

- [54] ELECTRON BEAM THERAPY UNIT
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- [51] Int. Cl. H01j 37/30
- [58] Field of Search 250/49.5 TE, 50, 250/54, 55, 56, 52, 91

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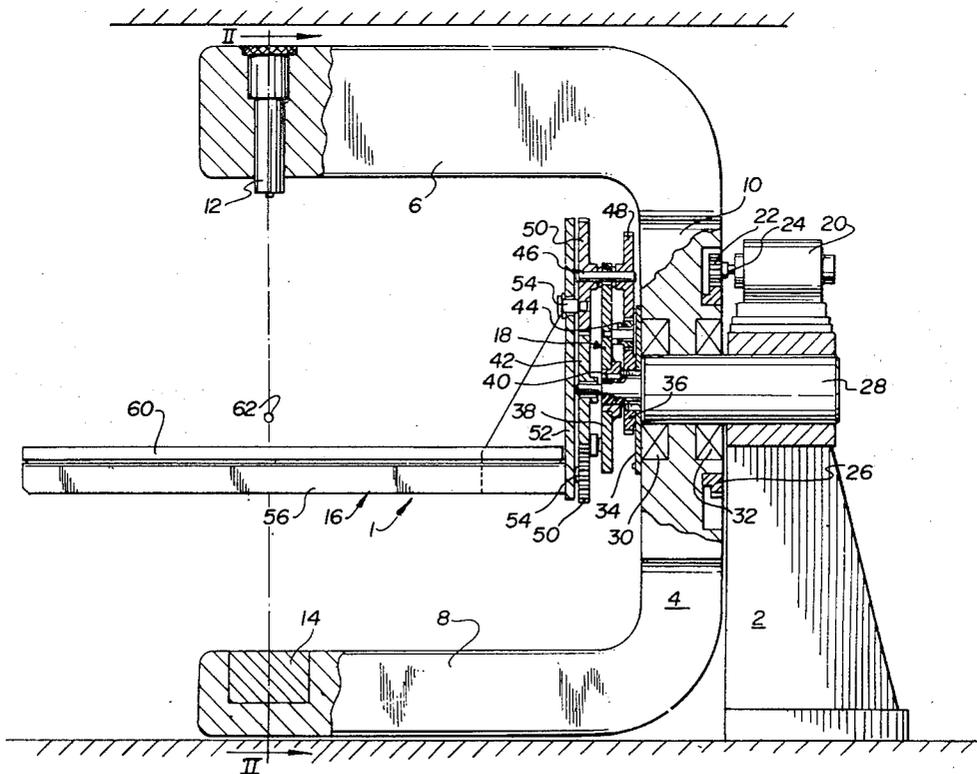
"A Precision Cobalt 60 Unit for Fixed Field and Rota-

[57] ABSTRACT

An electron beam therapy unit in which an electron beam source and a shield are mounted on the opposed horizontally extending arms of a U-frame mounted for rotation about a horizontal axis, and a patient support is pivotally attached at off-centre positions to three planet gears which are rotatable about fixed axis and mesh with a rotatable sun gear.

As the U-frame is rotated a gear train connected to it rotates one of the planet gears, which rotates the other planet gears through the sun gear, so that the patient support is rotated along a circular path around the U-frame axis of rotation so that the patient is always diametrically opposite the electron beam source.

