

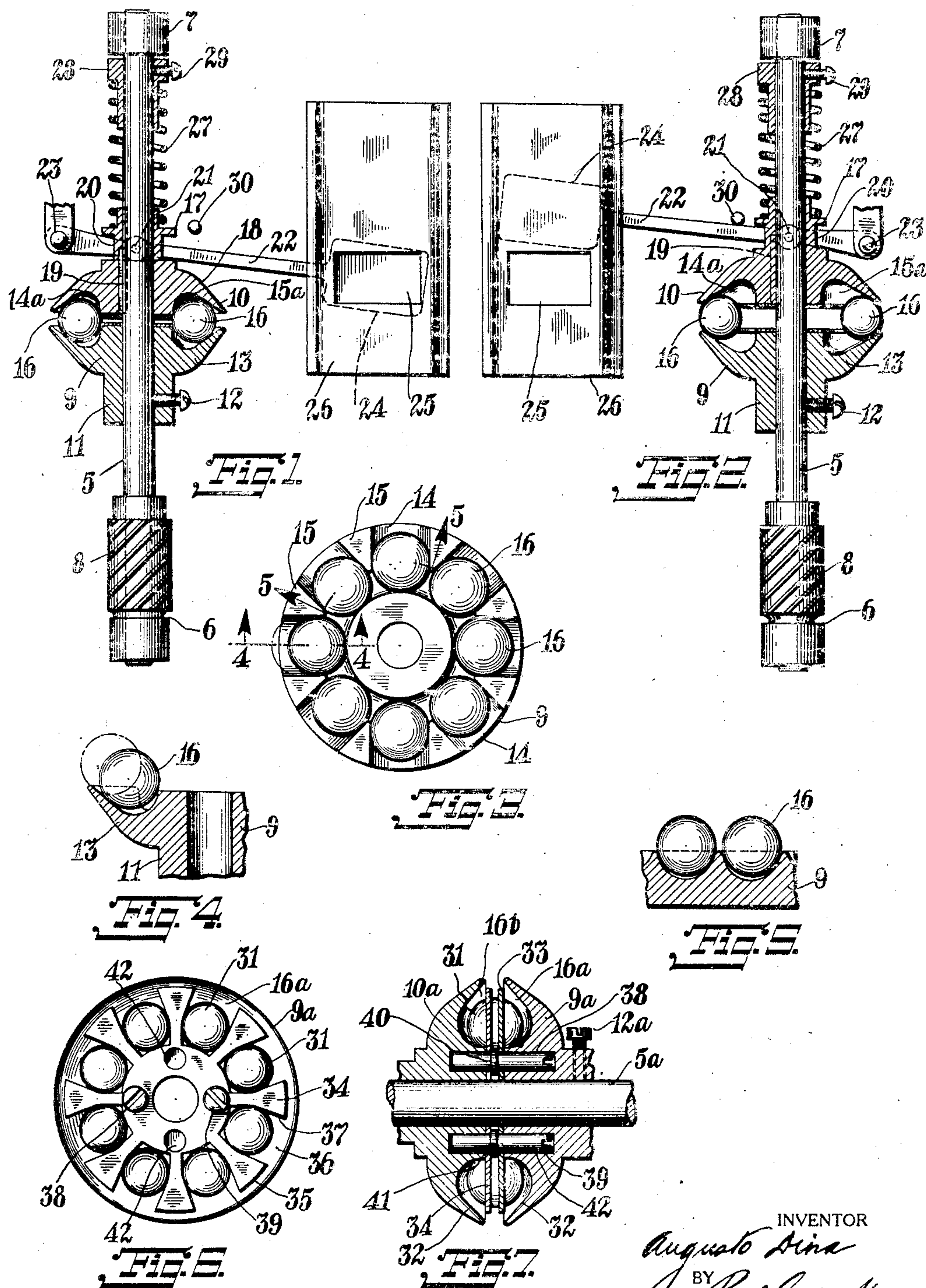
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GOVERNOR

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## UNITED STATES PATENT OFFICE

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GOVERNOR

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This invention relates broadly to motion imparting devices, and more particularly to speed controlled devices, and takes its principal form in a governor for imparting motion to an instrumentality here represented as the fire shutter of a motion picture projector.

The adaption of the invention here illustrated is merely exemplary as the device may be employed for imparting motion to various elements, and the device therefore finds a wide field of utility.

