Oct. 14, 1947. C. E. TORSCH ET AL 2,428,948

HIGH VOLTAGE TRANSFORMER

Filed Feb. 27, 1945 2 Sheets-Sheet 1

Fig. 1.

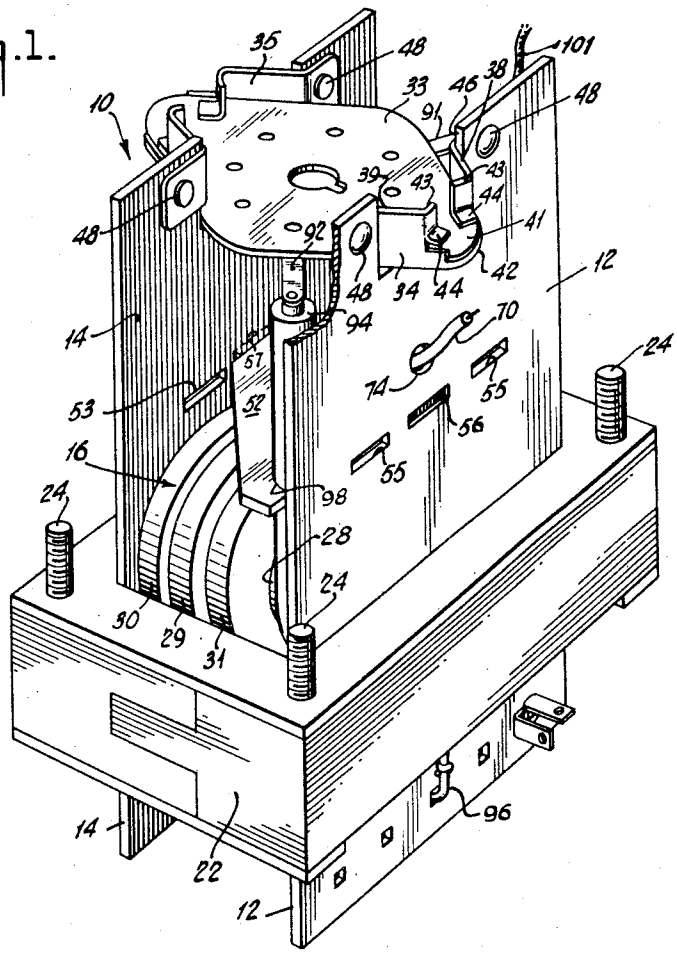
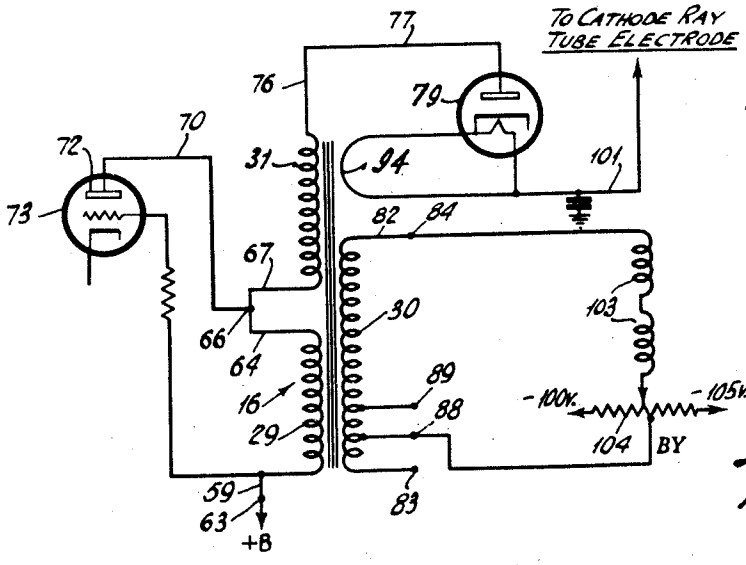


Fig. 4.



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Fig. 3.

