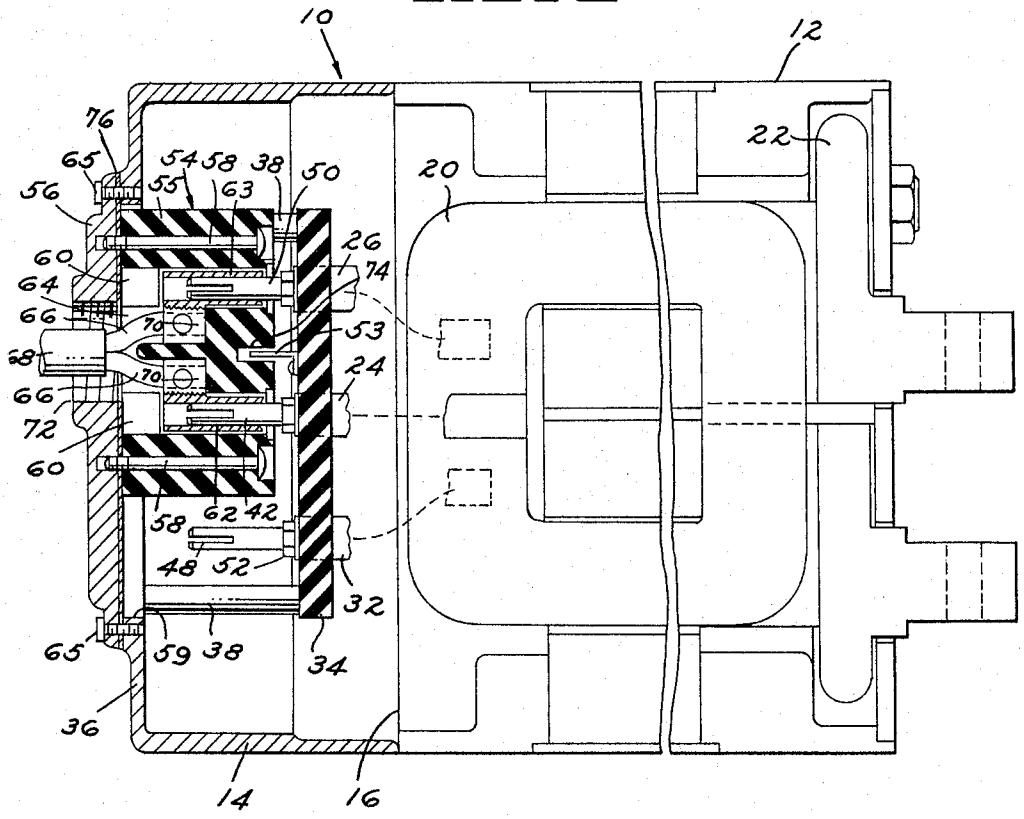
Oct. 25, 1966 A. O. WINSAND 3,281,747

MULTI-TAP PLUG

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FIG. 1



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MULTI-TAP PLUG

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FIG. 2

