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Method of manufacturing a degaussing loop, and
loop obtained by this method.

The invention relates to degaussing loops intended to equip cathode-ray tubes for colour television. The degaussing loop consists of a winding of enamelled electrical wire protected by a hot-welded insulating sheath. It is fixed against the glass bulb of the mask-type image tube, and it is linked to the electrical circuit of the television set by a pair of conductors terminating in a two-pole connector. The conductors are linked electrically to the two ends of the winding in a region which is not covered by the insulating sheath. This uncovered region is then enclosed in an insulating casing which provides for the electrical protection and the mechanical strength of the connected pieces. The casing may consist of a taping or of two shells made of synthetic organic resin forming an interconnection housing.

Loops manufactured according to techniques of taping or fitting of a housing require hardware, the cost price and the handling difficulty of which entail a not inconsiderable additional cost. These loops may exhibit an impermeability defect at the interconnection, and their aesthetic appearance leaves something to be desired.

In order to alleviate the drawbacks set out above, the method according to the present invention uses a technique of moulding by injection of thermoplastic, which replaces the interconnection housing and gives rise to a gusset or sleeve shape which constitutes an effective electrical insulator and, moreover, an element for mechanical linking between the loop proper and the insulated wiring which links it to the circuit of the television set or of the video monitor.

The subject of the invention is a method of manufacturing a degaussing loop, including a stage of producing a coil surrounded by a tubular insulating sheath over almost all of its perimeter, the ends of

the coil emerging into the uncovered region, a stage of connecting, to these ends, two insulated electrical conductors provided for electrical connection of the loop, and a stage consisting in encasing the said
5 region with an appropriate electrical insulation element, characterized in that the connecting stage uses, as connecting element, a bifilar cable, the electrical insulant of which includes a spacer linking the sheaths of the conductors together, and in that the
10 following stage consists in overmoulding an encasing by hot-injection of an insulating thermoplastic into a mould.

A further subject of the invention is a degaussing loop including a coil enclosed over almost
15 all of its periphery in a tubular insulating sheath, a connection by two insulated electrical conductors, made at the ends of the said coil, and an insulating casing for concealing the connection and the uncovered region of the coil by covering over the ends of the said
20 sheath, characterized in that the connection is provided by a bifilar cable, the electrical insulant of which includes a spacer linking the sheaths of the conductors together, and in that the said casing consists of an overmoulding of insulating
25 thermoplastic.

The invention will be better understood by means of the description below and of the attached figures among which:

Figure 1 is an isometric view of a degaussing
30 loop of known type.

Figure 2 is an isometric view of a loop according to the invention, in the course of manufacture.

Figure 3 is an isometric view of a half-mould
35 used for a hot-premoulding operation.

Figure 4 is an isometric view showing the intermediate product obtained on leaving the mould of Figure 3 and the structure of a half-mould used for the final overmoulding.



Figure 5 shows a part of the degaussing loop according to the invention.

In the description which will follow, the same elements are designated by the same references.

5 In Figure 1 can be seen a degaussing loop in the course of manufacture. The main element is a coil of enamelled wire 12 having two ends 1 and 2 which emerge into an uncovered region. A tubular insulating sheath 3 encloses the coil 12, except for the uncovered
10 region visible in Figure 1 in the direction of the axis OZ. The axis OX is the axis of winding of the coil 12 and the other axes define a plane of symmetry YOZ of the coil. In Figure 1, the cross-section of the sheath 3 has been greatly exaggerated with respect to its
15 perimeter in order better to reveal the structural details. In practice, the diameter of the sheath 3 may be 9 mm while the diameter of the coil may vary from 300 to 1000 mm. By way of non-limiting example, the sheath 3 is derived from a strip of hot-weldable
20 plastic which has been curved inwards in order to obtain a toroidal shape with overlapping edges, which are then hot-welded.

