Jan. 15, 1929. 1,699,292

W. HESS.

HIGH TENSION TRANSFORMER

Filed Aug. 15, 1927 2 Sheets-Sheet 1

Fig. 1.

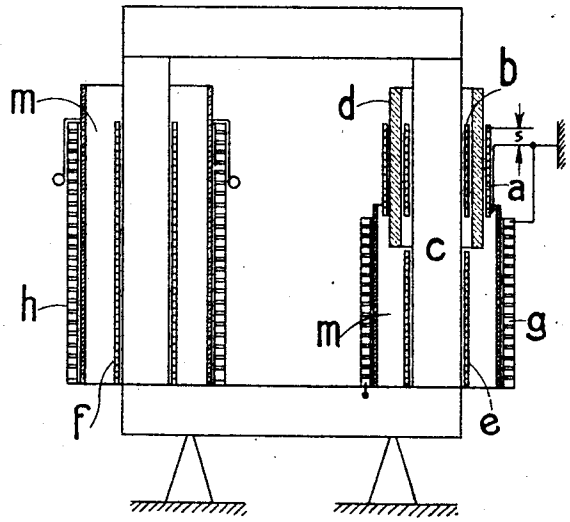
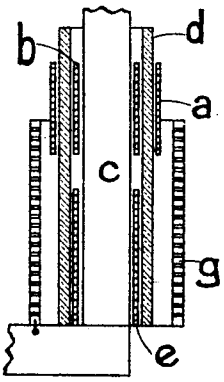


Fig. 2.



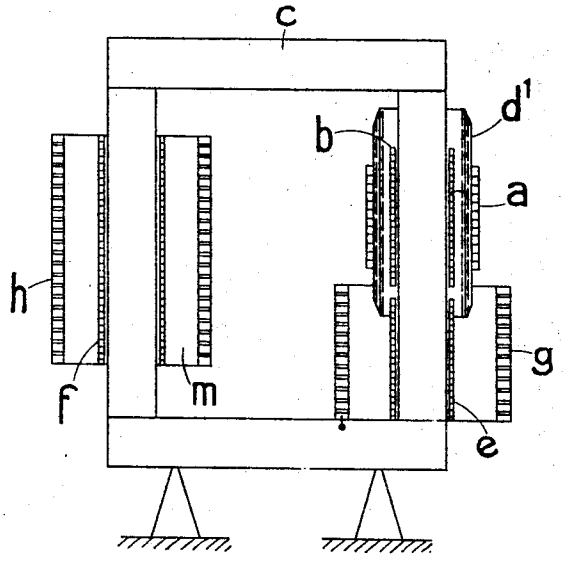


Fig. 3.

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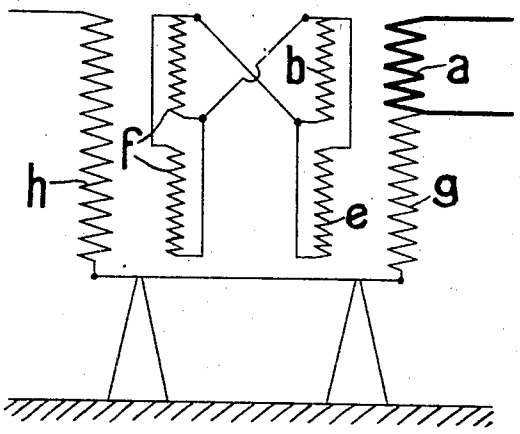
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Fig. 4.



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Patented Jan. 15, 1929. 1,699,292

UNITED STATES PATENT OFFICE.

WILHELM HESS, OF BASEL, SWITZERLAND, ASSIGNOR TO THE FIRM EMIL HAEFELY & CIE. A. G., OF BASEL, SWITZERLAND.

HIGH-TENSION TRANSFORMER.

Application filed August 15, 1927, Serial No. 213,141, and in Germany August 21, 1926.

This invention relates to air-insulated transformers for high tensions and has for its object to provide an improved transformer of this character.

It is known to employ, for the purpose of insulating transformers of the oil-insulated type, insulating devices comprising condenser elements between the high and low voltage windings, these devices having for their object to ensure a uniform potential distribution and thus to arrive at a minimum expense of material.

