(54) Title: DEVICE FOR GENERATING HIGH VOLTAGE IN THE CONTROL OF CATHODE-RAY TUBES

(57) Abstract: It is disclosed a high-voltage generating device to be used in the control of cathode-ray tubes in which a flyback transformer (2) and a potentiometer (4) are respectively housed in a holding structure (3) and a housing body (5) that are directly linked to each other. The device further comprises an air space (7) interposed between the flyback transformer (2) and potentiometer (4) in order to limit the heat flow from the potentiometer to the transformer. The device as a whole is therefore capable of generating higher powers as compared with the same devices of the known art, the inner temperature of the transformer being the same.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
DEVICE FOR GENERATING HIGH VOLTAGE IN THE CONTROL OF CATHODE-RAY TUBES

Description

The present invention relates to a device for generating high voltage in the control of cathode-ray tubes.

It is known that television sets and monitors basing their operation on a cathode-ray tube obtain an image on the screen by sending a suitably controlled beam of electrons onto the phosphorus particles present therein.

For doing so it is first of all necessary to create and accelerate the electrons towards the screen by a high-voltage electric field.

Secondly, it is necessary to control the beam movement so that it fills the whole screen, from the upper left corner to the lower right corner.

This scanning is carried out with two magnetic fields perpendicular to each other: one of them, the horizontal field moving from the left to the right, is generally created by the horizontal deflector coils; the other, with a movement from top to bottom, is created by the vertical deflector coils.

The task of ensuring the necessary energy both to maintain the high-voltage field of the tube, and carry out the horizontal or line deflection substantially relies on a single component, i.e. a device for high-voltage generation generally comprising two main elements, a flyback transformer or horizontal output transformer and a potentiometer electrically connected thereto, in which this potentiometer for example supplies
voltages to the focusing grids of the cathode-ray tube.

According to a first known technique, devices are provided in which the horizontal transformer and potentiometer are supplied as components separated from each other and subsequently assembled (spaced apart from each other and only electrically connected) within the television set or monitor during assembling of the last mentioned apparatus.

It is clear that supplying the high-voltage generating device in the form of separated components not only increases management, storage and transportation costs, but also involves further cost increases due to final assembling of the device in the television set or monitor.

In order to solve the above mentioned problems, high-voltage generating devices have been recently widely spread in which the horizontal transformer and potentiometer are made and assembled with each other so as to constitute a unitary body. This body is then supplied to television and monitor assemblers who therefore have to bear reduced costs for final assembling of these apparatus.

Obviously, miniaturization of all electronic components of a television set is an additional problem nowadays present on the market obviously for reasons of costs involving the whole production chain.

It should be pointed out however that the device for high-voltage generation produces a great amount of heat during operation.

The generated temperature value is mainly connected with
heat produced by the transformer windings and heat generated by the ferrite core and is also due to heat generated by the potentiometer plate.

It is also to be noted that the operating life of the transformer greatly depends on the operating temperature of the latter.

An empiric rule that however has been always substantially confirmed states that a 10-degree variation in the operating temperature of the transformer, the other conditions being the same, is able to double (in case of a reduction of 10 degrees) or halve (in case of an increase of 10 degrees) the operating life of the product.

It is therefore apparent that for being able to increase the power delivered from the device without reducing the intrinsic reliability of same, it is necessary either to come back to a technical solution in which potentiometer and horizontal transformer are separated and then assembled by the monitor or television manufacturers, or re-size the components themselves thereby increasing bulkiness, thickness and weights of same.

Accordingly, it is an aim of the present invention to overcome the above mentioned drawbacks and/or operating limits.

A first aim of the invention is to allow manufacture of a device for high-voltage supply in which the intrinsic reliability and compactness of the product can be maintained unchanged, while allowing cathode-ray tubes requiring powers up to even 120 watts and more to be energised.
It is a further aim of the invention to maintain the sizes and structural features of the device substantially unchanged, so that production, assembling and storage costs of the devices can be maintained within limits.

