July 21, 1942. F. W. REUTER 2,290,767

FLUOROSCOPE

Filed Jan. 21, 1942 2 Sheets-Sheet 1

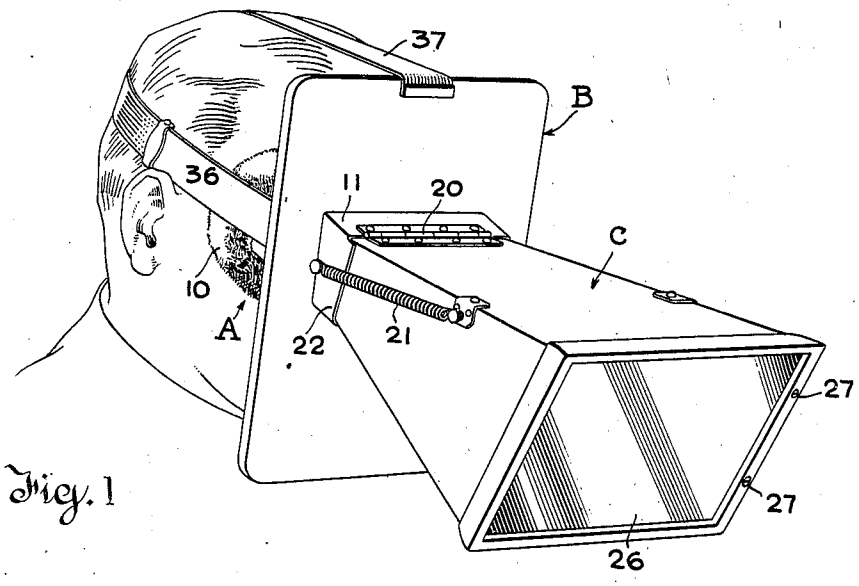


Fig. 1

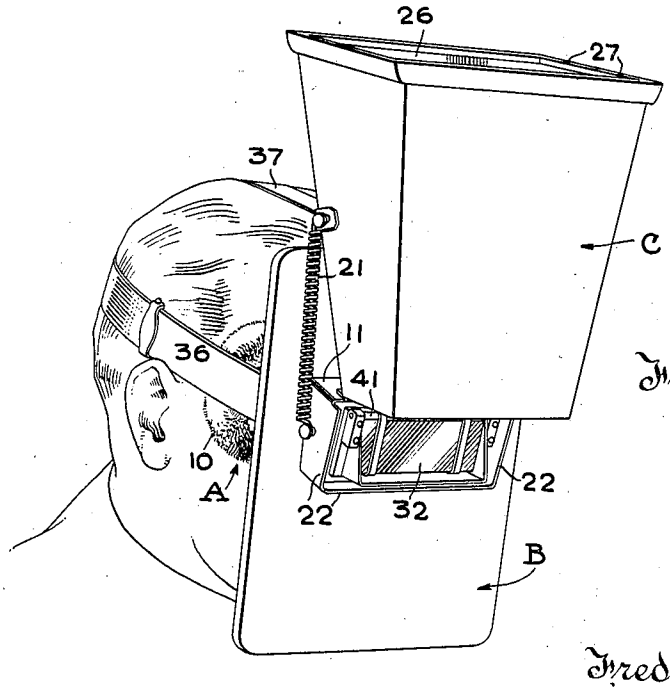


Fig. 2

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July 21, 1942. F. W. REUTER 2,290,767

