United States Patent

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[72] Inventor **Adriaan Koopmans**
Emmasingel, Eindhoven, Netherlands

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[73] Assignee **U.S. Philips Corporation**
New York, New York
a corporation of Delaware

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[31] **6613163**
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[54] **PATIENT SUPPORTING TABLE FOR X-RAY EXAMINATION**
9 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **108/8,** 269/323
[51] **Int. Cl.** **A47f 5/12**
[50] **Field of Search** 108/1-10; 269/323-326

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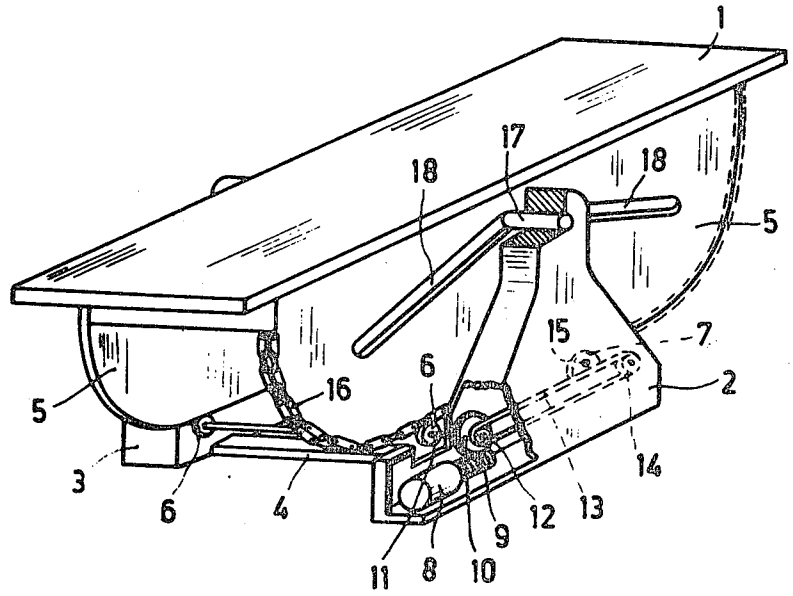
Primary Examiner— Bobby R. Gay
Assistant Examiner— Glenn O. Finch
Attorney—J. Davis Dainou

ABSTRACT: An adjustable table has a table top with a downward extending side member and a base including on each side lower roller supports for engaging a curved drive surface of a side member and an upper pivot support for engaging a slot in the side member. The supports have fixed positions and cooperate with the drive surfaces and slots, such that the table top is movable between horizontal and vertical orientations without any part extending below the lower support.



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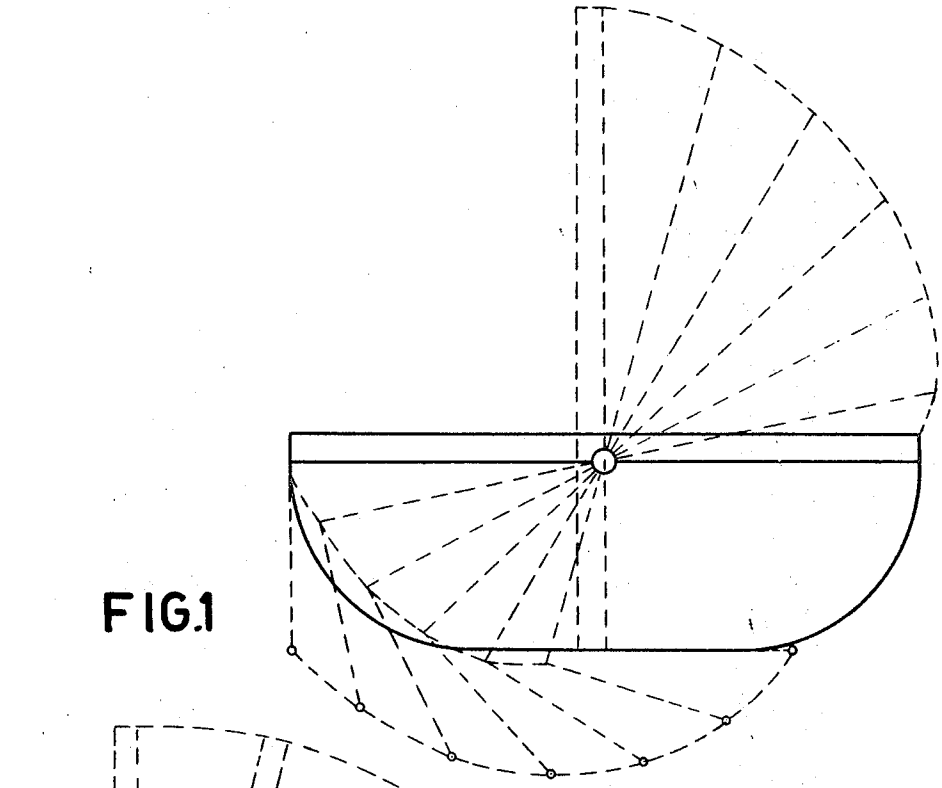

