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[54] **X-RAY MAMMOGRAPH IN WHICH THE X-RAY SOURCE AND FILM CASSETTE ARE ROTATABLE ABOUT THE SUBJECT BEING PHOTOGRAPH**
6 Claims, 2 Drawing Figs.

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250/65, 250/92
 [51] Int. Cl. **G03b 41/16**
 [50] Field of Search **250/50, 91,**
61.5, 65

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ABSTRACT: The X-ray apparatus is especially well adapted for taking mammograms; that is, X-ray pictures of the female breast. A single upright supporting column and a patient chair are mounted on a platform. The column supports a counter-balanced vertically movable member which in turn supports a horizontally movable arm. A head is adjustably rotatable about the horizontal axis of the arm. An X-ray source and a cassette carrier are mounted on opposite portions of the head. The arm is movable horizontally toward and away from the front of the chair, which is movable horizontally along the platform at right angles to the movement of the arm. The X-ray source is preferably movable along the head, toward and away from the cassette carrier for making mammograms in which the breast is compressed. A control console is preferably mounted on the platform and is screened from the X-ray source by a protective wall.

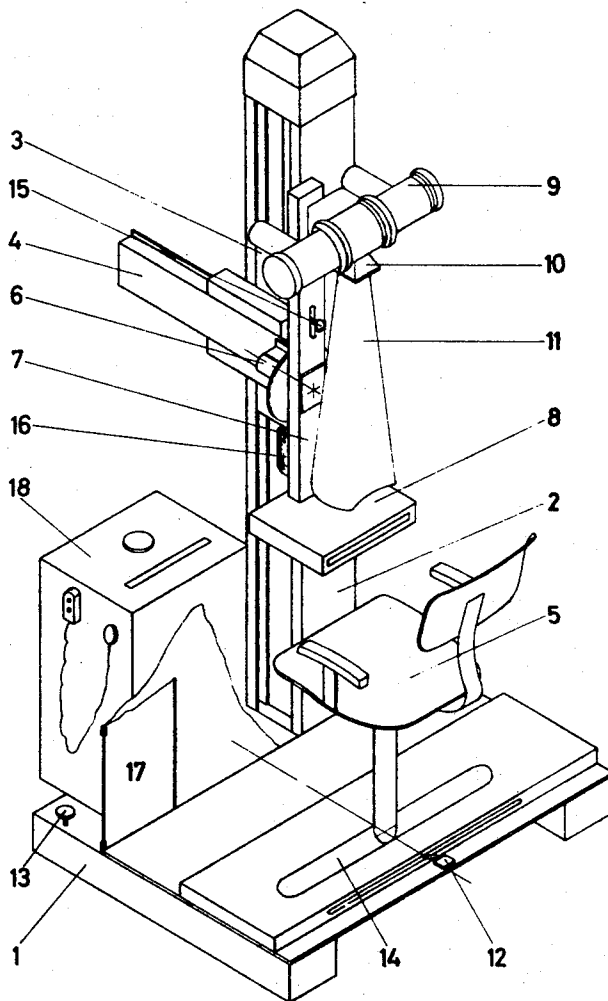


Fig.1

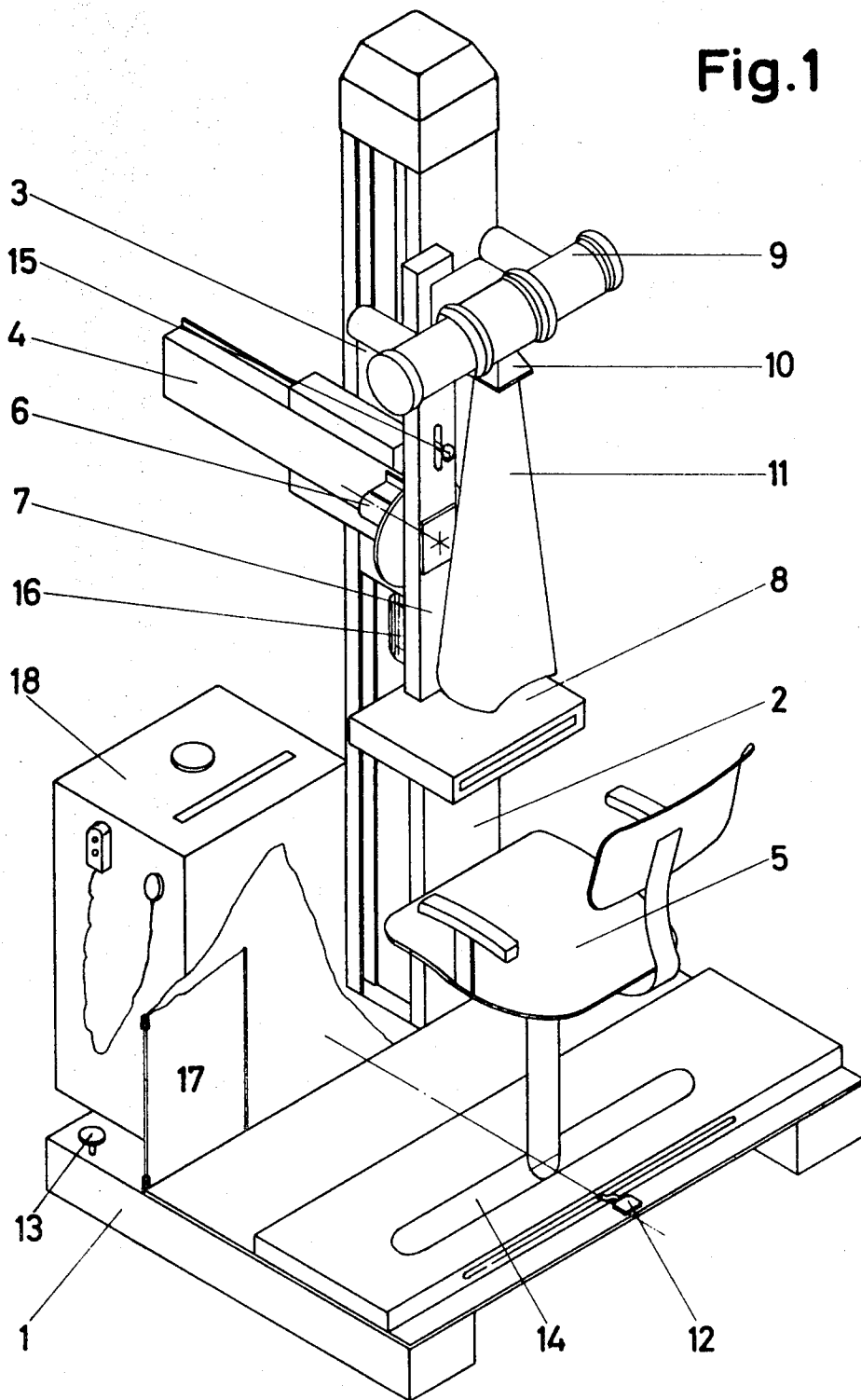
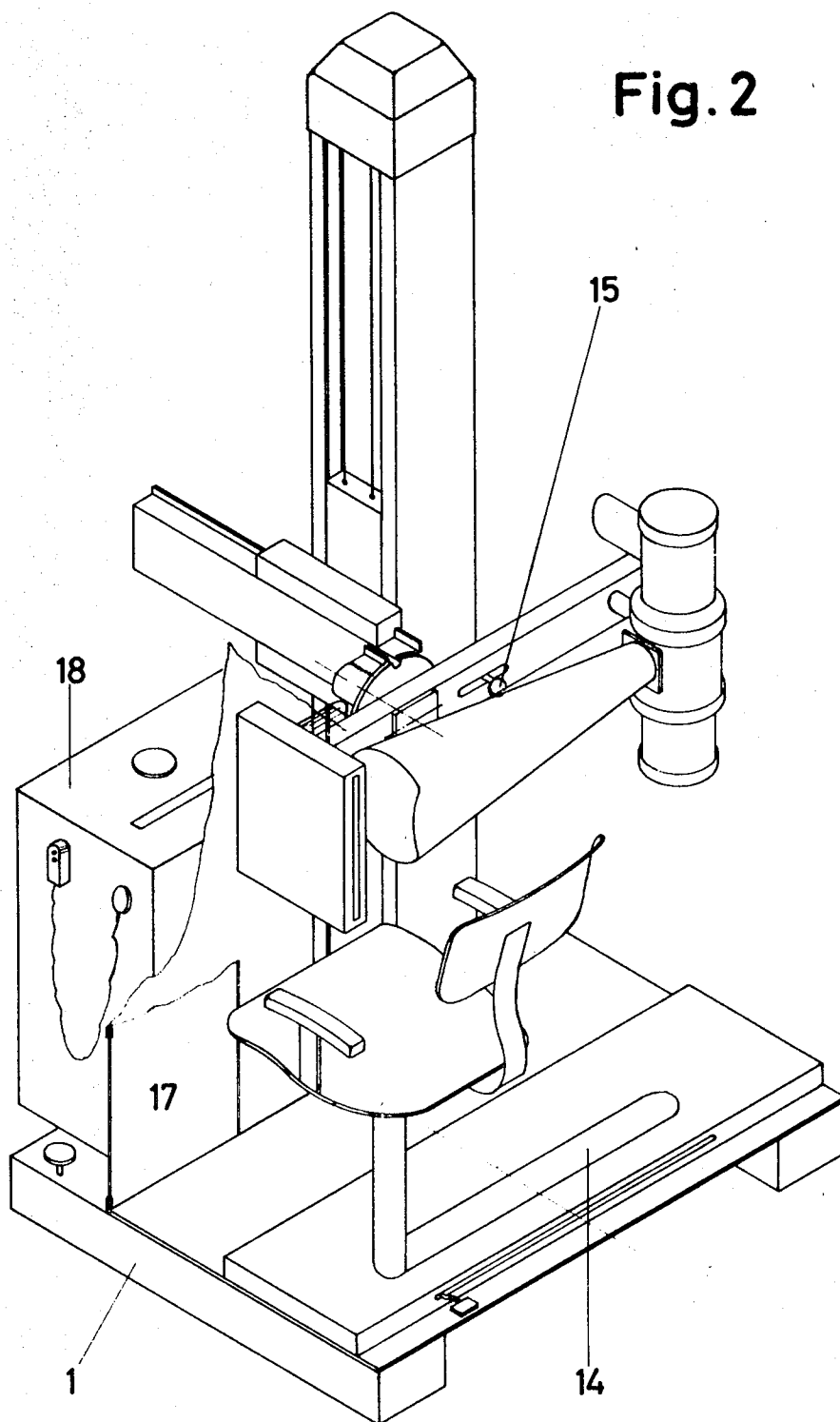


