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X-RAY APPARATUS

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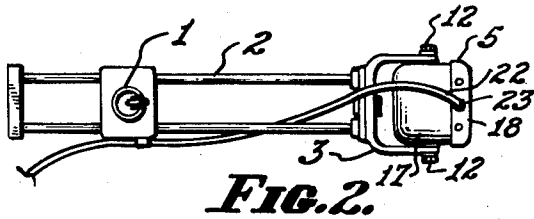


FIG. 2.

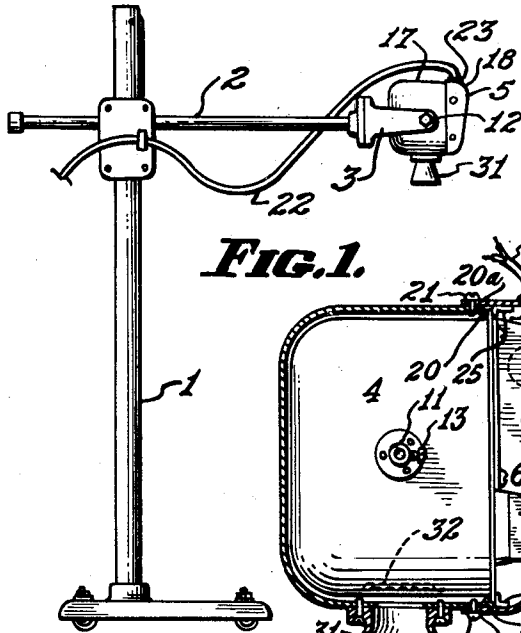


FIG. 1.

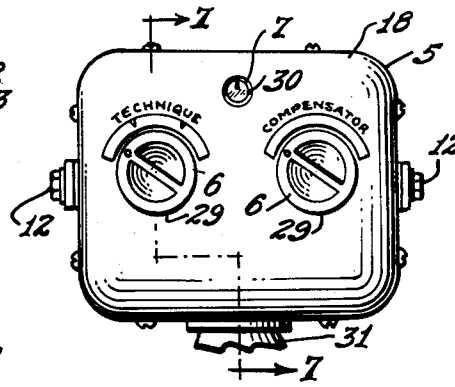


FIG. 3.

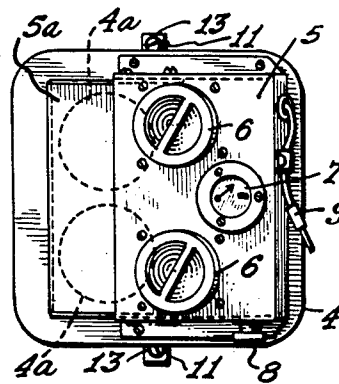


FIG. 6.

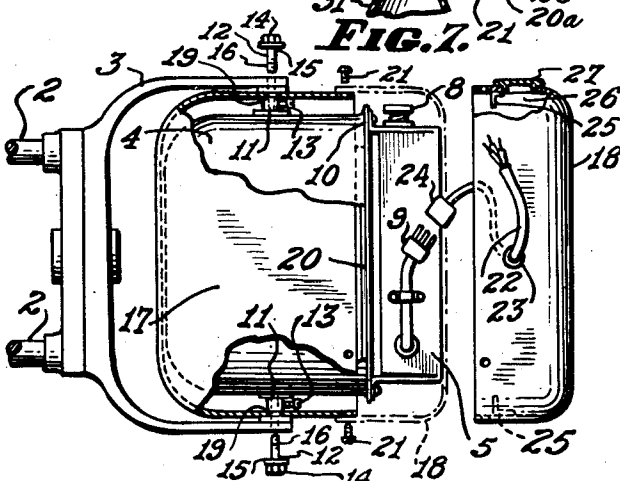


FIG. 4.

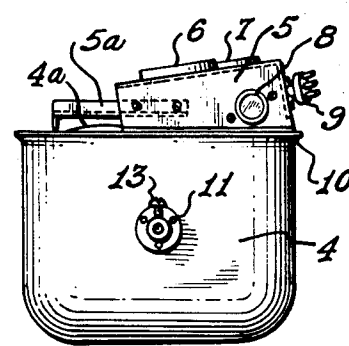


FIG. 5.