FIG.1

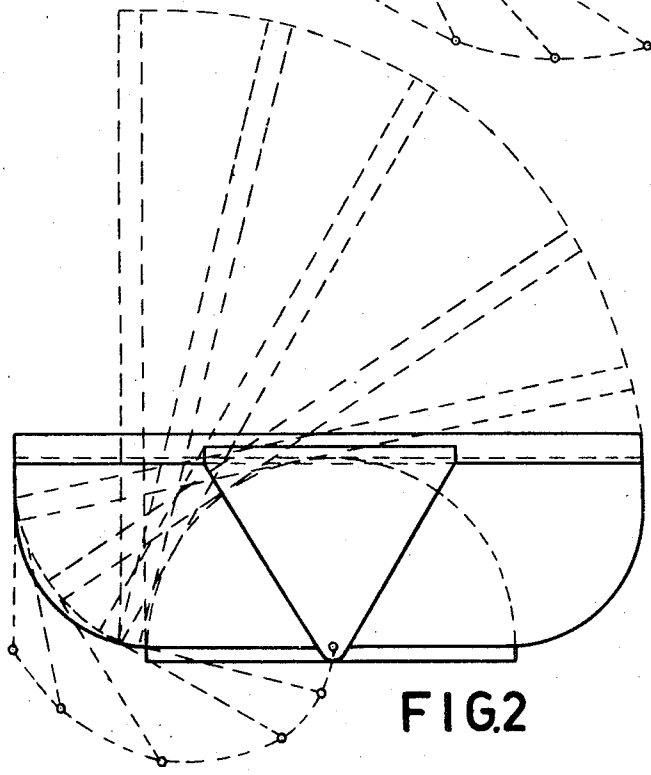

FIG.2

INVENTOR.
ADRIAAN KOOPMANS
BY
Frank R. Trifari
AGENT

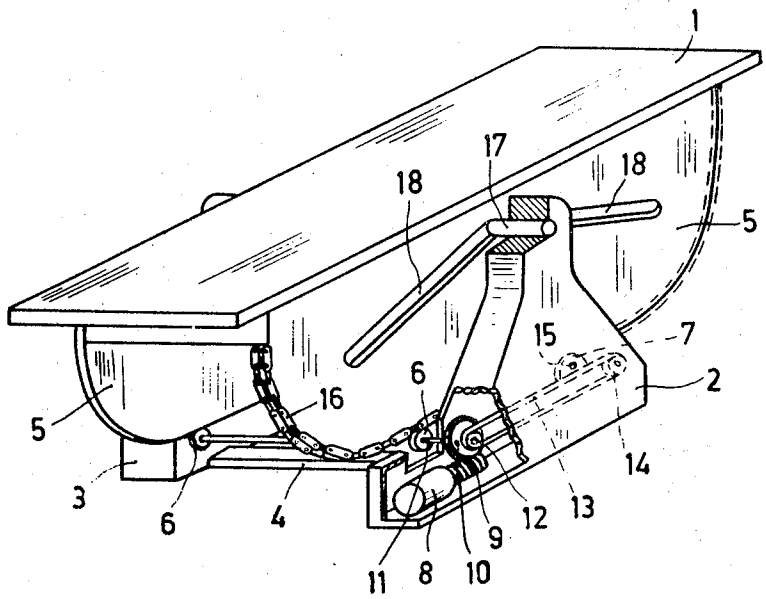

FIG.3

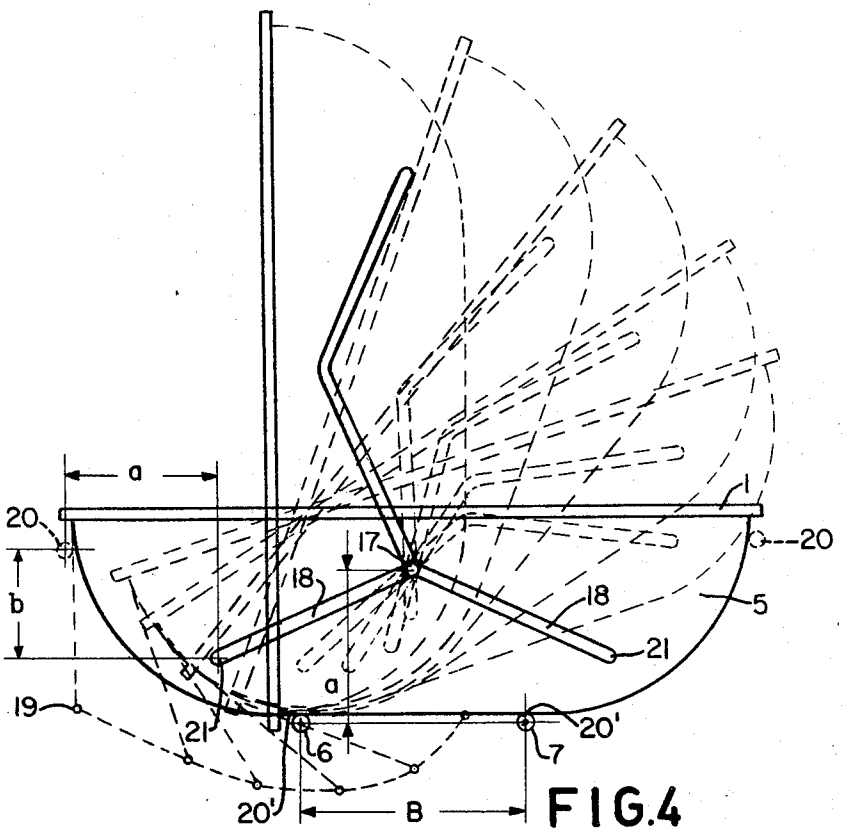

FIG.4

INVENTOR.
ADRIAAN KOOPMANS
BY
Frank R. Trifari
AGENT

PATIENT SUPPORTING TABLE FOR X-RAY EXAMINATION

This application is a continuation of application of application Ser. No. 667,999 filed Sept. 15, 1967, now abandoned.

Patient supporting tables for X-ray examination have to permit of putting the patient both in a horizontal and in a vertical position and in any intermediate position. This requirement is satisfied by any structure in which the supporting surface of the table can be tilted to both sides out of the horizontal position into the vertical position. The moving mechanism of such tables is usually complicated and hence expensive, since in general the conventional height of the supporting surface above the floor is smaller than half the length of the table so that by a simple turn about an axis located beneath said surface the supporting surface cannot be moved from the horizontal into the vertical position. With a construction frequently used the surface is displaced in the direction of length during the tilting movement about the axis.

In order to move the supporting surface, driving gears are usually employed which start simultaneously the tilting movement and the displacement, terminating the same simultaneously when the supporting surface is in the vertical position. The rates of both movements have in this case a fixed ratio, the consequences of which are described more fully with reference to FIGS. 1 and 2.

Tables symmetric on both sides and have a supporting face adapted to be tilted into the vertical position in both directions about an axis of rotation located centrally beneath the patient supporting surface at a height above the floor which is smaller than half the length of the supporting surface and may be provided with a rotary shaft arranged at a maximum height or with a rotary shaft located at a small height above the floor.

FIG. 1 illustrates a series of positions occupied by the ends of the supporting surface during tilting from the horizontal into the vertical position about a rotary shaft at a great height.

FIG. 2 illustrates an identical series of positions of the supporting surface tilted about a rotary shaft at a smaller height.

One embodiment of a patient supporting table will be explained with reference to FIGS. 3 and 4 of the drawing, in which:

FIG. 3 shows a supporting table with the moving mechanism, and

FIG. 4 shows the supporting surface in different positions during the tilting movement.

