June 24, 1952 H. BLATZ 2,601,361

CLOSURE FOR FLUOROSCOPE MACHINE CASING

Filed Aug. 10, 1948 3 Sheets-Sheet 1

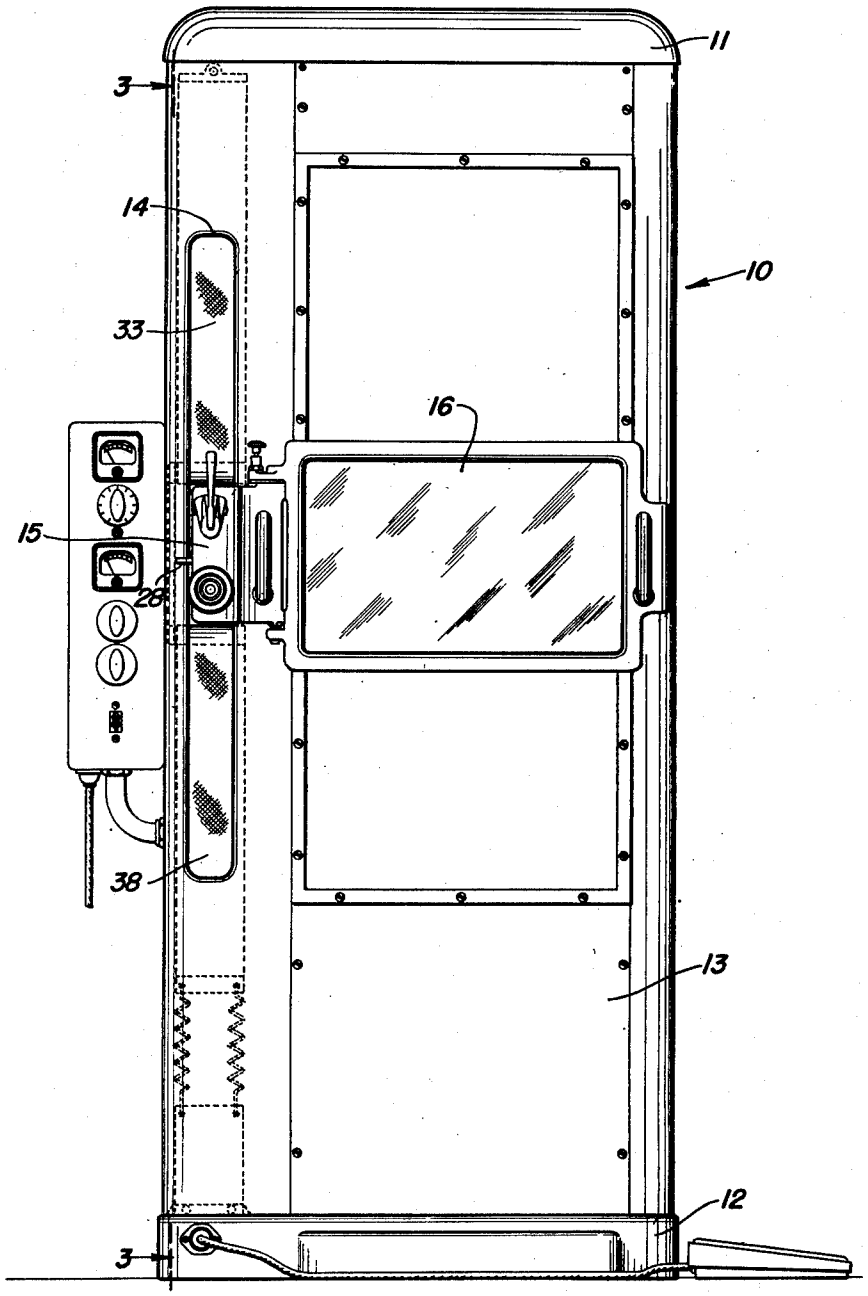

FIG. 1.

