



SCREENING DEVICE FOR SWITCHED-MODE POWER SUPPLY TRANSFORMER

5 The present invention relates to an electromagnetic screening device for a switched-mode power supply transformer.

Switched-mode power supplies currently equip the large majority of television sets and of monitors for computer installations. Each of these power supplies is provided with a transformer placed on a chassis, which is
10 itself positioned below the cathode-ray tube of the television set or of the monitor.

These power supplies operate by chopping the current, or switching it on and off, and this switching has the undesirable effect, within the transformer, of
15 inducing stray electromagnetic radiation which acts on the electromagnetic receivers which particularly the deflection coils of the cathode-ray tube constitute. This results in image disturbances, which are more or less significant, that is to say more or less visible, according to the value of the switching frequency, the physical position of the transformer and the sensitivity of
20 the deflection coils.

In the case where a synchronized and fixed-value switching frequency is involved, these electromagnetic
25 disturbances certainly exist, but they are very fortunately not represented on the screen as they appear during a period of time when the scanning spot is in its flyback phase.

On the other hand, some switched-mode power
30 supplies operate at a frequency which varies significantly as a function of the electrical power demanded by the television set or the monitor, as a function of its power supply voltage, and as a function of what is demanded of the transformer. This switching frequency is
35 then constantly varying, and this results in a phenomenon of beating between the latter and the fixed scanning frequency of the spot of the television set or of the monitor. This frequency beating produces an image inter-



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ference phenomenon on the screen, which is expressed visually by a more or less dark horizontal "moiré pattern", that is to say by a greyish band which scrolls on the screen of the cathode-ray tube, which clearly cannot
5 be allowed in the large majority of cases. As it is not generally possible to shift the switched-mode transformer physically by a sufficient distance (it would then be necessary to take it completely out of the chassis of the television set or of the monitor), another solution has
10 to be found to remedy this image interference phenomenon.

It might be thought, in the first place, to reverse the stray electromagnetic field emitted by the switched-mode transformer, by reversing its windings in order to shift this field. Such a palliative unfortunately turns out to be insufficient for completely
15 avoiding the abovementioned image interference, and finally a device for screening this transformer has to be provided.

A first screening device, currently existing on
20 these transformers, consists of a metal cap which completely envelopes the transformer, which, obviously, gives an excellent result from the point of view of protection against the abovementioned image interference. However, this takes the form of a component of large
25 size, which is expensive in terms of fabrication cost (if only due to the cost of the raw material). Moreover, this largely enveloping cap tends to reduce the safety distances between the two primary and secondary circuits of the transformer, since it passes close to some of the
30 cable or wire outlets: in order to comply with the obligatory standards for electrical insulation, it is then most often necessary to insulate the interior of this metal cap by depositing a layer of insulating material. It is moreover generally necessary to insulate
35 its outer part in the same way, as this cap often comes to a distance from the electronic components, situated on the circuit board of the television set, which is too small to comply with the safety standards. This results in an increase in the already high cost price of this

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screening component.

Another screening solution consists in providing a magnetic loop, consisting of an annular strip of copper which encloses the mid-part of the transformer parallel to the circuit board onto which its output pins are soldered.

With this being a transformer in "layered" mode, the fitting of this screening ring takes place directly by tightly winding and soldering this ring round the "belly" of the transformer (that is to say around the part which includes its winding). This solution gives results which are satisfactory from the point of view of electromagnetic protection, but however not as good as that obtained by the abovementioned total screening. It nevertheless remains quite expensive, since it involves a fitted component which has to be placed precisely around the transformer, clamping it tightly in order to avoid any risk of movement (such a risk would be contrary to the safety standards), and on which a soldering operation has to be carried out in order to guarantee that it is short-circuited.

Moreover, these transformers in layered mode tend more and more to be replaced by transformers in "pancake" mode, for obvious reasons of ease of automation of their method of fabrication. A transformer of this type is represented, under the general reference 1, on the attached Figure 1.

In this figure, the ferrite core of the transformer is designated by the reference 2, the "pancakes" by 3, the wires which they guide and support by 4, and the input/output pins of the transformer by 5.

For such a transformer, it is obviously not possible to provide a short-circuited metal ribbon clamping it round the belly, since the pancakes 3 are provided with jagged parts projecting. The solution which is then adopted consists in providing a plastic cap 6, which completely envelopes the transformer 1 as represented in the drawing, and around which a metal screening loop 7 has previously been fixed, similar in height and



thickness to they [sic] provided for transformers of the layered type. This component 6, 7 is fixed by clipping onto the transformer 1. Here again, this is a component which, like the preceding one, is expensive in terms of
5 fabrication cost, and which lends itself badly to automatic fitting on a production line for these switched-mode transformers. Moreover, as in the preceding case, the electromagnetic protection performance obtained is not absolutely perfect.

