Sept. 10, 1940. P. F. SPERRY 2,214,185

SPEED CONTROL MEANS FOR CAMERAS AND THE LIKE

Filed Oct. 29, 1938

Fig. 1.

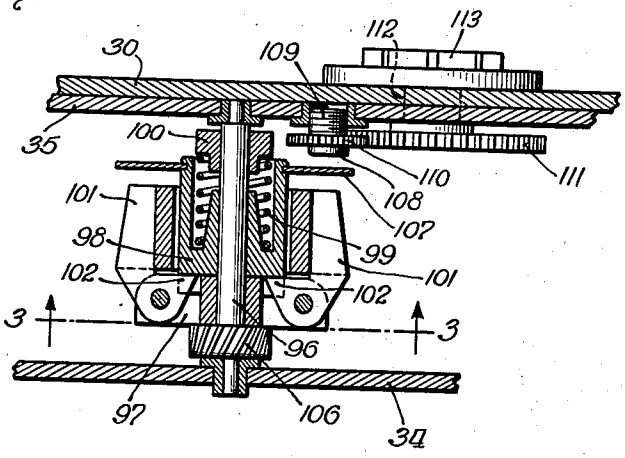


Fig. 2.

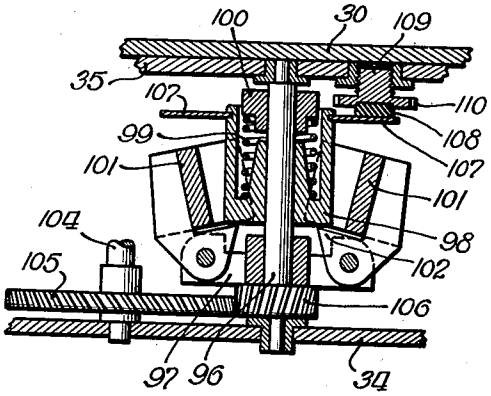


Fig. 4.

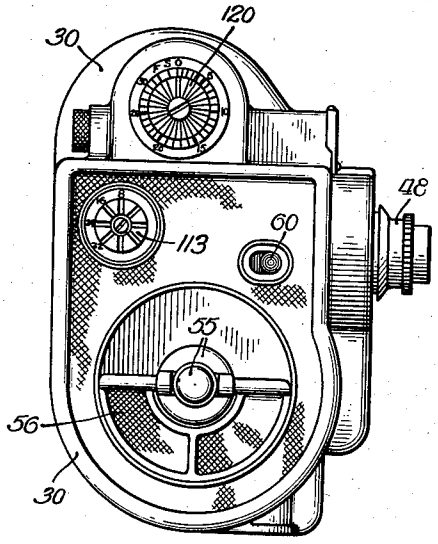
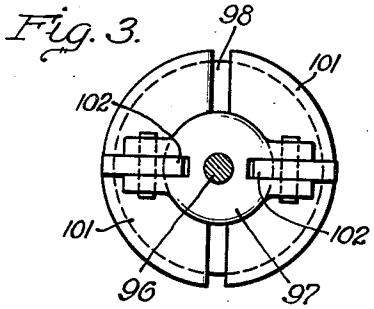


Fig. 3.



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SPEED CONTROL MEANS FOR CAMERAS AND THE LIKE

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Application October 29, 1938, Serial No. 237,667

6 Claims. (Cl. 188—187)

My invention relates to moving picture cameras or other devices in which films are used, and it has for its principal object the provision of an improved driving and controlling means for such films.

It is one of the objects of my invention to provide an improved form and arrangement of parts by which a spring motor or other variable speed driving means is utilized for driving the film and actuating the shutter, arranged for controlling the rate of driving for giving the film 8, 16, 24, 32 or 40 step by step movements per second to correspond to accepted practice,—or for giving the film any other desired number of movements per second. For attaining this result, I have provided a governor in connection with the driving means and have associated with the governor a loading or braking device for keeping the speed of the driving down to the desired point. For working out the desired control of the speed of driving by such loading or braking means, I have provided a bearing ring in transverse position on the governor so as to rotate with the governor, together with a second bearing member mounted in position to have frictional engagement with the face of the ring, such second bearing member being adjustable longitudinally of the axis of the governor by means of a screw-threaded part adapted to be rotated by gearing connected with an operating and indicating member mounted on the outer face of the camera. In the preferred form of construction, the control mechanism comprises a bearing member formed of Bakelite mounted directly on the end of a quick-acting screw which is rotated by means of a shaft connected with the screw by means of intermeshing gears and having on its outer end a calibrated head by which the parts can be very quickly and easily set in the desired adjusted position.