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X-RAY APPARATUS

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2 Claims. (Cl. 250-91)

1

Our invention relates to X-ray apparatus such as is employed by physicians, for example, in X-ray photography, and examination through fluoroscopic screens.

In a physician's office, in particular, the apparatus used must be attractively housed and conveniently mounted for use. It is desirable in such apparatus to house the X-ray generator proper in a sealed oil-tight casing filled with a special oil. In addition there are a host of connections which extend from the sealed casing to rheostats and other controlling instruments which are to be manipulated by the operator, and are located on the exterior of the apparatus.

There is a limitation in possible outer finishes in making up in the factory an oil sealed unit of the proper metals for resisting corrosion, etc., and which adapt themselves to the action of the X-rays.

The devices in question are heavy and not easy to handle. The repair of anything that goes wrong inside of the sealed housing is naturally impossible in the office of the user. Also the repair of the various electrical connections constitutes a problem which requires time and patience and a proper place to work, with soldering facilities, etc.

Except for replacing a fuse, the work on an X-ray apparatus of the type noted can best be done in the factory and the work of a physician or technician, or of a shipping concern, in crating up such a device is quite likely to mar its external appearance. Not only is this the case but when the physician's X-ray device is at the factory, he is without its use, which may be a great hardship.

Accordingly it is our object, consistent with the problems of mounting and using X-ray apparatus, such as for radiography, fluoroscopy and the like, to provide an X-ray device in which the operating parts including the sealed-in chamber are made up as a cartridge which can quickly and readily be inserted into the supports and ornamental casing of the complete device. All controls and electrical connections except for a single cable connection by means of a pronged terminal and socket, and all parts of the generator, make up this cartridge. A physician owning one of the machines can thus dismount the parts which might get out of order all in one piece, and replace them with a substitute unit which is simply dropped into place and plugged into the supply cable. When the manufacturer is notified of some disorder of any apparatus, it will at once ship a substitute cartridge, which

2

means that except for the time between notice and arrival of the cartridge, the X-ray machine will be in operation.

All repairs can be done under factory conditions without service men who must be called in, under present conditions. The practice will be to rebuild each cartridge when it is returned and hold it for the next substitution called for. Surface defects which may develop on account of packing and shipping, or during repair, will not be of any importance, since the cartridge is completely housed in the treatment apparatus when it has been located thereon.

To attain this general object, various items must be provided for. It is desirable although not necessary to provide for considerable tolerance in fit of the cartridge in the casing while at the same time it is imperative to have a close and accurate register of the operating parts. Since the X-rays are to be caused to emanate through a discharge cone which is directed as required by the operator, it is required that when the cartridge is set into place it will be properly oriented so that the window in the sealed unit will register with the orifice of the discharge cone, the latter desirably being a part of the casing of the device, rather than of the cartridge.

The cartridge is heavy, and since a pivotal mounting is required for the generator device, there exists the problem of supporting a heavy cartridge in a separable casing. This problem is solved in our present construction by supporting the cartridge directly on the trunnions of the apparatus and supporting the casing, as it were, from the cartridge mountings.

The casing is arranged preferably in two parts, a main portion and a removable lid. To remove and replace the cartridge, the lid of the casing is all that must be removed.

Since the control dials for the apparatus are part of the cartridge, the casing must provide apertures for them to extend through, which apertures are placed in the lid of the casing, since this is the most readily manipulated part of the casing. Incidentally the closeness of fit of parts preferably results in an outside appearance as if the several control dials are on the outside of the apparatus, although in fact they protrude from the inside.

For fusing the device, the arrangement has been made for a single fuse, which is a plug fuse, located in the top of the cartridge, and thus readily available through a hole in the lid of the casing, which may be kept closed by a flat friction cover. Otherwise a hole large enough for the

fingers to enter in order to unscrew the fuse would constitute an entrance for dirt into the interior of the casing.

