

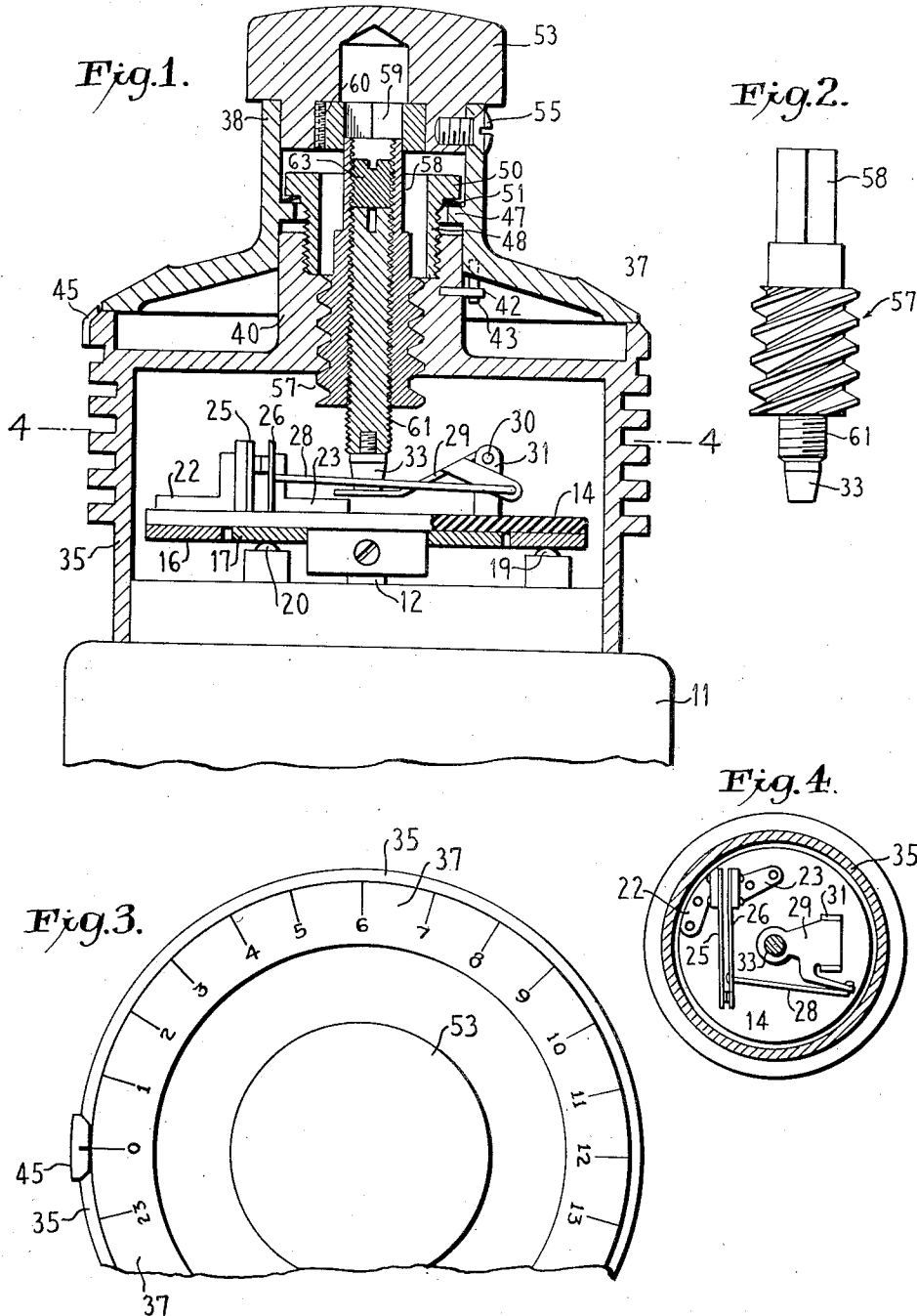
March 22, 1938.

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2,111,960

MOTOR GOVERNOR SPEED ADJUSTMENT

Filed March 18, 1936



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2,111,960

MOTOR GOVERNOR SPEED ADJUSTMENT

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Application March 18, 1936, Serial No. 69,471

3 Claims. (Cl. 200—30)

This invention relates to speed control devices for electric motors, and more particularly to speed adjustment apparatus for centrifugal governors. Such governors have proved themselves very satisfactory for operating small motors at uniform speed. The governors are adjustable to change the amount of centrifugal force required to operate them, with a corresponding change in the speed at which the motors run.

