

Dec. 31, 1935.

S. T. CURRAN

2,026,303

CONNECTING DEVICE

Filed June 9, 1934

3 Sheets-Sheet 1

FIG. 1

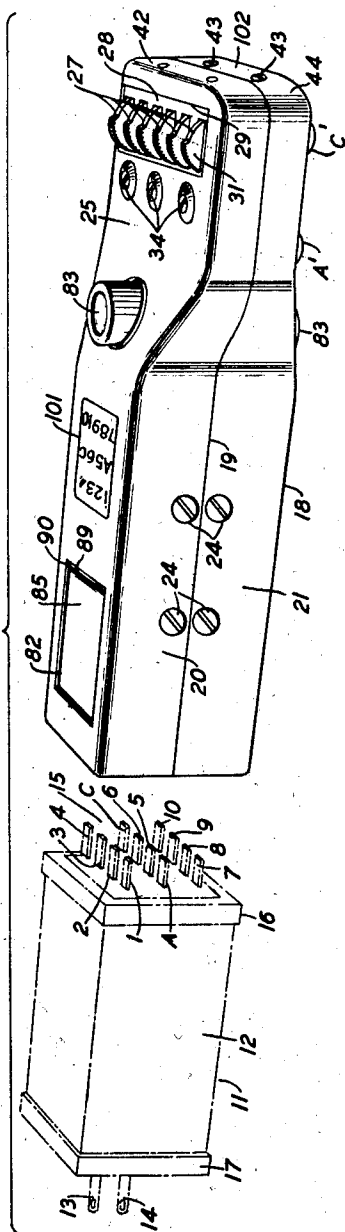
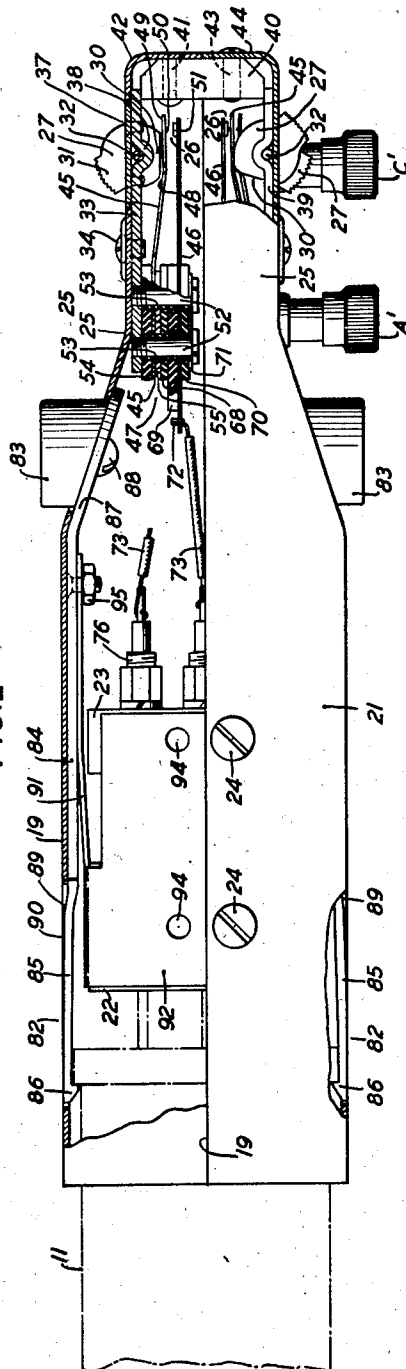


