E. H. PIERSEN.

EQUALIZER FOR VARIABLE TENSION MOTORS.

APPLICATION FILED AUG. 2, 1915.

1,359,464.

Patented Nov. 16, 1920.

2 SHEETS—SHEET 1.

Fig. I.

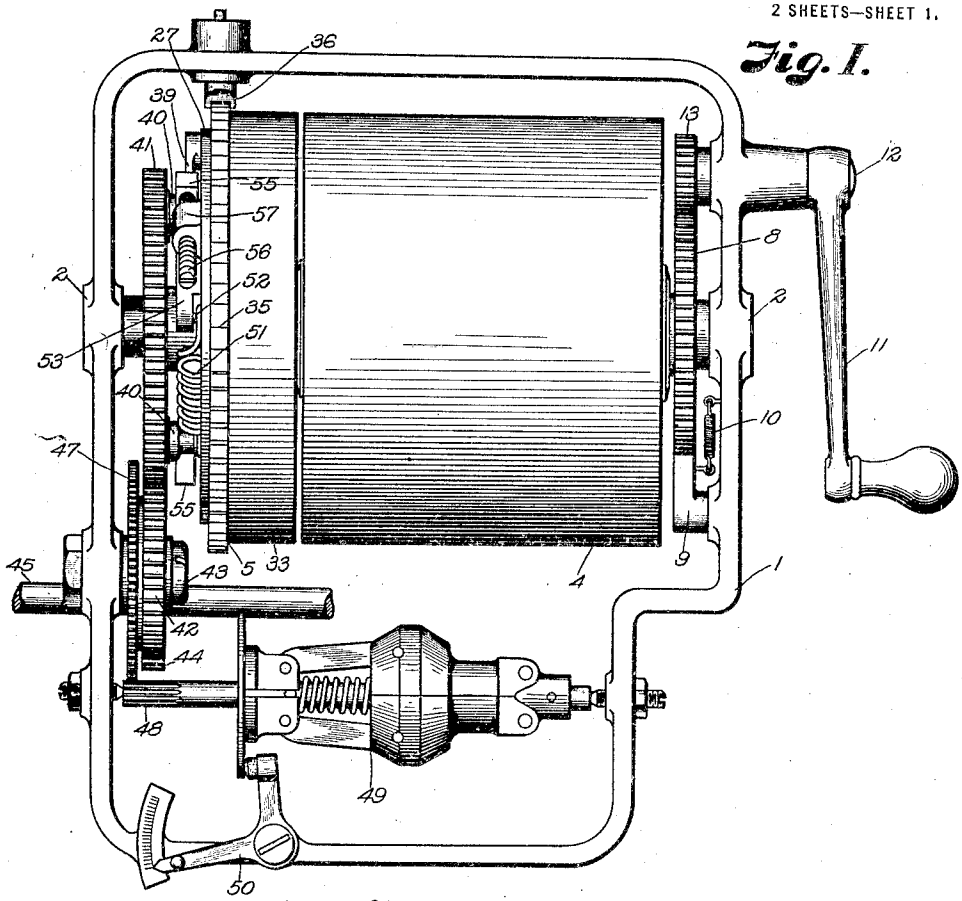
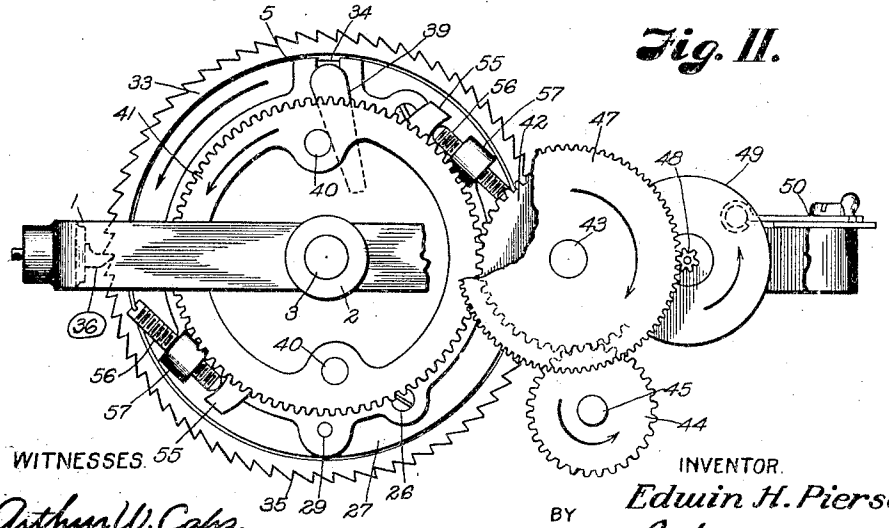


Fig. II.



