Aug. 9, 1938. J. A. COMSTOCK 2,126,174

ADJUSTABLE VOLTAGE TRANSFORMER

Filed Aug. 31, 1935

Fig. 1.

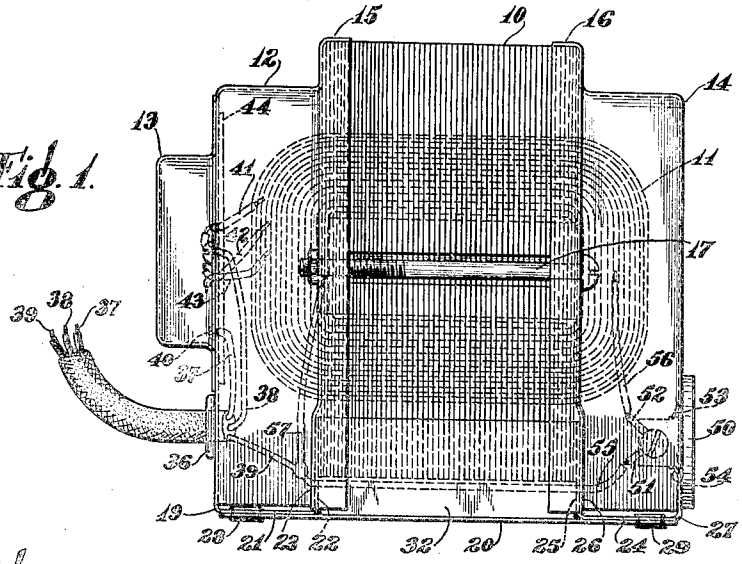


Fig. 2.

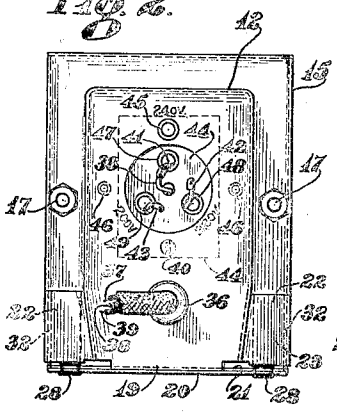


Fig. 3.

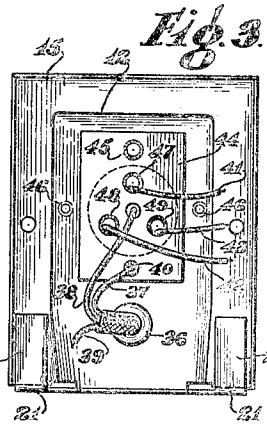


Fig. 4.

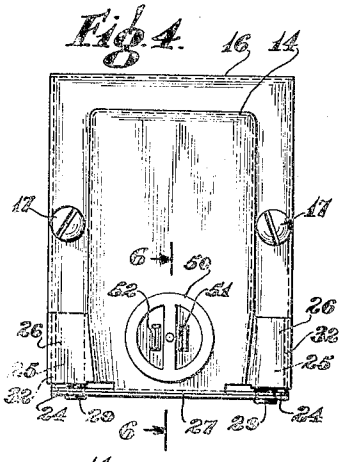


Fig. 8.

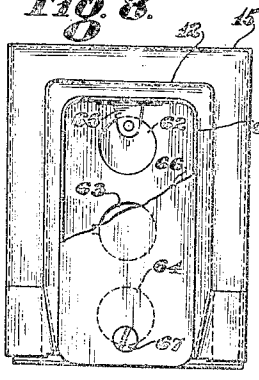
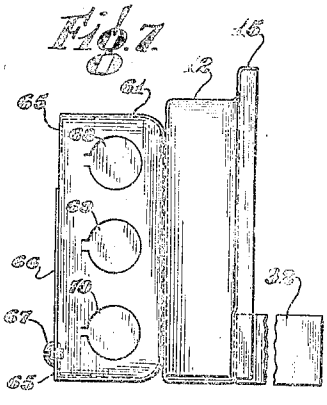


Fig. 7.



