PATENT SPECIFICATION

398,339

Convention Date (United States): Aug. 20, 1931.

Application Date (in United Kingdom): Aug. 18, 1932. No. 23,188/32.

Complete Accepted: Sept. 14, 1933.

COMPLETE SPECIFICATION.

Improvements in Cinematographic Cameras.

We, TECHNICOLOR MOTION PICTURE CORPORATION, a corporation of Maine, United States of America, of 110, Brookline Avenue, Boston, Massachusetts, United States of America, Assignees of JOSEPH ARTHUR BALL and GERALD FRANKLIN RACKETT, citizens of the United States of America, both of 823, North Seward Street, Hollywood, California, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to cameras for making photographs in natural colors, by utilizing a divided light beam, and although it is of more general applicability and usefulness for various methods of cinematography and still photography, the invention is particularly adapted and designed for purposes of cinematography in natural colors according to the methods described and claimed in specification No. 373,429.

It is the main object of the present invention to provide a mount for the light-dividing optical system of a camera of this nature which can be very accurately adjusted and brought into exact register with the film positioning elements of the camera, namely, the so-called "registering pins", so that the optical images can be properly aligned with the film perforations as fixed by these positioning elements. At the same time, the new mount permits disassembly of the optical system, as for example, for cleaning, and reassembly exactly into the pre-existing alignment, making painstaking realignment after each disassembly of the optical unit unnecessary.

Additional objects of our invention will be apparent from the following description of a typical concrete embodiment illustrated by drawings, in which:

Fig. 1 is a front elevation of a camera incorporating the invention, with the front wall removed;

Fig. 2 is a plan of the front part, with the cover removed and only one film movement shewn, of a camera incorporating the present invention;

Fig. 3 is an elevation of the light-dividing prism and its mount viewed from the front;

Fig. 4 is a plan view of the upper part of the prism mount;

Fig. 5 is a section on line 21—21 of Fig. 3;

Fig. 6 is a section on line 22—22 of Fig. 3;

Fig. 7 is a plan view of the lower half of the prism mount with the knife edge in place; and

Fig. 8 is similar to Fig. 7, but with the knife edge cut away.

Referring especially to Figs. 1 and 2, a camera incorporating the present invention will be described as far as desirable for a better understanding of the cooperation of its film movements with the new optical mount. The camera housing is built up upon a base 6 to which side walls, or doors, 16, 36, respectively, are fastened. Likewise mounted on the base plate is a central supporting block 51 for the light splitting prism and the film movements, there being two film movements for transporting one or two films at each of two adjacent sides of the prism, as described in the above-identified copending application, the films being indicated at B, R and G.

The block 51, which supports the light-dividing prism system and the two film movements of the camera, is screwed directly to base 6 through foot 52. The body of block 51 is formed with two flanges 53 and 54 providing a main cross-section in the shape of an L, as shown in Fig. 2, and a housing 134 for the shaft of the film movement drive which is located in the angle of this L-shaped support. The film movement drive comprises gears 210, 241, 242 and 70, 72; the gear wheels 70 and 72, actuate two intermittent film feed movements on the outside faces of flanges 53 and 54 of the L-shaped block. Block 51 also carries a prism bracket 55. The flanges 53 and 54 and bracket 55 have machined mutually perpendicular faces, and the flanges 53 and 54 have vertical keyways 56 and 57 in their faces to

[Price 1/-]

position the film movements to be described hereinafter, and to permit adjustment of them. Openings for the bearings of the shafts carrying the gears 70, 241 and 72, 242 are also provided in the flanges 53, 54. The two intermittent movements are carried by aperture plates 61, 62, respectively, which are formed integrally with flange plates 81, 82 at right angles to them. The plates 81, 82 also carry backing plates 63, 64, which, with the aperture plates 61, 62 form film confining devices, the films passing between them and the aperture plates. The flange plates 81, 82 are slidably fastened to the block flanges 53 and 54. With the aid of keys in keyways 56 and 57, flange plates 81 and 82 with the intermittent feed movements can be adjusted in vertical direction without becoming subject to rotation about the axis of their shafts, and by shimming the plates away from the supporting faces of the flanges 53, 54, the movements can also be adjusted perpendicular to these faces. For adjusting and maintaining the relative positions of the flanges 53, 54 and the flange plates 81, 82, any suitable means may be used which enables the flange plates and the intermittent movements to be slightly moved in vertical direction with respect to block flanges 53 and 54 and to be secured after such movement. After proper adjustment, aperture plates 61 and 62 can be braced, dowelled, and fastened together with a strong aperture plate bracket 60 (Fig. 1).

