Jan. 15, 1935. L. WENCZLER 1,988,367

COPYING CAMERA

Filed July 3, 1933

Fig. 1

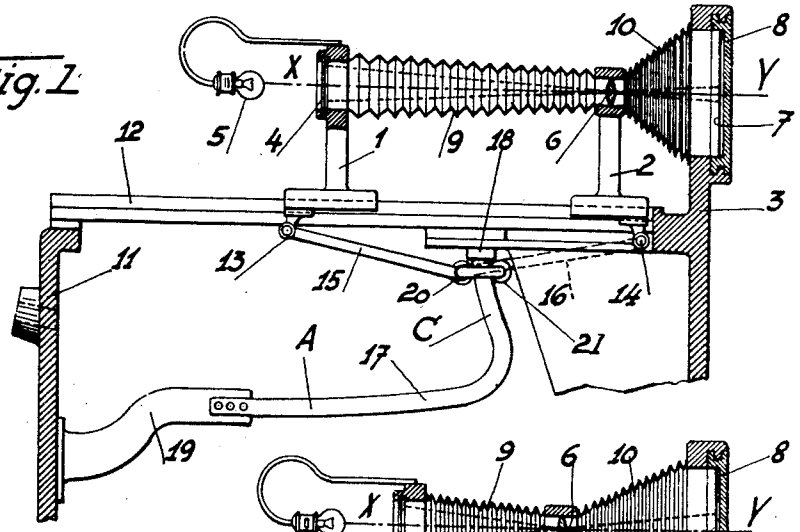


Fig. 2

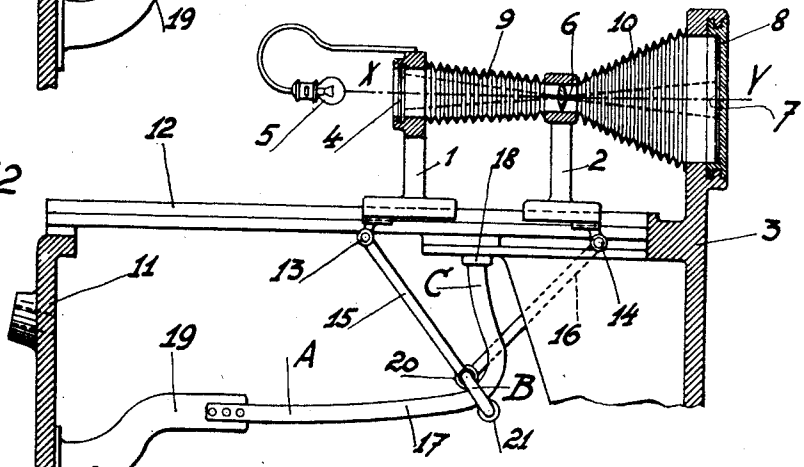
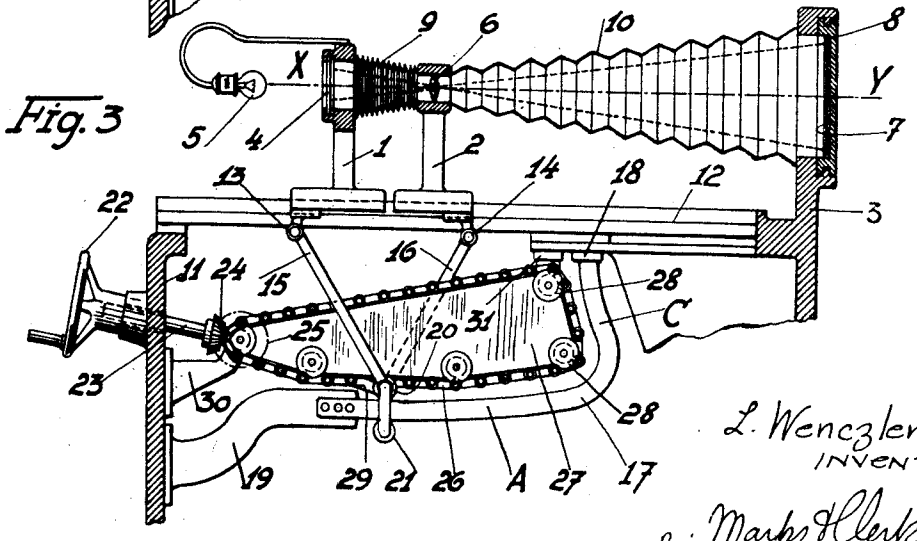


