G. RAMSEY.

MOVING PICTURE CAMERA.

APPLICATION FILED JULY 7, 1917.

1,388,892.

Patented Aug. 30, 1921.

2 SHEETS—SHEET 1.

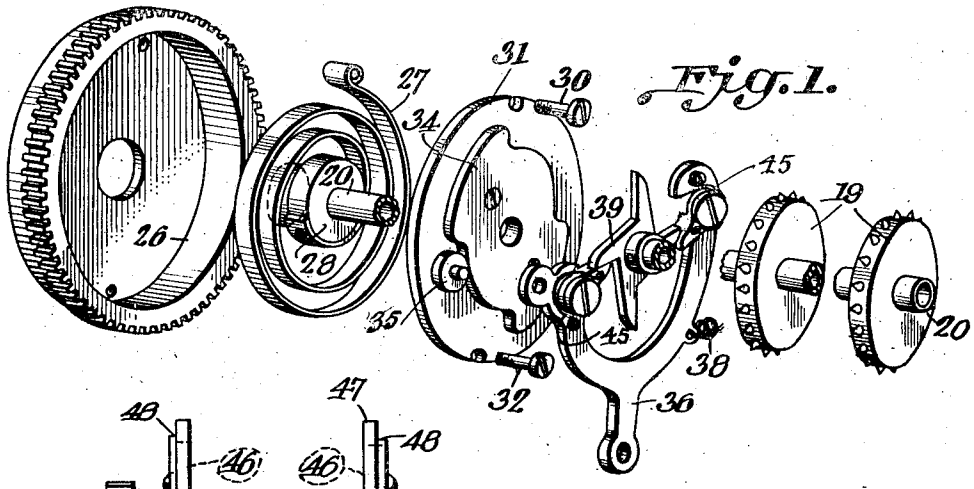


Fig. 1.

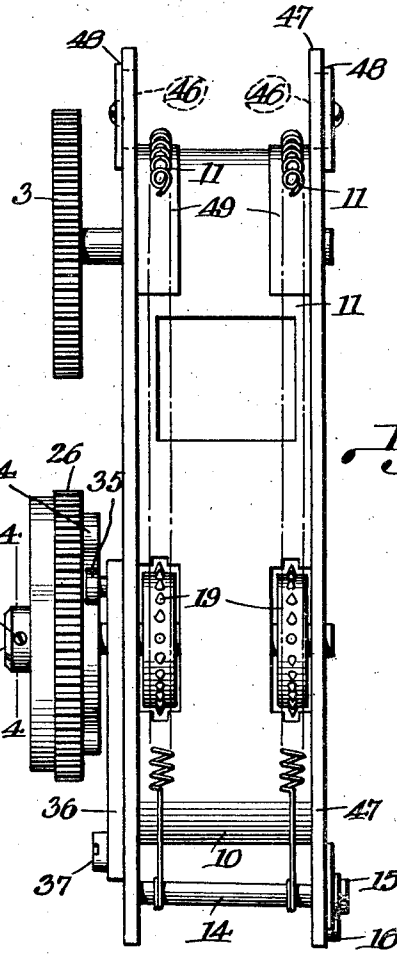


Fig. 2.

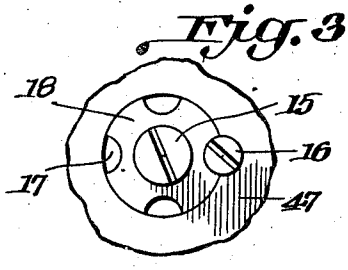


Fig. 3.

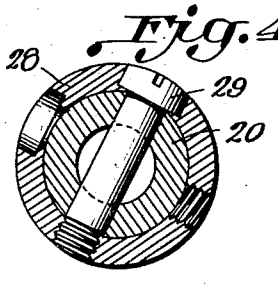


Fig. 4.

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2 SHEETS—SHEET 2.

