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CONTINUOUS DUTY X-RAY UNIT

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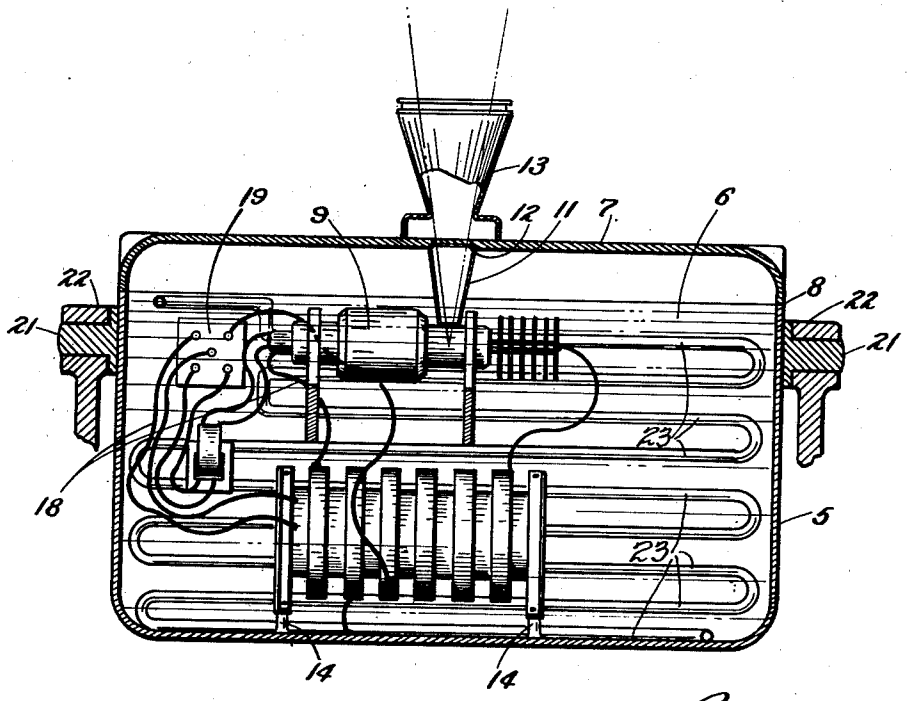


Fig. 1

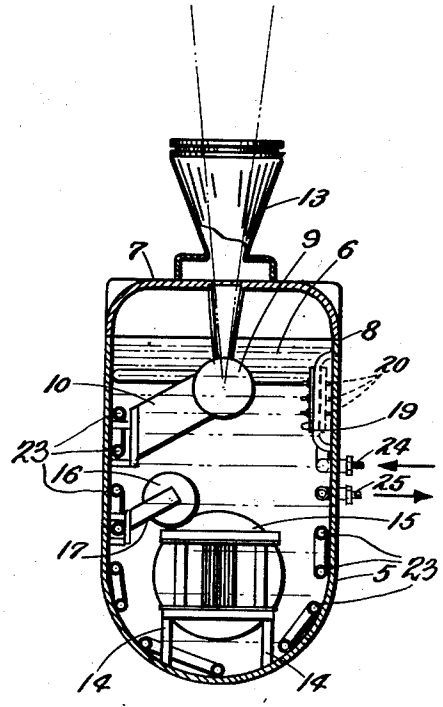


Fig. 2

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CONTINUOUS DUTY X-RAY UNIT

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4 Claims. (Cl. 250—87)

The present invention relates to X-ray units and has for an object the provision of a shock-proof unit that is adapted for continuous duty thereby avoiding the limitations and actual dangers heretofore encountered with previously known and used shock-proof X-ray units when the latter were energized for extended periods of time.

Another object of the invention is to provide a simple and effective means for controlling the temperature conditions of both the X-ray tube and its energizing transformer or transformers in a shock-proof X-ray unit.

A further object of the invention is to provide an X-ray unit with a selectively operable cooling system that is effective in all operative positions of adjustment of the device.

These and other objects are attained by the means described herein and disclosed in the accompanying drawing, in which:

Fig. 1 is a longitudinal sectional view of a shock-proof X-ray unit embodying the invention.

Fig. 2 is a transverse sectional view of the same device.

It has been known to provide an encased and oil immersed assembly of X-ray tube and the necessary transformers so that all high tension coils and conductors connecting them with the tube are insulated from each other and from the enclosing casing. Such shock-proof units have the advantage of being either portable or mobile and adjustable but are not suitable for uses that require any extended period of actuation because of danger of damaging the equipment and actual injury to the operator.