Fig. 3



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Patented Jan. 15, 1935

1,988,367

UNITED STATES PATENT OFFICE

1,988,367

COPYING CAMERA

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Application July 3, 1933, Serial No. 678,951
In Germany, February 23, 1932

7 Claims. (Cl. 88—24)

This invention relates to copying cameras in which the degrees of enlargement and reduction may be varied within wide limits and a correct focus on the sensitive surface is automatically maintained for all degrees of enlargement and reduction. More particularly the invention relates to copying cameras of this type in which the relative movement between the movable optical parts is governed by a toggle the arms of which are connected to said movable optical parts and the joint of which arms follows a stationary cam.

The primary object of the invention is to secure exact operation of the mechanical means governing the movements of the optical parts. Another object of the invention is to provide improved means to cause the joint of the toggle arms to move along, and exactly follow all curvature of, the cam. Other objects of the invention will appear from the following description of an embodiment of the invention, reference being had to the accompanying drawing in which:

Figure 1 is a sectional side elevation with the parts adjusted for reduction, Figure 2 is a similar illustration with the parts adjusted for full or equal size copies, and Figure 3 is a similar illustration with the parts adjusted for enlargement, the mechanism for controlling the various adjustments being shown in Figure 3 only.

Three uprights 1, 2, and 3 are mounted on a base frame 11. Upright 3 which carries the frame 8 for the sensitive surface 7 is fixed to the base frame 11, whereas the upright 2 carrying the lens 6, and the upright 1 carrying the surface to be copied as well as the light source 5, are both movable longitudinally of the base frame 11 along a dovetailed track 12 which they cannot leave. Openings in the uprights allow free passage to the pencil of rays which is indicated in dash lines in all figures and which is sheltered by a pair of bellows 9 and 10, the ends of which have light-tight connections with the openings in the uprights.

The degree of enlargement or reduction depends on the relative positions of the movable uprights 1 and 2 to each other and to the stationary upright 3. The movements of the uprights 1 and 2 are governed, as known per se, by a cam rail 17 fixed at 18 and 19 to the base frame 11 beneath the track 12, and a toggle, the arms 15 and 16 of which are respectively connected to upright 1 at 13 and to upright 2 at 14, the joint of the toggle arms being bound to follow the cam rail 17 which is so shaped in accordance with the focal length of the lens 6, as to secure automatically a sharp image on the sensitive surface 7 for any degree of enlargement or reduction. As a novel feature of the invention, the cam rail 17 consists of two sections A and C approximatively perpendicular to each other and connected by a rather sharp bend B. Section A which runs approximatively parallel to the axis of projection X—Y serves for enlargements, Fig. 3, and section C which ends in the midway of the course of the movable uprights 1 and 2 serves for reductions, Fig. 1, while the position of the joint of the toggle arms at B, Fig. 2, corresponds to full or equal size copies.

The joint of the toggle arms 15, 16 carries a roller 20, to which a second roller 21 is so linked that the cam rail 17 is closely embraced by the two rollers 20, 21. Roller 20 runs on the concave side, and roller 21 runs on the convex side of rail 17, the line connecting the axes of the rollers being always coincident with the normal of the cam curvature. Thus a strictly exact positive guidance of the toggle joint is obtained and back-lash is avoided even in the bend B.

According to the invention, when change in the position of the uprights 1 and 2 is desired, the primary movement is not imparted to one of the movable uprights, but to the joint of the toggle arms. It will be understood, that in view of the fact, that the joint of the toggle arms has to follow the curvatures of the cam, while the uprights have a straight course, it will be more advantageous to impart motion directly to the joint, which will, moreover, equally act through the toggle arms of equal lengths upon both the movable uprights. The mechanism for imparting direct motion to the roller 20 is shown in Figure 3 and consists of an endless flat link chain 26 and a link connection 29 between the same and the roller 20. The chain 26 runs over a plurality of guide sprockets 28 journaled in a plate 27 situated in the plane of the cam rail 17 and secured at 30 and 31 to the base frame 11. A hand-wheel 22 on a shaft 23 journaled in the base frame 11, and a pair of bevel wheels 24, 25 serve to drive the chain 26. The tight run or side of the chain is carried substantially parallel to the cam rail 17 in the plane of the latter and the link connection 29 between the chain and the roller 20 will compensate for any divergencies so that roller 20 will exactly follow the cam 17 even in the sharp curve B.