FIG. 2



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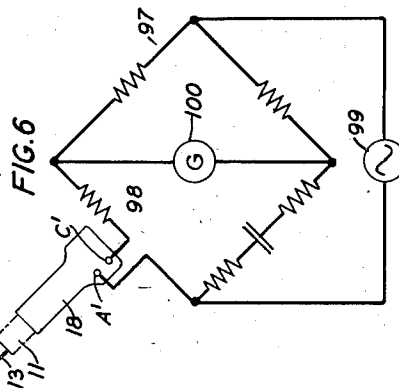
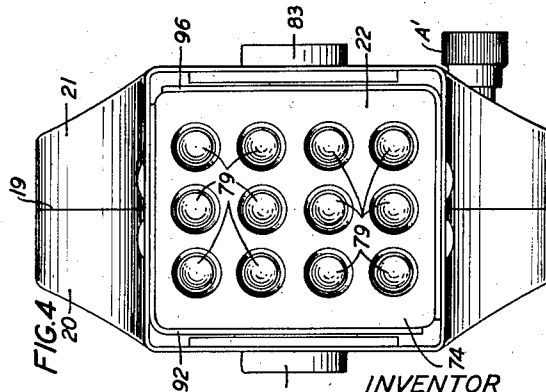
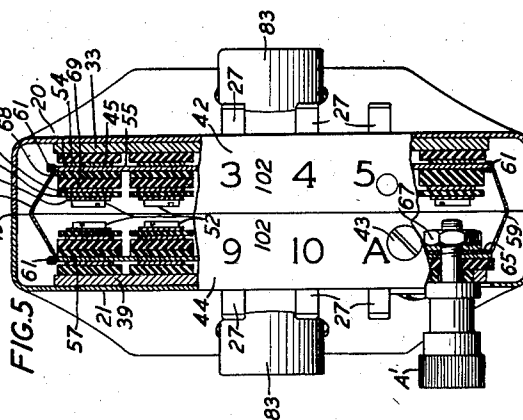
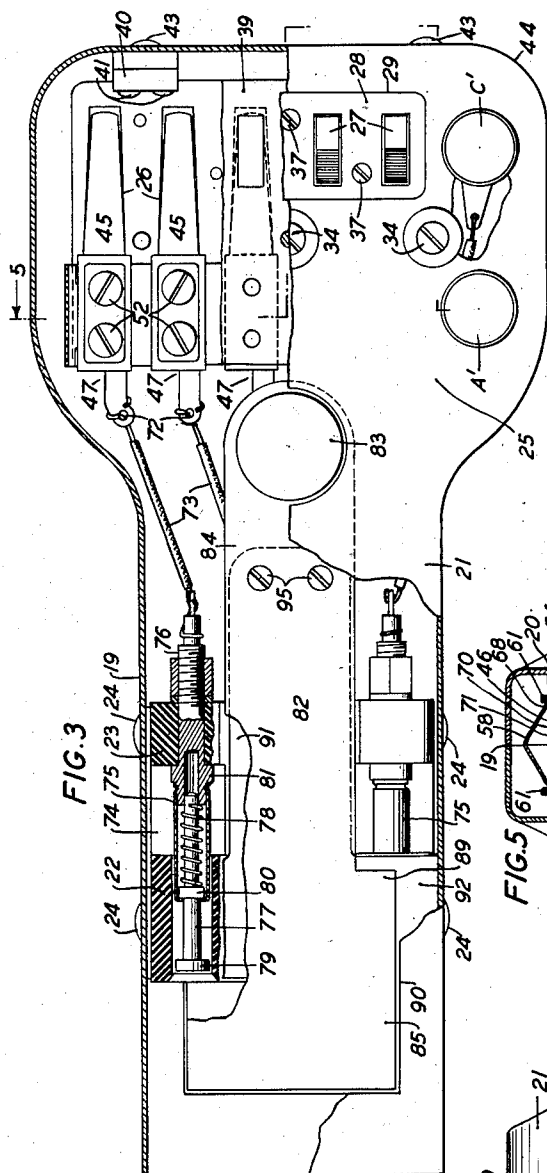
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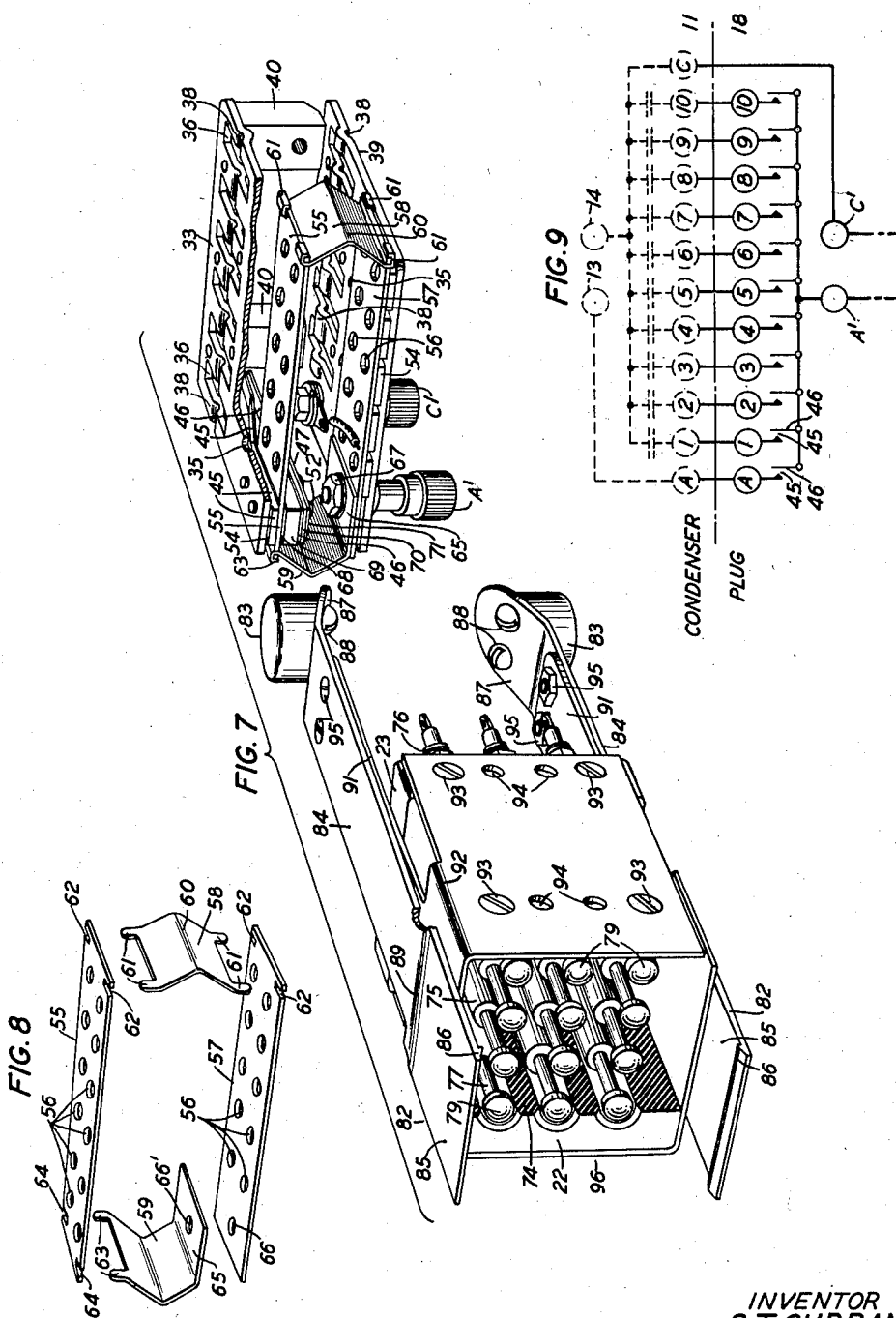
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3 Sheets-Sheet 3



