April 19, 1949. R. H. MORGAN ET AL. 2,467,592

DRIVING MECHANISM FOR X-RAY GRIDS

Filed July 22, 1943 2 Sheets-Sheet 1

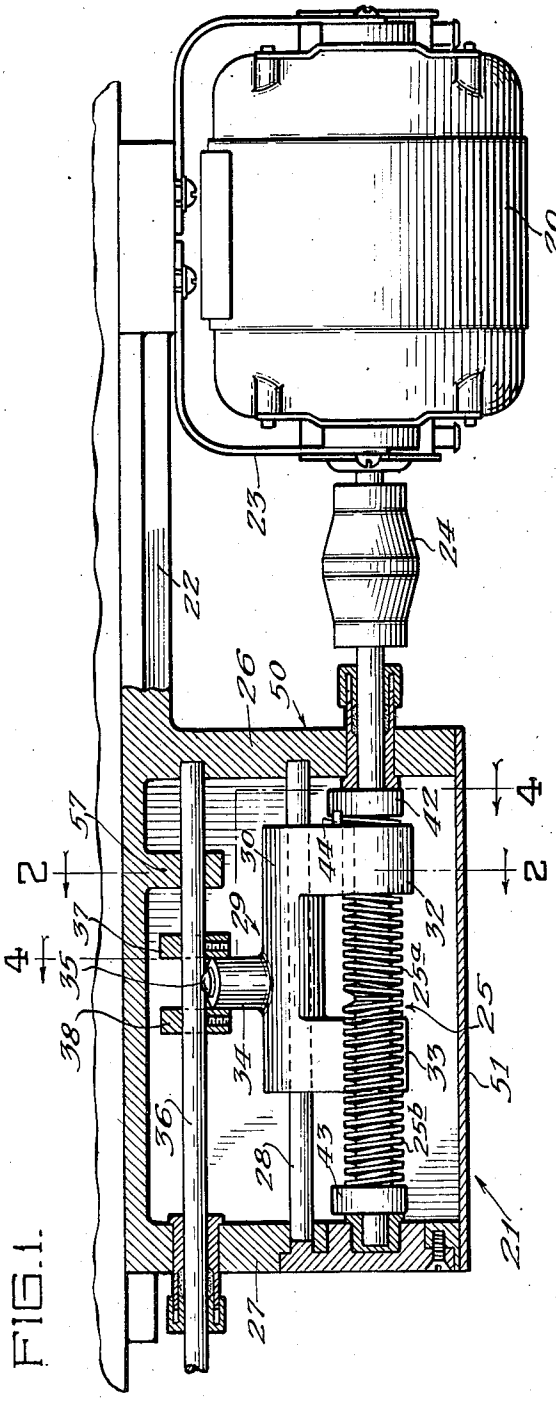


FIG. 1.

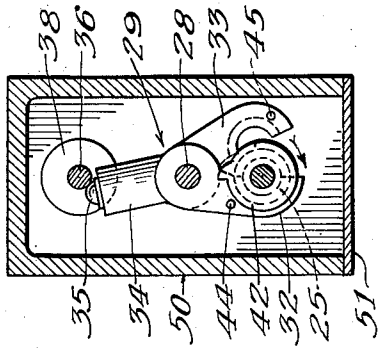


FIG. 4.

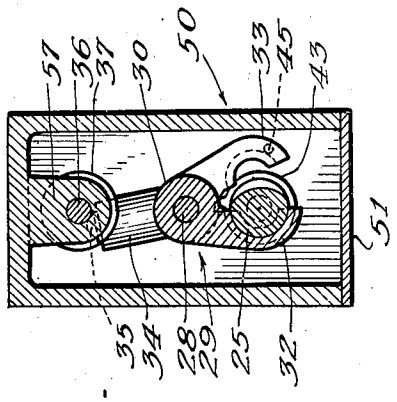


FIG. 2.