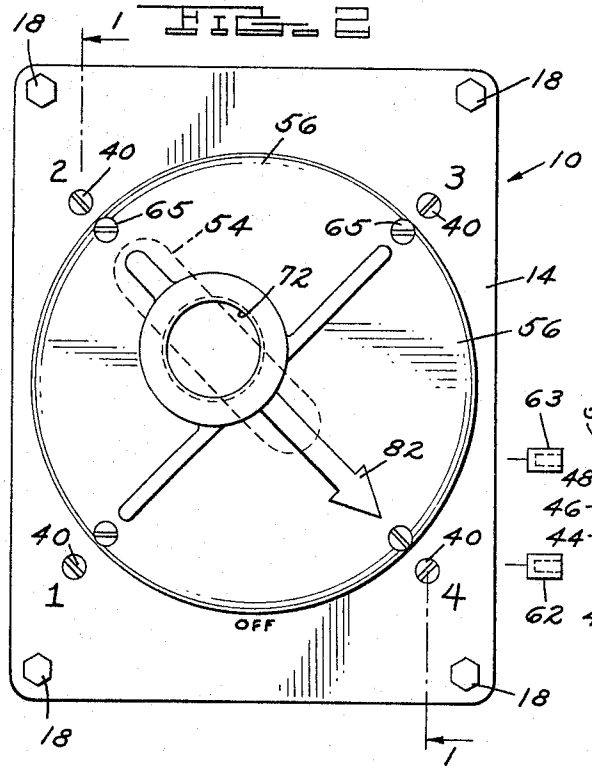


FIG. 4

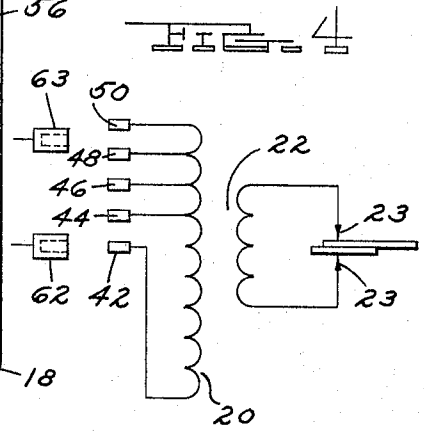
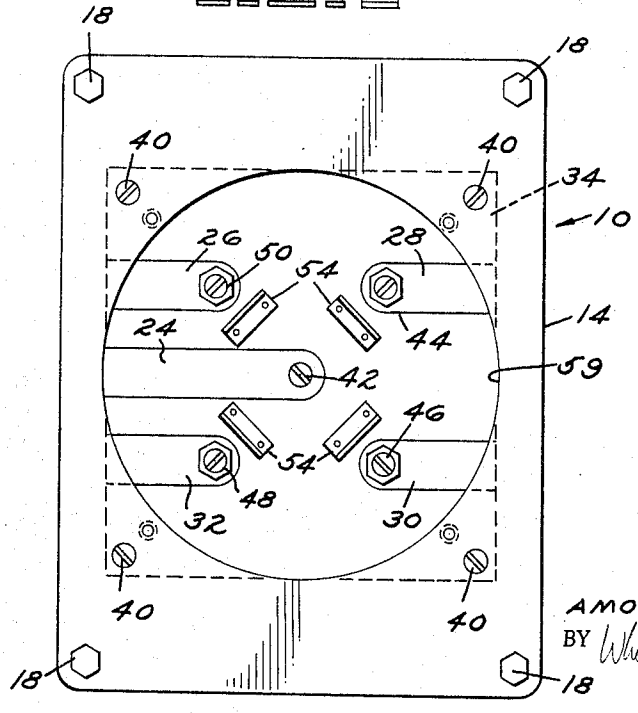


FIG. 3



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MULTI-TAP PLUG

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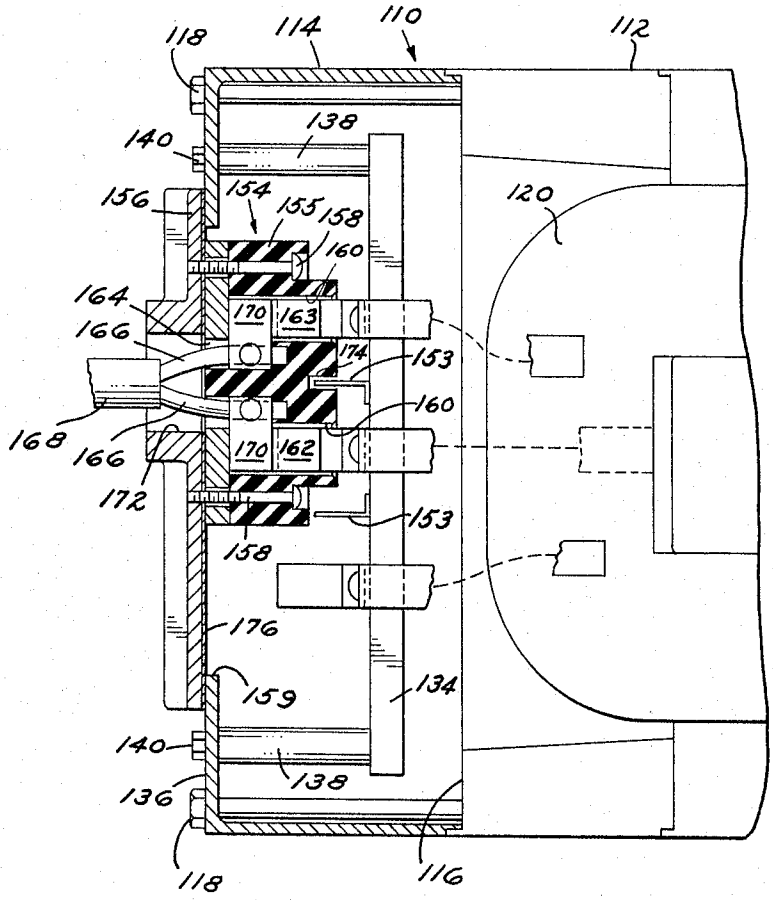


