April 17, 1962 D. MORT ET AL 3,030,508

X-RAY APPARATUS

Filed Sept. 24, 1959

Fig. 1.

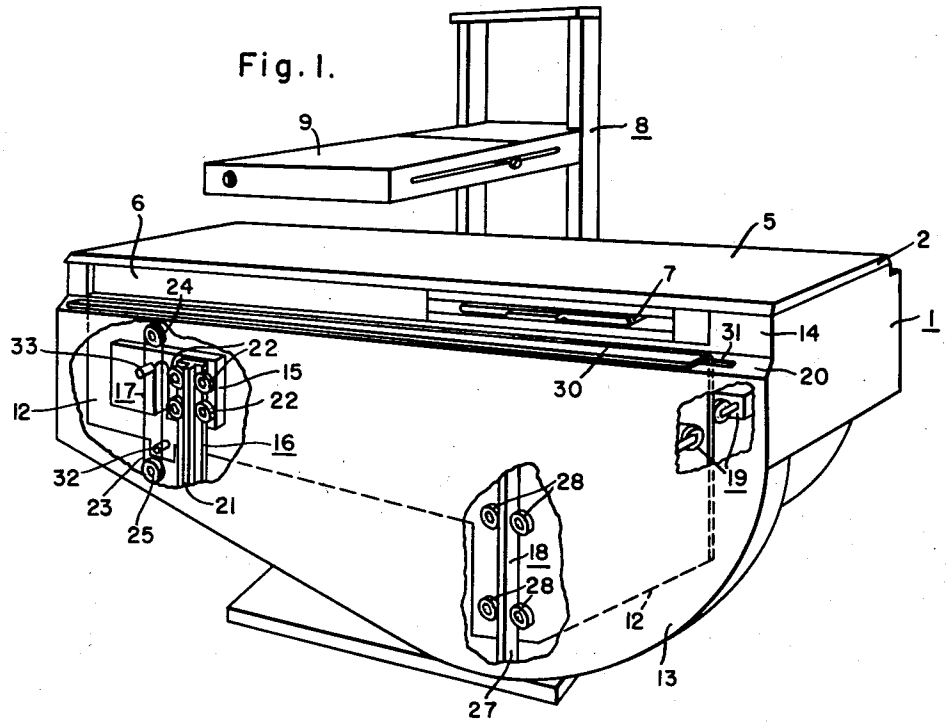
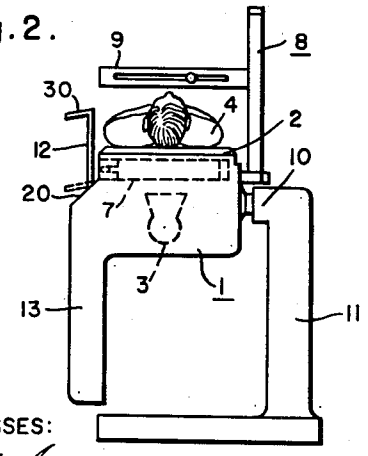


Fig. 2.



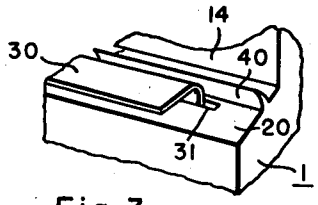


Fig. 3.

WITNESSES:

W. C. Groome

D. F. Straitiff

INVENTORS

David Mort &

Charles H. Jennings

BY P. M. Brodahl

ATTORNEY

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X-RAY APPARATUS

David Mort, Catonsville, and Charles H. Jennings, Ellicott City, Md., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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The present invention relates to an X-ray apparatus and more particularly to an improved X-ray table structure.

A table structure of the type in which the present invention may be embodied to advantage will essentially include a frame or chassis providing support for an object-support or patient-support panel forming a table top. Provision may be made for tilting the frame and patient-support panel selectively between horizontal and vertical limit positions.

The table may be employed in conjunction with either fluoroscopy or radiography in which an X-ray source is disposed beneath the patient-support panel and the X-ray sensitive material is located above such panel. The table may also include the usual longitudinally-movable carriage disposed beneath the patient-support panel to accommodate a film cassette and Bucky diaphragm for use when it is desirable to employ an X-ray source located externally of the table structure. To enable access to the film cassette and Bucky diaphragm in this latter case, the front panel of the table structure will include a Bucky slot.