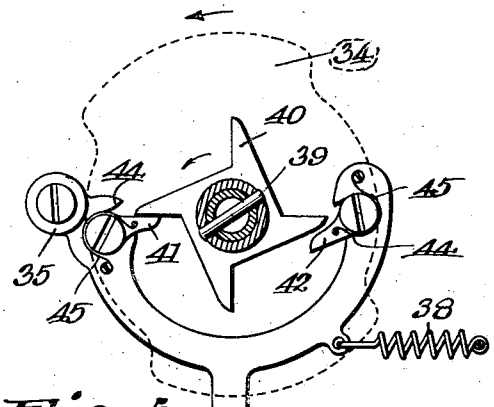


Fig. 5.

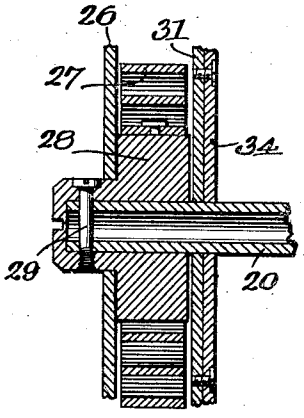


Fig. 7.

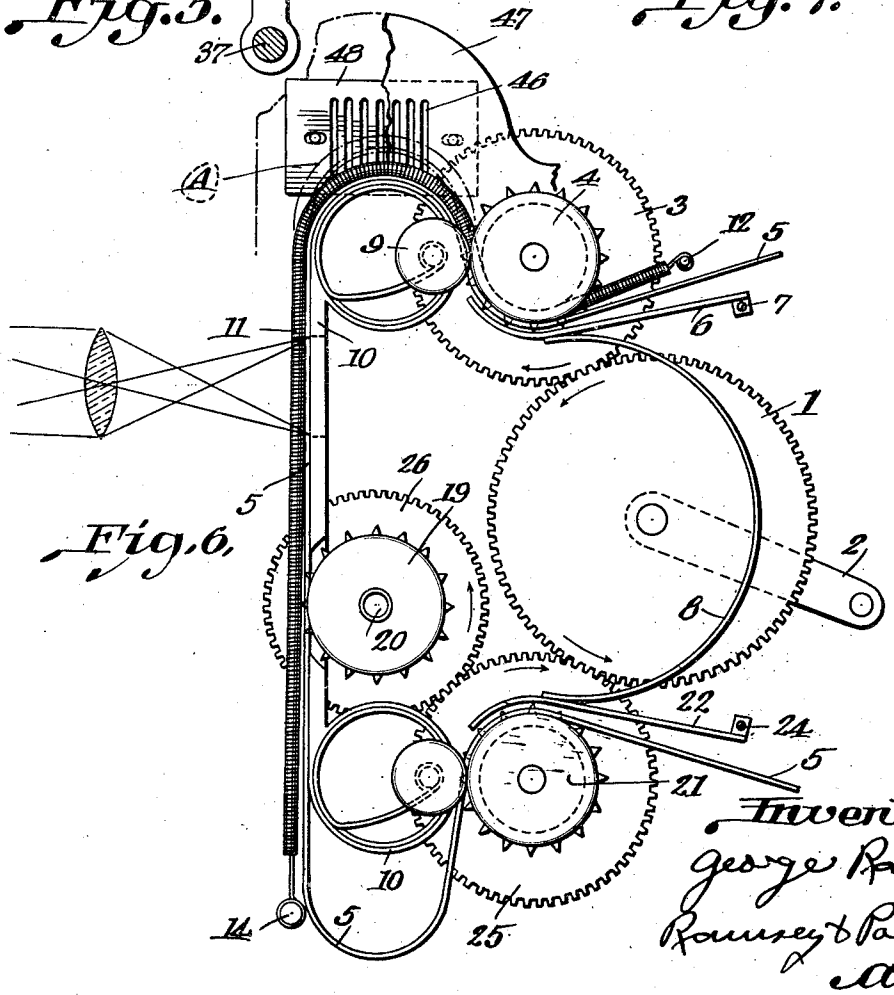


Fig. 6.

