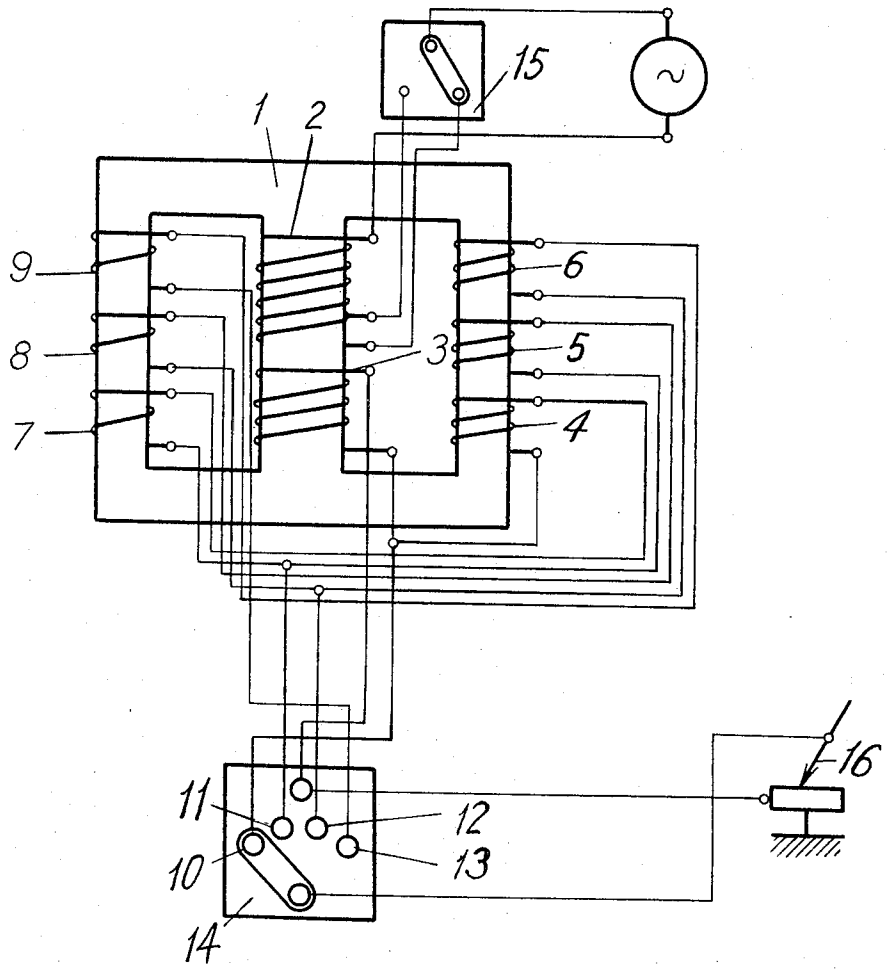
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SINGLE-PHASE TRANSFORMER FOR ELECTRIC ARC WELDING

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Inventor:
Stefan GROSU
by Arthur O. Klein
his Attorney

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SINGLE-PHASE TRANSFORMER FOR ELECTRIC ARC WELDING

Stefan Grosu, cal. Bucuresti, bloc 1, Craiova, Rumania

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ABSTRACT OF THE DISCLOSURE

A single-phase transformer of the shell type especially adapted for electric arc welding which is simple in construction and economical to operate. The transformer comprises a rectangular laminated core, constructed of paramagnetic material, which has three parallel leg portions. A primary winding and a secondary winding are arranged on the central leg of the magnetic core. At least one pair of opposite windings for adjusting the output current is respectively arranged on opposite outer legs and the windings of this pair are connected in series to each other and to the secondary winding on the central leg. A switch having appropriate contacts is provided for selectively connecting the secondary winding and preselected pairs of adjusting windings to the outlet circuit of the transformer.

Background of the invention

The present invention relates to single-phase transformers of the shell type.

In particular, the present invention relates to a transformer of this type which has a rectangular core and three parallel leg portions.

Various types of welding transformers are known. They can be classified in accordance with the method and means used for adjusting the welding current. Thus, there are transformers known which have displaceable coils, so that the distance between the primary and secondary coils can be varied.

There are also known welding transformers wherein the secondary winding is connected in series to an entirely separate adjustable choke coil. The latter forms sometimes part of the transformer construction proper so that the magnetic core of the choke coil constitutes a part of the rectangular core of the transformer.

The afore-described constructions are relatively complicated and heavy.

Summary of the invention

It is therefore a general object of this invention to provide a welding transformer of a more simple and economical construction.

In accordance with the present invention the welding transformer comprises a rectangular laminated shell type core constructed of paramagnetic material. The shell type core has three parallel leg portions. The primary and secondary windings are arranged on the central leg portion and windings for adjusting the welding current are arranged on the outer leg portions. Suitable switching means for energizing the primary and connecting the secondary and adjusting windings are provided.

Brief description of the drawing

The invention is illusrated by way of example in the accompanying drawing which forms part of this application and in which the sole figure illustrates diagrammatically the transformer of this invention together with the electrical connections for energizing it.

Description of preferred embodiments

Referring now to the figure there is illustrated a magnetic core **1** having a central leg portion and two outer

parallel leg portions. A primary winding **2** and secondary winding **3** are operatively arranged on the central leg portion. The primary winding **2** is connected to suitable contacts of a control panel **15** which has a pair of contacts and corresponding taps adapted to cooperate with a switch so that the input voltage in the primary winding may be adjusted. Both leads of the secondary winding **3** are connected to a variable outlet **16** via the welding electrode contacts of a control panel **14**.

