

Oct. 4, 1955

R. H. TULL

2,719,945

ELECTRIC MOTOR SPEED CONTROL MECHANISM

Filed Nov. 13, 1951

2 Sheets-Sheet 1

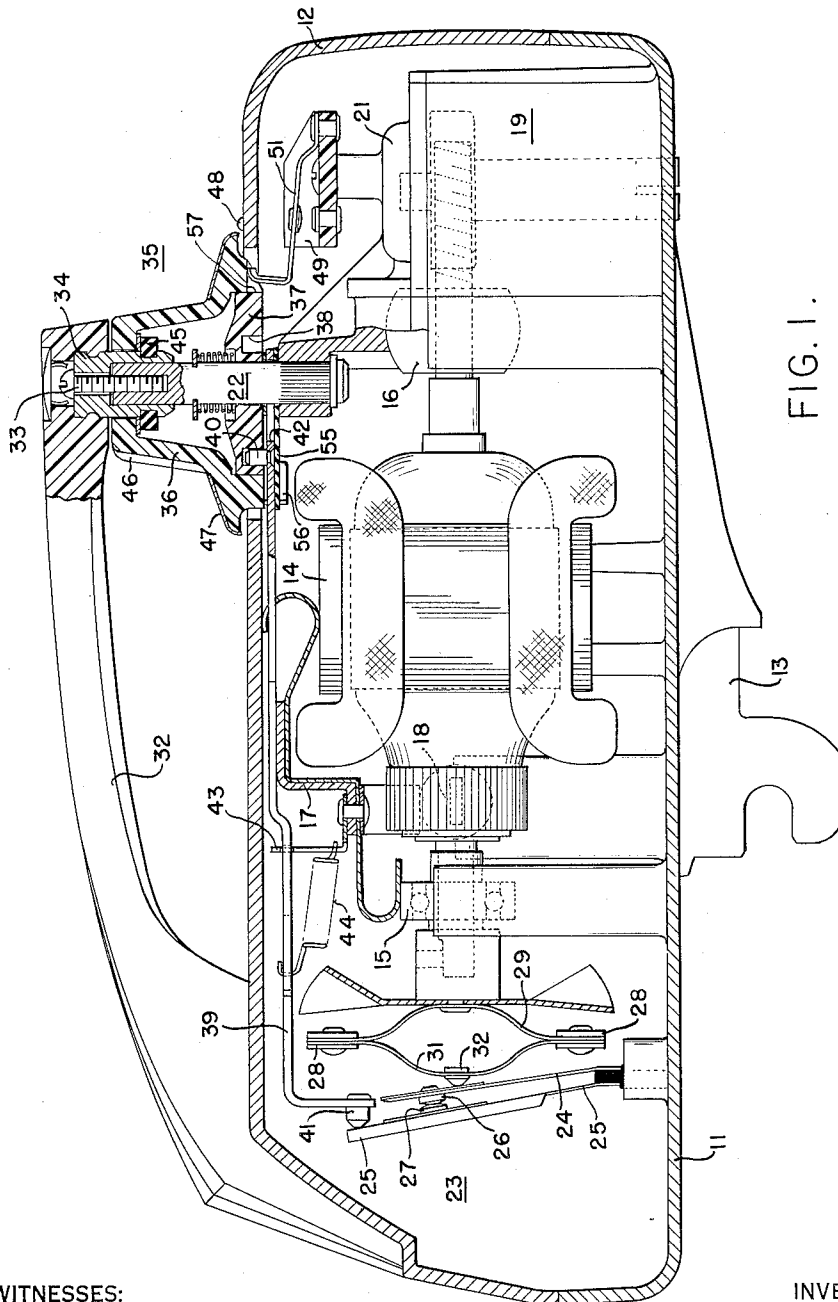


FIG. 1.

