

HIGH-VOLTAGE CONNECTION DEVICE, IN PARTICULAR
FOR A HIGH-VOLTAGE TRANSFORMER WITHOUT HIGH-VOLTAGE
OUTPUT CABLES AND WITH A REMOVABLE POTENTIOMETRIC UNIT

The present invention relates to a high-voltage
5 connection device, in particular for a high-voltage
transformer without high-voltage output cables and with
a removable potentiometric unit.

A high-voltage (HV) connection, such as a car
spark plug connection, is generally made using at least
10 one connector socket crimped onto the connecting wire;
this connector socket may be a female connector which
fits onto a terminal or male connector, or alternatively
may be a male connector which is inserted into a cup or
into a female connector. Such a connection therefore
15 requires crimping of a connector socket onto the connect-
ing wire, which requires special apparatus.

Generally, a high-voltage transformer intended to
supply colour cathode-ray tubes comprises an integrated
potentiometric unit which delivers the voltages of the
20 prefocusing grids G3 and screen G2 of these tubes.
However, the high-voltage cable and the grid output
cables G2 and G3 are fixed and integral with the trans-
former. These cables, whose lengths can vary according to
the users, constitute a problem for manufacturing,
25 handling and mounting the transformers. Furthermore, the
potentiometric unit integrated with the transformer
requires internal cabling operations which may be detri-
mental to the reliability of the product.

An oscillation locking element for a motor
30 vehicle ignition harness is known from document
FR-E-71570. This locking element comprises a sleeve made
from insulating material in which is located a block made
from conducting elastic material. According to a first
embodiment, the block comprises, before mounting in the
35 sleeve, its own output connectors. This device cannot
therefore be used for making the connection between
removable conductors. According to the second embodiment
described in this document, there is placed in an

insulating sleeve a block made from conducting elastic material, in each end of which is formed a cavity intended to receive a component such as a spark plug head. This second embodiment does not make it possible, either, to make the connection between removable conductors with a rigid core.

The subject of the present invention is a device for HV connection between at least two removable conductors with a rigid core, which device is reliable, affords durable high-quality connection, is easy and quick to use and does not require any special apparatus.

A further subject of the present invention is a connection device for a high-voltage transformer whose output cables, such as the cable for linking to the potentiometric unit and the high-voltage cable, are removable and make a reliable connection which is as simple as possible.

The high-voltage connection device according to the invention is a device for connection between at least two removable conductors with a rigid core, the said device comprising a sleeve made of an insulating material into which a block of silicone loaded with a conducting powder is fixed, into the faces of which the stripped ends of these conductors may easily be pushed.

The high-voltage transformer according to the invention comprises removable connection means for joining high-voltage output cables to it. These means comprise, for each output of the transformer, a rapid cable fastening device and a device for contact with the conductor or core of the cable. According to a preferred embodiment of the invention, the rapid fastening device is a clip-fastening device comprising a first part integral with a "chimney" integrally moulded with the covering which covers the insulator for encapsulating the coil of the transformer, the internal diameter of this chimney being substantially equal to the external diameter of the cable, the base of this chimney being situated above or in proximity to the corresponding terminal or output plug, this terminal or plug being

joined to a conducting block, preferably made of silicon loaded with a conducting material, this block closing the base of the chimney in a sealing manner, the second part of the clip-fastening device being fixed to the cable
5 near to its end and positioned such that the end of the conductor or of the core of the cable is in good contact with the said block when the end of the cable is pushed into the chimney and the two parts of the rapid fastening device interlock.

10 The present invention will be better understood on reading the detailed description of several embodiments, taken as non-limiting examples, and illustrated by the attached drawing, in which:

- Figure 1 is a partial sectional view of a high-voltage transformer according to the invention, with two
15 output cables;

- Figure 2 is a highly simplified top view of a potentiometric unit arranged on a printed circuit separate from the transformer, this unit being joined to a
20 transformer such as that in Figure 1;

- Figure 3 is a highly simplified front view of a high-voltage transformer according to the invention, showing several possibilities for fixing the potentiometric unit, and

25 - Figure 4 is a sectional view of a HV connection device in accordance with the invention.

Figure 4 shows an HV connection device in accordance with the invention. The example represented relates to the joining of a motor vehicle spark plug with a VHV supply wire of this spark plug, but it is obvious that
30 the invention is not limited to such an application and may be used for making any HV, or even low-voltage, connection, on the condition that a low current is passed through it.

35 The example in Figure 4, represented when the connection is made, relates to a connection between an ignition spark plug 30 and an HV supply wire 31. For this purpose, a sleeve 32 made of a rigid insulating material is produced, comprising a constriction 33 approximately

at its middle. One of the ends of the sleeve 32 fits onto the spark plug 30, constriction 33 forming an end-stop for the upper part of the spark plug. In order to make the seal on the spark plug side, it is possible to make
5 near the edge of this end of the sleeve an internal groove in which is arranged an appropriate seal 34. The electrode of the spark plug terminates in an axial metal tip 35.