FLUOROSCOPE

Filed Jan. 21, 1942 2 Sheets-Sheet 2

Fig. 3

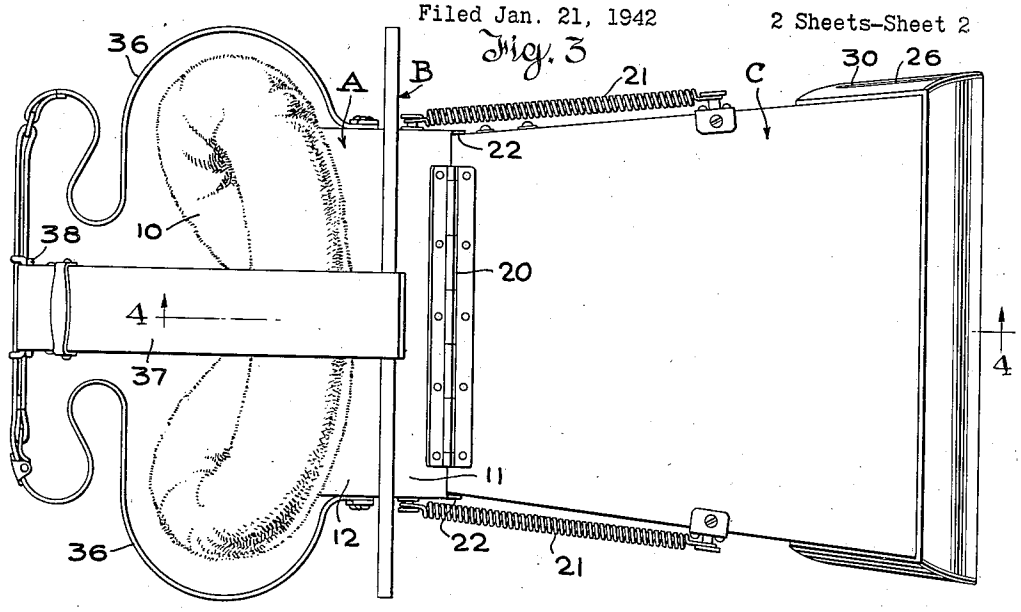


Fig. 4

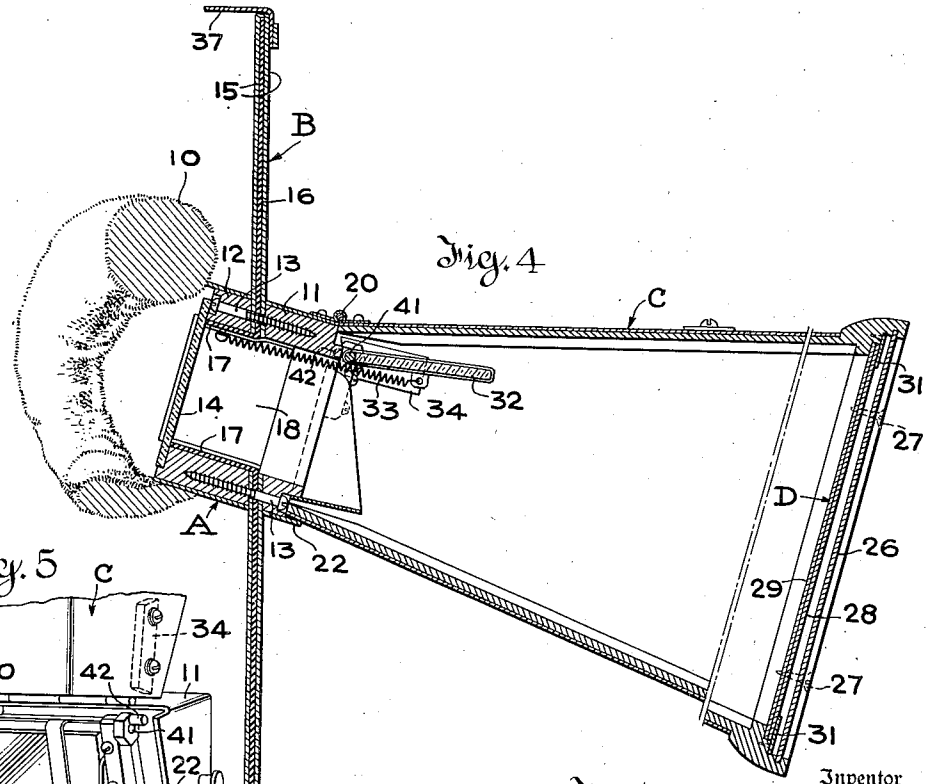
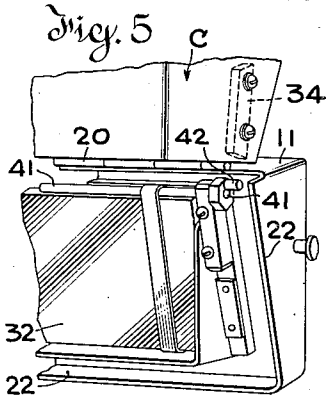


Fig. 5



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FLUOROSCOPE

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Application January 21, 1942, Serial No. 427,663

9 Claims. (Cl. 250—78)

This invention relates to fluoroscopes and more particularly to a portable fluoroscope to be supported and used by an individual in his fluoroscopic examination of a subject. In a preferred form of this invention, the fluoroscope is constructed to be supported solely by the head of the user.

