May 15, 1934. J. L. BONANNO 1,958,884

GOVERNOR

Filed Nov. 10, 1931

FIG. 1.

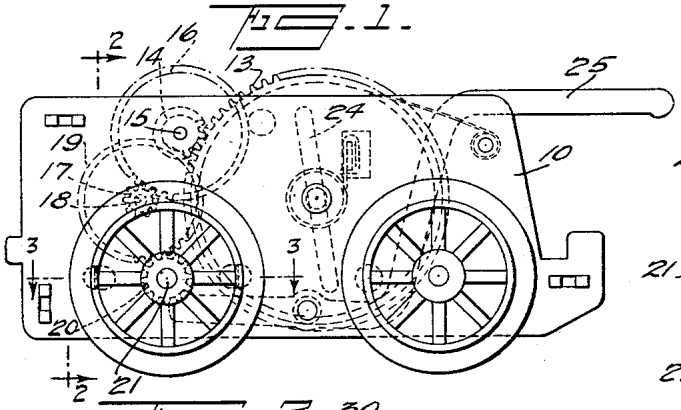


FIG. 2.

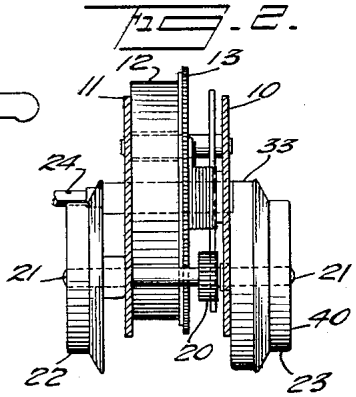


FIG. 3.

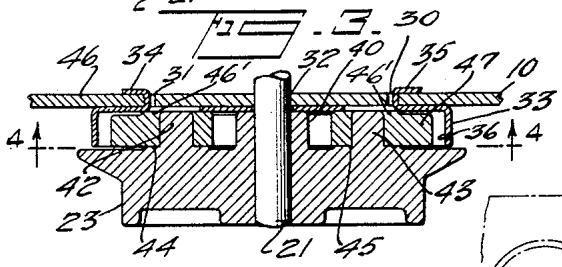


FIG. 6.

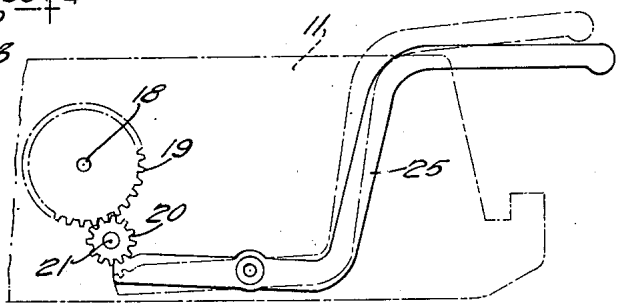


FIG. 4.

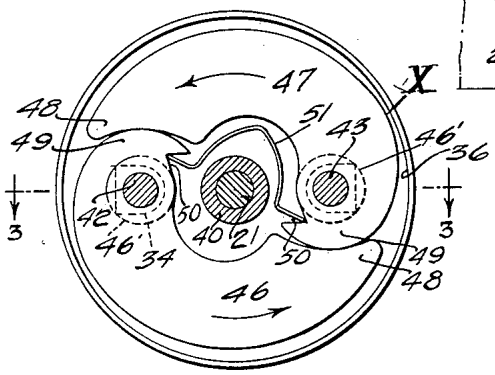


FIG. 7.

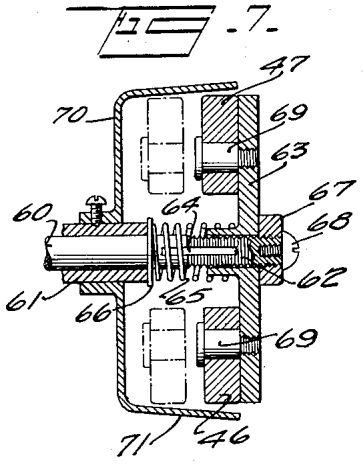
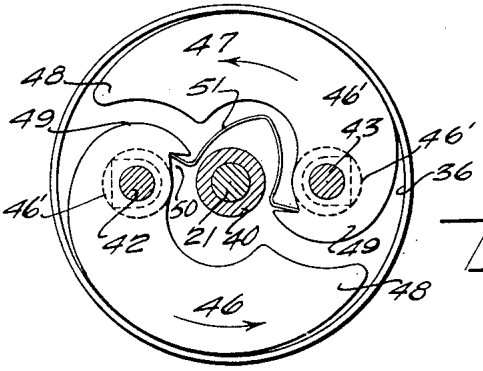


FIG. 5.



