Nov. 20, 1928.

E. OEHMICHEN

1,692,092

CINEMATOGRAPHIC APPARATUS

Filed Dec. 31, 1926

2 Sheets-Sheet 1

Fig. 1

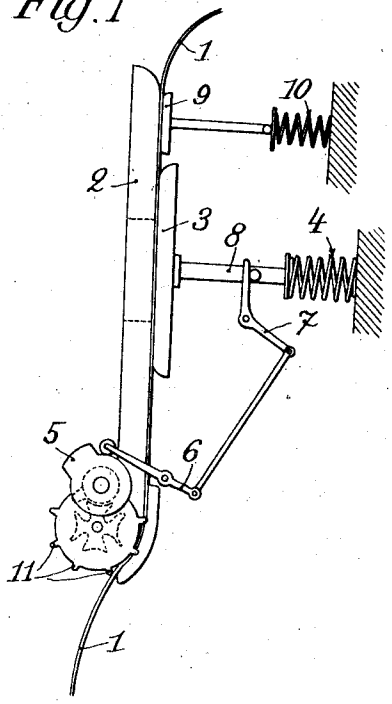


Fig. 2

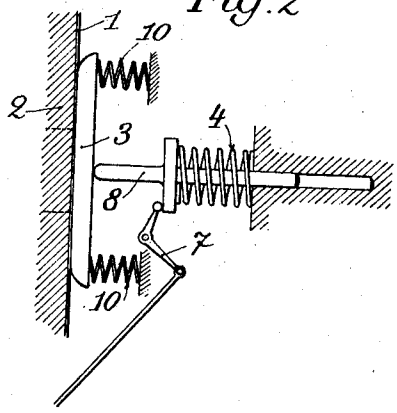


Fig. 3

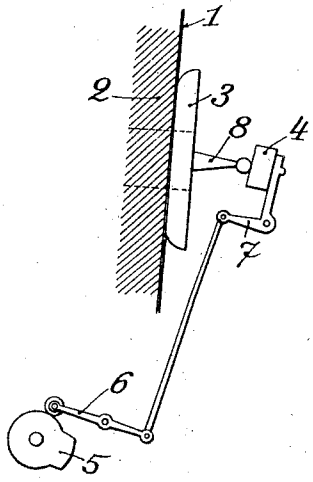
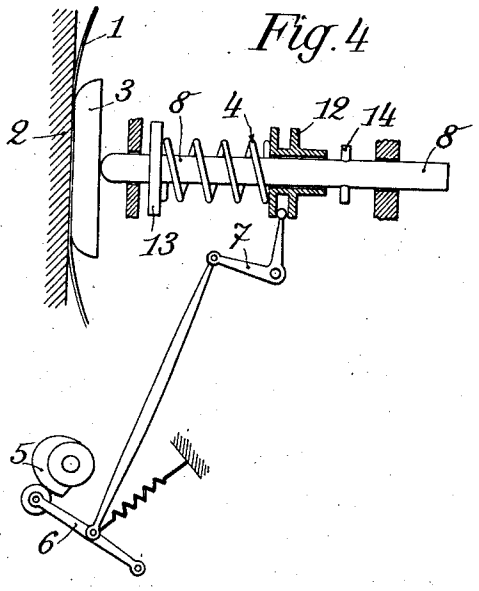


