July 1, 1930. I. G. FABE ET AL 1,769,370

CASSETTE

Filed Oct. 13, 1925

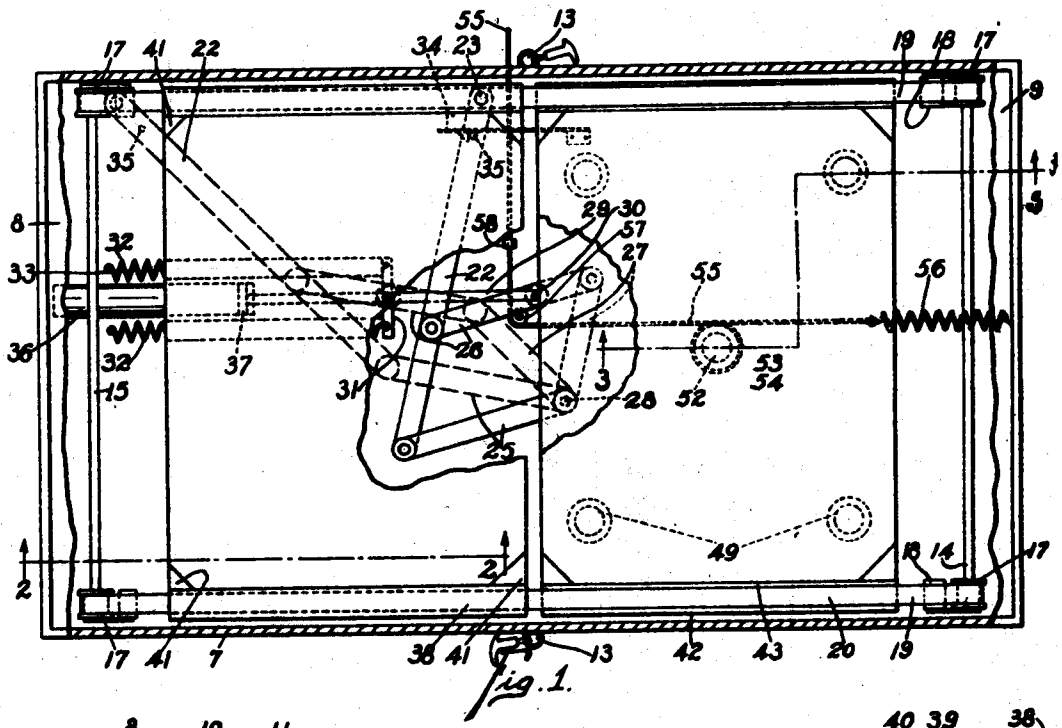


Fig. 1.

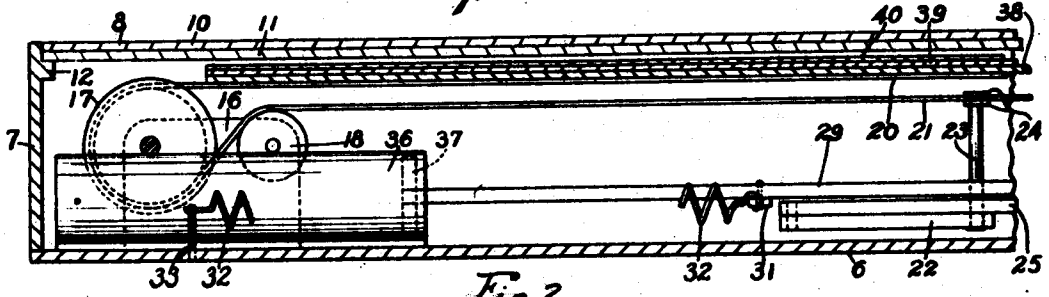


Fig. 2.

