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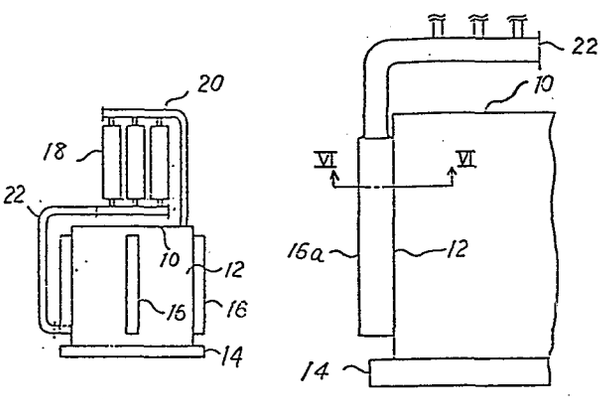
(54) Static induction device.

(57) A static induction device has a transformer disposed within a box-shaped housing including a top cover (10), two pair of opposite lateral plates (12) provided with a plurality of reinforcing rectangular rods (16) and a bottom plate (14), an electrically insulating cooling medium charged into the housing, a cooler unit (18) located above the top cover (10), an upper piping (20) extending between an inlet of the cooler unit (18) and the top cover (10), and a lower piping (22) connected at one end to outlet of the cooler unit (18) and at the other end to the reinforcing rod (16a or 16b) having a U-shaped or a hollow rectangular cross section, disposed on the lateral plate (14) remote from the upper piping (20) and open in the interior of the housing through a hole (24) disposed on the lower portion of the lastmentioned lateral plate (14).



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STATIC INDUCTION DEVICE

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BACKGROUND OF THE INVENTION

This invention relates to a static induction device, and more particularly to improvements in a piping structure located between a cooler unit and the main body of a static induction device comprising the cooler unit.

There is known a static induction device comprising a cooler unit located above a top cover for the same and including an inlet and an outlet, an upper piping for connecting the inlet of the cooler unit to a hole disposed on either one of the top cover adjacent to one edge and one of a plurality lateral plates for the static induction device connected to the one edge of the top cover on the upper portion, a lower piping for connecting the outlet of the cooler unit to a hole on the lower portion of the lateral plate opposite to the first-mentioned lateral plate, the upper and lower pipings forming a passageway for an electrically insulating, cooling medium for cooling the static induction device, and a plurality of reinforcing members disposed on the lateral plates.

In the accompanying drawings:

Figure 1 is a plan view of the known static induction device;

Figure 2 is a front elevational view of the arrangement shown in Figure 1; and

Figure 3 is a side elevational view of the arrangement shown in Figures 1 and 2.

The static induction device shown in those Figures comprises a transformer (not shown) disposed within a housing in the form of rectangular box including a top cover 10, two pairs of opposite lateral plates 12 and a bottom plate 14. In order that the housing withstands an excessive pressure developed upon the occurrence of a fault on the transformer and a vacuum resistance test, the lateral plates 12 are generally reinforced by a plurality of reinforcing rectangular rods 16 disposed thereon to extend perpendicularly to both the top cover 10 and the bottom plate 14. In the example illustrated, a single one of the reinforcing rectangular rods 16 is centrally disposed on each of the two opposite shorter lateral plates 12 and the three reinforcing rectnagular rods 16 are disposed in parallel, spaced relationship on each of the two opposite longer lateral plates 12. Furthermore the housing is fully charged with an electrical insulating cooling medium for example, an electrically insulating oil so that the transformer is immersed into the oil.

The arrangement comprises further a cooler unit, in this case, six coolers 18 arranged in three rows and two columns as viewed in Figure 1 above the top cover 10.