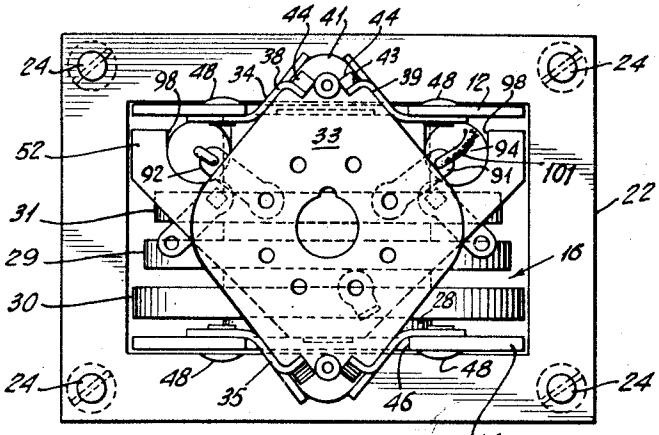
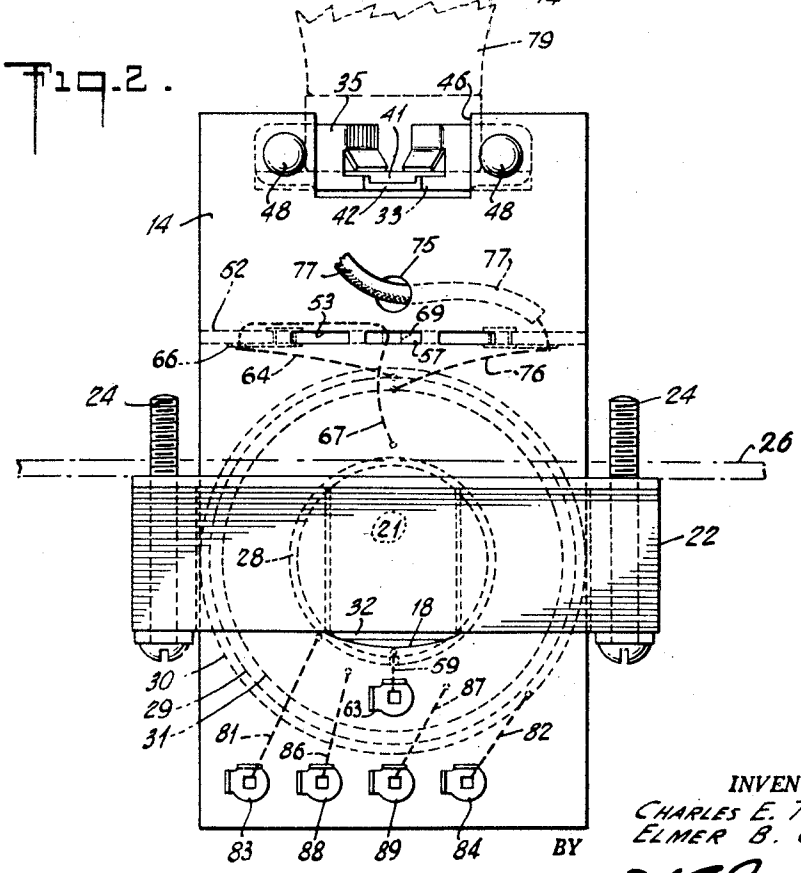


Fig. 2.



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Patented Oct. 14, 1947

2,428,948

UNITED STATES PATENT OFFICE

2,428,948

HIGH-VOLTAGE TRANSFORMER

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Application February 27, 1945, Serial No. 579,964

2 Claims. (Cl. 175—356)

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The present invention relates to transformers, and more particularly to a combined transformer constructed and arranged for use in television circuits.

Transformers for use in deflection circuits of television receivers, especially those which handle deflection currents at line scanning frequency, present special insulation problems and also must be of compact construction. It has been proposed previously to provide polarizing potentials of relatively large magnitude for certain of the elements of a cathode ray tube from the high kick voltage which is developed by the steep wave front of the sawtooth of current used for deflection purposes. Such proposals usually employ a rectifier and are exemplified by the disclosure of U. S. Patent No. 2,074,495, granted to A. W. Vance on March 23, 1937. The rectifier represents an additional piece of equipment having relatively high voltages impressed upon its terminals, and it is one of the aims of the present invention to provide a novel space saving mounting for the rectifier. Moreover, where a transformer is to be employed as a coupling link in the deflection circuit of a television receiver, the invention has for an additional aim, not only to provide a novel and compact transformer for the purpose, but also to provide a transformer which has a novel provision for furnishing the fluctuating high voltage for rectification and application to one of the elements of a cathode ray tube.

