

May 27, 1930.

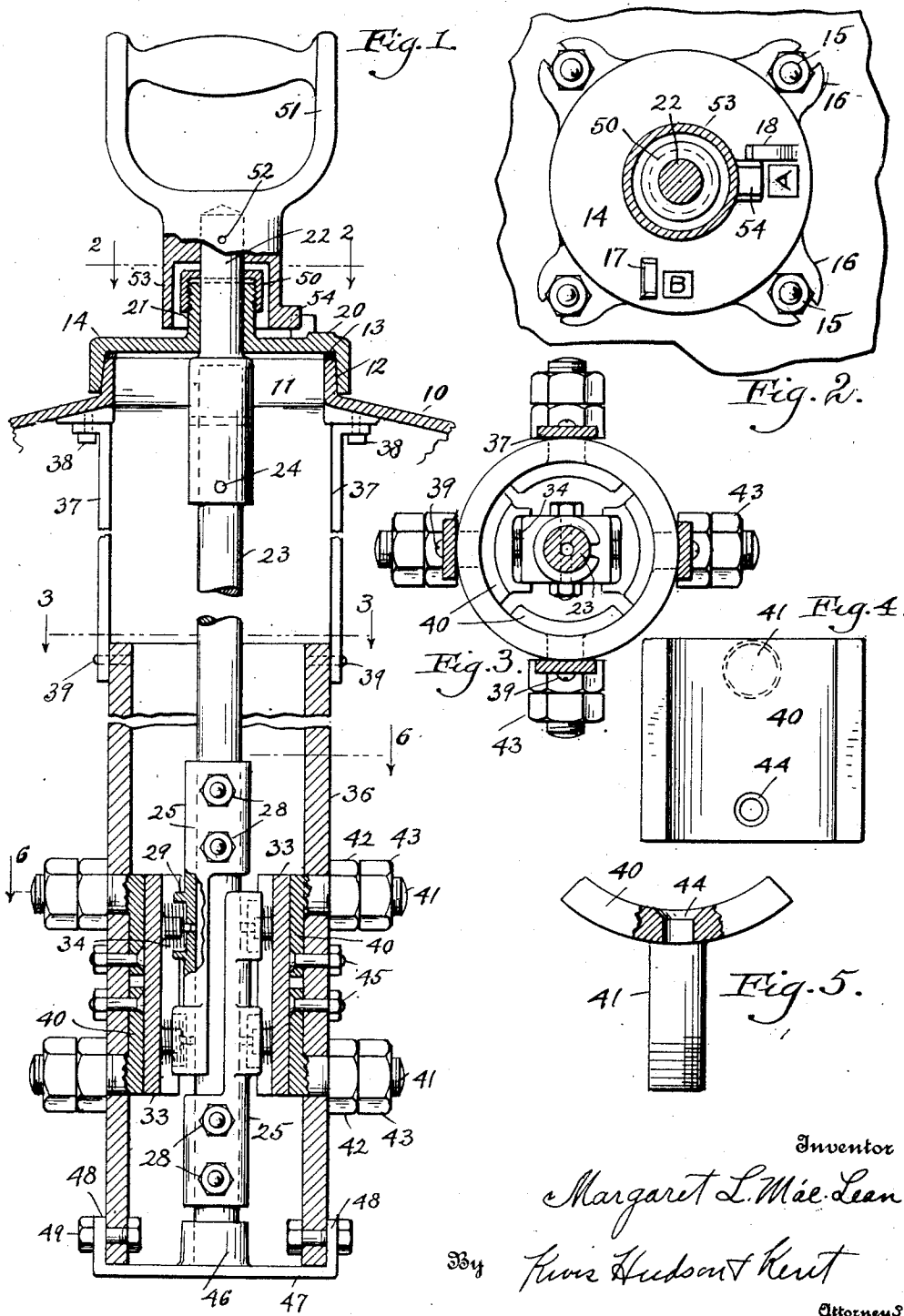
M. L. MacLEAN

1,759,991

TAP CHANGER

Filed June 2, 1927

2 Sheets-Sheet 1



Inventor

Margaret L. MacLean

By *Russ Hudson & Kent*

Attorneys

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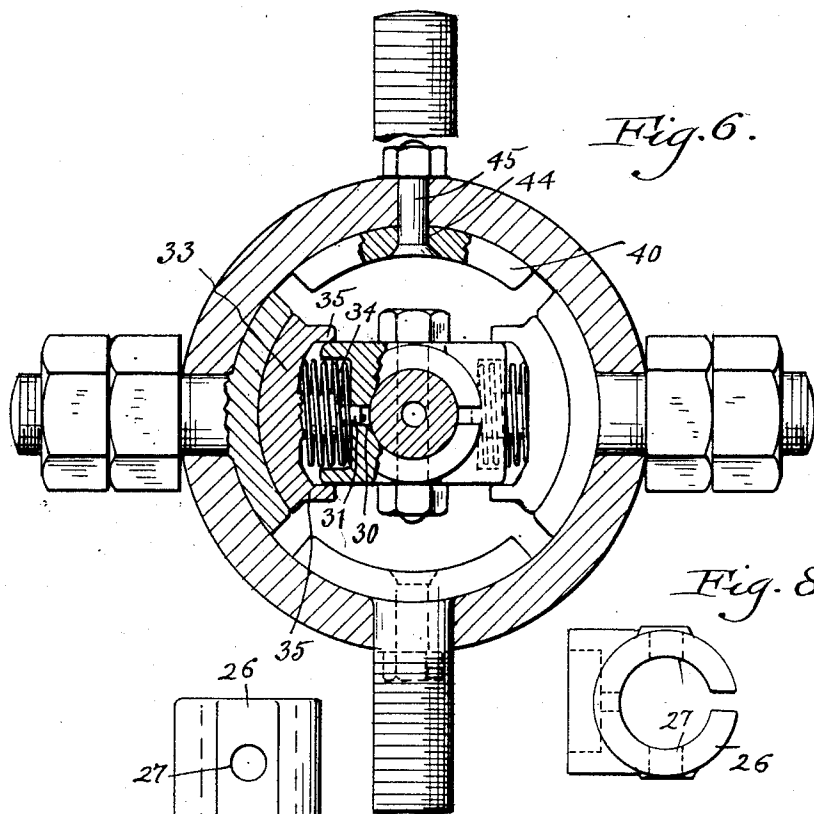
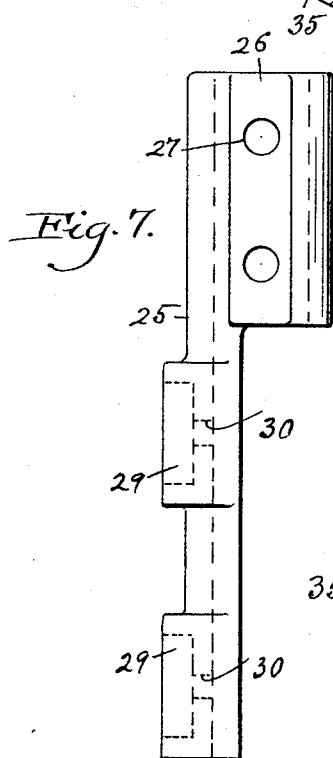
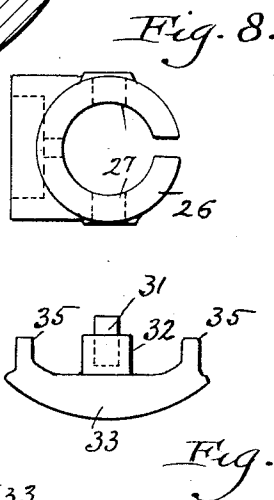
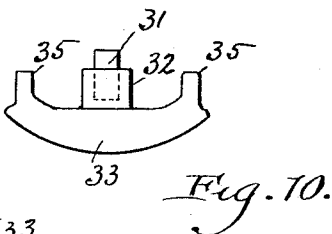
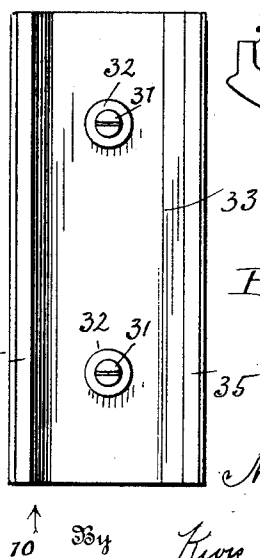
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2 Sheets-Sheet 2



Inventor

Margaret L. Mac Lean.

Kline Hudson & Kent

Attorneys

UNITED STATES PATENT OFFICE

MARGARET LEE MacLEAN, OF NILES, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
AMERICAN BROWN BOVERI ELECTRIC CORPORATION, OF NEW YORK, N. Y., A COR-
PORATION OF NEW YORK

TAP CHANGER

Application filed June 2, 1927. Serial No. 195,974.

This invention relates to improvements in tap changers for transformers such as are adapted to be employed in places exposed to the weather.

5 An object of the invention is the provision of improved contact devices whereby the tap connections of the transformer may be changed.