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2,026,303

CONNECTING DEVICE

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Application June 9, 1934, Serial No. 729,731

3 Claims. (Cl. 200—51)

This invention relates to a connecting device and more particularly to a combined multi-contact plug and keyset.

The object of this invention is to connect the contacts of a multi-contact electrical element to a testing system.

A feature of this invention resides in a set of spring pressed plunger contacts to engage the contacts of an electrical element.

Another feature resides in spring clamping members for holding the connecting device to the element engaged by the contacts.

Another feature resides in a set of manually operated keys and associated contact springs through which connections may be selected and extending from plunger contacts in the device to a testing system.

Still another feature resides in strap connection members which form electrical connections between common sides of the contact springs in the keyset.

In the drawings, Fig. 1 is a view in perspective of the connecting device and a multi-unit condenser;

Fig. 2 is a side elevational view partly in section of the connecting device;

Fig. 3 is a bottom plan view partly in section of the connecting device;

Fig. 4 is an end view taken from the left end of the device shown in Fig. 3;

Fig. 5 is an end view partly in section of the device taken from the right end of the device shown in Fig. 3 and sectioned to the broken line 5—5;

Fig. 6 is a schematic view of the device connected to a testing system;

Fig. 7 shows views in perspective and partly in section of details of the device, the parts being shown in partly assembled condition;

Fig. 8 is an exploded view showing in perspective, strap connection members for common sides of spring contacts of the keyset; and

Fig. 9 is a schematic showing the circuit arrangement of the device connected to a multi-unit condenser.

In making capacitance tests of circuits including condensers it is desirable that some means be provided for readily bringing the portion of the circuit to be tested into connection with suitable testing apparatus.

To effect economies in the electrical art in the manufacture of fixed condensers, it has been found advisable to make multi-unit condensers instead of making a large number of individual fixed condensers of different values. These

multi-unit condensers are provided with a plurality of terminals which may be selectively connected to conductors of a circuit or may be connected together by suitable conductive straps to obtain the required capacitance value. When a multi-unit condenser has been placed in the circuit and a required capacitance value has been obtained by connecting into the circuit selected portions of the condenser, certain terminals of the multi-unit condenser are connected by strap conductors to make the selected portions of the condenser a permanent part of the circuit.

Where a comparatively large number of condensers of a certain predetermined value are in constant demand, it is frequently found desirable to carry a stock of condensers of the required value. The condensers placed in stock for this purpose may be multi-unit condensers in which certain predetermined terminals have been strap-connected to set the condensers at the required value. In making these condensers and determining which of the terminals should be connected by strap conductors, it is desirable that some means be provided for connecting suitable testing apparatus to a multi-unit condenser and for selectively connecting the various units of the condenser to the testing apparatus.