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UNITED STATES PATENT OFFICE.

GEORGE RAMSEY, OF WASHINGTON, DISTRICT OF COLUMBIA.

MOVING-PICTURE CAMERA.

1,388,892. Specification of Letters Patent. Patented Aug. 30, 1921.

Application filed July 7, 1917. Serial No. 179,189.

To all whom it may concern:

Be it known that I, GEORGE RAMSEY, a citizen of the United States, and a resident of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Moving-Picture Cameras, of which the following is a specification.

This invention relates broadly to moving picture apparatus, and more particularly to mechanism for intermittently moving the film in taking or projecting moving pictures.

The principal object of this invention is to provide a method and mechanism for producing a very high speed movement of the film in changing from one picture interval to another.

Another and primary object of the present invention comprises the method and mechanism of intermittently moving the film by combined pushing and pulling action of the portion of the film being moved.

A still further and equally important object of the present invention comprises the method of and apparatus for producing a very rapid movement of the film during the change of picture intervals and wherein the rapidity of movement is independent of the period of time between picture changes, and wherein the film is subject to both pushing and pulling forces.

Other and further objects of the present invention will in part be obvious and will in part be pointed out hereinafter in the specification following by reference to the accompanying drawings wherein like parts are designated by like characters throughout the several figures thereof.

Figure 1 is an extended perspective view, more or less diagrammatic illustrating portions of the operative structure.

Fig. 2 is a front view of a portion of the device.

Fig. 3 is a detail view of the tension spring adjusting mechanism.

Fig. 4 is a sectional view on lines 4—4 of Fig. 2.

Fig. 5 is a detail view of one form of escapement mechanism.

Fig. 6 is an elevational diagrammatic view illustrating the film feed and the air pressure take-up for the film.

Fig. 7 is a detail sectional view through part of the coiled pulling spring.

In the moving picture art wherein a series of pictures are taken upon a strip of film the period of time necessary for movement of the film, individual picture length intervals, is a dead loss so far as the effective taking or projecting of pictures is concerned. Obviously it is necessary to move the film individual picture intervals so therefore this period of time is an essential factor in operation. If it were possible to reduce this period of time to substantially zero, then all of the time periods could be utilized in exposing or projecting the pictures. The more nearly this ideal condition can be approached the more effective is the taking or projecting apparatus. An important factor in approaching this ideal condition is the matter of inertia of parts. The stopping and starting of the various masses requires considerable energy which can only be expended during the period of movement. Large masses cause vibration and vibration disturbs ideal conditions for either taking or projecting. It has been proposed in the art to move the film by storing energy in a loop in the film while the projected or exposed portion of the film is held stationary, then releasing the stationary portion of the film and permitting the energy stored in the film to snap the film forward. This produces a rapid movement of the film, and it has been proposed to increase this movement by applying springs over the loop formed. In such constructions it has been usual to provide pins to hold the stationary part in register. These pins are liable to be received in the same perforations each time the film is used and ordinarily these pins are withdrawn under the full force utilized to move the film. These conditions may tend to produce wear on the film.

The present invention comprises an improvement on the known prior art in that the energy stored in the film, as previously explained, is augmented by additional energy which tends to pull the film forward at the same instant the energy in the film and tension springs tends to push the film forward thereby both pushing and pulling simultaneously on a section of the film. Mechanism for holding the film stationary may comprise

devices movable with the film when the film is released. More specifically the invention may be embodied in an apparatus, one form of which may comprise loop forming devices to store energy in the film, and sprocket wheels adapted to be held stationary by a suitable escapement mechanism with restrained energy normally tending to rotate the sprocket wheels. When the escapement mechanism releases the sprocket wheels for rotative movement the restrained energy is effective to turn the sprocket wheels thereby to pull forward on the film and thus augment the energy stored in the film. The energy pushing the film may be still further increased by utilizing springs that are flexed when the loop is formed and apply pressure to the formed loop.