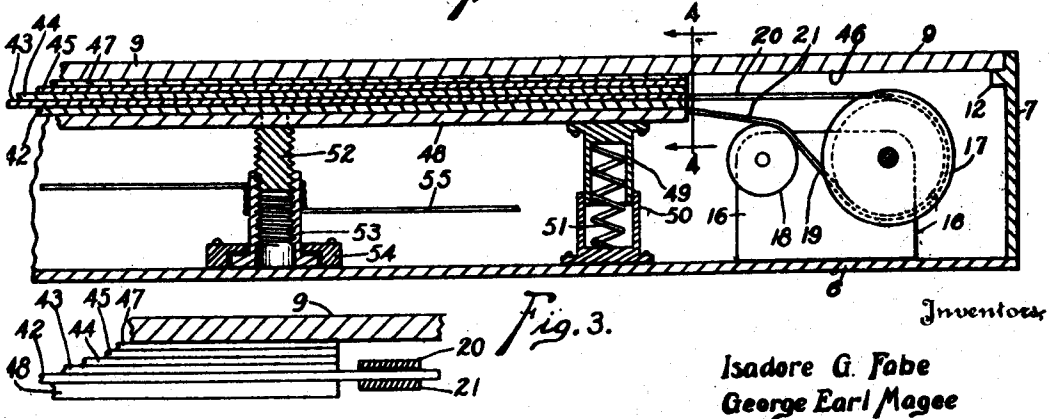


Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE

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CASSETTE

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An object of this invention is to provide a cassette for use in making radiographic X-ray exposures.

Another object is to provide a device of this kind by means of which two film or plate exposures may be made at short intervals of time, thereby minimizing the possibility of having a patient move the portion of his body under examination.

Another object is to provide a device of this kind which may be placed in various positions without impairing its effectiveness.

Another object is to provide a plate or negative shifting cassette which automatically shifts films or plates and one which also positions such plates accurately and automatically with relation to the subject under examination.

These and other objects are attached by the means described herein and disclosed in the accompanying drawings, in which:

Fig. 1 is a top plan view of a device of the invention, parts being broken away.

Fig. 2 is an enlarged cross sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross sectional view on line 3—3 of Fig. 1.

Fig. 4 is a view taken on line 4—4 of Fig. 3.

The device comprises a suitable base 6 which is preferably of a light weight metal such as aluminum and a box like cover comprising a rectangular frame 7 forming the sides, and a top having one end 8 impervious to Roentgen rays and the other end 9 impervious to ordinary light rays. The end portion 8 is preferably formed of a plate of steel 10 superposed upon a sheet of lead 11. The end portion 9 may be of vulcanite, bakelite or other strong material which is not entirely impervious to Roentgen rays. The shoulder 12, formed along the inside faces of the frame 7, provides a convenient seat upon which the top portions 8 and 9 may be secured. The cover is removably secured upon the base 6 by any suitable clamping means such as 13.

At opposite ends of the base 6 are parallel shafts 14 and 15 journaled in suitable blocks 16 mounted on or integral with said base. Shafts 14 and 15 carry pulleys 17 fixedly mounted adjacent their opposite ends. Each of the blocks 16 carries a freely revoluble pulley 18 positioned adjacent to and in alignment with one of the pulleys 17. A continuous belt 19 is passed about the opposite pulleys 17 and over the top of pulleys 18 so that a top section 20 of the belt 19 is normally retained in a substantially horizontal position supported by the topmost portions of pulleys 17, while a lower section 21 of the belt 19 is normally retained parallel to and spaced below the section 20 by means of pulleys 18. From the foregoing, it will be apparent that when the top portion of the belt 19 is moved longitudinally in one direction, the lower section will move in the opposite direction. Since the pulleys 17 are fixedly mounted on their respective shafts, it will be apparent that both sections of the belts 19 will move equal distances in opposite directions when motion is imparted to either of the belts 19. The belts 19 are adapted to support two films, one supported upon upper belt sections 20 adjacent shaft 15 and the other supported upon lower belt sections 21 adjacent shaft 14, so that one film will be disposed beneath the protective lead plate 11 while the other is positioned beneath the vulcanite 9 for exposure. When the last mentioned film has been exposed, the belts may be moved longitudinally whereupon the exposed film moves beneath the protective plate while the other takes its place beneath the vulcanite plate 9. In this way, two films may be successively placed beneath a part of a patient's body, without moving the patient so that the required exposure may be effected. It is well understood by those conversant with the art, that the X-ray tube is moved a short distance between the exposures of the two films so that the two finished films may be viewed stereoscopically to obtain a proper view of the part under examination.

