PATENT SPECIFICATION

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447,225

Application Date (in United Kingdom): April 5, 1935. No. 10658/35.

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COMPLETE SPECIFICATION

Improvements in Photographic Apparatus for Colour Cinematography

We, AUGUSTE VALENTIN, a Citizen of the French Republic, of 11 bis, rue du Lunain, Paris, France, and LAURENT BASSANI, a Subject of the King of Italy, of 288, rue de Vaugirard, Paris, France, 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 three-colour cinematography in which colour-record images are recorded on two films by means of a single objective.

According to the invention three colour-record images are taken in two stages constituting one operation which is repeated continually and comprises taking successively two images on one film through each of two movable colour-selecting screens, and taking the third image simultaneously with one of the said two images on the second film and through a fixed colour selecting screen.

In the taking apparatus there may be arranged between the objective and a first film situated normally with respect to this objective, a semi-transparent glass inclined at 45° with respect to the optical axis of the objective, and a second negative film may be placed at a right angle to the first one in the path of the rays reflected by the glass.

The beam of rays coming from the objective and striking the inclined glass is divided into two parts, a first part passes through the glass and continues on its way towards the first film, whilst the other portion of the beam is reflected and is directed on to the second film through the movable colour-selecting screens.

The fixed screen is preferably constituted by the glass itself and to this end the back of the glass is coated with a varnish having the desired colouring.

The invention is illustrated by way of example in the accompanying drawings, in which:—

Figure 1 shows a group of two negative films adapted for use in three-colour photography;

Figure 2 is a plan section of the optical part of an apparatus for taking three-colour views on two negative films;

Figure 3 is a sectional elevation on the line III—III of Figure 2;

Figure 4 and 5 show the front views of two shutter discs used in the apparatus;

Figure 6 is a diagram illustrating the method of operation of the coloured selective screen;

Figure 7 is a side view of the complete mechanism of the apparatus for taking views;

Figure 8 is a plan view of this mechanism;

Figure 9 is a front view of the same mechanism;

Figures 10 and 11 are detailed views with respect to the control of the feed claw devices of the film.

For three-colour cinematographic projection, positive films may be used which are made by means of negative films impressed as shown in Figure 1, where two films 20 and 21 of ordinary dimensions are shown and which are impressed for each picture, the first with two images 22 and 23, and the second with a single image 24.

The images 22 and 23 may be, for example, respectively allocated to the blue and green rays, and the image 24 to the red rays.

Since, in the utilisation of the films 20 and 21 their running rate should be equal, it is necessary to place the images 24 with intervals between them without an image, this interval being of the same dimensions as an image.

The optical portion of an apparatus for taking views according to the invention and permitting the impressioning of two films, comprises, as shown by Figure 2, an objective 25 mounted in the front part of a dark chamber formed by the frame 26 of the apparatus. Perpendicularly to the optical axis of the objective 25, the frame 26 forms at a suitable distance a vertical passage 27 intended to receive the film 21.

Between the objective 25 and the film 21 is arranged a glass 28 with parallel

faces and inclined at 45° with respect to the optical axis of the objective 25.

Perpendicularly to the means rays coming from the objective 25 and reflected by the glass 28, the frame 26 forms a second vertical passage 29 intended to receive the film 20.

In order to impress the film 21 by transparency through the glass 28, by means simply of red rays, the back of the glass 28 is coated with a red varnish. Furthermore, between the glass 28 and the film 21, there is arranged a shutter 30 (Figure 4) having an opening 31 permitting the passage of the luminous rays for a certain interval of time when the disc 30 rotates regularly.

Since it is necessary to impress the film 20 successively by means of the blue rays and then by the green rays, there is interposed between the glass 28 and the film 20 a movable member carrying two screens, shown particularly in Figure 6; this member comprises a frame 32 adapted to slide in vertical guides 33. Two screens, one, 34, green, and the other, 35, blue or violet, are fitted one below the other in the frame 32.

This frame, as shown by Figure 6, is connected by a rod 36 to a crank plate 37 rotating continuously. Finally, there is arranged between the objective 25 and the glass 28 a second rotating shutter 38 fixed on the same spindle 39 as the shutter 30, but which comprises as shown by Figure 5, two openings, of which one, 40, coincides with the opening 31 and the other, 41, is diametrically opposite to the first.