10 Other objects will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

15 Fig. 1 is a central vertical sectional view of a tap changer showing a small fragment of the transformer tank to which the tap changer is applied;

Fig. 2 is a plan view, partly in section, on the line 2—2 of Fig. 1;

20 Fig. 3 is also a plan view, partly in section, on the line 3—3 of Fig. 1;

Fig. 4 is an elevational view showing the inner side of one of the contacts;

25 Fig. 5 is a plan view of the contact shown in Fig. 4;

Fig. 6 is a sectional plan view taken substantially on the line 6—6 of Fig. 1 and showing the parts on a larger scale;

30 Fig. 7 is a detail elevational view of a shoe carrier;

Fig. 8 is a plan view of the carrier illustrated in Fig. 7;

35 Fig. 9 is an inside elevational view of one of the shoes employed for bridging the individual members of a pair of contacts; and

Fig. 10 is an end view of the shoe, looking in the direction of arrow 10, Fig. 9.

40 Similar reference characters refer to like parts throughout the views.

In the drawings, a fragment of a tank for enclosing a transformer is indicated at 10 and is shown provided with an opening 11 surrounded by an upstanding flange 12. Above the flange 12 is an annular gasket 13, serving to exclude moisture from the tank when the cover 14 is applied and clamped down by means of stud bolts 15 threaded into the tank and provided with heads which engage slotted projections 16 on the cover, as illustrated in Fig. 2.

The cover 14 is provided with a pair of integral stops 17 and 18 and may have markings A and B on its upper surface to indicate different positions of adjustment of the tap changer, as will presently appear. The cover 14 has a central hole therein surrounded by an upstanding threaded flange 21. Rotatably mounted in this flange 21 is a metal shaft 22 enlarged below the cover 14 and bored out to receive snugly the upper end of a rod 23 of insulating material, these two parts being fastened together by suitable means as by a pin 24.

The rod 23 has secured thereto one or more carriers 25, shown in detail in Figs. 7 and 8, there being two illustrated herein. They are identical in form but one is inverted with respect to the other. Each of these carriers 25 has at one extremity a split clamp 26 which is provided with a pair of holes 27 extending through both jaws of the clamp. Corresponding holes are provided in the rod 23 and bolts 28 are inserted and drawn up to secure the carrier to the rod.

These carriers each have one or more sockets 29, preferably two as shown, with a small hole 30 extending into the carrier from the bottom of each socket. The hole 30 receives a dowel or pilot 31 integral with or mounted in a boss 32 on a contact shoe 33, and the socket 29 receives a coil spring 34 tending to separate the shoe 33 from its carrier 25. The shoe 33 is provided with vertical ribs 35 near its side edges which overlap the side edges of the carrier 25 and thus insure the movement of the shoe with the carrier when the latter is rotated, as will presently be described.

A tube 36 of fiber or other insulating material is suspended from the top of the tank 10 by means of a plurality of hangers 37 which are attached to the tank by machine screws 38 and to the tube 36 by screws 39 or the like.

On the inner wall of the tube 36 I mount contacts 40 which are preferably in the form of segments of a cylinder concentric with the tube 36. These contacts are arranged in pairs with the two contacts of each pair spaced apart vertically. Each of the contacts 40 is provided at one end with an integral stud 41

which projects through a hole in the tube 36 and is threaded to receive a nut 42 by means of which the contact is clamped to the tube.

This stud 41 serves not only as a securing means for the contact but also as a binding post, a second nut 43 being provided as a means for clamping the wire lead or tap to the contact. At the end of the contact opposite the stud 41 I provide a countersunk hole 44, and a hole is drilled through the tube 36 to register therewith, these holes receiving a bolt 45 as an additional means for holding the contact firmly in position. The two contacts of each pair are preferably reversed so that the binding posts may be separated as much as possible. In the form here illustrated there are four pairs of contacts 40, but a change in the number of these pairs involves merely a matter of design, as will be obvious.

The lower end of the rod 23 is mounted for rotation in a bearing 46 which is carried by a bracket 47 having flanged ends 48. Bolts 49 extend through aligned openings in the flanges 48 and in the tube 36 to hold the bracket 47 in place.

Packing surrounds the shaft 22 at the upper end of the flange 21 on the cover 14, being held in place by a packing gland 50 threaded onto the flange 21.

A handle 51 is secured to the shaft 22 by a pin 52 and has a depending skirt 53 which extends down around the packing gland and nearly to the surface of the cover 14, acting as a watershed or moisture deflector. At one point on the skirt 53 there is a projection 54 which is adapted to engage one or the other of the stops 17 and 18.

In the embodiment of the invention which is here disclosed, I have shown two positions only of the operating handle, four pairs of contacts 40, and two contact shoes 33. Without departing from the spirit of the invention, however, the number of handle positions may be increased and the number of shoes 33 and pairs of contacts 40 may be either increased or decreased, depending upon requirements. The handle 51 is located outside the tank 10, and its movement from position A to position B is an operation which may be performed almost instantly. Any tendency of the shoes 33 and the contacts 40 to separate, due to sudden surges of current in the line to which the transformer is connected, is absorbed by the springs 34, which immediately return the shoes to their contact position and no out of adjustment condition results.