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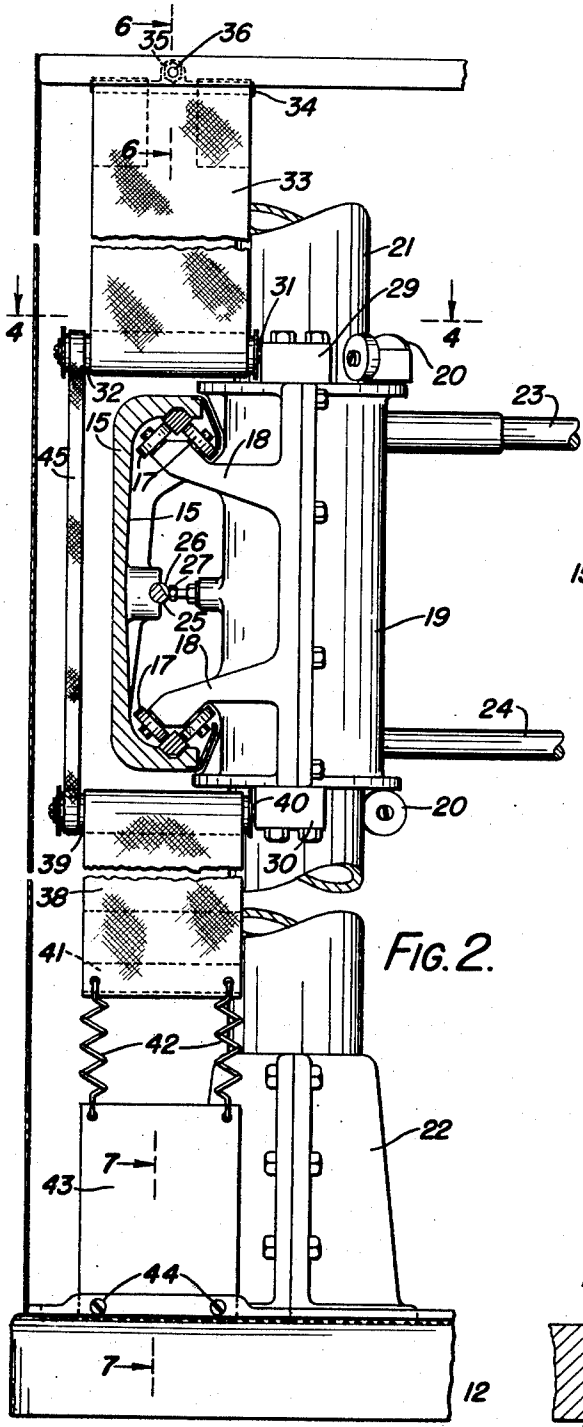

FIG. 2.

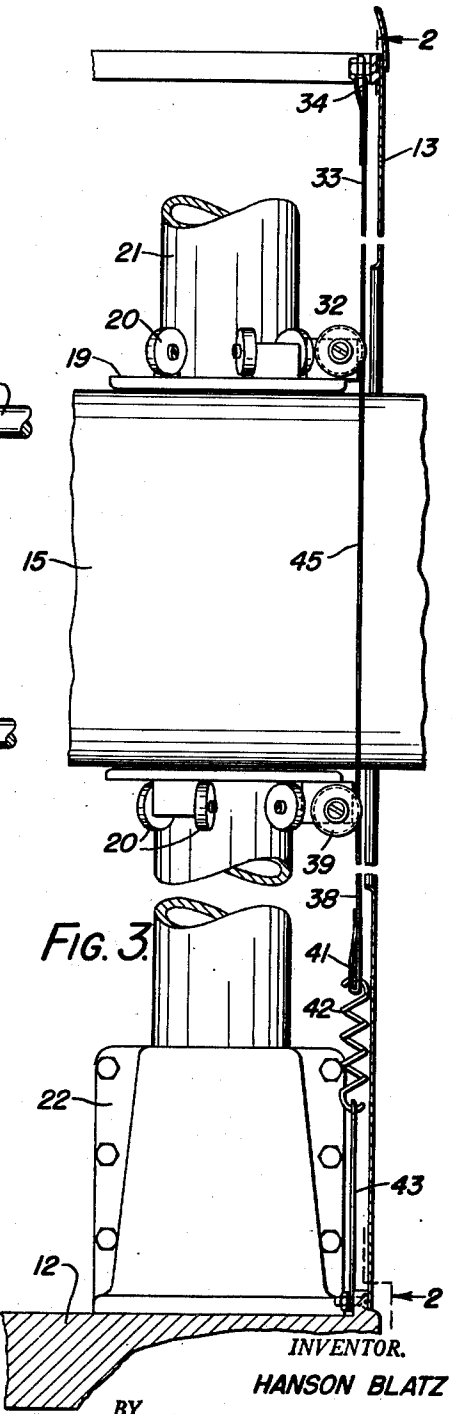

FIG. 3.