In the present invention the advantages of the heretofore known shock-proof X-ray units are retained and the unit made according to the invention is additionally equipped with a coolant circulating system of conduits providing a heat dissipating means operative on the body of oil. This heat dissipating means serves to cool and to effect thermal circulation of the oil, thus enabling safe, continuous operation of the unit.

In the embodiment illustrated in the drawing the device of the invention comprises a casing 5 for receiving insulating oil 6 and adapted to be sealed with a cover 7 that is suitably secured to the casing with a gasket 8 interposed between the members. An X-ray tube 9 is mounted on brackets 10, secured to an interior side wall of casing 5, the tube 9 having a member 11 which preferably enters a recess 12 in the under side of the cover 7. An aperture member 13 is secured to the outer face of cover 7.

Supported on brackets such as 14 on the interior bottom of the casing is the high tension transformer 15 and a filament transformer 16 is mounted on a bracket 17 which is also on the inside wall of the casing. The transformers are connected in a known manner to the X-ray tube by conductors indicated generally as 18. Terminal block 19 is disposed within the casing to provide for the distribution of electrical supply to the primary windings of the transformers 15 and 16 and connection between the connectors on said terminal block and the existing house current supply is effected through the exterior low tension connectors 20 of any approved construction. The details of high and low tension wiring and the various electrical connections therefor form no part of this invention. It is essential only that a suitable source of primary energizing current be introduced through the wall of the casing to the interior thereof.

The unit illustrated is provided with trunnions 21 at opposite ends whereby the unit is tiltably supported in bearings 22 of any desired mounting structure (not detailed).

The selectively operable cooling system for the device comprises a circuitous hollow member such as a tube which is suitably supported on or near the inner surfaces of the bottom and at least the greater area of the side walls.

As shown, the cooling means is provided by securing (as by soldering) a copper tube bent into a series of reaches 23 of tubing extending from end to end of the casing in substantially parallel spaced relation, the tube having an inlet coupling 24 from which the tube passes upwardly by successive reaches across one side of the casing, thence transversely across the casing and downwardly over the other side and across the bottom of the casing to an outlet coupling 25. A flexible hose (not shown) is connected to coupling 24 and to a source of cooling fluid medium, for example, a cold water tap, and another flexible hose (not shown) connects outlet coupling 25 with a drain.

In operation, the oil 6, in which the tube 9 and the transformers are immersed, will dissipate the heat generated by short periods of use as in picture work. When conducting a prolonged fluroscopic examination or for any other prolonged operation of the unit a circulating supply of coolant medium would be passed through tubing 23 as aforementioned.

In use the device illustrated is usually adjusted about its bearing mounting 21—22 so that aperture 13 points angularly to the side or perhaps perpendicularly downwardly and in any of these

positions a portion of the coolant circulating tubing will obviously be disposed above the heat producing coils of the transformers and above the radiator of the X-ray tube to chill the heated oil that rises. This sets up a thermal circulation of oil over and about all parts which become hot. The insulating properties of the oil are preserved through cooling maintained by a proper flow of coolant medium through the tubing. Tap water as a coolant medium is usually employed where the supply and pressure is adequate however, the means shown and described are adapted for connection with any other suitable or available cooling circulating supply apparatus.

What is claimed is:

1. A shock-proof continuous duty X-ray unit comprising a sealed casing containing oil, an X-ray tube in the casing, energizing transformer means for the tube mounted in the casing and heat exchange means traversing the interior of the casing and terminating exteriorly of the casing for connection with a source of circulating coolant medium.

2. A continuous duty shock-proof X-ray unit comprising an encased oil immersed assembly consisting of an X-ray tube and energizing transformer means therefor, and independent heat exchange means comprising metallic tubing arranged in a series of reaches traversing the interior of the casing and terminating exteriorly of the casing for connection with a source of circulating coolant medium.

3. A continuous duty shock-proof X-ray unit comprising a casing filled with oil, an X-ray tube mounted within the casing, a cover sealing the casing, an X-ray aperture carried by the cover and cooperating with the tube for directing the rays from the tube, energizing transformer means for the X-ray tube disposed in the casing, bearing support means mounting the casing for adjustment about an axis thereof and heat exchange means comprising metallic tubing arranged in a series of reaches traversing the interior of the casing and terminating exteriorly of the casing for connection with a source of circulating coolant medium.

4. A continuous duty shock-proof X-ray unit comprising an X-ray tube, an energizing transformer means therefor, an oil filled casing enclosing said tube and said transformer means, and coolant circulating heat exchange means traversing the interior of the casing and terminating exteriorly thereof for connection with a source of circulating coolant medium.

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