3 Claims, 2 Drawing Figures



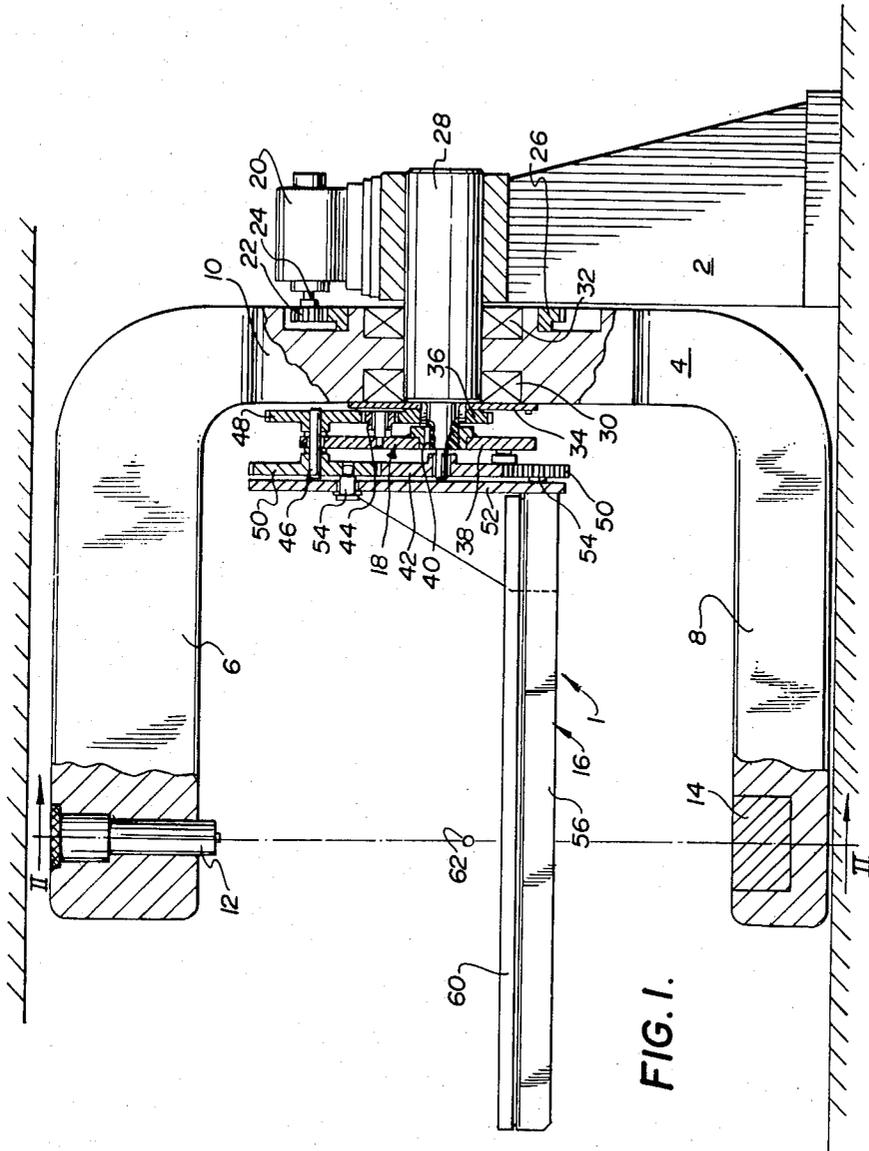
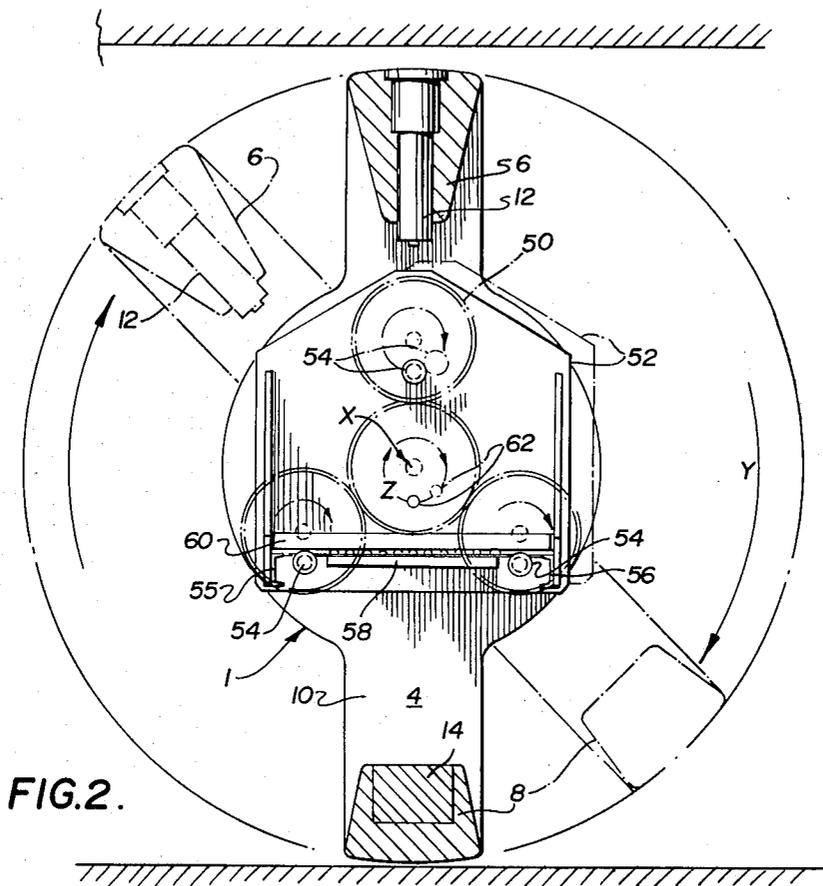