WITNESSES:

V. W. Navak

INVENTOR
Robert H. Tull

BY *R. J. Eisinger*
ATTORNEY

Oct. 4, 1955

R. H. TULL

2,719,945

ELECTRIC MOTOR SPEED CONTROL MECHANISM

Filed Nov. 13, 1951

2 Sheets-Sheet 2

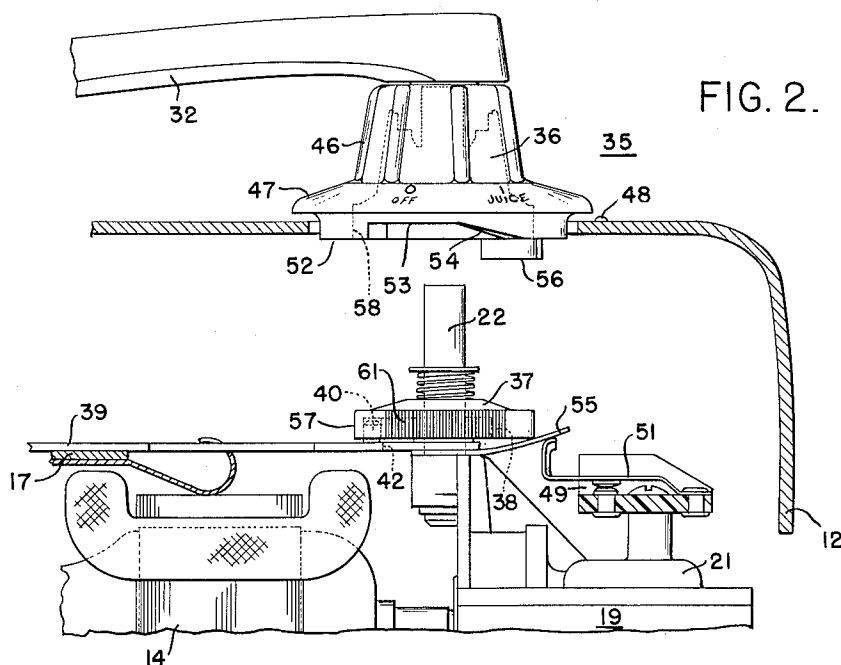


FIG. 2.

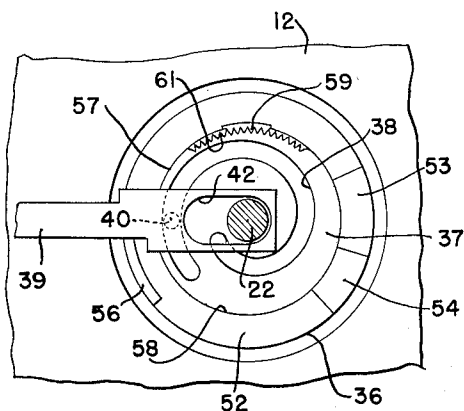


FIG. 3.

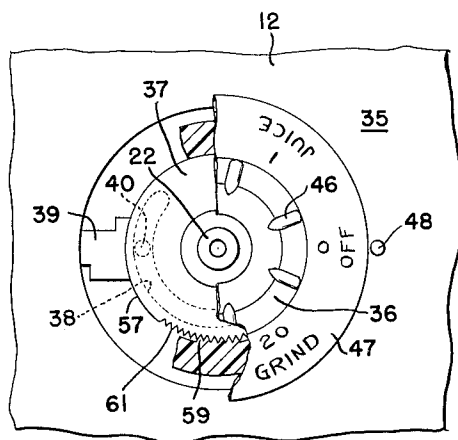


FIG. 4.

WITNESSES:

U. W. Novak

INVENTOR
Robert H. Tull

BY *R. J. Eisinger*
ATTORNEY

1

2,719,945

ELECTRIC MOTOR SPEED CONTROL
MECHANISM

Robert H. Tull, Wilbraham, Mass., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application November 13, 1951, Serial No. 256,060

4 Claims. (Cl. 318—325)

My invention relates to a control mechanism that includes a regulating mechanism and a manually operated knob or the like movable to several different positions to adjust the regulating mechanism to different settings and movable to still another position, designated an "off" position, in which operation of the controlled device is terminated. It is particularly applicable, for example, to a speed control mechanism for a food mixer motor.

The object of the invention is to provide improved means for effecting adjustment between the manually actuated member and the regulating mechanism.

In the preferred embodiment of my invention, I provide a manually operable knob which comprises an outer part and an inner part telescoped within the outer part. The outer part and a stationary member have indicia designating an "off" position and a plurality of operating positions, and the outer part has a cam which is adapted to open the circuit when the knob is in the "off" position. The inner part has a cam surface for adjusting the setting of the regulating mechanism. The inner and outer parts of the knob have interlocking portions or teeth whereby the inner part can be inserted in the outer part in any one of several relative positions, said interlocking portions preventing relative rotation of the inner and outer parts from the relative position in which they are assembled.