Each intermittent film feeding device is associated with registering pins 66 mounted on a yoke 67 provided with a rod 68 carrying a fork 69, the registering pins being reciprocated perpendicularly to the aperture plate by means of a pin 71 which is eccentrically mounted upon gear 70 or 72. Each intermittent movement comprises feeding pins 73 driven by a cam 74 on a gear 75 which meshes with gear 72. The film movements are of known design and may be replaced by any other suitable movements, and need therefore not be described in detail herein.

The light-dividing and selecting system P is preferably arranged as described in the above-identified copending application, and its optical characteristics need not therefore be described in detail herein. The prism receives, through a lens system L, a light beam along an optical axis *a*, which beam is divided by a semi-transparent mirror surface M into branch beams along axes *b* and *c*. As shown in Figs. 3 and 4, the prism system is clamped to a steel plate 86 by means of a yoke 287 and screws 288 and 289. The steel plate 86 has a recess in which a knife-edge 88 is held in place by screws 89, the recess and knife-edge together forming a precisely straight groove 87. A base plate 91 rests upon prism bracket 55 and has two bosses 92 and 93 which fit snugly into slots 94 and 95 of steel plate 86, and confine the relative motion of prism mount and base plate to motion within a plane perpendicular to groove 87. The base plate 91 is fixed to bracket 55 with the line joining the bosses 92 and 93 perpendicular to the aperture plate 61. The groove 87 receives a knife 96 with an edge 97, knife 96 having a round extension 98 which rests rotatably in an eccentric bushing 99 confined in base plate 91. Accordingly, the prism mount can rotate about a horizontal axis formed by the knife-edge 97 in a plane determined by the bosses 92, 93 and slots 94, 95. For final adjustment, it can also be transposed laterally by means of the eccentric bushing which may have graduations (as shown in Fig. 8), indicating the degree of lateral movement. Steel plate 86 is pressed towards the ball point 103 of a screw 104 by screw 101 and flat spring 102, the screw 104 being supported in boss 105 of bracket 55 and locked by screw 106. By adjusting screw 104 the prism mount can be rotated about edge 97.

This arrangement of a central supporting block for aperture mounts and prism mount permits adjustment of the relative position of prism and apertures in the following manner. The aperture plates 61 and 62 determine, with back plates 63, the planes of the recording surfaces and the registering pins 66 position the recording surfaces definitely within their planes by engaging the film perforations, so that aperture plates and registering pins together fully determine the position of the picture frames. In order to coordinate the two aperture planes with the optical planes of the images as produced by lens and prism, it is preferable first to fix the relative positions of the aperture rectangles or picture frames by positioning the four registering pins in a single plane transverse to the supporting block flanges, and at equal distances from the line of intersection of the two aperture planes. This is accomplished by slightly moving the aperture flanges longitudinally along keyways 56 and 57 of the supporting block, in order to bring the registering pins in the same plane, and by slightly shimming them in order to equalize their distances from the intersection line of the aperture planes. After the aperture planes and the picture frames within these planes are correctly positioned, the light splitting prism can be fixed in its proper position relative

to the apertures by adjusting the knife-edge 97 and ball point 103. In this manner the prism can be very accurately shifted into optical alignment and register with the film positioning members and the lens system, and then held accurately and permanently in that position. Furthermore, the prism can be removed for cleaning or other purposes and repositioned, without in any way disturbing its correct position, merely by loosening screw 101 and, upon returning, engaging its slots 94 and 95 with registering bosses 92 and 93 until it rests on knife-edge 97 (which is free to rotate about extension 98 into alignment with the groove) and ball point 103, whereupon it is again fastened with screw 101. In this manner, the prism mount proper is secured in place merely by the faces of bosses 92 and 93, knife-edge 97 and ball point 103, these elements being sufficient positively to determine the spatial position of the mount, without introducing uncontrolled stresses, since they form a statically determinate system.

Permanent adjustment of the prism system relative to the lens system of the camera and to the apertures is accomplished by properly and accurately machining the faces of bracket 55, base plate 91, knives 97 and 88, steel plate 86, slots 94 and 95, and bosses 92 and 93, and by setting ball point 103. As described above, the apertures can be positioned by vertically shifting the aperture flanges 81 and 82 and keyways 56 and 57 and by shimming them perpendicular to the faces of flanges 53 and 54. The various positioning movements are so arranged as to allow relative motion of the optical elements in straight paths along the three mutually perpendicular dimensions and rotation about three axes coinciding with the directions of the dimensions; in other words, adjustment takes place by transverse motion along the three axes of a three-dimensional rectangular reference system and rotation about these three axes. As mentioned before, the prism system can be removed for cleaning or other purposes and again replaced exactly into the former position by means of screw 101, knife-edge 97, ball point 103, and bosses and slots 92, 93, 94, 95, defining a statically determinate system, as described hereinbefore.