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CLOSURE FOR FLUOROSCOPE MACHINE CASING

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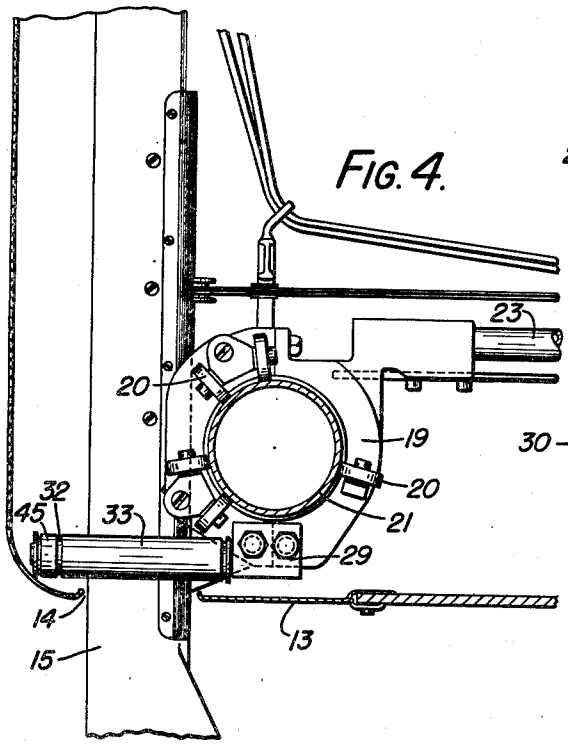

FIG. 4.

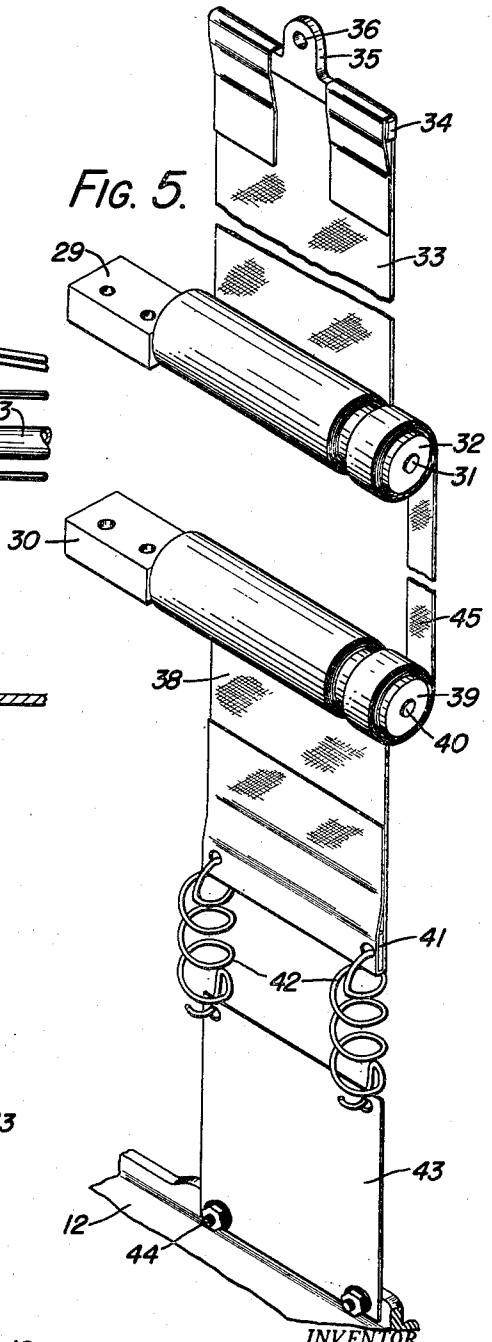

FIG. 5.

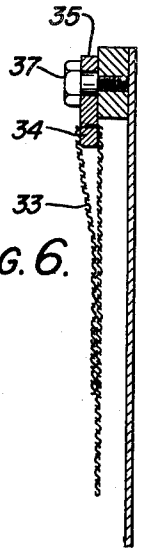

FIG. 6.

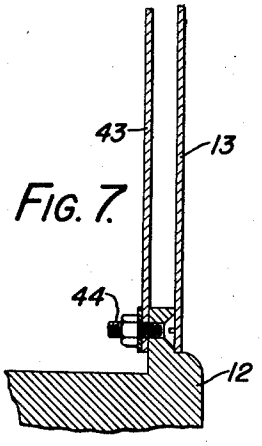

FIG. 7.

