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MOTOR GOVERNOR

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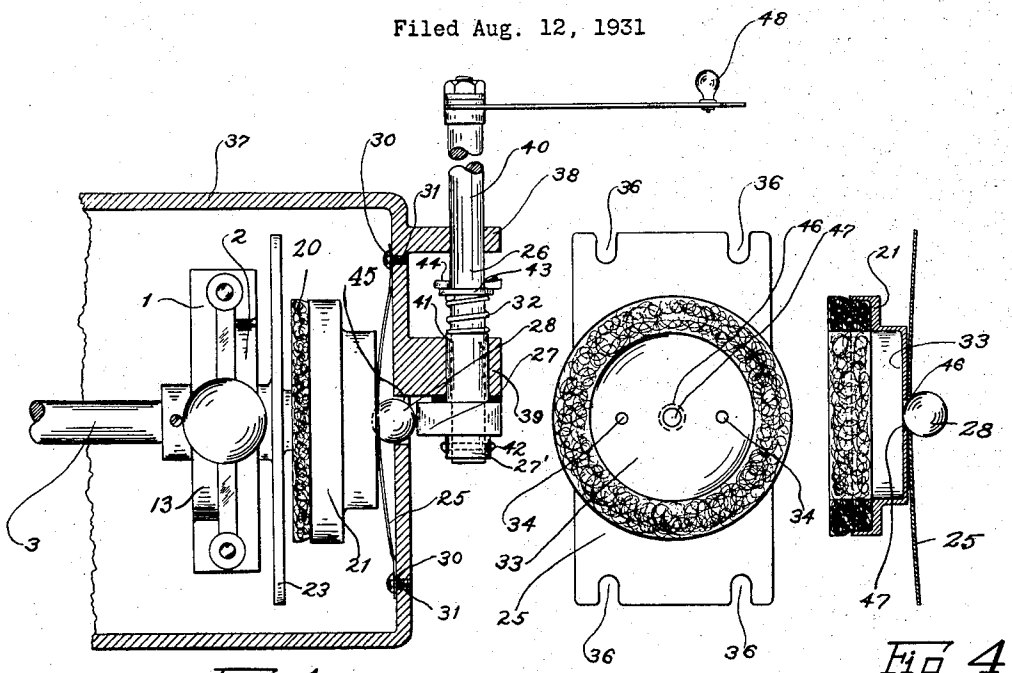


Fig 1

Fig 3

Fig 4

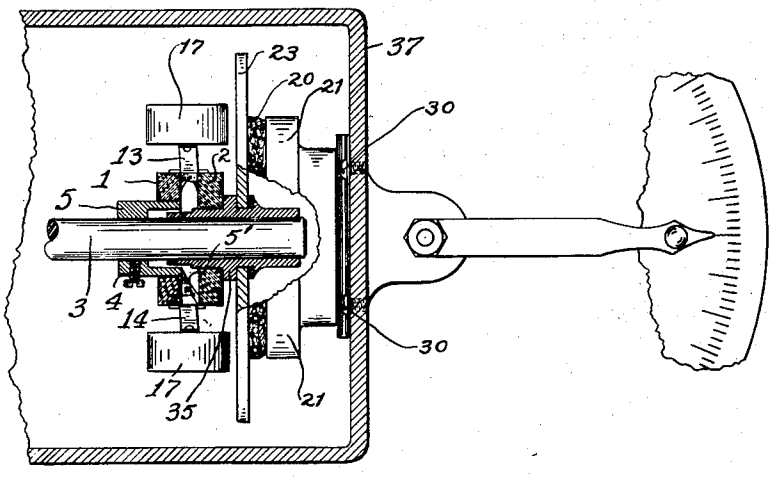


Fig 2

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MOTOR GOVERNOR

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19 Claims. (Cl. 188—187)

My invention relates to centrifugal governors and relates more particularly to governors applicable to controlling the speed of such mechanisms as phonograph motors and the like, employing either electric motor or spring motor power.

In motor mechanisms such as employed for driving a phonograph turntable, the maintenance of a predetermined rotational speed is of importance, and centrifugal governors of various types have long been employed, and of these types the general type relying upon the effect of braking of a rotational motor part commensurably with the speed at which said part is rotated, is most commonly employed.

An object of the present invention is to provide an improved centrifugal governor of a form adapted for disposition in a very narrow space extending in the direction of the axis of the rotating part, such as a phonograph motor driven shaft.

Another object of my invention is to provide an improved centrifugal governor adapted to effect a very graduated but heavy braking effect upon the motor shaft commensurably with increases of speed of such shaft.

