No. 706,317. Patented Aug. 5, 1902.

A. B. HOLSON.

ELECTRIC MOTOR.

(Application filed Nov. 4, 1901.)

(No Model.) 2 Sheets—Sheet 1.

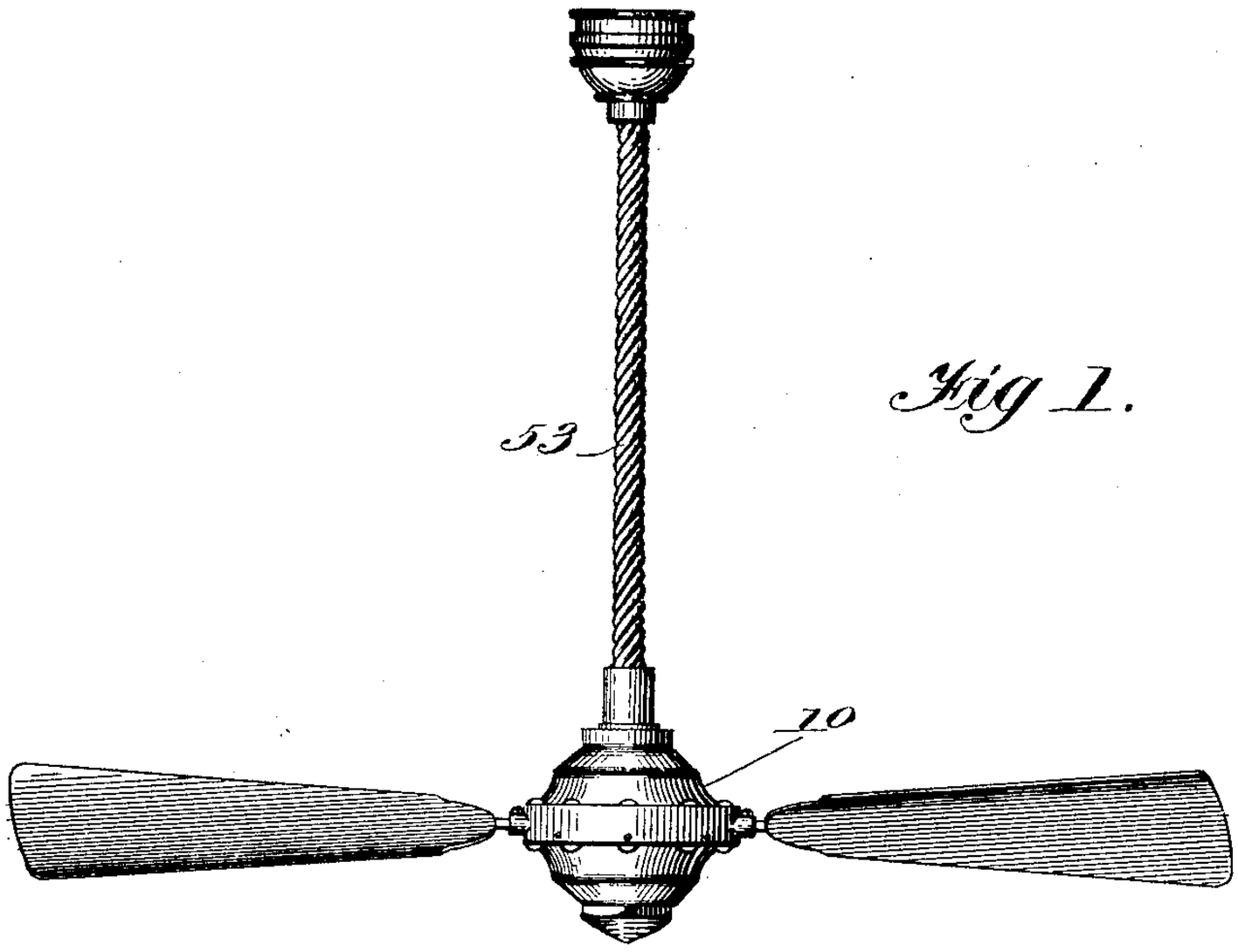

Fig. 1.

