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J. F. PETERS ET AL
VARIABLE VOLTAGE TRANSFORMER

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Fig. 1.

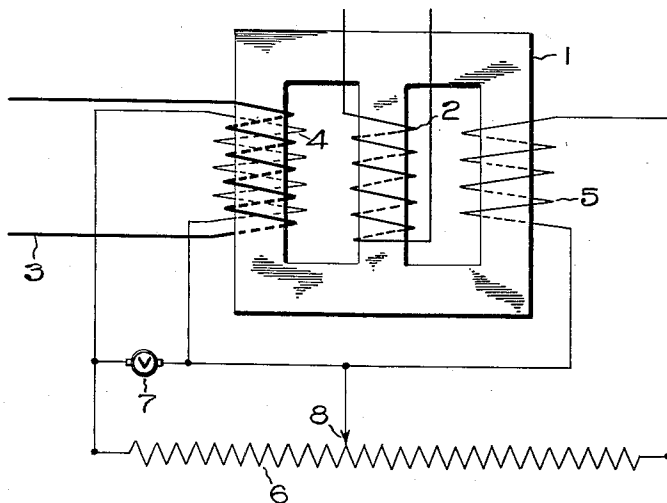
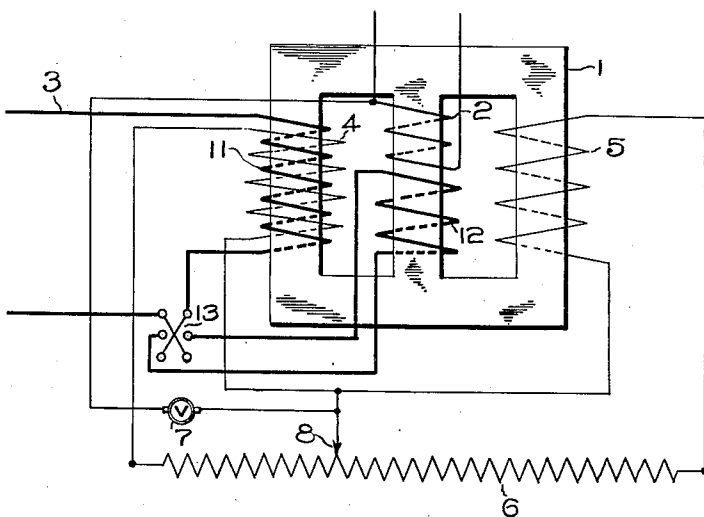


Fig. 2.



WITNESS

R. S. Harrison

INVENTORS

*John F. Peters and
Albert J. Maslin*

BY

Charles E. Sloan
ATTORNEY

UNITED STATES PATENT OFFICE

JOHN F. PETERS AND ALBERT J. MASLIN, OF EDGEWOOD, PENNSYLVANIA, ASSIGNORS
TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION
OF PENNSYLVANIA

VARIABLE-VOLTAGE TRANSFORMER

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Our invention relates to electrical trans-
lating devices and particularly to trans-
formers for delivering variable voltage to
testing instruments. One object of our in-
vention is to provide a transformer that shall
be capable of delivering a variable voltage
over a wide range.

Another object of our invention is to pro-
vide a transformer for testing instruments
such that an operator may closely regulate the
terminal voltage thereof.

A further object of our invention is to pro-
vide a transformer for delivering a variable
voltage to testing instruments such that the
operator may vary the applied voltage by a
very large number of graduations as distin-
guished from a succession of relatively few
predetermined steps.

In electrical testing and measuring appa-
ratus it is frequently necessary to employ the
same instruments for widely different cal-
culations and when such calculations depend
upon voltage as a factor, it becomes neces-
sary that a transformer shall be capable of
developing a continuously varying voltage
ratio, the characteristic curve of which is
much smoother than that obtained by vary-
ing the tap connections of one of the trans-
former windings through a succession of pre-
determined steps.