The ends of the supporting surface trace curved paths; FIG. 1 shows that the path covered by the downward moving end terminates even beneath the horizontal plane marked by the lowermost end of the supporting surface in the vertical position.

In the first case a driven toothed rim, adapted to rotate about the horizontal shaft, is provided with a sledge in which the supporting surface is adapted to slide. The second embodiment comprises a stationary toothed rim along which the supporting surface rolls downwards and simultaneously slides in a sledge.

The required space of movement is considerably increased, when the X-ray apparatus supported by the table projects over a fairly large distance beneath the supporting surface. This is the case when an X-ray image intensifier is employed as a ray collector with which optical instruments such as a television camera, a cinematographic apparatus or a fairly bulky optical observation system comprising mirrors may be connected, while the X-ray apparatus may be shifted up to the ends of the supporting surface. The result of tilting of the supporting surface with an X-ray apparatus arranged in this manner and equipped with modern instruments is indicated by the strongly curved lowermost line in FIGS. 1 and 2.

There is known a patient supporting table provided with a moving mechanism with which the ratio between the rates of movement of tilting and displacing of the supporting surface during the tilting movement varies, while from the horizontal position the ratio between the two rates is initially higher than the average value, the ratio dropping subsequently to a lower value. Therefore, the displacement during the tilting movement is initially faster, so that the lines of the movement of points located beneath the supporting surface and at the ends thereof are less strongly curved. For this purpose two parts of the driving mechanism are coupled by two pulleys, one of which is cylindrical. The other has a different shape matching the desired variation of the ratio between the rates of movement, so that its manufacture is not simple. When ropes are employed, difficulties arise from their being stretched so that the correct ratio between the relatively adjusted tilting and shifting movements is not maintained.

The invention relates to a patient supporting surface table comprising a supporting surface adapted to be tilted on both sides out of a horizontal position into a vertical position, which surface bears in the horizontal position at two points located on the same level side by side. In contrast to known supporting tables of this kind the supporting points do not form, at the same time, the two axes of rotation about which the supporting surface is tilted out of the horizontal position. The invention has for its object to provide a table of simple structure, while during the tilting movement the supporting surface is suitably shifted in order to obtain a flat curve of movement and said disadvantages are avoided. According to the invention the supporting points are formed partially by rollers driven by a mechanism and arranged along the bottom side of a vertical wall having a curved end face and arranged along the supporting surface in the direction of length. The end face bears on the rollers, while at a greater height above the floor a third supporting point is provided at the same distance from the driving rollers. The supporting end of the third point projects in a groove-shaped recess of the vertical wall, where its place changes during the tilting movement of the supporting surface. In a preferred embodiment having a great stability in all positions occupied during the tilting movement, the groove-shaped recess in each wall extends along a straight line from a higher point towards a point forming the point of intersection of a line at right angles to the supporting surface and a line parallel to the supporting surface, said lines being spaced apart from the place occupied by the active driving roller in the vertical position of the supporting surface by a distance equal to the difference in height between the third supporting point and the plane of the rollers, and by half the distance between the rollers respectively.

In order to obtain a uniform movement the edge of the vertical wall is curved away from the two ends of the supporting surface in the form of a circle or an ellipse. The driven rollers may be coupled with the edge of the vertical wall by mutual toothings.

For holding the table top supporting surface **1** a base formed by two columns **2** and **3**, which may be interconnected by transverse beams **4**, is provided. The vertical side partitions **5** have end and lower driving surfaces which bear on lower support rollers **6** and **7**, associated with the driving gear for producing the tilting and shifting movements of the supporting surface **1**. A worm shaft **9** transfers the force of an electric motor **8** to a worm wheel **10**, which drives the shaft **11**, which is provided, apart from this wheel, with two driving rollers **6**. The shaft **11** has furthermore a sprocket wheel **12**, which transfers by means of a chain **13** the rotation of the shaft **11** to a second sprocket **14**, arranged on a driven shaft **15**, also having two driving rollers **7**. The driving rollers **6** and **7** are adapted to engage by teeth the edges of the side partitions **5**. The figure shows a chain **16**, fastened along the periphery of one of the partitions **15**, the links of which chain co-operate with the toothed driving roller **6**.