The foregoing and further aims that will become more apparent in the course of the present description are substantially achieved by a device for high-voltage generation in the control of cathode-ray tubes in accordance with the features set out in the appended claims. Further features and advantages will be best understood from the detailed description of a preferred, but not exclusive, embodiment of the invention, with the aid of the accompanying drawings, in which:

- Fig. 1 shows a device for high-voltage generation in the control of cathode-ray tubes in accordance with the present invention;
- Fig. 2 shows the device in Fig. 1 partly sectioned at the potentiometer; and
- Fig. 3 shows the device in Fig. 1 in which the box-shaped body forming the potentiometer is separated.

With reference to the drawings, a device for high-voltage generation in the control of cathode-ray tubes has been generally identified by reference numeral 1.

As previously pointed out, the devices for high-voltage generation being the object of the present invention are currently used for energising and controlling cathode-ray tubes in monitors and televisions.

In particular and as viewed from the accompanying drawings, the device generally comprises at least one horizontal output transformer or flyback transformer 2, structure and operation of which are known and use of which particularly occurs in the television and monitor
sector, and a potentiometer or resistive divider 4 that receives an input voltage and, by means of an adjusting knob, outputs a proportional voltage from a minimum value to a maximum value of the input voltage.

Generally, the input voltage value in the potentiometer is established by the secondary windings of the transformer to which a potentiometer inlet is electrically connected.

The output voltage from the potentiometer is on the contrary applied to the focusing grid of the cathode-ray tube.

Obviously, based on the features of the cathode-ray tube, the potentiometer will be able to supply the latter with high voltage to a greater or lesser degree, i.e. the potentiometer must be able to supply the tube with the maximum focusing voltage that the tube will require.

From a structural point of view the horizontal output transformer 2 is housed in a respective holding structure 3 whereas the potentiometer 4 is in turn contained in a respective housing body 5.

In particular, it is to be noted that the holding structure 3 and housing body 5 are directly in engagement with each other so as to ensure an appropriate compactness of the whole device for high-voltage generation.

As can be seen from the accompanying drawings, the holding structure 3 of the horizontal output transformer 2 has two suitable slide guides 8, preferably with a C-shaped section, extending along a longitudinal direction shown in Fig. 2 and denoted at "L".
Correspondingly, the housing body 5 of the potentiometer 4 has respective protrusions 9 designed to allow engagement and positioning by sliding of said potentiometer with respect to the horizontal output transformer 2.

In other words, at least during assembling the two components can be mutually engaged in a removable manner and the subsequent possible locking of same will take place through resin-bonding of an element on the other, for example.

Looking at Fig. 3, on the contrary, with reference to the housing body 5 designed to contain the potentiometer 4, it is possible to see that it mainly consists of at least one base 10 (carrying protrusions 9 and directly in engagement with the holding structure 3 of the transformer) and of a cover 11 in engagement with base 10 (by interference, for example) in a removable manner at least during the assembling steps of the device.

Generally, the potentiometer 4 circuitry will be housed in the cover 11 of the housing body 5 and will have, in its lower portion, appropriate electrical connection terminals designed to allow the electric connection with the transformer.

For the purpose, base 10 will have appropriate holes to enable centring and passage of these electrical terminals and, correspondingly, connection with the transformer in the underlying region.

Since, as above said, the potentiometer while working generates heat due to dissipation of some power on an appropriate plate, the device advantageously comprises a thermal-cutting region 6 interposed between the
potentiometer or divider 4 and the horizontal output transformer 2.

In this way at least the heat flow from potentiometer 4 to transformer 2 is restricted.

The above is achieved while maintaining the potentiometer as much as possible close to the transformer also for reasons of electric connection between the two parts.

In detail the thermal-cutting region 6 comprises at least one air space 7 (see Figs. 2 and 3, in particular) that appears to be substantially closed.

Said air space, provided it is of appropriate sizes, can be interposed between the housing body 5 and holding structure 6 or, as an alternative, it can be directly provided within the housing body and/or the holding structure 3.

The particular embodiment shown allowing the greatest construction simplifications, provides for the air space 7 to be defined between the base 10 and cover 11 of the housing body 5.

The air space 7 shall in particular have sizes adapted to allow an important temperature reduction (approximately included between about 4 and 8 degrees) of transformer 2, the delivered power being the same, under use conditions of the device.

