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SPEED-REGULATING DEVICE

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This invention relates to speed regulating devices, and more particularly to frictionally retarded centrifugal governors.

Governors of this character usually employ 5 rotatable weights which are thrown outwardly by centrifugal force into frictional engagement with a stationary member whereby a retarding force is created in opposition to the force rotating the governor. The rotatable 10 weights are generally restrained in their outward movement by so-called retractile springs, individual to each weight, and the speed at which such governors operate is ordinarily regulated by varying the tension of 15 the springs, the speed of the mechanism increasing with the tension of the springs and vice versa.

In governors of the aforementioned character it is a difficult task to balance the 20 rotatable weights whereby a uniform retarding force is created by each of them upon the stationary member. The difficulty of balancing the weights is due largely to the use of an individual spring for each weight which 25 necessitates an adjustment of each of the springs to vary the tension thereof, and consequently to provide a uniform tension it is necessary to repeatedly adjust them until a desired uniform restraining force is imparted 30 to each of the weights.

The primary object of this invention is to provide a balanced centrifugal governor of simple and inexpensive construction wherein 35 necessary adjustment to provide the desired retarding force in opposition to the force rotating the governor is effected without altering the relation of the resilient means thereof.

In accordance with the general features of this invention as embodied in one form 40 thereof, there is provided a stationary cup-shaped housing having an inner conical surface surrounding a pair of uniform weights pivoted at diametrically opposed points upon a rotatable frame having its axis coincident 45 with the axis of the cup-shaped housing, the weights being interconnected by a single tension spring to restrain them equally in their outward movement under the influence of centrifugal force to frictionally engage the conical 50 surface. To vary the frictional force ex-

erted upon the conical surface by the pivotal weights, means accessible from the exterior of the housing is provided for adjusting the rotatable frame along its axis of rotation to increase or decrease the length of the paths 55 traveled by the pivotal weights and consequently the frictional retarding force thereof upon the conical surface is decreased or increased respectively.

Other objects and advantages of this invention 60 will become apparent from the following detailed description, reference being had to the accompanying drawings wherein

Fig. 1 is a bottom view of a governor embodying the features of this invention with a 65 surrounding stationary housing shown in section, and

Fig. 2 is a sectional view upon the line 2—2 of Fig. 1 looking in the direction indicated 70 by the arrows.

One form of this invention, as described hereinafter, is of a type particularly suitable for use in automatic telephone calling devices, 75 such as shown in U. S. Patent No. 1,161,854, issued to O. F. Forsberg, November 30, 1915, but its utility is not limited to such application.

Referring now to the drawings in detail wherein like reference numerals indicate 80 similar parts, a base 10, shown fragmentarily, of a calling device of the hereinbefore referred to type carries a circular cup-shaped housing 11 provided with a continuous inner conical surface 12. Spanning the open side 85 of the housing 11 is a bridge member 13 fixed to the base 10 by means (not shown). Screw threaded at one end axially into the flat wall of the housing 11, as indicated at 14, is a stationary spindle 15, the opposite end fitting 90 freely into an opening provided in the bridge member 13. Journaled upon the spindle 15 with thrust washers 17 at each end is a pinion 18 having formed thereon at its upper end, as viewed in Fig. 2, a ratchet wheel 19. Upon 95 the spindle 15 is rotatably mounted a pair of interconnected bridge members 20 and 21, the bridge members and pinion 18 with the opposed thrust washers 17 being restrained from longitudinal movement upon the spindle 100 in one direction by a lock nut 22 threaded

thereon and in the opposite direction by an annular shoulder 23 formed upon the spindle, suitable clearances being provided between the relatively movable parts. Pivotal-
 5 studs 26 and 27 fixed to and serving to separate and retain the bridge members 20 and 21 in spaced relation as a unit are a pair of substantially semi-circular shaped weights or
 10 arms 28 of uniform weight and contour carrying friction studs 29 adjacent their free ends and arranged to engage the conical surface 12 of the cup-shaped housing 11 when the arms move outward under the influence
 15 of centrifugal force, as will be explained hereinafter. The studs 29 may be composed of rubber or any suitable anti-friction material. The arms 28 are restrained in their outward movement by a single coiled tension
 20 spring 30 having its opposite ends connected to the arms 28, as clearly indicated in Fig. 2 by the numerals 33, the spring serving to draw the arms into abutting relationship at their free and pivoted ends, respectively,
 25 as clearly shown in Fig. 1, the abutting of the arms serving to limit the inward movement thereof about their pivots 26 and 27. Although a coiled tension spring 30 is illustrated in the drawing for restraining the arms
 30 28 in their outward movement it will be apparent that other resilient means could be used.