By the above described apparatus it will be seen that the method of moving the film may be carried out as specified to quickly produce picture interval changes. As the film moves at a high rate of speed, it is desirable that the stopping of the film take place without injury to the film, and to this end air may be trapped under the loop formed and the trapped air controlled in such manner that the film will be quickly, though gradually, checked and come to rest with a minimum shock.

Referring more particularly to the drawings, the drive wheel 1 (Fig. 6) is mounted upon a suitable stud and may be rotated by the crank handle 2 and meshes with the gear 3 which drives the drive film sprocket 4 that engages the perforations in the film 5 that is led from a suitable supply and is maintained against the upper sprocket 4 by means of the guide 6 which is pivoted to the frame as at 7 and is held in position by the U-shaped spring 8. The film passes between the sprocket 4 and a spring pressed idler roll 9 over the frame 10 and beneath a pair of tension coiled springs 11 which are anchored at one end to a post 12 and at the other end to an adjustment shaft 14. The tension of these springs may be regulated by turning the adjustment shaft 14 through the kerfed head 15, and locked in adjusted position by means of the set screw 16, the head of which is adapted to fit within recesses 17 in the disk 18. The film passes outwardly over a pair of light hollow feed sprocket wheels 19 that are rigidly mounted upon the light hollow shaft 20. The film continues beyond the frame 10 in the form of a lower loop and over the take-up sprocket 21, then beneath the lower guide 22 that is pivoted, as at 24, and is held against the sprocket 21 by means of the U-shaped spring 8. The film then continues to a suitable take-up winding mechanism. The drive wheel 1 meshes with the gear 25 that drives the take-up sprocket 21, and the gear 25 meshes with a gear spring drum 26. This gear spring drum carries a convolute coiled spring 27 that is mounted upon a hub 28 that is secured to the hollow shaft 20 by means of a through screw bolt 29. This hub 28 extends outwardly through the gear drum 26 and is provided with a kerf to permit the removal of the screw bolt 29 and the tightening or adjustment of the tension of the convolute spring 27 in its relation between the hollow shaft and the spring drum 26, it being understood that one end of the convolute spring 27 is secured to the drum 26 as by means of the screw 30. Preferably the end of the hub 28 is provided with an extra pair of openings to receive the screw bolt 29 thereby permitting ninety degree adjustments of the hub relative to the hollow shaft 20. The spring 21 may be housed within the spring drum by means of a cover plate 31 that is secured in position through the agencies of the screw 30 and a similar companion screw 32. This cover plate 31 may carry a control cam 34 upon which rolls a pilot roll 35. This pilot roll is carried by an escapement frame 36 which is pivoted to the main frame as by means of the stud screw 37. The tension spring 38 is anchored at one end to the main frame and at the other end to the escapement frame thereby maintaining the pilot roll at all times in contact with the cam 34. An escapement wheel 39 is fixedly mounted upon the hollow shaft 20 and is provided with arms 40 which are controlled by the dogs 41 and 42. These dogs are pivoted to the escapement frame and are normally held against stops 44 by springs 45 except when the dogs are in engagement with the operative faces of the arms 40. The diameter of the feed sprocket wheels 19 is such in relation to the angles between the arms 40 that when the escapement wheel 39 moves one step the film will move forward one picture interval. The relation of the faces on the cam 34 is such that when the drive sprocket wheel 4 has rotated to feed a picture interval of film to form a loop (as indicated in dotted lines in Fig. 6) the spring drum 26 has been rotated sufficiently to cause the control cam 34 carried thereby to oscillate the escapement frame 36 thereby permitting the energy stored in the convolute spring 27 to rotate the shaft 20 the angular distance between the faces on the arms 40 of the escapement wheel 39. It is to be noted that the drive wheels 1, 3, 25 and 26, have a continuous rotative movement during the operation of the device thereby storing energy in the loop in the film, in the tension coil springs 11, and in the convolute spring 27. The intermittent movement is produced through the feed sprocket wheels 19 under control of the escapement mechanism.