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Patented June 24, 1952

2,601,361

UNITED STATES PATENT OFFICE

2,601,361

CLOSURE FOR FLUOROSCOPE MACHINE CASING

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Application August 10, 1948, Serial No. 43,508

6 Claims. (Cl. 160—122)

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This invention relates to vertical fluoroscope machines of the variety having an adjustable screen arm projecting through the casing thereof, one object of the invention being to provide such a machine having means for closing the casing opening through which the adjustable arm projects, to enclose and protect the parts and safeguard the operation thereof.

Another object is the provision of such a machine with casing means adapted to more effectively contain the light rays from the X-ray tube filament, so that they will not reduce the visibility of faint images on the fluorescent screen.

Another object is to provide such a machine having a casing adapted to obstruct the insertion of the hands or other objects through the screen arm opening into dangerous proximity to the high voltage parts of the mechanism.

Further objects are to supply casing means adatped to exclude the dust which tends to collect especially on high tension parts, to close up unsightly openings and improve the appearance of the casing, and generally to provide a casing for such machines having the above advantageous features in a simple and practical type of construction.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a front elevation of a vertical fluoroscope machine embodying the present invention;

Fig. 2 is a sectional elevation substantially on the line 2—2 in Fig. 3;

Fig. 3 is a sectional elevation substantially on the line 3—3 in Fig. 1;

Fig. 4 is a horizontal section substantially on the line 4—4 in Fig. 2;

Fig. 5 is a perspective view of curtain means constructed in accordance with the present invention;

Fig. 6 is an enlarged, sectional elevation on the line 6—6 in Fig. 2, and

Fig. 7 is an enlarged sectional elevation on the line 7—7 in Fig. 2.

The invention is embodied in the present instance, by way of illustration, in association with a vertical fluoroscope machine, indicated generally at 10, having a casing comprising a top 11, a base 12, and a front wall 13. The front wall is formed at one side with a vertical slot 14 for a fluorescent screen arm 15 projecting exteriorly through the slot 14 from supporting means on the inside of the casing, the forward end of the arm having mounted thereon a fluorescent screen 16. Arm 15 is supported for longitudinal movement, into and out of the casing, by pairs of

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rollers 17 rotatably mounted on bracket arms 18 extending from a carriage 19. The upper and lower ends of the carriage are equipped with rollers as 20, rolling on a vertical cylindrical column 21 fixed in a step 22 on the base 12 of the machine. The carriage supports spaced upper and lower guide rails 23 and 24 on which an X-ray tube assembly is mounted for sliding movement toward and from the carriage. A counterbalance means (not shown) is provided for counterbalancing the weight of the carriage and its arm and other associated parts, and a rod 25 mounted for rocking movement in the arm has a cam-shaped section 26 adapted to be rotated into clamping engagement with a stud 27 sliding longitudinally in a bearing in the side of the carriage. The rod has a handle 28 at the front end of the arm by which it may be rocked to frictionally engage the rod section 26 with stud 27 to frictionally engage the latter with the column 21 and thus lock the arm to the carriage and the carriage to the column in suitably adjusted positions.

It is apparent from the foregoing construction that when the parts are unclamped, the screen arm 15 may be slid longitudinally on the carriage, transversely of the slot 14, to project its forward end and the screen 16 to different distances from the front wall of the casing and that the arm with the carriage and the tube assembly guides may be adjusted vertically on column 21, thus effecting a transverse adjustment of the arm longitudinally of slot 14 to position screen 16 at a suitable vertical elevation. The further details of the foregoing machine are fully described in my copending patent application, Serial No. 787,597, filed Nov. 22, 1947, now Patent Number 2,567,363, issued Sept. 11, 1951 for Vertical Fluoroscope Apparatus, so that further description herein is believed to be unnecessary.

In a construction such as described, slot 14 creates openings of substantial size above and below the screen arm in the front wall of the casing through which the rays from the incandescent filament of the X-ray tube tend to be reflected, so as to reduce the visibility of faint images on the screen. Such openings also permit the insertion of the hands, or other means, inside the casing which contains parts charged with high voltage current. Furthermore, such an opening permits the entry of dust which tends to collect especially on such high tension parts, as well as exposing to view the unsightly operating parts within the casing. I have found that these slot openings may be effectively closed to overcome these disadvantages by convenient and practical curtain means which will now be described.