With the optical elements properly positioned, it will hardly be necessary ever to readjust them because both aperture and prism systems are arranged upon the rigid main supporting block 51.

Although the invention has been described with the employment of separate films for each aperture, it must be understood that only one aperture may be utilized at a time or that a single film may be used, as for example a longitudinally bent or folded film covering both apertures, or a single film arranged to run around two sides of a prism.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A device for corelating within a photographic camera a film (or films) and a light dividing system transmitting light through two or more exposure apertures toward said film or films, characterised by a support common to a film confining device adjustably associated therewith, and to said system, and by a mount for adjustably fastening said system upon said common support, said mount permitting removal and replacement of said system without disturbing the relative positions of the light dividing system and film confining device.

2. The arrangement according to claim 1, further characterised by the fact that the light dividing means is carried by a mount itself supported in a statically determinate manner and permitting adjustment of said light dividing system in a plane substantially perpendicular to the film, and rotatory adjustment thereof about an axis in said plane.

3. An arrangement according to the claim 1 and 2, characterised in that the mount positions said system rigidly except for rotation about an axis substantially parallel to an optical axis of the camera, and has instrumentalities apart from those for positioning the mount with respect to the axis for adjusting and maintaining the degree of rotation about said axis.

4. The arrangement according to the preceding claims further characterised in that the mount comprises a substantially horizontal plate to which said system is fixed, a free linear support for said plate which can be adjustably moved in a plane substantially perpendicular to the film, and a free adjustable point support for said plate permitting rotation thereof about said linear support, said linear support and said point support being associated with said common support.

5. The arrangement according to the preceding claims further characterised in that the mount comprises a plate to which said system is secured, said plate having a linear groove, a knife edge resting upon said common support and engaging said groove, the knife edge being freely rotatable about an axis substantially perpendicular thereto, a point sup-

port for said plate mounted on said common support and adjustable in a direction substantially parallel to said axis, means confining the relative motion of plate and knife to a plane substantially perpendicular to said groove, and resilient means for pressing the plate against the knife edge and the point support.

Dated the 18th day of August, 1932.

WM, BROOKES & SON,
No. 1, Quality Court, Chancery Lane,
London, W.C. 2,
Chartered Patent Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1932

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

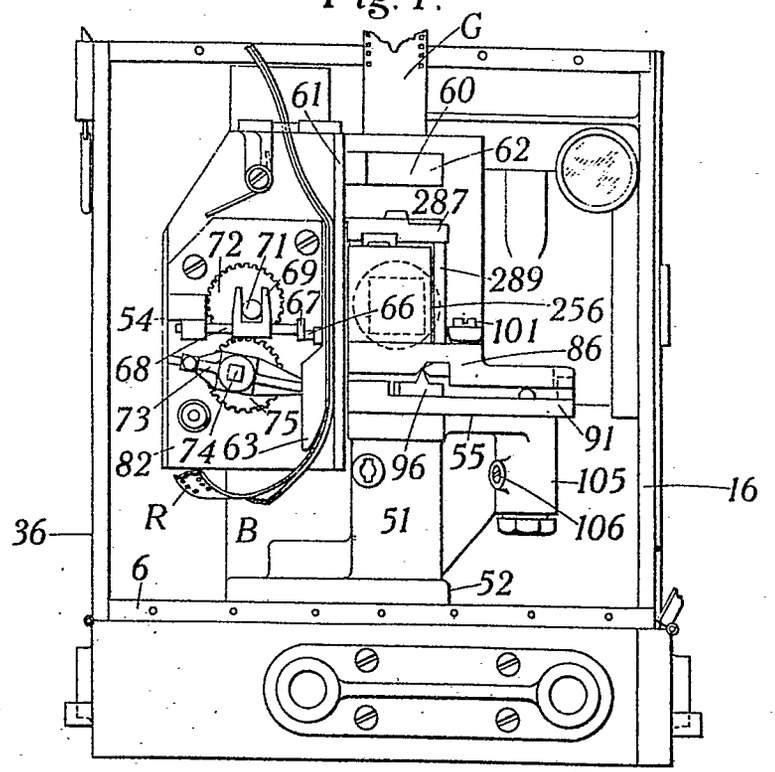


Fig. 2.