In order to cause a current to flow in the coil 12, an electrical connection is provided by means
25 of two insulated conducting wires 4 and 5, which are linked to the ends 1 and 2 of the coil 12 by soft soldering or with insulation-displacement crimping sleeves. In order to encase the electrical connections in the uncovered region of the coil and cover over the
30 ends of the sheath 3, an insulating housing can be used, half of which 6 is represented in Figure 1. Two orifices are provided to clamp the sheath 3 and two smaller additional orifices serve as passages for the conductors 4 and 5. Within the housing 6, electrical
35 interconnection means and means of retaining the sheath and the conductors can be provided. In addition to its relatively high cost, this type of loop is not sealed, giving rise to the possibility of corrosion of the bare parts of the electrical circuit.





In accordance with the invention, in order to form a casing around the connection elements and the uncovered part of the coil and so that it covers over the ends of the sheath, a thermoplastic injection technique is proposed. The material to be injected into a mould in two parts is chosen for its electrical insulation properties, for its qualities of adhesion to the PVC material from which the sheath 3 is made, and for its high fluidity at the injection temperature. By way of non-limiting example, an adhesive is used based on copolyamide resin, such as is used in the injection process known by the name of "HOT MELT". This involves, for example, a hot-melt pure copolyamide resin having a density of 0.98, a softening point of 129 to 140°C (AFNOR standard T76106) and a Brookfield viscosity at 190°C of 2.5 to 4.0 Pa.s. This resin, which acts as an adhesive, is brought to a temperature lying between 180 and 210°C for the purpose of being injected into a mould at a pressure of a few Bars. Certain materials for injection under high pressure are not indicated, since the high-pressure injection may damage the strand of enamelled wire and bend the terminations of the conductors. They can then become short-circuited or come too close to the walls of the mould, which gives rise to defective electrical insulation. It should be remembered that the standard of insulation required of a degaussing loop is high, due to the presence of very high voltages on the cathode-ray tube.

Making the connection by means of two insulated flexible conductors poses a problem of keeping the pieces to be coated in place. In accordance with the invention, in order to make this connection, an insulated bifilar cable is adopted, having two parallel electrical conductors, the sheaths of which are linked to one another by a spacer, for example a flat spacer, which keeps them at a constant spacing. The spacer and the sheathing are obtained by a single extrusion operation, according to the method employed to manufacture the symmetric lines used for



transmitting VHF and UHF signals. Advantageously, a double-insulated cable is selected, that is to say that, starting with two solid conductors insulated by a first tubular sheath, an insulating ribbon is then produced by extrusion, which coats the first sheaths and forms the spacer mentioned above.

In Figure 2 is seen a part of the degaussing loop in the region where the coil 12 is not covered by the insulating sheath 3. The bifilar cable 9, which is presented perpendicularly to the winding 12 is also seen, after its two single-strand conductors 4 and 5 have been bared. The ends 1 and 2 of the coil are made to pass through a hole 11 pierced in the core of the cable 9, so as to fold them towards the coil 12, making them run along the two conductors 4 and 5 in their bared part. Insulation-displacement crimping sleeves 13 and 14 are slipped on and crimped so as to establish a good electrical contact between the coil 12 and the conductors 4 and 5. The sleeves 13 and 14 abut the sheaths 7 and 8 of the cable 9, which tends to hold them in the extension of these sheaths. Folding of the enamelled wire of the coil keeps the sleeves 13 and 14 very close to the sheath 3, the ends of which are closer than the spacing of the sleeves 13 and 14. In order to obtain this result, the loop and the connecting cable are retained by supports forming a mounting template which is not illustrated in Figure 2.

The device illustrated in Figure 2 may be subjected to coating in a single operation, but it is preferable to proceed in two stages in order to enhance the accuracy of positioning of the elements to be coated with thermoplastic.