In the other end of the sleeve 32, whose internal
10 profile is cylindrical, is inserted with slight force a conducting block 36, coming to abut on the constriction 33. The length of the said other end of the sleeve 32 is greater than the length of the block 36, which is fixed thereto by a ring 37 which may be screwed, adhesively
15 bonded, or forcibly fitted thereto. The hole in the ring 37 is cylindrical towards the outside of the sleeve and conical towards the block 36. The cylindrical part of this hole has a diameter slightly less than the external diameter of the insulator of the wire 31, whilst its
20 conical part is used to guide, as required, the stripped end (end of the core) 38 of the wire 31, which is pushed into the block 36. Thus, the ring 37 advantageously acts as a means for sealing the connection on the wire 31 side. The tip 35 is pushed into the block 36 facing the
25 core 38. The block 36 is advantageously made from silicone loaded with an electrically conducting powder. The tip 35 as well as the core 38 can be pushed easily therein, without needing to be pointed and without risk of twisting, the core 38 nevertheless needing to be
30 relatively rigid.

Obviously, such a connection does not make it possible to pass very high currents, but it is very well suited for low currents such as those in motor vehicle spark plugs or high-voltage television transformers.

35 The use of the connection device of the present invention is explained hereinbelow with reference to a high-voltage transformer for a television set, with a focusing-voltage output and a high-voltage output for the anode of the cathode-ray tube, but it is obvious that the

invention is applicable to high-voltage transformers for television sets comprising a different number of outputs, as well as to high-voltage transformers intended for other uses.

5 The high-voltage transformer 1 represented in Figure 1 essentially comprises a magnetic circuit 2 and a coil 3 (not represented in detail) with several windings. This transformer may for example be of the "split diode" type, that is to say of the type with a
10 split secondary winding separated by diodes. The coil 3 is encapsulated in a moulded resin in a leaktight manner, and this encapsulation may be coated with a protective covering, not shown.

 The transformer 1 comprises on one of its faces,
15 for example the lower face, several pins 4 joined to primary windings, and possible secondary low-voltage windings of the coil 3, these pins 4 being intended to fix the transformer 1 onto an appropriate printed circuit and to make the electrical connections with the conduc-
20 tors of this printed circuit.

 The transformer 1 comprises, in the present case, two high-voltage outputs: a focusing-voltage output, for supplying, via a cable and a potentiometric unit, the grids G2 and G3 of a cathode-ray tube (not shown) whose
25 anode is supplied with very high voltage via a cable 6 via another output of this transformer.

 In Figure 1, the embodiment details allowing the connection of the focusing-voltage output have been represented in an exploded sectional view, it being
30 understood that the connection of the other high-voltage output is produced in a similar manner.

 At the time of moulding the protective covering of the resin for encapsulating the coil 3, it is intended to form, projecting from the protective covering, preferably opposite the pins 4, two "chimneys" 7, 8 intended to
35 receive the ends of the cables 5, 6 respectively. These chimneys are short enough not to constitute a problem for use and handling of the transformer, and not to make them fragile, whilst being long enough to prevent electrical

flashover with any part which is earthed. Their external length may advantageously be from approximately 2 to 4 cm. Their wall thickness, in particular at their base, must be sufficient not to make them fragile, this
5 thickness being advantageously from approximately 2 to 5 mm.

The chimneys 7 and 8 communicate with the internal space of the said covering, and in particular with the connection terminals of the plugs or ends of corresponding high-voltage windings. These chimneys may either
10 stop at their base or junction with the covering, or, as shown in the drawing, extend inside the covering in order to meet the connection terminals, the duct 9 thus formed inside the covering being capable of acting as a housing
15 for elements such as resistors, capacitors, protection elements, etc.

The chimney 7 comprises, substantially at its base, a slight conical constriction 10, widening outwards, making it possible correctly to centre the end of
20 the cable in the chimney. Just after this constriction, inwards, is located in the chimney 7, and in the present case more precisely in the duct 9, a block 11 made of a conducting material, closing the chimney in a sealing manner. According to a preferred embodiment of the
25 invention, this block is made of silicone loaded with a powder having good electrical conductivity.

A conductor 12, joined in a manner not shown to the high-voltage winding supplying the necessary focusing voltage to the grids G2 and G3 is pushed into the internal
30 face of the block 11.

Advantageously, the conductor 13 of a discharge resistor 14 called a "bleeder" is pushed into the internal face of the block 11, the other conductor of this resistor being pushed, in a manner not shown, into the
35 internal face of the block of the chimney 8.

A hook device 15, for example, as shown in the drawing, in the form of a socket, one of whose ends opens out into a conical collar 16, and the other of whose ends is split along one or two generatrices, is threaded onto

the end of the cable 5. The internal diameter of this socket is substantially equal to the external diameter of the cable 5.