I have found in making certain tests of electrical systems and apparatus units that if comparatively long conductors are employed in extending connections from the system or apparatus under test, to testing apparatus that undesirable values of resistance or capacitance or both are introduced which affect the testing apparatus and prevent the apparatus from giving a true indication of the electrical value of a system or apparatus unit under test. For instance, if comparatively long conductors are employed in extending connections from terminals of a condenser to testing apparatus and the long conductors extend parallel to each other, a certain capacitance value inherent in the long conductors will be included in the results shown or indicated by the testing apparatus. To determine the true electrical value of a system or apparatus unit under test as it will be when the long conductors are removed, the value introduced by the long conductors must be calculated and deducted from the reading given by the testing apparatus.

The device of this invention serves as a means for connecting a multi-unit condenser to testing apparatus and for selectively bringing the various units of the condenser into circuit connection with the testing apparatus to determine what

portion or portions of the multi-unit condenser are required to obtain the required capacitance value. In this device no comparatively long conductors are employed in extending connections from the terminals of a system or apparatus unit to the testing apparatus. The device of this invention is brought into direct contact with the terminals of a system or apparatus unit under test and terminals are provided on the device to facilitate connection of the device to a testing system. With this device the possibilities of introduction of undesirable electrical values between the system or apparatus unit under test and the testing apparatus are reduced to a minimum.

In Fig. 1 a typical multi-unit condenser 11 is shown comprising a rectangular metal can 12 which contains the various layers of conducting and non-conducting material employed in a well known manner in fixed condensers of this type. A pair of terminals 13 and 14 to be connected to conductors of a circuit extend from one end of the condenser and a group of terminals 15 which serve as terminals for the various condenser units enclosed in the can project outward from the end of the condenser 11 opposite to that from which the terminals 13 and 14 project. In the group of terminals 15 there are twelve terminals which in practice may or may not bear identifying numbers or figures but which for the purpose of illustration we will assume to be numbered and lettered respectively in the order in which they stand as 1, 2, 3, 4, A, 5, 6, C, 7, 8, 9 and 10. Around each end of the cam 12 are metal beads 16 and 17 formed by overlapping edge portions of the ends of the can.

The connecting device of this invention which for the purpose of identification has been given the general number 18 is shown to the right of the condenser 11 in Fig. 1. In the connecting device 18 a substantially rectangular hollow shell 19 is formed by an upper half 20 and a lower half 21. These upper and lower halves 20 and 21, respectively, are substantially rectangular channel members which may be made of metal or insulating material. The two halves 20 and 21 of the hollow shell 19 are held in cooperating relation to form a casing by means of spaced insulating blocks 22 and 23, shown in Figs. 2 and 3, and by other parts which will be subsequently described, all located within the shell 19 and by the machine screws 24. The upper and lower halves 20 and 21, respectively of the hollow shell 19 are widened at the right ends as shown in Figs. 1 and 3 and the channels are reduced in depth at these points as shown in Figs. 1 and 2 to form a housing portion 25 for key contacts 26. The key contacts 26 are manually operated by means of cams 27 which project through spaced apertures in an apertured panel 28 which is disposed across an elongated aperture 29 in the key housing portion 25 of the shell 19. The cams 27 are substantially circular blocks of insulating material which may be, for instance, a hard rubber composition or bakelite. A flat portion is provided on the periphery of the cams 27 at 30 as shown in Fig. 2 to permit separation of the key contacts 26. A radially extending portion 31 is also provided on the periphery of each cam 27. This radially extending portion 31 is knurled on the outer edge to enable an operator to manually rotate the cam. Extending laterally through substantially the center of each cam 27 is a pin 32. The pin 32 projects a sufficient distance beyond the sides of the cam to form trunnions for