The spring 30 is formed with an elongated coil portion 34 intermediate its ends with the
 35 spindle 15 passing through its center, the longitudinal axis of the spring extending at right angles to and passing through the axis of rotation of the spindle. The opposite ends of the spring 30 are connected to the arms
 40 28, as clearly shown in Fig. 1, at diametrically opposed points with respect to the axis of the spindle 15, thus providing a fully balanced arrangement of pivotal weights, which under the influence of centrifugal force move
 45 outward, the studs 29 frictionally engaging the conical surface 12 of the housing 11, each creating an equal retarding force in opposition to the force rotating the governor. Pivotal-
 50 ly carried upon the stud 26 at its lower end and below the bridge member 21, as viewed in Fig. 2, is a pawl 35 adapted to be pressed into engagement with the teeth of the ratchet wheel 19 by a coiled tension spring
 55 36, opposite ends thereof being fixed to ears formed on the bridge member 21 and pawl 35. The upper end of the spindle 15, as viewed in Fig. 2, is provided with a screw driver slot 37 whereby the spindle may be
 60 rotated to raise or lower the pivotal weights or arms 28 along the conical surface 12 of the housing 11, the arms as hereinbefore described being carried upon the bridge mem-
 65 bers 20 and 21 which are fixed to the spindle for longitudinal movement therewith along with the pinion 18 by the lock nut 22 and

the shoulder 23 threaded onto and formed upon the spindle, respectively. A lock nut 38 is provided upon the upper end of the spindle 15 and outside the housing 11 for retaining the spindle in its adjusted position.

In the operation of the calling device as
 70 fully described in the aforementioned patent and in response to the setting of a dialing member (not shown) the pinion 18 with attached ratchet wheel 19 is rotated in a
 75 counter-clockwise direction, as viewed in Fig. 1, by means of an interconnecting gear train (not shown), the teeth of the ratchet wheel idly riding past the pawl 35. During
 80 the rotation of the pinion 18, as just described, a motor spring (not shown) associated with the referred to gear train is wound up for returning the operable parts
 85 of the calling device to their normal position. Upon release of the dialing member it will be apparent that the energy stored in the referred to motor spring will cause the
 90 pinion 18 to be revolved in a clockwise direction, as viewed in Fig. 1, and through the spring pressed pawl 35 carried by the bridge
 95 members 20 and 21 and engaging the ratchet wheel 19 carried by the pinion 18 causes the rotation of the bridge members in a clockwise direction. Due to the action of centrifugal
 100 force, the pivoted arms 28 which rotate with the bridge members 20 and 21 fly outwardly against the tension of the single coil spring 30 and press the friction studs 29 against
 105 the conical surface 12 of the housing 11. As a result of the friction between the studs 29 and the surface 12 of the housing 11, the reverse rotation of the pinion 18 and consequently the associated gear train (not shown)
 110 and other operating parts of the calling dial, fully described in the aforementioned patent, is reduced to a speed predetermined by the longitudinal adjustment of the stationary
 115 spindle 15 along the conical surface 12 of the housing 11. This adjustment may be varied as hereinbefore described by rotating
 120 the spindle 15 in one direction or the other upon the housing 11, the spindle turning upon the screw threads 14. The peripheral surface of the teeth upon the pinion 18 is
 125 of such a length that they are at all times in engagement with the teeth of the cooperating driving gear (not shown). It will be apparent from the foregoing description that the
 130 lengths of the paths traveled by the pivotal weights or arms 28 in carrying the frictional studs 29 into engagement with the conical surface 12 of the housing 11 will be increased or decreased, depending upon their position relative to the conical surface 12 and consequently the frictional retarding force of the studs 29 upon the surface 12 will be decreased and increased respectively.