Moreover, the chimney 7 comprises at its free end
5 a clip device 17 interacting with the hook device 15. According to the preferred embodiment represented in the drawing, the device 17 is a lug or protuberance formed on the internal wall of the chimney 7. According to another
10 embodiment (not shown), the clip device is a cylindrical socket threaded onto the chimney and comprising such a lug. The dimensions of the collar 16 of the lug 17 are such that they can clip together, firmly holding the cable 5 in the chimney 7, and, if required, the cable 5
15 can be withdrawn by pulling strongly on the cable, without damaging them. The lug 17 may be made with the same material as that of the chimney 7, or may be metal and joined onto the chimney. The aforementioned sockets are made from an appropriate plastic.

The socket forming the hook 15 is positioned on
20 the cable 5 so that the stripped end 18 of this cable is pushed at least 3 mm into the block 10 when clipping the hook and the lug, in order to ensure a good electrical contact and prevent the formation of ozone.

Figure 2 represents, in a simplified manner, a
25 potentiometric unit 19, comprising the potentiometers 20 and 21. The slides of the potentiometers 20 and 21 are joined, in a manner not shown, by the cables 22 and 23 to the grids G2 and G3 respectively of the cathode-ray tube supplied by the transformer 1. This potentiometric unit
30 19 either forms part of one of the printed circuits of the television set, or is fixed onto one of these circuits. One of the ends of the cable 5 is joined to the transformer, the other end of the cable 5 is joined to this unit, advantageously by a connection device with a
35 conducting block similar to that fitted to the chimney 7. The cables 22 and 23 may be fixed onto the unit 19 permanently or removably, and in the latter case, it is also possible to use a rapid fastening device and conducting blocks.

Figure 3 represents, in a simplified manner, one embodiment for which the potentiometric unit 24, with its potentiometers 25, 26 is fixed onto one of the faces of the transformer by clip fastening (unit 24 represented in solid lines for a first solution, and in broken lines for two other possibilities). The cables 27 and 28 for joining to the grids G2 and G3 of the cathode-ray tube may be fixed onto the unit 24 permanently or removably, in the latter case, also using conducting blocks.

The removable fixing of the very high voltage cable 6, with its sucker 6A, in the chimney 8 is similar to that of the cable 5 in the chimney 7, and will not be described in more detail.

By virtue of the invention, it is possible to arrange the high-voltage transformer on its printed circuit in the position in which the effect of its radiation on its surroundings is the least, and the potentiometric unit may be positioned where it is easy to adjust its potentiometers.

Another advantage of the invention is that it makes it possible to dissociate the transformer from the potentiometric unit and the corresponding cables, which simplifies repair in the event of a fault in one of the elements.

Finally, the transformer manufacturer no longer has to deal with bulky cables, and the user can fit the elements of the high-voltage circuit at the end of manufacturing.



CLAIMS

1. Device for high-voltage connection between at least two removable conductors (5, 6, 12, 13) with a rigid core, the said device comprising a sleeve (7, 8)
5 made of an insulating material into which a block (11) of silicone loaded with a conducting powder is fixed, into the faces of which (11) the stripped ends of these conductors (5, 6, 12, 13) may easily be pushed.
2. High-voltage connection device according to Claim
10 1, characterised in that the sleeve comprises an uncouplable rapid fastening device (17) for a conductor, this conductor being fitted with a hook device (15) interacting with the said fastening device.
3. Device according to Claim 1 or 2, characterised
15 in that the sleeve comprises means for sealing the connection at its two ends (37, 34).
4. Connection device according to one of Claims 1 to 3, characterised in that it is that of a high-voltage television transformer with a removable potentiometric
20 unit, this transformer having a high-voltage output (8) for supplying the anode of a cathode-ray tube, and a high-voltage output (7) for the focusing voltage, and in that the said sleeve consists, for each of the outputs, of a chimney (7, 8) integrally moulded with the
25 protective encapsulation covering of the coil (3) of the transformer.
5. Device according to Claim 4, characterised in that the chimney comprises a slight conical constriction(10) for guiding the end of the cable (18).
- 30 6. Connection device according to either of Claims 4 or 5, characterised in that its focusing-voltage output cable (5) is removably connected to the potentiometric unit (19, 24).
7. Connection device according to any one of Claims
35 4 to 6, characterised in that the potentiometric unit (19) is fixed to or forms part of a printed circuit.
8. Connection device according to any one of Claims 4 to 6, characterised in that the potentiometric unit (24) is removably fixed to one of the faces of the



transformer.

9. Connection device according to any one of Claims 4 to 8, characterised in that the cables (22, 23, 27, 28) for linking between the potentiometric unit and the grids of the cathode-ray tube supplied by the transformer are removably connected to the potentiometric unit.

10. Connection device according to any one of Claims 4 to 9, for a transformer with two high-voltage outputs, characterised in that the ends of the conductors of one so-called "bleeder" resistor (14) are each pushed into a corresponding chimney conducting block, inside the protective covering of the transformer.

11. High-voltage transformer for a cathode-ray tube, characterised in that it comprises at least one connection device according to one of Claims 4 to 10.