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GOVERNOR

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13 Claims. (Cl. 188—184)

The present invention relates to governors and is more particularly directed toward governors designed for use with a spring operated mechanism, such as employed in mechanical toys.

The present invention contemplates a speed responsive mechanism having a rotatable member, a comparatively stationary member concentric with the rotatable member, and a plurality of spring loaded weights adapted to swing outwardly in response to centrifugal forces against the relatively stationary member. In order to increase the effectiveness of the governor and make it operate satisfactorily at comparatively low speeds and with comparatively light weights, the parts are so arranged that a servo action takes place as soon as the weights contact with the relatively stationary member. This servo action serves to increase or multiply the pressure exerted by the weights against the stationary member so that it is many times greater than would be the case were sliding friction the only factor involved.

The invention also contemplates a speed responsive mechanism designed as a variable speed control wherein the servo action takes place at various speeds according to the adjustment of the parts.

The present invention contemplates a speed governor suitable for toy locomotives and the like wherein the governor parts are operated at the same speed of rotation as the propulsion wheel. This greatly reduces the cost of manufacturing such motors as it eliminates the gearing ordinarily employed to build up higher speeds on supplemental shafts for operating governors at such higher speeds.

A further object of the invention is to provide a governor suitable for such purposes which can be readily made and easily assembled out of relatively inexpensive cast and stamping parts.

Other and further objects will appear as the description proceeds.

The accompanying drawing shows, for purposes of illustrating the present invention, two of the many embodiments in which the invention may take form, it being understood that the drawing is illustrative of the invention rather than limiting the same. In the drawing:

Fig. 1 is a side elevational view of the propulsion unit of a mechanical toy locomotive;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows, and showing the parts in elevation;

Fig. 3 is a section on the line 3—3 of Figs. 1 and 4, showing the propulsion wheel, governor weights, and associated parts.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3 looking in the direction of the arrows, showing the parts in the position of rest;

Fig. 5 is a view similar to Fig. 4 showing the parts in the position assumed at maximum speed;

Fig. 6 illustrates a stop mechanism for the spring motor; and

Fig. 7 illustrates a modified form of governor for variable speed control.

The frame of the toy locomotive includes frame members 10 and 11 constructed as usual and adapted to contain the spring motor. The spring for the motor is indicated at 12. It operates a large gear 13 in mesh with a pinion 14 on a shaft 15 which shaft carries a gear 16 in mesh with a pinion 17 on a shaft 18. The shaft 18 carries a gear 19 in mesh with a pinion 20 carried on the shaft 21. This shaft 21 carries the track wheels 22 and 23 by which the toy locomotive is propelled along the track. The spring is adapted to be wound by a winding key indicated in dotted lines at 24 and is adapted to be stopped by brake member 25, illustrated in Fig. 6, this brake member engaging the gear teeth on the pinion 20, as indicated.

The frame member 10 is provided with two holes 30 and 31 on opposite sides of the opening 32 which forms the bearing for the shaft 21. A stationary cup-shaped stamping 33 is provided with a central opening to accommodate the shaft and has two rearwardly extending prongs 34, 35, which extend through the openings 30 and 31 and are bent back as indicated in Fig. 3 so as to secure this cup-shaped stamping in place. This stamping has a smooth cylindrical surface 36 concentric with the axis of the shaft 21. The propulsion wheels 22 and 23 are in the form of die castings as usually employed in toy railroad wheels and may, if desired, be provided with the steel tread as customary. The opening in the center of the wheel 23 is of the right size to provide a tight fit when the wheel is pressed on to the shaft 21. It has a hub 40 to space the body of the wheel the proper distance from the stamping 33. The wheel also carries two round posts 42 and 43 which are on opposite sides of the shaft 21 and with their axes parallel with the axis of the shaft 21. These posts are surrounded by surfaces 44 and 45 which are slightly raised above the rear face of the die cast wheel. Each of the posts 42 and 43 carries a governor weight, these weights being indicated at 46 and 47. The weights are spaced from the surface of the wheel by said raised elements 44

and 45. The outer faces of the weights 46 and 47 are provided with raised surfaces indicated at 46' to space the surface of the weights away from the stamping 33.