The curtain means for the casing slot 14 com-

prises, preferably, a separate curtain for each portion of the slot at opposite sides of the screen arm 15, each curtain being connected at one end to the casing and at its other end to a roller on the carriage 19, the rollers moving up and down with the arm and carriage to operate the curtains and the screen arm being left free of interference with its longitudinal sliding movement. To this end, carriage 19 is provided at its top and bottom adjacent the front wall of the casing with bearing blocks, 29 and 30 (Figs. 2 and 4). Fixed at one end in block 29 is a spindle 31 on which is rotatably supported a curtain roller 32. A curtain 33 of any suitable flexible material, such, for example, as the focal plane shutter cloth employed in cameras, is fixed at one end to the roller and wound spirally thereon, with its other end fixed to the top of the casing. For this purpose the upper end of the curtain is lapped around and secured to a bar 34 having a lug 35 formed with an opening 36 through which a bolt 37 is loosely passed and screwed into the frame of the casing, thus providing a swiveling connection of the upper end of the curtain with the casing, to allow it to smoothly align itself in position between its supports by which it is located close to the front wall of the casing in rear of the slot 14.

A lower curtain 38 of similar material has its upper end fixed to and wound spirally on a similar roller 39, rotatably mounted on a spindle 40 fixed at one end in the lower block 30 on the carriage. The lower end of the curtain is lapped around and secured to a bar 41, to the extremities of which are connected the upper ends of coiled tension springs 42 having their lower ends fixed to the top corners of a plate 43. The lower edge of the plate is secured by bolts 44 to the base 12 of the machine and this lower curtain also is located by its supports so as to extend closely adjacent the rear side of the lower portion of casing slot 14. Springs 42 serve to smoothly tension the lower curtain and also to tension the upper curtain as hereafter described.

As the screen arm carriage is moved vertically in either direction, it unwinds one of the curtains and thus rotates its roller, and an actuating connection is provided between the rollers for rotating one by the rotation of the other thereof, so as to automatically wind up one curtain as the other is unwound. Such means comprises, preferably, a flexible element or band 45 (Figs. 2 and 5), of any suitable material such as focal plane shutter cloth, the band having its opposite ends fixed to and wound spirally on the curtain rollers, 32 and 39, respectively. The curtains are wound on their rollers, in opposite directions, as shown, and the ends of the band are also wound on the rollers in opposite directions and on each roller in a direction opposite to that in which the curtain is wound. The band is tautly extended from one roller to the other, with the result that as the screen arm carriage is moved in one direction, the curtain from which it moves away is unwound to cover the increased opening, while the other curtain is correspondingly wound up by the rotation of its roller by the band 45. The lengths of the curtains are thus automatically adjusted to the lengths of the portions of the slot above and below the arm as the arm is adjusted to positions at different distances from the ends of the slot and the slot is thus kept closed except for that portion occupied and substantially closed by the arm itself.

The operation of the curtain closure means has been explained in connection with the above description of its construction and it is apparent that as the screen arm is adjusted vertically to different positions the slotted opening of the casing in which it moves is kept substantially closed to overcome the defects of the prior construction and accomplish the advantageous purposes referred to above. These advantages are obtained, furthermore, by a simple and practical type of construction in which the curtain rollers are operated automatically by the movements of the screen arm and its carriage so as to eliminate the known disadvantages of spring actuated curtain rollers. The curtains, furthermore, have their extended portions fixed to the casing and stationary during operation, as desirable to reduce friction and for best appearance.

It will thus be seen that the invention accomplishes its objects and while it has been herein disclosed by reference to the details of a preferred embodiment, it is to be understood that such disclosure is intended in an illustrative, rather than a limiting sense, as it is contemplated that various modifications in the construction and arrangement of the parts will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

I claim:

1. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for positioning movement longitudinally of said slot, a pair of rollers connected and movable with said arm, a pair of flexible curtains each having one end connected to said casing adjacent one end of said slot and the other end thereof wound on one of said rollers, in positions for closing the slot portions between said slot ends and said arm, respectively, and a flexible element connecting said rollers and having its ends wound on said rollers in a direction opposite the direction in which the corresponding curtain is wound for rotating one of said rollers and winding up the associated curtain as said arm is moved in each direction longitudinally of said slot, for adjusting said curtains to the lengths of said slot portions as said arm is adjusted to different positions at different distances from said slot ends, the diameter of the portion of each roller upon which the flexible element is wound being at least as great as the diameter of the portion upon which the curtain is wound.

2. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for positioning movement longitudinally of said slot, a pair of rollers connected and movable with said arm, a pair of flexible curtains each having one of its ends connected to said casing adjacent an end of said slot and its other end wound on one of said rollers, for closing the portions of said slot between the ends thereof and said arm, and a belt means connecting said rollers and having its ends wound on said rollers in a direction opposite the direction in which the corresponding curtain is wound for rotating one of said rollers and winding up the associated curtain as the other of said rollers is rotated and the other of said curtains is unwound, as said arm is moved longitudinally of said slot to different positions at different distances from said slot ends, the diameter of the portion of each roller upon which the belt means is wound being at least

as great as the diameter of the portion upon which the curtain is wound.

3. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for positioning movement longitudinally of said slot, a pair of rollers connected and movable with said arm at opposite sides thereof, respectively, a flexible curtain having at one of its ends a swiveling connection with said casing and having its other end wound on one of said rollers, a second flexible curtain having one of its ends connected by resilient tensioning means with said casing and its other end wound on the other of said rollers, said curtains being positioned to close the portions of said slot between the ends thereof and said arm, respectively, and a flexible element connecting said rollers and having its opposite ends wound on said rollers in a direction opposite the direction in which the corresponding curtain is wound for rotating one of said rollers by the rotation of the other thereof, to adjust the lengths of said curtains to the lengths of said slot portions as said arm is moved to positions at different distances from said slot ends, the diameter of the portion of each roller upon which the flexible element is wound being at least as great as the diameter of the portion upon which the curtain is wound.

4. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for longitudinal movement transversely of said slot and for lateral movement longitudinally of said slot, a pair of rollers rotatably mounted on said supporting means at opposite sides of said arm, respectively, a pair of flexible curtains each having one of its ends connected to said casing adjacent an end of said slot and its other end wound on one of said rollers, for closing the portions of said slot between the ends thereof and said arm, and a belt means connecting said rollers and having its opposite ends wound on said rollers in a direction opposite the direction in which the corresponding curtain is wound for rotating one of said rollers by the rotation of the other thereof, for extending one of said curtains and retracting the other curtain to adjust the lengths thereof to the lengths of said slot portions as said arm is moved longitudinally of said slot to positions at different distances from the ends thereof, the diameter of the portion of each roller upon which the belt means is wound being at least as great as the diameter of the portion upon which the curtain is wound.

5. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for positioning movement longitudinally of said slot, a pair of rollers connected and movable with said arm, a

pair of flexible curtains each having one of its ends connected to said casing adjacent an end of said slot and its other end wound on one of said rollers, for closing the portions of said slot between the ends thereof and said arm, said curtains being wound on said rollers in opposite directions, and a flexible element having its end wound on said rollers in opposite directions and on each roller in a direction opposite the direction in which the corresponding curtain is wound for rotating one of said rollers by the rotation of the other thereof, for adjusting the lengths of said curtains to the lengths of said slot portions as said arm is moved to positions at different distances from said slot ends, the diameter of the portion of each roller upon which the flexible element is wound being at least as great as the diameter of the portion upon which the curtain is wound.

6. In a fluoroscope machine, a casing having a wall thereof provided with a slot, a screen arm projecting exteriorly through said slot, means in said casing supporting said arm for longitudinal sliding movement through said slot and for lateral movement longitudinally of said slot, a pair of rollers rotatably mounted on said supporting means at opposite sides thereof, respectively, a flexible curtain having at one of its ends a swiveling connection with said casing and its other end wound on one of said rollers, a second flexible curtain having one of its ends connected by resilient tensioning means with said casing and its other end wound on the other of said rollers, said curtains being wound on said rollers in opposite directions, and closing the portions of said slot between the ends thereof and said arm, and a flexible element having its ends wound on said rollers in opposite directions and on each roller in a direction opposite the direction in which the corresponding curtain is wound, for rotating one of said rollers by the rotation of the other thereof, to adjust the lengths of said curtains to the lengths of said slot portions as said arm is moved longitudinally of said slot to positions at different distances from the ends thereof, the diameter of the portion of each roller upon which the flexible element is wound being at least as great as the diameter of the portion upon which the curtain is wound.

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