FIG. 5

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MULTI-TAP PLUG

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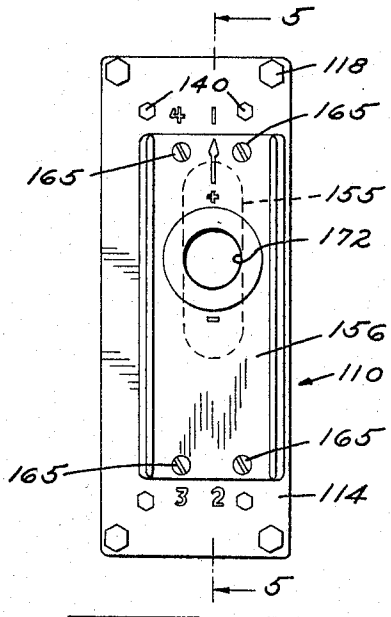


FIG. 6

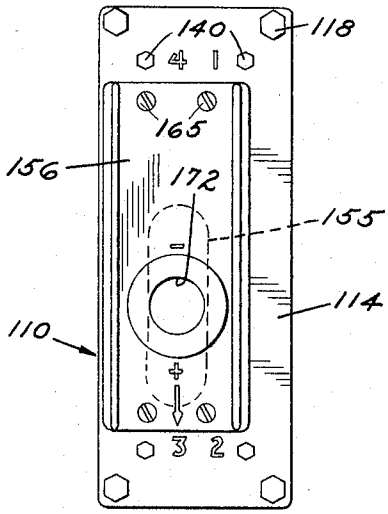


FIG. 7

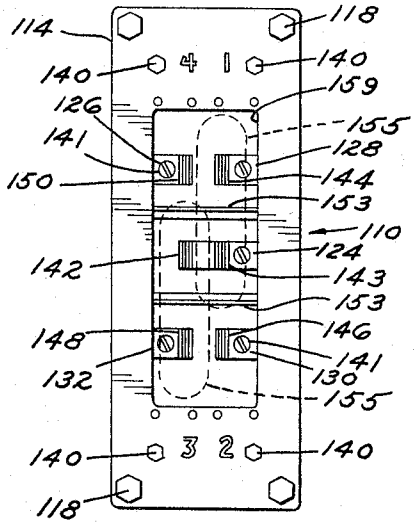


FIG. 8

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United States Patent Office

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MULTI-TAP PLUG

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Filed Feb. 25, 1963, Ser. No. 260,621

5 Claims. (Cl. 336—137)

This invention relates generally to transformers and refers more particularly to resistance welding transformers.

An essential object of the invention is to provide a transformer having a plug for carrying current to the transformer which also serves as a tap switch.

Another object of the invention is to provide a transformer having primary tap terminals so arranged and constructed that the plug which carries current to the primary can be plugged directly into different pairs of the tap terminals.

Another object is to provide a transformer having a plurality of terminals electrically connected to the primary, and a primary disconnect plug having spaced terminals, the spacing between the tap terminals being such that the plug can be connected to the primary by having its terminals simultaneously in contact with different pairs of tap terminals.

Another object is to provide a transformer wherein one of the tap terminals is spaced from two others a distance equal to the spacing between the plug terminals so that the plug can be connected to the primary by having its terminals simultaneously in contact with the one tap terminal and either of the other two.

Another object is to provide a transformer wherein one of the tap terminals is centrally located and the other tap terminals are arranged in a circle around the central tap terminal.

Another object is to provide a transformer wherein the tap terminals are arranged in two parallel rows with the middle terminal in each row spaced the same distance from both of the other terminals in the same row, and with both middle terminals connected to the same primary tap.

Another object is to provide an opening in the transformer housing through which the primary disconnect plug can be inserted, and a cover plate for the plug adapted to overlie and fully close the opening.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a sectional view of a transformer constructed in accordance with the invention, and taken on the line 1—1 of FIGURE 2.

FIGURE 2 is a front elevation of the transformer.

FIGURE 3 is a view similar to FIGURE 2 but with the primary disconnect plug removed.