Fig. 2.

Fig. 3.

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Fig. 3.

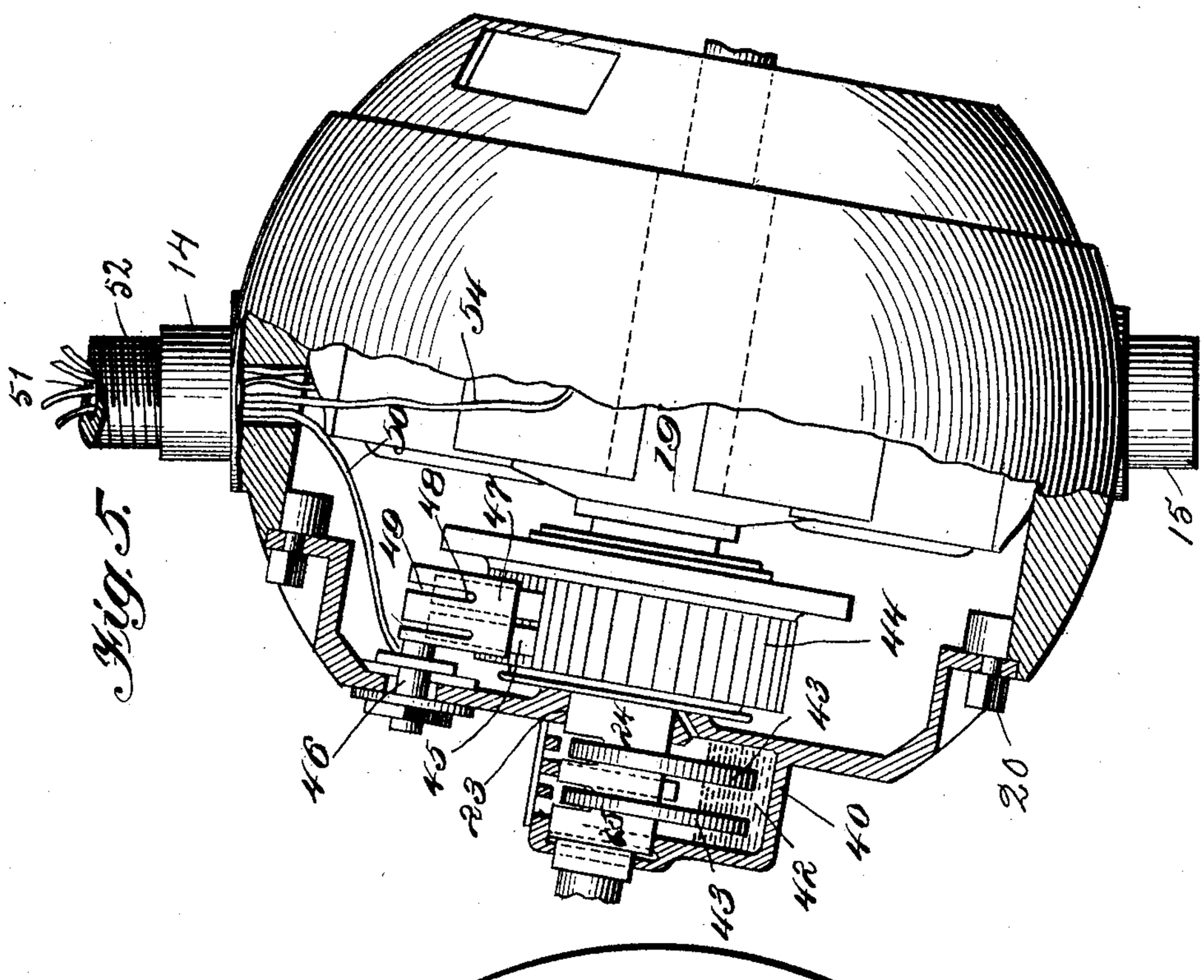
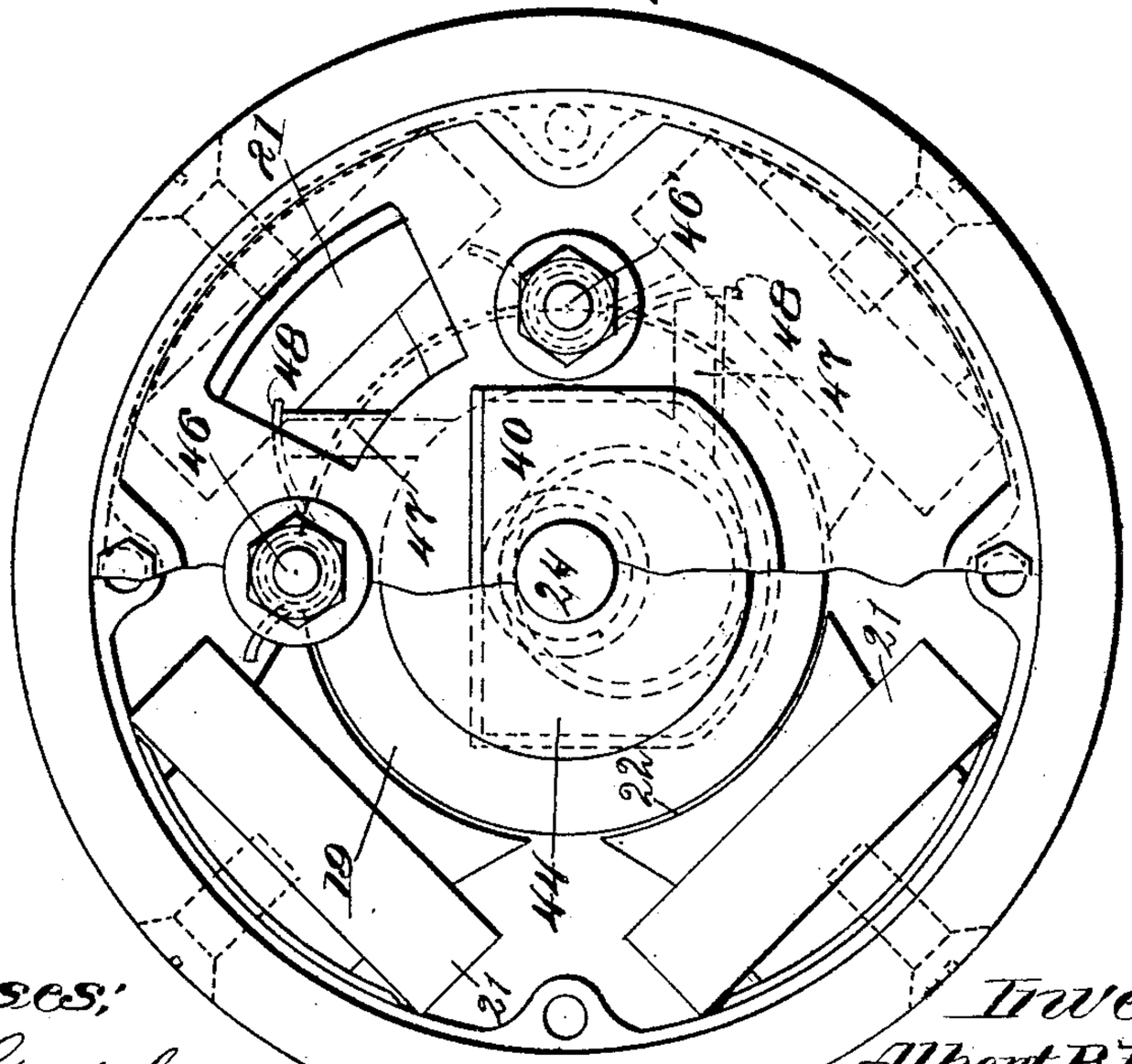


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALBERT B. HOLSON, OF CHICAGO, ILLINOIS.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 706,317, dated August 5, 1902.