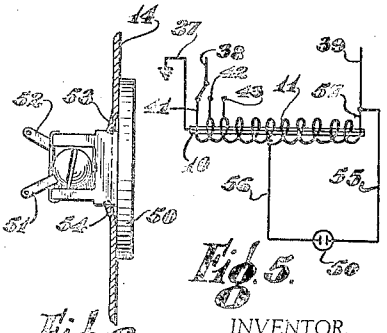


Fig. 5.

Fig. 6.

INVENTOR.

James A. Comstock

BY

George N. Hoodling

ATTORNEY.

Patented Aug. 9, 1938

2,126,174

UNITED STATES PATENT OFFICE

2,126,174

ADJUSTABLE VOLTAGE TRANSFORMER

James A. Comstock, Cleveland, Ohio, assignor to The Acme Electric & Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application August 31, 1935, Serial No. 38,755

7 Claims. (Cl. 171—119)

My invention relates, in general, to transformers, and more particularly to adjustable voltage transformers.

An object of my invention is the provision of an adjustable voltage transformer having a plurality of taps which are carried to the outside of the transformer housing for external connection, so that the output voltage may be adjustably varied without making connections within the housing of the transformer.

Another object of my invention is the provision of a transformer having magnetic core means with a housing mounted upon opposite sides of the magnetic core means, the housing on one side having arrangements to take care of the adjustable voltage tap connections and the housing on the opposite side being arranged to take care of the electrical connections for the output side of the transformer.

Another object of my invention is the provision of a housing mounted on one side of the magnetic core means of the transformer wherein the housing is provided with an insulating means having metallic connections to which the taps of the transformer winding may be soldered or otherwise suitably connected when the taps are not in use.

A further object of my invention is the provision for holding a plug insertion outlet to one of the housings by means of tabs formed integrally with the housing and arranged to project into the plug insertion outlet and hold the same in place.

A still further object of my invention is the provision of constructing the housing which fits against the magnetic core means of one integral stamping.

Another object of my invention is the provision of a transformer having a housing mounted on opposite sides of the magnetic core means, together with the arrangement of having electrical connections pass under the magnetic core means as the connection extends from one housing to the other.

Further objects and a fuller understanding of my invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawing, in which:

Figure 1 is a side elevational view of a transformer embodying the features of my invention;

Figure 2 is an end view of the housing mounted on the left hand side of the transformer core means as shown in Figure 1, with the small end cover removed to show the arrangement of the electrical tap connections;

Figure 3 is an end view of the inside of the housing which is mounted on the left hand end of the magnetic core means of the transformer;

Figure 4 is an end view of the housing which is mounted on the right hand end of the transformer shown in Figure 1;

Figure 5 is a diagrammatic illustration of the electrical connections of the transformer winding and the transformer taps, together with the supply conductors, and the output conductors;

Figure 6 is a fragmentary cross-sectional view taken along the line 6—6 of Figure 4, showing the arrangement of the tabs for holding the plug insertion outlet in place;

Figure 7 is a modified arrangement of the housing mounted on the left hand end of the magnetic core means; and

Figure 8 is a left hand end view of the modified housing shown in Figure 7.

With reference to the drawing, my invention comprises, in general, magnetic core means 10, a winding 11, a first housing 12 mounted upon the left hand end of the magnetic core means 10, and a second housing 14 mounted upon the right hand end of the magnetic core means.

The construction of the magnetic core means may be similar to that employed in the usual construction of the core of a transformer. As illustrated, the magnetic core means 10 is held by the two housings 12 and 14 by means of through bolts 17. The housings 12 and 14 may be constructed of stamping material and are provided with engaging flanges 15 and 16, respectively, which snugly fit around the sides and the top of the magnetic core means 10. Each of the housings 12 and 14 has a base constructed integrally with the other portions during the stamping operations. The stamping 12 at its lowermost portion is bent inwardly as at 19, and thence runs horizontally as indicated by the reference character 21 to a point substantially under the engaging flange 15 where it is bent upwardly as indicated by the reference character 22 and fits closely to the inside wall of the slightly enlarged lower flange portion 23, see Figures 1, 2, and 3. By a similar construction, the housing 14 has a base construction and is bent inwardly as indicated by the reference character 27, then runs substantially horizontal as indicated by the reference character 24 to a point substantially below the engaging flange 16 where it is bent upwardly as indicated by the reference character 25, and fits closely to the inside wall of the slightly enlarged lowermost flange portion 26, see Figures 1 and 4. The bases of the two