FIGURE 4 is a wiring diagram of the transformer.

FIGURE 5 is a fragmentary sectional view, taken on the line 5—5 of FIGURE 6, showing a modification.

FIGURE 6 is a front elevation of the transformer shown in FIGURE 5.

FIGURE 7 is similar to FIGURE 6 but shows the primary disconnect plug in another position.

FIGURE 8 is a front elevation of the transformer shown in FIGURES 5–7, with the primary disconnect plug removed.

Referring now more particularly to the drawings, and especially to FIGURES 1–4, the transformer comprises a housing 10 which includes a casing or enclosure 12 and a cover 14. The cover is removably secured over the open front end 16 of the housing by fasteners 18. The transformer primary 20 and secondary 22 are housed within casing 12. Electrodes 23 are connected to the secondary and may be employed to effect a weld, as shown in FIGURE 4.

The primary taps 24, 26, 28, 30 and 32 are electrically connected to the coils of the primary at spaced intervals, and are in the form of electrically conductive strips which extend to the terminal support or base 34. The base 34 is formed of insulating material and is connected to the front wall 36 of the cover 14 by posts 38 and fasteners 40. The cylindrical tap terminals 42, 44, 46, 48 and 50 are secured to the base 34 in parallel relation. The ends of the taps 24–32 extend across the front surface of the base 34 and are in electrical contact with terminals 42–50. The taps may have holes in their ends to clear the terminals, and nuts 52 on the terminals clamp the taps securely in place. Arc barriers 53 are secured to the front surface of the base.

The arrangement of tap terminals 42–50 is such that the terminal 42 is centrally located and the others are arranged in a circle around the central terminal. The space between terminal 42 and each of the others is the same.

The primary disconnect plug 54 also serves as a tap switch and comprises an elongated body 55 of electrically insulating material secured to the rear face of a circular cover plate 56 by fasteners 58. The plug body 55 extends through a circular opening 59 in the cover 14 and is formed with parallel passages 60. Tubular socket terminals 62 and 63 are secured in passages 60. The socket terminals 62 and 63 have an inside diameter approximating the diameter of the tap terminals 42–50 so that they can receive the tap terminals with a close friction fit. The tubular socket terminals 62 and 63 are arranged so that their cylindrical passages are parallel and spaced apart a distance equal to the spacing between the central tap terminal 42 and each one of the remaining tap terminals 44–50.

The plug body 55 has a recess 64 in its front face which opens into both passages 60 so that the leads 66 of the primary current conductor 68 can be connected to the laterally offset portions 70 of the socket terminals. The cover plate 56 is formed with an opening 72 which registers with the recess 64 in the plug body to clear the primary current conductor. The rear face of the plug body has a slot 74 to clear the arc barriers 53.

The cover plate 56 is somewhat larger in diameter than the opening 59 in the cover 14 and is removably secured to the cover by fasteners 65. A gasket 76 may, if desired, be provided across the rear face of the cover plate to seal the opening.

In use, the plug body 55 is inserted into the cover 14 through the opening 59 and is electrically connected to the primary by having its socket terminal 62 extend over the tap terminal 42 and its socket terminal 63 extend over one of the other tap terminals 44–50. By reason of the fact that the space between tap terminal 42 and any one of the other tap terminals is the same as the spacing between the plug socket terminals 62 and 63, the primary current conductor can be electrically connected to the primary across the tap terminals 42, 44 or 42, 46 or 42, 48 or 42, 50. Hence the primary disconnect plug 54 also serves the purpose of a tap switch. The friction engagement between the plug and tap terminals may be enough to hold the plug in assembly. However, preferably the fasteners 65 are employed.

The socket terminal 62 of the disconnect plug is disposed at the center of the circular cover plate 56 so that the cover plate merely rotates on its axis, and does not bodily shift, when moving the primary disconnect plug from one pair of tap terminals to another. This can be readily accomplished by removing fasteners 65, pulling

out the disconnect plug, rotating it, and pushing it back in with its socket terminals engaging tap terminal **42** and any of the other surrounding tap terminals. The fasteners of course are re-inserted.

FIGURE 2 shows the primary disconnect plug **54** connected across terminals **42** and **50**, and the arrow **82** on the front face of plate **56** indicates the plug is in the number four position. The arrow thus indicates the amount of the primary that is connected into the circuit. When the arrow **82** extends down in the OFF position, the plug terminal **62** engages tap terminal **42**, but the plug terminal **63** does not engage a tap terminal.