For avoiding an objectionable shock upon the parts at the start of the drive of the film when the governor forces the bearing ring into engagement with the cooperating adjustable bearing member, I have made the bearing ring in the form of a spring plate which is adapted to yield to a substantial extent upon the initial contact and which almost immediately straightens out into its normal operative form for continued operation. By the use of the yielding member at this point for taking up the shock of the contact, I have prevented damage to the parts and have made certain that there shall be at each actuation of the driving parts substantially complete accommodation to the speed at which the driving is to take place.

It is another object of my invention to improve mechanisms of this type in sundry details hereinafter pointed out. The preferred means by which I have accomplished my several objects are illustrated in the accompanying drawing, in which—

Fig. 1 is a horizontal sectional view through the governor and associated parts by which the speed of driving is controlled;

Fig. 2 is a view of substantially the same parts as are shown in Fig. 1 but with the parts in changed position;

Fig. 3 is a vertical sectional view taken substantially at the line 3—3 of Fig. 1; and

Fig. 4 is a side face view of a camera provided with the improved structure.

In a moving picture camera, it is usual to provide means for varying the speed of driving of the spring motor by which the mechanism is actuated so as to vary the number of step by step movements of the film past the exposure point. In the motion picture industry, it is customary with different projectors to drive the film at different speeds, some projectors being driven at the rate for giving the film 8 movements per second, some for giving the film 16 movements per second, and still others for driving the film at the rate of 24 movements per second. Since it is desirable normally that the film in the camera be given the same number of step by step movements per second in the exposure as that at which the film is to be moved in the projector, my camera is arranged for opening the shutter and advancing the film any desired number of times per second from 8 per second up to 32 or 40 per second or even more.

In the arrangement shown in the drawing, 30 indicates the casing of a camera in which an intermediate frame plate 34 is provided, a cooperating frame plate 35 being positioned on the inner face of the wall of the casing, as is shown in Figs. 1 and 2. In Fig. 4 of the drawing, I have shown a winding cap 55 and key 56, a lens system 48, a handle 60 on the means for starting and stopping the operation of the camera mechanism, and a footage indicator 120,—all of any approved form and arrangement, forming no part of the present invention.

In my camera, I have provided an improved form of governor and cooperating means for controlling the speed of driving. This improved governor comprises a shaft 96 having a crosshead 97 fixedly mounted thereon (see Figs. 1 and 2) and a body member 98 slidably mounted on the shaft, a spring 99 being interposed between the body member 98 and a collar 100 on the shaft for

opposing movement of the body portion 98 longitudinally of the shaft, the collar 100 being adjustable upon the shaft for controlling the effective strength of the spring 99. Weight means 101 are pivotally mounted upon the crosshead 97 having lugs 102 extending therefrom into position to engage the body portion 98 so that when the weight means are moved outwardly by centrifugal force away from the body portion as shown in Fig. 1 into the position as shown in Fig. 2, the body portion is moved longitudinally of the shaft against the action of the spring 99.

The connection between the governor and the usual spring motor comprises a shaft 104 provided with a gear 105 thereon meshing with a pinion 106 carried by the shaft 96 of the governor. As will be readily understood, such arrangement of gearing causes the shaft 96 and the governor mechanism associated therewith to rotate in timed relation to the movement of the spring motor and the other parts driven thereby.