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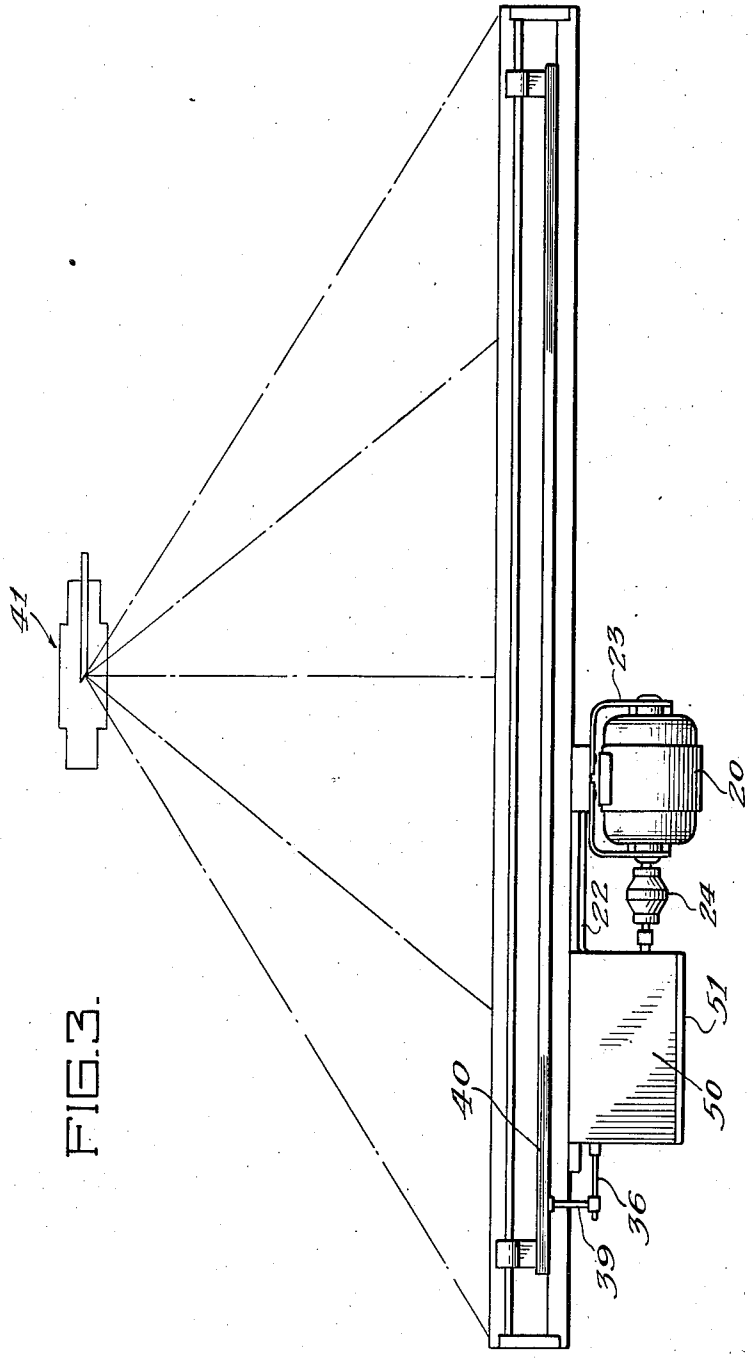


FIG. 3.

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Patented Apr. 19, 1949

2,467,592

UNITED STATES PATENT OFFICE

2,467,592

DRIVING MECHANISM FOR X-RAY GRIDS

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Application July 22, 1943, Serial No. 495,690

2 Claims. (Cl. 250—63)

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This invention relates to an X-ray apparatus and more particularly to a driving mechanism for imparting reciprocating movements to a so-called Potter-Bucky grid.

In taking certain X-ray photographs it is a common practice to use a moving grid called a Bucky grid or Bucky diaphragm between the source of X-rays and the film. In order to secure a properly exposed film without grid lines it is essential that the Bucky diaphragm be moved at a uniform speed and that reversal of its movement be substantially instantaneous.

It is thus an object of the present invention to provide a driving mechanism for a Bucky grid or diaphragm that will substantially instantaneously reverse the direction of movement of the grid in its reciprocation.

It is another and still further object of the present invention to provide a mechanism of the character stated wherein the arms of an oscillatable fork are adapted for alternate engagement respectively with oppositely threaded portions of a positively driven member for effecting a substantially instantaneous reversal of the direction of movement of the Bucky diaphragm.

These and other objects will be apparent from the following detailed description of a preferred embodiment of the invention taken in connection with the accompanying drawings in which:

Fig. 1 is a partly sectioned elevational view of the driving mechanism; Fig. 2 is a sectional view taken vertically on the line 2—2 of Fig. 1; and Fig. 3 is an elevational view of the driving mechanism coupled to a Potter-Bucky grid in operative relation to an X-ray tube. Fig. 4 is a section taken on the line 4—4 of Fig. 1.

With reference to Fig. 1, a constant speed electric driving motor 20 and a reciprocating mechanism 21 are mounted on a base 22. The motor 20 supported by a resilient mounting 23 rotates through a flexible coupling 24, a member 25, which is supported in brackets 26 and 27 and is provided with left-hand and right-hand threaded portions. Thus a portion 25*a* of member 25 is threaded in one direction while a similar portion 25*b* is threaded in the opposite direction. In the brackets 26 and 27 above the member 25 is a parallel guide rod 28 on which a forked member 29 reciprocates and oscillates. This member 29 comprises a forked body 30 drilled axially to receive the rod 28 and formed to provide two arms 32 and 33 which extend downwardly, one on either side of the rotating member 25. As best illustrated in Fig. 2, the lower side portions of the arms 32 and 33 are threaded so that they may

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removably engage the member 25, and are set at such an angle, relative to each other, that only one of the arms may engage the member 25 at a given time. Extending upwardly from the body 30 of the forked member 29 is a third arm 34, in the end of which is a spring-pressed detent 35 adapted to ride smoothly over the rod 36. Located in abutting relation on either side of the arm 34 and secured to the rod 36 are the collars 37 and 38. It will thus be seen that longitudinal motion of the forked member 29 imparts corresponding longitudinal motion to the rod 36. The rod 36 is mounted for sliding movement in bearings located in brackets 57 and 27. The unconfined end of the rod 36 is coupled to an arm 39 (Fig. 3), securely fastened to the Bucky diaphragm 40 which is reciprocated beneath an X-ray tube 41.