the cam and is knurled at the center and drive-fitted to the cam so that it will rotate with the cam. The keys comprising the cams 27 and the key contacts 26 are divided into two groups to permit reduction in the width of the key housing portion 25 of the connecting device 18. The keys, however, could be arranged all in a single line and the cams could be arranged so that they would all project through either the upper or the lower face of the key housing portion 25 of the connecting device 18. For the purpose of illustrating this invention, however, it will be assumed that the keys are divided into two groups and that they are arranged as shown in Figs. 1, 2, 3 and 5 of the drawings. In the structure 15 shown there are six keys in the upper half 20 of the device and five keys in the lower half 21. All of the cams 27 are not shown in Fig. 5 since in some parts the section line 5-5 runs back of the cams 27. The cams 27 for operating the key contacts 26 in the upper half 20 of the shell, project through spaced apertures in the apertured panel 28. The cams 27 for operating the key contacts 26 in the lower half of the shell project through spaced apertures in an apertured panel 28 in the lower half 21 of the shell. To support the cams 27 in the upper half 20 of the shell, a substantially rectangular flat plate 33 shown in Figs. 2, 5 and 7 is secured by means of the screws 34 to the inner face of the upper half 20 of the shell 19 in the key housing portion 25. The plate 33 is provided with internally threaded spaced apertures 35 to receive the screws 34 and has rectangular spaced apertures 36 registering with the apertures in the apertured panel 28 located in the upper half 20 of the shell 19 to accommodate the cams 27. The apertured panel 28 is secured to the upper face of the plate 33 in the elongated aperture 29 of the upper half 20 of the shell 19 by machine screws 37, shown in Fig. 3, and one of which is shown in dotted line in Fig. 2. Extending laterally across the plate member 33 and in line with the lateral centers of the apertures 36 is a broken indentation 38 which faces the inner wall surface of the upper half 20 of the shell 19. The indentation 38 in the plate member 33 serves as a rest for the projecting ends of the pins 32 of the cams 27. The projecting ends of the pins 32 of the cams 27 are truncated in the indentation 38 of the plate member 33 and are held by the plate member 33 against the inner wall surface of the upper half 20 of the shell 19.

The cams 27 provided for operation of the key contacts 26 in the lower half 21 of the shell 19 are held in place by a rectangular plate 39 which corresponds to the plate 33 in the upper half 20 of the shell 19 except that the plate 39 has five spaced apertures for the cams 27. The indentation 38 extends only far enough across the plate 60 to take care of five cams and in one end of the plate spaced apertures are provided to accommodate two binding posts A' and C'. The two plates 33 and 39 which serve to support the cams 27 in addition to being secured to their respective upper and lower halves 20 and 21 of the shell 19 by means of the screws 34, are still further maintained in spaced relation by means of a pair of spaced metal blocks 40 located in the shell 19 and which are secured at one end by rivets 41 to a 70 closed end 42 of the upper half 20 of the shell 19. The blocks 40 are provided with internally threaded apertures to receive machine screws 43 which pass through apertures in the closed end 44 of the lower half 21 of shell 19. The blocks 40 serve as 75

rests and spacer members for the free ends of the plates 33 and 39. The blocks 40 also serve to hold together the closed ends 42 and 44 of the respective halves 20 and 21 of the shell 19.

5 The key contacts 26 are paired spring finger members of conducting material. Each pair comprises an outer spring member 45 and an inner spring member 46. The outer spring member 45 has a straight apertured inner end portion to permit securement of the spring member 45 in a spring pile-up 47, an inwardly directed arm portion 48 and a substantially straight free end portion 49 bearing on its inner surface a contact point 50. The inner spring member 46 of key contacts 26 is a straight spring finger member having suitable apertures near its inner end portion to permit mounting in the spring pile-up 47 and a contact 51 at its free end facing the contact point 50 of the outer spring member 45. Each pair of key contacts 26 is arranged in a separate spring pile-up 47. The spring pile-ups 47 for the upper row of keys are supported on the inner surface of the apertured plate 33 by means of machine screws 52 but by reason of insulating sleeves 53 and apertured insulating blocks 54 have no electrical connection with the apertured plate 33. The spring pile-ups 47 for the lower row of keys are supported by means of machine screws 52 on the inner surface of the apertured plate 39 and are insulated from the apertured plate 39 in the same manner as the spring pile-ups 47 in the upper row of keys are insulated from the apertured plate 33.

A comparatively long rectangular metal plate 55 shown in Figs. 7 and 8 having spaced apertures 56 to accommodate the machine screws 52 and insulating sleeve 53 is provided as a common connection for the outer spring members 45 of the spring contacts for the upper row of keys. A comparatively long rectangular metal plate 57 shown in Figs. 7 and 8 having spaced apertures 56 similar to the metal plate 55 and having a comparatively large aperture 66 on one end to accommodate the shank of the binding post A' is provided as a common connection for the outer spring members 45 of the spring contacts for the lower row of keys. The metal plates 55 and 57, as shown in Figs. 5 and 7, are electrically connected on one end by means of a metal strap 58, shown in Figs. 5, 7 and 8 and are electrically connected on the other end by means of a metal strap 59, shown in the same figures. The metal strap 58 is laterally creased and outwardly bowed at 60 from the ends of plates 55 and 57 and has spaced tabs 61 on its ends which are inserted through notches 62 in the ends of the plates 55 and 57 and bent over to secure the metal strap 58 to the ends of the plates 55 and 57. The metal strap 59 is similar to the metal strap 58 in that it is outwardly bowed from the ends of the plates 55 and 57 and has spaced tabs 63 on one end which pass through notches 64 in the adjacent end of the metal plate 55 and which are bent over to secure the strap 59 to the plate 55. The lower end of the metal strap 59, however, terminates in an inwardly directed end piece 65. The end piece 65 is apertured at 66' to receive the shank of binding post A'. The binding post A' is in electrical connection with the metal strap 59 and in cooperation with a nut 67 clamps the end piece 65 to the apertured metal plate 57. Each spring pile-up 47 for the upper row of keys and assuming that the beginning is at the top in Figs. 2 and 7 and at the right in Fig. 5 contains the following elements: An apertured block