Figures 4 and 5, show that the angular extent of the openings 31, 40 and 41 is about 120°.

Figures 7, 8 and 9 show in detail the mechanism of the apparatus permitting the suitable displacement of the films 20 and 21, the rotation of the rotary shutters 30 and 38 and the alternating sliding of the screen carrying frame 32 to be assured.

On these figures will be seen most of the members which have been described, but it is now seen that the films 20 and 21 are moved respectively by two integral toothed drums 42 and 43 on which they are pressed, according to well-known practice, by loose rollers such as 44.

These films enter and leave the frame 26 by two passages indicated by 45 and connecting the interior of this box with a suitable magazine, not shown.

The two toothed drums 42 and 43 are fixed on a spindle 46 which is terminated on the outside of the box by a square head 47 on which there can be engaged an ordinary feed crank (not shown).

On the same spindle 46 is keyed a toothed wheel 48 which engages with a pinion 49 of much smaller diameter and which is keyed on an intermediate spindle 50 itself carrying a toothed wheel 51 engaging with a pinion 52 keyed on a spindle 53, the end of which is seen on Figure 7 and which carries a cam 54. It should be noted that these various countershaft gears give a great multiplication and that the rotation of the spindle 53 is much more rapid than that of the operating crank of the apparatus.

The intermediate spindle 50 carries outside the apparatus a pulley 55 which is adapted to take a belt coming from a suitable motor (not shown) due to which the use of the crank could be avoided.

The spindle 50 also carries a helicoidal wheel 56 which, through the intermediation of two other wheels 57 and 58, rotates the spindle 39 which carries the shutter disc 30 and 38 at exactly the desired speed.

The spindle 53 which carries the cam 34, also carries a toothed wheel 59 which drives a pinion 61 keyed on to the spindle 60 of the crank plate 37 controlling the screen-carrying frame 32.

Finally, the cam 54 rotates in a cage 62 which is guided vertically in slides such as 63 of the frame 26. The cage 62 forms at its upper part a kind of platform which carries two horizontal feed claws, 64 for the film 20, and 65 for the film 21. As shown particularly by Figures 10 and 11, each claw carrier has a finger 66 or 67 and these two fingers are connected by a right angled lever 68 pivoting about an axis 69 of the cage 62.

Owing to this lever it will be understood that the movements in advance and in return of the claws 64 and 65 are absolutely identical. The carrier of the claw 65 carries a small cage 70 which surrounds a cam 71 of comparatively great height, so that the cage 70 can slide vertically on this cam without ceasing to be controlled.

The cam 71 is keyed on a spindle 72 which is put in movement in a continuous manner by the horizontal spindle 53 due to two helicoidal pinions 73.

The spindle 72 also carries at its upper part a second cam shown at 74 in Figure 8 and there is seen at 75 on Figure 7 the cage of this cam. This cage carries a retaining pin 76 placed above the claw 65 which deals with the film 61.

By means of a counter movement by an elbow lever 77 similar to that shown in Figure 10, the retaining pin 76 actuates another retaining pin 78 which deals with the film 20.

The mechanism of the retaining pins 76 and 78 is, on the whole, identical with that of the feed claws 64 and 65, except that the cams 71 and 74 are diametrically opposite and the retaining pins 76 and

78 remain at a constant level whilst the feed claws 64 and 65 participate in the vertical movement of the cage 62.

The operation of the mechanism thus described is easily understood: the spindles 46 and 50 being set in movement, either by hand or by motor, the drums 42 and 43 rotate and feed the films at a definite speed, at the same time the shutters 30 and 38 and the spindles 53 and 72 rotate.

Supposing that fresh portions of film are in the passage 27 and 29, the cam 74 is in a position such that the retaining pins 76 and 78 are each engaged in a perforation of the films 20 and 21, and these films are thus rigidly held fast.

The corresponding openings 31 and 40 of the discs 30 and 38 come into the optical axis of the objective 25 so that the rays passing through this objective strike the glass 28. A portion of these rays pass through this glass, then the layer of red varnish with which it is coated. All the rays of colours other than the red are arrested by this layer and thus only the red rays strike the film 21.