Fig. 4



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2 Sheets-Sheet 2

Fig. 5

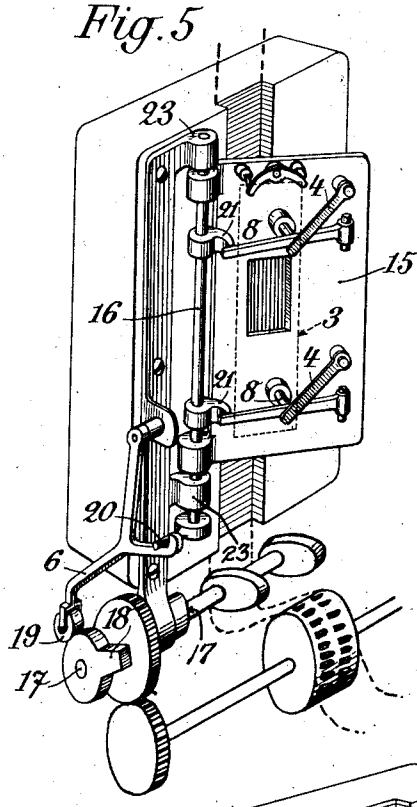


Fig. 6

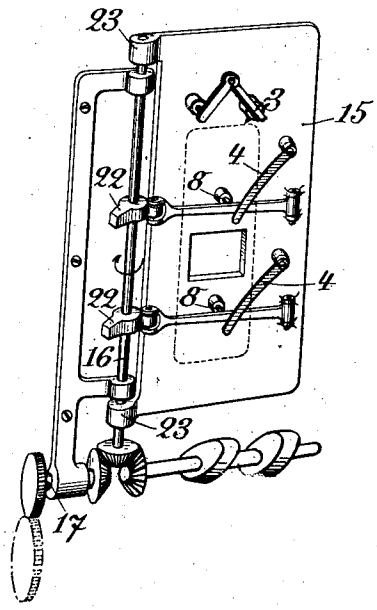
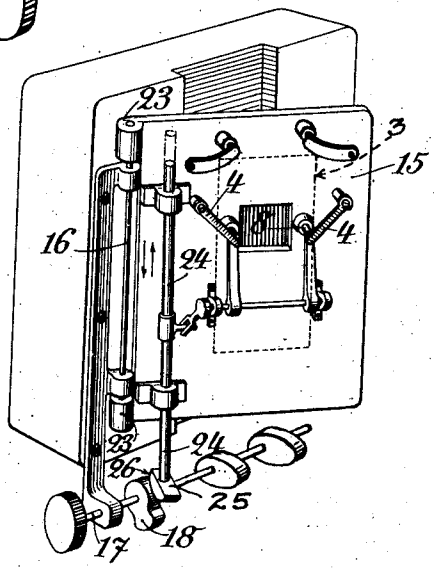


Fig. 7.



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Patented Nov. 20, 1928. 1,692,092

UNITED STATES PATENT OFFICE.

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CINEMATOGRAPHIC APPARATUS.

Application filed December 31, 1926, Serial No. 158,297, and in France November 25, 1926.

In all cases, the known types of cinematographic apparatus for view taking or projection utilize pressing elements, usually controlled by springs, for constantly applying the film against its guideway.

This arrangement assures the flat position of the film and obviates all irregularity in the travel of the film such as would necessarily occur by reason of the play of the driving teeth in their coacting perforations. This pressure must be considerable in the case of the usual films consisting of celluloid, since they can only be kept flat with difficulty, so that the traction on the film for its forward travel must be great, thus resulting in a rapid deterioration of the perforations in the film and also of the teeth of the driving device, with a consequent wear of the film and of the apparatus at the same time.

With the use of special films, consisting of a substance other than celluloid, which are weaker or thinner than the usual films, it may prove impossible to dispose the films in the normal apparatus, even when reducing the pressure of the said springs to the extreme limits.

My invention relates to cinematographic apparatus in which the pressure elements are controlled by means of a device which is automatically actuated by the mechanism of the cinematographic apparatus, so as to produce the full pressure on the film when it is stopped, and to remove the pressure during the whole or a part of the travel of the film.

According to my invention, the mechanism for the periodic pressing forms a complete device together with the gate, which can be readily adapted to the usual apparatus by a very simple transformation, thus enabling them to use films of all kinds in conditions in which the film will be subject to less strain and wear.

The appended drawings show by way of example various embodiments of the invention.

Figs. 1, 2, 3 and 4 show various controls for the push rod, with variable pressure.

Figs. 5, 6, and 7 are perspective views showing doors which are entirely fitted out and enable the present invention to be employed with the known cinematographic apparatus.

In Fig. 1, 1 is the film which travels between the wall 2 of the guideway and one of the principal shoes which is urged by the spring 4.

A power transmission device connected with the mechanism of the cinematographic apparatus actuates by means of a cam 5 (or an eccentric or like member) a set of levers 6—7 acting upon the rod 8 of the shoe 3 so that the latter will exercise its action when the film is stopped and will be separated from the wall 2 when the film travels.

