continuity of multiple connections.

Thus, Fig. 1 therefore illustrates one application of the applicant's invention for testing. It is understood that these tools may be used for testing terminals under other circumstances or for use in testing single terminals and their outside connections.

Referring now to Fig. 2, this tool consists of two jaws 25 and 26 each rotatably mounted on the corresponding screws 27 and 28 secured to a guide plate 30 of insulation material. As shown in Fig. 2 guide plate 30 is provided with a shoulder 31, the forward end of the plate being thinner than the body thereof. Thus jaws 25 and 26 which are mounted on the body of the guide plate are spaced from the forward end

thereof by a distance equal to or greater than the thickness of insulating blank 9. The jaws are normally held in the position shown to abut with their inner edges at the front of the screws 27 and 28 against a stop pin 32 to keep them normally in a certain fixed position to each other and they are held in this position by a spring 35 engaging with its ends the projections 36 and 37 on the jaws 25 and 26, respectively. This spring is coiled around a supporting screw 40 secured to the guide member 30 and underneath the spring is mounted a terminal 41 to which conductor 42 is soldered. The other end of conductor 42 is soldered to a pin 43 on the jaw 25. A similar conductor is provided from the terminal 41 to connect it to the jaw 26 to secure a good electrical connection between the jaws and the terminal 41. This terminal is also connected to an outside insulated conductor 45 at point 46 which is held by bracket 47 to the member 30 by means of screw 48. The conductor 45 may be of any desirable length as shown for example for tools 1 and 10 where the conductors 20 and 21 extend to suitable indicating instruments.

Referring now to Figs. 3 and 4 these figures show sections of terminals arranged in the typical manner in switch banks with pairs of layers insulated from each other and from spacers between the pairs of layers. Fig. 3 shows the forward end 52 of guide member 30 in cross-section with the jaws 25 and 26 also in cross-section and gripping a terminal 55 on the opposite narrow sides thereof as the end 52 is inserted between layers of terminals. In this case as shown in Fig. 3 the member 52 is inserted between a layer 56 and a layer 57 in the terminal bank and the member 52 is provided on its upper side with depression 59 to accommodate the terminal 60 shown in cross-section in the layer 56 and provided with a similar depression 61 to accommodate the terminal 62 shown in cross-section in the layer 57. As a result of the cutting of these depressions in guide member 52, a pair of projections or flanges 65 are formed on each side of the member. These depressions 59 and 61 exactly fit the terminals 60 and 62 and the guide 30 is therefore guided when inserted between the layers 56 and 57 to be exactly located between the two terminals 59 and 62 to place the jaws 25 and 26 against the opposite narrow edges of a terminal 55 of the layer of terminals 64 which is located exactly above the terminal 60 in the layer 56. When the tool is so inserted between terminal layers 56 and 57, Fig. 3, insulating blank 9 will enter the vertical space between the forward end of guide plate 30 and jaws 25 and 26. By this means therefore jaws 25 and 26 can only engage terminal 55 in a definite manner and under no circumstances can these jaws come in contact with the upper surface of terminal 55. That is, the jaws cannot cause injury to the contacting surfaces of terminals as they will be guided by the member 30 to always enter the terminal field after the end 52 has engaged the terminals to locate the jaws in their proper position to engage the sides of a third terminal, the end 52 it should be observed is for that purpose made to extend beyond the front ends of the jaws as shown in Fig. 2. It should be observed that when the tool is inserted in this manner the jaws will slide over the narrow edges with considerable pressure due to the tension of spring 35. Consequently the teeth on the jaws which are rather sharp will remove or scrape off any dirt, dust or oily substances from the edges and thereby

establish firm and intimate electrical connections with the terminal at these opposite edges.

Referring now to Fig. 4, if it is desired to test terminal 60 instead of terminal 55, the tool is inserted upside down so that the jaws are below the guide member 30 and the end 52. In this case the end 52 is inserted to fit with its depression 59 exactly around the terminal 55 and with its depression 61 to fit exactly around the terminal 70 of the layer 71 above the layer 64. When the end 52 is thus placed and guided by the depressions therein to engage terminals 61 and 70, insulation blank 9 again slides into the space between the jaws 25 and 26 and the end 52 and the jaws 25 and 26 will slide in and engage the opposite narrow edges of the terminal 60 and thereby prevent the jaws from engaging the contacting surface of this terminal 60 and cause injury thereto. In this manner succeeding terminals in succeeding layers may be tested with the tool turned around for each succeeding layer.