The proportions of the various cog wheels and the film sprockets may be varied to suit

conditions, but it is preferred that the diameter of all film sprockets be the same, and that the cog wheels, 3, 25, and 26 be of a common diameter.

Referring now more particularly to Fig. 6 it is noted a plurality of slots 46 are provided in the side frame 47 and are controlled by slotted gates 48 so that the slots 46 may be opened or closed at the will of the operator. When the slots 46 are open the air trapped between the frame 10 and the loop A may escape outwardly through the slots and by adjustment of the gates 48 the air may be trapped under the film and form a cushion for checking the inertia of the film. It is desirable that the air beneath the loop escape to a certain extent and the perforations in the film, as well as the slots 46, may be utilized for this purpose. Where it is desired to more efficiently trap the air under the loop there may be provided a pair of flexible guides or covers comprising flat strips 49 anchored to the post 12 and extending under the springs 11, thereby covering and closing the perforations in the looped portion of the film, as illustrated in Fig. 2. These strips may be of polished steel or other suitable material, and they perform the further useful function of comprising shoes upon which the coiled springs 11 ride, thereby reducing the friction between the springs and the film and thus reducing the wear both on the springs and on the film.

Realizing that the method herein described and the apparatus herein illustrated are susceptible of change and variation without departing from the scope of the present invention, I desire that the disclosure herewith be considered as illustrative and not in the limiting sense.

Having thus described my invention what I claim is:

1. In a moving picture instrument, an intermittent feed comprising in combination, means to hold a portion of film stationary, devices for feeding another portion of film to form a loop to store up energy capable of pushing forward the stationary portion of the film, mechanism for storing up energy capable of pulling forward the stationary portion of the film, and means for releasing the stationary portion of the film and permitting the stored up energy to move the portion of the film that was held stationary.

2. In a moving picture instrument, devices for producing an intermittent film feed and comprising in combination, means to hold a portion of the film stationary, means for continuously feeding an adjacent portion of film and storing energy capable when released of quickly pushing forward the stationary part of the film, mechanism for storing energy capable when released of quickly pulling forward the stationary portion of the film, and means for releasing the energy stored to permit both pulling and pushing forces to act simultaneously to move the portion of the film that was held stationary.

3. In a moving picture instrument, in combination, means to store latent energy in the film and capable of pushing the film forward, devices to store latent energy capable of pulling the film forward, and means enabling the stored latent energy to become potential energy for intermittently moving the film individual picture lengths.

4. In the moving picture art, mechanism for intermittently moving a portion of film, means for storing latent energy capable of pushing forward a portion of the film, means for storing latent energy capable of pulling forward the same portion of film, and mechanism for intermittently causing the latent energy to become active potential energy capable of moving said portion of the film predetermined picture length intervals.

5. In a moving picture instrument, in combination, a lens, holding means for maintaining a portion of film stationary, devices for feeding a predetermined picture length of film while the first mentioned portion is stationary, devices to cause the fed portion to push the first mentioned portion forward a predetermined picture length when the holding means is released, and mechanism capable of operating the holding means to simultaneously pull the first mentioned portion forward when the holding means is released.

6. In a moving picture instrument, a lens, holding devices to maintain an effective portion of the film stationary, feeding means to feed another portion of the film a predetermined picture length and to store latent energy in the film while the effective portion is stationary, mechanism for storing latent energy capable of pulling the effective portion of the film forward, and means to release the effective portion when a picture length has been fed forward by the feeding means and to permit the stored latent energy to become potential energy for moving the effective portion by simultaneous application of pushing and pulling forces.

7. In a moving picture instrument, a lens, holding means to intermittently hold a portion of the film stationary, in combination with devices to form a loop in another portion of the film and to store latent energy in said loop, means to store energy capable of causing the holding means to assist in the movement of said portion of the film, and devices to release said holding means when a predetermined amount of film has been formed into said loop and to permit the stored energy to quickly move predetermined portions of the film adjacent the focus of the lens by simultaneously applying pushing and pulling forces thereto.

