May 7, 1935. H. C. GUHL 2,000,754

VARIABLE RATIO TRANSFORMER

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Fig. 1.

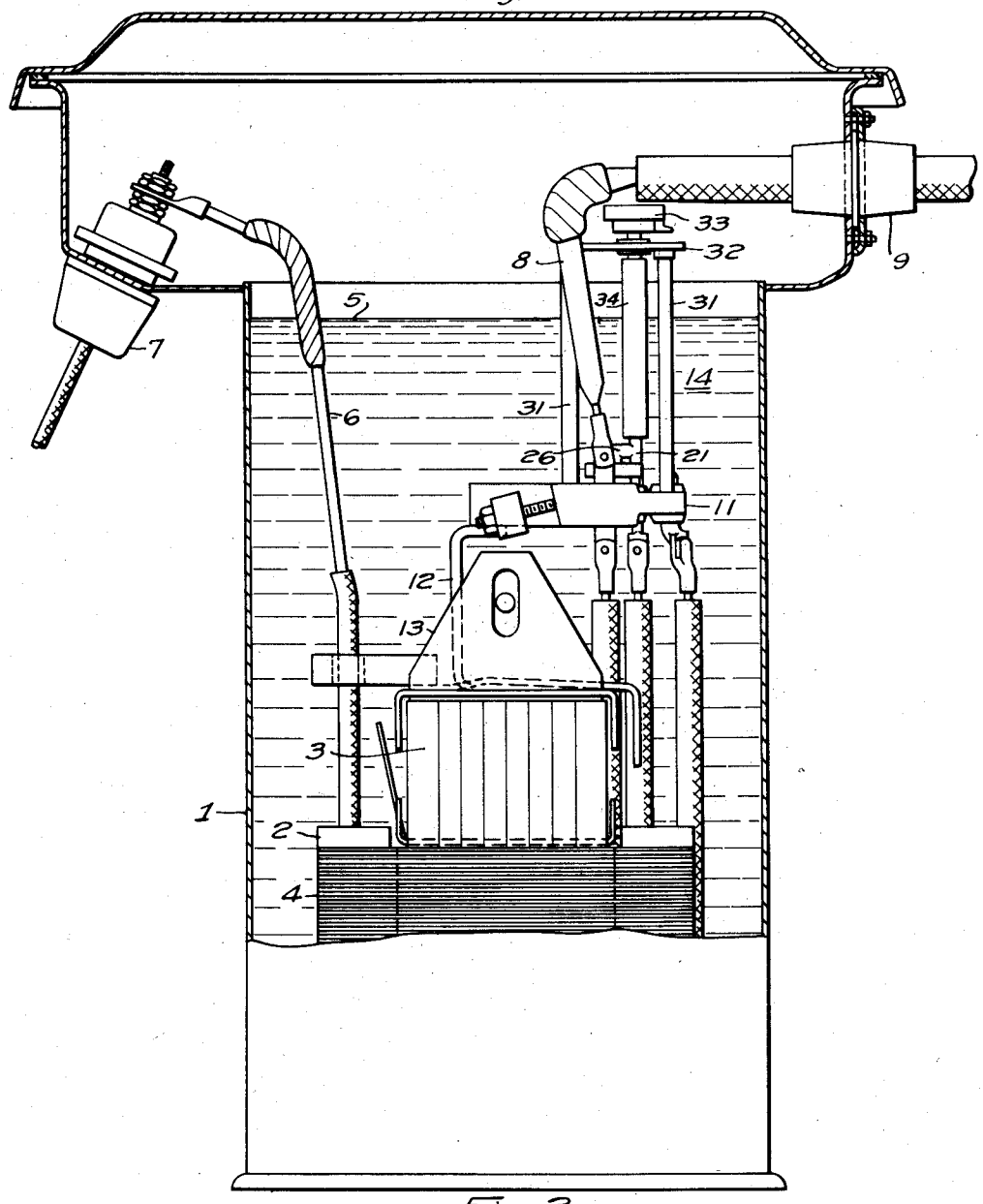

Fig. 2.