It is readily seen that no particular care needs to be taken in guiding the jaws onto the terminals as after the end 52 is located between opposing terminals the jaws will fall into place readily without further guidance. To remove the tool from a terminal that has been tested, the operator may engage the projections 36 and 37 and press them together and thereby remove the jaws 25 and 26 from the tested terminal during the withdrawal.

What is claimed is:

1. A tool for testing the conductivity of terminals in layers in a bank comprising a pair of jaws, a guide member attached thereto for insertion between two adjacent layers of terminals, and paired projections on said member to engage the edges of terminals in said two adjacent layers to guide said jaws to engage accurately a terminal in another layer.

2. A tool for testing the conductivity of terminals in layers in a bank comprising a pair of jaws, a guide member attached thereto for insertion between two adjacent layers of terminals, and paired projections on said member to engage the edges of terminals in said two adjacent layers to guide said jaws to engage accurately a terminal in a layer immediately above or below said two layers.

3. A tool for testing the conductivity of terminals arranged in layers in a bank comprising a pair of metal jaws, an insulation guide member attached thereto for insertion between two adjacent layers of terminals, and paired projections on said member to engage the edges of a terminal in each of said two layers to adjust the jaws to grip the terminal located in the same relative position in a third layer in the bank.

4. The combination in a terminal bank having a plurality of layers of terminals of a metal clip, an insulation member attached thereto for insertion between two adjacent layers of terminals, and paired flanges on said member to engage the edges of terminals in said two adjacent layers to guide said clip to engage accurately a terminal in a layer immediately above or below said two layers.

5. A tool for testing the conductivity of terminals arranged in layers in a bank so as to have one surface of each terminal serving as a contact surface for wipers traveling over said terminals, comprising a pair of jaws, a spring for normally holding said jaws tensioned against each other at a distance slightly less than the width of a

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terminal in the direction perpendicular to its contact surface, and a guide member attached to said jaws and cooperating with two terminals in two adjacent layers when inserted between said two layers for guiding said jaws to grip under tension of said spring a terminal in an adjacent layer on two opposite sides thereof perpendicular to the contacting surface.

6. The combination of a terminal bank having a plurality of terminals arranged in close proximity to each other in insulated layers of an insulation member having depressions therein on opposite sides so arranged that when said member is inserted in between two opposing terminals of two adjacent layers each of said terminals fits snugly in a corresponding one of said depressions and a contact clip associated with said member so arranged as to engage a corresponding terminal in a third layer when said member is so inserted.

7. The combination with a terminal bank having a plurality of terminals arranged in close proximity to each other in insulated layers and with the insulation so arranged that the terminals in every other layer are exposed for contact purposes on the upper surface and every other intermediate layer is exposed for contacting purposes on the under surface, and so that the opposite side surfaces of all terminals are also free from insulation, of an insulation member having depressions on opposite sides so arranged that when said member is fed in between any two terminals of adjacent layers having their contacting surfaces exposed and facing each other the said terminals will fit in either depression independent of which depression is on the top or on the bottom of said member at the time of insertion, and a contact clip mounted on one side of the member over one of the depressions in such a position as to grip the sides of the

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terminal of the adjacent layer above the top terminal engaging a depression in the member or to grip the sides of the terminal of the adjacent layer below the bottom terminal engaged in a depression depending on which way the member is turned and inserted.

8. A tool for testing the conductivity of terminals in a terminal bank in which terminals are arranged in layers insulated from each other and in which the insulation between succeeding pairs is cut back to expose said adjacent top surfaces of the terminals facing each other of adjacent pairs for the travel thereover by wipers, comprising an insulation member insertable between any two said terminals facing each other and provided with depressions on opposite sides in which any two said terminals of adjacent layers may be fitted when said insulation member is inserted between said two terminals, a pair of metal prong members each having teeth on the inside edges thereof that face each other and mounted on the top of said insulation member and adapted to grip the upper companion terminal on opposite edges thereof of the upper pair of two aligned pairs between which said insulation member has been inserted, and means for holding said metal prongs with their teeth against said sides of said upper terminal to establish a firm connection between said prongs and said terminal.

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The following references are of record in the file of this patent:

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