We obtain the foregoing results by em-
ploying a plurality of auxiliary windings, one
of which is wound on the same core leg as
one of the windings of the secondary circuit.
These auxiliary windings are connected to a
common variable burden so that it is possible
to short-circuit either one of the auxiliary
windings or to cause it to carry the entire
variable burden. Accordingly, as the load on
the auxiliary coil that is mounted adjacent to
the secondary coil varies, the energization,
and consequently the voltage output, of the
secondary coil varies proportionally. In the
accompanying drawings,

Fig. 1 is a diagrammatic view of a trans-
former and circuits embodying our invention.

Fig. 2 is a similar view of a modified form
of our invention.

Our invention comprises, in general, a
core member 1 having the customary pri-

mary winding 2 and secondary winding 3,
together with a pair of auxiliary windings
4 and 5 that are connected to a common vari-
able burden such, for example, as a variable
resistor 6 and a measuring instrument 7.

The auxiliary windings 4 and 5 are mount-
ed upon different legs of the transformer than
is the primary winding 2. The auxiliary
winding 4, however, is mounted on the same
core leg as is the secondary winding 3. The
variable resistor 6 may be connected wholly
or partially in series with either of the auxil-
iary windings 4 and 5 by an adjustable con-
tact element 8 adapted to selectively divide
the resistor 6 into sub-divisions that are in
series respectively with the auxiliary coils 4
and 5.

The measuring instrument 7, which is pref-
erably a volt-meter, is connected across the
terminals of the auxiliary winding 4 and
may be calibrated to indicate the voltage
across the secondary coil 3.

Upon energization of the primary wind-
ing 2 and with the adjustable contact in the
mid-portion of the variable resistor 6, the
flux threading the auxiliary winding 5 and
that threading the auxiliary winding 4 and
the auxiliary winding 3 are inversely propor-
tional to their relative impedances. Since
the impedances of the windings 4 and 5 are
substantially equal, the winding 5 will be
threaded by enough more flux than the wind-
ing 4 to compensate for the impedance of the
secondary winding 3 with the result that the
voltage across the auxiliary winding 5 will
be slightly in excess of that across the auxil-
iary winding 4 and the reading on the in-
strument 7 represents the difference in poten-
tial across the terminals of the winding 4
which difference in potential is directly pro-
portional to the potential across the second-
ary winding 3.

It is obvious that, as the movable contactor
is moved to the left or the right along the
variable resistor 6, the impedances of the coils
4 and 5 vary correspondingly with the result
that the readings of the instrument 7 like-
wise vary in accordance with the potential of
the secondary winding 3. Assuming the
movable contact member to be at the extreme

left hand terminal of the variable resistor 6, the auxiliary winding 4 will be short-circuited and its impedance will be such as to preclude any flux traversing that leg of the transformer core 1 with the result that the voltage across the terminals of the secondary winding 3 is zero. At the same time, all of the flux generated by the primary winding 2 threads the auxiliary winding 5.

As the contact member 8 is moved along the variable resistor 6 to the right, the combined impedances of the auxiliary winding 4 and the secondary winding 3 decrease, an appreciable voltage appears across their terminals which is registered by the measuring instrument 7. This voltage increases until the contact member 8 is moved to the extreme right of the variable resistor 6 when the impedance of the auxiliary winding 5 becomes so low as to preclude the passage of any flux there-through, at which time all the flux traverses the windings 3 and 4. Under such conditions, the instrument 7 registers its maximum reading and the secondary winding 3 delivers its maximum voltage.

Referring particularly to Fig. 2, we have shown a modified form of our invention in which the secondary coil is divided into two sections 11 and 12, section 12 being mounted on the same leg as is the primary winding 2, while the section 11 is mounted on the same leg as is the auxiliary winding 4. By placing a reversing switch 13 across the terminals of one of the sections 12 or 13 so that they either oppose or assist each other, it is possible to secure a voltage across the secondary winding of the transformer that varies over a range of voltage proportional to the sum of the voltages of the sections 11 and 12 or their difference.