In addition to the foregoing, another aim or object is to provide novel terminal arrangements in a transformer having a plurality of coils.

A further object is to provide for obtaining low voltage current from the transformer for cathode heating current for a vacuum tube.

A still further object is to combine a plurality of transformer windings and a rectifier mounting in a manner to occupy minimum space and to provide maximum insulation and cooling of the parts.

Other and more specific objects of the invention will become apparent from a consideration of the fol'owing specification and claims in connection with the accompanying drawings illustrating one preferred form of the invention, in which:

Fig. 1 is a perspective view of a combined transformer constructed in accordance with the invention;

Fig. 2 is a side elevational view of the transformer of Fig. 1;

Fig. 3 is a view in plan of the transformer, and;

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Fig. 4 is a schematic diagram illustrating a suggested use of the transformer of Fig. 1.

Referring to Fig. 1, the entire unit of the present invention is indicated by reference character 10 which comprises side frame members 12 and 14 of insulating material apertured at several points to provide support for the parts of the transformer, including the coil assembly designated generally by reference character 16.

The frame members 12 and 14 are each provided with an aperture 18 so aligned that the middle leg 21 of a magnetic core 22 of stacked laminations passes through these apertures (Fig. 2). The core 22 is clamped together by suitable fastening means such as self-tapping screws 24, which may be conveniently placed adjacent each corner of the core. The entire combined unit 10 may be mounted to a base member, such as the plate 26 (Fig. 2), of a television receiver chassis or the like so that the portion of the unit above the magnetic core 22 projects above the top of the chassis. This mounting plan, when followed, brings several leads from the transformer adjacent the most convenient points in the television receiver in which it is employed. Also, the plate 26 aids in cooling as it conducts heat away from the core.

The coil assembly 16 comprises a tube of insulating material 28 upon which is mounted three coils, namely, a primary coil 29, a secondary coil 30, and a high voltage coil 31 (Fig. 1). The tube 28 is wedged against the laminations of the magnetic leg 21 by thin wedges of insulating material 32, one of which appears in Fig. 2 of the drawings. Clearance for accommodating the wedges is provided by the arcuate shape of the lower edge of the apertures 18.

The windings 29, 30, and 31 are relatively thin axially and are spaced apart to provide free circulation of air around them. This is facilitated by the structure of the combined transformer unit. The windings are preferably wound so that in each turn the winding conductor weaves from one side of the coil to the other axially as it progresses around the winding. The thin windings reduce the volts per layer.

A wafer type tube socket 33 is carried by brackets 34 and 35, secured to the side members 12 and 14, respectively. With the socket forming a unitary part of the transformer structure, in accordance with the present invention, insulation difficulties are readily overcome. The brackets 34 and 35 are similar and each may be

formed from a single piece of sheet metal or the like having oppositely disposed upturned flanges 38 and 39. The following description will therefore apply to either bracket. A corner of the tube socket which may be rounded as shown, for example the corner 41, is seated between the flanges 38 and 39 and rests upon the bottom part 42 of the bracket. The inwardly turned tongues 43, having outwardly crimped ends 44, hold the socket 33 rigidly in place. The flanges 38 and 39 extend inwardly of a notch 46 in the side frame member where they are secured against the frame member by fastening means such as rivets 48. By employing the socket mounting just described, there are no metallic parts such as screws or other fastening means projecting toward the coils. Also, the socket may be readily removed and replaced without disturbing the rivets 48.

A terminal board 52, the function of which will be later described herein, is mounted between the members 12 and 14 at a point above the coil assembly 16. Each of the members 12 and 14 is provided with a plurality of apertures 53, three apertures being present in the illustrative embodiment, and the terminal board 52 is most conveniently held in position by providing two tongues 55 and 56 at its broad end and a single tongue 57 on its narrow end.

Fig. 4 indicates the connections of the several coils, and the physical location of the coil leads and terminals is indicated on Figs. 2 and 3 of the drawings by similar reference characters. Coil 29 in the illustrative embodiment is designed to serve as the primary transformer winding, and the lead from the initial turn or start 59 (Fig. 2) of this winding passes into the interior of the coil supporting tube 28 and is brought out through an opening in the member 14 to a terminal 63. The wire 64 from the last turn of the coil 29 is soldered or otherwise secured to a terminal 66 on the terminal board 52.