Application filed November 4, 1901. Serial No. 81,070. (No model.)

To all whom it may concern:

Be it known that I, ALBERT B. HOLSON, a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electric Motors, of which the following is a specification.

This invention relates to improvements in electric motors, and has reference more particularly to improved means of transmitting the driving moment from the armature to a surrounding member rotatable relative thereto.

The present invention is in the nature of an improvement upon a prior invention of mine set forth in an application filed by me in the United States Patent Office July 15, 1901, Serial No. 68,374, the salient object of the present invention being to provide an improved construction and arrangement of the driving connections between the armature and element driven thereby.

Another object of the invention is to provide an improved electric fan which embodies as its principal mechanism the improved motor forming the principal subject of the present application.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a view in side elevation of an electric fan embodying my invention. Fig. 2 is an axial sectional view of the motor mechanism and inclosing shell, taken in the plane of the axis of the armature and showing the latter in elevation. Fig. 3 is a similar sectional view of a modified construction of rack-rings and the driving-pinion engaging the same. Fig. 4 is an end elevation of the armature and inclosing field-ring, parts of the motor-shell being broken away to show the arrangement of the field-pieces; and Fig. 5 is a view, partly in side elevation and partly in axial section, of the mechanism shown in Fig. 4.

Considered in its broader sense the present invention is not to be understood as in any wise limited to the particular application shown herein—to wit, the driving of an electric fan—but, on the contrary, may be adapted to numerous other uses. With this explanation in view I will describe the preferred embodiment illustrated in the drawings, in which—

10 designates as a whole an outer shell-like member or casing which in the present instance constitutes the rotary driven member of the motor and is made in the form of an approximately spherical or globe-like shell arranged to inclose the armature and commutator mechanism of the motor. At diametrically opposite points said shell is provided with journal portions 11 12, respectively, which are journaled upon the trunnion-like journal portions 14 and 15, respectively, of an inner stationary member, (designated as a whole 13,) bearing-rings or bushings 16 and 16′ being preferably interposed between the said bearing members. The stationary member 13 has the form of a ring-like frame or annulus, externally partispherical, so as to fit closely within the outer shell, and provided at each side with closing-caps 17 and 18, which, together with said annular member, form a substantially complete inner casing, within which is mounted the armature proper, (designated as a whole 19.) The end caps 17 and 18 are removably attached to the stationary ring member 18, being conveniently bolted thereto, as indicated at 20.

The armature 19 may be of any suitable type, that shown herein being externally cylindric, while the field-pieces 21, which are rigidly supported upon the interior of the stationary ring 13 at regular intervals apart, as shown clearly in Fig. 4, are correspondingly hollowed at their inner sides, as indicated at 22, to approach as nearly as possible the armature without interfering with the movement of the latter, there being four of said field-pieces in the present instance which are accordingly arranged at ninety degrees apart.

The bearings 23, within which the ends of the main shaft 24 of the armature are mounted, are formed directly through the end walls or caps 17 and 18 of the motor-casing, as best indicated in Figs. 4 and 5, the armature-shaft being arranged to extend at both ends through and beyond said end walls and being provided at each end with a driving-pinion, respectively designated 25 and 26, which pin-

ions are arranged to engage with annular gears or driven members 27 and 28. In this connection it is to be observed that the axis of the main shaft of the motor is arranged in such relation to the journal portions 11 and 12 of the rotary shell as to extend transversely across the interior of the shell in a plane nearly at right angles to the axis of rotation of the shell, but inclined sufficiently from a right angle to cause the driving-pinions 25 and 26 of the shaft to respectively engage the two annular gears or driving members 27 and 28 at diametrically opposite points, notwithstanding said gears are separated from each other a substantial distance, as indicated clearly in Figs. 2 and 3. Inasmuch as the outer rotary shell is journaled upon the fixed member 13 and the armature is journaled within said fixed member it will be obvious that the armature-shaft is supported in fixed relation to the shell and driving-gears carried thereby, the outer shell being free to rotate under the driving moment of the armature. In the present instance the driving engagement between the pinions 25 and 26 and annular gears 27 and 28 is a frictional drive, and the pinions 25 and 26 are therefore made of or covered with suitable friction surfacing material and the engaged surfaces of the gear members 27 and 28 correspondingly finished to coöperate with said pinions.