In Figure 3 can be seen a half-mould making it possible to carry out precoating of the structure represented in Figure 2. This precoating bears the reference 22 in Figure 4. It exactly fills the space between the ends of the sheath 3 without going any further in diameter, it completely coats the crimping sleeves 13 and 14 and it coats the non-bared



end of the cable 9, at the coil 12 end. Thus reinforced, the loop structure of Figure 4 can undergo final overmoulding. Coming back to Figure 3, it is seen that the precoating mould comprises two shells 15 which are fitted together by virtue of centring pins 19 and 190. A semicylindrical housing for the sheath 3 can be seen, as can a housing 18 where the cable 9 is set in at mid-height, and a cavity 17 which will give rise to the part of the precoating which extends between the sheath and the visible part of the cable 9 (see Figure 4). In order to ensure correct positioning of the cable 9 with respect to the sheath 3, the pin 190 passes through an orifice 10 of the cable 9. The orifices 10 and 11 are created by the machine which serves to bare the end of the cable 9. The shells 15 of the precoating mould surround the structure of Figure 2, above and below. When the mould is closed, injection of the thermoplastic is carried out through the nozzle 20, which occupies a position opposite the cable with respect to the sheath 3. If the sleeves 13 and 14 are very close to the walls of the mould, at the worst, they may come flush, but as overmoulding is carried out next, it is certain that the insulant thicknesses will be complied with. When the material has been injected, it solidifies and the mould can be opened by withdrawing the two shells 15. The precoating of the crimping sleeves may have a height equal to the diameter of the sleeves, and there is no drawback in the closing of the two parts of the mould exerting a precise realignment of the sleeves. In fact, the insulant thicknesses required will be obtained during the final overmoulding. Injection in two successive phases is a particularly advantageous solution.

The "HOT MELT" method mentioned above uses a molten material generator which includes a reservoir with two stages, which carry out respectively the preheating and the heating of the substance to be injected. The reservoir feeds a pump which sends the heated material via a transport tube to an injection



gun which is applied against the injection nozzle 20 of the mould. The liquid substance is propelled to the valve of the gun at a pressure of a few bars. Timed control of the valve of the gun determines the quantity
5 of substance injected into the mould. Thus three parameters are monitored, which are: the pressure, the temperature and the duration of injection. Precoating gives rise to a structure with good rigidity, leaktight, but which is not sufficiently robust for the
10 envisaged use and which does not supply the required thicknesses of insulant.

It is now time to move to the final phase of the method, which consists in overmoulding, with thermoplastic, a more enveloping shape of the gusset,
15 T connection or sideways-branching sleeve type. By way of non-limiting example, Figure 5 illustrates overmoulding in the form of a gusset 28. In order to produce this particular shape, two half-moulds 21 as illustrated in Figure 4 are used.

20 Half-mould 21 includes semicircular orifices 23 intended to accommodate the sheath 3, a recessed part 27 which matches the shape of the cable 9, so that it is half set in and a half-cavity 25 which gives the gusset 28 its external shape. In order to avoid
25 leakages of injected substance, seals 26 have been provided, which are set into the half-mould close to the three outlet orifices. These seals consist of pieces made of elastomer resistant to the injection temperature. Pins 24 will also be noted, which serve
30 for centring the two parts of the mould, as will an injection nozzle 20. The injected substance may be the same as that used for precoating, but it is also possible to choose another substance for overmoulding, as the precoated part is better able to resist the
35 deformations which the final injection may induce.

The method of manufacture which has just been described reduces the manpower time, and requires raw material of a reasonable cost. Moreover, it offers good adhesion of the overmoulding with the sheath without

clamping force, and the product obtained is impervious. Finally, this finish is aesthetic, which is no bad thing.

5 The invention is not limited to the examples described. It extends to embodiment variants as far as the shape of the sheath, the bifilar cable and the shape given to the precoating and to the final overmoulding are concerned. The final overmoulding makes it possible to inscribe, in relief, the
10 references of the degaussing loop and the seals of approval which it has satisfied.

