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CENTRIFUGAL GOVERNOR FOR MOTION-PICTURE APPARATUS

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This invention relates to an improvement in centrifugal governors, especially for motion-picture apparatus.

Changes of speed in motion-picture cameras are generally obtained by means of a centrifugal governor. The main difficulty resides in obtaining the widest possible range of speeds with a governor requiring a minimum of space and possessing sufficient sensitivity to provide good pictures at all speeds. For a range of speeds from eight to sixty-four images per second, for instance, satisfactory sensitivity of the governor can be achieved by the use of two balancing springs, i. e., a weak spring functioning at low speeds, and a strong spring operating only at the higher speeds, from thirty images per second upward.

In previous devices operating according to this principle, the two springs opposing the action of the centrifugal force at high and at low speeds are coil springs whose manufacturing tolerance cannot be closely controlled. This makes it necessary either to provide for an adjustment on the governor with a resultant considerable increase in the cost of production and greater space requirements, or a series of manually selected adjustments for each speed which no longer permits any progressive change of speed necessary for certain exposure effects. Moreover, the governor weights are fastened to the shaft by linked levers, and when these levers have a slight play, the weights are no longer held rigidly, giving rise to vibrations and defective functioning.

The present invention relates to a centrifugal governor, particularly for motion picture apparatus, comprising weights and a braking disk axially movable on a shaft, characterized by the fact that the weights are connected, on one hand, to the shaft by spring leaves and, on the other hand, to the braking disk by links, a coil spring being provided on the shaft, and the whole arrangement being such that, for regulating the low speeds, only the spring leaves oppose the centrifugal force acting on the weights, whereas for the regulation of high speeds the action of the spring leaves is supplemented by the action of the coil spring.

The accompanying drawing shows, by way of example, one embodiment of the object of the invention.

Figure 1 is a side elevation of the governor.

Figure 2 is a side elevation of Figure 1 with the shaft removed.

Figure 3 is a section along the line III—III of Figure 1. Similar reference characters designate corresponding figures throughout the several figures of the drawing.

A shaft 1, supporting a toothed driving pinion 2, is provided with two journal end portions 3 and 4. Two opposite grooves 5 and 6 (Fig. 3) are arranged parallel to the shaft on part 7 of larger diameter. Between grooves 5 and 6, the shaft is traversed by a threaded bore 8, provided for screws 11 and 12, in order to secure two spring leaves 9 and 10 onto the part 7 of the shaft 1. The two spring leaves 9 and 10 are fitted in the grooves 5 and 6, and, at their ends, are clamped onto the shaft by the screws 11 and 12 and washers 13 and 14. Two weights 15 and 16 are rigidly secured to the other end of spring leaves 9 and 10. Each of the weights has two spaced parallel slots or grooves 17 and 18 into which are introduced the ends of four links 19, 20, 21, 22, rockably connected to the weights by pins 23. Each of these pins traverses a third slot or groove 24 located between grooves 17 and 18. These grooves 24 make it possible to grip pins 23 and to impart to them a permanent deformation so as to prevent the possibility of axial displacement by pins 23. The links are engaged in pairs

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at their upper ends in grooves 25 and 26 provided on the hub of braking disk 27 and are rockably connected to co-axially disposed pins 28 and 29. Braking disk 27 can slide freely on shaft 1 and brush against brake shoe 33.

The position of this brake shoe can be adjusted by hand by means of a rod 34. A coil spring 30 is provided on shaft 1, between a boss 31 of the shaft and a washer 32 is provided on shaft 1 between disk 27 and coil spring 30. This spring is shorter than the available space.

In operation, shaft 1 is caused to rotate by pinion 2 and drives disk 27 by means of spring leaves 9 and 10, weights 15 and 16, and links 19, 20, 21, 22.

The centrifugal force separates the weights from the shaft against the action of spring leaves 9 and 10, with the result that disk 27 comes in contact with brake shoe 33 in a position varying in accordance with the speed of rotation. The constants of the springs are fixed in such a way that only the two spring leaves 9 and 10 exert a balancing force against the centrifugal force for the low speeds ranging up to about thirty images per second. For the higher speeds, the braking disk rests, through washer 32, on the coil spring 30 so that the balancing force of coil spring 30 acting on disk 27 is added to the balancing force of the two leaves 9 and 10.

The hereindescribed governor is characterized by great sensitivity derived from the two spring leaves for low speeds and from the added effect of the coil spring from a certain speed upward. Moreover, the production of this governor can be effected with great precision so that no adjustment of the governor is necessary and its parts are interchangeable without difficulty. The rigidity with which the weights are secured to the spring leaves, which in turn are rigidly fastened in a groove, eliminates any danger of vibration, thus insuring perfect operation.

I claim:

1. In a centrifugal governor for motion-picture apparatus and the like, the combination comprising a rotatable shaft, leaf springs secured with their lower ends to the lower portion of the shaft, weights each connected to the upper end of one of said leaf springs and having three aligned grooves, a brake disc movable axially of the shaft, a pair of links for each weight pivoted with their upper ends to the brake disc, the lower ends of each pair of links being disposed in the two outer grooves of their weight, and a pin for each weight passing there-through and through the grooves and the ends of the links in the outer grooves and having its portion within the third intermediate groove deformed to defy extraction.

2. In a centrifugal governor for motion-picture apparatus and the like, the combination comprising a rotatable shaft, leaf springs secured at their lower ends to the lower portion of the shaft, weights affixed to the upper ends of said leaf springs, a brake disc movable axially of the shaft and having two grooves parallel to the axis of the shaft and located on opposite sides of said shaft, a pair of links located in each groove having their upper ends pivotally connected to a common pin in said groove, each link of said pair of links having its lower end pivotally connected to a respective weight, a coil spring around the shaft for bearing against a shoulder thereof and of a length shorter than the distance between the shoulder and the position of the brake disc occupied at predetermined lower speeds of the shaft whereby the brake disc compresses the coil spring only at predetermined higher shaft speeds.

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