A pressure element 9 controlled by permanently acting springs 10, may be disposed preferably at the input end of the guideway. The said pressure element is so regulated as to exercise upon the film the exact pressure required to assure a constant contact between the teeth of the film-actuating device 11 and the co-operating edges of the film perforations. However, the pressure due to the said element 9 is not sufficient to flatten the film, this being obtained by the device for intermittent pressure which is controlled by the mechanism. As will be observed, the film is left free by the main pressing device 3 when it travels forward, and the additional pressing element 9 whose action is very slight will simply assure the uniform travel of the film.

The element 9 must be suitably adjusted as to its pressure, according to the nature of the film employed. It should be noted that a light film, which is consequently weaker, will have a small inertia and will hence require less pressure to prevent it from passing beyond the teeth when the latter are stopped.

Obviously, my invention does not depend upon the method of power transmission employed to assure the periodic motion of the pressing device, and I may utilize various means producing the same result, such as pneumatic elements comprising closed expansion chambers or pistons, electromagnetic devices controlled by rotating or like

contacts, or analogous devices, without departing from the general principle of the invention, the said devices acting in all cases to effect the periodic and automatic variation of the pressure on the film, by suitable arrangements which are controlled by the unwinding mechanism, in such manner as to release the film during the whole or a part of its movement, and to press it to the maximum during the stopping period.

I may employ various devices for this purpose. For example the pressing devices may be reduced to a single one, or on the contrary their number may be increased.

In the cease in which a single element is employed, the device is constructed as shown in Fig. 2. The push rod 8, controlled by the strong spring 4, acts periodically upon a shoe 3 (or a frame) which is permanently urged by one or more springs 10 which are very weak and are only sufficient to produce the braking effect necessary to hold the film. The actuating device directly controls the push rod 8 so that its pressure is added to that of the springs 10 when the maximum pressure on the shoe is to be obtained, and that the action of the pressing element can be eliminated or reduced during the other parts of the period.

Obviously, the said actuating device may be employed without the intermediary of the shoes or like pressing devices. Fig. 3 shows a construction of this kind, in which the rod 8 of the shoe is connected with its control lever 7 by means of an elastic member 4. I may even eliminate this member if the device 6—7 has a sufficient elasticity.

For the indirect control, which is usually employed, two distinct arrangements may be provided, as follows.

In the first arrangement (Fig. 4) the lever 7 acts upon a grooved sleeve 12 which is slidable on the push rod 8; the spring 4 is placed between the said sleeve and a disc 13 secured to the said rod. By the use of the pin 14, the said rod can be moved backward by the said sleeve.

The spring 4 normally urges the rod 8 against the shoe 3, and the actuating mechanism 6—7 acts in such manner as to reduce the effect of the spring 4, and then to draw back the push rod itself at a certain point in the functioning of the said mechanism. I thus obtain a progressive action, and the whole effect is produced as if the tension of the spring were regularly diminished or increased in order to obtain the back motion of the push rod, or the pressure of the said rod.

In the second arrangement (Fig. 2), instead of varying the tension of the spring 4, I directly control the push rod 8 in such manner that as soon as the mechanism acts, the said shoe will be released and the pressure eliminated in an abrupt manner.

The device shown in Fig. 4 is thus adapted for progressive action and the device shown in Fig. 2 for immediate action.

In all cases, the principle of the invention remains the same. The apparatus will always provide for the variation—by a suitable cam on the mechanism—of the pressure of the shoes upon the film, so as to afford to the film the maximum freedom when travelling and to exercise a strong pressure thereon during the stopping periods.

It may be advantageous to entirely remove the pressure during the functioning, except for a very short instant before each stop, and herein I may so dispose the apparatus that the intermittent device controlled by the mechanism will also effect the slight pressure at 9 for the tension of the film. The said pressing device will thus be raised during the major part of the travel, and it will be again applied against the film for only a very short time before the end of the travel of the film, thus giving the film a slight tension which is just sufficient for a regular succession of the images. By thus reducing the duration of the pressure to the minimum, I am enabled to reduce the wear of the film perforations.

In these conditions, the duration of the stress of the teeth upon the film is reduced to the minimum and the resulting wear is diminished.