FIG. I.



ELECTRON BEAM THERAPY UNIT

This invention relates to an electron beam therapy unit.

Cobalt therapy units are known wherein a patient is disposed on a stationary therapy couch which is cantilevered between two horizontally extending arms of a U-frame mounted for rotation through 360° about a central horizontal axis. One of the arms carries a cobalt source for radiation treatment of the patient, whilst the other arm carries a shield for the absorption of radiation passing through the patient.

It is generally accepted that the maximum tolerable height from the floor of the axis of rotation of such cobalt therapy units is 116 cms, and whilst this is acceptable for such machines it would be unacceptable for an electron beam therapy unit where the radius between the innermost end of the electron gun and the target must be 80 cms.

One way of providing an electron beam therapy unit rotatable through 360° would be to recess the floor to accommodate the sweep of the electron beam source. However, recessing the floor introduces a number of problems such as difficulties in wheeling a patient on a stretcher into position for transfer to the electron beam therapy unit.

It is an object of the present invention to provide an electron beam therapy unit which is rotatable without having the floor recessed to accommodate the sweep of the electron beam source.

According to the present invention there is provided an electron beam therapy unit, comprising a support, a frame having two spaced arms extending substantially horizontally from a bridge portion, an electron beam source mounted on one arm, for directing an electron beam towards the other arm, a shield on the other arm in the path of the electron beam, a target support between the arms, and mounting means mounting the frame and the target support on the support for rotation of the arm portions around and movement of the target support along circular paths around a common horizontal axis, with the electron beam source diametrically opposite a target on the target support, and the target support maintained in the same horizontal orientation between the arms.

Preferably the mounting means comprises a central, rotatably sun gear mounted on the common horizontal axis and driven by the frame, three planet gears meshing with the sun gear and pivotally mounted on the support to rotate about fixed axis and off-centre pivots attaching the planet gears to the target support at the same angle of inclination from the centre of the planet gears.

In the accompanying drawings which illustrate, by way of example, an embodiment of the invention,

FIG. 1 is a partly sectioned side view of an electron beam therapy unit, and

FIG. 2 is a sectional end view along II—II, FIG. 1, with the support omitted.

Referring to FIGS. 1 and 2 there is shown an electron beam therapy unit generally designated 1, comprising a support 2, a frame 4 having two spaced arms 6 and 8 extending horizontally from a bridge portion 10, an electron beam source 12 mounted on arm 6, for directing an electron beam towards the other arm 8, a shield 14 on the other arm 8 in the path of the electron beam, a target support 16 between the arms 6 and 8, and

mounting means 18 mounting the frame 4 and the target support 16 by means of the bridge portion 10, for rotation of the arms 6 and 8 around and movement of the target support 16 along circular paths around a common horizontal axis X (FIG. 2) with the electron beam source 12 diametrically opposite the target support 16, and the target support 16 maintained in the same horizontal orientation as shown between the arms 6 and 8.

The support 2 has an electric motor 20 mounted thereon with a gear 22 on its output shaft 24. The gear 22 meshes with a fixed gear 26 on the frame 4.