Nevertheless, the other portion of the luminous beam coming from the objective is reflected towards the film 20, and since, at this instant the screen-carrying frame 32 has brought the green screen 34 opposite this beam of reflected rays, only the green rays will impress the film 20.

Thus, the images 23 and 24 are impressed simultaneously. Immediately afterwards the shutter disc 30 and 38 interrupt the passage of the luminous rays and by the action of the cams 71 and 74, the feed claws 64 and 65 penetrate into the perforations of the film 20 and 21, whilst the retaining pins 76 and 78 move away and permit them to shift in position.

From this moment, the cam 54 causes the cage 62 to descend, carrying with it the claws 64 and 65 and the films 20 and 21.

In the course of the following period, the retaining pins 76 and 78 penetrate into the perforations. The feed claws 64 and 65 move away from the films and the cage 62 again rises with a view to the following movement of descent. But the films 20 and 21 are, for the moment, held stationary, and the shutter disc 38 brings its opening 41 opposite the objective.

But the disc 30 has a solid part in front of the film 21, so that no light can strike this film. It is not the same as regards the film 20 which is impressed by the rays reflected from the glass 28, but this time, through the blue screen 35.

The image 22 of the film 20 is thus impressed thereon.

Immediately afterwards, the shutters again interrupt the luminous rays and the mechanism of the apparatus causes the films to descend with a view to the impression of the following picture, and so on.

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 process of three-colour cinematography, characterised in that three colour-record images are taken through one objective in two stages constituting one operation which is repeated continually and comprises taking successively two images on one film through each of two movable colour-selecting screens, and taking the third image simultaneously with one of the said two images on a second film and through a fixed colour-selecting screen.

2. A photographic apparatus for three-colour cinematography as claimed in claim 1, comprising a camera having a single objective characterised by the provision in front of one of the films of a member carrying two colour-selecting screens, adapted to slide with a rectilinear reciprocatory motion, and actuated by the camera mechanism itself in such a manner that the said film is exposed successively through the two colour screens.

3. A photographic apparatus for three-colour cinematography, substantially as described and shown in the accompanying drawings.

Dated this 5th day of April, 1935.

AUGUSTE VALENTIN and LAURENT BASSANI.

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Chartered Patent Agents.

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

Fig. 1

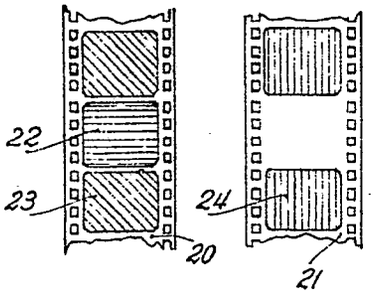
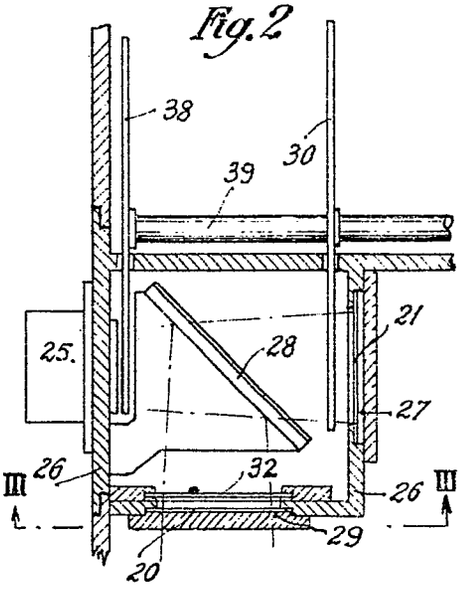