Irrespective of the location of the X-ray source, internally or externally of the table structure, X-rays will be transmitted through both the table top and the patient or object resting thereagainst. In either event, the operator or radiologist will be located at the front of the table, a position in which his mid section may be exposed to stray or secondary X-ray emission from the table top and patient.

In view of the foregoing remarks, it becomes an important object of the present invention to provide an X-ray table structure having a radiation shield for protection of the operator from the above-mentioned stray or secondary X-ray emission.

Another important object of the invention resides in the provision of an X-ray table having a radiation shield for the aforementioned purpose which is conveniently stored within the table and readily available for use when desired.

Another important object of the present invention resides in the provision of an X-ray table having a radiation shield for the stated purpose which is relatively simple and preferably in the form of a thin plate-like member which may be moved conveniently and with relative ease from a retracted position to positions at the front of the table in projection above the table top selected heights up to an extent at least substantially equal to the thickness of the patient which will rest against such top.

Another important object of the present invention resides in the provision of an X-ray table having a radiation shield, which, in addition to being extensible to a position in projection above the table top, also will simultaneously cover a Bucky slot at the front of such table.

Another important object of the present invention resides in the provision of an X-ray table having a front radiation shield in accord with the foregoing objects which is fully counterbalanced irrespective of the attitude of the table top; i.e. horizontal, vertical, or tilted.

Other objects and advantages of the invention will become apparent from the following description thereof

when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view, with partial cutaway, of a preferred form of an X-ray table embodying the invention;

FIG. 2 is an end view of the X-ray table of FIG. 1, showing the novel radiation shield incorporated therein in raised position; and

FIG. 3 is a partial view of the table of FIG. 1, showing a preferred detail of the invention.

Referring particularly to FIG. 1 of the drawing, an X-ray table embodying the invention essentially will comprise a chassis or body portion **1** which may take the form shown in the drawing as an elongated rectangular box-like member having a patient-support panel **2** attached to an upper face thereof, to form the table top as viewed in FIG. 1, and containing therein the usual structural members, table-counterbalance means, and Bucky carriage (not shown). The usual X-ray table embodying the invention also will include an X-ray source **3** contained within the body portion **1** and directed toward the patient-support panel **2** or table top for emission of X-rays through a patient **4** disposed against the patient-support surface **5** of such panel **2**.

The table may also include the usual Bucky slot **6** extending longitudinally of body portion **1** and opening outwardly through a front face portion thereof. A Bucky diaphragm **7** in the form of a tray may be employed in conjunction with the X-ray source **3** to serve its usual well-known function, such diaphragm **7** being removable and insertable through the Bucky slot **6**. The usual carriage mechanism (not shown) will be associated with the X-ray source **3** and with the Bucky diaphragm **7** to enable same to be moved longitudinally of the body portion **1**.

The usual spot film tower **8**, including a spot film device **9** will be associated with the body portion **1** and suitably mounted by means (not shown) for movement longitudinally of body portion **1** in synchronism with movement of the X-ray source **3**. Spot film device **9** will be adapted in the usual manner for accommodation of X-ray film and a fluorescent screen to produce recorded and visible images of the patient or object undergoing examination. In the usual manner, the spot film device **9** may be displaced, preferably to a vertical position, to permit employment of an external source of X-rays for direction toward the patient-support panel **2**, and the Bucky slot **6** will serve to accommodate substitution of a film cassette tray for the Bucky diaphragm **7**.

The X-ray table embodying the invention also may be of the tiltable type, in which case as shown in FIG. 2, the body portion **1** will be pivotally supported such as by bearing means **10** carried by a pedestal member **11** which may be disposed at the rear and bottom of such body portion **1**, or in any other suitable manner.

