United States Patent [19]

Peyser

[11] **3,777,162**

[45] **Dec. 4, 1973**

[54] **CASSETTE LOCKING MECHANISM**

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[22] Filed: **May 18, 1972**

[21] Appl. No.: **254,581**

[52] **U.S. Cl.** **250/468,** 250/471

[51] **Int. Cl.** **G01b 41/16**

[58] **Field of Search** 250/66, 105, 468, 250/471

[56] **References Cited**

UNITED STATES PATENTS

3,581,094 5/1971 Peyser 250/105

2,668,913 2/1954 Goldfield et al. 250/66

Primary Examiner—James W. Lawrence
Assistant Examiner—B. C. Anderson
Attorney—Harold A. Murphy et al.

[57] **ABSTRACT**

A positive functioning lock for retaining a film-bearing cassette in the Bucky tray utilized in X-ray systems, which lock efficiently clamps opposite sides of a cassette of any of the standardized sizes and locks the cassette firmly in position on the tray by means of a pin which engages a specific slot in a locking bar, which slot corresponds to the selected cassette size being used.

5 Claims, 5 Drawing Figures

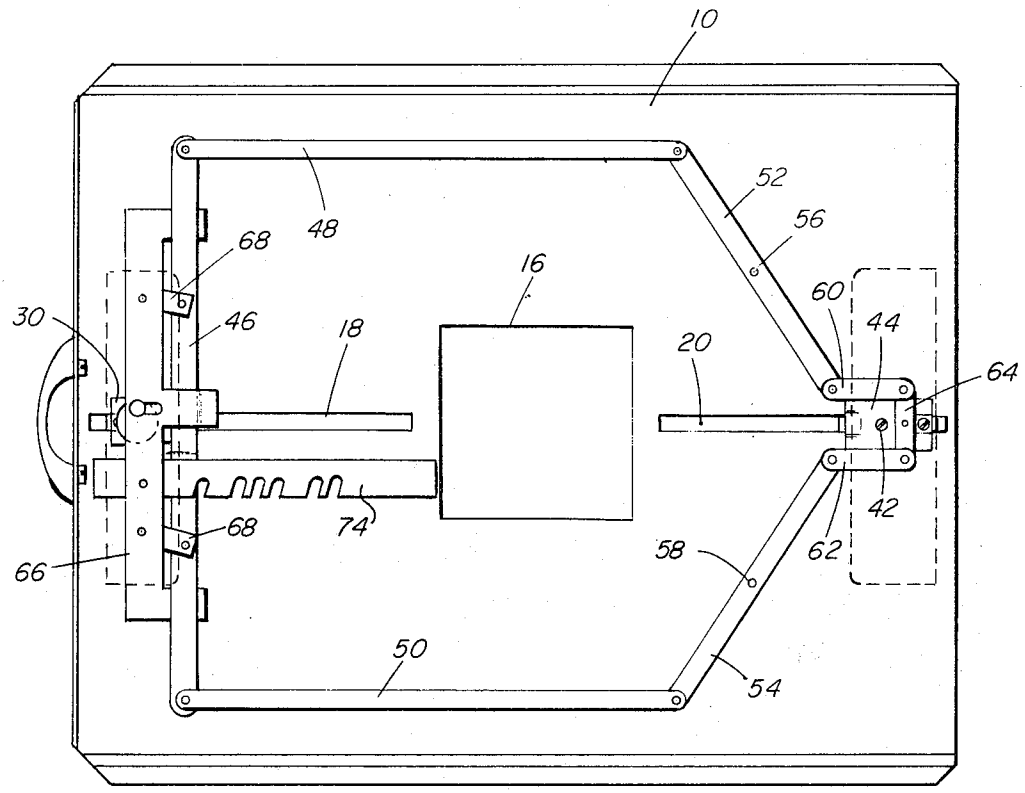


FIG. 1

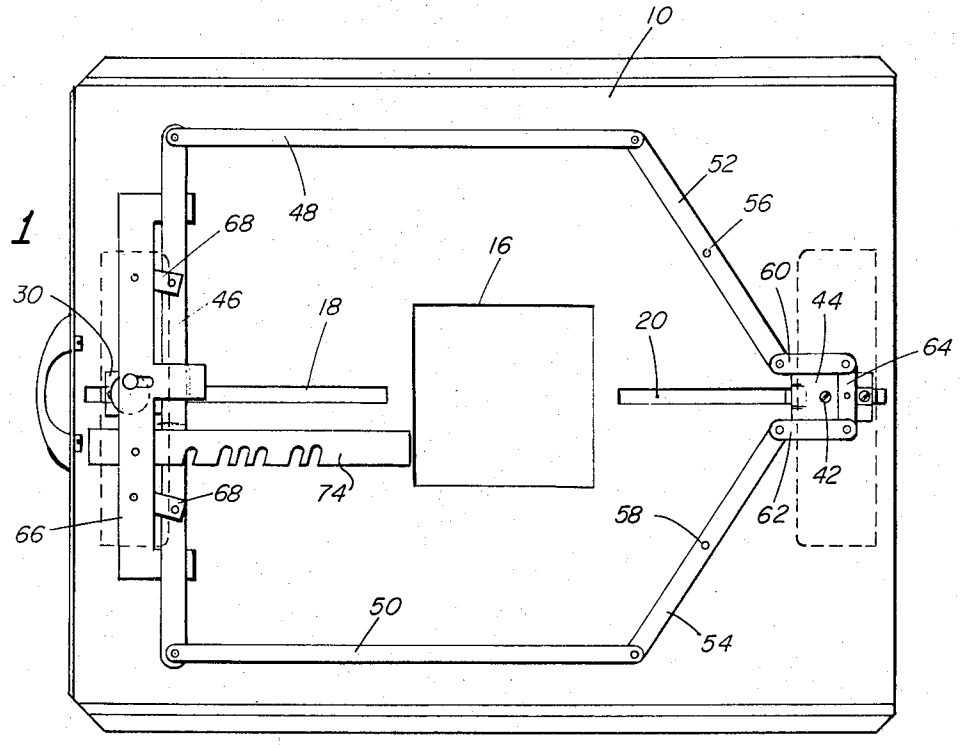
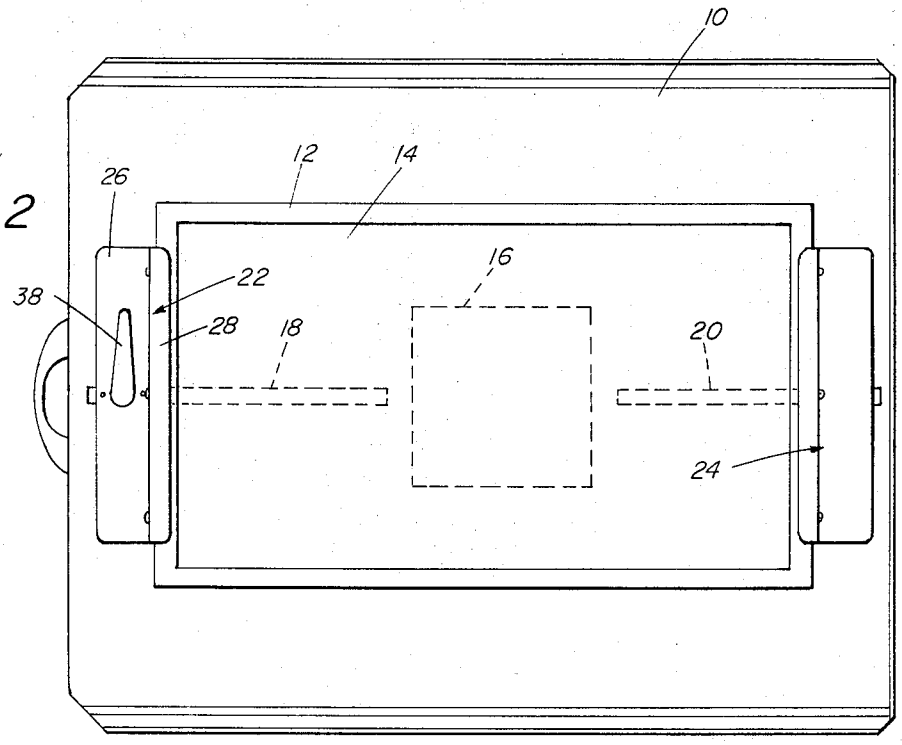