Also, in the preferred embodiment, the inner part is mounted so that it is operable to adjust the setting of the regulating mechanism and the controlled device is adapted to be operated even though the outer part is removed. Thus, the inner part may be rotated until the condition, such as speed, corresponding to one of the indicia is obtained. The outer part is turned to the rotative position designated by such indicium and telescoped over the inner part. The inner and outer parts of the knob are thus assembled in proper relative position to provide the setting of the regulating mechanism called for by the indicium at which the knob is positioned.

The above and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a longitudinal vertical section of an electric motor used in a food mixer and provided with a speed control mechanism in accordance with my invention;

Fig. 2 is an exploded view showing the parts which carry the two parts of the knob spaced from each other;

Fig. 3 is a bottom plan view of the control knob; and

Fig. 4 is a top plan view of the control knob, with parts broken away.

Referring to the drawings in detail, I show an electric motor which is used in a food mixer and which is enclosed within a casing having a lower part or base 11 and an upper part or cover 12. The base 11 may be provided with an extension 13 for pivotally connecting the motor to the pedestal of the mixer base. The motor parts are mounted on the lower part 11 and the motor is adapted to operate while the cover 12 is removed. The stator 14

2

and the bearing 15 are held against their seats formed in the base 11 by a spring structure 17 which is fastened to the base at 18, as more fully disclosed in Ritter Patent No. 2,469,932. A reduction gear casing 19 is formed partly by a member integral with the base 11 and partly by a gear case cover 21, which also serves to retain the shaft bearing 16 against its seat. A post 22 is fastened to the gear case cover 21 in permanent fixed relation and extends upwardly through an opening in the cover 12.

A speed governor 23 is also mounted on the base 11 and includes contact-carrying arms 24 and 25, which are self-biased forwardly, or to the right as shown in Fig. 1, and which carry cooperating contacts 26 and 27 adapted to engage and disengage as the arms move toward and away from each other. The contacts are connected in the motor circuit in a known manner so that when they are open they interrupt the current to the motor either completely or partially to reduce the speed of the motor. The governor further includes centrifugal weights 28 carried by the connected ends of two oppositely bowed spring strips 29 and 31. The spring strip 29 is connected, at the center of rotation, to the motor shaft, and the spring member 31 carries an insulating button 32 disposed at the axis of rotation and adapted to contact and to actuate the arm 24.

A handle 32 is connected at its rear end to the cover 12. The front end is connected to the upper end of the post 22 by means of a screw 33 which extends through a thimble 34 fixed to the handle and which is screw-threaded into the upper end of the post 22.

The speed adjusting knob, to which this invention particularly relates, is shown at 35 and comprises an outer part 36 and an inner part 37, assembled in telescoped relation as shown in Fig. 1.

The inner part 37 is mounted for rotation about the post 22, and has a central circular opening through which the post 22 extends. The inner part has a spiral groove 38 formed in the lower face thereof for adjusting the speed setting of the speed governor 23. A slide bar 39 is provided to transmit motion to the governor, and it is provided with a pin or projection 40 which is received in the groove 38 and with a button 41 which bears against the contact arm 25. The bar 39 is provided with a slot 42 through which the post 22 extends, and it extends through an opening in a bracket 43, whereby the bar is mounted and guided for longitudinal sliding movement. A tension spring 44 may be provided to cause the pin 40 always to bear against the radially inner side of the groove 38, thereby avoiding change in speed setting by reason of lost motion of the pin in the groove.

The outer part 36 of the knob is of inverted cup shape and is rotatably mounted on the thimble 34 carried by the handle. The thimble extends through a circular opening in the top wall of the outer part 36, which is retained on the thimble by a ring 45. The outer part 36 includes an upper grip portion 46 and a lower flange portion 47 which bears various indicia for the various positions. A projection or pointer 48 is provided on the cover 12, and the indicium adjacent the projection 48 designates the position of the knob. On the bottom, the outer part is formed with a cam surface that actuates a line switch 49 including a spring arm 51 which carries the movable contact. The switch 49, when open, completely interrupts the supply of electric current to the motor regardless of the contacts 26 and 27. The cam surface, as shown more particularly in Fig. 2, includes a portion 52 of uniform height and a recess or lower portion 53 connected by an inclined portion 54. The recess 53 of the cam surface and the "off" indicia of the outer knob part 36 are in fixed relation such that when the knob is in the "off" position in which the "off" indicia is at the projection 48, the recess 53 is in alignment with the switch

3

arm 51 and permits the same to be in open position. When the knob is rotated to an operating position, the inclined portion 54 moves the lever 51 downwardly to close the line switch and the lower uniform surface 52 holds the line switch closed in all operating positions.