A further conventional driving gear is formed by the gearwheel and toothed rim structure.

The third upper supporting point is located in the top of the columns **2** and **3** and is formed by a horizontal shaft **17**, located centrally beneath the supporting surface **1** in the horizontal position thereof and bearing on the two columns **2** and **3**. This is not necessary, since in the two columns a short stub shaft may be secured, the supporting ends of which pro-

ject in slots **18** in the side partitions **5**. The slot **18** is curved and its ends project downwardly, the axis of which extends between two points on the side member.

In FIG. **4** the reference points **20** define the positions of the driving rollers **6** and **7** at the curved end surfaces when the table top **1** is vertical. In horizontal position of the table top, the rollers engage the side member at the points **20'**. The slot end as defined by **21** is located at a horizontal distance *a* from the reference point **20**, *a* corresponding to the vertical distance of the support **17** relative to the level of the supports **6** and **7**. Point **21** is at a vertical distance *b* from the reference point **20**, corresponding to half the distance B between the supporting rollers **6** and **7**.

When the driving gear is actuated, the movement of the supporting surface **1** is performed in the manner illustrated in FIG. **4**. The initial displacement of the supporting surface is such that during the tilting movement the end of the supporting surface does not project beyond the space required for the side partitions **5**. This may be varied by the choice of the place of the driving rollers **6** and **7** and the place of the horizontal shaft **17**.

For illustrating the advantage obtained in connection with apparatus employed in the X-ray examination and projecting far beneath the supporting surface the curve of movement of an arbitrary point, located perpendicularly below the end of the supporting surface **1** is shown. With respect to similar curves of movement of FIGS. **1** and **2** the curve of FIG. **4** is bent considerably more gently, which means that at the foot of the table less space is required for the use of such apparatus, while the required height of the supporting surface above the floor may be smaller.

I claim:

1. An adjustable table comprises:

a. an elongated table top;

b. a side member fixedly extending downward from the table top, having curved drive surfaces at the end and lower parts thereof, and including a slot; and

c. a base having a lower support part, and an upper support part including a pivot means in a fixed location above and laterally displaced from said lower support, the height between said supports being less than half the table top length;

d. the table top being pivotally mounted on the base with the lower support engageable to said drive surfaces and the upper support engaging the slot;

e. the axis of the slot defined by a line extending angularly downward between two points on the side member, the first point being located where the pivot means engages the member when the table top is horizontal, the second point being located (when the table top is vertical) the same vertical and horizontal distances as the upper support is above and laterally displaced from the lower support, whereby when the table top is moved between horizontal and vertical positions, no portion of the table top and the side member extends below the lower support.

2. Apparatus as defined in claim **1** wherein:

a. the table top has a second side member similar to and spaced from the first; and

b. the base has second lower and upper support parts similar to and spaced from the first and cooperatively engaged to said second side member.

3. Apparatus as defined in claim **2** wherein both the table top and the base are substantially symmetrical with respect to a vertical mid-line, and the pivot means on each side member correspond to the mid-point of the table top length.

4. Apparatus as defined in claim **3** wherein said support means includes a drive wheel for engaging each of said drive surfaces, and motor means for rotating said wheels.

5. Apparatus as defined in claim **4** wherein the drive wheel has peripheral teeth and the drive surfaces include teeth-engaging means.

6. An adjustable table comprising:

a. an elongated table top having a side member fixedly extending downward with curved drive surfaces on the end and lower parts thereof, and connection means spaced from said drive surfaces; and

b. a base having a lower support part in a fixed location and an upper support part including a pivot means in a fixed location, the height between said supports being less than half the length of the table top;

c. the table top being pivotally mounted on the base with the lower support sequentially engaging portions of said drive surfaces and the upper support engaging said connection means;

d. said lower support including means at said fixed location for engaging said drive surfaces to move relative to the base and thereby pivot the table top between horizontal and vertical positions with no portion of the table top or side member extending below the lower support.

7. A table as defined in claim **6** wherein the table has a second side member similar to and spaced from the first and the base has second upper and lower supports similar to and spaced from the first and cooperatively engaged with said second side member.

8. A table as defined in claim **7** further including power means for driving said lower support means to pivot said table top.

9. A table as defined in claim **8** wherein said curved drive surface defines part of a circle.