The invention has for its object to provide improved speed control apparatus of the type having a centrifugal governor, and comprises novel features and combinations of elements that make the apparatus easier to set for a desired motor speed and more reliable and convenient in use.

In accordance with one feature of the invention the motor governor can be adjusted for a given speed before the motor is started. With centrifugal governors of the prior art it has been necessary to start the motor and then adjust the governor by trial and error until the desired speed was reached.

This invention not only provides simple and reliable means for adjusting the governor before the motor starts, but it has the important advantage of being applicable to existing motor governors.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawing, forming part hereof:

Fig. 1 is a sectional view through speed control apparatus made in accordance with this invention;

Fig. 2 is a detail view showing a portion of the structure of Fig. 1 in elevation;

Fig. 3 is a fragmentary plan view of the apparatus shown in Fig. 1; and

Fig. 4 is a reduced sectional view taken at the level of the line 4—4 of Fig. 1.

Fig. 1 shows one end of a motor 11 having an upwardly extending armature shaft 12. A circular plate 14 is made of insulating material and secured to the upper end of the motor shaft 12. Two concentric conductor rings 16 and 17 are fastened to the under side of the plate 14. Brushes 19 and 20 are urged against the rings 16 and 17, respectively, by springs which are not shown in the drawing but well understood in the art.

Two brackets 22 and 23 are fastened to the top of the plate 14 and are electrically connected with the conductor rings 16 and 17, respectively.

Spring blade arms 25 and 26 are secured to the brackets 22 and 23 and have contact points at their ends which normally touch each other.

The movement of the contact point end of the arm 26 in one direction is limited by a link 28 connected to the short arm of a bell-crank lever 29 which is supported by a pivot connection 30 with a bracket 31 fastened to the plate 14. Upward movement of the long arm of the bell-crank lever 29 is limited by a tip 33 of the governor adjustment apparatus.

When the motor is running, the contact ends of both arms 25 and 26 tend to move away from the center of rotation by centrifugal force. The ends of the arms 25 and 26 which are secured to the brackets 22 and 23 are fixed with respect to the plate 14, and the arms must therefore bend as the contact points move away from the center of rotation. These arms being of spring material permit the contact points to move further from the center of rotation as the speed of the motor increases and the centrifugal force becomes greater.

When the arm 26 moves out as far as the link 28 will permit, a further increase in motor speed causes the arm 25 to move away from the arm 26 to break the circuit through the governor. The arms 25 and 26, therefore, comprise a switch that is opened by centrifugal force at a certain motor speed. At least a portion of the current which runs the motor passes through the arms 25 and 26, and the power and speed of the motor drop when these arms move apart and break the circuit. A showing of the motor circuits is not necessary for a complete understanding of this invention. Such circuits may be found in Patent No. 1,767,146, dated June 24, 1930.

The rotating parts of the governor are enclosed in a structure or housing 35 fastened to the end of the motor frame. In applying the invention to centrifugal governors of the prior art, the housing 35 replaces the old governor housing. A dial 37 has a sleeve portion 38 which fits over the upper part of a central boss 40 at the top of the housing 35. The dial 37 turns on the boss 40 as a bearing, but its rotation is limited to one revolution by a pin 42 extending from the boss 40 in position to contact with a pin 43 protruding downward from the under side of the dial 37. The dial 37 is graduated, as shown in Fig. 3, and the reason for limiting the movement of the dial to a single revolution is to prevent the governor from having more than one adjustment corresponding to each graduation on the dial. Such a condition would make the invention less

reliable in shop use, because of danger of confusion.

A pointer 45 is attached to the side of the housing 35 near the periphery of the dial 37. The graduation on the dial 37 in register with the pointer 45 indicates the adjustment of the governor.

The sleeve portion 38 has an inside flange 47 extending over the upper end of the boss 40. A bushing 48 threads into the boss 40 and has a flange 50 which presses a spring 51 against the inside flange 47. The spring holds the dial 37 against the upstanding peripheral edge of the housing 35 with such force that the friction between the dial and housing prevents the dial from turning easily enough to be displaced by vibration from the motor.

