W. D. COOLIDGE.

X-RAY TUBE SHIELD.

APPLICATION FILED MAR. 27, 1919.

1,437,290. Patented Nov. 28, 1922.

Fig. 1.

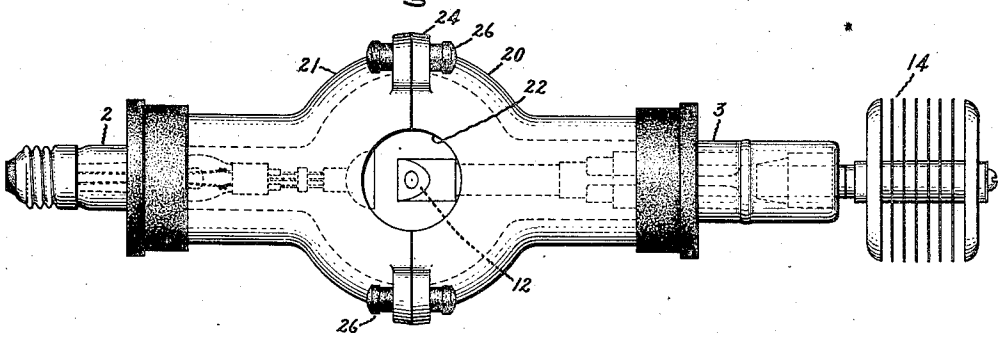


Fig. 2.

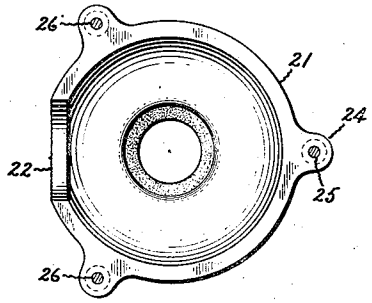
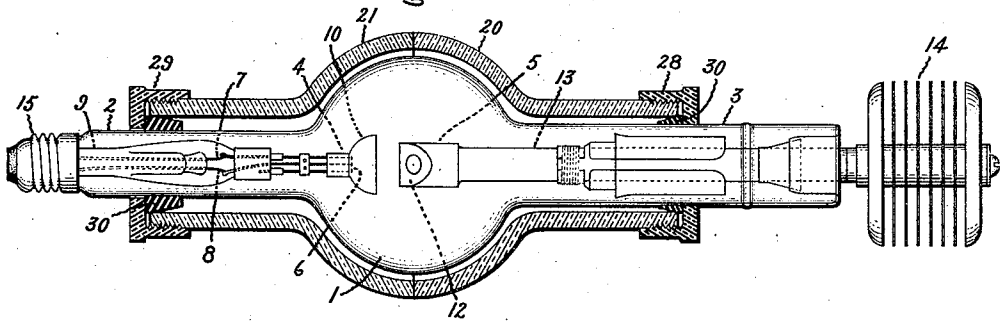


Fig. 3.



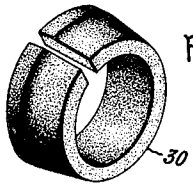


Fig. 4.

Inventor:
William D. Coolidge,
by Albert G. Davis
His Attorney

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UNITED STATES PATENT OFFICE.

WILLIAM D. COOLIDGE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

X-RAY-TUBE SHIELD.

Application filed March 27, 1919. Serial No. 285,461.

To all whom it may concern:

Be it known that I, WILLIAM D. COOLIDGE, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in X-Ray-Tube Shields, of which the following is a specification.

The present invention comprises an improved shield or protecting envelope for X-ray tubes, and the object of the improved construction is to provide a shield which will not lower the maximum of voltage at which the tube may be operated and which will enable the shield to be so firmly held in contact with the X-ray tube that the tube and shield may be handled as a unit without displacement.

In some cases the shields for X-ray tubes formerly used have consisted of two parts held together by longitudinal metal straps. The presence of these metal straps adjacent the surface of the X-ray tubes has lowered the maximum voltage at which the tube is operable without sparkover between terminals or puncture through the glass wall. In the device embodying my invention, the arc-over voltage across the tube is substantially unaffected and the shield forms an integral part of the X-ray tube so as to be transportable with the tube without fear of displacement or damage.

The novel features of my invention will be best understood by reference to the following description taken in connection with the accompanying drawing.

In the drawing, Fig. 1 shows in perspective an X-ray tube, on which is mounted a shield embodying my invention; Fig. 2 is an end view of one member of the shield; Fig. 3 is a sectional view showing the attachment or mounting of the shield upon the tube; and Fig. 4 is a perspective view of one form of washer used as part of my improved structure.