Alternatively and in a quite equivalent manner, the high-voltage generating device being the subject of the present invention shall be able to keep the transformer temperature unchanged while being capable of supplying output powers greater than those of the devices of the
standard type.

Looking at the device along a transverse extension direction T, it is therefore possible to see the presence of the horizontal output transformer housed in the holding structure 3; there is then the base 10 of the housing body 5, the air space 7 and the potentiometer 4, one after the other.

Preferably the thermal-cutting region or air space 7 along the transverse extension direction T shall have a thickness included between 3 mm and 8 mm depending on requirements of temperature and power dissipated by the potentiometer.

The invention achieves important advantages.

It will be first of all recognised that by adopting the structure as previously described it will be possible either to obtain devices of more reduced sizes than those of the transformers and potentiometers presently on the market, the inner temperature of the potentiometer and the delivered power being the same, or to keep the inner temperature of the transformer unchanged and increase the power delivered from the device, the sizes being the same.

The above allows manufacture of a device of a very compact structure, sent to the assemblers already in a unitary piece and therefore not requiring subsequent steps for assembling and electric connection.

Due to the above, the production and management costs too can be maintained substantially unchanged.
CLAIMS

1. A device for high-voltage generation in the control of cathode-ray tubes, comprising:
   - at least one horizontal output transformer or flyback transformer (2) housed in a respective holding structure (3);
   - at least one potentiometer or divider (4) electrically connected to said horizontal output transformer (2), said potentiometer or divider (4) being contained in a respective housing body (5), said holding structure (3) and housing body (5) being in engagement with each other, characterized in that the device further comprises a thermal-cutting region (6) interposed between the potentiometer or divider (4) and the horizontal output transformer (2) to limit at least the heat flow from the potentiometer or divider (4) to the transformer (2).

2. A device as claimed in claim 1, characterised in that said thermal-cutting region (6) comprises at least one air space (7) interposed between the horizontal outlet transformer (2) and the potentiometer or divider (4).

3. A device as claimed in claim 2, characterised in that said air space (7) is substantially closed and disposed between the housing body (5) and holding structure (3), or in the housing body (5) or also in the holding structure (3).

4. A device as claimed in anyone of the preceding claims, characterised in that the holding structure (3) of the horizontal output transformer (2) and the housing body (5) of the potentiometer (4) are susceptible of being engaged with each other in a removable manner at least during the assembling step of the device.
5. A device as claimed in anyone of the preceding claims, characterised in that the holding structure (3) of the horizontal output transformer (2) has a slide guide (8) adapted to receive in engagement corresponding protrusions (9) of the housing body (5).

6. A device as claimed in claim 5, characterised in that the slide guide (8) has a double-C section and extends in a plane parallel to a longitudinal extension axis (L) of the device.

7. A device as claimed in anyone of the preceding claims, characterised in that the housing body (5) comprises at least one base (10) and one cover (11) for engagement with the base (10) in a removable manner at least during the assembling steps of the device.

8. A device as claimed in claim 7, characterised in that the thermal-cutting region (6) is defined between said base (10) and cover (11) of the housing body (5).

9. A device as claimed in anyone of the preceding claims, characterised in that said holding structure (3) and housing body (5) are directly linked to each other.

10. A device as claimed in claim 7, characterised in that the potentiometer (4) circuitry is housed in said cover (11) of the housing body (5).

11. A device as claimed in claim 2, characterised in that the air space (7) has sizes adapted to allow a temperature reduction included between 4 and 8 degrees in the transformer (2), the delivered power being the same, under use conditions of the device.

12. A device as claimed in claims 2 and 7, characterised
in that it exhibits, along a transverse extension direction (T), the horizontal output transformer (2), an upper surface of the holding structure (3), the base (10) of the housing body (5), the air space (7) and the potentiometer (4).

13. A device as claimed in anyone of the preceding claims, characterised in that the thermal-cutting region has a thickness included between 3 and 8 mm in a transverse extension direction (T).
### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>A</td>
<td>2 July 1985 (1985-07-02)&lt;br&gt;claims 1,4&lt;br&gt;column 6, line 59 - column 7, line 19&lt;br&gt;figures 2,4</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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