Another object of my invention is to provide an improved mechanism of the class described adapted to be manufactured in quantities at small cost.

Another object of my invention is to provide an improved mechanism of the class described wherein the adjusting mechanism will effect an equal pressure on every side of the axis of the rotating part.

Other objects of my invention and the invention itself will soon become apparent from the following description of an embodiment of my invention and in which description reference will be had to the accompanying drawing illustrating the said embodiment.

Referring to the drawing:

Fig. 1 illustrates, in side elevational view, a centrifugal governor mechanism applied to a rotatable shaft of a motor whose speed is to be controlled thereby, a part of the enclosing casing being illustrated in longitudinal medial sectional view;

Fig. 2 is a plan view of the apparatus of Fig. 1, certain of the parts, however, being shown in transverse section taken on horizontal planes, which will be apparent by reference to Fig. 1, a fragment of an indicating scale being also illustrated in plan view;

Fig. 3 is an end elevational view and

Fig. 4 is a vertical sectional view of a spring mounted adjustable frictional element employed in the embodiment of my invention illustrated in the foregoing figures.

Referring to the figures of drawing in all of which like parts are designated by like reference characters, at 1 and 2 I show preferably like complementary plates, each with an enlarged central portion which is bored axially to permit the plates to be telescoped onto the motor shaft 3.

At 17—17 I have shown centrifugal weights disposed on opposite sides of the shaft 3 connected to central portions of leaf springs 13 and 14, the opposite end portions of which are respectively connected to the plates 1 and 2. A bushing 5 pressed into the bore of the plate 1 and telescoped on the shaft 3 and rigidly connected to the shaft by a set screw 4 rigidly connects the plate 1 with the shaft 3 to rotate therewith. A bushing 5' pressed into the bore of the plate 2 to rigidly connect it therewith has rotational and axial movement on the shaft 3 and externally of the plate 2 is provided with a collar 35.

Confronting portions of the plates 1 and 2 are formed with mating inter-engaging cam surfaces. Upon rotation of the shaft 3, plate 1 and spring-connected plate 2, the centrifugal devices 17 move outwardly to varying degree and cause the plates 1 and 2 to react on their cam surfaces to cause the plate 2 to move axially relative to the plate 1.

A centrifugal device of this character whereby the plate 2 is moved axially in correspondence with speed of revolution of the shaft 3 is fully illustrated and described in my Patent No. 1,807,052, May 26, 1931, in which substantially the same reference characters as used in the foregoing brief description are employed. It is therefore believed unnecessary to describe in detail herein the construction of such a centrifugal device and reference may be had to the said patent in connection with this application.

The plate 2 is joined to a smooth rotatable disc 23 by means of the bushing 5', the plate 23 being rigidly secured to the bushing in any suitable manner and positioned thereon against the collar 35 of the bushing.

Cooperating with the disc 23, which is shiftable axially of the shaft 3 by the centrifugal action of the governor balls 17, together with the plate 2, is a substantially stationary friction pad 20, which is carried by a cup element 21, said pad being recessed partially within said cup and partially confined by the annular walls thereof. The cup is carried by its end wall 33 on the medial

portion of a leaf spring 25 to which it is medially affixed by rivets 34. The spring 25 is slotted at 36 at the longitudinal ends, said slots 36 receiving mounting screws 30, which are turned only partially to a complete "home" position, into threaded openings 31 in a governor frame casting 37.

The casting 37 is provided with a pair of spaced parallel lugs 38 and 39 within which there is journaled an adjusting rod 40 rotatable therein, a bearing bushing 41 being provided in the lug 39, the rod 40 being telescoped through said bearing bushing and a rotatable cam 27 being rigidly affixed by a tubular projection 27' on the end of said rod 40, a pin 42 being projected through said tubular projection and the end of said rod. A spring 32 with a cooperating collar 43 with cotter pin 44 restrains downward longitudinal movement of the rod 40 through the lugs to maintain the cam 27 in axial alinement with a longitudinal projection of the motor shaft 3.

A thrust bearing ball 28 is disposed within an aperture 45 of the end wall of the casting 37 and extends laterally into engagement with the cam face of the cam 27 in one direction, and in the opposite direction projects into aligned openings 46 of the spring 25 and 47 of the end wall 33 of the friction pad supporting cup 21.

The apertures 46 and 47 are of insufficient size to permit the ball 28 being projected therethrough so that the surface of the ball extending within the aperture thus makes bearing engagement with the edges of said apertures and the cam 27 being rotated to different adjusted positions by rotational movements of the rod 40 effected by the indicating handle 48 affixed to the end of said rod, projects the ball 28 inwardly and outwardly against the spring pressure of the spring 25 to move the cup 21 axially toward and away from the disc 23 according to the axial adjustment desired to be effected between the friction pad 20 and the friction disc 23.

