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FLOATING TOP X-RAY TABLE PERMITTING CLOSE PROXIMITY BETWEEN A PATIENT SUPPORTED THEREON AND A DIAPHRAM PLACED THEREBENEATH

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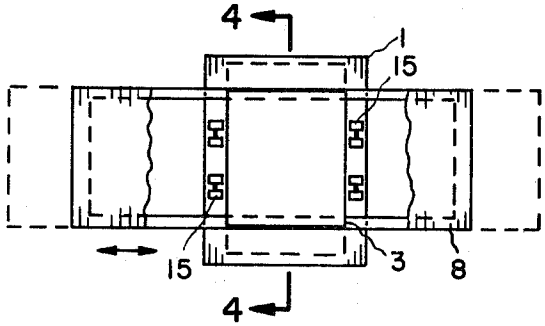

Fig. 1

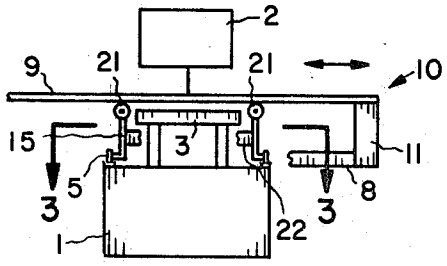

Fig. 2

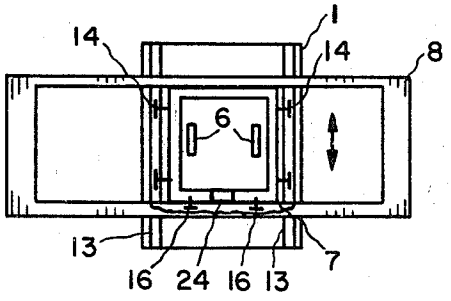

Fig. 3

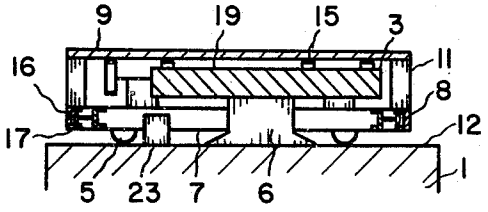

Fig. 4

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FLOATING TOP X-RAY TABLE PERMITTING CLOSE PROXIMITY BETWEEN A PATIENT SUPPORTED THEREON AND A DIAPHRAGM PLACED THEREBENEATH

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ABSTRACT OF THE DISCLOSURE

The apparatus disclosed is an improved floating top X-ray table. The apparatus includes a table top which is freely movable in the transverse and longitudinal directions, over a Potter-Bucky diaphragm, called a Bucky. The Bucky is rigidly mounted in spaced relation with a table base. The primary structure and mechanism enabling the motion of the table top is located between the undersurface of the Bucky and the top surface of the said table base.

Rotatable support means are attached to a transversely movable frame mechanism and provide a support for the table top at points on either side of the Potter-Bucky diaphragm. These support means permit the use of a thin sheet of material for a table top and also permit the positioning of the X-ray film in close proximity to the object to be X-rayed.

This invention relates to diagnostic X-ray tables. Present X-ray techniques use two basic approaches in regard to positioning the patient or object in relation to the X-ray tube and the Bucky. A Bucky contains a grid member for minimizing scatter radiation and the X-ray film. The first technique involves rigidly positioning the patient on the X-ray table and moving the X-ray tube to a position overlying the area to be X-rayed. The second technique, the one to which this invention relates, involves the use of an X-ray tube in fixed axial alignment with the Bucky, but with said tube and diaphragm relatively movable along said axis, and moving the table top on which a patient or object to be X-rayed into the radiation zone of the fixed tube. The table top is usually moved manually to position the portion of the patient or object within said radiation zone. The problem with existing floating table tops is that relatively large structure is necessary to provide both support and mobility to said table top, which is mounted in spaced relation over the rigidly mounted Bucky. This type of structure results in the spacing of the upper surface of the table top on which the patient or object rests a substantial distance from the Bucky and the X-ray film, as well as requiring a table top of substantial thickness to support the weight of the patient or object placed thereon. The remoteness of the patient or object from the film and the thick table top creates geometric or focus unsharpness and undesirable enlargement of the image produced on the X-ray film.

It is an object of this invention to provide a floating top X-ray table which positions the patient to be X-rayed in close proximity to the X-ray film with the Bucky.