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FIG. 2


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16
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24

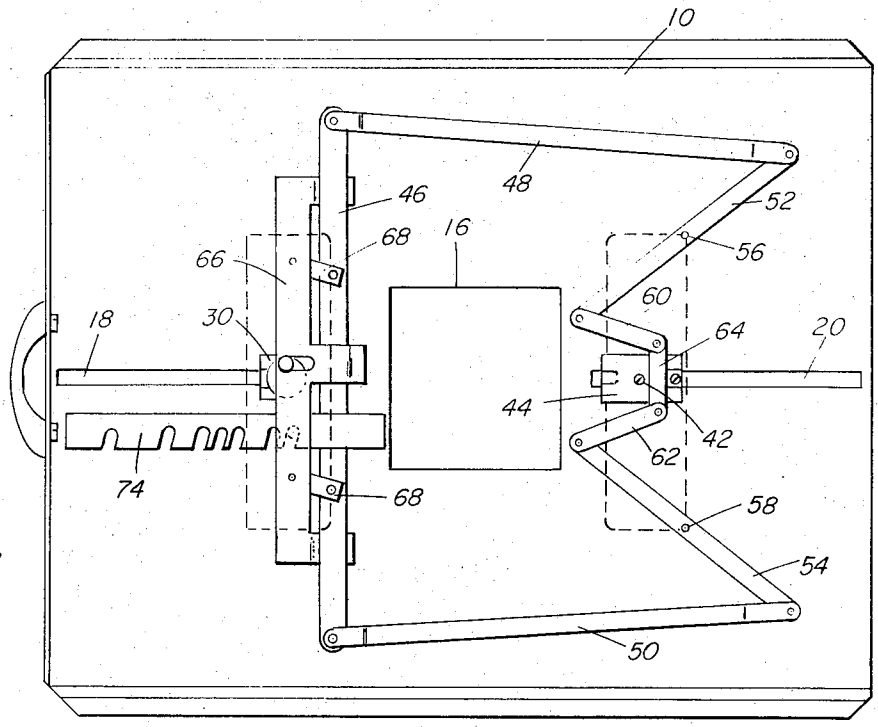

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FIG. 3

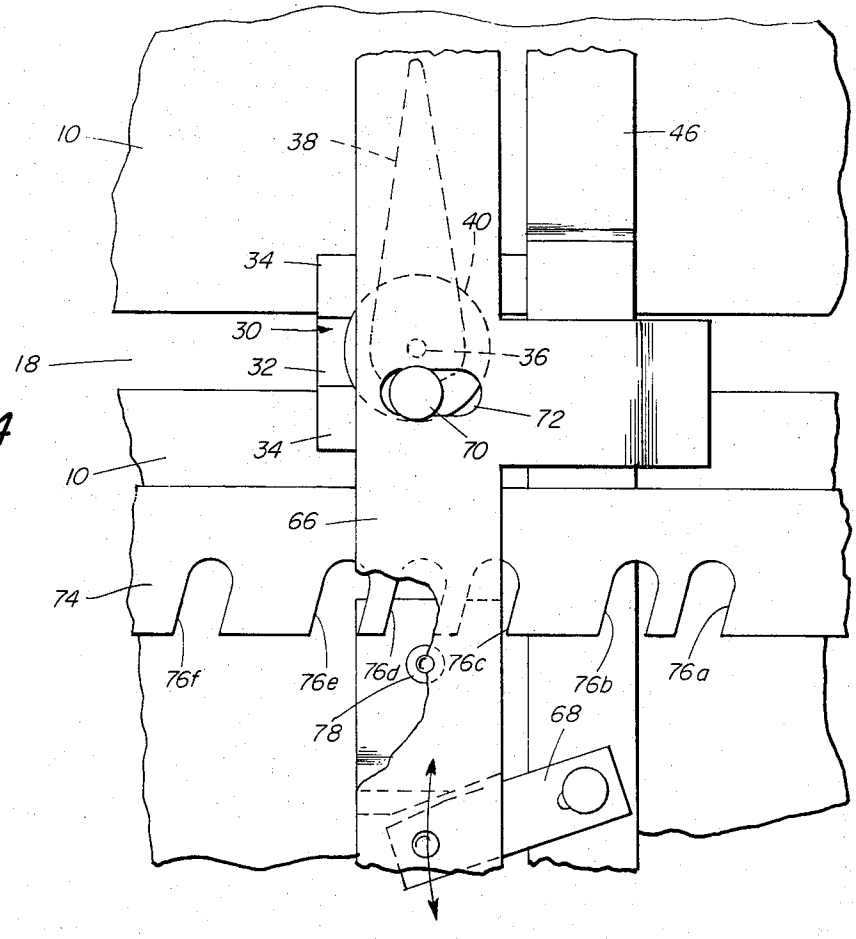
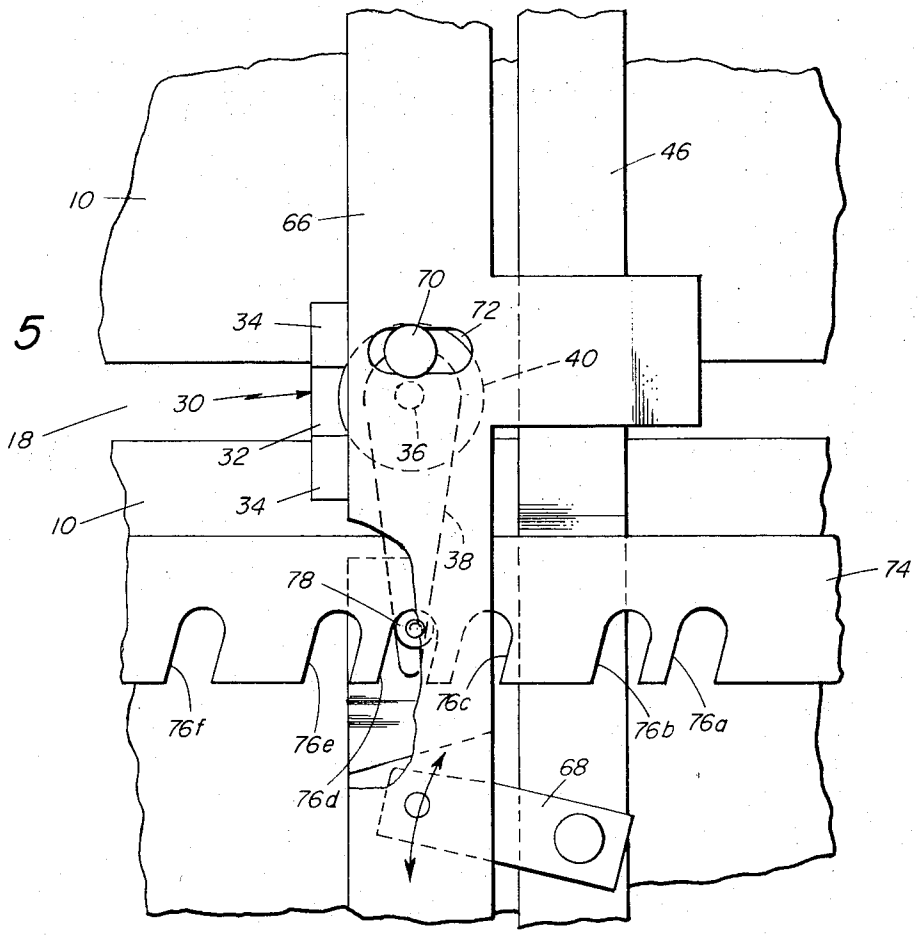

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76f
76e
76d
76c
76b
76a
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68

FIG. 4

FIG. 5


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72
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76d
76c
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76a
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CASSETTE LOCKING MECHANISM

BACKGROUND OF THE INVENTION

In the manufacture and use of collimating devices for X-ray systems, it has become extremely important that a film to be exposed to X-rays be properly positioned with respect to the collimated X-ray beam so that the X-radiation will impinge only upon the X-ray sensitive film or on a selected area thereof without contacting extraneous areas outside the margins of the film. This is of particular and paramount importance when the system is being utilized in connection with radiation of a portion of a human body since only the selected portion should be irradiated without subjecting any other portions to what might be harmful exposure.