In order to hold the switch arm 51 down to close the line switch 49 while the outer knob part 36 is removed, there is provided a flexible arm 55 which is pivotally or rotatably mounted on the post 22 between the slide bar 39 and the gear case cover 21. When the cover 12 is assembled, the arm 55 is swung to the left as shown in Fig. 1.

The outer knob part 36 is further provided with a downwardly extending projection 56 which is adapted to abut the bar 39 to limit the rotation of the knob to a value slightly less than 360 degrees, and thereby to prevent continuous rotation of the knob. The projection 56 is also useful in swinging the arm 55 to a position under the bar 39 after the cover is assembled.

Referring again to the telescoping relation of the knob parts as shown in Fig. 1, the inner part 37 has a convex cylindrical peripheral surface 57 (Fig. 3) which fits a concave cylindrical surface 58 in the outer part 36. In order to hold the inner and outer parts against relative rotation from the desired relative position, the outer part is provided with a plurality of teeth 59 which project radially inwardly from the concave surface 58, and the inner part 37 is formed with cooperating interlocking teeth 61 which are adapted to interlock or intermesh with the teeth 59. The spaces or recesses between adjacent teeth 59 are adapted to receive the teeth 61 of the outer part. The teeth 61 and the recesses therebetween are disposed within the cylinder defined by the cylindrical surface 57. Since the teeth 59 project inwardly of the cylinder defined by the surfaces 57 and 58, the inner and outer parts can be assembled only in a relative position in which the teeth 59 are within the angular extent of the teeth 61, so that they can be received within the recesses between the teeth 61. The number of teeth 61 is substantially greater than the number of teeth 59, so that a limited range of relative angular adjustment is thereby provided.

Operation

Operation of the speed governor will first be considered. Assume the slide bar 39 to be in a given position and the motor to be connected to a supply of electric current. As the motor increases in speed, the weights 28 draw the two spring arms 29 and 31 toward each other, and the arms 24 and 25 move to the right, as seen in Fig. 1, as they follow the button 32. As the arm 25 engages the button 41, it is held stationary, and upon further movement of the arm 24 accompanying continued increase in speed of the motor, the arm 24 moves its contact 26 out of engagement with the contact 27 to decrease the current supplied to the motor. The speed then decreases and the spring forces of the arms 29 and 31 cause them to separate. The button 32 then moves the arm 24 toward the arm 25 to re-engage the contacts, thereby energizing the motor. This cycle of energizing and deenergizing the motor is continually repeated so as to restrict the speed of the motor to a small range extending slightly above and slightly below a selected speed at which the contacts open and close.

As the slide bar 39 is moved to the right, away from the arm 25, the governor is adjusted to a higher speed setting, since a higher speed will be required to move the contact arm 24 out of engagement with the arm 25. Conversely, upon moving the slide bar 39 to the left against the arm 25, a lower speed setting is obtained, since a lower speed is required to bring the arm 24 into engagement with the arm 25. To increase the speed of the motor during use of the food mixer, the knob 35 is turned clockwise (counterclockwise as seen in Fig. 3). Upon such rotation of the knob, the slide bar 39 is drawn forwardly or to the right by engagement of the projec-

4

tion 40 in the groove 38, to increase the speed setting as just described. Upon rotation of the knob in counterclockwise direction (clockwise as seen in Fig. 3), the slide bar 39 is moved to the left by such engagement of the pin or projection 40 in the groove 38, thereby lowering the speed setting. Continued rotation of the knob to the "off" position brings the recess 53 into alignment with the arm 51, which is self-biased upwardly, and thereby opens the switch 49 to completely deenergize and terminate operation of the motor. To initiate operation of the motor, the knob is turned from the "off" position to one of the operating positions and as the inclined cam surface 54 passes over the lever 51, it depresses the same to close the switch 49, so that the motor is energized under control of the speed governor.