In the drawings, we have shown but one example of the invention, the novelty of which will be set forth in the claims that follow, to which reference is hereby made. It is not intended by the use of one example to exclude equivalent structures within the scope of the said claims.

Figure 1 in the drawings, is a side elevation view of the treatment apparatus, with the discharge cone directed downwardly.

Figure 2 is a top plan view of the same.

Figure 3 is an enlarged elevation of the generator, taken at right angles to the showing in Figure 1.

Figure 4 is an exploded view with the casing portion partly broken away, to show the relation of the cartridge to the casing.

Figure 5 is a side elevation of the cartridge.

Figure 6 is a plan view of the cartridge.

Figure 7 is a section of the complete generator taken on the line 7—7 of Figure 3.

The apparatus is illustrated with a standard 1, and a supporting arm 2 thereon. Normally such an arm is movable up and down on the standard, and slides in and out thereon. The end of the arm is forked as at 3, and provides for two trunnion supports for the complete generator.

The particular cartridge illustrated consists of a sealed oil filled container 4 having secured thereon a protective removable housing 5 between which housing and the top of the container, is a chamber which contains the wiring connections for the device which are connected up to the two control dials 6. These dials are mounted in the top of the housing portion 5 so that they protrude therefrom. An indicator meter 7 is also secured on the top of this housing. Also in the top of the container portion 4 are diaphragms 4a which allow for expansion and contraction, these diaphragms being flat, and located beneath a protective apron 5a of the housing.

The fuse protection for the wiring is by means of an exposed fuse 8 which is located at one side of the housing 5. It might be desirable to use more than one fuse. Here we show a cylindrical plug fuse. It could be a cartridge type fuse, as well, the point being that the fuse protection is removable and located so as to be available through an opening in the outer casing, to be described. The electric connection to the cartridge terminates in a single forked terminal plug 9, which is again desirable although not an absolute requisite.

Around the upper end of the sealed casing is a flange 10, which is, incidentally, the sealed joint between the top and the body of the cartridge. This flange functions in the mounting of the cartridge. On each side of the sealed casing are trunnion supports 11, which may be sleeves, secured by a flange to the housing, and internally threaded for reception of trunnion pins 12. If desired, set screws 13, may be set into the sleeves to bind the engagement of the trunnion pins. These pins, in the example, have heads 14, cylindrical portions 15, which lie in the trunnion openings in the fork of the mounting arm, threaded portions 16 which are threaded into the trunnion supports 11. As so arranged the cartridge could be mounted by itself in the supporting arm, the significant point being that when mounted the heavy cartridge is held directly on supports

which engage it and engage the mounting arm.

The casing of the device, as noted is in two parts. A main portion 17, and a lid 18, which is shaped to embrace the housing portion of the cartridge, already described. In the sides of the main portion 17 are holes 19 for reception of the pins and which fit fairly closely on these pins.

The upper edge of the portion 17 of the casing is formed with inwardly and upwardly angling ledges 20, 20 one at each side. The ledges are positioned to admit at least one dimension of the sealed-tight container portion 4 between their ends. The height of these ledges from the inner bottom of the portion 17 is somewhat less, preferably, than the height of the sealed tight portion of the cartridge. As a result, when the container portion 4 is set into the casing portion 17, it will be held in position, as shown in Figure 7, with its sides spaced from the casing and its bottom spaced from the casing.

In its other dimension the casing portion 17 is wide enough to leave space for the trunnion supports 11, which act as spacers for the container within the casing on the two sides not above mentioned.

The lid portion 18 of the casing, may well be held in place when the apparatus is set up by means of an overlap as at 20a, which is held on the portion 17 of the casing by means of screws 21. This lid portion has the supply cable 22 passing through it, by means of a grommet element 23. Inside of the casing is the companion plug terminal element 24, which is to be plugged into the terminal plug 9, that projects from the housing on the cartridge. Angle pieces to serve as rests as indicated at 25, are secured to the inside of the lid, and rest on the flange about the sealed container portion of the cartridge. There is a hole 26 in the lid portion which comes opposite the fuse on the housing. This hole is preferably closed by a friction cap 27, the flange of which fits in the hole.