Fig. 2



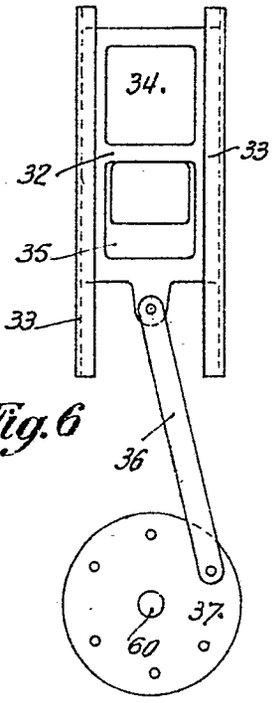


Fig. 6

Fig. 3

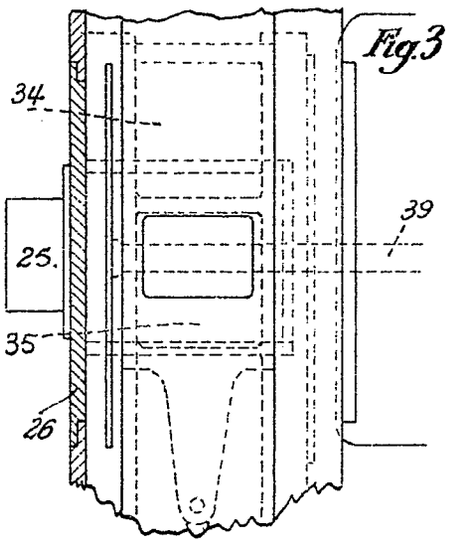


Fig. 4

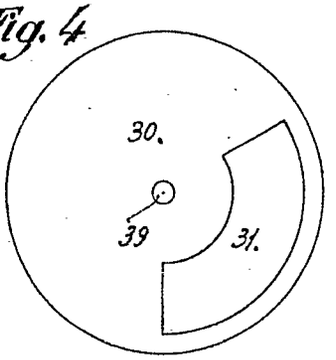