The dial 37 is turned by a knob 53 which fits into the upper end of the sleeve portion 38 and is held in place by a set-screw 55.

A lead screw 57 threads through the boss 40. Since this lead screw must advance far enough to adjust the governor over its entire range in one revolution, the lead screw is provided with a triple thread. The upper portion 58 of the lead screw 57 is of reduced hexagonal section and extends into an opening of similar cross-section in a bushing 59. This bushing is held in a recess in the knob 53 and is prevented from rotating with respect to the knob by a set-screw 60.

The hexagonal portion 58 of the lead screw slides in the bushing 59 as the knob 53 is turned to move the lead screw 57 toward or from the bell-crank lever 29, and it is not necessary, therefore, to have the knob 53 or dial 37 move axially with respect to the housing 35. This is advantageous because the dial 37 does not move away from the pointer 45. Such a movement would introduce the danger of parallax errors in setting the dial.

The tip 33 which bears against the bell-crank lever 29 is made of fiber or other long-wearing insulating material and is threaded into and cemented to the lower end of a pin screw 61, which threads into an opening through the lead screw 57. The pin screw 61 has a slot at its upper end for receiving a screw driver when making a zero adjustment of the apparatus. To make such an adjustment, the dial 37 is turned to bring the zero graduation, or any other desired graduation, into register with the pointer 45, and the pin screw 61 is turned, while the motor is running, until the motor rotates at the desired speed for that setting of the dial. The pin screw 61 is then locked in its set position in the lead screw 57 by a lock screw 63 which threads into the opening through the lead screw and jams against the pin screw 61.

The graduations on the dial may be made at positions which correspond to given motor speeds after the dial settings for those speeds have been determined by tests. I prefer to graduate the dial beforehand, however, with a uniform scale such as shown in Fig. 3. Each motor and governor is then tested and a card made giving the motor speed for each graduation on the scale. A separate card is made for every governor because centrifugal governors are not uniform enough for speed tests on one to be used in de-

termining the adjustment of another. After a card has been made for a particular motor and governor, the governor can thereafter be set at the graduation indicated by the card for any desired motor speed before the motor is started. Loss of time adjusting speed by trial and error is done away with, and more reliable speeds are obtained because it is practical to take enough time to determine the speeds accurately when making out governor setting cards for this invention, but the determination of speed by trial and error for each particular job is inconvenient and time consuming and if often not done carefully enough to obtain the correct motor speed.

The preferred embodiment of the invention has been described, but it will be understood that changes and modifications can be made without departing from the invention as defined in the claims.

I claim:

1. The combination with a centrifugal governor for controlling the speed of an electric motor, of adjustment means for changing the speed at which the governor becomes effective, a fixed structure covering the governor, said structure having an opening with threads along at least a portion of the opening, a lead-screw extending through said opening with threads fitting those of the opening, the lead-screw being so disposed that its longitudinal movement operates the governor-adjusting means, a bearing on the fixed structure, a dial and pointer, one of which turns on said bearing and the other of which is attached to the fixed structure, and a sliding connection through which the element that turns on said bearing transmits rotation to the lead-screw without partaking of the longitudinal movement of the lead-screw.

2. The combination with a centrifugal governor having a governor adjustment means, of a fixed structure covering the adjustment means, a lead-screw threaded through an opening in the fixed structure with one end of the screw controlling the setting of the governor adjustment means, a bearing on the fixed structure, indicating devices including a dial and a pointer, one of which turns on said bearing, means holding the indicating device on said bearing against longitudinal movement, and a telescoping connection that transmits to the lead-screw any rotation of the indicating device that turns on said bearing.

3. The combination with an electric motor governor of the class having a lever which is movable to determine the speed at which the governor becomes effective, of a fixed structure covering the lever and having a boss in which is a threaded opening, an adjusting screw threading through said opening and contacting with the lever to control the setting of the governor, a dial with a central portion that fits over the boss as a bearing, limit means which hold the dial against longitudinal movement on the boss, a knob connected with the dial, and a telescoping connection between the knob and adjusting screw including a non-circular end on the adjusting screw freely fitting into a recess in the knob.

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