To provide adjustment between the speed governor and the speed adjusting knob, the cover 12 is removed and the arm 55 is swung into alignment with the arm 51 to depress the same to closed position. Suitable connection to a source of electric current being made as by the conventional cord and plug, the motor is now energized and operating. A tachometer is applied to the shaft and the inner knob part 37 is adjusted until a preselected speed, corresponding to one of the indicia and arbitrarily selected for test purposes, is attained. The arm 55 is then rotated to open the switch 49, while the inner part 37 is retained in the position at which the preselected speed was attained. The outer knob part 36 is rotated to bring the indicia which calls for the preselected speed opposite the projection 48, and the cover is then assembled to the base 11 and secured thereto by any suitable means (not shown), and the screw 33 is inserted to securely attach the handle 32 to the post 22. During such assembly, the group of teeth 59 of the outer knob part enter recesses between adjacent teeth 61, thereby providing an interlocking relation between the outer and inner parts that prevents their relative rotation. The inner and outer parts are now assembled and held in their proper relative position so that as the knob is rotated to the different operating positions, the desired speed of the motor is obtained. While only the preselected speed is individually adjusted, the variation in speed effected by rotation of the knob is adequately controlled by the design of the cam groove 38, so that substantially the correct or desired speed is obtained for each operating position of the knob.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What I claim is:

1. An electric motor comprising a casing having a lower section and an upper section or cover, a post mounted on structure supported by said lower section, said post extending upwardly through said cover, a handle attached at one end to said cover and at its other end to the upper end of said post, a manually operable control knob, including an upper part and a lower part, mounted for rotation about said post, said upper and lower parts of the knob having interlocking portions which permit the parts to be assembled in any one of several relative positions but interlock the parts against relative rotation, said knob parts being retained in assembled interlocked relation by and between said other end of the handle and structure supported by the lower casing section, each of said knob parts having a cam surface, and a line switch and a speed governor within the casing, said line switch being operated by the cam surface of one of said parts and the cam surface on the other of said parts adjusting the speed setting of the speed governor when the knob is rotated.

2. An electric motor comprising a casing having a lower section and an upper section or cover, a post mounted on structure supported by said lower section, said post extending upwardly through said cover, a handle attached

5

at one end to said cover and at its other end to the upper end of said post, a manually operable control knob mounted concentrically with said post and comprising a lower part rotatable about said post and an upper part rotatably supported by said other end of the handle, said upper and lower parts having interlocking portions permitting the parts to be assembled in any one of several relative positions but preventing relative rotation between the parts, each of said parts having a cam surface, a line switch and a speed governor supported on the lower casing section, said line switch being operated by the cam surface of said upper part and said cam surface on the lower part adjusting the speed setting of the speed governor when the knob is rotated, whereby there is provided a construction wherein said upper knob is assembled with said lower knob part in interlocking relation when the upper and lower sections of the casing are assembled as a unit.

3. The combination with an electric motor, of a speed control mechanism therefor including a rotatable manually operable knob which comprises an inner and an outer part, said parts being axially movable into and out of telescoping relation and having interlocking portions which permit assembly of such parts in any one of several relative positions angularly displaced from each other but which prevent relative rotation of said parts when they are in telescoped relation, each of said parts having a cam surface, means for mounting said inner part for rotation independently of the outer part, a speed governor operable to control the supply of electrical energy to the motor in response to the speed thereof, means including a cam follower actuated by the cam surface on said inner part for adjusting the speed setting of said speed governor, a line switch adapted to open the circuit to the motor, said line switch being adapted to be

6

actuated to closed position by the cam surface on said outer knob part, and other means normally disposed out of engagement with said line switch but movable into engagement therewith to hold the same in closed position when said outer knob part is removed, whereby said inner knob part may be adjusted to effect a predetermined speed setting of the governor while said outer knob part is removed to facilitate assembly of said knob parts in proper angular relation.

4. An electric motor comprising a casing having a lower part and an upper part or cover, a post mounted on the lower casing part and extending upwardly through said cover, a handle attached at one end to said cover and at its other end to the upper end of said post, a manually operable control knob mounted concentrically with said post and comprising an inner part mounted on said post and an outer part mounted on said handle, said inner and outer parts having interlocking portions permitting insertion of the inner part within the outer part in any one of several relative positions but preventing relative rotation when it is inserted, each of said parts having a cam surface, a line switch mounted on the lower casing part and operated by the cam surface of said outer knob part, a speed governor mounted on the lower casing part, and a connecting mechanism operated by the cam on said inner knob part for adjusting the speed setting of said speed governor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,262,306	Thompson	Nov. 11, 1941
2,557,765	Robertson	June 19, 1951
2,623,961	Holstein	Dec. 30, 1952