Referring to FIG. 1, in accord with the invention, the X-ray table is provided with a rigid sheet-like radiation shield **12** disposed at the front of the table and hidden from view by a front cover panel member **13**, attached to the body portion **1**. The front cover panel member **13** extends preferably perpendicular to the patient-support panel **2** and is offset forwardly of the front end of such panel **2** as well as forwardly of a front portion **14** of body portion **1** in which the Bucky slot **6** is located. The space located behind the front cover panel member **13** serves to accommodate the radiation shield **12** for concealed storage as well as to provide for disposition of a counterweight **15**, counterweight guide means **16**, cable and pulley means **17** for operatively connecting the counterweight **15** to the radiation shield **12**, guide means **18** for directing movement of the radiation shield **12** perpendicularly of the patient-support panel **2** and for supporting such radia-

tion shield 12 when the table is in a vertical attitude, and another guide means 19 cooperable with the radiation shield 12 to maintain its proper attitude and facilitate its movement. The top, as viewed in FIG. 1, of the radiation shield storage space behind the front cover panel member 13 is enclosed by a cover member 20 which preferably extends downwardly and forwardly from the front portion 14 of body portion 1 into juncture with the front cover panel member 13.

The counterweight 15 may be of any suitable shape, preferably substantially flat as shown in FIG. 1, and is guided for movement perpendicularly of the patient-support panel 2 by means of the guide means 16 which preferably takes the form of a track 21 attached to body portion 1, through the medium of such as the front cover panel member 13, and rollers 22 carried by counterweight 15 cooperable with the track 21.

Means for operably connecting the counterweight 15 to the radiation shield 12 preferably will take the form of a flexible cable 17 of elongated closed loop shape extending in the direction parallel to the direction of extension of the guide rail 21 and passing around pulleys 24 and 25 at fixed locations with respect to the body portion 1 as by attachment to front cover panel member 13.

Guide means 18 preferably will take the form of a guide rail 27 extending perpendicularly of the patient-support panel 2 and attached to the body portion 1 through the medium of such as the front cover panel member 13, and a plurality of rollers 28 carried by the radiation shield 12 and arranged to prevent its tilting in a longitudinal direction. Guide roller means 19 are suitably attached to the body portion 1 for cooperation with opposite faces of the radiation shield 12 to facilitate its movement and support same against tilting in the direction forwardly of the table.

The radiation shield 12 may be made of a sheet of suitable rigid X-ray shielding material such as steel, for example, or layers of steel and lead of such thickness as will block secondary emission of X-rays from the patient and from the support panel 2 to the desired degree during X-ray examination. The uppermost end of the radiation shield 12 as viewed in FIG. 1, for example, is provided with a handle member 30 in the form of a continuous flange which is preferably formed integral with and extends forwardly of the shield. Angulation of the handle member 30 with respect to the cover member 20 is such that when the radiation shield 12 is disposed in its retracted position in which it is shown in FIG. 1, ample space is provided between such handle member 30 and cover member 20 to facilitate the placement of the operator's hands therebetween to grip such handle member at any point along the shield 12 for moving it. Cover member 20 is provided with a slot 31 through which the radiation shield 12 extends, and a longitudinally-extending rib 40, FIG. 3, is attached to cover member 20 to project above the slot 31 for preventing entrance of spillover material into such slot when the table is in a horizontal attitude.

During non-employment of the novel radiation shield 12 embodied in the X-ray table as shown in FIG. 1, the shield will normally be disposed in its concealed and retracted position in which it is shown in FIG. 1. When the table is in its horizontal attitude, in which it also is shown in FIG. 1, the radiation shield 12 may be raised with ease to any desired extent up to its upper limit position (FIG. 2) by simply gripping the handle member 30 and exerting a slight lifting effort thereagainst. During upward movement of the shield 12, roller guides 28 and 19 will serve to direct such movement, while the counterweight 15 will balance the weight thereof. The cable 23 is anchored at 32 to the radiation shield 12 and at 33 to the counterweight. During upward movement of the radiation shield 12, the counterweight 15 will move downwardly along the path of travel defined by guide rail 21 and rollers 22, while the cable 23 travels around

pulleys 24 and 25 and exerts an upward pulling effort on the radiation shield 12.

When the table is in a vertical attitude, the weight of the counterweight 15 will be supported by the guide rail 21 through the medium of rollers 22, and the weight of the radiation shield 12 will be supported by the guide rail 27 through the medium of roller members 28, which rails 21 and 27 will then be disposed in a horizontal attitude. It will be apparent, therefore, that the radiation shield may be actuated with ease also when the table is in a vertical attitude; the counterweight 15 merely rolling along the guide rail 21 by action of the cable 23 as the radiation shield 12 is moved inwardly and outwardly to and from its position behind the front cover panel member 13.