It is a further object of this invention to utilize a relatively thin table top member over the Bucky to attain a close proximity between the film and the object to be X-rayed and to thereby minimize the focus unsharpness.

It is another object of this invention to locate the structure providing mobility to the table top below the Bucky which enables a further reduction of the space between the film and object to be X-rayed.

It is a further object of this invention to provide means on the undersurface of the table top which will support said table top without interfering with the primary radiation zone between the X-ray tube and the X-ray film.

The apparatus of the present invention provides a floating top X-ray table in which the surface supporting the patient or object to be X-rayed is in close proximity to the Bucky and hence the film. Said apparatus includes said Bucky rigidly mounted in spaced relation to a table base member, a structural framework mounted on rollers for providing longitudinal and translational motion of the table top, said framework being positioned between the Bucky and the table base, a table top attached to and in spaced relation from the said structural framework, said table top closely overlying the Bucky, and support means for supporting the table top. The framework providing the longitudinal and translational movement of the table top includes several elements. The element permitting transverse motion has a rectangular frame member with rollers attached thereto. This element is mounted in tracks on the table base and moves only transversely thereof by means of said rollers. Transverse movement of the frame is limited by the members which support the Bucky member is spaced relation from the table base. A second rectangular frame is movably attached to the transversely movable frame by means of roller bearings. The second frame moves in a longitudinal direction with respect to the transverse frame. Consequently, the second frame is movable in a transverse direction with respect to the table base since the second frame is attached to the transverse frame and it is also movable in a longitudinal direction with respect to the table base since said second frame is longitudinally movable with respect to the transverse frame.

Support members are attached to each of the transverse portions of the transversely movable frame; said members extend upwardly of said frame and are located adjacent the ends of the Bucky. These supports are in contact with the undersurface of the table top.

These and other objects of the present invention will become apparent from the following detailed description of our embodiment, the invention taken in conjunction with the accompanying drawings wherein:

FIGURE 1 shows a plan view of the floating top X-ray table apparatus.

FIG. 2 is a front view of the table with a partial section showing the supports for the table top.

FIG. 3 is a sectional view along lines **3–3** of FIG. 2 which illustrates the X-ray table with the Bucky removed.

FIG. 4 is a transverse cross-sectional view along line **4–4** of FIG. 1 illustrating the mobile transverse and longitudinal frames and the supported table top.

Referring to FIGURES 1–4, the apparatus comprises a floating top X-ray table **10** on which a head **2** containing an X-ray tube is mounted. The table **10** comprises a Potter-Bucky Diaphragm **3** rigidly mounted in spaced relation to a table base member, a roller mounted structural framework **7** and **8** for providing longitudinal

and transverse motion of the table top, a table top **9** attached to the structural framework, and support means **15** for supporting the table top.

The Bucky **3** is a standard piece of equipment which contains the X-ray film and a grid element for minimizing scatter radiation. Scatter radiation is a secondary radiation that occurs when the primary radiation transmitted from the X-ray tube passes through the patient or object to be X-rayed, the table top and the intervening distance between the table top **9** and the X-ray film. The purpose of the grid element within the Bucky then is to absorb as much of the scatter radiation as possible and still permit the passage of sufficient primary radiation to produce a clear image on the film.

The Bucky **3** is mounted on support members **6**. These support members **6** are centrally located on the table base and position the Bucky **3** above the upper surface **12** of the table base. The plane of the film within the Bucky is parallel with the surface of the table base **12** and normal to the longitudinal axis of the radiation cone eminating from the X-ray tube located in the head **2** spaced above the table **10**.

Track members **13** are mounted on the table base **1** parallel to the transverse edges of the Bucky **3**, i.e. normal to the longitudinal axis of the table top **9**. A first rectangular frame member **7** having rollers **14** rollers **14** mounted on the transverse elements of said frame is mounted on the tracks **13**. This rectangular frame **7** is movable only in a transverse direction with respect to the table base as shown in FIG. 1, and moves in the space below the undersurface of the Bucky **3**. The engagement between the inner periphery of the rectangular frame and the support members **6** defines the limits of travel of the frame in the transverse direction.

A second rectangular frame member **8** engages the first frame member **7** and is relatively movable therewith. Rollers or bearings **16** are mounted on the outer faces of the longitudinal elements of the first frame **7** and engage track means **17** on the inner faces of the longitudinal frame elements on the second frame member **8**, thus permitting the second frame to move in the direction normal to the motion of the first frame as shown in FIG. 1. That is, the second frame **8** moves in the longitudinal direction while the first frame **7** moves in the transverse direction. Bracing members **11** are located at the extreme ends of the second frame **8** structure. These bracing members **11** extend upwardly to a height slightly greater than the height of the upper surface of the Bucky. The table top **9** is attached to the bracing members, the undersurface of which passes over and in close proximity with the upper surface **19** of the Bucky.

