May 9, 1933. E. E. FRANZ 1,907,776

SELECTIVE ELECTRICAL DEVICE

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Fig. 1.

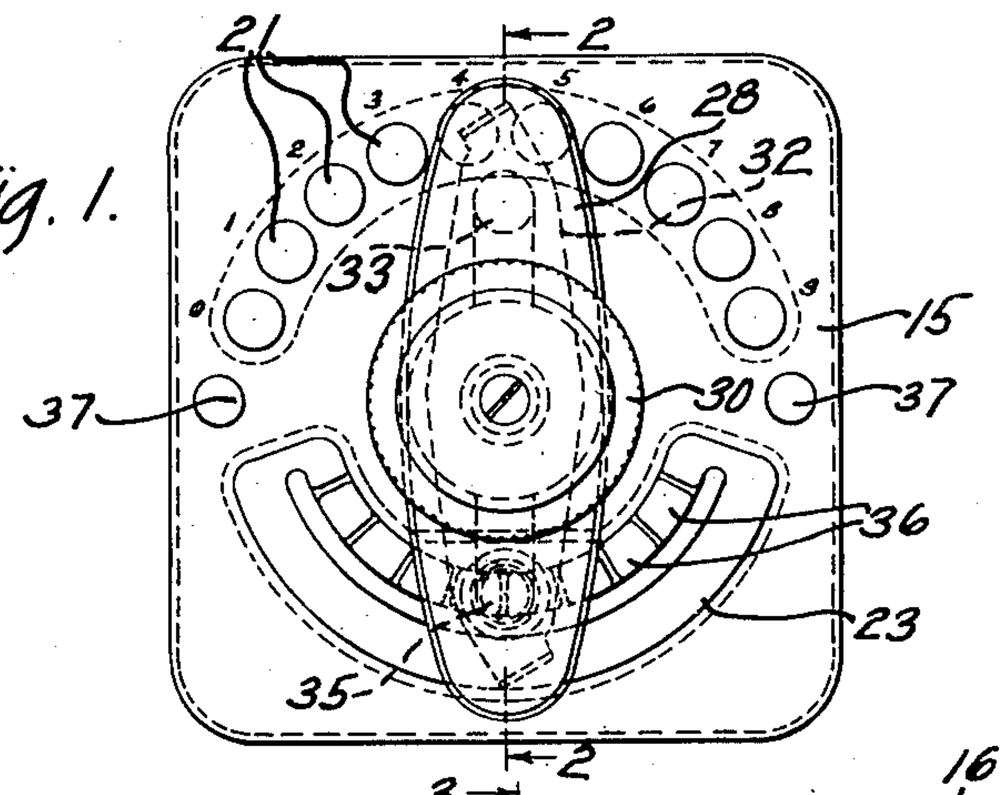

Fig. 2

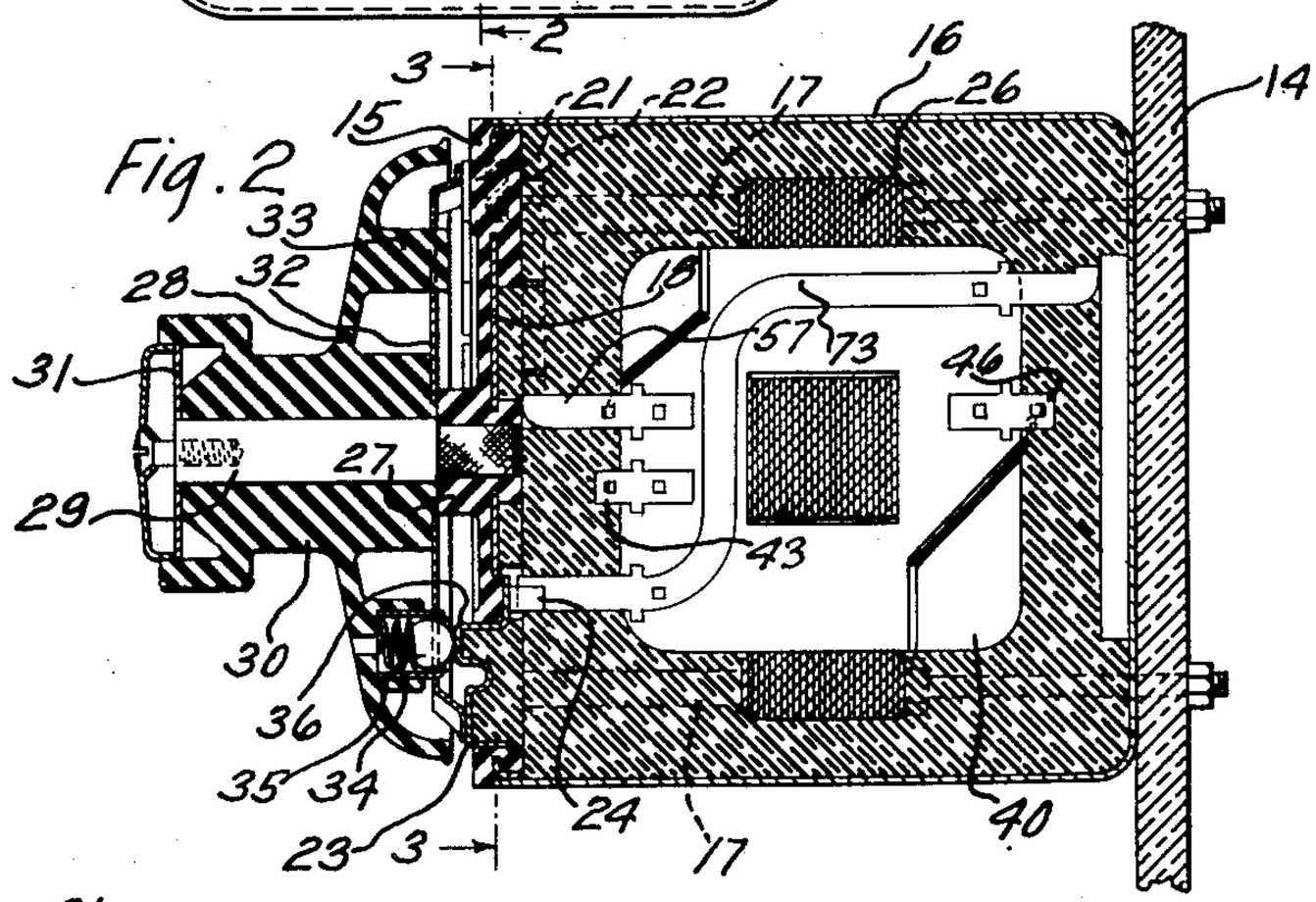

Fig. 3

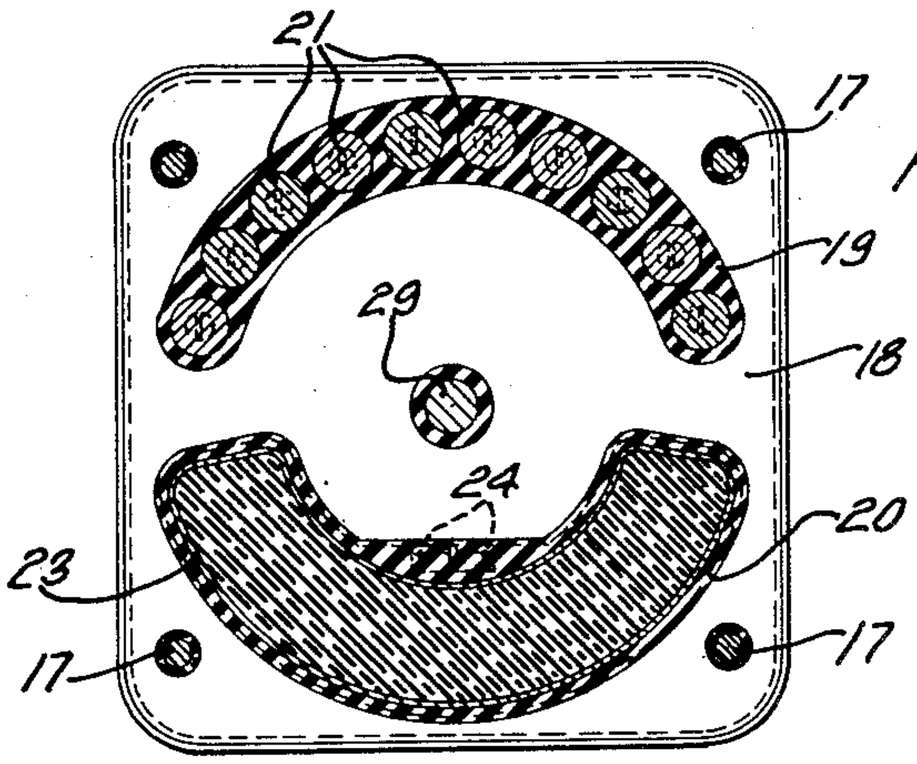

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Fig. 4

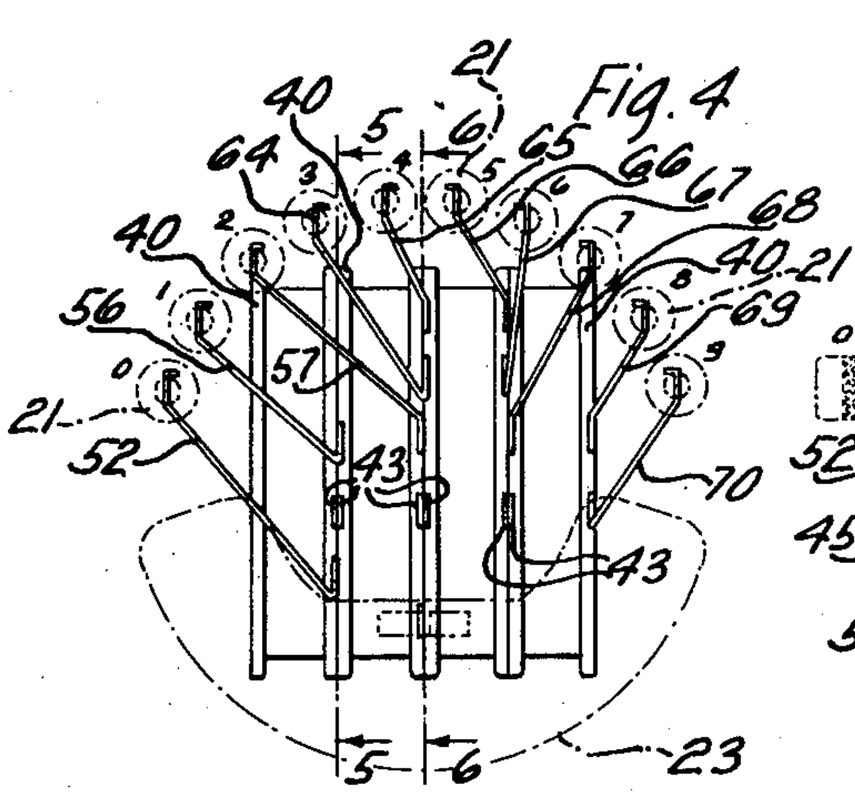


Fig. 5

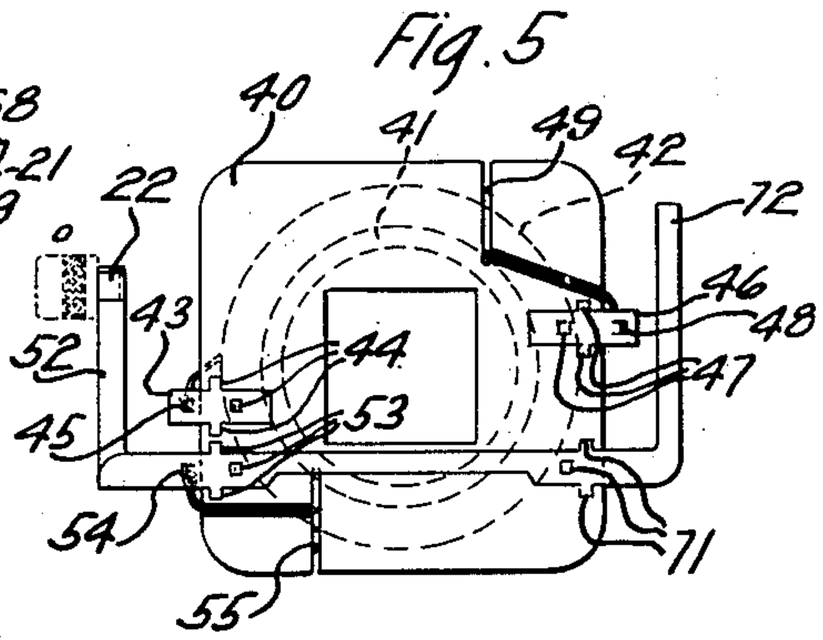


Fig. 6

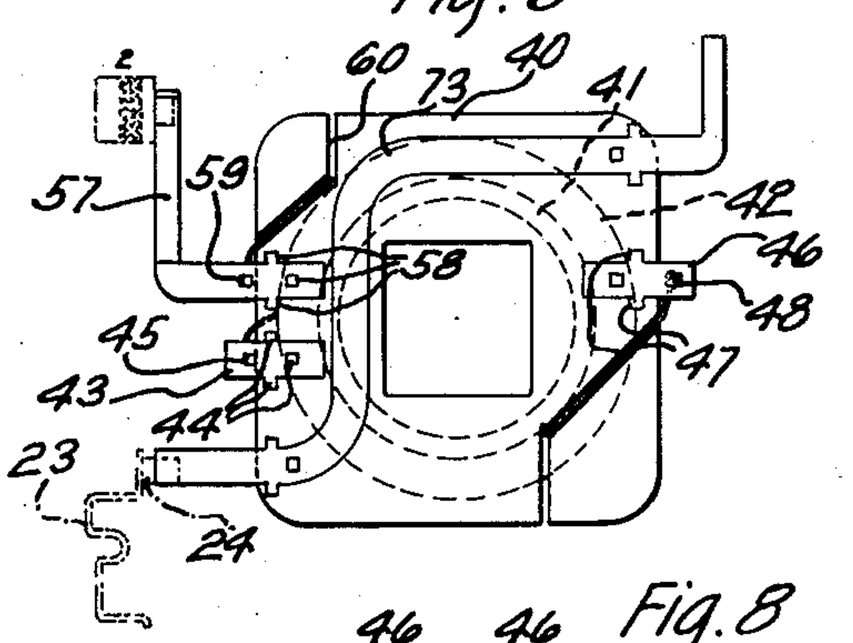


Fig. 7

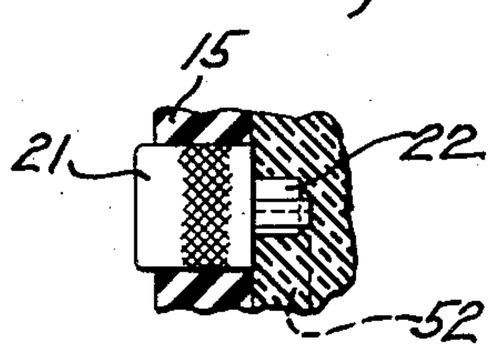


Fig. 8

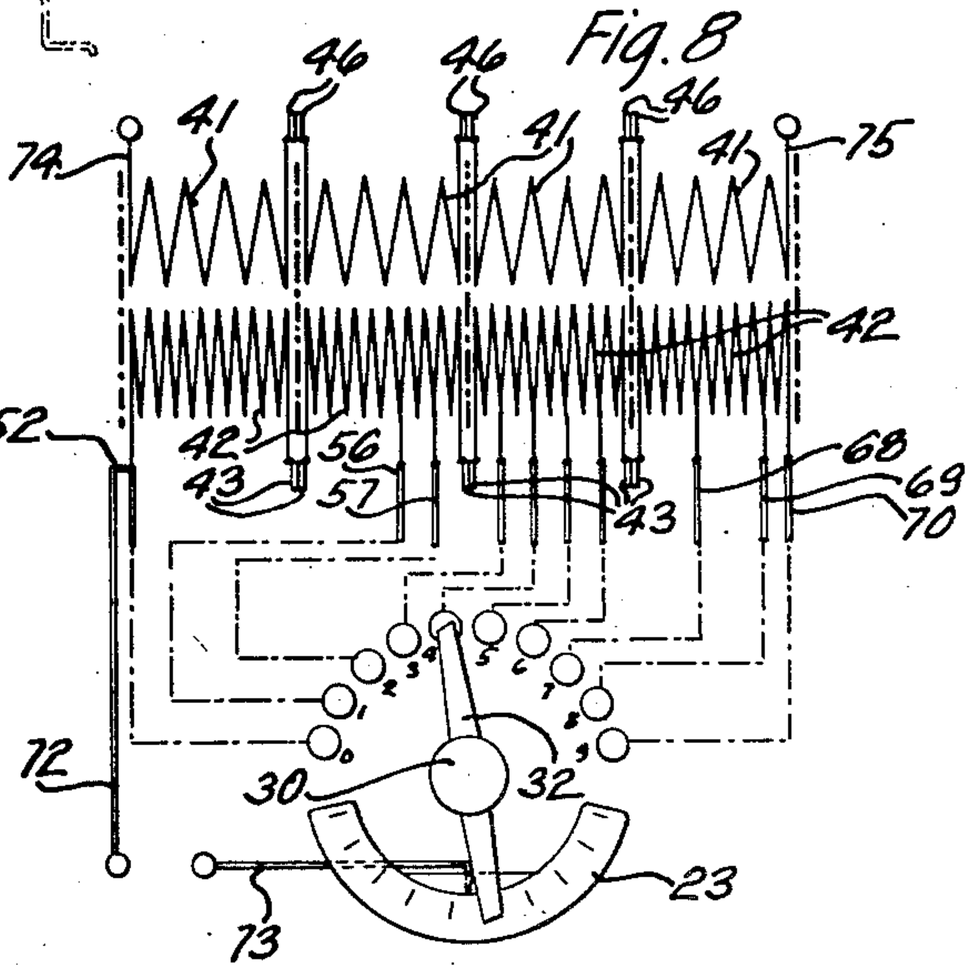