An important object of this invention is to provide a portable fluoroscope which affords such X-ray shielding that exposure of the face and head of the user to X-rays is minimized.

Another important object is to provide a fluoroscope which is to be supported by the head of the user, which affords X-ray shielding for the face of the user, and which may be carried on the head of the user with maximum comfort and minimum effort.

Still another object is to provide a head supported fluoroscope with X-ray shielding positioned closely adjacent the face of the user.

A further object is to provide a fluoroscope with a novel, simple, and efficient form of X-ray shielding.

A still further object is to provide a portable fluoroscope with head straps which afford maximum comfort to an individual during his use of the fluoroscope with the same supported on his head.

Other objects and advantages will be apparent from the following description, the appended claims, and the accompanying drawings which illustrate a preferred embodiment of this invention. Referring now to the drawings:

Figures 1 and 2 are perspective views illustrating the manner in which a preferred embodiment of this invention may be used by an individual.

Figure 3 is a top view of the fluoroscope of Figure 1.

Figure 4 is a cross-section taken on line 4—4 of Figure 3, part of the casing in Figure 4 being broken away for the purpose of illustration.

Figure 5 is a detail showing in perspective with the fluoroscope adjusted as in Figure 2.

The fluoroscope of the accompanying drawings comprises a hollow eye piece A, an X-ray shield B, and a casing or hood C which is adapted at its forward end to receive a fluorescent screen D (Figure 4).

The eye piece A is shaped to fit the face and is provided with a piece of plush or the like 10 to rest against the face of the user. The eye piece A also comprises front and rear frame-like sections 11 and 12 respectively. Each of the sections 11 and 12 is provided with top, bottom and side walls which surround a viewing orifice. The viewing orifice at the entrance to the interior of the eye piece section 12 is covered or completely closed by a lead glass 14 which shields the user's eyes from exposure to X-rays.

In assembling the fluoroscope, the X-ray shield B is positioned between the eye piece sections 11 and 12, and these three parts (B, 11 and 12) are secured in the assembled relation by means of screws 13 as shown in Figure 4. The shield B has an opening or aperture corresponding in shape and size to the interior of the eye piece A (or sections 11 and 12). This opening in the shield B is aligned with the interior of each of the sections 11 and 12 so that the shield B does not obstruct the view through the eye piece A.

The X-ray shield B may be of laminated material with an inner lamination 16 (Figure 4) in the form of a thin lead sheet having a thickness on the order of 0.5 millimeters. Other material having the same X-ray shielding effect as sheet lead may be used, if desired, in the place of the sheet lead 16. The lead sheet lamination 16 may be reinforced by outer laminations 15 of plywood, Bakelite or other suitable lightweight material to impart stiffness to the shield B. The shield B may also have a covering of cloth to provide desired finish in its appearance.

The shield B is of a height and width substantially greater than that of the eye piece A for protecting the head and face of the user from exposure to X-rays. A convenient size for the shield B is on the order of 9 inches wide by 10 inches high so that the shield B will extend over the full width and length of the average face.

The interior walls of the eye piece A are lined with X-ray shielding material, such as, sheet lead, to avoid the passage of X-rays through the walls of the eye piece section 12 and between the lamination 16 of the shield B and the lead glass 14. The lining 17 for the top and bottom inner walls of the eye piece section 12 may be formed as continuations of the lamination 16 of the shield B as shown in Figure 4. The lining for each inner sidewall of the eye piece A may be in the form of a plate 18. One of the two plates 18 is shown in Figure 4. The inner eye piece wall opposite that seen in Figure 4 is similarly provided with the second of the plates 18. It is to be understood that the lamination 16 of the shield B and each of the two plates 18 are fitted closely together to avoid space therebetween through which X-rays might pass. It will also be understood that the edges of the lining 17, 18 facing the lead glass 14 meet the lead glass within its marginal limits. Thus protection against X-rays

coming from any angle and within the outer limits of the shield B is provided for the face and head of the fluoroscope user.

