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(54) **Combined current and voltage transformer for high voltages.**

(57) A combined current and voltage transformer for high voltages consists of a current transformer of inverse type placed in the transformer head (1) and an inductive voltage transformer with a stack magnetic core (9). The secondary leads (7) of the current transformer are laid by or through the open magnetic core (9) of the voltage transformer, which together with its appertaining secondary winding (11) of the voltage transformer is placed in the vertical axis of the transformer inside an earthed supporting tube (8) and around which is placed the insulation of the voltage transformer (12), which together with the insulation of the current transformer in the area of the head (5) make an unseparably entity. The sections of the primary winding (13) of the voltage transformer are placed vertically inside the supporting insulator (2) around the insulation of the voltage transformer (12).

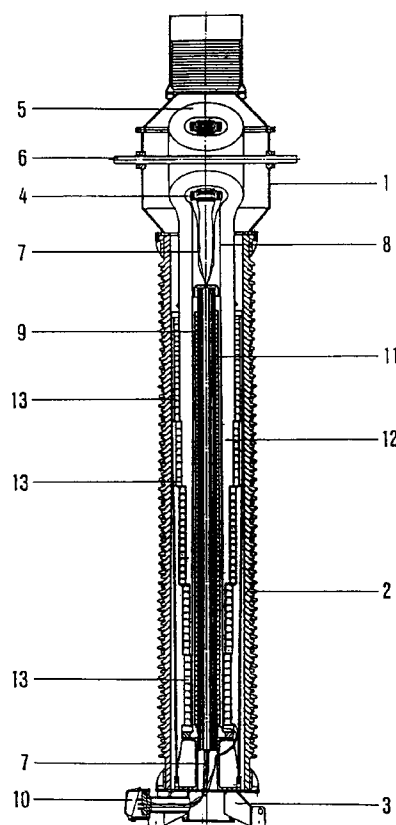


FIG.

The object of the present invention is a combined current and voltage transformer for high voltages which consists of a current transformer of inverse type placed in the transformer head and an inductive voltage transformer with a stack magnetic core.

Combined current and voltage transformers are mostly made as separate isolated current or rather voltage transformer put into one or two housings with a joint supporting insulator.

Such a design of combined transformers presents a technical solution, which, applied for high voltage transformers, results in an expensive and unsuitable design due to enlarged dimensions and weight of transformer.

According to the current prior art the inductive combined transformers are made in such way that the current transformer and voltage transformer with a closed magnetic core are placed in one common or two separate metal housings, which practically means that all sorts of combinations in distribution are possible. The most frequently seen variants are that the current transformer is of the inverse type, placed in the head, whereas the voltage transformer is in the base, or both transformers are in the head of the combined transformer. In the latter variant there are two combinations possible, meaning that the active part of the voltage transformer can be placed above or below the current transformer.

DE-U 72 34 359 describes a well-known solution. The problem is solved in such a way that the round core of the voltage transformer, with the appertaining primary and secondary winding, is placed under the inverse current transformer. The whole active part is sealed into a compact body of artificial resin and placed inside the supporting insulator.

In the window of the horizontally placed core of the voltage transformer there is a metal tube through which the secondary leads of the voltage transformer are conducted. This tube is joined in the middle of the window with the metal tube of the current transformer where secondary leads of the current and voltage transformer intertwine, and they reach the base of the transformer through a common vertical metal tube.

The basic disadvantage of this solution is that the volume, mass and height of the transformer head are comparatively big in relation to the supporting insulator and this proportion grows with increased rated voltage of the transformer. Furthermore, due to the distribution of weight, the center of gravity of the transformer is high above the base of the transformer so that such a design is statically unstable, especially in case of an earthquake.

Since this is a design, in which the active part is sealed with artificial resin, increasing the nominal voltage of the transformer makes the production technology very complicated and expensive which results in the fact that it is practically not applicable with very high voltages.

The primary winding of the voltage transformer has to be insulated for the full voltage against the current transformer which in addition results in increased dimensions and weight of a combined transformer constructed in such a way.

Further the metal tube, through which the secondary leads of the voltage transformer are conducted, has to be insulated against the full voltage, which demands even more space.

The design of combined current and voltage transformers described in the prior art is therefore unsuitable for making combined transformers with high rated voltage.

The present invention aims at solving the technical problem of finding a new design for a combined current and voltage transformer for high voltage by placing the whole inductive voltage transformer into the supporting insulator. For solving this problem the combined current and voltage transformer for high voltages according to the present invention is essentially characterized in that the secondary leads of the current transformer are laid by or through the open magnetic core of the voltage transformer, which together with its appertaining secondary winding of the voltage transformer is placed in the vertical axis of the transformer inside an earthed supporting tube and around which is placed the insulation of the voltage transformer, which together with the insulation of the current transformer in the area of the head make an unseparably entity and in that the sections of the primary winding of the voltage transformer are placed vertically inside the supporting insulator around the insulation of the voltage transformer.