In order to effect an automatic shift movement of the belts and films carried thereby, the following simple actuating mechanism has been provided. A pantograph mechanism has a long link 22 pivotally mounted

upon a pin 23 which is secured to and extends downwardly from the lower section 21 of one of the belts 19. The pin 23 may be secured to the belt by any suitable means such as nuts or clamping plates 24. An arm 25 has its one end pivotally connected to the opposite end of link 22 while a second arm 26 has its one end pivotally connected to link 22 intermediate its ends. A short link 27 has its ends pivotally mounted upon the free ends of arms 25 and 26. The pivot 28 connecting arm 25 and link 27 is elongated and extends downwardly into the base 6 so that said pivotal point of the pantograph is fixed. An actuating rod 29 has a pivotal mounting as at 30 on and intermediate the ends of arm 26. A cross bar 31 has a pivotal mounting upon actuating rod 29 and a pair of springs 32 are secured at one end to the base 6 by any suitable means such as pins 33. The opposite ends of springs 32 are connected to the cross bar 31 on opposite sides of its pivotal mounting upon actuating rod 29. From the foregoing it will be apparent that springs 32 exert a constant pressure upon actuating rod 29 and therefore tend to retain the long link 22, arms 25 and 26 and short link 27 in the position shown in dotted lines in Fig. 1. A spring catch or trigger 34, mounted on base 6, is adapted to engage pin 35 on long link 22 adjacent its pivotal mounting on pin 23 so that the arms and links of the pantograph mechanism may be retained in the position shown in full lines in Fig. 1, against the pressure exerted by the springs 32. The movement of the long link 22 is such as to carry substantially one-half of the lower sections 21 of belts 19 from a position beneath the vulcanite plate 9 to a position substantially beneath the protective lead plate 11 at the opposite end of the cassette. At the same time, such movement will carry the sections 20 of the upper portion of belts 19 which are normally disposed beneath the protective plate to a position beneath the vulcanite plate 9. By providing the pantograph mechanism, the distance through which actuating rod 29 must move to effect the desired movement of the long link 22 and the belt connected thereto is materially reduced. Dash pot 36 and piston 37 mounted on actuating rod 29, serves to retard or dampen the movement of the pantograph mechanism and belts when catch 34 is released. This structure renders the operation of the actuating mechanism practically noiseless and therefore eliminates the possibility of startling a nervous person and causing him to move during the shifting of the films or plates carried by the belts.

The mounting of the films or plates upon sections 20 and 21 of belts 19 is effected as shown in Figs. 1 and 3. A sheet of cardboard or flexible fibre 38 is secured adjacent its opposite edges upon upper sections 20 of the belts 19 so that said sheet 38 is disposed horizontally beneath the protective lead plate 11 when the belts are in position with link 22 retained by catch 34, as shown in full lines in Fig. 1. Mounted upon the cardboard 38 is an intensifying screen 39 upon which film 40 rests. Suitable triangular pockets 41 are provided at each of the four corners of the rectangular sheet 38 for receiving the corners of the film and thereby definitely positioning and securing the film with relation to the cardboard and belts. This structure is shown in cross section in Fig. 2. The lower sections 21 of belts 19 carry a cardboard or fibre film support sheet 42 similar to film support sheet 38, and upon sheet 42 is fixedly mounted a second cardboard sheet 43 which is of a thickness substantially equal to the thickness of upper section 20 of the belts. This sheet 43 is narrower than sheet 42 so that the upper section 20 of belts 19 may lie in the same plane with the sheet 43. An intensifying screen 44 is glued or otherwise secured to the cardboard film support and triangular pockets are provided for receiving the second film 45. Glued to the lower face 46 of the vulcanite plate 9 is a second intensifying screen 47 which serves its function in the exposure of both films 40 and 45.