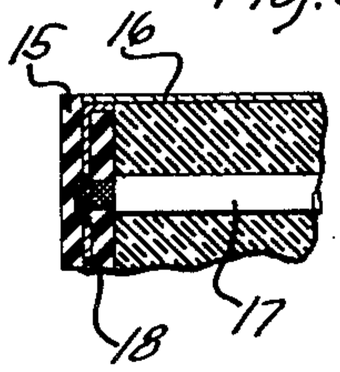


Fig. 9



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Patented May 9, 1933 1,907,776

UNITED STATES PATENT OFFICE

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SELECTIVE ELECTRICAL DEVICE

Application filed January 8, 1931. Serial No. 507,408.

This invention relates to selective electrical devices, and more particularly to electrical devices such as variable transformers and resistances having sectional windings with their ends terminating in contacts to allow for their selective inclusion in an electrical circuit.

An object of this invention is to provide a simple and efficiently constructed electrical device having a plurality of component windings arranged to be selectively controlled.

In accordance with this object, one embodiment of the invention comprises a transformer having its primary and secondary windings composed of a plurality of windings arranged in sections and wound on separate spools with the ends and taps of the windings connected with terminals and lugs molded in the spool heads. These terminals are formed of flat flexible metal strips capable of being variously bent to extend to arcuately arranged contact buttons which may be selectively engaged by a switch blade which makes a continuous contact with a metal sector to vary the number of secondary coils which are connected in series.

A better understanding of the invention will be had from the following description of one specific embodiment thereof as illustrated in the accompany drawings, wherein

Fig. 1 is a front view of a transformer embodying the invention;

Fig. 2 is a sectional view of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view of the same taken on the line 3—3 of Fig. 2;

Fig. 4 is a detailed front view of the assembled molded spools upon which the transformer section windings are wound, and the terminal strips for this winding;

Fig. 5 is a sectional side view of the assembled spools taken on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view of the assembled spools taken on the line 6—6 of Fig. 4;

Fig. 7 is a detailed view of one of the contact buttons with the terminal strip attached thereto;

Fig. 8 is a diagram of the connections of the device, and

Fig. 9 is a fragmentary detailed view of a portion of the frame.