The principal objects and advantages of this invention reside in the provision of an improved motion imparting device; the provision of an improved motion imparting device particularly adapted for embodiment in a governor; the provision, therefore, of an improved form of governor; the provision of an improved speed controlled device, such as a governor, which is particularly characterized by the absence of numerous external pivoted parts as commonly employed in governors known to me; the provision of a device of the character described, wherein the motion imparted to the movable member is created by a rectilinear pressure, the provision of a governor in which the movable element is operated by an evenly distributed pressure, to prevent binding of the elements and to reduce friction and thus render the device more highly sensitive to slight variations in speed and enhance its capabilities of accurate adjustment; the provision of a governor including relatively displaceable elements and means for separating said elements for imparting motion wherein means is provided for imposing a uniform pressure upon the relatively movable members during such separation; the provision of a device of the character described in which the number of moving parts is considerably reduced; the provision of a governor in which at least two separate adjustments may be readily made; the provision of a device of the character described characterized by the absence of objectionable pivot joints, thus eliminating vibration and lost motion to a large degree; and the provision of a device of the character described, which is simple, compact and highly efficient in operation.

The foregoing and such other objects and advantages as may appear or be pointed out as this description proceeds are attained in the embodiment illustrated in the accompanying drawing, in which:

Figures 1 and 2 are elevational views, parts in section, illustrating in two of its positions one application of the present invention;

Figure 3 is a plan view of one of the motion imparting elements of this invention;

Figures 4 and 5 are enlarged sectional views taken on the lines 4—4 and 5—5, respectively, of Figure 3, looking in the direction indicated by the arrows; and

Figures 6 and 7 are plan and sectional views, respectively, of an alternative form of this invention.

Referring now more particularly to the drawings, 5 designates a shaft which, as shown, is placed in suitable bearings 6 and 7, and in which the shaft is revoluble by any suitable driving means (not shown) connected to the shaft by engagement with the worm gear 8.

The governor, as shown in the form of Figures 1 to 5, includes the retainer or cup members 9 and 10, the former being fixedly secured to the shaft 5 for rotation therewith and the latter being keyed to said shaft whereby to rotate therewith and to be slidable thereon toward and away from the complementary cup member 9.

The two retainer members 9 and 10 are substantially identical in general form, the member 9 including a hub portion 11, fixed to the shaft 5 by the provision of a set screw 12 passing through said hub. The member 9 further includes an annular flange 13, which extends laterally and angularly with respect to the longitudinal axis of the shaft 5, and said flange is provided with a plurality of radial channels or grooves 14—14 and intermediate abutments 15—15, forming radial pockets affording seats for the centrifugal actuating devices, which in the present instance take the form of balls 16—16. It will be observed that the inner ends of the radial channels 14 are joined so as to afford a substantially circumferential recess for reception of the actuating elements 16, the abut-



ments merely serving to space the balls from each other. This exact form need not be adhered to as the abutments may be omitted and a continuous circumferential groove substituted, such as indicated at 16<sup>a</sup> in Figures 6 and 7, to be described presently.

It will be observed that the curvature of groove 16<sup>a</sup> is such that only a relatively small surface of contact exists between the member 9 and the balls, thus preventing them from "hugging" the hub thereof. In fact the balls all have relatively small contact surfaces with the members 9 and 10 and their respective abutments, thereby enhancing the sensitivity of the governor.

The member 10 includes a hub portion 17 and a radial flange 18 formed with a plurality of radial grooves or channels 14<sup>a</sup>—14<sup>a</sup> and abutments 15<sup>a</sup>—15<sup>a</sup>, complementally with respect to the grooves and abutments of the member 9, said grooves 14 and 14<sup>a</sup> cooperating to receive and retain the balls 16.

The hub 17 and the member 10 are provided with a key 19 which serves to connect the member 10 to the shaft 5 for sliding and rotative engagement therewith. Said hub 17 is also provided with an external circumferential channel 20, which serves to receive a pin 21 carried by the shutter operating arm 22, which latter is pivotally mounted at 23 and carries a shutter 24 adapted to be moved to open and close the opening 25 in the frame 26, which in the present instance may be the frame of a motion picture projector.

The members 9 and 10 are normally maintained in the position shown in Figure 1 while the shaft 5 is at rest, by the provision of an expansion spring 27 which surrounds the shaft 5 and disposed between and having its ends seated on the hub 17 and adjustable collar 28, which latter is adjustably secured to the shaft 5 by the provision of a set screw 29 passing through said collar.

In operation, assuming that the device is applied to a motion picture projector wherein stoppage of the machine might cause ignition of the film, the governor operates to maintain the shutter in a raised position, as seen in Figure 2, while the machine is running, but upon stoppage of the machine, the governor, in response to the action of the spring 27, and the tendency for the balls to seek the lowest level in the grooves 14, moves the arm 22 downwardly to close the opening 25 by means of the shutter 24. It will be noted that a stop member 30 in the path of movement of the arm 22 limits the upward movement thereof to such extent that the balls cannot escape from the governor, that is, the members 9 and 10 cannot be separated to such an extent that the flanges 13 and 18 would fail to retain the balls.

The important advantages of this construction are that the governor is highly sensitive to the action of centrifugal force, and

the provision of the balls and channels therefor reduces the friction and vibration usually attendant upon the provision of a plurality of jointed levers such as is employed in most of the modern governors. Furthermore, the balls act simultaneously and thereby insure an even distribution of the pressure and a straight line action upon the relatively movable member 10, thus eliminating canting of the latter and jamming of the governor. It will be found that only a relatively small space is occupied by this type of governor and this is important in motion picture projectors, wherein the machine must be made as compact as practicable.