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2 SHEETS—SHEET 2.

Fig. III.

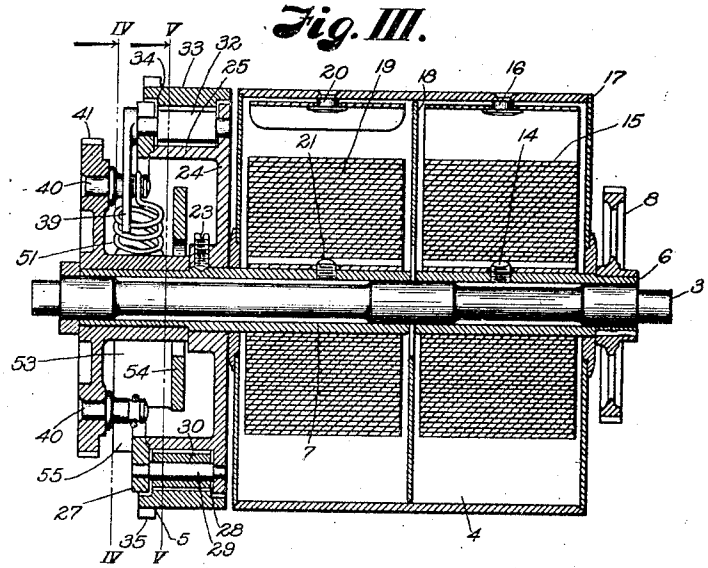


Fig. IV.

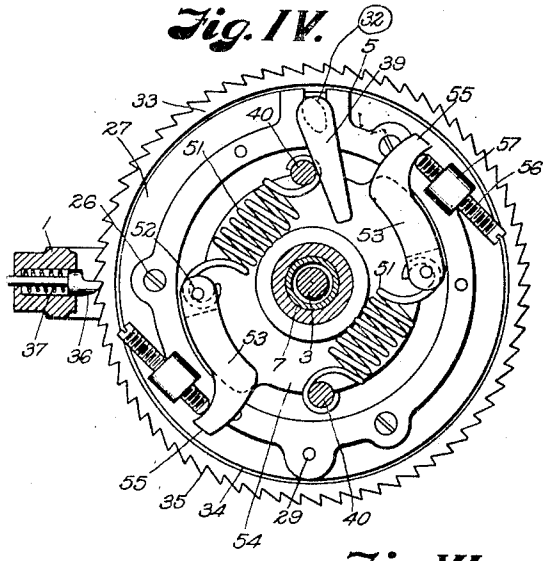


Fig. V.

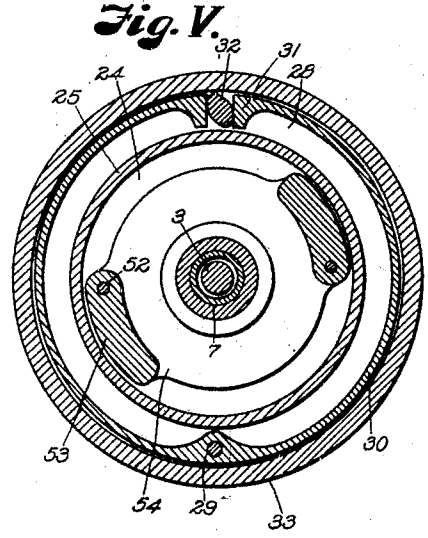
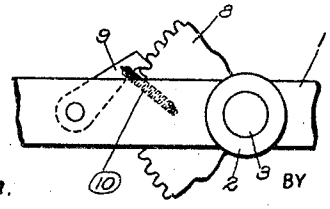


Fig. VI.



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EQUALIZER FOR VARIABLE-TENSION MOTORS.

1,359,464. Specification of Letters Patent. Patented Nov. 16, 1920.

Application filed August 2, 1915. Serial No. 43,118.

To all whom it may concern:

Be it known that I, EDWIN H. PIERSEN, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Equalizers for Variable-Tension Motors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to equalizers, and more particularly to a device for equalizing the tension of a spring motor, or the like, the principal object of the invention being to provide mechanism which may be interposed between a spring motor and the point of power consumption to maintain an even pressure on the latter irrespective of the speed at which the power is delivered from the former.