As shown best in Figure 3, an upper piping 20 in the form of an L has one leg extending from the top cover 10 of the housing adjacent to one edge, in this case, the righthand edge as viewed in Figure 3 to be perpendicular to the top cover 10 and the other leg extending in parallel to the top cover 10 above the coolers 18 to be connected to inlets, in this case, the upper ends of the coolers 18 through individual branches. Also a lower, generally

L-shaped piping 22 is disposed between outlets or the lower ends of the coolers 18 and the lower portion of that longer lateral plate 12 remote from the upper piping 20. More specifically, the lower piping 22 has one leg of the "U" extending in parallel, spaced relationship with the last-mentioned lateral plate 12 and including an end portion bent toward the lower portion of that plate and connected thereto between the central reinforcing rod 16 and the righthand reinforcing rod 16 as viewed in Figure 2 to be substantially aligned with the lower ends thereof. On the other hand, the other leg of the "U" extends in parallel to the top cover 10 between the latter and the coolers 18 and connected on the end portion to outlets or the lower ends of the coolers 18 through individual branches.

Thus the upper piping 20 connects the inlets of the coolers 18 to the interior of the housing 10-12-14 through a mating hole disposed on the top cover 10 and the lower piping 22 connects the outlets of the coolers 18 to the interior of the housing through a mating hole disposed on the lower portion of the longer lateral wall 12 remote from the upper piping 20 resulting in the formation of a passageway for the electrically insulating cooling medium or the oil.

If desired, the upper piping 20 may be connected to a hole disposed on the upper portion of the longer lateral plate 12 connected to the one edge of the top cover 10 between the adjacent reinforcing rectnagular rods.

In operation, the transformer is heated to decrease a specific gravity of the oil. The oil decreased in specific

gravity is raised toward the upper portion of the housing until it passes through the upper piping 20 to reach the inlets of the coolers 18. During the passage thereof through the coolers 20, the oil is cooled through heat exchange between the same and the surrounding air to increase in specific gravity. The oil increased in specific gravity passes through the lower piping 22 to reach the lower portion of the housing. The process as described above is repeated to continuously cool the transformer.

In conventional static induction devices comprising the cooler unit located above the same such as described above, the lower piping 22 has been required to extend along the adjacent lateral plate and the top cover of the housing separately from the reinforcing rectangular rods 4. In addition, the lower piping, in many cases, has been located outside of the adjacent reinforcing rods. This has meant that the resulting static induction device increases correspondingly in outside dimension.

Accordingly it is an object of the present invention to provide a new and improved static induction device decreased in outside dimension and therefore saved in amounts of materials used.

In order to attain the object thereof, the present invention is characterized in that at least one of the reinforcing rods is formed into a passageway for the electrically insulating cooling medium to be also used as a part of the lower piping.

Preferably, the reinforcing rod forming the passageway has a U-shaped cross section and includes two

legs of the "U" connected at both ends to the lateral plate remote from the upper piping, one end closed and opening in a mating hole disposed on the lower portion of the last-mentioned lateral plate and the other end open and connected to the lower piping.

The present invention will now be further described by way of example with reference to Figures 4, 5 and 6 of the accompanying drawings in which:

Figure 4 is a fragmental side elevational view of one embodiment according to the static induction device of the present invention;

Figure 5 is a sectional view of the arrangement shown in Figure 4 with part omitted;

Figure 6 is a cross sectional view taken along the line VI-VI of Figure 4; and

Figure 7 is a view similar to Figure 5 but illustrating a modification of the present invention.

Throughout those Figures like reference numerals designate the components identical or corresponding to those shown in Figures 1, 2 and 3.

The arrangement illustrated in Figures 4, 5 and 6 is different from that shown in Figures 1, 2 and 3 only in that in Figures 4, 5 and 6 one of the reinforcing rectangular rods 16a disposed on the longer lateral plate 12 remote from the upper piping 20 (not shown) has a rectangular U-shaped cross section and includes two legs of the "U" connected at both ends to that lateral plate 12 and one end, in this case, the lower end as viewed in Figure 5 closed but connected to the interior of the housing formed of the top cover 10,

the lateral plates 12 and the bottom plate through a hole 24 (see Figure 5) disposed on the adjacent part of the lower portion of the lateral plate 12. Thus the reinforcing rectangular rod 16a forms a passageway leading to the interior of the housing. The reinforcing rod 14a includes the other or upper ends open and connected to the lower piping 22 as shown in Figures 4 and 5.

