INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS

'INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS' is constructed by a tube form expansive dissipator cell (1) to oil radiators (3) of electric transformers (4), that belongs to the electric materials field, the radiator (3) or, more precisely, the expansive thermal radiator was developed looking for eliminating the expansion tank on transformers and other electric equipment that uses high dielectric oils closed in sealed containers; such radiator (3) is built from an extruded tube, whose transversal section presents a predominantly elliptical form with projections (2) of many geometric forms that could be triangular, rectangular, semicircular, semi-elliptical among other ones permitted by the technique, such geometry allows the diametral expansion of tube form cell because of the pressures inside of it, keeping the electric transformer container internal pressure (4) between the structural safety limits.
INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS"

Field of Application

The present patent of utility model, "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", is about an improvement in tube heatsink cells, from electric equipment field, used in oil radiators to cool down power transformers, and the tube form cell has an innovative constructiveness, and it has no precedents, once it has is capable of expanding itself because of its internal pressure and a greater capacity of dissipating heat. Its manufacture process is obtained by extrusion process, embodying an innovative design of its transversal section, as well as its structural characteristic.

The object of this patent refers to the cell tube form shaped from the extrusion technique, having in its forming structure small geometric projections that could be different according to its need and to the size of the equipment where it is installed. This transversal section conformation, besides giving a dissipating area increasing, makes possible the cell volumetric expansion avoiding the use of an expansion tank on oil transformers and also allows the oil transformer volumetric expansion and its tightness. Such tube cells are disposed side-by-side with a small space linked at their ends by ducts that form dissipating sets that are paired at certain equidistance between them and are interconnected by an oil duct in their upper and lower ends, creating, together, the radiator, where the high dielectric oil circulates by convection and gravity, affording the refrigeration by the air that gets in contact with the outside, absorbing heat.

In this way, we have, in this patent request, a new model of heatsink that embodies in its constructiveness an extruded tube form dissipating cell developed to be applied in dissipating heat in transformer radiator of any size, whose technology dispenses expansion tanks with breathers, and allows it to be hermetically isolated from external environment.

It is also scope of the present request to introduce an innovative oil radiator expansible tube form cell, with low cost to its industrial feasibility, affording to the industrial customer and additional freedom and a
choice at the reference industry, offering countless possibilities of benefit, becoming an specific product well acceptable, in the reference industry.

Disposition historic

Tension transformers are used in all electric transmission systems and they have a full range of sizes to support all the needs in power. Their function is to rise or down electric current, according to the actual needs. Basically, transformers are built in conductor wire coiled wined around a ferromagnetic nucleus, and it can be shut up a receptacle with high dielectric oil, gas such as sulfur hexafluoride or dry.

The transformer isolation system and the oil that works as the isolating element is the set used in the main part of the equipments, because of its great characteristics in working with the electric, mechanical and thermal needs in the transformer.

In the manufacture process of these electric equipments, or even during its operation, the solid isolation is an important factor for its durability.

These current transformers are of many sizes and to the bigger ones - the ones that make more heat - it is necessary to associate a cooling system. In oil transformers, heatsinks are characterized by a blade radiator, because it has an outstanding efficiency in heat exchanging, where oil, when circulating in cavern-like cells, aimed to confining the oil at the same time that the outside air cools its great surfaces, projected with the purpose of taking their heat.

The oil inside the electric transformer increases its volume when heated and the surrounding structure of this kind of equipment has an oil exchanger chamber with a breather to relief inside pressure caused by the oil distension. Without this apparatus, surrounding structure would blow up. When it is requested a great amount of electric power, transformers dissipate more thermal energy and, subsequently, oil gets hot and expands. In this moment, the extra volume that oil dilatation generates fills the expansion tank and air is drawn by breather. When the delivered power decreases, consequently the system has a temperature decreasing and oil reduces its volume, proportionally emptying expansion chamber.
Defective points at the state of art

The constructive form used until this time on electric transformer equipments needs a tank for oil expansion when it is heated.

When transformer works more than the usual, it starts to heat oil that gets expanded. To avoid explosion, it is expected to have an expansion chamber with an air exit, so the oil could fill its volume, drawing the air by the breather.

As the experts in this field already know, the oil utilized in these equipments cannot have any contamination of any kind, mainly moisture. Because of its physical-chemical feature, the contact of any small part of moisture or water with oil can dramatically decrease its thermal isolation ability, jeopardizing all parts. To avoid contaminating oil by moisture, there is a capsule with drying elements on expansion chamber breather, in a way that when the environment air enters the chamber, it goes first through the drying elements, what decreases its relative humidity.

Another apparatus used at expansion chamber breathers to avoid oil contamination by atmosphere air is the expansive bag. In this system, expansion chamber has an expansive bag where oil enters when it distends. In this way, the atmosphere air humidity never gets in contact with oil.