In the operation of certain kinds of machinery, it is convenient to use a spring motor, but owing to the excessive tension of the power when the motor is wound to its capacity, it has been found to have disadvantages, owing to the strain imposed on the machine parts. I have found that by using separate springs auxiliary to the motor, and providing means for automatically tensioning these springs from, and checking the power of the spring motor, a practically constant pressure can be obtained, irrespective of the speed of the motor or the machinery operated therefrom.

In accomplishing the object of the invention, I have provided the improved details of structure hereinafter described and illustrated in the accompanying drawings, wherein:—

Figure I is a plan view of an equalizer constructed in accordance with my invention, showing its relation to a spring motor, power shaft, and governor control.

Fig. II is an elevation of the same, parts being broken away for better illustration.

Fig. III is a longitudinal sectional view of the equalizer and spring motor.

Fig. IV is a sectional elevation of the equalizer on the line IV—IV, Fig. III.

Fig. V is a similar view on the line V—V, Fig. III.

Fig. VI is a detail view of the ratchet pawl for holding the spring motor against unwinding.

Referring more in detail to the parts:—

1 designates a frame preferably composed of metal and having bearings 2, in which is mounted the shaft 3, of a spring motor 4 and equalizer 5.

The spring motor, as illustrated, is of the multiple-spring type and comprises separate sleeves 6 and 7 revolubly mounted on the shaft 3, the former being provided with a gear wheel 8, which is held against revolution in one direction by a ratchet pawl 9 that is yieldingly held in mesh with the teeth of the gear wheel by a coil spring 10; and which may be manually revolved in the opposite direction by means of the crank 11 that is operatively connected to said gear wheel through the shaft 12 and pinion 13.

Fixed to the sleeve 6 by means of a stud 14 is one end of a volute spring 15, the opposite end being connected with a stud 16 in a casing 17 that is revolubly mounted on the sleeves 6 and 7 respectively. Separated from the spring 15 by means of a dividing plate 18 is a second volute spring 19, which is attached to a stud 20 in the casing 17 and to a stud 21 in the sleeve 7 and which is coiled in the opposite direction from the spring 15 so that when the crank 11 is revolved to turn the sleeve 6, the spring 15 will be tensioned and carry the casing 17 around to tension the spring 19.

Fixed on an extended portion of the sleeve 7 by means of a set screw 23 is a collar 24, having a laterally extending, peripheral flange 25, and rigidly secured to said flange by means of screws 26 is a ring 27; the ring and collar extending beyond the flange 25 to form an annular groove 28.

Pivotally mounted on a pin 29, that is carried by collar 24 and ring 27, and nested within the groove 28, is a spread-band 30, which is split opposite the mounting, and provided with enlarged heads 31, between which operates a cam 32 in such a manner that when the cam is rocked, the spread-band may be spread so as to grip the inner face of a loose band 33 that rides on the collar 24 and ring 27.

The band 33 is provided with an inset shoulder 34, which rests loosely in the groove 28 to prevent lateral displacement thereof, and integral with the outer face of

the band is a plurality of ratchet teeth 35, which are engaged by a pawl 36 in the frame 1 that is held yieldingly toward the teeth by a coil spring 37.

The cam 32 is pivotally mounted in the ring 27 and collar 24 and provided with an arm 39, which projects into the path of one of the studs 40 on the gear wheel 41, the said gear wheel being revolubly mounted on the sleeve 7 and adapted to mesh with a gear wheel 42 revolubly mounted on the stub shaft 43 on the frame 1.

The gear wheel 42 meshes with a gear wheel 44 on the shaft 45 of a machine or any point of power consumption, (not shown) and also carries a gear wheel 47, which meshes with a pinion 48 of a governor 49 that may be regulated through a speed controlling mechanism 50.

Attached to each of the studs 40 is one end of a spring 51, the opposite ends of said springs being secured to pins 52 in the laterally projecting portions 53 of a floating member 54.

Integral with the portions 53 are radially extending arms 55, which lie adjacent the outer face of ring 27 and are adapted for engagement by adjusting screws 56, which are threaded into bosses 57 on the ring 27.