Figure 7 shows a modification of the present invention in which one of the reinforcing rectangular rod 16b has a hollow rectangular cross section and is substituted for the reinforcing rectnagular rod 16a as described above.

In other respects the arrangement is identical to that shown in Figures 4, 5 and 6.

From the foregoing it is seen that, by forming an oil path of the reinforcing rod 16a or 16b having the rectangular U-shaped or the hollow rectangular cross section respectively, the reinforcing rod 16a or 16b can serve as both an oil piping and a reinforcing member for the housing. In other words, the oil as having passed through the lower piping 22 flows into the interior of the reinforcing rod 16a or 16b connected thereto and then enters the interior of the housing through the lower portion of thereof resulting in the formation of the passageway for the electrically insulating cooling medium.

As described above, one portion of the lower piping extending from the coolers can also act as a part of reinforcing means for the housing. Accordingly, the resulting device can decrease in outside dimension and also saved in amounts of materials used.

While the present invention has been illustrated described in conjunction with the single reinforcing rod forming the oil path, it is to be understood that a plurality of such reinforming rods may be provided.

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CLAIMS:

1. A static induction device comprising cooler unit (18) located above a top cover (10) for the same and including an inlet and an outlet, an upper piping (20) for connecting the inlet of the cooler unit (18) to a hole disposed on either one of the top cover (10) adjacent to one edge and one of a plurality of lateral plates (12) for the static induction device connected to the one edge of the top cover (10) on the upper portion, a lower piping (22) for connecting the outlet of the cooler unit (18) to a hole on the lower portion of the lateral plate (12) opposite to the first-mentioned lateral plate (12), the upper piping (20) and the lower piping (22) forming a passageway for an electrically insulating cooling medium for cooling the static induction device, and a plurality of reinforcing rods (16) disposed on the lateral plates (12), characterized in that at least one (16a or 16b) of the reinforcing rods (16) is formed into a passageway for the electrically insulating cooling medium to be also used as a part of the lower piping (22).

2. A static induction device according to claim 1 characterized in that the at least one (16a) of the reinforcing rods (16) has a U-shaped cross section and includes two legs of the "U" connected at both ends to the lateral plate (12) remote from the upper piping (20), one end closed and opening in the mating hole (24) disposed on the lower portion of the last-mentioned lateral plate (12) and the other end open and connected to the lower piping (22).

3. A static induction device according to claim 1, characterized in that the at least one (16b) of the reinforcing rods (16) has a hollow rectangular cross section and includes one side connected to the lateral plate (12) remote from the upper piping (20), one end closed and opening in the mating hole (24) disposed on the lower portion of the last-mentioned lateral plate (12) and the other end open and connected to the lower piping (22).