The mounting means 18 comprises a non-rotatable, cantilevered shaft 28 mounted in the support 2, two bearings 30 and 32 rotatably mounting the frame 4 on the shaft 28, a fixed plate 34 mounted on the frame 4 for rotation therewith, a frame gear 36 secured to the plate 34 for rotation therewith, a fixed plate 38 non-rotatably mounted on the shaft 28 by key 40, a sun gear 42 rotatably mounted on shaft 28, an intermediate gear 44 rotatably mounted in the plate 38, and meshing with gear 36, a shaft 46 rotatably mounted on the plate 38, a planet drive 48 mounted for rotation with shaft 46, and similar to gear 36, the gear 48 meshing with gear 44 and three similar planet gears 50 the upper one of which is mounted for rotation with shaft 46 and the lower two of which are rotatably mounted on the fixed plate 38, with each planet gear 50 being pivotally attached to a bracket 52 by off-centre pivots 54.

The bracket 52 forms part of the target support 16, which further comprises two joists 55 and 56, and a runner support 58 for a portable, hospital therapy stretcher 60.

In operation a person to receive electron beam radiation therapy is placed on the runner support on the stretcher 60 with the portion of the person to receive treatment located at target 62. With the apparatus as shown in FIGS. 1 and 2 the electron beam source 12 is then energized to direct a beam of radiation towards the target 62, and the electric motor 20 is started.

The electric motor 20 rotates the gear 22 which turns the gear 26, causing the frame 4 to rotate around the shaft 28 in the direction of arrow Y (FIG. 2). Movement of the frame 4 in the direction of arrow Y causes the gear 44 to be driven by the gear 36.

The gear 44 in turn drives gear 48, which causes gears 50 to be rotated about their fixed axis and drive the sun gear 42 about its axis of rotation. As the planet gears 50 rotate the bracket 52, whilst remaining horizontally oriented, is moved through a circular path by means of the off-centre pivots 54 so that the target 62 moves around a circular path in the direction of arrow Z (FIG. 2).

In this manner the target 62 and the electron beam source 12 are both moved along circular paths around a common horizontal axis X (FIG. 2) with the electron beam source 12 diametrically opposite the target 62 on the target support 16, and the target support 16 is maintained in the same horizontal orientation between the arms 6 and 8.

Thus when the arms 6 and 8 have passed through 315° rotation and reached the position shown chain-dotted (FIG. 2), the bracket 52 has also moved the target 62 through 315°, whilst remaining horizontal, to the positions where the target 62 and bracket 52 are shown chain-dotted. The top off-centre pivot 54 having moved 315° around the axis of rotation of the top

planet gear 50 to which is attached, to the position shown chain-dotted.

It will be seen that basically that the mounting means need only comprise a central sun gear 42 mounted on a common horizontal axis of rotation with and driven by the frame 4, three planet gears 50 meshing with the sun gear 42 and pivotally mounted on the support 2, and off-centre pivots 54 attaching the planet gears 50 to the target support 16 at the same angle of inclination from the centre of the planet gears 50.

We claim

1. An electron beam therapy unit, comprising a support, a frame having two spaced arms extending substantially horizontally from a bridge portion, an electron beam source mounted on one arm, for directing an electron beam towards the other arm, a shield on the other arm in the path of the electron beam, a target support between the arms, and mounting means mounting said frame and the target support on said support for rotation of the arm portions and the target support along circular paths about a common horizontal axis, with the electron beam source diametrically opposite a target on the target support, and the target support maintained in the same horizontal orientation be-

tween the arms.

2. A unit according to claim 1, wherein the mounting means comprises a central, rotatable sun gear mounted on the common horizontal axis and driven by the frame, three planet gears meshing with the sun gear and pivotally mounted on the support to rotate about fixed axes, and off-centre pivots attaching the planet gears to the target support at the same angle of inclination from the centre of the planet gears.

3. A unit according to claim 1, wherein the mounting means comprises a stationary shaft on the support with the frame rotatably mounted on the stationary shaft, a stationary plate mounted on the stationary shaft, a sun gear rotatably mounted on the stationary shaft, three planet gears rotatably mounted on the stationary plate and meshing with the sun gear, a frame gear attached to the frame for rotation therewith about the axis for rotation, an intermediate gear rotatably mounted on the stationary plate and meshing with the frame gear, and a planet drive gear mounted for rotation with one of the planet gears and meshing with the intermediate gear.

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