A series of support means **15** are mounted on the transverse elements of the first rectangular frame **7**. These supports **15** comprise cylindrical roller members **21** and mounts **22**. Said roller members **21** are positioned on either side of the Bucky and engage the undersurface of the table top **9**. These support means **15** permit the use of a relatively thin table top **9**. That is, the table top **9** need not be the sole supporting structure for the forces imposed by the patient or object to be X-rayed, since the forces can be transmitted via the support means **15** to the table base **1**. Table top support structure along the longitudinal edges is also eliminated by the support means **15** since said supports resist bending of the table top in the transverse direction as well as the longitudinal direction. A Formica covered plywood table top having a total thickness dimension one-half an inch is used.

The support means **15** and the positioning of the movable frameworks **7** and **8** in the space between the undersurface of the Bucky **3** and the top surface **12** of the table base **1** permit the locating of the top surface of the table top **9** approximately one and seven-eighths inches from the plane of the X-ray film. Existing floating top tables have a separation of three and one-half to five inches between the table top surface and the plane of the film.

A first set of brake means **23** are mounted on the table base **1** for engaging the transversely movable first frame **7** and a second set of brake means **24** are located on the transversely movable frame **7** for engaging the longitudinally movable second frame **8**. In the embodiment illustrated, electromagnetic brake means are used.

The table **10** is used in the following manner. A patient or object is placed on the table top **9**. This placement is facilitated by the lack of any structural ridges around the table top. Existing floating top tables have a structural ridge around he periphery of the top which provides a structural support to the table top. Injured or unconscious patients have to be lifted over said ridges in order to be placed on the top surface of the table.

During the placement of the patient or object the brakes **23** and **24** engaging the movable framework **7** and **8** are actuated thereby locking the table in a fixed position. After placement, the brakes **23** and **24** are released permitting the manual movement of the table to position the portion of the patient or object to be X-rayed within the radiation zone under the X-ray tube in the head **2**. The movement of the transverse and longitudinal frames **7** and **8** is virtually unrestricted so that the portion of the table top **9** to be placed within the radiation zone may be moved substantially in a straight line from its existing location to said radiation zone. The table top **9** need not be moved along the coordinate paths of motion; that is, the table top need not be moved along the transverse path and then along the longitudinal path or vice versa, but may be moved along the resultant path of the two coordinate paths of motion.

After positioning the patient or object within the radiation zone the brakes **23** and **24** are again actuated thereby locking the table top **9** in its present alignment and thereby holding the patient or object in the position to be X-rayed.

The above cited embodiment is intended as exemplary only, and while we have described our invention with a specific application and embodiment thereof, other modifications will be apparent to those skilled in the art.

What is claimed is:

1. A floating top X-ray table, for use with an X-ray tube and Bucky in fixed alignment, comprising:

a table base,

a Bucky diaphragm holding an X-ray film therein rigidly affixed to the table base,

a first frame member positioned below and around the Bucky and supported on first track means on the table base for transverse movement with respect to the Bucky,

a second frame member positioned below and around the Bucky and supported by second track means in contact with the first frame for longitudinal movement with respect to the Bucky,

a table top having a thickness no greater than one-half inch attached to the second frame, said top positioned a distance less than two inches over the X-ray film in the Bucky and displaceable with respect to the Bucky in both a transverse and longitudinal direction; and

table top support means secured to the first frame member and positioned to contact and support the undersurface of the table top.

2. A floating top X-ray table, as claimed in claim **1**, further comprising:

a first plurality of roller members attached to the first frame member so as to engage the first track means.

3. A floating top X-ray table, as claimed in claim **2**, further comprising:

a second plurality of roller members attached to the first frame member so as to engage the second track means.

4. A floating top X-ray table, as claimed in claim **3**, wherein

the table top support means includes a third plurality of roller members.

5. A floating top X-ray table, as claimed in claim 4, further comprising:

a first set of brake means, mounted in the table base, for controlling the transverse movement of the first frame member, and

a second set of brake means, mounted on the first frame member, for controlling the longitudinal movement of the second frame member.

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