In using the device, assuming that the motor is unwound, the first step is to tension the springs 15 and 19 to produce rotative force. This is accomplished by rotating the shaft 3 from the crank and gear mechanism provided for that purpose, it being apparent that as the sleeve 7 is fixed to the collar 24, the spring 19 fixed to the sleeve 7 and motor drum and the spring 15 fixed to the drum and sleeve 6, when the crank is operating the gear wheel 8 will revolve the sleeve 6 and as the collar 24 is held against rotation by the speed controlling lever 50, that contacts with the governor mechanism, the spring 15 will be wound about the sleeve 6 and the spring 19 about the sleeve 7, the reverse arrangement of the springs causing the same to be tensioned in opposite directions, one internally from its sleeve and the other externally from the drum. While the motor is held from the speed controlling member 50, this holding action is not directly on the motor but through the equalizing device, comprising the floating member 54, having gear connection with the governor shaft so that it is held against rotation when the governor is locked. As the spring drum is turned in the direction of the arrows, Fig. II, the adjusting screws 56 on the ring 27 of the collar 24 abut against the arms 55 on the floating member 54 and initially move said member about, tensioning springs 51, this movement of the floating member and rings 27 continuing until the cam lever 39 engages one of the studs 40 on the gear 41 and rocks the lever. The rocking of the lever 39 effects movement of the cam 32 on its axis so that the heads of the cam engage the heads 31 of the spread-band 30 and move the band to contact with the ratchet band 33. As the band 33 is held against rotation in the direction of the arrows, Fig. II, by the pawl 36, the sleeve 7 is locked and continued operation of the crank winds the motor springs until they have been properly tensioned.

With the motor tensioned, when it is desired to operate the apparatus for which the motor provides motive power, the speed controlling mechanism or governor is released through the part 50, to permit the gear wheel 41 to revolve. As soon as the gear wheel is released, the stud 40 moves away from the cam lever 39 under the influence of springs 51 and the spread-band is released and moves away from the ratchet ring 33, thereby freeing the collar 24 so that the collar may revolve under tension of the spring motor and retension springs 51. The motor springs are considerably stiffer when the motor is wound to the maximum but reduces its proportional tension as the motor runs down, so that the thrust of the adjusting screws 56 on the arms 55 carries the floating member 54 about against the springs 51 and when the springs are tensioned carries the gear wheel 41 about its center, thereby operating the shaft 45 and any driven member that may be connected therewith. As the driving force of the motor springs exceeds resistance of springs 51, the ring 27 is advanced relative to the gear wheel 41 and would continue to advance until the motor and equalizer springs reach an equilibrium unless the motor springs were held. This holding is accomplished at a determined point in the expansion of the springs 51 by movement of the cam lever 39 against the stud 40; such engagement rocking the cam, as above described, to lock the ring 27 to the ratchet ring and lock the motor. While the motor is locked as described, the gear wheel 41 continues to move about this center under tension of springs 51 until stud 40 is carried away from the cam lever 39 and the motor again freed to effect a further driven or thrust operation. This action continues as the motor runs down, until the tension of the springs 51 equals that of the motor springs, at which point the cam 32 ceases to act and the springs 51 merely act as links between the gear wheel 41 and the floating member 54 and gear wheel 41 is thereby driven as if connected directly to the sleeve 7 of the motor.

When the speed control device 50 is opened, the governor is released and will revolve in proportion to the amount the speed control device is opened and operate any machine or mechanism driven from the shaft 45.

It will be noted, however, that as the governor is revolved from the gear 41, the gear receives its tension from the springs 51 and not from the spring motor, and that when the spread-band 30 is loosened, the spring motor is permitted to revolve sufficiently to re-tension the springs 51, whereupon the arm 39 again moves against the stud 40 to lock the motor on the ring 33.

As this movement is self-contained and substantially constant, it is apparent that irrespective of how fast the motor unwinds or how fast the power is taken off, the pressure on the shaft 45 will be constant. It is also apparent that the result will be the same if the governor is not connected in train and the shaft 45 coupled to an intermittent movement wherein it is desirable to have a constant even tension maintained at all times.

With some machinery, it is desirable or necessary to reverse the action for a short period, and in order that this feature may be accomplished without extra mechanism, I have provided the ratchet teeth 35 on the ring 33 so that if the shaft 45 and adjacent gearing is reversed, the stud 40 will move against the arm 39 and turn the ring 33 backwardly so that the pawl 36 will engage another tooth among the teeth 35 and maintain the same conditions.