X-ray systems for this purpose generally employ a tray, sometimes called a "Bucky" tray, which carries a film cassette bearing an X-ray sensitive film of a selected size. The tray is disposed in place beneath a table on which the patient is lying, and an X-ray generator is located above the patient at a predetermined focal distance from the film whereby, when the X-ray collimator is suitably adjusted, the cross-sectional size and shape of the cone of radiation to be produced by the generator will be no larger at the film level than the size of the film. By so controlling the size and shape of the X-ray beam the patient will be subjected to a minimum area of X-radiation which will accomplish the desired objectives; that is, the patient will be exposed only in the area requiring diagnosis or treatment, and adjacent areas will receive no irradiation. One example of a known system of this type is shown and described in U.S. Pat. No. 3,581,094.

The film must be properly positioned with respect to the patient and to the X-ray beam. Therefore, the Bucky tray is adapted to be located in a predetermined position in the table. However, the mechanisms used in many conventional devices for clamping a film-holding cassette on a tray have been found to possibly inaccurately position the film. This is usually due to improperly functioning clamping devices, or to devices which may be improperly positioned by careless or untrained technicians. As a result, the apparatus is improperly used, sometimes resulting not only in undesirable films but also in undesirable subjection of a patient to irradiation.

Furthermore, when the system being used includes a collimator which operates automatically in response to electrical signals created by the cassette and corresponding to its size and position on the tray, it will be apparent that improper signals will be transmitted to the collimator, resulting in the production of an X-ray beam of improper cross-sectional size. Obviously this could produce radiation harmful to a patient.

SUMMARY OF THE INVENTION

The above and other disadvantages of known prior art devices are overcome by the present invention wherein a film-bearing cassette is positively and accurately supported in a Bucky tray by a novel mechanism which may be satisfactorily operated by untrained personnel, whereby accurate signals will consequently be transmitted to a cooperating collimator for controlling the size and shape of an X-ray beam in accordance with the size of the film.

The supporting means for the cassette includes a Bucky tray on which two spaced clamps are simultaneously slidably movable toward and away from each other into engagement with opposite side edges of the cassette in the well-known manner, the extent of the resultant spacing between the two clamps being dependent, of course, on the cassette length or width dimension between the clamps.

The clamps are mounted on one side of the tray for supporting the film-holding cassette on that side. However, the clamp operating mechanism is located on the opposite side of the tray and is connected to the clamps by bolts which extend through aligned slots which thus serve as guides for the clamps. The mechanism includes an arm connected to one of the calmps by a crank on the associated bolt. The crank carries a crankpin which engages a slot in a locking bar whereby the bar may be moved laterally when the crank is rotated. The locking bar carries an indexing pin which, when the clamp is in engagement with a cassette, moves laterally with the locking bar into one of several slots in a perpendicularly extending fixed indexing plate. The plate is provided with several of such slots, each slot corresponding to a known cassette and film size.

Thus when a cassette of selected size is positioned on a tray and the clamps are slid into holding engagement with the cassette, the crank is operated to cause the indexing pin to move into the associated slot which corresponds to the selected cassette. This locks the cassette in position.

If the cassette is improperly positioned the locking mechanism cannot be operated. Therefore, since the locking mechanism can only be operated when the cassette is properly positioned, it will be apparent that an untrained operator can be utilized to perform this operation.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objectives of the invention will become apparent from the following description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a bottom plan view of a Bucky tray embodying the invention and showing the locking mechanism in one position;

FIG. 2 is a top plan view of the device shown in FIG. 1;

FIG. 3 is a view similar to FIG. 1 showing the locking mechanism in a different position;

FIG. 4 is an enlarged plan view of the locking mechanism in unlocked position; and

FIG. 5 is a view similar to FIG. 4 showing the locking mechanism in locked position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, there is shown in FIG. 2 a top plan view of a tray **10** which supports a cassette **12** carrying a film **14.** The tray is adapted to be slid into suitable supporting means therefor on the under side of a table on which a patient rests as is well known. An X-ray generator (not shown) is adapted to direct X-rays through the patient and table onto the film, as is also well known, and described in aforementioned U.S. Pat. No. 3,581,094, for example.