Fig. 5

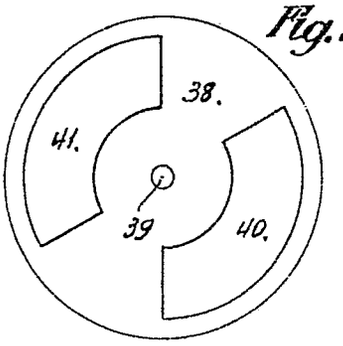


Fig.7

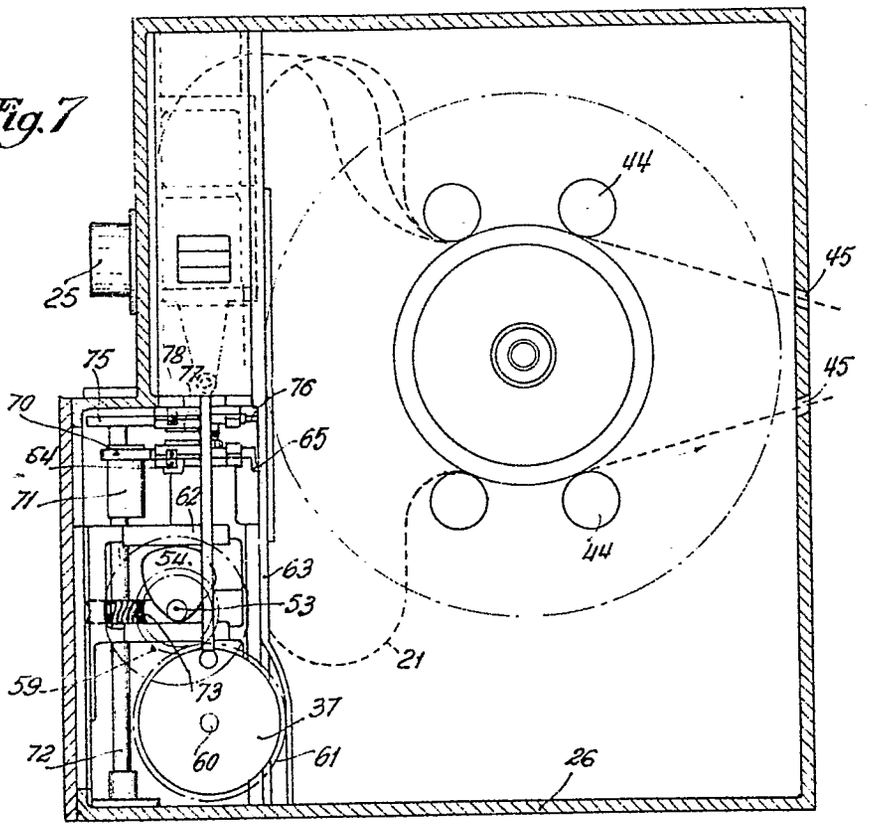
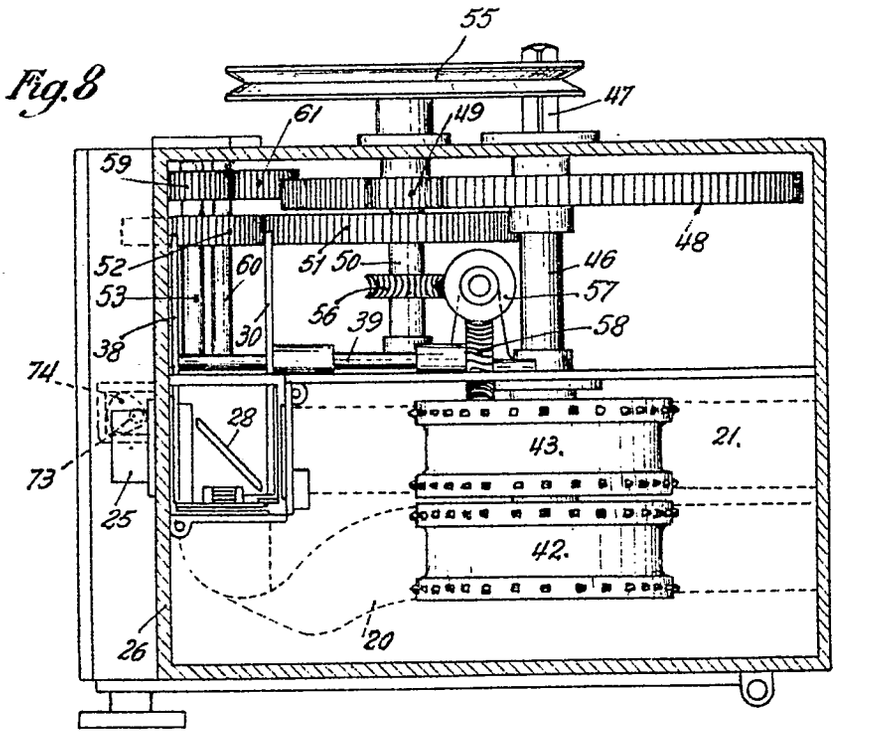