It is to be understood that in case the sections 11 and 12 are capable of delivering the same voltage under one condition, the total secondary voltage delivered would be zero and that under the other extreme condition, the secondary voltage would be twice the voltage of either coil. The interaction between the auxiliary winding 4 and the secondary winding 11 in this form of our invention is similar to the interaction between the secondary winding 3 and the secondary winding 4 in the form of our invention shown in Fig. 1.

In the form of our invention shown in Fig. 2 the section 12 of the secondary winding will normally deliver its full potential by reason of its being mounted on the same core leg as the primary winding 2 while the voltage delivered by the secondary winding 11 varies from zero to its maximum, in accordance with the position of the adjustable contact member 8 with reference to the variable burden 6. This maximum potential of the section 11 may oppose or be additive to the potential of the section 12.

In both forms of our invention the auxiliary winding 5 is mounted alone on one of the legs of the core member 1.

It will thus be seen that we have provided a transformer for delivering a continuous but variable voltage for testing and measuring instruments that is characterized by employing an auxiliary winding to control the flux traversing it and a secondary winding and thereby vary the potential of the secondary winding.

It is to be understood that such changes may be made in the arrangement and disposition of the several parts of our invention as shall fall within the scope of the appended claims.

We claim as our invention:

1. In a transformer, a core member comprising a plurality of legs, primary and secondary windings associated with said core member, auxiliary windings on a plurality of core legs, and a variable translating device connected to the auxiliary windings for controlling the flux distribution between the several legs associated with the auxiliary windings.

2. In a transformer, a core member comprising a plurality of legs, a primary coil mounted on one of the legs, a secondary winding mounted at least partially on a second leg, and auxiliary windings on certain of the transformer legs, one of the auxiliary windings being mounted on said second leg and adjustable means connected to the auxiliary windings for controlling the flux distribution in the several transformer legs.

3. In a transformer, a core member comprising a plurality of legs, a primary coil mounted on one of the legs, a secondary winding mounted at least partially on a second leg, and auxiliary windings on certain of the transformer legs, one of the auxiliary windings being mounted on said second leg, and a variable burden connected to the auxiliary windings causing the auxiliary winding associated with the secondary winding to operate between conditions of short-circuit and full burden whereby the voltage delivered by the secondary winding is varied.

4. In a transformer, a core, a primary winding thereon, an auxiliary winding and a secondary winding mounted on the same core leg, and means for varying the reactance of the auxiliary winding comprising a variable burden and an auxiliary winding mounted on another core leg and connected in circuit with the first-named auxiliary winding and the variable burden for controlling the reactance of the first named auxiliary coil and thereby the voltage of the secondary winding.

5. In a transformer, a core structure, primary and secondary windings associated therewith, an auxiliary circuit comprising a plurality of windings mounted on different legs of the core structure, and means for pro-

portioning the flux traversing the respective last-named windings.

5 6. In a transformer, a core structure, a primary winding on one core leg, a secondary winding on another core leg, two auxiliary windings on separate core legs, and a burden in circuit with said auxiliary windings for inversely varying the impedance of said auxiliary windings.

10 7. In a transformer, a core structure, a primary winding on one core leg, a secondary winding on another core leg, auxiliary windings on separate core legs, a burden in circuit with said auxiliary windings, and
15 means for controlling the impedances of said auxiliary windings.

8. In a transformer, a core structure, a primary winding on one core leg, a secondary winding on another core leg, an auxiliary
20 winding on said other core leg, an auxiliary winding on another core leg, and a burden in circuit with said auxiliary windings.

9. In a transformer, a core structure having a plurality of core legs, a primary winding on one core leg, a secondary winding and
25 an auxiliary winding on another core leg, a second auxiliary winding on another core leg and a variable burden in circuit with said auxiliary windings for controlling the
30 flux traversing said windings.

In testimony whereof, we have hereunto subscribed our names this 26th day of January, 1926.

JOHN F. PETERS.
ALBERT J. MASLIN.

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