Sept. 8, 1942. Z. O. ST. PALLEY 2,295,303

TAP CHANGER

Filed April 3, 1942

Fig. 1.

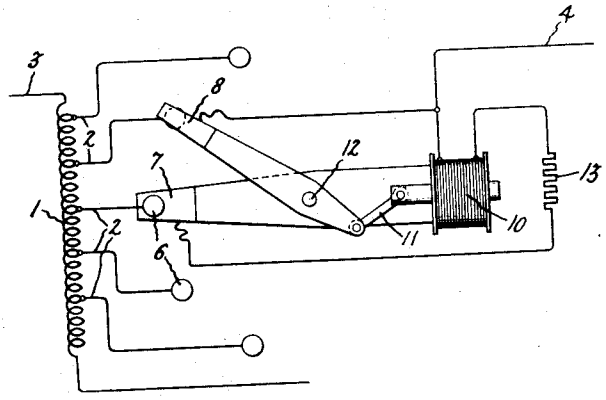
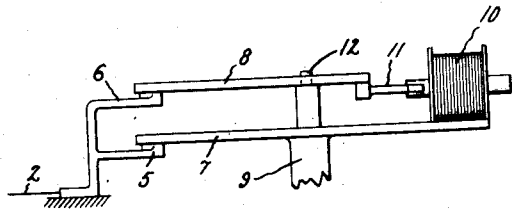


Fig. 2.



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TAP CHANGER

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3 Claims. (Cl. 171—119)

This invention relates to tap changers and more particularly to an improved arrangement for changing taps in a load circuit without interrupting the load current.

Many electrical devices, such as transformers, reactors, potentiometers, rheostats and Petersen coils, are often provided with a plurality of taps to which it is desired to make selective electrical connection without interrupting the current through the device. In accordance with the present invention there is provided a novel and simple arrangement of this type which makes use of the tap-to-tap voltage difference for energizing an electromotive device which thereupon automatically completes a tap change in a very rapid and very reliable manner.

An object of the invention is to provide a new and improved tap-changing arrangement.

Another object of the invention is to provide an improved arrangement for changing taps in electrical apparatus without interrupting the load current of the apparatus.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing Fig. 1 is a circuit diagram in which a plan view is shown of my novel tap-changing means and Fig. 2 shows a side elevation of the tap-changing means.

Referring now to the drawing, there is shown therein by way of example a transformer winding 1 provided with a plurality of taps 2 terminating respectively in fixed tap contacts. The winding 1 may be any one of a number of insulated windings of a conventional transformer or it may be an autotransformer. Load current may be considered as entering the winding through a conductor 3 and leaving it through a conductor 4 although, of course, the direction of current flow is immaterial. As shown more clearly in Fig. 2, the fixed tap contacts which are connected to each of the taps 2 are double contacts 5 and 6 which co-operate respectively with movable contacts 7 and 8. These two movable contacts normally engage fixed tap contacts which are connected to the same tap and the circuit conductor 4 is connected directly to the movable contact 8 so that normally substantially all of the load current flows through the movable contact 8. This contact is a trailing or follow-up contact with respect to the contact 7 which is a leading contact in so far as the operatoin of the invention is concerned. Thus, contact 7 is connected to main driving means 9 for the tap-changing means.

For causing automatic follow-up operation of the trailing contact 8 there is provided an electromotive means of any suitable type, shown, for example, as a solenoid electromagnet 10 carried by the leading contact 7 and having its plunger connected by a pivoted link 11 to the trailing contact 8 which in turn is pivotally mounted at 12 on the leading contact 7. This magnet is connected electrically between the two movable contacts.

For controlling the electrical characteristics of the tap-changing circuit suitable impedance means 13 may be connected in circuit with the electromagnet 10, if desired, and this impedance means may be of any type, such as a resistor, reactor, capacitor, or any suitable combination thereof.

The operation of the illustrated embodiment of the invention is as follows: Assume that in Fig. 1 the movable contact 7 had previously been making connection to the same tap with which the trailing contact 8 is shown as making connection and that, therefore, the leading contact 7 has just been moved in a counterclockwise direction to the next lowermost tap. During this movement the transformer load current is substantially unaffected because substantially all of it flows through the movable trailing contact 8 as the impedance through the current path of this contact is lower than the impedance through the contact 7 because of the impedance of the device 10 and also of the device 13, if it is present, which is in series with the latter. However, as soon as the leading contact 7 engages the next adjacent tap contact the tap-to-tap voltage difference will be impressed across electromagnet 10, thereby causing it to attract its plunger whereby force is applied to the trailing contact 8 tending to snap it rapidly in the follow-up direction into alignment with the leading contact 7. Ordinarily, there will be a momentary arc drawn when the trailing contact 8 leaves its tap contact but this arc will not be carried across between fixed or tap contacts and when it goes out during the motion of the trailing contact all of the load current will be transferred to the leading contact 7 and will flow through the magnet 10 and through the impedance 13, if present. There is, therefore, ample operating current for the electromagnet for insuring that the follow-up operation of the contact 8 is completed. As soon as it is completed the magnet 10 and impedance 13 will be short circuited and all of the current will be returned to the trailing contact 8.

It will be obvious from the above that the same operation or results would follow if the

leading contact had been moved clockwise instead of counterclockwise and that no matter how the leading contact 7 is moved, as soon as it engages an adjacent contact the electromagnetic means is automatically energized and provides a powerful and reliable force for causing follow-up motion of the contact 8 whereby the latter contact will be aligned with the former contact.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and, therefore, it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, an electrical load current carrying device provided with a plurality of taps, and switching means for transferring said load current from tap to tap without interrupting said current comprising a leading movable contact and a trailing movable contact which normally make connection to the same one of said taps and through the trailing one of which substantially all of said load current normally passes, means for moving the leading one of said contacts in either direction to an adjacent tap, and electromotive means responsive to the tap voltage difference applied between said movable contacts when said leading contact reaches said adjacent tap for moving said trailing contact in a follow-up direction into connection with the tap to which said leading contact has been moved.

2. In combination, a transformer winding provided with a plurality of taps which are spaced substantially equally electrically, a pair of movable contacts for normally making connection to the same tap, one of said contacts being a trailing contact and being connected normally to carry substantially all of the transformer load current, the other of said contacts being a leading contact, means for moving said leading contact to an adjacent tap, and means including an electromagnetic means connected between said contacts for causing follow-up motion of said trailing contact when said leading contact reaches an adjacent tap and thereby causes the tap-to-tap voltage difference to be applied to said electromagnetic means, said electromagnetic means being capable of carrying the transformer load current during at least a part of the follow-up movement of said trailing contact.

3. In combination, a transformer winding provided with a plurality of taps which are spaced substantially equally electrically, a pair of movable contacts for normally making connection to the same tap, one of said contacts being a trailing contact and being connected normally to carry substantially all of the transformer load current, the other of said contacts being a leading contact, means for moving said leading contact to an adjacent tap, means including electromagnetic means connected between said contacts for causing follow-up motion of said trailing contact when said leading contact reaches an adjacent tap and thereby causes the tap-to-tap voltage difference to be applied to said electromagnetic means, said electromagnet being capable of carrying the transformer load current during at least a part of the follow-up movement of said trailing contact, and impedance means connected in circuit with said electromagnetic means for controlling the volt-ampere characteristics of the circuit during a tap-changing operation.

ZOLTAN O. ST. PALLEY.