Upon the body 98 of the governor, I have mounted a bearing member 107 in the form of a resilient ring extending outwardly from the body portion about the axis of the governor. In the path of movement of the resilient bearing ring 107 of the governor longitudinally of the governor shaft 96, I have provided a second bearing member adjustably mounted in position so as to engage said first-named bearing member when the speed of rotation of the shaft 96 and the governor reaches the required value. In the arrangement shown, this adjustable bearing member is in the form of a block 108 of Bakelite carried by the end of a quick-acting screw 109 adjustably mounted in the plate 35 (see Figs. 1 and 2) so that by rotating the screw it can be moved longitudinally for changing the position of the bearing block 108. For effecting the desired rotation of the shaft 109, I have provided speed-up gearing comprising a pinion 110 upon the shaft, in the arrangement shown the shaft 109 and the pinion 110 being formed integrally with each other. For driving the pinion 110, I have provided a gear 111 meshing with the pinion, such gear 111 being rotatably mounted in position by means of a short shaft 112 extending through an opening in the wall of the casing 30, such shaft 112 having a head 113 in the form of a disk mounted upon its outer end. The arrangement is such that the block 108 can be moved through the normal range of its adjustment by a single revolution of the head 113, with the result that such head may be used as a dial for showing the degree of adjustment of the parts. As is clearly shown in Fig. 4, the disk 113 is calibrated in units corresponding to the number of step by step movements of the film per second of operation. In the arrangement shown, the shaft 112 and the parts associated therewith are arranged to have such frictional engagement with the adjacent parts as to be adapted to hold the shaft 109 in any adjusted position without danger of the parts being moved by vibration or by a blow thereon out of adjusted position.

With the bearing member 108 in any desired adjusted position, when the shaft 98 is rotated by power from the spring motor so as to cause the bearing plate 107 to move longitudinally of the shaft 96, the plate 107 is brought into engagement with the cooperating bearing member 108 at a critical speed of rotation of the shaft depending upon the position of adjustment of said bearing member 108. By changing the position of the bearing member 108 through the use of the adjusting head 113 in accordance with the graduations thereon, the speed at which such engagement of the bearing members takes place is changed. After the resilient bearing plate 107 has been brought into engagement with the bearing member 108, a frictional braking effect is applied to the motor by such engagement serving to prevent the motor from exceeding such critical rate of rotation.

In the arrangement shown, the bearing plate 107 is made of spring metal of such strength and thickness as to serve efficiently for applying the desired braking effect upon the motor. The plate is thin enough however as to permit it to bend backwardly to a substantial extent at the start of the rotation of the spring motor. As will be readily appreciated, when the spring motor is released for operation of the camera, the motor is permitted to move initially without any braking effect thereon before the governor has brought the brake into effective operation. As a result of this arrangement, the shaft 96 is ordinarily rotating at high speed when the contact takes place between the bearing plate 107 and the bearing 108. My arrangement comprising the comparatively very flexible bearing part 107 is such that the bearing plate yields backwardly upon the impact of the parts and almost instantaneously resumes its normal transverse position as shown in Fig. 2, with the result that the operation of the parts is comparatively very smooth and that the motor responds almost immediately to the desired speed regulation.

While I prefer to employ the form and arrangement of parts as shown in my drawing and as above described, it is to be understood that my invention is not limited thereto except so far as the claims may be so limited, it being understood that changes might well be made in the arrangement without departing from the spirit and scope of my invention.

I claim:

1. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted thereon, governor means arranged to rotate with said shaft, variable speed driving means for rotating said shaft and governor, a bearing member adapted to be moved by said governor, a screw-threaded part adjustable longitudinally independently of said governor, a second bearing member movably mounted so as to be adjusted by said screw-threaded part into position for differential engagement with said first-named bearing member for braking the action of said driving means and thus limiting its speed of rotation, and speed-up gears connected with said screw-threaded part for rotating it for adjusting the operative position of said second bearing member so as to move said screw-threaded part through the normal range of its adjustment by not more than a single revolution of the slower moving gear for controlling the speed of rotation of said shaft at which said bearing members effectively interengage for applying a braking effect upon said driving means.

2. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted thereon, governor means arranged to rotate with said shaft, variable speed driving means for rotating said shaft and governor, a bearing member adapted to be moved by said governor, a screw-threaded part adjustable longitudinally independently of said governor, a second bearing member movably mounted so as to be adjusted

by said screw-threaded part into position for differential engagement with said first-named bearing member for braking the action of said driving means and thus limiting its speed of rotation, speed-up gears connected with said screw-threaded part for rotating it for adjusting the operative position of said second bearing member so as to move said screw-threaded part through the normal range of its adjustment by not more than a single revolution of the slower moving gear for controlling the speed of rotation of said shaft at which said bearing members effectively interengage for applying a braking effect upon said driving means, and graduated means connected with said gearing for indicating the adjustment being effected.

3. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted thereon, governor means arranged to rotate with said shaft, variable speed driving means for rotating said shaft and governor, a bearing member adapted to be moved by said governor, a screw-threaded part adjustable longitudinally independently of said governor, a second bearing member in the form of a block having a friction bearing face carried by said screw-threaded part at its end arranged for engagement with said first-named bearing member for braking the action of said driving means and thus limiting its speed of rotation, speed-up gears connected with said screw-threaded part for rotating it for adjusting the operative position of said second bearing member so as to move said screw-threaded part through the normal range of its adjustment by not more than a single revolution of the slower moving gear for controlling the speed of rotation of said shaft at which said bearing members effectively interengage for applying a braking effect upon said driving means and arranged so as normally to be held by friction in adjusted position, and graduated means connected with said gearing for indicating the adjustment being effected.

4. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted on said frame, governor means arranged to rotate with said shaft, variable speed driving means for rotating said shaft and governor, a bearing member in the form of a thin resilient metal plate connected with the governor so as to be moved axially by the governor upon rotary movement of the shaft, and a second bearing member adjustably mounted in the path of movement of said first-named bearing member and standing normally out of engagement with the plate adapted by engagement with said plate to have a braking effect on the rotary movement of the governor for limiting its speed of rotation, said plate being adapted to yield backwardly upon initial impact with said second bearing member and adapted quickly after such impact by its own resiliency to straighten up to a large extent for establishing prompt normal speed regulation.

5. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted on said frame, variable speed driving means for rotating said shaft, a head mounted on said shaft so as to rotate therewith, a body member slidably mounted on said shaft so as to rotate therewith adjacent to said head, spring means bearing on said shaft and on said body member normally pressing said body member toward said head, weighted means movably mounted on said head and bearing on said body member adapted by centrifugal force to press said body member along said shaft against the action of said spring means upon the rotation of the shaft, a thin resilient metal plate carried by said body member in transverse position thereon, and a bearing member adjustably mounted in the path of movement of said resilient plate and standing normally out of engagement with said plate adapted by engagement with said plate to have a braking effect on the rotary movement of the plate and shaft for limiting its speed of rotation, said plate being adapted to yield backwardly upon initial impact with said adjustable bearing member and adapted quickly after such impact by its own resiliency to straighten up to a large extent for establishing prompt normal speed regulation.

6. In a mechanism of the type described, the combination of a frame, a shaft rotatably mounted on said frame, variable speed driving means for rotating said shaft, a head mounted on said shaft so as to rotate therewith, a body member in the form of a hollow cylinder slidably mounted on said shaft so as to rotate therewith adjacent to said head, a coiled spring in said hollow body member bearing at one end on said body member, a collar fixedly mounted on said shaft in engagement with the opposite end portion of said spring, weighted arms pivotally mounted on transversely positioned axes on said head having lugs bearing on said body member adapted by centrifugal force to press said body member along said shaft against the action of said spring upon rotation of the shaft, a thin resilient metal plate carried by said body member in transverse position thereon, and a bearing member adjustably mounted in the path of movement of said resilient plate and standing normally out of engagement with said plate adapted by engagement with said plate to have a braking effect on the rotary movement of the plate and shaft for limiting its speed of rotation, said plate being adapted to yield backwardly upon initial impact with said adjustable bearing member and adapted quickly after such impact by its own resiliency to straighten up to a large extent for establishing prompt normal speed regulation.

PHILMORE F. SPERRY.