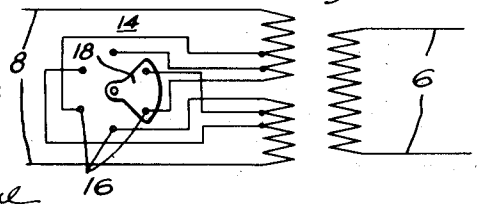

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Fig. 3

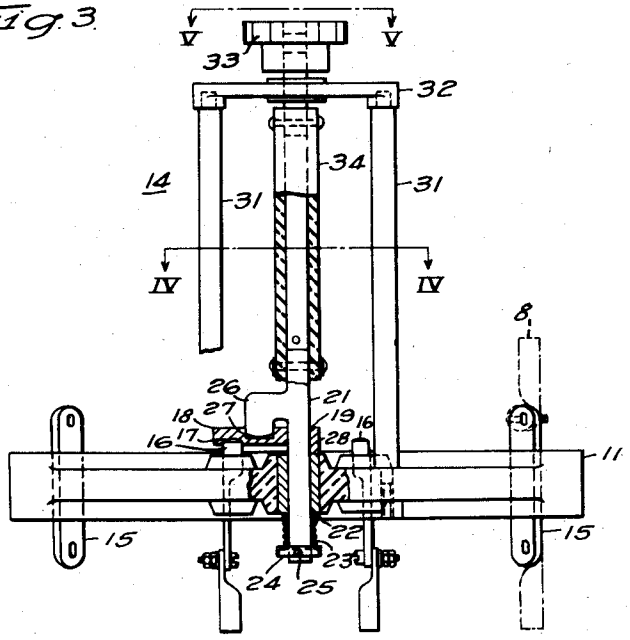


Fig. 4

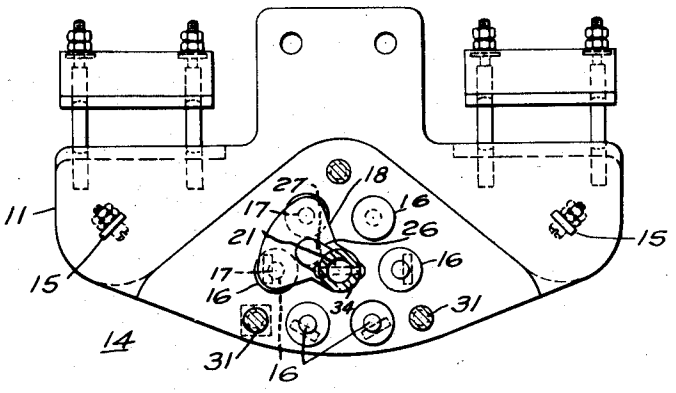
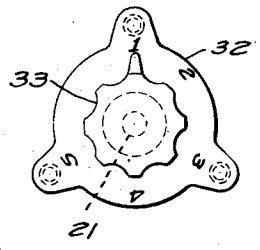


Fig. 5



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2,000,754

UNITED STATES PATENT OFFICE

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VARIABLE RATIO TRANSFORMER

Henry C. Guhl, Haven, Kans., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application October 6, 1933, Serial No. 692,460

2 Claims. (Cl. 200—11)

My invention relates to variable ratio transformers, and more particularly to an improved arrangement for changing the effective number of turns in a transformer winding to correspondingly change the ratio of voltage transformation between the primary and secondary circuits thereof.

Transformers are frequently operated under conditions that require the voltage ratio to be adjusted from time to time. Provision for making such adjustments is usually arranged by providing taps on one of the transformer windings and a tap changer switch for changing the effective number of turns of the winding by cutting sections of the windings into or out of the circuit.

It is an object of my invention to provide a variable ratio transformer arranged for adjusting the voltage thereof that is compact and simple in its construction and inexpensive to manufacture.

Other objects and advantages of my invention will appear from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a view of an oil-immersed transformer partly in side elevation and partly in vertical section, and provided with a variable ratio switch arranged in accordance with my invention;

Fig. 2 is a diagrammatic view showing the connections between the variable ratio switch and one of the transformer windings;

Fig. 3 is a view partly in side elevation and partly in vertical section of the tap-changing mechanism shown in Fig. 1;

Fig. 4 is a sectional view taken along the line IV—IV of Fig. 3, and looking down toward the base or support of the tap-changing switch; and,

Fig. 5 is a plan view of the top of the switch operating handle as indicated by line V—V of Fig. 3.