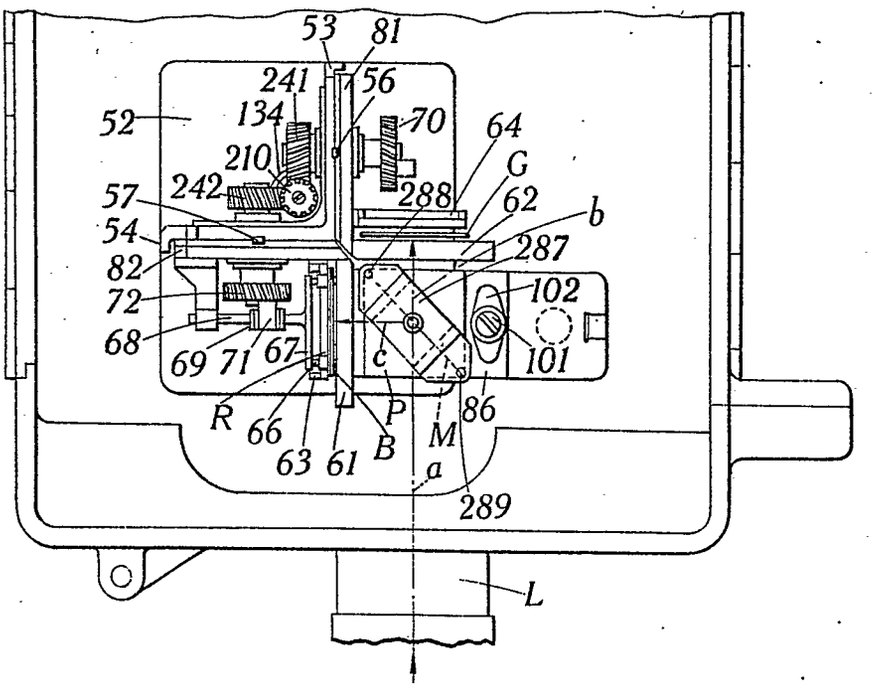


Fig. 3.

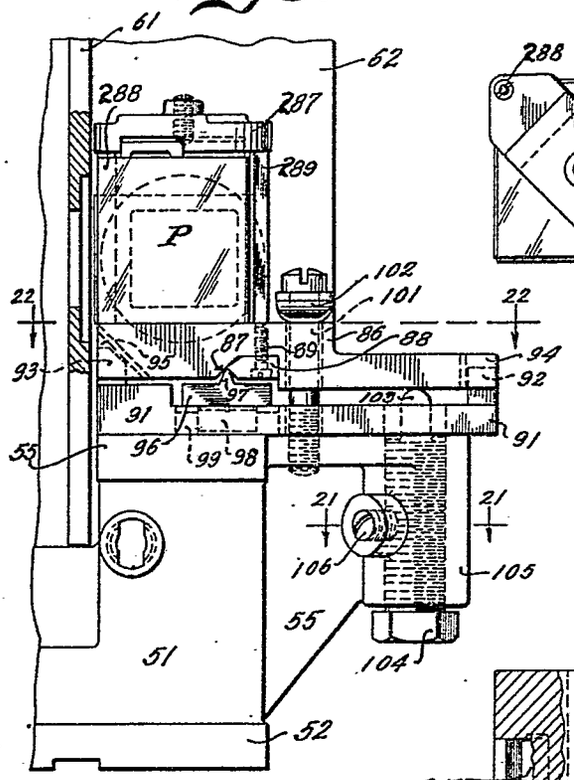


Fig. 4.

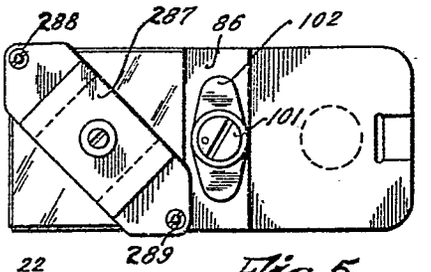


Fig. 5.

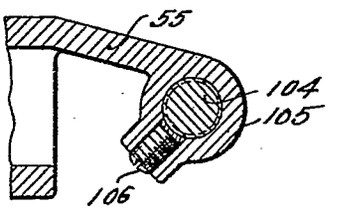


Fig. 6.

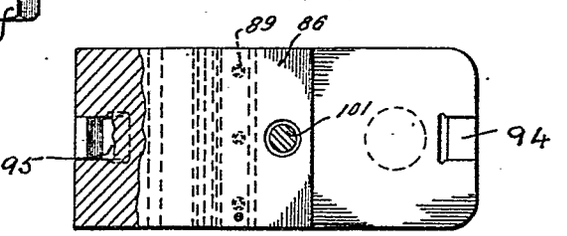


Fig. 8.