The tray **10** is provided with a central opening **16** for phototiming purposes not concerned with this inven-

tion, and with aligned slots 18 and 20 extending longitudinally thereof on opposite sides of the opening substantially midway of the tray. A pair of clamps 22 and 24 are mounted on the top surface of the tray 10 for sliding movement toward and away from one another along respective slots. Clamp 22 comprises a flat elongated portion 26 which lies perpendicularly across slot 18 and has an angled portion extending upwardly therefrom and from which extends a shelf portion 28 which is spaced above the surface of the tray 10. Disposed against the under side of the tray directly beneath clamp 22 and slot 18 is a clamping plate or lug 30 (FIGS. 1, 3, 4 and 5) which has a central portion 32 adapted to slide within the slot 118 and side portions 34 which slide along the bottom surface of the tray.

A shaft 36 (FIGS. 4 and 5) extends through clamp portion 26 and slot 18 into portion 32 of plate 30. On the top side of the tray a knob 38 is fixed onto the adjacent end of the shaft 36. The opposite end of the shaft has fixed to it a disc 40 which rests upon the under side of the plate 30.

This whole clamping structure, including clamp 22, knob 38, shaft 36, plate 30 and disc 40, may be moved as a unit longitudinally of the slot 18 and consequently of the tray 10, and locked in desired adjusted position as will be described.

Clamp 24 is constructed very similarly to clamp 22 and is connected by a pin or screw 42 (FIGS. 1 and 3) to a clamp plate 44 beneath the tray and slot 20 for slidable movement along the slot 20.

As seen best in FIGS. 1 and 3, wherein the under side of the tray is shown, the two clamps are interconnected by linkage for simultaneous movement toward and away from each other. The linkage may take any suitable form and in the illustrative example is shown as including a bar 46 fixed to clamp plate 30 and extending laterally in both directions therefrom. A pair of link bars 48 and 50 extend generally lengthwise of the tray from opposite respective ends of bar 46 to which they are pivotally connected at one end. The other ends of link bars 48 and 50 are each pivotally connected to an end of respective pivot bars 52 and 54, which bars 52 and 54 are pivotally attached as by pins 56 and 58 respectively to the tray. The opposite ends of bars 52 and 54 are each pivotally connected to an end of respective short links 60 and 62, which short links 60 and 62 are pivotally connected to respective opposite ends of an arm 64 pivotally attached to the clamp plate 44 of clamp 24. It will now be apparent, therefore, that manual movement of clamp 22 will, through the described linkage, cause resultant responsive simultaneous movement of clamp 24.

In FIG. 2 the clamp structures are spaced apart nearly to their extreme positions whereupon the linkage system parts assume the positions shown in FIG. 1. In this position the clamps are able to grip and support the largest of a number of different sized cassettes. Film or cassette sizes are often expressed in inches such as 5×17, 8×10, 10×12, 11×14 and 14×17, for example. However, such measurements of cassette size are often expressed in terms of meters. Nevertheless, the sizes are pretty much standardized and the trays will accommodate any size.

If a small size cassette is being used, the clamps will, of course, be positioned closer together whereupon the linkage and associated parts will assume positions substantially as shown in FIG. 3.

In accordance with this invention, there is provided locking means for locking the entire clamping structure in its proper adjusted position with respect to whatever size cassette is being used. Since cassette sizes are standardized, the locking means, to be described, is also standardized for locking a selected cassette in proper position.

The locking means includes a lock bar 66 which extends generally parallel to linkage bar 46 and is pivotally connected to it at spaced locations by a pair of links 68 so that it is provided with limited motion laterally as indicated by the arrows in FIGS. 4 and 5. Lock bar 66 is connected to clamp disc 40 by a roller 70 which is carried by the disc in offset relation to the shaft 36 so that it moves in a circular path around the shaft when knob 38 is rotated. The roller engages within a slot 72 in the lock bar 66 as shown. Thus rotation of knob 38 and consequently of disc 40 and roller 70 will cause sliding movement of the lock bar 66 laterally of the tray.

