

Nov. 5, 1963

A. MULLER

3,109,950

AXIALLY MOVABLE ROTOR ASSEMBLY FOR ELECTRICAL MOTORS

Filed Feb. 9, 1961

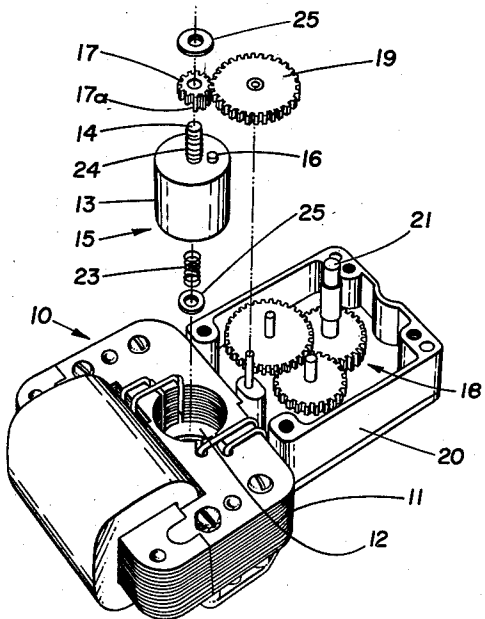


FIG. 1

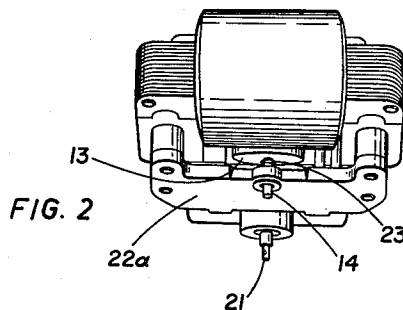


FIG. 2

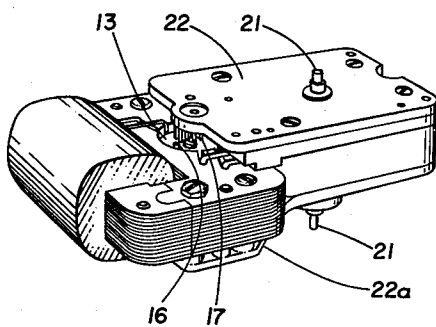


FIG. 3

Inventor

ALOIS MULLER

by: Cavanagh & Norman.

1

3,109,950

AXIALLY MOVABLE ROTOR ASSEMBLY FOR ELECTRICAL MOTORS

Alois Muller, Toronto, Ontario, Canada, assignor, by mesne assignments, to Opal Manufacturing Co. Limited, Toronto, Ontario, Canada

Filed Feb. 9, 1961, Ser. No. 88,107

3 Claims. (Cl. 310-83)

This invention relates to improvements in electric induction motors of the type having an axially-movable rotor assembly.

In electric motors of the type referred to, and as presently used, the rotor, when not energized, lies at rest upon a shaft suitably journaled to permit rotation, the rotor, in one embodiment being disposed partially within a portion of a laminated core and maintained in such a position either by the effect of the gravitational attraction on the rotor, or under the influence of a spring or other resilient means, dependent upon the operating position of the motor. For example, if the axial movement of the rotor assembly, when energized, is substantially vertically upward, the rotor will be maintained in its rest position by the force of gravitational attraction. If, however, the axial movement is substantially horizontally outward when energized, the rotor will be maintained in its rest position by means of a spring or other resilient means.

The invention herein relates to an improvement in a motor of the type described which is positioned to effect axial movement of the rotor assembly in a substantially vertically upward direction, when energized, wherein the return to the rest position of the rotor when de-energized is effected by gravitational attraction on the rotor assembly.

Many motors of this type in use having low power characteristics are affected by the mass of the rotor, which, due to its mode of manufacture is necessarily heavily constructed. The attendant gravitational attraction upon the rotor mass is such that upon a slight reduction of potential at the power source, due to external causes, the force causing the rotor assembly to move axially vertically upwards against gravitational attraction, is reduced, so that the rotor will not engage or effect motion of a work load because of the torque requirements under the decreased power conditions.