FIGURES 5–8 show a modified transformer which comprises a housing **110** having a casing or enclosure **112** and a cover **114**. The cover is removably secured over the open end **116** of the housing by fasteners **118**. The transformer primary and secondary are housed within casing **112**. The primary is designated **120** and the secondary, although not shown, may be the same as the secondary shown in FIGURE 1.

The primary taps **124**, **126**, **128**, **130** and **132** are electrically connected to the coils of the primary at spaced intervals, and are in the form of electrically conductive strips which extend to the terminal support or base **134**. The base **134** is formed of insulating material and is connected to the front wall **136** of the cover **114** by posts **138** and fasteners **140**. The ends of the taps **124–132** extend across the front face of the base **134** and are secured thereto by fasteners **141**. The tap terminals **142** and **143** are secured to the tap **124**, tap terminal **144** is secured to tap **128**, terminal **146** is secured to tap **130**, terminal **148** is secured to tap **132**, and terminal **150** is secured to tap **126**. The tap terminals are in the form of elongated flat blades which may be secured to the taps in any suitable manner, as by welding, and project in a forward direction.

The terminals **143**, **144** and **146** extend in a row, are uniformly spaced apart, parallel to one another and lie in a common plane. The terminals **142**, **148** and **150** likewise extend in a row, and are uniformly spaced apart, being parallel and disposed in a common plane. The two rows of terminals are parallel and the terminals in the two rows are respectively opposite one another. The spacing between the terminals in one row is the same as the spacing of the terminals in the other row.

Arc barriers **153** are mounted on the base **134**.

The primary disconnect plug **154** comprises an elongated body **155** of electrically insulating material secured to the rear face of a rectangular cover plate **156** by fasteners **158**. The plug body **155** extends through a rectangular opening **159** in the cover **114** and is formed with parallel passages **160**. Socket terminals **162** and **163** are secured in the passages **160**. The socket terminals have narrow slots open at the rear ends so that the tap terminals can be pressed in with a friction fit. The plug terminal slots are parallel and are spaced apart a distance equal to the spacing between the tap terminals in either row. The plug body **155** has a recess **164** in its front face which opens into both passages **160** so that the leads **166** of the primary current conductor **168** can be connected to the laterally offset portions **170** of the plug terminals. The cover plate **156** is formed with an opening **172** which registers with the recess **164** in the plug body to clear the primary current conductor. The rear face of the plug body has a slot **174** to clear the arc barriers **153**.

The cover plate **156** is somewhat larger in length and width than the opening **159** in the cover **114**, and is removably secured to the cover by fasteners **165**. A gasket **176** may, if desired, be provided across the rear face of the cover plate to seal the opening.

In use, the plug body **155** is inserted into the cover **114** through the opening **159** and is electrically connected to the primary by having its slotted terminal **162** receive either the tap terminal **142** or **143**. If it receives tap terminal **142**, the other slotted terminal **163** of the plug will engage either tap terminal **148** or **150** in the same row. Likewise, if the slotted plug terminal **162** engages tap terminal **143**, the other plug terminal **163** will engage either tap terminal **144** or **146** in the same row. While there is substantial friction engagement between the plug and tap terminals, the fasteners **165** are preferably employed to removably secure the disconnect plug to the cover.

The cover plate **156** is enough larger than the opening **159** to always cover the opening no matter what position it is in. It is capable of four different positions, as will be apparent from a consideration of Figures 6–8. The arrow on the cover indicates its position.

What I claim as my invention is:

1. A transformer including a primary and a secondary, a plurality of taps connected at spaced points to said primary, said taps respectively having spaced tap terminals insulated from one another, a primary disconnect plug having a pair of spaced plug terminals and having leads from a voltage source connected to said plug terminals, a first pair of said tap terminals being spaced apart the same distance as said plug terminals and a second pair of said tap terminals being spaced apart the same distance as said plug terminals, neither terminal of said first pair being a terminal of said second pair, said plug being connected to said primary by having said plug terminals simultaneously in removable contact with the tap terminals of the first pair, said plug terminals also being adapted to be removed from contact with said tap terminals of the first pair and to be placed simultaneously in removable contact with the tap terminals of said second pair, said primary disconnect plug thereby serving also as a tap switch.