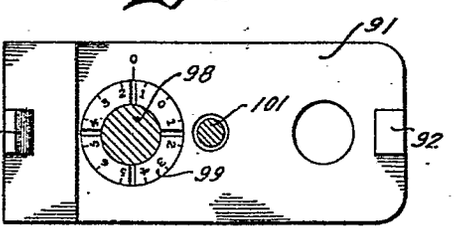
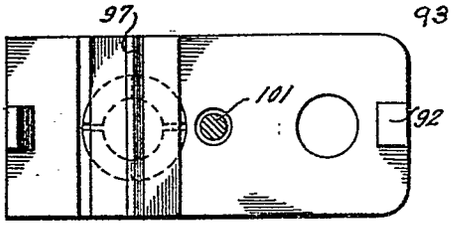


Fig. 7.



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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

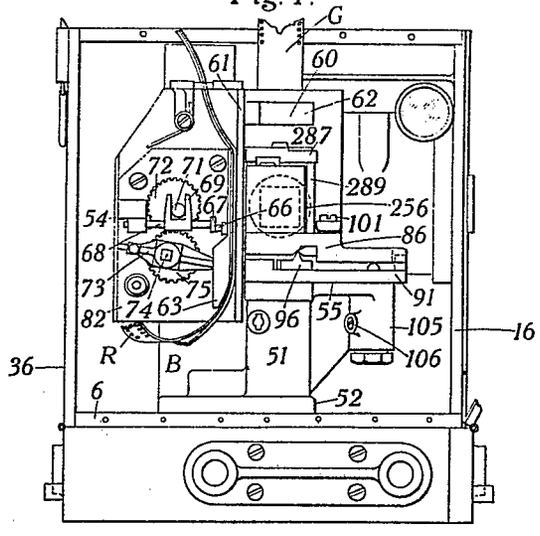


Fig. 2.

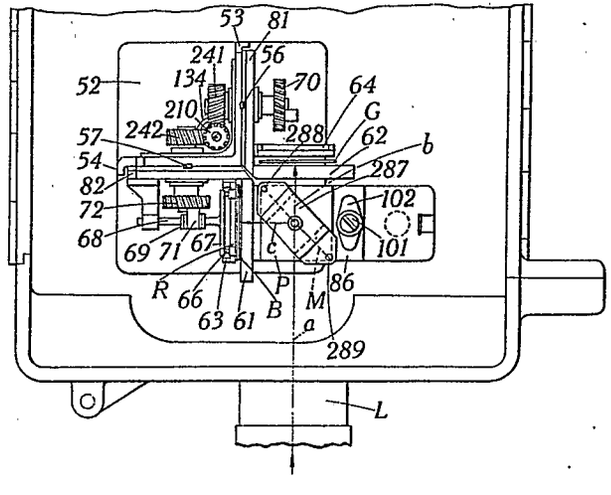


Fig. 3.

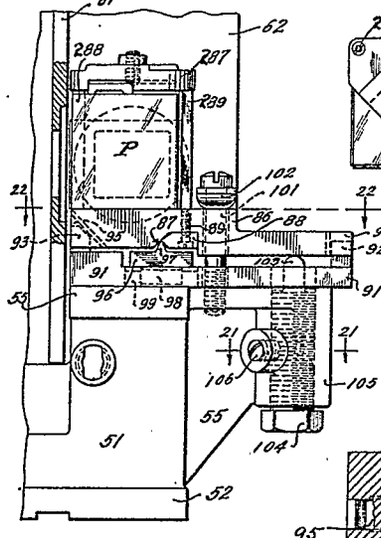


Fig. 4.

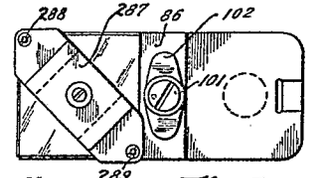


Fig. 5.

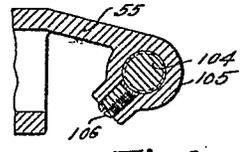


Fig. 6.

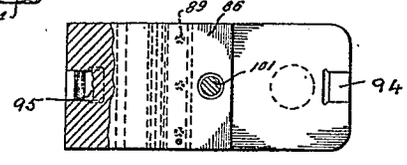


Fig. 8.

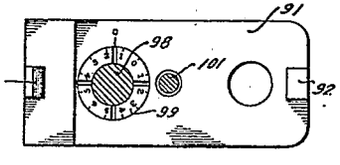
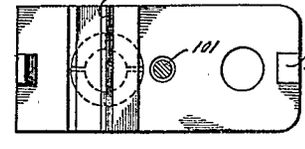


Fig. 7.



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