Fig.8



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SHEET 1

3 SHEETS

SHEET 2

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

Fig.1

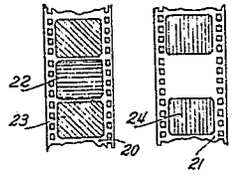
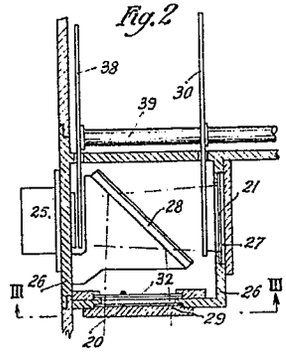


Fig.2



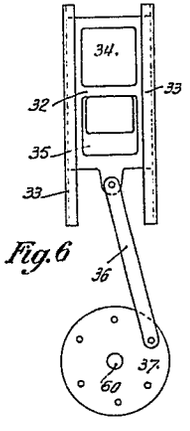


Fig.6

Fig.3

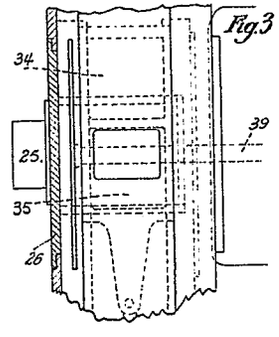


Fig.4

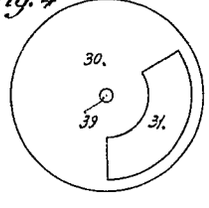


Fig.5

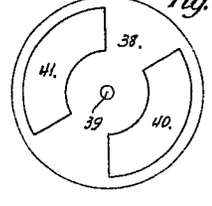


Fig.7

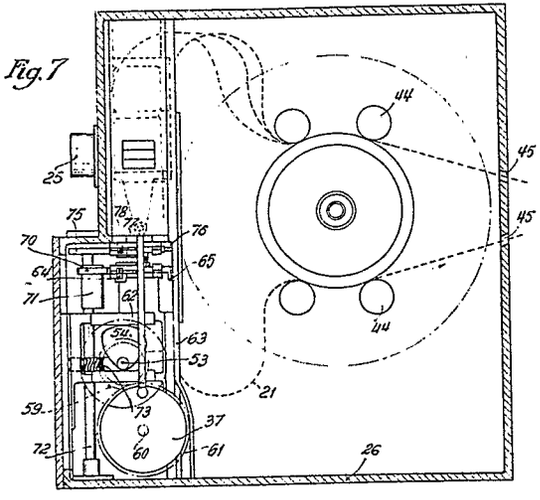
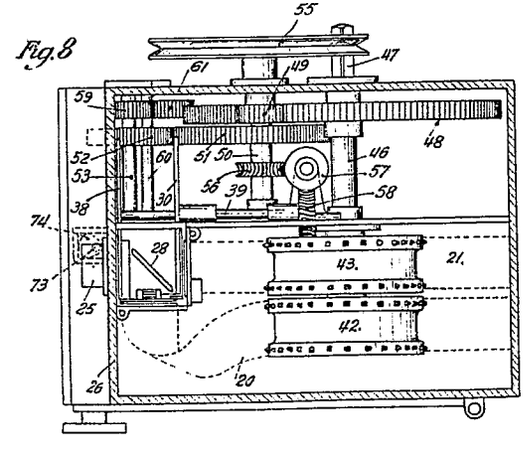


Fig.8



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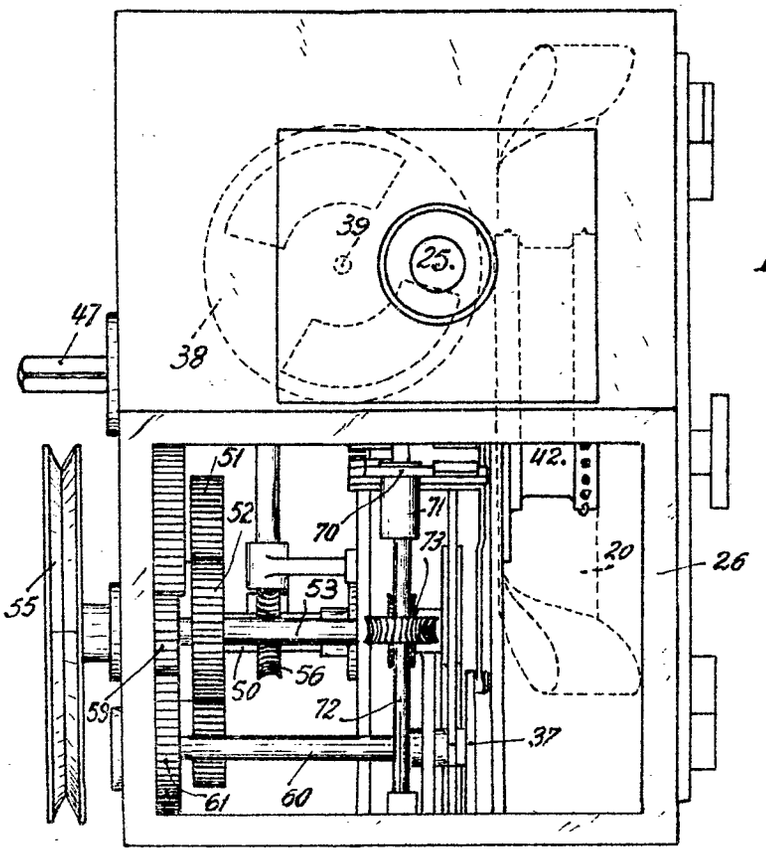
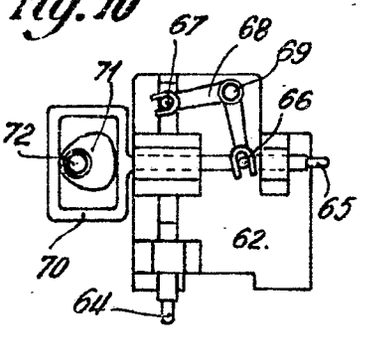


Fig. 9

Fig. 10



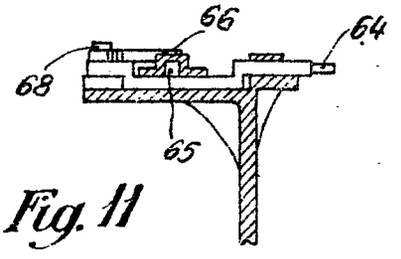


Fig. 11

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