Pairs of opposite windings **4**, **7**, **5**, **8** and **6**, **9** are operatively arranged on the outer leg portions of the magnetic core **1**. Thus winding **4** is arranged opposite winding **7**, winding **5** opposite winding **8**, and winding **6** opposite winding **9**. Each pair of opposite windings is connected in series. Furthermore, the pairs of opposite windings are arranged so that the output of one pair is connected as an input for the adjacent pair. The pairs of opposite windings are also connected in series to the secondary winding **3**. The pairs of opposite windings **4**, **7**, **5**, **8** and **6**, **9** respectively are connected by means of contacts **11**, **12** and **13** on the control panel **14** to an outlet **16** as is illustrated in the drawing. One lead of the secondary winding **3** is permanently connected to the outlet **16** whereas the other lead is adapted to be connected to the outlet **16** by means of the contact **10** on the control panel **14**.

The adjustment of the output welding current is achieved by selectively moving the multiple switch of the control panel **14** to a preselected contact. As can be noted from the drawing, contact **10** is connected to the junction of the other lead of the secondary winding **3** and the one lead of the adjusting winding **4**; contacts **11** and **12** are respectively connected to the junctions of opposite windings and contact **13** is connected to the end lead of adjusting winding **9**. When output **16** is connected via the switch of control panel **14** to the contact **10**, the output **16** receives a maximum welding current which is produced by electromagnetic induction in the secondary winding **3**. When the output **16** is connected to one of the contacts **11** to **13** the output welding current is reduced because the current passing through one or more pairs of opposite windings as well as the secondary winding **3** produces an unequal distribution of the magnetic flux in the outer leg portions and, consequently, an electromotive force in opposition to the passage of the current through the adjusting windings appears. This current choking effect increases as the number of loops in the adjusting windings increases. Thus the output current decreases as the switch of control panel **14** moves across the contacts of control panel **14** in the following sequence: **10**, **11**, **12**, **13**.

It is also possible to provide pairs of opposite adjusting windings which have an unequal number of loops. For example, the windings **4**, **5** and **6** may have a larger number of loops than the windings **7**, **8**, and **9**, as a consequence of which the no-load voltage at contacts **10**, **11**, **12** and **13** increases from contact to contact. Thus the more the welding current diminishes from contact to contact the more the no-load voltage increases which is advantageous because thereby there is provided an adequate no-load voltage for each welding current intensity.

It is also within the scope of this invention to provide a transformer in which one of the outer leg portions is larger than the other. In such an embodiment the electromagnetic induction in the two outer leg portions equalizes itself during a welding operation.

The afore-described embodiments of transformers according to this invention render some important advantages. The transformers of this invention are reduced in overall size and weight when compared with trans-

formers of the prior art having comparable outputs and inputs. Their no-load voltage can be progressively increased as the welding voltage is adjusted downwardly, which is not possible with prior art transformers wherein the output voltage is adjusted by a magnetic shunt, movable coils or a separate reactor. The output voltage can be controlled within large limits which is not possible with those prior art transformers which have one primary winding and two secondary windings.

It is, of course, to be understood that what has been described above is not only applicable to single-phase welding transformers, but also to other types of transformers. Such modifications are intended to come within the scope of the invention if defined by the following claims.

I claim:

1. A single-phase transformer of the shell type, comprising in combination,

a rectangular laminated core, constructed of laminated paramagnetic material, which has three parallel leg portions;

a primary winding and a secondary winding arranged on the central leg portion of said three parallel leg portions;

said primary winding being connected to an alternating current power source and one lead of said secondary winding being connected to an outlet via switching means;

at least one winding arranged on each one of the outer leg portions of said three parallel leg portions so as to form a pair of oppositely positioned windings on the two outer leg portions of said three parallel leg portions;

said pair of windings being connected in series to each other and to said secondary winding and being adapted to be operatively connected to said outlet via said switching means;

whereby said switching means can selectively cut in or cut out said pair of windings on said two outer leg portions and the other lead of said secondary winding from the outlet circuit of said transformer thereby adjusting the output current of said transformer.

2. The single-phase transformer as set forth in claim **1**, wherein a plurality of separate windings are arranged on each one of the outer leg portions of said three parallel leg portions so as to form a plurality of pairs of oppositely positioned windings on the two outer leg portions of said three parallel leg portions,

said switching means including a plurality of contacts and a movable contact arm for selectively connecting a contact of said plurality of contacts to said outlet, a first contact of said plurality of contacts being connected to the other lead of said secondary winding and the other contacts of said plurality of contacts being connected to one lead of each pair of oppositely positioned windings;

said secondary winding, said plurality of pairs of oppositely positioned windings and said plurality of contacts being arranged so that a first one of said plurality of contacts is adapted to be connected to said secondary winding by said contact arm, each successive contact when contacted by said contact arm, cutting into the outlet circuit of said transformer, said secondary winding and an increasing number of pairs of windings of said plurality of pairs of oppositely positioned windings on the two outer leg portions, thereby decreasing the output current of the transformer.

3. The single-phase transformer as set forth in claim **2**, wherein the windings in each pair of said plurality of pairs of windings have an equal number of turns, and whereby each successive contact of said plurality of contacts after the first one thereof, when contacted by said contact arm, effects a different no-load voltage in said outlet circuit.

4. The single-phase transformer as set forth in claim **2**, wherein said two outer leg portions are different in size.

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LARAMIE E. ASKIN, *Primary Examiner.*

D. A. TONE, *Assistant Examiner.*

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