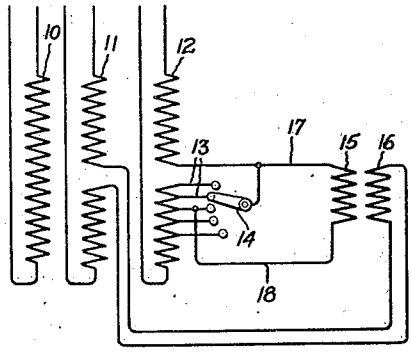
June 27, 1933. M. B. MALLETT 1,916,007

TRANSFORMER

Filed July 28, 1932



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TRANSFORMER

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My invention relates to transformers and more particularly to transformers having three or more windings. Transformers are often operated under conditions where the voltage of the primary circuit is variable but where it is desirable that the voltage of the secondary circuit be maintained at a constant value. Under such conditions, it is customary to provide one of the transformer windings with taps to permit the number of effective turns in the tapped winding to be varied. Thus, the voltage ratio of the transformer may be varied to compensate for any variation of the primary voltage and the secondary voltage may be maintained at a constant value.

A variation in the voltage at the terminals of the primary winding will cause a corresponding variation in the induction in the transformer core and this in turn will cause a variation in the secondary voltage. If the primary winding is provided with taps, any variation of primary voltage may be compensated by changing the number of effective primary winding turns to restore the secondary voltage to its desired constant value by restoring the induction in the core also to its previous corresponding value. If the secondary winding is provided with the taps, the number of effective turns in the secondary winding may be changed to compensate for a change in the induction in the core due to a variation in the primary voltage to restore the secondary voltage to its desired constant value.

Some transformers have three or more windings of which one is a primary winding and the others are secondary windings. Any variation in the primary voltage of such a transformer may be compensated by changing the number of effective turns in the primary winding by taps provided in that winding to keep the induction in the transformer core and, therefore, the voltage of each secondary winding constant. However, there may be reasons such as high voltage and insulation difficulties in the primary winding which make taps in the primary winding undesirable. It is also undesirable to provide taps in each of the secondary windings as such a multiplicity of taps would be complicated and expensive. The general object of the invention is to provide a transformer having more than one secondary winding with improved means including taps in a single secondary winding for regulating or adjusting the voltage of all the secondary windings.

The invention will be explained more fully in the following description taken in connection with the accompanying drawing which is a diagrammatic view of the windings of a three winding transformer provided with voltage regulating means in accordance with the invention.

The drawing shows a transformer primary winding 10 and two secondary windings 11 and 12. One of the secondary windings 12 is provided with taps 13 and a tap switch 14 for varying or adjusting the number of effective turns in this secondary winding. Thus, the voltage of this secondary winding may be maintained at a constant value if the voltage of the primary winding 10 should vary. Changing the number of effective turns in the secondary winding 12 cannot alone, however, maintain a constant voltage in the other secondary winding 11.

The voltage of the secondary winding 11 is regulated by a small auxiliary transformer having two windings 15 and 16. The winding 16 of the auxiliary transformer is connected in series with the secondary winding 11 and the other winding 15 of the auxiliary transformer is connected across the tap switch 14. In the arrangement shown in the drawing, one end of the winding 15 is connected through a conductor 17 to the movable contact of the switch 14 and the other end is connected through the conductor 18 to one of the taps 13 but other arrangements may obviously be used.

When the switch 14 connects the conductor 17 to the same tap 13 to which the conductor 18 is connected, the auxiliary transformer winding 15 is short-circuited and, therefore, induces no voltage in the winding 16 and does not change the voltage between the terminals of the secondary winding 11. When the switch 14 connects the conductor 17 to some other tap 13 than the one to which the

conductor 18 is connected, then the section of the winding 12 which is between these two taps is connected across the winding 15 so that a voltage is induced in the winding 16.

Assume that the primary voltage between the terminals of the winding 10 is inducing the desired secondary voltages in the windings 11 and 12. An increase or decrease in the primary voltage will cause a corresponding increase or decrease in the induction in the core and in the secondary voltages in the windings 11 and 12. The voltage of the winding 12 may be corrected or adjusted to its desired value by increasing or decreasing its effective number of turns by means of the tap switch 14. As the movable contact of the switch 14 is changed, there is a corresponding change in the voltage between this contact and the conductor 18 and, therefore, in the voltage induced in the winding 16. The voltage ratio of the windings 15 and 16 is made to produce a voltage in the winding 16 of just the proper value to compensate for the change in the induction in the core and thus to correct or adjust the voltage between the terminals of the secondary winding 11 to its desired value. If the conductor 18 is connected to an intermediate tap 13 as shown in the drawing, the voltage of the winding 16 will be added to the voltage of the winding 11 when the movable contact of the switch 14 is at one side of this intermediate tap and will oppose the voltage of the winding 11 when the switch contact is at the other side of this intermediate contact.

The invention provides a simple and efficient means for adjusting the voltages of two or more secondary windings where taps in the primary winding are undesirable and without the necessity of any taps in more than one of the secondary windings.

The invention has been explained by describing and illustrating a particular application thereof to a transformer having two secondary windings but it will be apparent that changes may be made without departing from the spirit of the invention and the scope of the appended claims.

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

1. A transformer including at least three windings, each winding being connected between a pair of terminals, one of said windings being provided with taps, the terminals of said tapped winding being arranged for connection to an external load circuit, means for changing the tap connections to vary the effective voltage between said terminals of the tapped winding, and means controlled by said tap connection changing means for varying the voltage in the circuit of another of the transformer windings.

2. A transformer including a primary winding and a plurality of secondary windings, each winding being connected between a pair of terminals, one of said secondary windings being provided with taps, the terminals of said tapped winding being arranged for connection to an external load circuit, means for changing the tap connections to vary the effective voltage between said terminals of the tapped secondary winding, and means controlled by said tap connection changing means for varying the voltage in the circuit of another of said secondary windings.

3. A transformer including a primary winding and a plurality of secondary windings, each winding being connected between a pair of terminals, one of said secondary windings being provided with taps, the terminals of said tapped winding being arranged for connection to an external load circuit, means for changing the tap connections to vary the effective voltage between said terminals of the tapped secondary winding, and an auxiliary transformer with one winding connected across said tap connection changing means and a second winding connected in series with another of said secondary windings.

4. A transformer including a primary winding and a plurality of secondary windings, each winding being connected between a pair of terminals, one of said secondary windings being provided with taps, the terminals of said tapped winding being arranged for connection to an external load circuit, a tap switch connected to said taps for varying the effective voltage between said terminals of the tapped secondary winding, and an auxiliary transformer with one winding connected across said tap switch and a second winding connected in series with another of said secondary windings.

In witness whereof I have hereunto set my hand.

MONTVILLE B. MALLETT.