In transformers of the oil-insulated type it has, however, been shown in practice, that no great purpose is served by employing such insulating condenser devices, as the insulating properties of the oil are themselves so great that no appreciable reduction in the thickness of the insulation required is attained.

On the other hand, however, in an air transformer of the kind in which an insulating air jacket is provided between the high and low voltage windings, as in the U. S. specification No. 1,523,891, on account of the comparatively large air jacket necessary for efficient insulation, a considerable increase in the stray voltage of the transformer occurs, especially when the air transformer has its windings connected in cascade, like an autotransformer, and uses a so called compensating winding.

According to the invention, therefore, an air-insulated transformer of the kind just described is provided with an insulating element, preferably constituted by a condenser device, arranged between the exciting and the compensating windings of the transformer, this being the position at which, in consequence of the comparatively short axial length of the exciting winding, the main portion of the stray voltage occurs, so that a considerable improvement in the voltage drop and efficiency of the transformer as a whole is attained, while at the same time, permitting the dimensions of the transformer to be reduced.

The invention will now be described by way of example, with reference to the accompanying drawing in which:

Figures 1, 2 and 3 are diagrammatic views illustrating three different embodiments of the invention.

Figure 4 shows a diagram of the windings of the first arrangement for example.

Figures 1 and 4 represent an air-insulated transformer of the kind disclosed by the U. S. specification No. 1,523,891 and arranged as an auto-transformer, a being the exciting or primary winding and g, h the secondary or high tension windings connected therewith, as is well known in auto-transformer connection systems. c is the iron core. On the same core c and as near as possible thereto is mounted an auxiliary winding b inductively coupled with the exciting winding a. This auxiliary winding b is connected with the auxiliary windings e, f on the legs of the core, which are themselves inductively coupled with the corresponding high tension windings g, h, the iron core c, as is usual, being arranged to be insulated against earth. These auxiliary windings constitute what is termed here "compensating" winding inasmuch as they have to produce a compensating effect on the potential stresses, said compensating winding being at the same potential as the core c. The arrangement of such "compensating" windings is disclosed for example in the U. S. Re. specification No. 15,951. A sufficiently large insulating air jacket m is provided between the high and low tension windings e, f and g, h, as described in the U. S. specification No. 1,523,891.

An insulating element d of suitable material and dimensions is arranged between the windings a and b, in order to permit of the exciting winding a being approached nearer than hitherto to the winding b, this obviating or reducing losses due to leakage.

In the embodiment of the invention illustrated in Figure 2, the insulating element d is arranged to extend between the windings e and g throughout the axial length of these windings, so as to serve as additional insulating means for the high tension winding g, but it may also be arranged so as to extend for a part only of the axial length of the windings e and g, the function of the air jacket not being affected thereby. Furthermore the high tension winding g is arranged to extend over the exciting winding a.

Referring now to Figure 3, it will be evident that the embodiment illustrated in this figure is similar to that illustrated in Figure 1. The insulating element, however, is constituted by a condenser device that is to say by a cylinder d^1 composed of alternate layers

or strata of insulating and conducting material. The outer conducting layer of the condenser device d^1 is preferably electrically connected to the exciting winding *a*, the inner layer being electrically connected to the compensating winding *b*.

In this embodiment of the invention it may be advisable to build up the condenser device of several similar condenser elements arranged coaxially within one another and leaving a suitable air space between them, this arrangement permitting the heat generated to escape more readily than in the case of a condenser without air spaces.

It will be evident that the invention is not limited to the particular construction and arrangement of parts herein above described which may be varied as desired to suit particular requirements within the scope of the invention.

What I claim is:

1. An air-insulated high tension transformer, having an earth insulated iron core, an exciting or primary winding, a secondary winding, an air jacket between same around the core, a compensating winding inductively coupled respectively with the primary and secondary windings and an insulating element, additional to air insulation, arranged between said exciting and compensating windings, substantially as and for the purpose described.

2. An air-insulated high tension transformer, having an earth insulated iron core, an exciting or primary winding, a secondary winding, an air jacket between same around the core, a compensating winding inductively coupled respectively with the primary and secondary windings and several coaxially arranged insulating elements, additional to air insulation, arranged between said exciting and compensating windings and having an air space between them, substantially as and for the purpose described.

In witness whereof I have hereunto signed my name this 29th day of July, 1927.

WILHELM HESS.