The casing C is secured to the eye piece section 11 as by means of a hinge connection 20. Springs 21 are provided to yieldingly maintain the casing C in either the lowered position of Figure 1 during fluoroscopic examinations or the raised position of Figure 2 during the intervals between fluoroscopic examinations. The sides and bottom of the eye piece section 11 are provided with forwardly projecting flanges 22 to form a recess for receiving the inner end of the casing C when in the lowered position of Figures 1 and 4. When the casing C is lowered, the flanges 22 prevent light passing between the eye piece A and the casing C and into the interior thereof.

The forward or front end of the casing C is provided with a plate 26, which may be formed of Bakelite, or other suitable material, through which X-rays may easily pass. The plate 26 affords protection against accidental damage to the fluorescent screen D and is removably secured in place by screws 27 (Figure 1). When the screws 27 are removed, the plate 26 may be withdrawn from the casing D by sliding the plate 26 through a suitably shaped slot 30 (Figure 3) in one side of the casing C.

The screen D comprises a fluorescent layer 28 and a protective backing 29 of suitable transparent material, such as a transparent Celluloid, or other cellulosic material. The screen D is removably secured in place and in spaced relation to the plate 26 by marginal portions of flexible strips 31 which are detachably fastened at their bases to the casing C by screws or the like.

The fluoroscope is also provided with a ruby glass 32 which is pivotally connected, by means of a hinge, to the top wall of the eye piece section 11. The hinge pintle 41 is rigidly secured to the ruby glass 32 and is provided with an eccentric pin 42 which is in the path of movement of an edge of a plate 34 (Figure 4) that is mounted on the adjacent interior wall of the casing C. As the casing C is lowered from the position of Figures 2 and 5 to the position of Figures 1, 3 and 4, an edge of the plate 34 engages the eccentric pin 42 and swings the ruby glass 32 from the lowered position of Figures 2 and 5 to the raised position of Figure 4 and against the action of a spring 33. This spring 33 is provided for yieldingly maintaining the ruby glass 32 in the lowered position of Figures 2 and 5 when the casing C is raised as in Figures 2 and 5. Thus the user of the fluoroscope may raise the casing C during the intervals between fluoroscopic examinations and have the accommodation of his eyes to fluoroscopic conditions retained by viewing through the ruby glass.

The fluoroscope is supported on the head of the user by means of straps 36, 37. The strap 36 is intended to extend along the sides and across the back of the head and may have its opposite ends secured to opposite sides of the eye piece section 12 as in Figure 3. The strap 36 may also be formed in two parts so that its effective length may be adjusted to the size of the head on which the fluoroscope is to be supported. The strap 37 is preferably connected to the center of the top marginal portion of the shield B and to the strap 37 at a point midway of its effective length. The connection between the straps 36 and 37 may be in the form of a clip 38 which is slidably adjustable along the length of the strap 36. Each of the straps 36 and 37 may be formed in part or entirely of elastic material so that they will snugly fit the head.

The fluoroscope may be comfortably supported since the X-ray shielding is positioned close to the head when the fluoroscope is used. A maximum X-ray shielding of the user's head is thus afforded with a minimum of force tending to tilt the head forward. It is also to be noted that the fluoroscope affords the same X-ray protection to the user regardless of whether the casing C is in its raised position (Figure 2) or in its lowered position for use (Figure 1).

As the top head strap 37 extends forwardly at the level of the top of the head and to the top edge of the shield B, it also contributes to the comfort of the user when the fluoroscope is supported by his head.

While the foregoing description and the accompanying drawings disclose one form of this invention, it will be understood that this invention includes all modifications and embodiments coming within the scope of the appended claims.

I claim:

1. In a portable fluoroscope, the combination comprising an X-ray shield having an aperture therein, an eye piece having a viewing orifice in alignment with said aperture, a lead glass covering said orifice, and X-ray shielding material interposed between said lead glass and said X-ray shield, whereby X-ray shielding is continuous from adjacent one side edge to adjacent the opposite side edge and from adjacent the top edge to adjacent the bottom edge of said X-ray shield.

2. In a portable fluoroscope, the combination comprising: a hollow eye piece formed of front and rear frame-like sections each having a viewing orifice; an element fitted between and secured to said eye piece sections, said element extending beyond the sides, the top and the bottom of said eye piece and having an aperture registering with the interior of each of said eye piece sections; X-ray shielding material extending throughout at least a substantial part of the area of said element, extending along the inner walls of one of said eye piece sections, and extending across the viewing orifice of said one eye piece section, and a casing secured to and projecting forwardly of the other or second of said eye piece sections and adapted at its forward end to receive a fluorescent screen.

