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ANTICONTACT CAP FOR X-RAY TUBES

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Fig. 1.

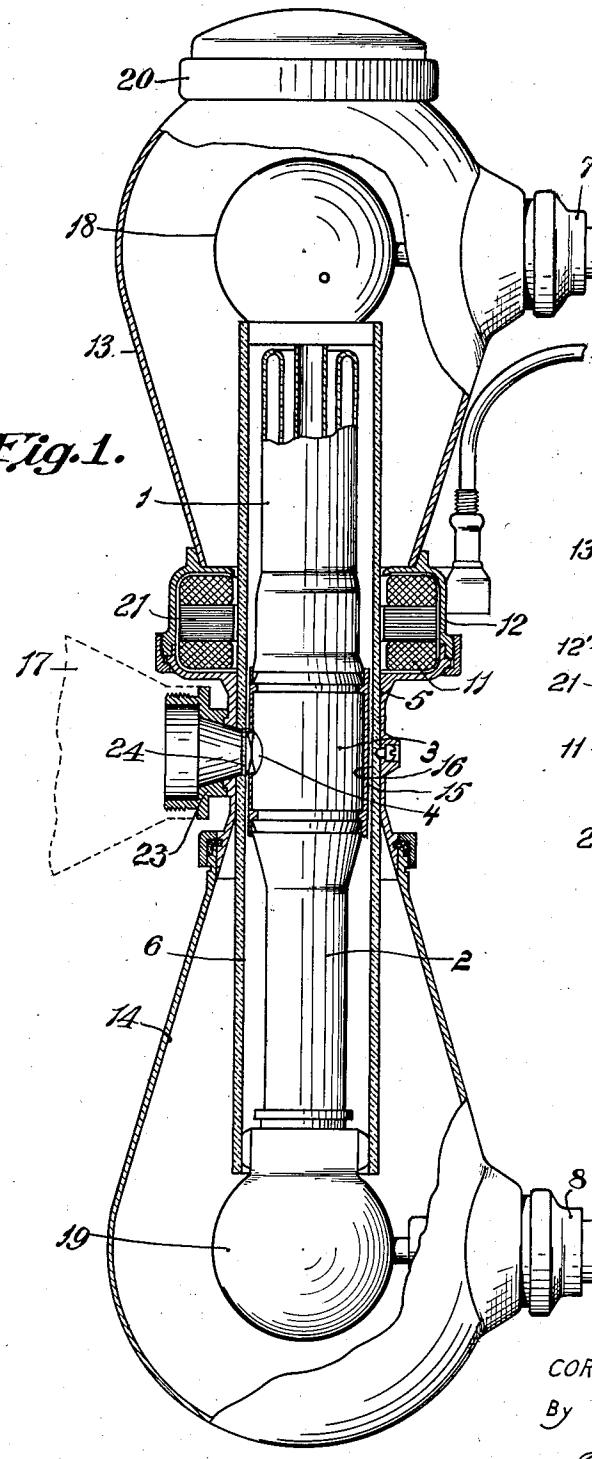
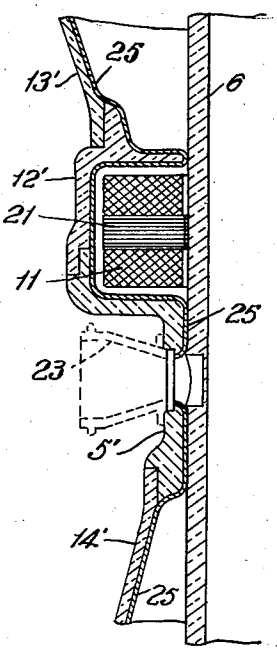


Fig. 2



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ANTICONTACT CAP FOR X-RAY TUBES

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4 Claims. (Cl. 250—35)

In order to support X-ray tubes at the middle, they are generally surrounded by a sleeve which may be grounded during the operation of the tube; which sleeve often extends sufficiently to surround the entire X-ray tube as a protective sheath.

With X-ray tubes provided with an anode which rotates during the operation of the tube, the magnet winding serving to drive the anode gave rise to inconveniences. Between this winding and the anode end of the tube there was observed a breakdown which could be prevented, for example by filling the air gap with an insulating material.

According to the invention, for this purpose use is made of a hollow body of solid insulating material, which body surrounds the tube at least over part of its length. This hollow body insulates the central part of the tube body from the sheath which surrounds the tube and which may be connected to ground, and in addition insulates from the other parts of the tube, the stator winding used to rotate the anode.

The presence of such a hollow body involves the slight drawback of weakening the X-rays which must pass through it. This drawback may, however, be reduced to a minimum by locally reducing the thickness of the hollow body in the vicinity of the window destined for the exit of the X-rays.

A preferred form of construction of the tube is characterized by an annular central metal part adapted to hold the hollow body and the stator winding serving to rotate the anode, and also to carry two detachable parts of the sheath which surround the ends of the X-ray tube.

The invention will be more clearly understood by referring to the accompanying drawing in which:

Figure 1 is a partly sectionized side view of an X-ray tube showing one embodiment of the invention;

Fig. 2 is a sectionized view of a portion of an X-ray tube showing another embodiment of the invention.

Referring to Fig. 1, the X-ray tube shown therein consists of two insulating neck-portions 1 and 2 serving for leading in the electrodes and sealed to one another by means of a central metal ring 3, provided with a window 4, to allow the X-rays to emerge from the tube.