8. In a moving picture instrument, in combination, a suitable lens, holding means to maintain a portion of film intermittently held stationary, devices for storing energy in another portion of the film, means for simultaneously storing energy in mechanism for causing the holding means to be capable of moving the stationary portion of film, and mechanisms to intermittently release said holding means to permit the stored energy to be applied as pushing and pulling forces acting simultaneously on the portion of the film adjacent the focus of the lens to move this portion of film a predetermined distance.

9. In a moving picture instrument, mechanism for moving the effective portion of the film suitable picture lengths, said mechanism comprising means to hold the effective portion of the film stationary, devices for storing energy in another portion of the film, means for storing energy capable of operating the holding means to cause the holding means to move the effective portion of the film, and devices for releasing the holding means and rendering the stored energy effective to operate as pushing and pulling forces for quickly moving the effective portion of the film predetermined picture length intervals.

10. In a moving picture apparatus, means to apply forces tending to push forward a predetermined portion of film, means to restrain the movement of the film during a predetermined interval, and devices to apply pulling forces simultaneously with the pushing forces to pull forward the same said portion of film.

11. In a moving picture machine, means to apply compressive forces to a predetermined portion of the film, means to restrain the movement of said film during a predetermined interval, and means to apply tension to the same portion of the film when the compressive forces are active in moving the film.

12. In a moving picture machine, means to form a loop in the film and apply compressive forces to a predetermined portion of a film, devices to hold the film stationary during the forming of the loop, the holding portion of said devices having a movement in the direction of travel of said film when the compressive forces are released and active to move the portion of the film held stationary.

13. In a moving picture apparatus, an exposure opening, means to form a loop on one side of said exposure opening and to store energy in the film capable when active of pushing forward the portion of film adjacent the exposure opening, and means operative upon the film on the other side of the exposure opening to pull forward the film when the energy stored in the film is effective and active in producing linear movement of the portion of the film adjacent the exposure opening.

14. In a moving picture apparatus, an exposure opening, means on one side of said opening to push the film past said opening, means on the other side of said opening to simultaneously tension and pull upon the portion of film being pushed, and devices to restrain the operation of both of said means during a predetermined interval.

15. In a moving picture machine, an exposure opening, means to produce an intermittent movement of the film adjacent the exposure opening and to produce a rapid acceleration of the film during such movement, in combination with devices independent of the said means to gradually stop the movement of the film at the end of each movement interval to prevent injury to the film.

16. In a moving picture machine, an exposure opening, means to produce an intermittent movement of film past said exposure opening and to produce a rapid acceleration of the film during such movement, in combination with devices to form an air cushion for stopping the film at the end of each movement interval.

17. In a moving picture machine, an exposure opening, means to produce an intermittent movement of the film past said exposure opening and to produce a rapid acceleration of the film during such movement, in combination with devices to form an air cushion for checking the movement of the film at the end of each movement interval, and means to adjust the effectiveness of said air cushion.

18. The method of intermittently feeding a moving picture film, which consists in holding a portion of the film stationary; forming a loop adjacent the stationary portion; storing up energy capable of pushing the stationary portion forward; storing up energy capable of pulling the stationary portion forward; then releasing the stationary portion and causing the stored energy to act simultaneously as pushing and pulling forces to move the stationary portion forward a predetermined distance.

19. The method of intermittently feeding a portion of film, which consists in periodically holding a portion of film stationary; then forcibly feeding an adjacent portion of film in the direction of its length a distance sufficient to accumulate a surplusage of film equal to the distance the film is to be fed forward; storing energy during the accumulation of the surplus length of film, which energy is capable of pushing the film forward; simultaneously storing energy capable of pulling the film forward; and then releasing the portion held and permitting

the stored energy to act as pushing and pulling forces to feed said held portion forward and take up the surplusage accumulated.