The idea of the present invention is in application of the inductive voltage transformer with an open core, which is placed in a supporting insulator and makes an integral part of the combined transformer. In this way a part of the insulation of the inverse current transformer, by which its supporting mechanical tube is insulated against high voltage is used as the insulation for the voltage transformer, and the hollow space inside this tube is used to place a core and secondary windings of the voltage transformer. This solution eliminates all the disadvantages which are to be seen in the known design, where the compact active part is placed in the head of the combined transformer.

The above-mentioned disadvantages of the prior art are eliminated through the new concept of the combined current and voltage transformer for high voltages according to the present invention which has the current transformer made as a transformer of inverse type with cores and secondary windings placed in the head of the combined transformer. The voltage transformer has an open magnetic core which is placed together with its windings on the vertical axis of the combined transformer, inside the supporting tube, through which the secondary windings of the

current transformer are deducted too. The primary winding of the voltage transformer is made out of several sections which are placed upon the cover of the main insulation wound around the supporting tube placed vertically inside the supporting insulator.

According to a preferred embodiment the primary winding of the current transformer has one or more turns and/or the current transformer has one or more cores. For a suitable connection of the current transformer it is preferred that the current transformer can be multiply reconnectable on the primary and/or secondary side.

Depending on the voltages for which the transformer according to the present invention is used, preferably the voltage transformer has one or more secondary windings.

The special advantage of the innovative design, according to the present invention, is that compared to the well-known designs it takes up much less space. This is achieved by placing the open magnetic core and the secondary windings of the voltage transformer inside the supporting tube which carries the active part of the current transformer. In addition to that distributing the primary winding of the voltage transformer along the vertical axis of the supporting insulator helps to save some space and at the same time optimizes the distribution of potential along the vertical axis of the transformer.

Another advantage of the design proposed by the present invention is the mechanical stability, since by placing the core and the primary winding of the voltage transformer vertically inside the supporting insulator an even distribution of weight within the combined transformer is achieved.

Technology of making and mounting of the combined transformer, as proposed by the present invention, is similar to making and mounting of current transformers of inverse type. This similarity makes the production of combined transformers according to the invention for highest rated voltages comparatively simple.

The figure shows a vertical intersection of an example of a combined current and voltage transformer for high voltages according to the present invention.

The combined current and voltage transformer for high voltages shown in the figure consists of a head 1, a supporting insulator 2 and a base 3.

In the head 1 there are placed cores and secondary windings 4 of a current transformer, which are insulated against the potential of the head 1 by the appertaining part 5 of the main insulation. This design shows the primary winding 6 of the current transformer as a bar primary winding. In the practice there are other possible variants with a bigger number of turns of the primary winding and/or cores and with a double or quadruple reconnection on the primary side of the current transformer.

Secondary leads 7 of current transformer are

placed by or through the open magnetic core 9 of a voltage transformer until they reach the secondary terminal box 10 at the base 3 of the transformer.

The open magnetic core 9 of the voltage transformer is made of electrical steel-sheets as a stack core with one or more packages and it is mechanically fixed in the base 3 of the transformer. Alongside the open magnetic core 9 there is wound at least one secondary winding 11 of voltage transformer, the leads of which end in the secondary terminal box 10. The open magnetic core 9 with the secondary windings 11 of the voltage transformer is placed vertically inside the supporting tube 8. The supporting tube 8 is at the same time a supporting mechanic carrier of the current transformer.

The whole main insulation of the combined current and voltage transformer makes a compact entity, consisting of part 5, i.e. the insulation of current transformer in the area of the transformer head 1 and part 12, i.e. the insulation of the voltage transformer which is at the same time the insulation of supporting tube 8. Part 12, insulation of voltage transformer, may be done stepwise, so that the thickness of insulation diminishes from the top towards the transformers parts which are earthed.

Along the whole cover of the insulation of the voltage transformer 12 in the vertical axis of the transformer, there is a primary winding 13 of the voltage transformer. Depending on the rated voltage of the transformer, the primary winding 13 of the voltage transformer can be divided into a few sections. Each section of the primary winding 13 contains a certain number of turns which are in the form of multi-layer windings wound around the carriers of sections made out of insulation material.

Claims

1. Combined current and voltage transformer for high voltages which consists of a current transformer of inverse type placed in the transformer head (1) and an inductive voltage transformer with a stack magnetic core (9), characterized in that the secondary leads (7) of the current transformer are laid by or through the open magnetic core (9) of the voltage transformer, which together with its appertaining secondary winding (11) of the voltage transformer is placed in the vertical axis of the transformer inside an earthed supporting tube (8) and around which is placed the insulation of the voltage transformer (12), which together with the insulation of the current transformer in the area of the head (5) make an unseparably entity and in that the sections of the primary winding (13) of the voltage transformer are placed vertically inside the supporting insulator (2) around the insulation of the voltage transfor-

mer (12).