Such expansion chamber has performed what it has to do, but since it is an apparatus added to the current transformer, it makes the current transformer more expensive, and also increases the failing points of the surrounding structure that suffers internal pressure, heating and resonance of coils and ferromagnetic elements. An inconvenient question is that the cost of material and manpower is high, where any forecast manufacture saving is substantial in the product final cost because of its high delivered value.

In the manufacture process of electric transformers, or even during its operation, the solid isolation is an important factor because of its durability.

The presence of oxygen acts as a powerful agent accelerator to the oil or paper degradation. The action of an equipment preservation system is important to isolate the moisture and the oxygen taken from the atmosphere air on the oil-paper system.
The moisture control of solid isolation dramatically contributes to minimize the effects of oxygen and moisture over the cellulose’s degradation and, as a consequence, to obtain a significant extension of equipment useful life. One can say that useful life of a transformer is the useful life of its solid isolation.

Another aspect of some huge importance in the constructiveness of oil transformer is that there is a huge global tendency in displacing mineral oil by vegetable oil.

Because of the huge world appeal to displace non-degradable and pollutant elements by biodegradable, recyclable and more environment-friendly ones, there is a great tendency among manufactures of transformers to use vegetable oils.

Besides the fact that the forenamed vegetable oil does not contaminate the environment, it has an elevated burn point and it is not sensible to moisture as the oils used nowadays.

But a great inconvenient of vegetable oil is that it is highly oxidizable. The contact of oxygen with vegetable oil decreases its pH, consequently it attacks the isolating paper used in coils that composes the transformer. Taking in account this factor, it is important to keep oil isolated from atmosphere air.

The oil radiators, which has the dissipating cells as its main element, even it works through concerning to thermal dissipation, did not have great progresses in their constructive projects, even being an equipment of great value and high cost and delivered value.

Disposition Summary

Considering the need of cost reduction on power transformer equipments manufacturing and maintenance allied to a more reliable and more robust project lead the inventor with prominent technical knowledge in the market to idealize, to project and to develop the object of the present patent "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", which incorporates a constructive detail in collapsible heatsink, allowing them to expand in function of their internal pressure, intending to obtain a covering of
hermetic transformer.

The tube dissipator cells are manufactured from extrusion techniques and have a predominantly elliptical transversal section with geometric projections in many forms, as well as rectangular, triangular, semielliptical, semicircular and others permitted by the technique.

A certain number of tube cells are disposed side by side in uniform spaces and linked at their ends by tubular elements that form dissipating sets which are disposed side by side in their face of bigger dimension, keeping a little interval and linked at the upper and low ends by an oil circulating tube, and together forming an expansible radiator where circulates oil with high dielectric oil circulates by convection and gravity, affording the refrigeration by the air that gets in contact with the outside, absorbing heat and compensating simultaneously by the volumetric expansion the tendency of increasing of internal pressure on the transformer reservoir.

**Brief description of drawings**

The characterization of this report to the utility model patent is made by representative drawings of the constructive disposition applied to the thermal radiator, expansible to oil electric transformers or others of the same kind, in such way that equipment can be totally reproduced by the adequate technique, allowing total characterization of the demanded object functionality.

From the elaborated drawings that express the best way or the preferable way to accomplish the product idealized, it is substantiate in the descriptive part of the report, through a detailed and consecutive numbering, clarifying aspects that can be understood by the adopted representation to clearly determine the intended projection.

These drawings are merely illustrative, and they can have variations, since they do not evade what was firstly demanded.

Following, for a better understanding (and comprehension) about the constitution of the "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", herein demanded, are illustrative drawings attached, where one
can see:

FIG. 1 - Shows an upper perspective view of a common radiator formed by tube form cell with common transversal elliptical sections.

FIG. 2 - Shows a side perspective view of a common radiator formed by tube form cell with common transversal elliptical sections.

FIG. 3 - Shows an upper perspective view of an oil electric transformer expansible thermal radiator or parallels formed by tube form expansive cells with blades.

FIG. 4 - Shows a front view of an oil electric transformer expansible thermal radiator or parallels formed by tube form expansive cells with blades.

FIG. 5 - Shows a front view of a detail of the oil electric transformer expansible thermal radiator or parallels formed by tube form expansive cells with blades, where it is possible to see the expansive cell connection to the lower duct.

FIG. 6 - Shows a back perspective view of a detail of the oil electric transformer expansible thermal radiator or parallels formed by tube form expansive cells with blades, where it is possible to see dissipator sets.

FIG. 7 - Shows a perspective view of the tube form expansive cell with triangular blades detail.

FIG. 8 - Shows a side perspective view of the tube form expansive cell with triangular blades.