Referring now to the drawings wherein like reference numerals indicate identical parts throughout the several views, the device includes a mounting plate 15 which is molded of insulating material, preferably a phenolic condensation product, which plate is supported in the front end of a transformer case 16 by corner bolts 17 which are knurled at their outer ends (Fig. 9) and molded in place in the molding material of the mounting plate 15 to support it in position within the case 16. The bolts 17 pass through holes formed in a transformer core 26 and the rear end portions of the bolts protrude from the case 16 to provide means for attaching the transformer to a suitable panel 14. The mounting plate 15 is reinforced by a magnetic shield 18, particularly shown in Fig. 3, having flanges which engage the inner edge surface of the transformer case 16 and having two arcuate slots 19 and 20 cut therein (Fig. 3). Within the slot 19 and embedded in the molding material disposed therein are a plurality of spaced metal contact buttons 21 which are numbered "0" to "9", respectively, by numerals formed in the molding material of the mounting plate (Fig. 1). Each of these buttons 21 is knurled (Fig. 7) for engaging the molding material in order to hold it in position and has a slotted projecting portion 22 for receiving a metal terminal strip to be described later.

Disposed within the arcuate slot 20 in the lower portion of the shield 18 and having a peripheral flange which is embedded in the molding material surrounding this slot is an outwardly protruding arcuate metal contact sector 23, which has at its central portion two integral lugs 24 bent inwardly therefrom for engaging a flat metal terminal strip to be described later. The central portion of the mounting plate 15 is provided with a molded boss 27 which secures the knurled end of a stationary stud 29, upon which is pivotally mounted a molded knob 30 which is secured to the shaft by washers 31. A metallic switch blade 32, preferably of resilient, phosphor bronze material is fixed to the

shaft 29 between the central boss 27 of the mounting plate and the inner central surface of the knob 30 and is bent inwardly at the ends for engaging the contact buttons 21 at one end and the contact sector 23 at the other end. An oval molded shield 28 is formed with the knob 30 and extends over the switch blade 32 to protect it. The shield 28 has an inwardly extending lug 33 and an inwardly extending bushing 34 (Fig. 2) in diametrically opposite ends which engage radial slots (shown dotted in Fig. 1) in the switch blade 32 for circumferentially locking the knob 30 and shield 28 to the switch blade. The bushing 34 houses a spring pressed detent ball 35 which is designed to engage selectively a series of depressions or indents 36 formed in the contact sector 23 for locking the switch blade to whatever position it may be adjusted by the knob 30. The apparatus just described constitutes a selector switch for the transformer.

It is apparent that the selector switch may be readily adjusted to engage selectively the various contact buttons 21 while the detent means consisting of the ball 35 and indents 36 provided in the handle locks the knob or switch blade in the adjusted position. It will also be understood that the switch blade makes a continuous contact with the sector 23. In order to limit the rotative movement of the switch blade, a pair of molded stop lugs 37—37 are provided in the mounting plate 15 to engage the sides of the shield 28.

The primary and secondary windings of the transformer are wound on spools 40 constructed entirely of molded insulating material, preferably a molded phenolic condensation product, the spools being placed end to end (Fig. 4) for mounting the core 26 (Fig. 2). The primary winding 41 (Figs. 5 and 6) is wound on each spool first, followed by a secondary winding 42 on top of the primary. The terminals for interconnecting the ends of the secondary windings 42 of the four spools consists of relatively short, flat, metal strips 43 (Figs. 4, 5, 6 and 8), each of which is secured flush in the end of the spool. It will be noted in Fig. 4 that the strip 43 of one spool is positioned adjacent to or with its back abutting the strip 43 of the next spool in order that these strips may be readily connected to each other by soldering the back of one to the back of the other, thereby interconnecting the four secondary windings. Three integral lugs 44 (Figs. 5 and 6) provided in each strip 43 and turned inwardly toward the spool aid in securing the strip to the spool. A fourth integral lug 45 is provided in each strip 43 for receiving or engaging one of the two ends or bared portions of the secondary winding 42, as shown in Figs. 5 and 6. Thus it will be understood that the terminal strips 43 operate to interconnect the four secondary windings 42 of the transformer.