FIG.1

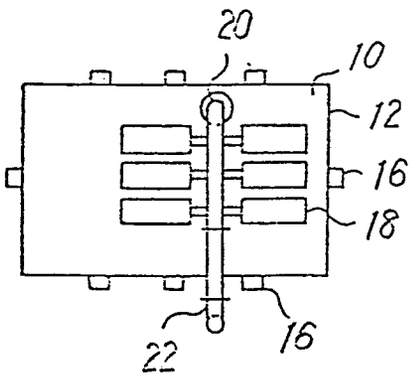


FIG.2

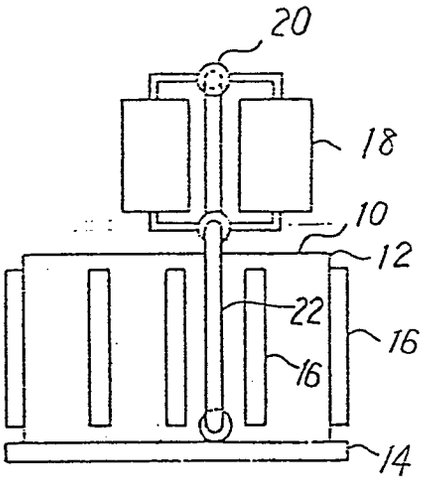


FIG.3

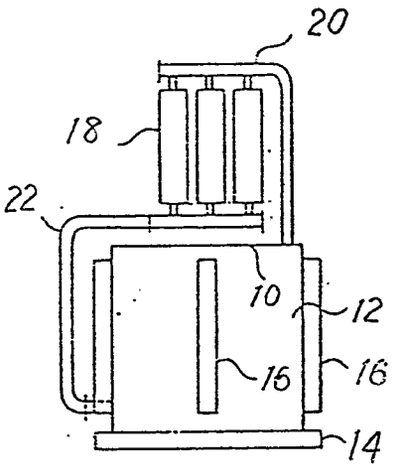


FIG.4

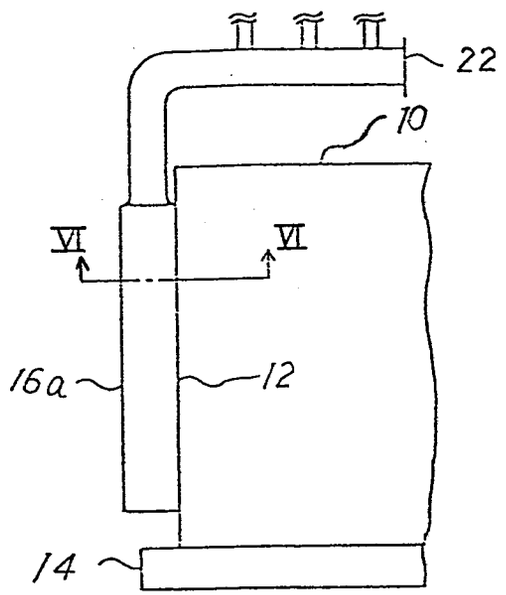


FIG.5

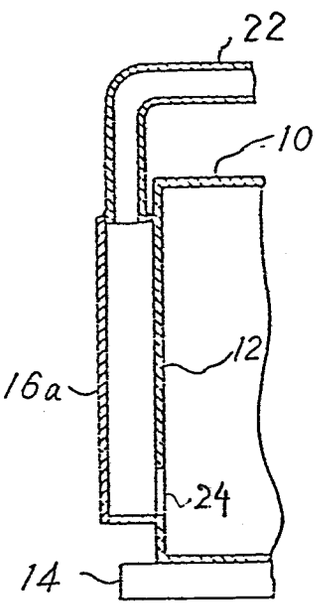


FIG.6

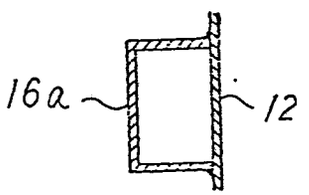
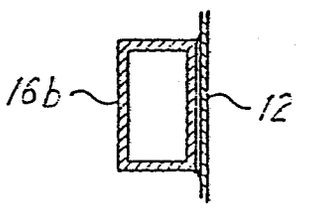


FIG.7



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EUROPEAN SEARCH REPORT

Application number 0130276

EP 84 10 2733

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. ³)
A	GB-A- 705 272 (THOMSON-HOUSTON) * page 2, lines 4-32 *	1,2	H 01 F 27/02 H 01 F 27/12
A	DE-B-1 216 422 (W. SMIT) * column 2, lines 20-25; column 3, lines 26-28 *	1,3	
A	GB-A- 511 717 (A.S.E.A.)		
A	GB-A-2 050 069 (TOKYO SHIBAURA DENKI)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

H 01 F 27/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-09-1984	VANHULLE R.

CATEGORY OF CITED DOCUMENTS

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