There are holes 29 in the lid which permit the two control dials to protrude through sufficiently to be manipulated by the operator. Also a sight opening 30 for the meter on the cartridge housing portion is provided in the lid.

The discharge cone 31 is secured in place in the casing portion 17, at precisely the point where the discharge window 32 appears in the cartridge, the cartridge being guided and held when mounting it with relation to the casing so that this precise alignment takes place.

As so constructed, the entire apparatus is sold, say to a physician and put into use. If a defect occurs, the physician notifies the manufacturer who sends him at once a new cartridge. He then proceeds as follows: He first removes the lid of the casing and disconnects the plug connector, by removing the attaching screws, in the particular example. He then removes the trunnion pins which will require, in the example shown, loosening the set screws in the trunnion supports by inserting a screw driver between the casing and the cartridge. He then lifts the entire generator structure out of the supporting arm fork and slips the main casing portion off of the cartridge. This completes the disassembly. He then inserts the new cartridge, dropping it into the casing so that it rests on the supporting flanges, already described. This will bring the trunnion supports to substantial alignment with the trunnion holes in the casing portion 17. He then places these parts between the forks on the apparatus arm, inserts the trunnion pins, and screws them in,

setting the set screws, when desired, which prevents accidental unscrewing of the trunnion pins during use. He then places the lid onto the casing, connecting up the plug connectors, and screws the lid in place. His apparatus is then ready for operation as usual.

As shown in the drawings, friction washers are provided at both sides of the yoke in accordance with usual practice and these will have to be removed and replaced with the trunnion pins.

During shipment of the removed cartridge to the manufacturer, and during the repairs on the cartridge at the factory, marring of its exterior is not a serious damage and requires little attention. The apparatus in the doctor's office remains attractive. The casing is not required to be heavy enough to support the cartridge, and the assembly and disassembly is practically fool proof. Further the refusing of the device is simple and possible without any disassembly whatever. To the observer the generator assembly shows no evidence of being made as it is.

It is quite evident that various modifications could be made in the particular structure to provide the several essential means which typify the example. Further many of the desirable aspects of our invention could be employed with elimination of others.

Thus some or all of the electrical controls could be secured on the lid, with detachable electrical connections to engage terminals located on the unit. This would to a certain extent gain the end in view, but with limitations over the simpler practice of housing all of the control devices as by a housing as at 5 located on the sealed container leaving a single terminal only for connection to the supply cable.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In an X-ray discharge device, a one-piece sealed unit constituting the X-ray generator, a housing located on the sealed unit containing electrical supply connections to the X-ray apparatus within the unit and on which are mounted control dials for the unit, a casing enclosing said unit and said housing, said casing comprising a body portion and a lid portion, said lid portion enclosing said housing and having apertures therein disclosing said control dials for manipu-

lation by an operator, trunnions removably mounted on said unit and adapted to mount the unit to a pair of spaced trunnion supports, said trunnions passing through apertures in said casing and engaging bosses on said unit, spacing means within said casing serving to maintain said casing spaced from said unit when said trunnions are in place, thereby providing a device in which the weight of the enclosed unit is borne directly by the trunnions and the casing is supported from the unit and its mountings.

2. In an X-ray discharge device, a sealed unit constituting the X-ray generator, a housing located detachably on the sealed unit and containing the electrical supply connections to the X-ray apparatus within the unit and on which are mounted the control dials for the X-ray unit, a casing for enclosing said unit and said housing, said casing comprising a body portion and a lid portion, said casing having apertures therein disclosing said control dials for manipulation by an operator, trunnions removably mounted on said unit and adapted to mount said unit to a spaced pair of trunnion supports, said trunnions passing through apertures in the said casing and engaging bosses on said unit, said bosses serving as spacers for the casing, a flange around one end of said unit, and means within said casing engaging said flange, said means serving to space the casing from the unit at the sides adjacent to the ones occupied by said bosses and to hold the casing spaced from the unit at the end of the unit opposite to the flange.

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