Extending perpendicularly to the lock bar 66 and fixedly mounted on the tray is an indexing plate 74 having in one edge thereof a number of angled slots 76*a*–76*f*. Each slot is spaced along the length of the plate at a location which corresponds to a respective cassette size. An indexing or locking pin 78 on lock bar 66 is adapted, when the lock bar is moved in one direction, to move into an adjacent slot and thus locks the clamps firmly in adjusted positions with respect to the particular cassette being used. When the lock bar 66 is moved in the opposite direction, the indexing or locking pin will move out of the slot and the clamps are then permitted to be moved.

The device is shown in unlocked position in FIG. 4 and with the parts in the positions as shown the device cannot be locked because movement of the lock bar and pin toward locked position will merely cause the pin 78 to engage an edge of the plate 74 at a point between slots. Therefore, an operator, whether trained or untrained, can easily determine that the cassette is improperly positioned because the knob 38 cannot be rotated fully to the locked position.

When the cassette is properly positioned, the pin 78 can be moved into the appropriate locking slot with little effort, and practically the only resistance to such movement might be occasioned by the use of resilient pads on the cassette-abutting surfaces of the clamps. This resistance can be easily overcome by only slight added pressure upon the knob to urge the pin into the slot. Thus, proper positioning and locking of the cassettes in place is assured.

From the foregoing it will be apparent that the objectives of this invention have been achieved by the structure shown and described whereby a film-carrying cassette is firmly and accurately locked in proper position on a tray whereby the film is properly located with respect to an X-ray beam.

It is to be understood, however, that various modifications in the structure shown and described may be made by those skilled in the art without departing from the spirit of the invention, as expressed in the accompanying claims. Therefore, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A device for positioning and locking in place on a supporting tray one of a plurality of film-carrying cas-

settes each of different dimensions in one direction, comprising a pair of clamps carried by said tray and movable in said one direction toward one another into engagement with opposed sides of a cassette having a selected dimension, and locking means for retaining said clamps in clamped position with respect to said cassette, said locking means comprising a plate fixed to said tray adjacent one of said clamps and having therein indexing means corresponding to said several cassette dimensions, a locking member carried by said adjacent clamp and movable independently of clamp movement in a direction transverse to said direction of movement of the clamp, and engagement means on said locking member movable into engagement with said indexing means in response to movement of said locking member in said transverse direction.

2. A device as set forth in claim **1** wherein said indexing means comprises a plurality of locking regions corresponding to selected ones of said cassette dimensions, and said engagement means is movable into engagement with a selected one of said locking regions corresponding to the dimension of the selected cassette on the tray.

3. A device as set forth in claim **2** wherein said locking regions each comprises a recess in an edge of said locking member, and said engagement means comprises a protrusion carried by the locking member, which protrusion is shaped to engage said recesses.

4. In X-ray apparatus comprising a supporting tray having thereon means for supporting one of a plurality of film-carrying cassettes each of different dimensions in one direction, a device for locking in place on said tray a cassette having a selected one of said dimensions, said device comprising a pair of clamps carried by said tray and movable in said one direction toward one another into engagement with opposed sides of said selected cassette, and means for retaining said clamps in locked position with respect to said cassette, said means comprising a plate fixed to said tray adjacent one of said clamps and having in one side a plurality of slots corresponding to said several cassette dimensions, a locking member carried by said adjacent clamp and movable independently of clamp movement in a direction transverse to said direction of movement of the clamp, and engagement means on said locking member movable into engagement with one of said slots corresponding to the selected dimension of the cassette in response to movement of said locking member in said transverse direction.

5. A device as set forth in claim **4** wherein said locking member is pivotally connected to said adjacent clamp for movement in a direction generally perpendicular to the direction of movement of the clamp, a shaft is rotatably mounted in said clamp and fixedly carries a rotatable member on one end adjacent said locking member, and a pin on said disc engages a slot in said locking member for moving same upon rotation of the shaft.

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