The improvements according to my invention consist more particularly in the use of an intermittent pressing mechanism which forms with the guideway a complete device which may be employed with the known cinematographic apparatus whereby they will be enabled to utilize all types of films in approved conditions of minimum wear.

Figs. 5 and 6 show such a construction, which is characterized by the use of a special door 15 in which the axle of the hinge forms the driving shaft for the various movements controlling the two push rods 8; the device, which is connected with the mechanism of the apparatus, actuates a shaft 17 carrying a cam 18 coacting with a roller 19 mounted on a lever 6 which draws upon the lever 20 secured to the shaft 16, thus rotating said shaft on its axis. Upon opening the door 15, the lever 20 mounted on the hinge axle will be released from the lever 6, so that the door may be freely opened or closed at all times during the travel of the film.

Upon the shaft 16 are mounted the actuating elements such as the levers 21 (Fig. 5) or the cams 22 (Fig. 6), acting upon the pressing members or upon the elastic means controlling said members which are mounted on the door itself. The said door, its pivot shaft, the hinge pieces 23 and the cam shaft 17, will constitute a combined device which

may be placed at once upon a known apparatus and may be substituted for the usual door with great facility: in this manner an apparatus adapted for the usual film can be converted into an apparatus employing a fragile film, and which, if the strong or normal film continues to be used, will assure a great reduction in the wear of the film and of the driving mechanism.

I may employ analogous constructions for the door with variable pressure. Fig. 7 shows a modification in which the shaft 24 controlling the pressing elements may slide lengthwise, and parallel with the hinge, or more generally, in a direction parallel with the direction of travel of the film, I prefer this disposition in cases in which the door is not hinged but is moved parallel with the main part of the guideway (i. e. a vertically sliding door or the like).

In this event, if the shaft 24 does not coincide with the axis of the hinge, the cams 25 (or the levers) controlling the transmission shafts mounted on the door, should be provided with the ramps 26 whereby the corresponding cams will not be held fast when the door is closed.

In principle, this part of my said invention consists of a door provided with pressing elements which are controlled by power transmission means which may be wholly or partially mounted upon the said door, which means may be controlled by the parts coacting with the mechanism of the apparatus, and whose supports are preferably mounted on the hinges of the door, so that the whole device may be mounted as a whole and without requiring any adjustment, upon a known cinematographic apparatus.

It may be advantageous, in order to maintain the film flat in more approved conditions, to combine the present invention with my prior invention, the subject-matter of the patent application No. 200,253, filed June 20, 1927, entitled: "Improvements in cinematographic apparatus" in which I utilize a current of air to apply the film against the wall of the guideway. I may further utilize plates of a rigid and transparent substance which are actuated by the driving mechanism and will press in a periodic manner upon the film so as to apply it against a stationary transparent surface comprised in the apparatus.

Having thus described my apparatus, what I claim as new therein, and my own invention, is:

1. In a cinematographic apparatus utilizing a flexible film, the combination of a guideway adapted to guide the said film, a pushing element adapted to maintain the said film in the said guideway and controlling means for periodically pressing and raising the said pushing element, the period of pressure of the said element corresponding to the stopping of the said film and the period of raising corresponding to the displacement of the said film, the said controlling means being connected with the mechanism of the apparatus, a second pushing element adapted to exert a constant and slight pressure on the said film, a movable door adapted to close the said guideway and to support the first and the second pushing element and also the said controlling means.

2. In a cinematographic apparatus utilizing a flexible film, the combination of a guideway adapted to guide the said film, a pushing element adapted to maintain the said film in the said guideway and controlling means for periodically pressing and raising the said pushing element, the period of pressure of the said element corresponding to the stopping of the said film and the period of raising corresponding to the displacement of the said film, the said controlling means being connected with the mechanism of the apparatus, a second pushing element adapted to exert a constant and slight pressure on the said film, a movable door adapted to close the said guideway and to support the first and the second pushing element and also the said controlling means, the pivoting axle of the said door being adapted to constitute the shaft for transmitting the motion to the said pushing elements mounted on the said door.

In testimony whereof I have hereunto affixed my signature.

ETIENNE OEHMICHEN.