As will appear more clearly in Fig. 4, these weights are so shaped that the free ends 48, 48 fit over the pivoted ends 49, 49. The weights have notches indicated at 50 to receive the ends of a bow spring 51 which passes around the hub 40. This spring acts to hold the weights in the position indicated in Fig. 4 when the device is at rest.

The propulsion spring 12 operates the wheels in one direction only, as will be readily understood. This direction of rotation is counterclockwise in the form shown in the drawing and is so indicated by the arrows in Figs. 4 and 5.

From an examination of the outline of the governor weights 46 and 47, as shown in Fig. 4, it will be apparent that the further one goes from the pivot posts in the direction of rotation, the greater is the distance of the outer surface of the governor weight from this center.

For a toy locomotive, such as indicated herein, the clearance between the governor weights and the cup-shaped stamping or casting 33 may be very small, for example, at the point indicated at X it may be .004''. When the motor is operating at the maximum speed allowed by the governor, the weights are thrown out as indicated at Fig. 5 so as to bring the surface of the governor weight against the casing. At whatever point this engagement takes place there will be a tendency, on account of the direction of rotation and the angle at which the parts engage, to rotate the governor weights further in the direction in which the centrifugal forces are moving them. This servo action by which the governor weights are self-energized greatly increases or multiplies the pressure against the friction surface and renders the device far more effective than it would be were it revolved in the opposite direction when merely dragging or sliding friction would take place.

The critical point, at which the governor will permit no further increase in speed, is determined by the tension of the spring, the coefficient of friction between the materials of the cup and governor weights, and the distribution of masses and material employed.

In Fig. 7 the driving shaft is indicated at 60. It is carried in a fixed bearing 61 and is threaded at the end as indicated at 62. A rotary member 63 is slidably carried on the end of the shaft 60 and is drivingly connected with it by a key 64. The rotary member 63 is urged outwardly by a spring 65 which presses against a washer 66. The position of the rotary member 63 along the shaft is adjustable by means of a nut 67 held on the shaft by a lock screw 68. This rotary member 63 corresponds with the wheel 23 and carries weights 46 and 47 similar to the weights above described. These weights are carried on headed screws 69 threaded into member 63 as indicated. The stationary casing is indicated at 70. It is fixedly carried by the bearing 61 and tapers slightly as indicated at 71. The position of the rotary element 63 and weights may be adjusted axially of the shaft so that the distance from the weights to the surface of the stationary casing may be varied. In this way the critical speed of the governor is variable.

It is obvious that the invention may be embodied in many forms and constructions, and I wish it to be understood that the particular forms shown are but two of the many forms. Various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. A speed control mechanism for spring motors and the like for limiting the speed to a predetermined amount, comprising a shaft rotated in one direction by the spring motor, a coaxial stationary casing, and eccentrically pivoted spring loaded weights rotated by the shaft and adapted to swing outwardly against the casing for frictional engagement therewith, the surface of the weights brought against the casing having a radius of curvature slightly less than that of the casing, the pivot points for the weights being adjacent the trailing end of the weights so that, upon contact with the casing, forces are set up tending to increase or multiply the pressure exerted by the weights against the casing.

2. A speed control mechanism for spring motors and the like for limiting the speed to a predetermined amount, comprising a shaft rotated in one direction by the spring motor, a coaxial stationary casing, eccentrically pivoted spring loaded weights rotated by the shaft and adapted to swing outwardly against the casing for frictional engagement therewith, the surface of the weights brought against the casing having a radius of curvature slightly less than that of the casing, the pivot points for the weights being adjacent the trailing end of the weights so that, upon contact with the casing, forces are set up tending to increase or multiply the pressure exerted by the weights against the casing, and means to vary the diameter of the portions of the casing presented opposite the weights so as to vary the speed at which the mechanism becomes effective.