Like reference characters indicate similar parts in the different views of the drawings. Referring to Fig. 1 of the drawings, a casing 1 is provided containing a transformer 2, comprising coils 3 and an iron core 4 immersed in an insulating fluid to the level 5 and provided with low voltage leads 6 that extend through the bushings 7 and with high-voltage leads 8 that extend from the high-voltage windings through the bushings 9. A base 11 is illustrated as supported by a bracket 12 from the upper end plate of the transformer 13 for supporting the tap-changing switch indicated generally at 14, and shown in greater detail in Figs. 3, 4 and 5.

Referring to Figs. 3, 4 and 5, the base 11 which may be formed from molded insulating material, carries terminal studs 15 embedded therein and extending therethrough to which the terminals of the high-voltage leads 8 and of the high-voltage winding may be connected.

A number of terminal studs 16, six in number being shown, are embedded in and extend like distances above the insulating base plate 11 and are arranged to be equally spaced along the arc of a circle about a central axis that extends transversely of the base plate. The several terminal studs are connected to tap points on one of the transformer windings as shown in Fig. 2. The tops of the studs may be slightly rounded to fit in similarly curved depressions 17 on the under-side of a movable cooperating contact member 18. The movable contact member is of sufficient width to bridge two of the equally spaced terminal studs and the location of the depressions 17 thereon corresponds to the distance between adjacent studs 16 and are similarly spaced from the axis of the arc along which the studs are arranged.

The movable contact member 18 is provided with an opening 19 through which an operating shaft 21 extends. The lower end of the shaft extends through a bushing 22 in the base plate 11 and is biased downwardly by a spring 23 acting between the bushing 22 and a washer 24 attached to the shaft 21 by any suitable means, such as the pin 25. An arm 26 extends outwardly from one side of the shaft 21 and downwardly into a recess 27 in the upper side of the movable contact member 18 in order to operate it from one switch closing position, bridging two terminal studs, to the next switch-closing position. An extension or leg 28 extends downwardly from the lower side of the contact member 18 at the side of the shaft 21 opposite to the bridging or contact closing portion thereof, thus forming a three-point support for the movable contact member to resist the downward push of the arm 26 caused by the spring 23.

The opening 19 in the movable contact member 18 is sufficiently large to permit the contact member to rock about any two of these three supporting points and consequently to insure a firm engagement between it and any two terminal studs bridged thereby and forming two of the three supports. The rocking movement permitted is slight, however, in order that the degree of rocking of the contact member will

not be so great as to permit engagement of the member with the next terminal stud toward which it is moved at an elevation that is too low to permit it to ride over the curved end surface thereof. The contact member when moved to engage a terminal stud first engages the lower curved portion of the upper end thereof and slides over and upon the end of the stud, dropping slightly downward as the stud enters the depression 17 therein.

Tie rods 31 are provided and extend upwardly from the base plate 11 to support a dial plate 32 upon which are indicated the different operative positions of the tap changer switch and above which is mounted a knob or handle 33 for operating the tap changer switch. The handle 33 is connected to the shaft 21 by any suitable means, as by the tube 34 attached thereto.

Many modifications may be made in the details of construction illustrated and described without departing from the spirit of my invention, and I do not wish to be limited, except as indicated by the prior art and the scope of the appended claims.

I claim as my invention:

1. A ratio adjuster comprising a base plate, a plurality of contact studs supported by said base and equally spaced in an arc about a central axis, a moving contact member having an opening therein, an operating shaft extending along said axis and through said opening and operatively connected to said movable contact member to operate it from one operative position to another, and means for biasing said movable contact member toward said contact studs, said member being of sufficient width to engage two adjacent studs and having a supporting leg extending toward and engaging with said base plate the opening in said movable contact member being of sufficient size to permit a slight rocking of the said member when actuated into operative position to insure a positive engagement of the said member with said contact studs.

2. A ratio adjuster comprising a base plate, a plurality of contact studs supported by said base and equally spaced in an arc about a central axis, a moving contact member having an opening therein, an operating shaft extending along said axis and through said opening and operatively connected to said movable contact member to operate it from one operative position to another, and means for biasing said movable contact member toward said contact studs, said movable contact member being of sufficient width to engage two adjacent studs and having recesses therein spaced to receive the contacting portions thereof and having a supporting leg extending therefrom toward and engaging with said base plate on the side of the shaft remote from the contact engaging portion thereof, the opening in said movable contact member being sufficiently large to permit said member to rock slightly when moved from one operative position to another to insure positive engagement thereof with said contact studs.

HENRY C. GUHL.