FIG. 9 - Shows a perspective view of the tube form expansive cell with semielliptical blades detail.

FIG. 10 - Shows a perspective view of the tube form expansive cell with semielliptical blades detail.

FIG. 11 - Shows an upper perspective view in diagonal cut of an oil electric transformer expansible thermal radiator or parallels formed by tube form expansive cells with blades.

FIG. 12 - Shows a lower perspective view of an oil electric transformer expansible thermal radiator or similar in presentation.
In conformity with what the above mentioned figures illustrate "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", it intents the improvement of dissipator cells that integrate the typical oil radiators used in electric transformers and other thermal generators which one endows its dissipate and expansive cells (1) projection tube form (2) whose forms can vary according to the transformer needs, which provides expansibility attributes because of its internal pressure allied to the greater thermal dissipation.

Among many heatsink models (3) used in oil electric transformers (4), the most common is the heatsink or radiator (3) made of a elliptical tube (5) set put side-by-side, keeping a little space and linked at their ends by ducts (6), forming the heatsink (7) set, which are put side-by-side keeping a little space to air flow, and are linked at their lower ends by oil ducts (8), with interface flanged nozzles(9) to connect the electric transformer manifold(4).

A new expansive dissipating cell building form (1) used in the radiator equipment (3) described below foresees the elimination of expansion tank connected to containers of electric transformers (4), allowing the hermetic closing of the receptacle.

The expansive dissipator cell (1) is built from an extruded tube, whose transversal section presents a predominantly elliptical form with projections (2) of many geometric forms that could be triangular, rectangular, semicircular, semi-elliptical among other permitted by the technique. Such geometry allows an expansion in diameter or radius of the tube form cell because of pressure that works inside of it.

Because of the great number of expansive dissipator tube form cells (1) that compound radiators (3), they represent a great area, providing not only a better thermal dissipation, but also providing an internal volumetric expansion to neutralize the increasing of pressure due to the oil volume expansion. The expansion capacity because of internal pressures executed by the increasing of oil amount, when heated, allows to keep intern pressure between the safety parameters supported by transformer container
The amelioration of dissipating cell was developed following not only to permit the elimination of expansion tanks, but to simplify the assembling of electric transformers and also to obtain a safer and more robust involving structure, since there is a reduction of welding and connection points.

The oil electric expansible thermal radiator presented can also be used on transformers that are already working.

As explained above, the main factor in transformer equipment useful life is the solid insulation against moisture and oxygen during its manufacturing and operation.

Therefore, we can confirm by what we have shown that the "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", herein demanded, is seen as an innovative product, configures as an expansive dissipator cell (1) to oil radiators which has all applicable and constructive qualities when compared to traditional models presented until now. The application of such dissipator allows to hermetically closing the transformer cabinets or containers avoiding the oil contamination by atmosphere air making possible to consequently low maintenance costs and giving a greater useful life to the equipment.

With the coming of vegetable oil using in electric transformers, this present patent intends to significantly contribute not only with the workability of application of such oil, but also with a better constructiveness of electric transformer equipments, on maintenance cost reduction and better useful life.

Because of the advantages it offers, and more, because of the really innovative characteristics that fulfills all requirements of individuality in its class, we certify that "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", has the necessary and sufficient conditions to deserve the Utility Model patent.
CLAIMS

1. "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS"

idealize a collapsible oil expansive dissipater cell (1) tube form to radiator (3) oil-type collapsible which is used in electrical transformers (4) immersed in oil of elevated dielectric characterized by been built by an extruded tube element, whose transversal predominantly elliptical presents a number of external projections (2) in its forming face that can have many geometric forms that could be triangular, rectangular, semicircular, semi-elliptical among other ones permitted by the technique.

2. "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS"*, according to the claim 1, characterized by the fact that the tube form expansible dissipater cell (1) has, internally, the same figure presented externally because of its projections (2).

3. "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", according to the claim 1, characterized by the fact that the tube form expansible dissipater cell (1) makes possible to hermetically closing containers in electric transformer equipment (4).

4. "INTRODUCED DISPOSITION IN EXPANSIBLE THERMAL RADIATOR TO OIL POWER TRANSFORMERS OR PARALLELS", according to the claim 1, characterized by the fact that the tube form expansible dissipater cell (1) expands it internal volume because of the direct expansion of oil inside the electric transformer container (4).
**INTERNATIONAL SEARCH REPORT**

**A CLASSIFICATION OF SUBJECT MATTER**

IPC\(^8\): **H01F 27/12** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

**B FIELDS SEARCHED**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**C DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>X</td>
<td>FR 261 1034 A (BUFFET JEAN) 19 August 1988 (19.08.1988) <em>Figs 1-6 and description</em></td>
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X Further documents are listed in the continuation of Box C

A See patent family annex

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