In exposing the films 40 and 45 it is essential that each film assume the same relative position against the intensifying screen 47 carried by the lower face of vulcanite plate 9. For this purpose an aluminum plate 48 is mounted for reciprocation toward and away from the intensifying screen 47. As shown in Fig. 3, hollow telescopic members 49 and 50 having a spring 51 contained in the hollow interior thereof are positioned beneath the four corners of the aluminum plate 48 and therefore serve at all times to urge the aluminum plate upwardly toward intensifying screen 47 on the vulcanite plate 9. The members 49 and 50 are secured to the aluminum plate and base 6 respectively by any suitable means such as rivets or the like. A threaded stud 52 is fixedly secured centrally of the lower face of aluminum plate 48 and is adapted to receive a freely revoluble and interiorly threaded collar 53 which is retained in substantial abutment with the base 6 by means of a flanged member 54. From the foregoing, it will be apparent that when the threaded collar 53 is rotated, the threads on the stud 52 engaging with the internal threads of collar 53 will pull the aluminum plate 48 downwardly against the action of the springs 51 in telescoping members 49—50. In this way the aluminum plate may pass upwardly against the cardboard supports 38 or 42 so that the films carried thereby will be held flat against the intensifying screen 47 on vulcanite plate

9. In order to lower the aluminum plate from its clamping position, against the cardboard film support a cord or other suitable flexible member 55 is wound about the collar 53 and is secured thereto by any suitable means such as a rivet, screw or the like, not shown. One end of the cord 55 is secured to a spring 56 which in turn is secured to the inside of base 6 adjacent shaft 14. The opposite end of the cord 55 passes about a suitable pulley 57 and from thence laterally outward through a suitable perforation in one of the longitudinal sides of the frame 7. This second end of the cord carries a block 58 which moves transversely of the frame when the cord is pulled for revolving the collar 53 to lower aluminum plate 48. The block 58 is so positioned that when stud 52 is moved to the bottom of collar 53, said block 58 will engage the spring catch 34 and carry it out of the path of the pin 35 on link 22 thereby releasing said link and permitting the springs 32 to act upon actuating rod 29 so that the link 22 will move the belts 19 thereby withdrawing one film from beneath the vulcanite plate and projecting the second film to a position for exposure. Upon releasing the cord 55, the spring 56 will rotate the sleeve 53 in the opposite direction thereby projecting the stud 52 upwardly and assisting the springs 51 in telescoping members 49—50 to again raise the aluminum plate for clamping and positioning the second film tightly against the intensifying screen on vulcanite plate 9.

The operation of the device is as follows: When it is desired to load the cassette, the latches 13 are loosened and the cover and frame 7 is removed thereby exposing the belts and actuating mechanism. A film is then positioned upon each of the cardboard supports as previously explained and the belts are moved against the yielding resistance of springs 32 until link 22 assumes a position under the control of catch or trigger 34. The cover is now replaced and clamped upon base 6, the cord 55 being momentarily pulled out sufficiently to slightly lower the aluminum plate 48. The device is now in condition for successively exposing the two films. When it is desired to expose the films, the device is positioned conveniently with relation to the part to be examined. For example, if the patient is prostrate, the device may be placed flat upon a table and the patient laid upon the device. The X-ray tube is then properly positioned above the patient and the first film is exposed. After the first exposure, the rays are shut off and the tube is moved to one side for a distance substantially equal to the average distance between the centers of the average pair of human eyes, or roughly about seven centimeters.