The adjustment effected by rotation of the rod 40 will remain substantially permanent for long period of use of the motor due to the reaction of the coil spring 32 introducing the element of friction into the capability of the rod 40 to rotate.

The relative axial movement of the plates 1 and 2, responsive to an increase of shaft speed, moves the plate 2 outwardly on the shaft 3 and away from the plate 1, thus effecting a corresponding outward movement of the rotating disc 23, causing an increased pressure engagement of the disc with the annular friction pad or surface 20 carried on the inner face of the cup 21.

The frictional engagement had between the pad 20 and the frictional braking surface of the rotatable disc 23, effects a retardation in rotational speed of the plate 2, and which retardation is communicated to the shaft through the springs 13 and 14.

During operation of the device, the friction pad 20 is stationary in its adjusted position, and the rotatable disc surface 23 attached directly to plate 2, is moved axially against the pad upon the increased speed, and the friction pad consequently engages it with increased pressure, retarding its rotative speed, whereupon the springs 13 and 14 resiliently retract the plate 2 to tend to withdraw it from contact with the pad.

All of these effects occur coincidentally, and the speed is maintained within very narrow limits at substantially a constant speed, even though there be, from time to time, variations in motor driving effect, or in the power required to drive the load, such as a phonograph turntable, since to compensate for such effects there will be opposite compensating variations in frictional retardation effected upon the disc 23, directly attached to plate 2, and thereby upon the shaft carrying the plate.

Having thus described my invention in a preferred embodiment, I am aware that numerous and extensive departures may be made from the embodient herein illustrated and described, but without departing from the spirit of my invention.

I claim:

1. In a governor mechanism, in combination a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a plate rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, and friction means having an annular friction surface adapted for engagement with an annular substantially coaxial surface portion of said plate to retard rotation thereof and engageable thereby with degrees of pressure according to the axial thrust effort imparted to said plate by said centrifugal means and a support for the friction means permitting universal rocking movement thereof.

2. In a governor mechanism, in combination a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a plate rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, and friction means having an annular substantially coaxial friction surface adapted for engagement with an annular substantially coaxial surface portion of said plate to retard rotation thereof and engageable thereby with degrees of pressure according to the axial thrust effort imparted to said plate by said centrifugal means, a support for said friction means and a resilient mounting for said support, said mounting comprising a leaf spring making engagement with said support to resiliently permit universal rocking movement.

3. In a governor mechanism, in combination a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a plate rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, and friction means having an annular friction surface adapted for engagement with an annular surface of said plate to retard rotation thereof and engageable thereby with degrees of pressure according to the axial thrust effort imparted to said plate by said centrifugal means, a support for said friction pad and a resilient mounting for said support, said mounting comprising a leaf spring making engagement with said support to resiliently permit universal rocking movement thereof, and adjusting means comprising an element engageable with said support by a portion thereof disposed axially of said shaft and means for adjusting its longitudinal position with respect thereto.

4. In a governing mechanism, in combination, a centrifugal means, a shaft for imparting rotational movement thereto, an element responsive to rotational movement of said centrifugal means to move it axially of said shaft, said element being co-incidentally rotated by said shaft, and having an outer annular friction surface concentric with and spaced from its axis of ro-

tation, a friction pad of yieldable friction material of annular form adapted for engagement with said friction surface of said element and a support for said friction pad supporting it by a side thereof remote from said element, resilient means resiliently impelling said support permitting universal rocking movement of said element and non-resilient adjustable means restraining said support from movement in the opposite direction from said element.

5. In a governor mechanism, in combination, a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a brake element rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, and friction means having an annular friction surface adapted for engagement with an annular substantially coaxial surface portion of the brake element to retard rotation thereof and engageable thereby with degrees of pressure varying according to the axial thrust effort imparted to said brake element by said centrifugal means and a support for the friction means permitting universal rocking movement thereof.

6. In a governor mechanism, in combination, a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a brake element rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, friction means having an annular substantially coaxial friction surface adapted for engagement with an annular substantially coaxial surface portion of said brake element to retard rotation thereof and engageable thereby with varying degrees of pressure according to the axial thrust effort imparted to said brake element by said centrifugal means, a support for said friction means, and a resilient mounting for said support, said mounting comprising a spring element making engagement with the support to resiliently permit universal rocking movement thereof.