2. A transformer including a primary and a secondary, a plurality of taps connected at spaced points to said primary, said taps respectively having spaced tap terminals insulated from one another, a primary disconnect plug having a pair of spaced plug terminals and having leads from a voltage source connected to said plug terminals, one of said tap terminals being the center tap terminal and the other tap terminals numbering at least three and being arranged in a circle around said center tap terminal, said center tap terminal being spaced from each of the circle of tap terminals a distance equal to the spacing between said plug terminals, said plug being connected to said primary by having its terminals simultaneously in removable contact with said center tap terminal and one of said circle of tap terminals, said plug terminals also being adapted to be removed from contact with said center tap terminal and said one of the circle of tap terminals and to be placed simultaneously in removable contact with said center tap terminal and any of the others of said circle of tap terminals, said primary disconnect plug thereby serving also as a tap switch.

3. A transformer including a primary and a secondary, a plurality of taps connected at spaced points to said primary, a plurality of spaced tap terminals, a primary disconnect plug having a pair of spaced plug terminals and having leads from a voltage source connected to said plug terminals, said tap terminals including a first row of three arranged in a straight line and a second row of three arranged in a straight line with the tap terminals of one row respectively opposite those of the other row, the middle tap terminals in both rows being connected to the same tap and the other two tap terminals in both rows each being connected to a different tap, the tap terminals in each row being insulated from one another, the middle tap terminal of each row being spaced from the other two tap terminals in the same row a distance equal to the spacing between said plug terminals, said plug being connected to said primary by having its terminals simultaneously in removable contact with the middle terminal and one of the other two in said first row, said plug terminals also being adapted to be removed from

contact with said middle terminal and said one of the other two terminals in said first row and to be placed in removable contact with said middle terminal and the other of the other two terminals in said first row, or with the middle terminal and either of the other two terminals in said second row, said primary disconnect plug thereby serving also as a tap switch.

4. A transformer including a housing, a primary and a secondary within said housing, a plurality of taps connected at spaced points to said primary, said tap respectively having spaced tap terminals within said housing insulated from one another, one of said tap terminals being the center tap terminal and the others numbering at least three and being arranged in a circle around the center terminal, the distance from the center terminal to each of the circle of tap terminals being the same, a circular opening in said housing opposite said terminals and concentric with said center tap terminal, a primary disconnect plug insertable within said housing through said opening and having a pair of plug terminals spaced apart a distance equal to the spacing between the center tap terminal and each of the circle of tap terminals, said primary disconnect plug having leads from a voltage source connected to said plug terminals, said plug being connected to said primary by having said plug terminals simultaneously in removable contact with said center tap terminal and one of said circle of tap terminals, said plug terminals also being adapted to be removed from contact with said center tap terminal and said one of the circle of tap terminals and to be placed simultaneously in removable contact with said center tap terminal and any of the others of said circle of tap terminals, said primary disconnect plug thereby serving also as a tap switch, a circular cover plate secured to said plug and adapted to overlie and completely close said opening in the housing in any of the aforesaid positions of said plug, and means for removably securing said cover plate to said housing.

5. A transformer including a housing, a primary and a secondary within said housing, a plurality of taps connected at spaced points to said primary, a plurality of spaced tap terminals within said housing, said tap terminals including a first row of three spaced apart uniformly in a straight line and a second row of three spaced apart uniformly in a straight line with the tap terminals of one row respectively opposite those of the other row, the spacing between the terminals of one row being the same as in the other row, the middle tap terminals in both rows being connected to the same tap and the other two tap terminals in both rows each being connected to a different tap, the terminals in each row being insulated from one another, said housing having a rectangular opening opposite said tap terminals, a primary disconnect plug insertable into said housing through said opening and having a pair of plug terminals spaced apart the same distance as said tap terminals in each row, said primary disconnect plug having leads from a voltage source connected to said plug terminals, said plug being connected to said primary by having said plug terminals simultaneously in removable contact with the middle tap terminal and one of the other two in said first row, said plug terminals also being adapted to be removed from contact with the middle tap terminal and said one of the other two in said first row and to be placed simultaneously in removable contact with said middle tap terminal and the other of the other two in said first row, or with the middle tap terminal and one or the other of the other two in said second row, said primary disconnect plug thereby serving also as a tap switch, a rectangular cover plate secured to said plug and adapted to overlie and fully close said opening in said housing in any of the aforesaid positions of said plug, and means for removably securing said cover plate to said housing.

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