54 of insulating material, the apertured inner end of the outer spring 45, the apertured metal plate 55, a comparatively narrow apertured strip of insulating material 68, a comparatively wide and apertured block of insulating material 69, an apertured inner end of the inner spring 46, an apertured block of insulating material 70, and a comparatively narrow apertured strip of insulating material 71. Each spring pile-up 47 for the lower row of keys contains the same elements as those listed for the upper row with the exception that in the lower row the metal plate 57 takes the place of the plate 55 in the upper row. The inner end of each of the inner spring members 46, as shown in Figs. 2 and 3, is extended inward of the connecting device and beyond the pile-up 47 of conducting and insulating members above described and is apertured at 72 to permit attachment thereto of a conductor 73 leading to a plunger type contact to be subsequently described.

Within the shell 19 and supported by the spaced apertured insulating blocks 22 and 23 is a group of terminals 74 shown in Figs. 2, 3, 4 and 7. The number of terminals in the group 74 and the spacing and arrangement of the terminals correspond to the number and the spacing and arrangement of the group of terminals 15 which project from one end of the multi-unit condenser 11. Each terminal in the group 74 in the connecting device 18 as shown in Figs. 3 and 7 comprises a sleeve member 75 terminating in an externally threaded shank portion 76, a spring pressed plunger 77 operating within the sleeve 75 and a helical spring 78 within the sleeve 75 to continually urge the plunger 77 outward of the sleeve 75. The threaded shank portions of the terminals 74 are inserted in apertures in the insulating block 23 and project from the block 23 inward of the connecting device 18 toward the keys 25. A group of comparatively short insulated conductors 73 are provided within the connecting device 18 to form connections between the group of terminals 74 and the inner spring members 46 of the keys 26. The sleeves 75 and the spring pressed plungers 77 of the group of terminals 74 are inserted in apertures in the insulating block 22 with the outer ends of the plungers 77 extending almost to the outer face of the insulating block 22. On the outer end of each plunger 77 is an enlargement 79 having a concave outer face to engage a terminal in the group 15 of the multi-unit condenser 11.

Disposed about midway of the shank portion of the plunger 77 is an annular shoulder 80 of about the same diameter as the inside diameter of the sleeve 75. The outer end of the sleeve 75 is spun over the outer face of the annular shoulder 80 to prevent complete removal of the plunger 77 from the sleeve 75. The sleeve 75 is supported on the inner end by an annular shoulder 81 which is integral with the shank 76. The helical spring 78 in the sleeve 75 and which continually urges the plunger 77 outward of the sleeve 75 is disposed around the inner end of the plunger between the inner face of the annular shoulder 80 of the plunger 77 and the inner end of the shank 76.

To hold this connecting device to an end of a multi-unit condenser spring latch members 82—82 are provided. The spring latch members 82—82 are provided with manually operated release buttons 83—83 which extend outward of the halves 20 and 21 of the shell 19 through apertures provided in the halves 20 and 21. In each half 20 and 21 a spring latch 82 is located. Each spring latch 82 as shown in the upper portion of Fig. 2 75