Fig. 2



X-RAY MAMMOGRAPH IN WHICH THE X-RAY SOURCE AND FILM CASSETTE ARE ROTATABLE ABOUT THE SUBJECT BEING PHOTOGRAPH

The present invention relates to apparatus for taking X-ray pictures, particularly mammograms; that is, X-rays of the female breast.

X-ray photography of the female breast constitutes one branch of the broader field relating to diagnostic X-ray photography of soft tissues, but the preparation of X-ray pictures of the female breast is very difficult, particularly in that the correct adjustment and focusing of the apparatus is rather complicated. In the prior art, it was the general practice to prepare mammograms by utilizing the available standard X-ray installations, while equipping such installations with auxiliary devices. While it was possible to obtain satisfactory results in this way, there were various drawbacks and disadvantages. For example, the female patient rarely remained in the desired standard position during the preparation of the mammogram. Moreover, the problems of focusing and adjustment were so difficult that the quality of the results was variable and rather unpredictable.

Thus, the desire arose to provide a special X-ray machine which would satisfy the demands of the physicians for easy and accurate focusing and adjustment of the machine during X-ray photography of the female breast.

It is the principal object of the present invention to provide such a machine.

Because X-ray departments must operate profitably, it is a further object to provide such an X-ray apparatus which can also be used for taking other types of X-ray pictures, in connection with depth diaphragms and scanning tables.

The present invention provides a new X-ray apparatus or instrument whereby a physician can prepare a mammogram with great ease and precision. Such apparatus preferably comprises a single supporting column which stands upright on a horizontal platform or base. A patient's chair is also mounted on the platform. A counterbalanced member is adjustable vertically along the supporting column and is fitted with a supporting arm, movable horizontally toward and away from the patient's chair. The supporting arm carries a head or turret which is adjustably rotatable about the longitudinal axis of the arm. An X-ray source and a cassette carrier are mounted on opposite portions of the rotary head. The chair is movable horizontally along the platform, at right angles to the movement of the supporting arm.

In accordance with additional features of the present invention, it is preferred to mount the X-ray source on the head for adjusting movement, toward and away from the cassette carrier, to facilitate the production of X-ray photographs in which the breast is compressed. The X-ray source usually comprises an X-ray tube within a protective housing. The range of movement may be about 12 to 14 centimeters. In order to facilitate this adjustment, the X-ray source is preferably counterbalanced by a counterpoise within the rotary head. This arrangement is especially advantageous when the adjustment has to be done manually. However, the invention preferably provides a motor for moving the X-ray source along the head. A safety device is preferably employed to limit the compressive pressure. For easier operation, it is preferred that the motions of the X-ray source be magnetically braked.

In order that the apparatus may be used to the fullest extent, the X-ray source is preferably arranged to be tilted around its bearing trunnions by 90° or even as much as 180°. In this way, the breast of a patient lying on her back can be subjected to mammography, using a compression tube.

For preparing X-ray pictures of other parts of the body, the special breast tube is replaced by a depth diaphragm with a light visor.

It is preferred to mount the control console, incorporating the high voltage power supply for the X-ray tube, on the same platform which supports the single column and the patient's chair. For the protection of the operator, a wall or screen to absorb X-rays is preferably positioned on the platform between the control console and the X-ray source. Further ob-

jects, advantages and features of the present invention will appear from the following description, taken with the accompanying drawings, in which;

FIG. 1 is a perspective view showing an X-ray apparatus or machine to be described as an illustrative embodiment of the present invention; and

FIG. 2 is a view similar to FIG. 1 but showing certain parts of the machine in changed positions. FIG. 1 shows an apparatus or machine, according to the present invention, for taking axial X-ray pictures of the female breast. The apparatus comprises a platform 1, serving as a base for a single supporting column 2, with a vertically adjustable cross-slide or supporting member 3 thereon. A supporting arm 4 is movably mounted on the cross-slide 3 so that the arm may be shifted horizontally in the direction of the chair 5 for the patient. The supporting arm 4 carries a shaft or pivot 6, about which a rotary head or turret 7 may be tilted. One side of the rotary head 7 is fitted with a cassette carrier 8, including a counterpoise. The other side of the head 7 carries the X-ray source 9, comprising a protective housing in which the X-ray tube is mounted. The X-rays leave the source at an exit 10, underneath which an unsymmetrical breast tube 11 is attached, if mammograms are to be prepared. However, if ordinary routine X-ray pictures are to be taken, the exit 10 is fitted with a depth diaphragm having a light visor.

The chair 5 is movable laterally along the platform and may be locked in any desired position by a brake 12. The platform 1 is preferably fitted with rollers for easy movement, but may be locked against movement along the floor by operating a setscrew 13.