The wire 67 from the start of the high voltage coil 31 is passed through an opening 69 in the terminal board 52 and continues across the board to be electrically secured to the terminal 66. It will be noted that by this arrangement a convenient input connection from a suitable deflecting current source is obtained in the example of Fig. 4. Also, there are no leads in the spaces between the coils 29, 30, and 31. A connection 70 from the plate 72 of an amplifier tube 73 passes through an aperture 74 in the member 12 to the terminal 66. The wire 76 from the finish turn of the high voltage coil 31 connects with a heavily insulated lead 77, passing through aperture 75, at the end of which may be secured a plate cap connector for connection to the plate terminal of the tube 79 (shown in dotted outline) which is inserted in the socket 33.

The start and finish wires 81 and 82, respectively, of the secondary 30 are connected to terminals 83 and 84 on the member 14. Two secondary taps 86 and 87 are provided which are connected to the terminals 88 and 89, respectively.

Heater or filament terminals 91 and 92 of the socket 33 are adapted to make contact with the heater or filament pins of a tube, such as the tube 79, and heating current is supplied by a single turn of heavily insulated cable 94 which passes around the coil holder 28 in the form of a loop as shown schematically in Fig. 4. The lower end of this cable loop is or may be secured in position by a lacing 96 of cord or the like which ties the cable to the frame member 12. This loop is coupled to the core. The terminal board 52 is provided with arcuate notches 98 (shown in outline in Fig. 3) to accommodate the cable and assist in holding it in position. A high voltage output lead 101 (indicated schematically in Fig. 4) for applying a rectified high voltage to the second anode of a cathode ray tube (not shown), for example, is or may be connected to one of the terminals 91 or 92.

The function of the various windings of the transformer during the operation of the electrical apparatus such as a television receiver in which it is installed will, it is believed, be understood from the foreging. The horizontal deflection coils indicated schematically at 103 in Fig. 4 are connected across the terminals 88 and 84, for example, in series with any desired centering control or the like, such as that indicated schematically at 104. The terminals 83 and 89 are available for such other connections as may be needed by circuit requirements of the apparatus in which the transformer is used.

Capacitance is held to a minimum to prevent leakage reactance resonance at a low frequency. Numerous other advantages of the combined transformer of this invention have been pointed out above in the objects, and at appropriate points in the description.

Various alterations may be made in the present invention without departing from the spirit and scope thereof, and it is desired that any and all such alterations be considered within the purview of the present invention as defined by the hereinafter appended claims.

Having now described the invention what is claimed and desired to be secured by Letters Patent is the following:

1. A combined transformer structure comprising spaced apart frame members having apertures for positioning and sustaining component parts of the structure, a core member surrounding said frame and having a magnetic leg extending through aligned apertures in said frame members, an insulating coil supporting member surrounding said magnetic leg, a series of magnetically coupled coils on said member, a terminal support carried by said frame members and serving in conjunction with said coil supporting member to maintain the spaced relationship of said members, terminals on said terminal support, connections from said coils to said terminals, said terminals lying beyond the electrostatic field produced by voltage differences between said coils, a second terminal support spaced from said first named terminal support thereby to be located at a greater distance from said coil supporting member than said first named support, terminals on said second named support, and an additional coil consisting of a single loop of cable extending from a pair of terminals on said second named terminal support and partially surrounding said coil supporting member.

2. A combined transformer structure comprising spaced apart frame members having apertures for positioning and sustaining component parts of the structure, a core member surrounding said frame and having a magnetic leg extending through aligned apertures in said frame members, an insulating coil supporting member surrounding said magnetic leg, a series of magnetically coupled coils on said member, a terminal support carried by said frame members and serving in conjunction with said coil supporting member to maintain the spaced relationship of said members, terminals on said terminal support, connections from said coils to said termi-

nals, said terminals lying beyond the electrostatic field produced by voltage differences between said coils, a second terminal support spaced from said first named terminal support thereby to be located at a greater distance from said coil supporting member than said first named support, terminals on said second named terminal support adapted to receive the terminal pins of a thermionic tube, and an additional coil consisting of a single loop of cable extending from one of said pin receiving sockets and in a loop partially surrounding said coil supporting member to another of said pin receiving sockets.

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