The angles at which the arms 32, 33 and 34 project from the body 30 of the forked member 29 are such that when the detent 35 lies on one side of the rod 36 the threaded portion of the arm 32 engages the threaded portion 25*a* of the member 25; and when detent 35 lies on the other side of the rod 36 the threaded portion of the arm 33 engages the threaded portion 25*b* of member 25 as shown in Fig. 2. Longitudinal motion is imparted to the forked member 29 by virtue of the threaded engagement of either of the arms 32 or 33 with the rotating member 25; the detent 35 imparting a counterforce preventing the arm from disengaging itself from the rotating member 25.

On either end of the rotating member 25 are the disc cams 42 and 43. The peripheral surface of each of the said cams is circular except for one lobe as shown in Fig. 1.

Two cam followers 44 and 45 are located in such a position on arms 32 and 33 respectively, that when the forked member 29, advancing towards the cam 42 or the cam 43 by virtue of the rotation of the member 25, reaches either one of the cams, the cam engages its respective cam follower, quickly disengages one threaded arm from the member 25, snaps the detent 35 across the rod 36, and engages with the member 25 the threaded arm that was previously disengaged.

Thus, the reciprocating mechanism may be seen to operate as follows:

The motor 20 rotates the double-threaded member 25 at a constant speed. When the threaded portion of the arm 32 is engaged with the threaded portion 25*a* of member 25, forked member 29 is caused to travel in a longitudinal direction toward the cam 42. In so traveling

the forked member slides over the rod **28** and by virtue of its connection to the rod **36** through the arm **34** and the collars **37** and **38** causes the rod **36** to travel in a like direction. The rod **36** through its connection with the arm **39**, which is in turn connected with a Bucky diaphragm **40**, causes a longitudinal motion of the said grid. When the arm **32** reaches the cam **42**, the said cam engages the cam follower **44** and instantaneously disengages the arm **32** from the member **25**, snaps the detent **35** to the opposite side of rod **36** and in turn engages the threaded portion of the arm **33** with the threaded portion **25***b* of the member **25**. The last-mentioned engagement produces almost instantaneous reversal of the motion of the forked member **29** and causes the said member to travel in a longitudinal direction toward the cam **43**.

In one embodiment this reversal occurred in less than one-fourth of one percent of the time needed for one complete grid cycle. The forked member **29** through its connection with the rod **36** and the arm **39** causes a similar reversal of travel of the Bucky diaphragm **40**. When the arm **33** of the forked member **29** reaches the cam **43** the follower **45** is engaged by the cam **43** which causes disengagement of the arm **33** from the threaded portion **25***b* and reengagement of the arm **32** with the threaded portion **25***a* of the member **25**. This produces another reversal in travel and causes the forked member **29** to travel in its original direction. Thus, the forked member **29** and thereby the Potter-Bucky grid **40** to which it is attached travel uniformly in a to-and-fro direction, reversal of travel being effected by the disengagement of one of the arms **32** or **33** through the engagement of the respective cams **42** or **43** with the respective cam followers **44** or **45** and the subsequent engagement of the opposite arm.

A box **50** surrounds the reciprocating mechanism and may be filled with lubricating oil through a removable end plate **51** to lubricate the device.

From a consideration of the embodiment of this invention that has been specifically described, it will be appreciated that a simple and effective means has been provided for reciprocating a Bucky diaphragm at the speed required to avoid shadows of the diaphragm appearing on the radiograph. Positive drive in both directions and reversal well within the limited permissible time are insured by the cam means employed to reverse the travel in either direction.

It will be apparent to those skilled in the art

that various changes and modifications can be made in the apparatus of the disclosed invention without departing from the spirit and scope thereof as defined in the appended claims.

What is claimed is:

1. In an apparatus for positively reciprocating a Bucky diaphragm, the combination of a rotatable shaft provided with oppositely threaded portions, and a cam connected to either end thereof, an oscillatable forked member adapted to be connected to a Bucky diaphragm, said forked member being provided with two arms having cam followers projecting therefrom, said arms being spaced longitudinally of said rotatable member and disposed on opposite sides of said rotatable member for alternate threaded engagement with the oppositely threaded portions thereof, and means to oscillate said forked member being adapted to oscillate upon contact of said cam followers with said cams to place the arms thereof alternately in threaded engagement with said rotatable member.

2. An apparatus for reciprocating a Bucky diaphragm at a uniform speed with quick reversal at each end of the stroke comprising a rotatable shaft provided with oppositely threaded portions, an oscillatable forked member adapted to be connected to a Bucky diaphragm, said forked member being provided with arms having cam followers projecting therefrom, said arms being disposed on opposite sides of said rotatable member for alternate engagement with the oppositely threaded portions of said threaded member thereof, and cams secured to said rotatable shaft and rotatable therewith adapted to engage said cam followers for oscillating said forked member to place the arms thereof in threaded engagement with said rotatable member.

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