20. The method of intermittently feeding picture strip film which consists in storing up energy in the film by deformation of the film; simultaneously storing up energy capable of pulling forward the film; and then utilizing said energy as pushing and pulling forces to advance the film a unit distance.

21. The method of intermittently feeding picture strip film which consists in storing up energy in the film by bending of the film; simultaneously storing up energy capable of pulling forward the film; and then permitting the stored energy to act on the film simultaneously at two places to advance the film a unit distance.

22. The method of intermittently feeding picture strip film, which consists in applying intermittently a compressive force to the film in the direction of its length and simultaneously applying pulling force to the same portion of the film in the direction of its length whereby the film advances under pushing and pulling forces individual picture length intervals.

23. In a moving picture instrument, a lens, holding means for maintaining a portion of film stationary adjacent the focus of the lens, devices for feeding a predetermined picture length of film while the first mentioned portion is stationary, means to cause the fed portion to push the first mentioned portion forward a predetermined picture length when said holding means is released, said holding means comprising devices having movement with the film when the fed portion is pushed forward.

24. In a moving picture instrument, in combination, means to store latent energy in the film and devices to enable the latent energy to become potential energy for intermittently moving the film individual picture lengths, said devices comprising film holding means having a movement in direction of travel of the film during a portion of the individual picture length movement.

25. In a moving picture instrument in combination, a feed sprocket wheel to feed forward a portion of film to form a loop and store energy in said loop capable of moving a portion of the film forward an individual picture length interval, means for intermittently holding a portion of the film stationary, said means comprising holding devices simultaneously and coincidently movable in the direction of movement of the film when the film moves.

26. In a moving picture instrument, devices for intermittently feeding a portion of film forward individual picture length intervals, in combination with shock absorbing mechanism adapted to check the movement of the film at the end of each picture length movement.

27. In a moving picture instrument, devices for storing energy capable of moving portions of film forward individual picture length intervals, in combination with devices for checking the movement of the intermittently fed film whereby the momentum of the moving portion is gradually absorbed.

28. In a moving picture instrument, devices for intermittently moving a portion of film at high velocity, in combination with shock absorbing devices for preventing injury to the film at the end of each moving interval.

29. In a moving picture instrument, devices for intermittently feeding a portion of film forward individual picture length intervals, in combination with shock absorbing mechanism adapted to check the movement of the film at the end of each picture length movement, and means for controlling the effective operation of said shock absorbing mechanism.

30. In a moving picture instrument, devices for storing energy capable of moving portions of film forward individual picture length intervals, in combination with devices for checking the movement of the intermittently fed film whereby the momentum of the moving portion is gradually absorbed, and mechanism for controlling the effective operation of said devices.

31. In a moving picture instrument, mechanism to form a loop, means to store latent energy in said loop, said means comprising coiled tension springs and members between said springs and said film whereby the tension of said springs is effectively transmitted to said film in such manner as to obviate the movement of the film from wearing said springs, in combination with devices to enable the latent energy to become potential energy for intermittently moving the film individual picture lengths.

32. In a moving picture instrument, in combination, devices to form a loop in a portion of film, tension members placed under stress during the formation of said loop, wear strips extending over said loop and in operative connection with said tension members whereby the forces of said tension members are transmitted to said loop through said wear strips.

33. In a moving picture instrument, the combination of devices to form a loop in a film and to store energy capable of moving a portion of film forward individual picture length intervals, said devices comprising coiled springs and shoes beneath said springs and over said loop whereby direct contact between said springs and said film is obviated.

34. In a moving picture instrument, means to store latent energy capable of pushing a portion of the film forward, said means comprising a suitable tension member, and adjustment devices to regulate the normal tension on said tension member, devices to store latent energy capable of pulling the said portion of the film forward, said devices comprising a suitable spring, means for adjusting the normal tension of said spring, in combination with means for enabling the stored energy to become potential energy for intermittently moving the said portion of film individual picture length intervals.

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