The chain 26, for which any other flexible driving means may be substituted, can be tight-

ened in the usual way by adjusting one or more of the guide sprockets 28 without interference with the exact guidance of the roller 20.

The copying camera as above described is particularly adapted for photo-composing purposes, as any variety of patterns may be reproduced from the same place of exposure at any desired degree of enlargement or reduction to make up a photograph of a letter-page out of partial reproductions.

What I claim is:

1. In a copying camera for enlarging and reducing work, a frame with a substantially horizontal rectilinear sliding path thereon, a holder for the sensitive surface fixed to the frame at one end of said sliding path, a lens carrier and a carrier for the surface to be copied, both carriers being slidable along said sliding path, in combination with a cam rail fixed to said frame and a toggle the arms of which are respectively connected to said slidable carriers, a roller mounted on the joint of the toggle arms arranged to follow the concave side of the cam rail, a second roller being so linked to said first roller as to follow the convex side of the cam rail, and means for imparting primary motion to said first roller along said cam rail.

2. In a copying camera for enlarging and reducing work, a frame with a substantially horizontal rectilinear sliding path thereon, a holder for the sensitive surface fixed to the frame at one end of said sliding path, a lens carrier and a carrier for the surface to be copied, both carriers being slidable along said sliding path, in combination with a cam rail fixed to said frame, and a toggle the jointed arms of which are respectively connected to said slidable carriers, means to cause the joint of the toggle arms to follow the cam rail, and flexible driving means carried substantially parallel to said cam rail and a link connecting said driving means to the joint of the toggle arms to impart primary motion to said joint.

3. In a copying camera for enlarging and reducing work, a frame with a substantially horizontal rectilinear sliding path thereon, a holder for the sensitive surface fixed to the frame at one end of said sliding path, a lens carrier and a carrier for the surface to be copied, both carriers being slidable along said sliding path, in combination with a cam rail fixed to said frame, and a toggle the jointed arms of which are respectively connected to said slidable carriers, means to cause the joint of the toggle arms to follow the cam rail, and flexible endless driving means the tight side of which is carried substantially parallel to said cam rail and a link connecting said driving means to the joint of the toggle arms so as to impart primary motion to said joint.

4. In a copying camera for enlarging and reducing work, a frame with a substantially horinontal rectilinear sliding path thereon, a holder for the sensitive surface fixed to the frame at one end of said sliding path, a lens carrier and a carrier for the surface to be copied, both carriers being slidable along said sliding path, in combination with a cam rail fixed to said frame, and a toggle the jointed arms of which are respectively connected to said slidable carriers, means to cause the joint of the toggle arms to follow the cam rail, and flexible endless driving means arranged in the plane of the cam rail and having its tight side carried substantially parallel to said cam rail and a link connecting said driving means to the joint of the toggle arms to impart primary motion to said joint.

5. In a copying camera in accordance with claim 4, a flat link chain as the flexible endless driving means.

6. In a copying camera for enlarging and reducing work, a frame with a substantially horizontal rectilinear sliding path thereon, a holder for the sensitive surface fixed to the frame at one end of said sliding path, a lens carrier and a carrier for the surface to be copied, both carriers being slidable along said sliding path, in combination with a cam rail fixed to said frame, and a toggle the jointed arms of which have equal lengths and are respectively connected to said slidable carriers, means to cause the joint of the toggle arms to follow the cam rail, and means for imparting primary motion to the joint of the toggle arms along said cam rail which comprises a portion approximatively parallel to said sliding path and another portion approximatively perpendicular to said first portion.

7. A copying camera in accordance with claim 6, in which that portion of the cam rail which is approximatively perpendicular to the portion running approximatively parallel to the sliding path of the slidable carriers ends in the midway of the course of the slidable carriers.

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