The X-ray tube is surrounded by a metal protective sheath consisting of a central part 5, and two end parts 13 and 14. The metal sheath may be grounded during operation and affords protection against contact with parts of the tube under high tension. Instead of being made of metal the protective sheath may be of insulating material and be made conductive on at least one of its surfaces.

The high-voltage energy is supplied to the tube through high-voltage cables 9 and 10 which are secured to the end parts 13 and 14 by sleeves 7 and 8 respectively. The cables 9 and 10 are provided with a metal coating which is conductively connected to the metal of the protective sheath.

In order to increase its resistance to electric voltages, the X-ray tube is surrounded—preferably throughout its length—by a hollow body 6 of good insulating material. The body 6 surrounds at least the central part of the body of the tube and insulates the X-ray tube from the sheath which is to be grounded, and also insulates the stator winding 11 and magnetic armature 21—which serve to rotate the anode—from the other parts of the tube. The winding 11 is arranged between the hollow insulating body 6 and the outer wall of the protective sheath, and within an annular hollow body 12, which body is supported by the central part 5 of the protective sheath.

The two end parts 13 and 14, which surround the ends of the X-ray tube, are detachably secured to the central part 5. Between the hollow insulating body 6 and the metal ring 3, there is provided a layer 15 of lead which prevents undesired X-rays from emerging from the tube.

To eliminate the electric field set up between the metal ring 3 and the insulating body 6, a metal film 16 should preferably be provided on the inner wall of the insulating body 6 and opposite the middle of the X-ray tube. The metal film 16 is conductively connected to the metal ring 3 by a contact spring (not shown).

Opposite the window 4, which serves for the exit of the X-rays, the metal sheath is provided with an aperture and with a flanged tube 23 to which a localizer 17, indicated by dotted lines, may be secured. Between the aperture defined by the tube 23 and the window 4, the insulating body 6 has a circular portion 24 of reduced thickness, for the purpose of lessening the absorption of the X-rays by the insulating body.

To insure a uniform distribution of the electric field within the protective sheath at the ends of the X-ray tube, the electrode supply conductors which protrude from the X-ray tube are covered with metal bodies 18 and 19, which preferably have substantially the shape of a sphere

whose surface is for the greater part concentric with the end surfaces of the end portions **13** and **14**.

The metal bodies **18** and **19** may be hollow in order to allow for the supply of a liquid or gaseous cooling agent, or again they may be solid in order to be capable of storing the heat. If in view of a higher load, a more intense cooling should be desired, a small fan may be arranged in a cap **20** at one of the ends of the protective sheath.

Figure 2 shows a portion of a tube whose construction is similar to that shown in Fig. 1 except for the following: The protective sheath consists of two end portions **13'—14'**, a central portion **5'**, and an annular portion **12'**, all portions being of insulating material. The central portion **5'** is provided with an aperture for the exit of the X-rays and has secured to it a flanged tube **23** (indicated in dotted lines).

The end portions **13'** and **14'** are secured to the annular portion **12'** and the central portion **5'** respectively, and surround a hollow insulating body **6** which is the same as that shown in Fig. 1, and which surrounds an X-ray tube (not shown). The inner surfaces of the end portions **13'** and **14'**, annular portion **12'**, and central portion **15'**, are made conductive in known manner by means of a coating **25** of conductive material.

What I claim is:—

1. In an X-ray tube comprising an enclosing envelope and a rotary anode therein, an electromagnetic stator for rotating said anode, an insulating sleeve surrounding said tube and extending at least along the length of the anode, and a metal protective sheath adapted to be grounded during the operation of the tube surrounding the tube and insulating sleeve, said sheath being formed with a hollow annular body in which said stator is arranged.

2. An X-ray tube comprising an enclosing envelope having a metal waist portion and vitreous portions sealed to each end of said waist portion, electrodes for said tube carried by said vitreous portions, a lead layer on said waist portion, a cylinder of insulating material surrounding said envelope and in spaced relationship therewith, a spherical metal body secured to each end of said tube and in contact with a corresponding electrode, said bodies having portions extending with a snug fit into the ends of said cylinder to support the tube from said cylinder, a metal sheath surrounding said tube and cylinder and comprising a portion closely surrounding that cylinder portion which opposes the metal waist portion, and serving to support said cylinder and tube, said sheath having flared portions with rounded ends, said ends being substantially concentric with the metal bodies, and shockproof cables secured to said flared portions for supplying high voltage to said bodies and electrodes.

3. An X-ray tube comprising an envelope and two electrodes within said envelope spaced to form a discharge gap substantially in the center of the tube, an insulating cylinder surrounding the tube and in spaced relationship thereto, a conductive coating on the inner surface of said cylinder opposite the discharge gap and having substantially the same potential as the envelope portion opposite the discharge gap, and a metal sheath adapted to be grounded during the operation of the tube surrounding the cylinder and the tube, said sheath closely surrounding said cylinder where it is provided with the conductive coating.

4. An X-ray tube comprising an enclosing envelope, a rotary anode and a cathode mounted therein and spaced apart to form a discharge gap, an electromagnetic stator for rotating said anode, an insulating sleeve surrounding said envelope at least throughout the length of said discharge gap and said anode, and a protective metal sheath surrounding the sleeve and the tube and having a central portion closely surrounding that sleeve portion which opposes the discharge gap, said sheath being provided opposite the rotary anode with an annular portion containing said stator, said sheath having two flared portions, one being secured to said annular portion and the other being secured to the opposite end of said central portion, said flared portions having rounded ends arching over the ends of the tube.

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