For the purposes of example, a shaded pole alternating current motor of the type described, when energized by a 110 volt A.C. supply, will function in the correct manner for the use intended. However, upon a power source fluctuation presenting a reduction of even two or three volts at supply, there is often insufficient power available to "lift" the rotor assembly into engagement with the work load, resulting in a malfunction of the device.

It has been found by incorporating a resilient support member for the rotor in the manner of the invention herein, that the desired functioning of the device has been accomplished under the same or similar load conditions when a voltage reduction to as low as 80 volts has been encountered.

It is therefore an object of this invention to provide a rotor assembly, for a motor of the type described, capable of being disposed into load-engaging position under conditions of decreased power supply.

It is another object of this invention to provide a rotor assembly biasing means interposed between the rotor and a stationary member to provide a resilient support of the rotor when the latter is in a position of rest.

It is a further object of the invention to provide a motor of the type described wherein the effect of the mass of the rotor is at least partially overcome during energization of the motor and consequent vertically upward movement of the rotor assembly.

2

Thus the invention generally concerns the provision of a resilient member positioned substantially in engagement with an axially movable rotor assembly of an electric motor which movement is responsive to energization or de-energization of the motor, and means seating the resilient member in position with respect to said assembly thereby to assist the axial movement of the assembly upon energization of the motor, and to flexibly support the assembly in a desired position upon de-energization of the motor.

A preferred embodiment of the invention is indicated in the drawings, in which:

FIGURE 1 is a partially exploded top perspective view of a motor generally of the class described with the reduction gear cover plate removed and indicating the relative positioning of the spring of the invention;

FIGURE 2 is an end perspective view of the under side of a motor generally of the class described partially indicating the position of the rotor in the rest position; and

FIGURE 3 is a view in perspective of the motor indicating the engaged position of the rotor assembly in the energized position of the rotor.

With reference firstly to FIGURE 1, an induction motor presently known is generally shown by the reference numeral 10 and comprises a laminated core 11 defining a bore 12 within which is rotatably inserted a rotor 13 on a shaft 14 journaled in a known manner within fixed portions of the motor body to permit rotation of the rotor on the shaft and limited axial movement of the rotor assembly, the latter generally shown by the numeral 15.

The rotor 13 may be fixed to the shaft for rotation therewith, or may rotate about the shaft. An extending stud 16 is positioned on the upper surface of the rotor for engagement with a gear 17 having at least one extending tooth 17a. The gear 17 is generally loosely fitted for rotation about the shaft 14 upon rotation of the rotor and is engageable with a gear reduction assembly generally indicated at 18, through gear 19 within a housing 20 affixed to the motor body. Shaft 21 is caused to rotate upon actuation of the reduction gear assembly to provide motion to an external work load, or directly, without the intervention of a reducing gear assembly.

The shaft 14, when positioned within the motor is suitably journaled within stationary members to permit rotation of the rotor and limited axial movement of the rotor and shaft assembly. The stationary members within which the shaft is journaled are shown in this type of motor as cover plates 22 and 22a, FIGURES 2 and 3.

The above description has been made to describe a motor of the general type to which the invention herein relates, however, it will be realized that the invention may be applied to types other than that specifically described.

It has been found, particularly when axial motion of the rotor assembly, when energized, is vertically upward, that a relatively slight potential decrease at supply will cause a malfunction of the device under certain load conditions and torque requirements.

This disadvantage has been largely obviated by the insertion of a spring 23 adjacent a surface of the rotor and bearing against a stationary member of the motor. The spring has been found to assist the rotor in its energized axial movement resulting in functioning of the device under the same load conditions as formerly encountered, under relatively greater potential decreases thus enabling an inexpensive motor to be utilized under formerly inoperative conditions.