housings 12 and 14 are held together by a base member 20 which is suitably connected to the horizontal base portions 21 and 24 by means of the rivets 28 and 29, respectively. The arrangement of the base member 20 and the through bolts 17 together with the two housings 12 and 14, is such that the magnetic core means 10 is supported rigidly in spaced relationship above the base member 20. As shown, there is an interconnecting strip of material 32 which extends from the housing 12 to the housing 14 and is placed alongside the lowermost portion of the magnetic core means 10 and encloses the space between the magnetic core means and the base 20. Each end of the interconnecting strip of material is inserted under the engaging flanges 15 and 16, respectively, of the housing 12 and 14.

The transformer winding 11 is energized by two supply conductors 38 and 39 which are enclosed within a cable that enters the housing 12 through an opening 36. Also enclosed within the cable is a ground wire 37, which is connected to the housing 12 by means of a screw 40 or any other suitable means. This means that the magnetic core means 10 and the entire metallic structure of the transformer is connected to a suitable ground when the free end of the cable is connected in circuit relation with a suitable supply source. I have preferably illustrated my invention in the nature of an auto-transformer having taps for varying the number of effective turns in the winding 11. To this end I have illustrated three lead conductors 41, 42, and 43 connected to the different taps of the winding, 11 of the transformer. The arrangement is such that the supply conductor 38 may be connected to either one of the lead conductors 41, 42, or 43. To facilitate the making of these connections between the supply conductor 38 and the three conductor leads 41, 42, and 43, I carry the three leads and the supply conductor 38 to the outside of the housing 12 through spaced openings provided in an insulated piece of material 44 which is fastened to the inner face of the housing 12 by means of a suitable rivet 45 and the ground screw 40 to which the ground conductor 37 is attached. As illustrated best in Figure 2, there is cut out a large circular piece in the face of the housing 12 to expose the insulating member 44. The three openings through which the lead conductors 41, 42, and 43 pass are provided with metallic eyelets or hollow rivets 47, 48, and 49, respectively. The purpose of these eyelets or hollow rivets is such that the free ends of the lead taps which are not in use, such as 43 and 42 as shown in the drawing may be soldered or otherwise suitably connected to the eyelets. In the drawing, as shown, the supply conductor 38, which passes through the central opening in the insulating member 44, is connected to the lead conductor 41. For the purpose of illustration, I have labeled the lead conductor 41 as 240 volts, the lead conductor 42 as 220 volts, and the lead conductor 43 as 200 volts.

The external connection of the lead conductors 41, 42, and 43 and the supply conductor 38 is enclosed within a third housing 13 which may be held to the face of the housing 12 by means of screws threading the openings 46 provided in the face of the housing 12.

The other supply conductor 39 is connected to the inner end of the winding 11 by means of a branch conductor 57. The output side of the transformer winding 11 is connected to a plug insertion outlet 50 which has two contacts 51 and 52 adapted to be connected in circuit relation with a suitable conventional two prong detachable plug. The contact 51 is connected to the supply conductor 39 by means of a branch conductor 55 which passes under the magnetic core means 10. The contact 52 is connected to a lead conductor 56 that is tapped to a turn in the winding 11. The arrangement of the winding and the tap connections together with the supply conductors, and the output conductors, and the outlet plug 50 is shown in Figure 5. In Figure 6, I illustrate the manner in which the outlet plug 50 is held in place. In the stamping of the housing 14 a suitable hole is pierced in the front wall thereof, to allow for the insertion of the plug. At the same time, there are stamped on opposite sides of the opening tabs 53 and 54 which are bent inwardly. After the outlet plug 50 is inserted into the opening, the two tabs 53 and 54 are driven inwardly, thus causing them to dig into the outlet plug 50 which is usually made of Bakelite or hard rubber so that when the tabs 53 and 54 are driven inwardly they grab and hold the plug 50 in place.