Also due to the arrangement wherein a single spring not requiring any adjustment is used to interconnect the weights or arms 28

a perfect balance is obtained between the arms and consequently the studs 29 carried thereon will be subjected to equal wear and as each provides a uniform retarding force upon the conical surface 12 of the housing 11, a smooth operating governor is provided. The means provided for adjusting the retarding force of the arms wherein a stationary, continuous housing surrounds the governor serves to minimize the gathering of dust upon the operating parts thereof, which in time would have a deleterious effect thereon. Since no spring adjustment to regulate the frictional force of the studs 29 upon the housing 11 is needed a simple and inexpensive construction results. It is to be noted that the means for varying the frictional force exerted upon the conical surface of the housing by the pivotal weights is such that it is accessible from the exterior of the housing and therefore the governor may be readily adjusted while in service.

What is claimed is:

1. In a centrifugal governor, a stationary cup-shaped member, a rotatable member, means movable on the rotatable member comprising a pair of arcuate diametrically oppositely pivoted members, means secured to each of said members for frictional braking engagement with a surface of the stationary member in response to centrifugal force, means normally causing said members to be drawn inwardly an equal amount to disengage the frictional means from the surface of the stationary member, and means for adjusting the rotatable member along its axis of rotation for varying the braking force applied by the pivoted members upon said surface and thereby the speed of rotation of the rotatable member.

2. In a centrifugal governor, a rotatable member, a member associated therewith, a pair of elements pivotally mounted on the rotatable member at diametrically opposite points and arranged for frictional braking engagement with a surface of the associated member in response to centrifugal force, means common to said braking elements for maintaining them in balanced relation and normally causing the elements to be in abutting relation, and means for causing a relative movement between said rotatable member and its associated member for varying the braking force applied to the braking elements upon said surface and thereby the speed of rotation of the rotatable member.

3. In a centrifugal governor, a stationary member having a conical surface, a plurality of balanced arcuate pivoted members rotatable as a unit about a common axis and arranged for frictional braking engagement with the conical surface of the stationary member in response to centrifugal force, means secured to each of said pivoted members near the point of frictional engagement

with the conical surface for normally restraining the elements against movement, and means for adjusting the rotatable members along their common axis of rotation for varying the braking force applied thereby upon the conical surface and thereby the speed of rotation of the rotatable members.

4. In a centrifugal governor, a stationary member having an inner conical surface, a rotatable frame, a pair of balanced substantially semi-circular shaped arms of uniform weight pivoted thereon at diametrically opposite points and arranged for frictional braking engagement with conical surface of the member in response to centrifugal force, means common to said arms and secured thereto at points near their ends for normally restraining them against movement, and means for adjusting the rotatable frame along its axis of rotation for varying the frictional braking force applied by the arms upon the conical surface of the stationary member and thereby the speed of rotation of the rotatable frame.

5. In a centrifugal governor, a stationary member having an inner conical surface, a plurality of members, each pivoted at diametrically opposite points and equally disposed radially about the axis of the stationary member and rotatable as a unit therewith for frictional braking engagement at their opposite ends with the conical surface thereof in response to centrifugal force, a single resilient member operatively connected to each of the pivoted members at points near the point engaging with the conical surface for maintaining them normally in balanced relation from engagement with the conical surface of the stationary member but in abutting relation, and means for adjusting the rotatable members along their axis of rotation for varying the frictional braking force applied thereby upon the conical surface and thereby the speed of rotation of the rotatable members.

6. In a centrifugal governor, a stationary member having a conical surface, a plurality of balanced, arcuate pivoted members rotatable as a unit about a common axis and arranged for frictional braking engagement with the conical surface of the stationary member at points substantially opposite to their pivotal points, means secured to each of said pivoted members for normally restraining the members against movement, and means for adjusting the rotatable members along their common axis of rotation for varying the braking force applied thereby upon the conical surface and thereby the speed of rotation of the rotatable members.

In witness whereof, I hereunto subscribe my name this 25 day of March, A. D., 1927.

MARION LLEWELLYN STRAWN.