The primary windings 41 are interconnected in a manner very similar to that just described for the secondary windings. Relatively short flat metal terminal strips 46 (Figs. 5, 6 and 8) are secured flush in the adjoining ends of the molded spools 40, being secured by three integral, inwardly bent lugs 47 (Figs. 5 and 6). A fourth integral lug 48 is provided in each strip 46 for receiving and engaging an end of the primary winding 41, which is brought out through a slot 49 in the spool end (Figs. 5 and 6). Therefore, it will be understood that each strip 46 connects to one end of each of the primary windings 41. The positioning of the strips 46 relative to each other does not appear in Fig. 4 since they are in that figure on the back side of the spools, but it will be understood that the strips 46 are positioned back to back the same as the strips 43, and therefore the strips 46 may be readily soldered together to interconnect the four primary windings 41. In this way the primary and secondary windings of the four spools of the transformer are interconnected by the short, flat metal terminal strips 46 and 43, respectively.

For tapping the secondary windings 42 to provide the selective operation thereof contemplated by the invention, the spools are equipped with tapping terminal strips which are very similar to the interconnecting strips 43 and 46 except that the tapping terminal strips, now to be described in detail, have extensions for engaging the above mentioned contact buttons 21, numbered "0" to "9" (Fig. 4). Thus, the first spool at the left (Fig. 4) is equipped in the end with a flush flat metal tapping terminal strip 52 (Figs. 4, 5 and 8) which is bent to engage the slotted projection 22 (Fig. 7) of the contact button numbered "0", and which strip is secured to the spool by three integral lugs 53 (Fig. 5). A fourth integral lug 54 provided in the strip 52 grasps the free end of the secondary winding 42 of this spool, which is brought out through a slot 55 thereof (Fig. 5). The secondary coil 42 on the second spool from the left (Fig. 4) is tapped twice (Fig. 8) by terminal strips 56 and 57 connecting with the contact buttons "1" and "2", respectively, the strip 56 being secured to the left end (Fig. 4) of the second spool while the strip 57 is secured to the right end of this spool. The strips 56 and 57 are secured in position and connected to the secondary winding 42 by the same type integral lugs as are provided in the aforedescribed strip 52. For instance, the strip 57, as shown in Fig. 6, is provided with three securing lugs 58 and a connecting lug 59 which grasps an end of the secondary winding which is brought out through a slot 60 in the spool end. Proceeding further with

the tapping construction, it will be noted that the third spool has four tapping strips 64, 65, 66 and 67, which connect respectively with the buttons "3", "4", "5" and "6". The fourth spool has tapping strips 68, 69 and 70 which connect respectively with the buttons "7", "8", and "9". The construction of the tapping strips on the third and fourth spools is similar to that of the strips 57 and 52 described in detail, and it is therefore believed that further description thereof is unnecessary. Thus it is believed to be manifest how the four secondary coils are tapped by the terminal strips. It will be noted in connection with these flat metal terminal strips that they may readily be bent to the desired shape for engaging the contact buttons, and being positioned flush in the ends of the spools they require a minimum amount of space.

The strip 52 (Fig. 5) is extended backwardly across the spool end and is secured thereto by a second set of lugs 71. This strip has an extension 72 which is adapted to provide one external connection for the entire secondary winding, as shown in Fig. 8. The other external connection for the secondary winding (Figs. 8 and 6) is provided by a curved flat metal terminal strip 73 of the same type as the strips above described, which strip connects with the lugs 24 of the sector 23. The external connections 74 and 75, shown in Fig. 8, for the primary winding are not shown in detail in the drawings because they are in the rear of the spools in Fig. 4, and furthermore these connections 74 and 75 are made by strips similar to the strip 57 (Fig. 6).

In the operation of the above described selective apparatus, which is shown to the best advantage in Fig. 8, the switch blade 32 is rotated by the knob 30 to whatever contact button "0" to "9" is desired, thereby completing a secondary circuit through the extension 72, the separate secondary windings 42, out of one of the contact buttons through the switch blade 32, to the continuously contacting sector 23 and out the terminal strip 73. The detent means consisting of the ball 35 mounted in the shield 28 and engaging the indents 36 in the sector 23 locks the switch blade in engagement with whatever contact button it may be rotated to.