2. Combined current and voltage transformer for high voltages according to claim 1, characterized in that the primary winding (6) of the current transformer has one or more turns. 5
3. Combined current and voltage transformer for high voltages according to claim 1 or 2, characterized in that the current transformer has one or more cores (4). 10
4. Combined current and voltage transformer for high voltages according to claim 1, 2 or 3, characterized in that the current transformer can be multiply reconnectable on the primary and/or secondary side. 15
5. Combined current and voltage transformer for high voltages according to any of the claims 1 to 4, characterized in that the voltage transformer has one or more secondary windings (11). 20

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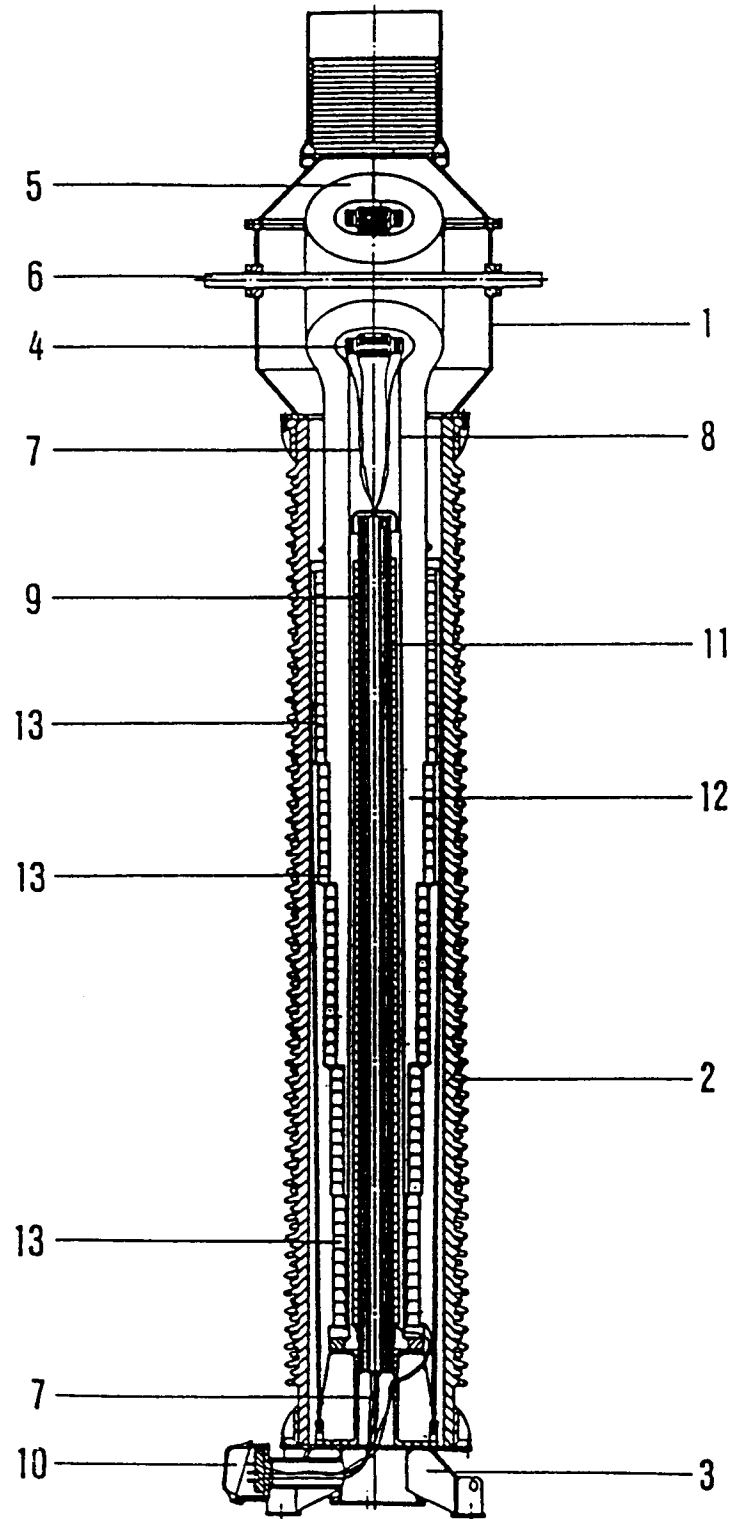


FIG.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 89 0065

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	FR-A-1 011 844 (COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ) * page 1, left column, paragraph 3 - page 2, left column, paragraph 1 *	1-3,5	H01F40/08
X	CH-A-312 592 (FABRIK ELEKTRISCHER APPARATE SPRECHER & SCHUH) * page 1, line 40 - line 65 *	1-3,5	
X	GB-A-742 554 (REYROLLE & COMPANY) * page 2, line 17 - line 64 *	1-3,5	
A	DE-C-976 080 (FRIEDRICH RAUPACH) * page 5, line 48 - line 76; figure 4 *	3-5	
A	CH-A-324 242 (MOSER-GLASER)		
A	GB-A-827 097 (THE BRITISH THOMSON-HOUSTON COMPANY)		
A	FR-A-1 086 362 (COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ)		TECHNICAL FIELDS SEARCHED (Int.Cl.5) H01F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 July 1994	Examiner Vanhulle, R
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