and still more clearly in Fig. 7 comprises a substantially long flat spring 84 terminating in one end in an enlarged portion 85 having an inwardly directed hook 86 and at the other end in an inwardly projecting end portion 87 to which is attached by means of screws 88 the manually operated release button 83. The enlarged portion 85 of each spring latch 82 is outwardly offset at 89 from the main portion of the spring latch and extends into apertures 90 provided in the halves 20 and 21 of the shell 19. The aperture 90 in each half 20 and 21 of the shell 19 permits outward displacement of the wide portion 85 of the spring latch 82 when the inwardly directed hook 86 is brought into engagement with the bead 16 of the condenser 11. The aperture 90 also permits outward movement of the large end 85 of the spring latch 82 by depression of the manually operated button 83 to release the hooked end 86 from engagement with the bead 16 of the condenser 11 when the connecting device 18 is to be released from the condenser. To support the spring latch 82 and to provide the required spring tension for its operation, the latch 82 is attached to a free end of a substantially long leaf spring 91. The leaf spring 91 projects from and is integral with a metal bracket 92. The metal bracket 92 on its outer end is L-shaped in cross-section and is attached on one of its sides by means of screws 93 to the spaced insulating blocks 22 and 23. The screws 24 which enter the spaced insulating blocks 22 and 23 and which serve to hold the halves 20 and 21 of the shell 19 together also pass through apertures 94 in the metal bracket 92 and clamp the one side of the metal bracket 92 between the inner wall surfaces of the halves 20 and 21 and the spaced insulating blocks 22 and 23. The leaf spring 91 is substantially the same width as the narrow portion of the latch 82 and extends substantially parallel to the straight central portion of the latch 82. The latch 82 is secured by spaced bolts 95 to the free end of the leaf spring 91. The latch 82 as shown in Fig. 2 is held against the inner wall surface of the upper portion of the upper half 20 of the shell 19. The point of attachment of the leaf spring 91 to the latch 82, namely, the point at which the leaf spring 91 is attached to the latch 82 by means of the bolts 95—95, forms a fulcrum for the latch 82. A duplicate of the latch 82 and the leaf spring 91, shown in the upper section of Fig. 2, is provided in the lower portion of the casing 19. The leaf spring 91 in the lower portion is attached to a metal bracket 96 which is a duplicate of the metal bracket 92. The metal bracket 96 extends around the two sides of the spaced insulating blocks 22 and 23 not occupied by the metal bracket 92 and is attached to the spaced insulating blocks 22 and 23 and to the halves 20 and 21 of the shell 19 by screws 93 and 24, respectively. The positions of the metal brackets 92 and 96 relative to the insulating block 22 in shell 19 are shown in Fig. 4.

The connecting device 18 is provided with binding posts A' and C' to permit attachment of the connecting device 18 to testing apparatus such, for instance, as the testing apparatus 97 shown in Fig. 6. The testing apparatus 97 shown in Fig. 6 includes a bridge circuit 98, a source of current supply 99 and a galvanometer 100. When the connecting device 18 is to be brought into connection with the multi-unit condenser 11, the connecting device 18 is pushed against the group terminal end of the condenser 11 until the terminals of the group 15 come in contact with the

concave outer faces of the enlargements 79 of the plungers 77. The connecting device 18 is then further thrust against the group terminals of the condenser until the hooked ends 86 of the latch springs 82 come in contact with the bead 16 of the condenser 11 and pass over the bead 16. This last thrusting movement will cause pressing inward of the plungers 77 and compression of the springs 78. The spring pressure therefore built up in the springs 78 will continually urge the plungers 77 against the terminals of the group 15 of the condenser 11 and will maintain the terminal plungers of the connecting device in good contacting relation with the group of terminals 15 of the condenser 11. The latch springs 82 will hook against the inner surface of the bead 16 of the condenser 11 and will prevent accidental dislodgment of the connecting device 18 from the condenser 11. The circuit connections then established between the connecting device 18 and the condenser 11 will be as shown in Fig. 9, the portion above the horizontal line being the multi-unit condenser 11 and the portion below the line being the connecting device 18. The circles below the line marked with the letters and numerals from A to 10 inclusive, represent the cams 27 of the connecting device 18. The circles above the line marked with the letters and numerals A to C inclusive, represent the group of terminals 15 of the multi-unit condenser 11.

Assuming that the binding posts A' and C' are connected to the testing system 97 as shown in Fig. 6 and that cam 1 is operated to close outer spring contact 45 against the inner spring contact 46, the condenser unit associated with terminal 1, shown in Fig. 9, will be bridged across the conducting leads from the binding posts A' and C'. Since as shown in Fig. 6 the binding posts A' and C' are connected in one arm of the bridge circuit 98 of the testing apparatus 97, the condenser unit associated with terminal 1 will be connected to the bridge circuit 98. It will be seen that by selectively operating the cams 1 to 10, inclusive, of the connecting device 18, the different units in the multi-unit condenser 11 may be connected either singly or in various combinations in one of the arms of the bridge circuit 98 and that various units or combinations may be connected to the bridge circuit until the galvanometer 100 indicates that the required capacitance value is obtained. By noting the cams operated to obtain the required capacitance value and by permanently connecting the terminals in the group 15 associated with the unit or units required with the terminal A of the multi-unit condenser, the multi-unit condenser 11 may be set for a required capacitance value. For instance, terminal 1 may be strap-connected by a conducting lead to terminal A. If the condenser 11 is then connected to wires of a circuit through the terminals 13 and 14, the capacitance value of the unit associated with terminal 1 will be included in that circuit. If the terminals 1, 2 and 3 are strap-connected to terminal A, the condenser units associated with terminals 1, 2 and 3 will be connected in parallel across that portion of the circuit including the terminals 13 and 14. A numbered and lettered plate 101 bearing numbers and letters corresponding to the numbers and letters assigned to the group of terminals 15 of the condenser 11 is secured in a depressed portion in the upper half 20 of the shell 19. Corresponding numbers and letters are also stamped on the cam portion end 25 of the connector 18 as shown at 102 in Figs. 1 and 5. The numbers and letters 75