10 The invention aims to remedy these drawbacks. To this end it relates to an electromagnetic screening device for a switched-mode power supply transformer, intended in particular to equip a television set or a
15 monitor, this device consisting of a small metal component in the shape of a trough or tray with a flat bottom and with flared edges, the flat bottom of this trough being designed to match the shape of the upper face of the ferrite core of the transformer in such a way that this metal component can easily be placed, and fixed for
20 example by bonding, on to this ferrite core with its flared edges turned downwards in the manner of a hat. These flared edges are chosen to be of sufficiently narrow width as not to affect the electrical insulation conferred by the transformer, but are, however, large
25 enough to, on the one hand, allow this tray to be fitted easily (for example by robot) on to the top of the transformer and to, on the other hand, provide the desired electromagnetic protection. This component is preferably produced by stamping. It is placed on the
30 ferrite core after prior deposition of adhesive on the latter, (one or two spots of adhesive for example), this adhesive advantageously being the same as that used to bond the elements of this ferrite core together. These operations of bonding and of fitting are easily carried
35 out by an automatic robot line.

In any event, the invention will be well understood, and its advantages and other characteristics will emerge, during the following description of a non-limiting embodiment example, by reference to the attached



Figure 2, which represents this screening device, in perspective and to scale 1, and the method of putting it in place on a switched-mode power supply transformer.

Referring to this Figure 2, the switched-mode power supply transformer 1 of Figure 1 is represented here in perspective, with its ferrite core 2, its pan-cakes 3, its connecting wires 4, and its input/output pins 5.

The electromagnetic screening device consists of a copper trough, or tray 7, produced by stamping. The flat bottom 8 of this tray is rectangular and is of the same external dimensions as those of the upper rectangular face 9 of the ferrite core 2. The tray 7 may be made of Al, brass, etc.

The edges 10 of the tray 7 are flared, with an angular slope α with respect to the axis perpendicular to the plane of the bottom 8 which, being of the order of 15 to 20 degrees for example, is optimized both to allow easy automatic placing of the cap 7 on to the top of the transformer 1 (as indicated in dots and dashes in the drawing) with the edges 10 turned downwards, and to provide the desired electromagnetic protection.

The width L of these edges 10 is chosen to be narrow (of the order of a few millimetres for example): it must be sufficient to make it as easy as possible to place the tray 7 on the upper face 9 of the core 2, but not too large, while providing the desired electromagnetic protection, to comply with the standards for electrical protection of the transformer.

The simple shape, without cutouts or sharp edges running the risk of causing components to catch on to one another, of the screening tray 7, and its small size allow it to be fed easily in a robotized automatic line, with a vibratory feeder hopper, without substantial modification to the production lines.

Prior to the tray 7 being placed by robot - along the arrow F and with the edges 10 turned downwards - on to the top 9 of the transformer 1, two spots of adhesive 11, 12 are deposited on this upper face 9 of the ferrite

core 2, this adhesive advantageously being the same as
that used to assemble, at 13, the two halves of the
ferrite core 2 (which is very advantageous from the point
of view of the provisioning of adhesive, for which no
5 additional cost is thereby entailed in practice).

The electromagnetic protection performance of the
deflection coils of television sets and monitors is
practically perfect, with this screening device.

Needless to say, the invention is not limited to
10 the embodiment just described but may, quite to the
contrary, be produced in other equivalent forms.

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CLAIMS

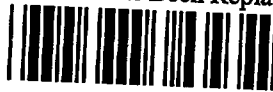
1. Electromagnetic screening device for a switched-mode power supply transformer, intended in particular to equip a television set or a monitor, characterized in that it consists of a small metal component (7) in the shape of a trough or tray with a flat bottom (8) and with flared edges (10), the flat bottom (8) of this trough (7) being designed to match the shape of the upper face (9) of the ferrite core (2) of the transformer (1) in such a way that this metal component (7) can easily be placed, and fixed for example by bonding (11, 12) on to this ferrite core (2) with its edges (10) turned downwards in the manner of a hat.
2. Screening device according to Claim 1, characterized in that this small metal component (7) is produced by stamping.
3. Screening device according to Claim 1 or 2, characterized in that the flared edges (10) are chosen to have a width (L) which is small enough that it does not adversely affect the electrical insulation conferred by the transformer, but is, however, large enough to, on the one hand, allow this tray (7) to be fitted (F) easily on to the top (9) of the transformer (1) and, on the other hand, to provide the desired electromagnetic protection.
4. Screening device according to Claim 3, characterized in that this width is of the order of a few millimetres.
5. Screening device according to one of Claims 1 to 4, characterized in that the angular slope (α) of the edges (10) of the trough (7) with respect to its bottom (8) is optimized both to allow easy automatic placing of the hat (7) on to the transformer (1) and to provide the desired electromagnetic protection.
6. Screening device according to Claim 5, characterized in that the angle (α) between these edges (10) and the axis of the flat bottom (8) of the trough (7) is of the order of 15 to 20 degrees.
7. Electromagnetic screening for switched-mode power supply transformer according to one of Claims 1 to 6,



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characterized in that it can be fixed by bonding (11, 12)
on the upper face (9) of the ferrite core (2) of the
transformer (1), by using the same adhesive as is used to
join (13) the constituent elements of this ferrite core
5 (2) together.

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