The cord 55 is then pulled out thereby lowering the aluminum plate 48 by means of the threaded sleeve 53 so that the film just exposed is released from the clamping action of said plate and at the same time the block 58 is moved outwardly until it abuts the spring catch 34 whereupon the pantograph mechanism is subjected to action of springs 32 so that the long link 22 is moved from the position shown in full lines in Fig. 1 to the position shown in dotted lines in Fig. 1, which movement effects uniform longitudinal movement of the upper and lower belt sections and in opposite directions so that the film supports are each carried to the opposite ends of the cassette. This shifting of the films places the exposed film beneath the protective lead plate 11 and moves the unexposed film to a position beneath the vulcanite plate 9. Now, upon releasing the cord 55, the springs 51 operating upon the four corners of the aluminum plate, and the spring 56 operating upon the cord 55 and sleeve 53 again push the aluminum plate upwardly so that the second film 40 and its screen 39 may move into abutment with the intensifying screen 47 whereupon this film is in position to be exposed. It will be observed that in addition to the several advantages heretofore noted, there is another notable advantage, namely there is required but three intensifying screens in exposing the two films whereas there would normally be required four of these intensifying screens.

What we claim is:

1. An automatic film shifting cassette comprising space endless belts disposed in parallelism one with the other whereby the upper and lower portions of said belts are disposed in spaced parallel planes, means for supporting films upon the upper and lower portions of said belts, means for effecting uniform movement of said belts whereby the film supporting means may be moved toward opposite ends of their respective sections, a cover plate for the belts and films, said cover plate comprising a portion of material impervious to Roentgen rays and a second portion permeable to Roentgen rays, and means for clamping the film support means against the last mentioned portion of the cover.

2. An automatic film shifting cassette comprising a base carrying pairs of spaced pulleys, endless belts carried by each pair of pulleys, a film support member secured at its opposite sides to the belts, a cover plate mounted above the pulleys, and belts, spring actuated means for effecting movement of the belts whereby the film support member is shifted beneath the cover, means adapted to clamp the film support member against the cover plate and means for retracting the film support clamping means

and adapted to release the spring actuated shifting means.

3. In a device of the class described the combination of a casing, a pair of support members normally disposed at opposite ends of the casing and mounted for simultaneous shifting movement for effecting reversal of said members within the casing, an intensifying screen carried by each of said members, means for mounting a photographic film on each of the screens on the support members, a cover plate for the casing comprising a portion impervious to Roentgen rays and a second portion pervious to Roentgen rays, a fixed intensifying screen secured to the lower side of said second portion of the cover and means for moving a clamping member toward the fixed intensifying screen whereby films carried by the support members may be sequentially clamped against the fixed intensifying screen.

4. In a device of the class described the combination of a cover plate having one end pervious to Roentgen rays, a pair of shiftable supports normally disposed one beneath each end of the cover, intensifying screens on each shiftable support, a fixed intensifying screen on the said end of the cover plate, and means for moving the supports against the fixed intensifying screen.

5. An automatic film shifting cassette comprising the combination of a light-proof casing including a cover, the cover having one portion pervious to Roentgen rays and the remaining portion impervious to Roentgen rays, a pair of shiftable supports in the casing adapted to normal positioning one beneath each portion of the cover, spring tension means for reversing the position of said supports, trigger means for releasing the spring tension means whereby to permit reversal of the supports, means disposed beneath the pervious portion of the cover adapted to normally press a support against the said pervious portion of the cover and unitary means controlling the clamping means and the trigger means whereby to simultaneously release the support from clamping position and to release the spring tension means whereby the supports are reversed, release of the unitary means serving to permit the clamping means to press the opposite support toward the pervious portion of the cover.

In testimony whereof we have hereunto subscribed our names this 9th day of October, 1925.

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GEORGE EARL MAGEE.