3. A governor comprising a rotary member operating in a predetermined direction and having pivot posts parallel with the axis of rotation, a weight pivoted on each post, a central spring holding the weights in against centrifugal forces, and a casing coaxial with the rotary member and in the path of the weights when swung outwardly by centrifugal force, the distance from the post axis to the outer surfaces of the weights which engage said casing increasing in the direction of rotation of the rotary member to produce a servo action upon contact of the weights with said casing.

4. A governor comprising a rotary member operating in a predetermined direction and having pivot posts parallel with the axis of rotation, a weight pivoted on each post, a central spring holding the weights in against centrifugal forces, and a casing having a conically tapered inner surface coaxial with the rotary member and in the path of the weights when swung outwardly by centrifugal force, the distance from the post axis to the outer surfaces of the weights which engage said casing increasing in the direction of rotation of the rotary member to produce a servo action upon contact of the weights with said casing, and means for effecting an axial adjustment of the relatively fixed and movable parts to vary the speed at which the mechanism becomes effective.

5. A speed governor comprising a member rotated in one direction only, an eccentrically located post supported from the member and parallel with the axis of revolution thereof, a weight pivoted on the post and having a free end adapted to swing outwardly in response to centrifugal forces, a spring for resisting such movement, a

casing engageable by the weight, the distance from the post axis to the outer edge of the weight increasing in the direction of rotation of the rotary member to produce a servo-action upon contact of the weight with said casing.

6. A governor comprising a rotary member operated in one direction only and carrying two eccentrically located posts on opposite sides of its axis and having axes parallel with the axis of rotation, a weight pivoted on each post and adapted to swing outwardly due to centrifugal forces, a spring acting on both weights to resist such outward movement, and a casing against which the weights are brought to prevent further movement and resist increase in speed, the distance from the post axis to the outer surfaces of the weights which engage said casing increasing in the direction of rotation of the rotary member to produce a servo action upon contact of the weights with said casing.

7. A governor as claimed in claim 6, characterized in that the spring is in the form of a bow spring having ends received in notches in the weights.

8. A governor as claimed in claim 6, characterized in that the weights are spaced away from the rotary member except adjacent the posts to reduce friction between the same.

9. A governor as claimed in claim 6, characterized in that the free end of each weight is held tightly against the pivoted end of the other weight when the parts are at rest.

10. A spring motor operated toy vehicle having a propulsion wheel driven from the spring motor, and a governor for limiting the speed of the vehicle, comprising pivoted governor weights rotating about the same axis as the propulsion wheel and at the same speed, and a stationary casing against which the outer faces of the weights are brought when the motor operates at maximum speed.

11. A spring motor operated toy vehicle having a propulsion wheel driven from the spring motor, and a governor for limiting the speed of the vehicle, comprising pivoted governor weights rotating about the same axis as the propulsion wheel and at the same speed, and a stationary casing about said weights, the distance from the axis for the weights to the outer surface thereof increasing in the direction of rotation of the wheel to provide clearance, the nearness of the point of contact of the weights and casing determining the degree of servo action.

12. In a spring motor operated toy locomotive, a frame, a propulsion shaft, a propulsion wheel carried in the shaft and spaced from the frame, governor weights pivotally secured to the face of the wheel adjacent the frame, and a concentric casing fixedly carried outside the weights and between the frame and wheel and against which the weights are brought when the motor operates at maximum speed.

13. In a spring motor operated toy locomotive, a frame, a propulsion shaft, a propulsion wheel carried in the shaft and spaced from the frame, governor weights pivotally secured to the face of the wheel adjacent the frame, and a concentric casing outside the weights and against which they are brought when the motor operates at maximum speed, the weights extending forwardly from the pivots so that their free ends are swung outwardly to bring their outer surfaces toward the casing as the speed increases, whereby an increase in the pressure is brought about as soon as contact of the weights and casing surface is established.

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