7. In a governor mechanism, in combination, a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a brake element rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, friction means having an annular substantially coaxial friction surface adapted for engagement with an annular substantially coaxial surface portion of said brake element to retard rotation thereof and engageable thereby with varying degrees of pressure according to the axial thrust effort imparted to said brake element by said centrifugal means, a support for said friction means, and a resilient mounting for said support, said mounting comprising a leaf spring making engagement with said support to resiliently permit universal rocking movement thereof.

8. In a governor mechanism, in combination, a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a brake element rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, friction means having an annular friction surface adapted for engagement with an annular substantially coaxial surface portion of said brake element to retard rotation thereof and engageable thereby with degrees of pressure according to the axial thrust effort imparted to said brake element by said centrifugal means, a support for said friction means and adjusting means comprising an element engageable with said support upon a portion thereof disposed substantially axially of the shaft and means for adjusting the longitudinal position of the adjusting means.

9. In a governor mechanism, in combination, a driven shaft, centrifugal means operable by rotation of the shaft to effect a thrust axially thereof, a brake element rotatable by the shaft movable axially with respect thereto responsive to the axial thrust of said centrifugal means, friction means having an annular substantially coaxial friction surface adapted for engagement with an annular substantially coaxial surface portion of said brake element to retard rotation thereof and engageable thereby with degrees of pressure varying according to the axial thrust effort imparted to said brake element by said centrifugal means, a support for said friction means, a resilient universally rockable mounting for said support, and adjusting means comprising an element engageable with the support by a portion thereof disposed substantially axially of the shaft and means for adjusting its longitudinal position with respect thereto.

10. In a speed governing mechanism, a driven rotatable element, centrifugal means operable by rotation of the rotatable element to effect a thrust, a brake element rotatable by the rotatable element movable responsive to the thrust of the centrifugal means, friction means engageable with the brake element on a surface portion thereof to retard rotation thereof, and with degrees of pressure varying according to the thrust effort imparted to the brake element by the centrifugal means, and a support for the friction means permitting universal rocking movement thereof to maintain substantially equalized engagement of the friction means and the brake element surface portion.

11. In a speed governing mechanism, a driven rotatable element, centrifugal means operable by rotation of the rotatable element to effect a thrust, a brake element rotatable by the rotatable element movable responsive to the thrust of the centrifugal means, friction means engageable with the brake element on a substantially coaxial annular surface portion thereof to retard rotation thereof, and with degrees of pressure varying according to the thrust effort imparted to the brake element by the centrifugal means, and a support for the friction means permitting universal rocking movement thereof to maintain substantially equalized engagement of the friction means and the brake element surface portion.

12. A speed governing mechanism as described in claim 10 and in which adjusting means is provided comprising an adjustably movable element associated with the friction means and adapted to exert thrust upon a portion thereof disposed substantially coaxially of the axis of rotation of the rotatable element and means to axially adjust the position of the adjustably movable element.

13. A speed governing mechanism as described in claim 11 and in which adjusting means is provided comprising an adjustably movable element associated with the friction means and adapted to exert thrust upon a portion thereof disposed substantially coaxially of the axis of rotation of the rotatable element and means to axially adjust the position of the adjustably movable element.

14. In a speed governing mechanism, a driven rotatable element, centrifugal means operable by

rotation of the rotatable element to effect a thrust, a first brake element rotatable by the rotatable element, movable responsive to the thrust of the centrifugal means, a second brake element engageable with the first brake element upon a surface portion thereof to retard rotation thereof and with degrees of pressure varying according to the thrust effort imparted to the first brake element by the centrifugal means, and the two brake elements being supported to permit relative universal rocking movement to maintain equalized contacts at the braking surface.

15. In a speed governing mechanism, a driven rotatable element, centrifugal means operable by rotation of the rotatable element to effect a thrust, a first brake element rotatable by the rotatable element, movable responsive to the thrust of the centrifugal means, a second brake element engageable with the first brake element upon a substantially coaxial annular surface portion thereof to retard rotation thereof and with degrees of pressure varying according to the thrust effort imparted to the first brake element by the centrifugal means, and the two brake elements being supported to permit relative universal rocking movement to maintain equalized contacts at the brake surface.

16. A speed governing mechanism as described in claim 10 and in which the friction means is supported on a spring support to provide universal rocking movement therefor.

17. A speed governing mechanism as described in claim 10 and in which the friction means is supported on a central portion of a flat leaf spring to provide the universal rocking movement thereof.

18. A speed governing mechanism as described in claim 14 and in which one of the brake elements is supported on a spring to permit the relative universal movement thereof.

19. A speed governing mechanism as described in claim 15 and in which one of the brake elements is supported on a spring to provide the relative universal rocking movement.

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