In the embodiment shown, the spring 23 is positioned against the lower surface of the rotor 13 and seated within the lower cover plate 22a to form a resilient

3

supporting member for the rotor in a rest position. At rest, in the de-energized position, the rotor is positioned so that at least a portion thereof is disposed outside the bore 12 of the core 11 as shown in FIGURE 2.

Upon energization of the motor, the rotor commences rotation and tends, or attempts, to centre itself within the bore of the motor which tendency provides the motivation for limited axial movement of the assembly.

The vertically upward movement of the rotor causes engagement of the stud 16 with teeth 17a of gear 17, to induce rotation of the latter to actuate the reduction gear mechanism and thence the load shaft 21.

Upon de-energization of the motor the tendency of the rotor to centre itself within the bore 12 is eliminated and the rotor (while still coasting in rotation) immediately disengages from teeth 17a of gear 17 and returns axially to its rest position, resiliently supported by the spring 23 which is at least partially compressed by the weight of the rotor at rest.

The effect of spring or resilient support 23 is therefore to permit axial movement of the rotor assembly upon energization of the motor under conditions of decreased potential at the source of electrical supply. As indicated above, and for the purpose of example only, under given load conditions, a 110 volt A.C. motor without the aid of spring 23 will not function at less than 100 volts. However, after positioning the spring in the manner of the invention the motor under the same conditions will function at a decrease in potential to 80 volts, thus rendering the motor usable below the range of normal power fluctuation.

In FIGURE 1 a spring 24 (which forms no part of this invention) is shown positioned between the rotor and gear 17, and used when a motor of the class described is positioned so that axial movement of the rotor assembly including shaft 14, is substantially in a horizontal direction rather than substantially vertical as shown. Spring 24 is mainly placed to urge the rotor into a disengaged position upon de-energization of the motor, when the latter is positioned substantially at right angles to that shown in the drawings herein, in which case gravitational attraction does not provide disengaging motion to the rotor.

Springs 23 however, in accordance with the invention, permits the upward axial movement under the conditions hereinbefore described when axial movement is from the vertical to (say) substantially 45° from the vertical, wherein the mass of the rotor has a detrimental effect upon the function of the motor.

Washers 25, of nylon or other suitable material, may be used adjacent the shaft journals as bearing members

4

as shown in FIGURE 1 and particularly to aid in the seating of the resilient support of the invention.

It will be realized that the invention herein is not to be restricted to the exact embodiment shown and described but rather the invention is also pertinent to any modification thereof being within the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. An induction motor for driving a work load, the motor being energizable by a source of electrical supply and having an axially movable rotor assembly including a substantially vertical rotor shaft, the rotor being rotatable within said motor upon energization of the latter whereby upon axial movement in one direction the rotor engages a driving mechanism and upon axial movement in the other direction, the rotor is disengaged from the driving mechanism, said motor comprising in combination: stationary motor frame members; rotor motion inducing members operable upon energization of the same; rotor assembly motion limiting members; journals within said limiting members for maintaining the rotor assembly in position for rotation of the same and permitting limited axial movement of the rotor responsive to energized and unenergized conditions of the motor; a resilient rotor support member positioned between the rotor and a limiting member, said support member on the lower side of said rotor remote from said driving mechanism maintaining the rotor in its limited position at rest said support member being compressed by the weight of the rotor; and seating means within said motor for maintaining the resilient support member in position.

2. An induction motor as claimed in claim 1 wherein the resilient rotor support member comprises a compressible spring member whereby the latter exerts a biasing force opposite to the force exerted by the weight of the rotor at the rest position of the rotor.

3. An induction motor as claimed in claim 1 wherein the seating means for maintaining the resilient support member in position comprises a frame member and a surface of the rotor, the resilient support member being coaxially positioned with respect to a portion of the rotor shaft in said position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,760,092	Gavlinski	Aug. 21, 1956
2,978,621	Martinek	Apr. 14, 1961

FOREIGN PATENTS

1,038,600	Germany	Sept. 8, 1960
-----------	---------	---------------