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Claims

1. Method of manufacturing a degaussing loop, including a stage of producing a coil surrounded by a tubular insulating sheath over almost all of its perimeter, the ends of the coil emerging into the uncovered region, a stage of connecting, to these bared ends, two insulated electrical conductors provided for electrical connection of the loop, and a stage consisting in encasing the said region with an appropriate electrical insulation element, characterized in that the connecting stage uses, as connecting element, a bifilar cable (9), the electrical insulant of which includes a spacer linking the sheaths (7,8) of the conductors (4,5) together, and in that the following stage consists in overmoulding an encasing (22,28) by hot-injection of an insulating thermoplastic into a mould (15,21).

2. Method according to Claim 1, characterized in that, prior to the overmoulding operation, a precoating (22) of the uncovered region and of the electrical connections (13,14) is carried out by hot-injection into a mould.

3. Method according to either of the preceding claims, characterized in that the said spacer is flat and in that an orifice (11) pierced in the flat spacer receives the ends of the said coil (12) for the purpose of folding them.

4. Method according to any one of the preceding claims, characterized in that the positioning of the pieces to be encased by injection is achieved by means of an orifice (10) pierced in the spacer of the said bifilar cable (9).

5. Method according to any one of the preceding claims, characterized in that the connecting stage consists in soldering, with a filler metal, the ends (1,2) of the coil to the ends of the conductors (4,5) of the said bifilar cable.

6. Method according to any one of Claims 1 to 4,





characterized in that the connecting stage consists in connecting the ends (1,2) of the said coil to the ends of the conductors (4,5) of the said bifilar cable with a pair of crimping sleeves (13,14).

5 7. Method according to any one of the preceding claims, characterized in that the electrical conductors (4,5) of the said bifilar cable (9) are single-strand conductors.

8. Method according to any one of the preceding
10 claims, characterized in that the injection employs a mould in two parts (15,23) having an injection nozzle (20) turned towards the said coil (12) and situated opposite the said bifilar cable (9) with respect to the coil (12).

15 9. Method according to any one of the preceding claims, characterized in that the said insulation thermoplastic is based on copolyamide resin.

10. Method according to Claim 9, characterized in that the said sheath is of PVC, as is the outer
20 insulant of the said bifilar cable.

11. Degaussing loop including a coil enclosed over almost all of its periphery in a tubular insulating sheath, a connection by two insulated electrical conductors, made at the ends of the said
25 coil, and an insulating casing for concealing the connection and the uncovered region of the coil by covering over the ends of the said sheath, characterized in that the connection is provided by a bifilar cable (9), the electrical insulant of which
30 includes a spacer linking the sheaths of the conductors (4,5) together, and in that the said casing (22,28) consists of an overmoulding of insulating thermoplastic.

12. Loop according to Claim 11, characterized in
35 that the said casing consists of an inner casing (22) and of an outer casing (28); the said inner casing consisting of a precoating obtained by injection of insulating thermoplastic and the said outer casing consisting of an overmoulding also obtained by





injection of insulating thermoplastic.

13. Loop according to either of Claims 11 and 12,
characterized in that the electrical link between the
ends of the said coil (12) and the conductors (4,5) of
5 the said bifilar cable is made with crimping sleeves
(13,14).

14. Loop according to Claims 12 and 13,
characterized in that the said crimping sleeves (13,14)
are buried in the said precoating (22) and come flush
10 with the surface thereof.

15. Loop according to any one of Claims 11 to 14,
characterized in that the said spacer is flat in shape.

16. Loop according to Claim 15, characterized in
that the said spacer includes an orifice (11) traversed
15 by the ends (1,2) of the said coil (12) in order to
retain the said cable (9) close to the said sheath (3).

17. Loop according to either of Claims 15 and 16,
characterized in that the said spacer includes an
orifice (10) intended for mechanical indexing in the
20 mould (15,21) serving for injection of the said casing
(22,28).