Referring now to the alternative form of this invention shown in Figures 6 and 7, a shaft 5<sup>a</sup> is provided, upon which the governor members 9<sup>a</sup> and 10<sup>a</sup> are mounted, the former being fixed to said shaft for rotation therewith by the provision of a set screw 12<sup>a</sup>, and the latter of said governor members being rotatable with and slidable upon said shaft.

The members 9<sup>a</sup> and 10<sup>a</sup> are provided with circumferential grooves 16<sup>a</sup> and 16<sup>b</sup>, respectively, these grooves being coextensive and receiving and retaining the actuating members, such as the balls 31—31, which function to engage the inclined surfaces 32—32 of the grooves 16<sup>a</sup> and 16<sup>b</sup> to separate the members 9<sup>a</sup> and 10<sup>a</sup> when the shaft 5<sup>a</sup> is rotated.

In this form of the invention, as previously pointed out, the abutments 15 are omitted, and spacing means for the balls are provided, which here take the form of the disks 33 and 34, disposed between the members 9 and 10, and axially mounted with respect thereto. The disks 33 and 34 are complementary, substantially identical in construction, reference being had to the disk 34 shown in Figure 6, the latter having a plurality of radial tongues 35 affording spaces 36, the balls 31 operating in said spaces, and being maintained in spaced relationship by the tongues 35 provided on each of the disks. The tongues 35 are provided with flaring ends 37, so that the outward movement of the balls tends to cooperate with the surfaces 32, 32 to separate said disks longitudinally of the shaft 5<sup>a</sup> and as a consequence relatively displace the members 9<sup>a</sup> and 10<sup>a</sup>, and perform the same function as that described in connection with Figure 1.

Instead of keying the member 10<sup>a</sup> to the shaft 5<sup>a</sup>, I provide the pins 38 and 39, which have each enlarged portions 40, 41, which lie between the disks 33 and 34, the opposite ends of said pins being seated in complementary aligned recesses 42—42 in the members 9<sup>a</sup> and 10<sup>a</sup>. The pins 38 and 39 thus serve to keep the members 9<sup>a</sup> and 10<sup>a</sup>, and disks 33 and 34, in alignment, and to cause the member 10<sup>a</sup> to rotate with as well as



slide upon the shaft 5<sup>a</sup>, and thus serve the function of keys.

In the arrangement shown in Figures 6 and 7, the provision of the disks 33 and 34 tends to distribute the wear on said disks and the members 9<sup>a</sup> and 10<sup>a</sup> and permits of ready renewal of the disks when they become worn.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In combination, a shaft, a member fixed to said shaft for rotation therewith, a complementary member slidable upon said shaft and held for rotation with said first mentioned member, circumferential complementary grooves in each of said members, and having inclined surfaces, means including revoluble members lying in said grooves engaging the edges thereof for separating said members along their axis of rotation when rotated, and means for preventing relative rotation of said first mentioned members including pins extending between the same.

2. In combination, a shaft, a member fixed to said shaft for rotation therewith, a complementary member slidable upon said shaft and held for rotation with said first mentioned member, circumferential complementary grooves in each of said members, and having inclined surfaces, means including revoluble members lying in said grooves, means between said first mentioned members for retaining and spacing said revoluble members, and means extending between said first mentioned members for retaining said spacing means.

3. In combination, a shaft, a member fixed to said shaft for rotation therewith, a complementary member slidable upon said shaft and held for rotation with said first mentioned member, circumferential complementary grooves in each of said members, and having inclined surfaces, means including revoluble members lying in said grooves, means between said first mentioned members for retaining and spacing said revoluble members, and pins extending between said first mentioned members for retaining said spacing means.

4. In combination, a shaft, a member fixed to said shaft for rotation therewith, a complementary member slidable upon said shaft and held for rotation with said first mentioned member, circumferential complementary grooves in each of said members, and having inclined surfaces; means including revoluble members lying in said grooves, means between said first mentioned members for retaining and spacing said revoluble members, and pins extending between said first mentioned members for retaining said spacing means, said pins also serving to prevent relative rotation of said first mentioned members.

5. In a device of the character described, in combination, a pair of separable elements,

radially movable means between said elements for separating same, a notched disk carried by the separable elements for spacing said radially movable means, and means positively engaging said separable elements and disk for removably securing said disk to and between said separable elements for rotation therewith.

6. In a device of the character described, in combination, a pair of separable elements, radially movable means between said elements for separating same, a notched disk carried by the separable elements for spacing said radially movable means, and means for relatively spacing and for removably securing said disk to both of said separable elements for rotation therewith and for preventing relative rotation of the latter.

In testimony whereof I have hereunto signed my name.

AUGUSTO DINA.

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