3. In a portable fluoroscope, the combination comprising an eye piece shaped to fit the face of an individual and having a viewing orifice, an apertured X-ray shield mounted on said eye piece with the shield aperture registering with said orifice and having such width and height as to be substantially larger than the corresponding cross-sectional area of said eye piece, and a casing pivotally supported on said eye piece and projecting forwardly therefrom, said casing adjacent the forward end thereof being adapted to receive a fluorescent screen for examination through said orifice.

4. In a portable fluoroscope, the combination comprising an eye piece having a viewing orifice, lead glass positioned at said orifice, a laminated X-ray shield mounted on said eye piece and forwardly of said lead glass, said shield having an aperture in alignment with said orifice and having a layer of relatively thin lead as one of the shield laminations, a lining of sheet lead for the interior part of said eye piece between said lead glass and said X-ray shield, and a casing projecting forwardly of said X-ray shield and adapted adjacent the forward casing end to

receive a fluorescent screen for examination through said lead glass.

5. In a portable fluoroscope, the combination comprising: a hollow eye piece having a viewing orifice; an element secured to said eye piece, said element extending beyond the sides, the top and the bottom of said eye piece and having an aperture registering with the interior of said eye piece; X-ray shielding material extending throughout at least a substantial part of the area of said element, extending along the inner walls of said eye piece, and extending across the viewing orifice of said eye piece, and a casing secured to and projecting forwardly of said eye piece and adapted at its forward end to receive a fluorescent screen.

6. In a portable fluoroscope, the combination comprising an eye piece having a viewing orifice, lead glass positioned at said orifice, a laminated X-ray shield mounted on said eye piece, said shield having an aperture in alignment with said orifice and having a layer of relatively thin lead as one of the shield laminations, and a casing projecting forwardly of said X-ray shield and adapted adjacent the forward casing end to receive a fluorescent screen for examination through said lead glass.

7. In a portable fluoroscope to be supported by the head of an individual in his fluoroscopic examination of a subject by means of X-rays, the combination comprising an eye piece shaped to fit the face of an individual and having a viewing orifice, a hollow casing projecting forwardly from said eye piece and adapted at the forward casing end to receive a fluorescent screen for examination through said orifice, and X-ray shielding arranged adjacent the end of the fluoroscope remote from the fluorescent screen, said X-ray shield being of such shape, height and width as to provide X-ray protection for substantially the entire face of the individual in his use of the fluoroscope.

8. In a fluoroscope to be supported by the head of an individual in his fluoroscopic examination of a subject by means of X-rays, the combination comprising an eye piece having a viewing orifice, a hollow casing secured to said eye piece and projecting forwardly from said eye piece, said casing at the forward end thereof being adapted to receive a fluorescent screen for examination through said orifice, X-ray shielding means so mounted on said eye piece as to be positioned closely adjacent an individual's head on which the fluoroscope is supported for use, said shielding means being of such shape, height and width as to provide X-ray protection for substantially the entire face of the individual in his use of the fluoroscope, said shielding means including a plate-like member projecting upwardly, downwardly and laterally from the top, bottom, and opposite sides, respectively, of said eye piece, said plate-like member having an opening aligned with said orifice, and straps secured to the fluoroscope for supporting the same on the head.

9. In a fluoroscope to be supported by the head of an individual in his fluoroscopic examination of a subject by means of X-rays, the combination comprising an eye piece having a viewing orifice, a hollow casing pivotally secured to said eye piece and projecting forwardly from said eye piece, said casing at the forward end thereof being adapted to receive a fluorescent screen for examination through said orifice, X-ray shielding means so mounted on said eye piece as to be positioned closely adjacent an individual's head on which the fluoroscope is supported for use, said shielding means being of such shape, height and width as to provide X-ray protection for substantially the entire face of the individual in his use of the fluoroscope, said shielding means including a plate-like member projecting upwardly, downwardly and laterally from the top, bottom, and opposite sides, respectively, of said eye piece, said plate-like member having an opening aligned with said orifice, and straps secured to the fluoroscope for supporting the same on the head, one of said straps being secured to the top edge of said plate-like member and being adapted to fit over the top of the head.

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