at 102 are directly in line with the cams 27 and identify the contacts affected by operation of each cam. By observing the cams operated and the numbers associated therewith and by noting the positions of the correspondingly numbered terminals as shown on the plate 101, the terminals in the group 15 of the condenser unit to be strap-connected to the terminal A in that group may be readily determined.

To release the connecting device 18 from a condenser, the push-buttons 83—83 are manually pressed toward each other to move the hook portions 86 of the latch springs 82—82 out of engagement with the bead 16 of the condenser 11. When the latch springs are released from engagement with the bead 16 of the condenser 11, the spring pressure in the springs 78 of the terminals 74 will press the connecting device 18 outward of the multi-unit condenser 11 a sufficient distance to move the hook portions 86 of the latch springs 82 outward past the bead 16 of the condenser 11.

If a multi-unit condenser 11 is already connected in a circuit by having the terminals 13 and 14 connected to wires of the circuit and it is desired to adjust the multi-unit condenser to a required capacity value, a test with the condenser in circuit may be made by means of the connecting device 18 and suitable testing apparatus connected therewith. Assuming that a multi-unit condenser is connected to the circuit wires of a system by way of the terminals 13 and 14 and that the connecting device 18 having the binding posts A' and C' connected to a testing system 97 is connected to the group of terminals 15 of the multi-unit condenser 11 and that the latches 82 are holding the connecting device 18 to the multi-unit condenser 11, it will be seen by referring to Fig. 9 that by operating cam A to close the spring contacts 45—46 a connection is completed from terminal 13 to the binding post A' and that none of the condenser units of the multi-unit condenser are connected to the testing apparatus 97 shown in Fig. 6. It is obvious that with this condition certain tests may be made of the system to which the terminals 13 and 14 are connected without having capacitance values of any of the units of the multi-unit condenser 11 affecting the system or the testing apparatus. By leaving cam A operated and by selectively operating the cams 1 to 10 to close the spring contacts 45 and 46 associated with these cams, various capacitance values residing in the units of the multi-unit condenser may be selectively bridged across the line wires of the system under test. When the testing apparatus indicates that the required capacitance value has been introduced into the system under test, the

cams 27 standing in operated position will indicate which unit or units of the multi-unit condenser 11 should be included in the system under test. To permanently set the multi-unit condenser to the required value, the terminal or terminals in the group 15 corresponding to the cam or cams operated is or are connected to the terminal A in the group 15 by a conductor, not shown, but which may, for instance, be a comparatively short lead wire soldered to the terminals required.

What is claimed is:

1. A connecting device comprising an apertured hollow casing, a set of spaced spring pressed contacts in one end of said casing, a set of manually operated keys including cams supported in said casing, a pair of spaced leaf spring contacts for each of said keys, conductors connecting one of each pair of leaf spring contacts to one of said spaced spring pressed contacts, and a pair of manually operated resilient latch fingers supported in said casing, said resilient latch fingers having hooked ends operating in apertures in the casing to engage an electrical device and hold the connecting device in engagement with the electrical device.

2. A connecting device comprising an apertured hollow casing having an open end portion and a closed end portion, a set of spaced spring pressed contacts in said open end portion extending longitudinally of said casing, paired key contacts in said closed end portion, manually operated cams supported in said casing and having portions projecting outward of said casing for manual operation and portions projecting inward of said casing to operate said key contacts, a pair of manually operated resiliently supported latch fingers supported within said casing, operating buttons attached to said latch fingers, said operating buttons extending outward through apertures in said casing, individual spring supports within said casing for each latch finger, and means for connecting wires of a circuit to said connecting device.

3. A connecting device comprising a combined multi-contact plug and a set of manually operated keys, said keys having associated therewith paired spring contacts divided into two groups, conducting bars connecting one of the spring contacts of each pair to the like spring contact of the other pairs in that group and outwardly bowed flat spring straps connecting the flat bar of one group to the flat bar of another and forming a common connection between the flat bar connected contacts in each group.

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