While in the drawings attached hereto, I have illustrated but one set or pair of shoes and cooperating contacts therefor, it is obvious that the lengths of the tube 36 and the rod 23 may be increased and the switch apparatus duplicated to whatever extent may be desired. For instance, if it should be desired to apply the invention to three phase

transformers, that may be accomplished by employing three sets of shoes with their necessary cooperating parts.

While I have described with more or less particularity one embodiment of my invention, I have done so for the purpose of making the invention clear by that means, and any details mentioned are not to be construed as limitations of the invention except as they may be specified in the appended claims.

Having thus described my invention, I claim:

1. In a tap changer, a supporting tube, contacts mounted upon said tube and arranged in pairs with the individual contacts of a pair spaced apart longitudinally of the tube, said pairs being spaced apart transversely of the tube, a metallic shoe adapted to bridge the contacts of a pair, a rod arranged axially within said tube and mounted for rotation, a carrier secured to said rod, means for supporting said shoe upon said carrier so as to permit of limited motion therebetween, a pair of springs, one in transverse alignment with each contact, said springs tending to separate said shoe and carrier, and means for rotating said rod so as to move said shoe from engagement with one pair of contacts into engagement with a different pair of contacts.

2. In a tap changer, a supporting tube, contacts mounted upon said tube and arranged in pairs with the individual contacts of a pair spaced apart vertically, said pairs being arranged at the same elevation and spaced apart horizontally, two metallic shoes adapted to bridge the contacts of a pair, a rod arranged axially within said tube and mounted for rotation, a pair of carriers each having rod engaging portions at one end thereof, one of said carriers being inverted with respect to the other, means for supporting one of said shoes upon each of said carriers, and means for rotating said rod so as to move said shoes from engagement with certain pairs of contacts into engagement with different pairs of contacts.

3. In a tap changer, a supporting tube, contacts mounted upon said tube and arranged in pair with the individual contacts of a pair spaced apart vertically, said pairs being spaced apart horizontally, two metallic shoes each adapted to bridge the contacts of a pair, a rod arranged axially within said tube and mounted for rotation, two carriers each formed at one end with a rod engaging clamp, one of said carriers being inverted with respect to the other, means for supporting one of said shoes resiliently upon each of said carriers so as to permit of limited motion therebetween, and means for rotating said rod so as to move said shoes from engagement with certain pairs of contacts into engagement with different pairs of contacts.

4. In a tap changer, a supporting tube, a

pair of contacts mounted on the inner wall of said tube and spaced apart longitudinally thereof, a metallic shoe adapted to bridge said contacts, a rotatable rod arranged within said tube parallel to the axis thereof, a carrier formed at one end with a rod-engaging clamp, means for supporting said shoe upon said carrier to one side of said clamp, and means for rotating said rod so as to move said shoe into or out of engagement with said contacts.

5. In a tap changer, a supporting tube, a pair of contacts mounted upon the inner wall of said tube and spaced apart longitudinally thereof, a metallic shoe adapted to bridge said contacts, a rotatable rod arranged within said tube parallel to the axis thereof, a carrier arranged upon said rod and engaging therewith through less than one-half its circumference, a continuation of said carrier having means for securing the same to the rod, means for supporting said shoe upon said carrier proper, and means for rotating said rod so as to move said shoe into or out of engagement with said contacts.

6. In electric switch apparatus, an operating member supported for rotary movement, and circuit making-and-breaking means associated with said member and including similar complementary parts fitted on said member in reverse and in spaced relation with respect to each other, adjacent portions of said parts being disposed axially along the same portion of said member.

7. In electric switch apparatus, an operating member supported for rotary movement, and circuit making-and-breaking means associated with said member and including similar complementary parts fitted on said member in reverse and in spaced relation with respect to each other and provided with enlarged head portions secured to said member, adjacent portions of said parts being disposed axially along the same portion of said member and falling short of the respective head portions.

8. In electric switch apparatus, a tubular casing of insulating material, contacts disposed interiorly of said casing and fixed directly to the inner wall thereof in spaced relation with respect to each other, an actuating rod of insulating material disposed interiorly and centrally of said casing and supported for rotary movement about its own axis, a carrier fixed directly to said rod, a contact shoe disposed between said carrier and said contacts for sliding movement thereon into and out of bridging relation with respect thereto, means forming respectively part of said carrier and said shoe and cooperating to connect said shoe to said carrier for rotary movement therewith while providing for free relative movement of said carrier and shoe in a direction radially of said rod, and means interposed between said carrier and said shoe and operating to urge the latter

radially outwardly into bridging relation with said contacts.

In testimony whereof, I hereunto affix my signature.

MARGARET LEE MacLEAN.

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