The X-ray tube, as best shown in Fig. 3, consists as usual of an envelope 1, consisting of glass and having a bulb-shaped part in which is located the electrode chamber and outwardly projecting arms 2, 3, into which are sealed the electrode stems. The electrodes consist of a cathode 4 and an anode 5, both of which may consist of tungsten. The cathode comprises a filament 6 adapted to be heated to incandescence by currents from leading-in wires 7 and 8 sealed into a stem 9. Surrounding the incandescible cathode is a bell-shaped focusing member 10 which electrostatically causes the electron stream from the cathode to converge upon the charge receiving face 12 of the anode. The X-ray tube is shown as illustrative only of any desired X-ray generator. The particular tube illustrated operates by substantially pure electron conduction. As such a tube is fully described in my various prior patents it need not be described in greater detail in this specification. Mounted upon the externally projecting part of the anode stem 13 is a heat radiator 14. The cathode conductors are connected to a standard base 15, as commonly used in lamps.

Surrounding the X-ray tube proper described above is a shield comprising paired members 20, 21, which are somewhat bell-shaped, that is, each having a tubular neck and a hemispherical flare joining the neck. These two members 20, 21, may be slipped over arms 2, 3, of the X-ray tube, and when fitted together, as illustrated in Fig. 1, enclose the electrode chamber of the tube except for a window 22 which is so registered with respect to the charge receiving face 12 of the anode that X-rays may pass through the window from the focal spot upon the anode face. The shield members 20, 21, consist of material, such as lead glass, which is impervious to X-rays.

Mounted upon the adjoining rims of the members 20, 21, are outwardly projecting lugs 24, each of which is provided with a hole 25, as best shown in Fig. 2. The two members 20, 21, are joined together by studs 26, consisting of insulating material, such as hard rubber. It is not necessary that the studs 26 should consist entirely of insulating material. One part may conveniently be provided with a small metal screw which passes into a threaded socket of the connecting part of the lug. This construction avoids the bridging of any substantial part of the gap between the opposite terminals of the X-ray tube by a conductor.

As shown in Fig. 3, the opposite tubular ends of the members 20, 21, are screw threaded and fitted with holders 28, 29, consisting of insulating material such as hard rubber. Interposed between the arms 2, 3

and the tubular ends of the X-ray shield are tapered split washers 30 consisting of resilient material such as cork composition, as shown in perspective in Fig. 4. By screwing the holders 28, 29 upon the ends of the shield, the washers 30 are forced into firm contact with the X-ray tube and the shield so as to hold the entire structure firmly in place and prevent any rotative displacement between the X-ray tube and the shield which would disturb the alignment of the window.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A shield for X-ray tubes comprising paired bell-shaped members surrounding, when fitted together, the electrode chamber of an X-ray tube but permitting the arms of an X-ray tube to project outside thereof and having an aperture through which X-rays may be emitted, and resilient means engaging with the ends of said members for holding the same in a fixed position upon an X-ray tube.

2. A protective shield for X-ray bulbs comprising paired members each having a bell-shaped portion and a tubular neck, disengageable means for uniting the bell-shaped portion of said members, and separable insulating holders engaging with the necks of said members and adapted to fixedly support said members upon the arms of an X-ray bulb.

3. A protective shield for X-ray bulbs comprising paired members substantially impervious to X-rays, each having flanged bell-shaped portions and a threaded tubular neck, means for securing said flanged portions to each other and separable threaded holders adapted to secure said shield against rotative displacement upon the arms of an X-ray tube.

4. A shield for X-ray tubes having outwardly projecting arms, said shield comprising separable paired members consisting of material impervious to X-rays, each having a tubular part and a hemispherical part, outwardly projecting lugs on the rims of the hemispherical parts of said members spaced to be located opposite each other when said members are fitted around a tube, insulating studs connecting said lugs, resilient washers interposed between the tubular part of said members and the arms of said tube, and annular rings for fastening the tubular ends of said shields to the arms of an X-ray tube.

5. An X-ray protective apparatus comprising paired shields adapted to surround an X-ray tube when fitted except for a window, and externally disengageable ring-shaped holders for frictionally securing said members upon the respective arms of an X-ray tube in position permitting the terminal portions of said arms to project beyond said shields.

In witness whereof, I have hereunto set my hand this 26th day of March, 1919.

WILLIAM D. COOLIDGE.