It is apparent that during the reverse movement, the equalizer turns as a unit and tends to rewind the spring motor to a greater tension so that nothing is lost and all the revolutions of the motor may be counted as applied to the forward movement of the shaft 45.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent is:—

1. In combination with a variable driving member, a driven member, and flexible connection between the driving member and driven member for maintaining constant tension on the driven member irrespective of variations in power of the driving member and comprising means for adjusting the tension of said connection, said connection being under control of the driven member to retard the driving member.

2. In combination with a motor and a driven member, an equalizer comprising a driving member operatively connected with the motor, a floating member operatively connected with the driving member, yielding means connecting the floating member with the driven member, a brake for the driving member, and means operable from the driven member for setting the brake.

3. In combination with a spring motor and a gear train, an equalizer comprising a driving member operatively connected with the motor, a floating member operatively connected with the driving member, a gear meshing with the gear train, springs connecting said gear and floating member, a brake for said driving member, and a cam operable from said gear for setting said brake.

4. In combination with a driven element, transmission operably connected with the driven element comprising a driving member having stops thereon, a brake ring, a motor, a brake band connected with the motor, a floating member operably connected with the motor, springs connecting the floating member with said stops to tension the transmission, and band actuating means movable with the motor and adapted for engaging one of said stops to actuate the brake member and stop the motor.

5. In combination with a driven element, driving mechanism for the driven element including a wheel having laterally projecting studs, a motor comprising annular rails, a brake ring on said rails, an expansible brake band arranged for locking engagement with the ring and having a contact arm for engaging a wheel stud, a floating ring having stop members thereon, springs anchored to the floating ring and to the studs on the transmission wheel, and means on the motor for engaging the ring stops to tension the springs.

6. In combination with a driven element, actuating mechanism for the driven element comprising a transmission, studs on one of the transmission members, a motor comprising a drum having spaced rails, a floating ring anchored to the rails, means for holding the ring against travel with the motor, a split brake band mounted on the motor between the rails and having spaced contact heads, a lever having a head pivotally mounted between the brake band heads and having an arm for engaging the wheel stud, a floating member having stop members, springs connecting the floating member with the wheel studs, and adjusting screws fixed to the motor and engaging the stop members to advance the floating ring when the motor is released.

7. In combination with a spring motor, a gear train and a supporting frame, an equalizer comprising a driving member operatively connected with the motor, a ring surrounding said driving member and locked to said supporting frame, a brake band on said driving member, a cam in said driving member adapted to expand said band against said ring, a lever on said cam, a gear opertively connected to said gear train, laterally directed studs on said gear, one of which is adapted to engage said cam lever, a floating member having driving engagement with said driving member, springs connecting said gear studs and said floating member, and means for tensioning said motor to lock said brake.

8. In combination with a spring motor, a gear train and a supporting frame, an equalizer comprising a driving member operatively connected with the motor, a brake ring surrounding the driving member, means for locking the brake ring to the frame, a brake band on said driving member, means for expanding said brake band against said brake ring to lock the motor, a gear operatively connected with the gear train and adapted to actuate said expanding means, a floating member adapted to be driven from said driving member, springs connecting said floating member with said gear, and means for releasing said gear train to release said brake and tension said springs.

9. In combination with a spring motor, a gear train and a supporting frame, an equalizer comprising a driving member, lugs on said driving member, adjusting screws in said lugs, a floating member contacting said adjusting screws, a gear operatively connected with the gear train, springs connected with said gear and with said floating member, and means operable from said gear for locking said driving member to said frame.

10. In combination with a spring motor, a gear train and a supporting frame, an equalizer comprising a driving member, a floating member, a gear operatively connected with the gear train, springs connecting said gear and floating member, adjusting screws on the driving member for driving said floating member and tensioning said springs, and means operable from the gear for locking said driving member to said supporting frame.

11. In combination with a spring motor, a gear train and a supporting frame, an equalizer comprising a driving member operatively connected with the motor, a brake on the driving member, a ring surrounding the brake and having a plurality of external ratchet teeth, a yieldable pawl in said frame for engaging said ring teeth, a floating member operatively connected with said driving member, a gear wheel in said gear train, springs connecting said floating member with said gear wheel for locking said driving member to said ring and holding the motor and whereby the equalizer may be turned backwardly as a unit to wind the spring motor.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN H. PIERSEN.

Witnesses:
W. H. METZDORF,
F. KENNEDY.