FIG. 2 shows the manner in which the machine is adjusted for taking lateral pictures of the right breast. The chair 5 is moved laterally to one side of the platform 1. The rotatable head 7 is turned so that the X-ray source 9 and the cassette carrier 8 are along a horizontal line.

If it is desired to obtain X-ray pictures of the left breast, the patient's chair 5 is moved along the platform 1 to the opposite end of the guide slot 14. Moreover, the rotary head 7 is turned through 180° to reverse the positions of the X-ray source 9 and the cassette carrier 8. The rotary head 7 is provided with a stop lever 15 which may be operated to insure accurate positioning of the head in the vertical position of FIG. 1, for making axial mammograms; the horizontal position of FIG. 2, for making lateral mammograms of the right breast; and the reversed horizontal position, for making lateral mammograms of the left breast.

As shown in FIG. 1, the rotary head 7 is equipped with a motor 16 for shifting the X-ray source 9 toward and away from the cassette carrier 8 so that the breast may be compressed. It is preferred to counterbalance the X-ray source 9 by providing a counterpoise within the head 7, in which case the head is made large enough to accommodate the counterpoise. The counterpoise is especially advantageous when the X-ray source 9 is adjusted manually. However, the counterpoise is also preferably provided in connection with the drive motor 16, together with a safety device to limit the compressive pressure.

A counterpoise is also preferably provided within the column 2, to counterbalance the weight of the cross slide 3 and the components mounted thereon, including the arm 4, rotary head 7, cassette carrier 8, and X-ray source 9.

The chair 5 is preferably arranged to be removable from the platform 1, so that the machine can be used in connection with a table on which the patient is supported. For taking X-ray pictures in this way, the usual screen or grid may be employed.

If X-ray pictures are to be taken with the use of a scanning screen, the X-ray source 9 may be turned about its supporting trunnions, through 90° to the right or to the left. The breast tube 11 is replaced by a depth diaphragm with a light visor (not shown).

As shown in FIG. 1, the machine includes a control console 18, preferably mounted on the platform 1. The console 18 in-

cludes the high voltage power supply for operating the X-ray tube. A wall or screen 17 is mounted on the platform 1 between the control console 18 and the X-ray source 9, to absorb X-rays so as to protect the operator. In FIGS. 1 and 2, the wall 17 has been shown with portions broken away for the sake of clarity.

I claim:

1. Apparatus for taking X-ray pictures of the female breast, said apparatus comprising a platform,
a single supporting column mounted on said platform and projecting upwardly therefrom,
a counterbalanced mounting member mounted on said column and movable vertically therealong,
a supporting arm,
means mounting said supporting arm on said mounting member for horizontal movement relative thereto,
a supporting head mounted on said supporting arm for rotary adjustment about a horizontal axis,
an X-ray source mounted on one portion of said head,
a cassette carrier mounted opposite said X-ray source on said head, and substantially perpendicular to the axis of said X-ray source,
a patient-supporting chair projecting upwardly from said platform,
said supporting arm being movable parallel to said horizontal axis and toward and away from the front of said chair,
means mounting said chair on said platform for horizontal movement at right angles to the movement of said sup-

porting arm,
and means mounting said X-ray source on said head for limited movement toward and away from said cassette carrier for taking X-ray pictures in which the breast is under compression between said X-ray source and said cassette carrier
said X-ray source and said cassette carrier being rotatable with said head, but being fixed in angular positions relative to said head,
the rotary adjustability of said head making it possible to compress the breast in any desired direction between said X-ray source and said cassette carrier.
2. Apparatus according to claim 1 in which said head contains means for counter balancing said X-ray source.
3. Apparatus according to claim 1 including a motor for adjusting the position of said X-ray source.
4. Apparatus according to claim 3, including magnetic braking means for stopping the movement of said X-ray source.
5. Apparatus according to claim 1, including a control console mounted on said platform for controlling the operation and movement of the X-ray source.
6. Apparatus according to claim 5, including a protective wall mounted on said platform between said control console and the X-ray source to screen the operator against radiation.

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