The foregoing description is believed to make clear the improved selective apparatus which the invention provides. It will, of course, be understood that the invention is not to be limited to the specific embodiment described, but is to be limited only by the scope of the appended claims.

What is claimed is:

1. In a transformer, a plurality of spools arranged end to end on which separate sections of the transformer winding are wound, and terminal strips for the winding sections secured in place by molding them in the spools, the terminal strips extending from between adjacent spools.

2. In a transformer, spools arranged end to end on which separate sections of the transformer winding are wound, and flat terminal strips for the winding sections provided with integral securing lugs, the strips and lugs being secured to the spools by molding them therein, the strips being embedded in the heads of the spools and extending from between adjacent spool heads.

3. In an electrical terminating apparatus, molded means on which an electrical coil is wound, and flat terminal strips for the coil secured in place by mounting in the ends of the molded winding means, the strips being flush with the ends of the winding means to permit end to end positioning of the winding means.

4. In an adjustable electrical terminating apparatus, spools on which sections of a coil are wound, and flat terminal strips molded in the spools and tapped to various parts of the coil sections, the external end of the strips being capable of being bent to terminate in the arc of a circle for connection purposes.

5. In a variable transformer, sectional spools on which the transformer winding is wound, tapping terminal strips molded to the spools and having their external ends bent to terminate in the arc of a circle, contact buttons secured to said external ends, and a manually operable pivoted switch blade cooperating with a contact sector for engaging the contact buttons.

6. In a transformer, a plurality of molded forms, electrical coils wound on each of the forms, means for connecting successive sections of corresponding windings together, terminal strips carried by the forms and tapped to portions of the windings, the external ends of the strips being bent to terminate in the arc of a circle, terminal members associated with the ends of the strips, and switching means selectively engageable with the contact members.

7. In a transformer, a sectional primary winding, a tapped sectional secondary winding, means for connecting successive sections of primary and secondary windings, terminal strips connected to the taps of the secondary windings, and having their external ends bent to terminate in an arc, contact members associated with the ends of the strips, and switching means engageable with the contact members and with a contact sector.

8. In a transformer, a plurality of molded spools having primary and secondary windings thereon, and having tapping and end terminal strips molded in the faces thereof, the ends of the windings being attached to the end terminals, and intermediate points of the secondary windings being secured to

the tapping terminals, the external ends of the tapping terminals being bent to terminate in an arc, and attached to contact buttons, and switching means engageable with the contact buttons.

9. In a transformer, a plurality of headed spools, separate sections of a transformer wound thereon, and a flat terminal strip secured to a head of each spool flush with the surface thereof, and means for mounting the spools end to end to obtain electrical connection between the terminal strips of adjacent spool heads.

10. In a transformer, a plurality of headed spools mounted end to end, separate sections of a transformer wound thereon, and a flat terminal strip secured to a head of each spool flush with the surface thereof, the terminal strips of adjacent spool heads being in mutual electrical engagement.

11. In a transformer, a plurality of molded headed spools arranged end to end, separate sections of a transformer wound thereon, and terminal strips embedded in the molded spool heads to be flush with the surfaces thereof, the terminal strips of adjacent spool heads being aligned for mutual electrical engagement.

12. In a transformer, a plurality of headed spools mounted end to end, separate sections of a transformer wound thereon, and tapping and end terminals mounted in the spool heads to be flush with the faces thereof, the end terminals of adjacent spool heads being aligned for mutual electrical engagement, the external ends of the tapping terminals being bent to terminate in an arc of a circle.

13. In a transformer, a plurality of molded headed spools arranged end to end, separate sections of a transformer wound thereon, and tapping and end terminals moulded into the heads of the spools to be flush with the surfaces and extend from the edges thereof, the end terminals of adjacent spool heads being aligned for mutual electrical engagement, and the external ends of the tapping terminals being bent to terminate in an arc of a circle.

In witness whereof, I hereunto subscribe my name this 24 day of December A. D., 1930.

ERWIN E. FRANZ.