In the operation of my transformer, the purpose is to give as near as possible a voltage in the output circuit that coincides substantially with the voltage that most electric devices operate upon. Thus, for example, most devices operate best at or near 110 volts but through lack of standardization, many cities and power companies have a wide range of voltages which makes it substantially impractical to operate universally all of the different electric devices. Therefore, with my transformer, I arrange to keep the output voltage in the plug 50 as near as possible to 110 volts or any other standard practice by compensating for the large range of supply voltage. This is taken care of by connecting the supply conductor 38 to the lead conductor, which closely coincides with the voltage of the supply source. Thus, for example, if the supply voltage were in the neighborhood of 240 volts, the supply conductor 38 would then be connected to the conductor lead 41. This is the arrangement shown in the patent drawing and by the same analogy, if the supply voltage were either 220 volts or 200 volts, the supply conductor 38 would be connected, respectively, to the lead conductor 42 or 43. In this manner the output voltage is maintained around 110 volts or any other suitable standard by which electric appliances work their best. One of the many applications of my transformer is to use it between the supply line and a household refrigerator or any other appliance which is plugged into the outlet plug 50. Therefore, the voltage employed upon the refrigerator or other device may be maintained at a standard value, even though the supply voltage varies throughout a large range throughout the various cities of the country.

In Figures 7 and 8, I show a modified form of my invention in that there is attached to the forward face of the housing 12, a standard inlet box 61. This may be done either by spot welding or by any other suitable means. The side of the inlet housing 61 may be provided with suitable "knockouts" 68, 69, and 70. The rear of the inlet housing 61 and the face of the housing 12 are provided with suitable openings 62, 63, and 64 through which the tap connections may be effected. In accordance with usual practise, the inlet housing 61 is provided with conventional tabs 65 to which a cover plate 66 may be held by means of screws 67. The arrangement of the wiring

connections is the same for this modification as that previously described with reference to the preferred showing.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. An adjustable voltage transformer comprising, in combination, magnetic core means, a winding having a plurality of taps associated with the magnetic core means, a first housing mounted upon one side of the magnetic core means, a second housing mounted upon the opposite side of the magnetic core means, said first and second housings each having a marginal upper rim and two oppositely disposed marginal side rims, each said housing having its central portion bulged away from the said marginal rims to make space for the enclosed sides of the said winding, each marginal side rim at its lower end being offset for a portion of the length thereof in the same direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bent inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means, supply conductors for energizing the said winding, said first housing having means through which the supply conductors may enter the said first housing, lead conductors for said taps, said first housing also having means through which the lead conductors and one of the supply conductors may be carried to the outside of the first housing for external electrical connection, said second housing having a two contact plug insertion outlet, means for connecting one of said contacts to the other of said supply conductors, and means for connecting the other of said contacts to one of the said taps of the said winding.

2. An adjustable voltage transformer comprising, in combination, magnetic core means, a winding having a plurality of taps associated with the magnetic core means, a first housing mounted upon one side of the magnetic core means, a second housing mounted upon the opposite side of the magnetic core means, said first and second housings each having a marginal upper rim and two oppositely disposed marginal side rims, each said housing having its central portion bulged away from the said marginal rims to make space for the enclosed sides of the said winding, each marginal side rim at its lower end being offset for a portion of the length thereof in the same direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bent inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means, supply conductors for energizing the said winding, said first housing having means through which the supply conductors may enter the said first housing, lead conductors for said taps, said first housing also having means through which the lead conductors and one of the supply conductors may be carried to the outside of the first housing for external electrical connection, said second housing having a two contact plug insertion outlet, means for connecting one of said contacts to the other of said supply conductors, means for connecting the other of said contacts to one of the said staps of the said winding, tabs formed integrally with the second housing for holding the said plug insertion outlet in place, and means for grounding the magnetic core means.