Irrespective of the attitude of the table 1, it will be apparent that the radiation shield 12 may be moved with ease to a selected position for the protection and accommodation of the operator of the X-ray apparatus. It will also be apparent that such shield as embodied in the X-ray table provides a simple, readily-accessible medium which protects the operator from secondary emission of X-rays from the table top 2 and patient 4.

We claim as our invention:

1. A horizontal X-ray table comprising a top panel for patient support; a vertical front portion having a Bucky slot adjacent to and extending longitudinally of said top panel for substantially its full length; a front cover panel disposed forwardly and unobstructively of said Bucky slot and top panel; and a rigid sheet-like metal radiation shield of length at least equal to that of said Bucky slot guidably mounted on said table for movement between a retracted position behind said front cover panel to raised protective positions in front of said Bucky slot up to a limit position in extension above said top panel.

2. A horizontal X-ray table comprising a top panel for patient support; a vertical front portion having a Bucky slot adjacent to and extending longitudinally of and substantially the length of said top panel; a front cover panel displaced forwardly and unobstructively of said Bucky slot and top panel; a rigid sheet-like metal radiation shield of length at least equal to that of said Bucky slot guidably mounted on said table for movement between a hidden retracted position behind said front cover panel to raised protective positions in front of said Bucky slot up to a limit position in extension above said top panel; and means including a counterbalance and guide for said radiation shield disposed behind said cover panel.

3. An X-ray table comprising a normally-horizontal patient support panel, and a rigid radiation shield of approximately the length of said patient support panel mounted on said table for vertical movement between a lowermost retracted position giving unobstructed accessibility to said patient support panel from the front thereof and raised selective protective positions in projection above the plane of said patient support panel adjacent to its front edge.

4. An X-ray table comprising a chassis, a patient support panel carried by said chassis, a flat radiation shield of length substantially equal to that of said patient support panel, guide-and-roller means interposed between said chassis and said radiation shield for directing movement of said shield in a plane intersecting the plane of said patient support panel from a retracted position to protective positions in extension beyond the plane of said patient support panel for disposition in front of a patient contacting such panel, and counterweight means for counterbalancing said radiation shield.

5. An X-ray table comprising a tiltable chassis having a patient support panel which may be oriented to and between horizontal and vertical positions; a rigid sheet-like radiation shield of length substantially equal to that of said patient support panel; track-and-roller means interposed between said chassis and said radiation shield to guide movement of said shield perpendicularly of said patient support panel from a retractable position to a

position intersecting and extending beyond the plane of said panel for disposition in front of a patient in contact with such panel, said track-and-roller means serving also to support the weight of said shield in degree directly proportional to the degree of verticality of said patient support panel; counterweight means; flexible cable means connected between said counterweight means and said radiation shield; pulley means on said carriage for said cable means; and track-and-roller means interposed between said chassis and said counterweight means to guide movement of said counterweight means perpendicularly of said patient support surface during movement of said radiation shield and to support the weight of said counterweight means in degree directly proportional to the degree of verticality of said patient support panel.

6. An X-ray table comprising a normally-horizontal patient support panel, and a radiation shield of approximately the length of said patient support panel mounted on said table for vertical movement between a lowermost retracted position giving unobstructed accessibility to said patient support panel from the front thereof and raised selected protective positions in projection above the plane of said patient support panel adjacent to its front edge.

7. An X-ray table comprising a normally-horizontal flat patient support surface, an X-ray source directed perpendicularly of said patient support surface and movable longitudinally thereof, and a rigid sheet-like radiation shield of length equal substantially to the length of said patient support surface which is subject to exposure to X-rays from said X-ray source in all of its longitudinal

position along the table, said shield being mounted on said table for vertical movement perpendicularly of said patient support surface from a retracted position beneath the plane of said surface to protective positions in extension above such plane at an edge of said surface.

8. An X-ray table comprising a normally-horizontal flat patient support surface, an X-ray source directed perpendicularly of said patient support surface and movable longitudinally thereof, a rigid sheet-like radiation shield of length equal substantially to the length of said patient support surface which is subject to exposure to X-rays from said X-ray source in all of its longitudinal positions along the table, said shield being mounted on said table for vertical movement perpendicularly of said patient support surface from a retracted position beneath the plane of said surface to protective positions in extension above such plane at an edge of said surface, and counterbalance means constructed and arranged to fully support said shield in any of its selected positions and provide for facile manual movement vertically from any of such positions.

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