3. An adjustable voltage transformer comprising, in combination, magnetic core means, a winding having a plurality of taps associated with the magnetic core means, a first housing mounted upon one side of the magnetic core means, a second housing mounted upon the opposite side of the magnetic core means, said first and second housings each having a marginal upper rim and two oppositely disposed marginal side rims, each said housing having its central portion bulged away from the said marginal rims to make space for the enclosed sides of the said winding, each marginal side rim at its lower end being offset for a portion of the length thereof in the said direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bent inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means, supply conductors for energizing the said winding, said first housing having means through which the supply conductors may enter the said first housing, lead conductors for said taps, said first housing also having insulating means through which the lead conductors and one of the supply conductors may be carried to the outside of the first housing for external electrical connection, said insulating means having spaced metallic means to which the lead conductors may be connected, said second housing having a two contact plug insertion outlet, means for connecting one of said contacts to the other of said supply conductors, and means for connecting the other of said contacts to one of the said taps of the said winding.

4. An adjustable voltage transformer comprising, in combination, magnetic core means, a winding having a plurality of taps associated with the magnetic core means, a first housing mounted upon one side of the magnetic core means, a second housing mounted upon the opposite side of the magnetic core means, said first and second housings each having a marginal upper rim and two oppositely disposed marginal side rims, each said housing having its central portion bulged away from the said mar-

ginal rims to make space for the enclosed sides of the said winding, each marginal side rim at its lower end being offset for a portion of the length thereof in the same direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bent inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means, a base member for connecting the inturned members of the two housings together, means for supporting the magnetic core means between the two housings and in spaced relation above the base member, supply conductors for energizing the said winding, said first housing having means through which the supply conductors may enter the said first housing, lead conductors for said taps, said first housing also having insulating means through which the lead conductors and one of the supply conductors may be carried to the outside of the first housing for external electrical connection, said insulating means having spaced metallic means to which the lead conductors may be connected, said second housing having a two contact plug insertion outlet, conductor means passing between the magnetic core means and the base for connecting one of said contacts to the other of said supply conductors, means for connecting the other of said contacts to one of the said taps of the said winding, tabs formed integrally with the second housing for holding the said plug insertion outlet in place, and means for grounding the magnetic core means.

5. An adjustable voltage transformer comprising, in combination, magnetic core means, a winding having a plurality of taps associated with the magnetic core means, a first housing mounted upon one side of the magnetic core means, a second housing mounted upon the opposite side of the magnetic core means, said first and second housings each having a marginal upper rim and two oppositely disposed marginal side rims, each said housing having its central portion bulged away from the said marginal rims to make space for the enclosed sides of the said winding, each marginal side rim at its lower end being offset for a portion of the length thereof in the same direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bet inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means, supply conductors for energizing the said winding, lead conductors for said taps, said first housing having means through which the lead conductors may be carried to the outside of the first housing for external electrical connection with one of the supply conductors, said second housing having a two contact plug insertion outlet, conductor means for connecting one of said contacts to the other of said supply conductors, and means for connecting the other of said contacts to one of the said taps of the said winding.

6. An end casing for transformers having magnetic core means and winding means comprising a generally rectangular metallic member having a marginal upper rim and two oppositely disposed marginal side rims, said casing having its central portion bulged away from the said marginal rims to make space for the winding means, each marginal side rim at its lower end being offset for a portion of the length thereof in the same direction as the bulge, the remainder of the two marginal side rims and the marginal upper rim lying in one plane for abutting against the marginal edge of the magnetic core means, the lower portion of the bulge being bent inwardly to form an inturned member which extends toward the said marginal rims, said inturned member at its inner end having spaced side portions bent upwardly to fit respectively between each offset portion and the magnetic core means, said spaced side portions lying substantially in the same plane as the said upper and side marginal rims to lie adjacent the magnetic core means.

7. In combination a transformer having magnetic core means and winding means, said magnetic core means surrounding said winding means and having a flat marginal region around said winding means on each side of said magnetic core means, and a pair of end casings as defined in claim 6 therefor, each said casing being disposed on one side of said magnetic core means to enclose said winding means therebetween with the marginal rims of said casings abutting against the flat marginal regions on said magnetic core means.

JAMES A. COMSTOCK.