The members 27 and 28 are rigidly mounted within the upper and lower halves of the outer shell, respectively, said shell being to this end made of two-part construction, so as to separate approximately in the plane of the axis of the armature and the gear-rings being seated in suitable annular rabbets 29 and 30 and held immovably in position by means of series of screws 31 and 32, inserted through the respective shell members and threaded into the gear-rings, as indicated clearly in the drawings.

In order to vary the tension or force with which the pinions are held in operative engagement with the gears driven thereby, I provide means for adjusting one member of the shell relatively to the other, so as to vary the distance between the engaged faces of the gears. To this end one of the shell members—in the present instance the upper one—is provided at that edge which joins with the meeting member with an internally-cylindric threaded portion 33 and the lower member is provided with a corresponding externally-threaded cylindric portion 34, adapted to fit therein. Obviously by adjusting the lower shell upwardly more or less within the upper shell the distance between the facing racks will be correspondingly varied, and inasmuch as the armature-shaft, as hereinbefore explained, is held in fixed relation to the inner motor-casing or stationary member the result will be to vary the bearing-pressure between the pinions and their respective gears. In order to lock the shell members in adjusted relation to each other, set-screws 35 are conveniently provided, which are threaded through the overlapping portions of the upper shell member and engage at their inner ends the lower shell member. In this connection it is to be noted that sufficient space is provided between the lower end of the lower trunnion-like bearing or journal 15 and the lower shell member to provide for the necessary adjustment hereinbefore described, as indicated at 36.

The blades or vanes of the fan are conveniently secured to the periphery of the upper shell member by means of shanks 37, which are provided upon the vanes and are seated in radially-disposed sockets 38, formed upon the periphery of the shell. The shanks 37 are conveniently held rigidly within their respective sockets by means of set-screws 39.

The extended ends of the armature-shaft outside of the end caps or walls of the inner motor-shell are inclosed in extensions or housings 40 41, respectively, which are internally enlarged at the lower sides of the shaft to form oil-cups 42, adapted to contain supplies of oil. In order to convey a continuous supply of oil from said oil-cups to the shaft of the armature, rings 43 are mounted loosely upon said shaft, which are of considerably-larger diameter than the shaft and are arranged to depend within the respective oil-cups, the rotation of the shaft serving to rotate the rings, and thus carry a continuous supply of oil upwardly to the shaft. The rings are suitably spaced by means of collars 24 and 25 upon the shaft, as indicated clearly in Fig. 5.

Upon the armature-shaft at a point inside of one of the end caps is mounted a commutator 44, composed of a plurality of segments insulated from each other and from the shaft in the usual manner, which segments are severally connected with the winding of the armature. The commutator-brushes 45 are mounted upon the end cap member 17, adjacent to the commutator, so as to be removable with said cap. To this end 46 46′ designate fixed studs mounted to project upon the interior of the said end cap—in the present instance at points separated from each other an angular distance of ninety degrees—and upon the inner ends of said studs are mounted brush-holders 47. These brush-holders in the preferred embodiment shown herein consist simply of fixed guides or sockets arranged to extend approximately tangential to the commutator-hub, within which are arranged to slide the commutator blocks or brushes 45, which are desirably of carbon and bear at their inner ends against the commutator-hub. Said brushes are held yieldingly in contact with the commutator by means of springs 48, working through suitable channels or slots 49, formed in the brush-holders, as indicated clearly in the drawings.

The pair of conductors 50 connecting the

motor with the source of current are respectively connected with the studs 46 and 46′ and extend thence out through a passage 51, formed to extend axially through the upper journal portion 14 of the inner motor-shell or fixed member, as indicated clearly in Fig. 5. Said journal portion 14 is conveniently provided with an externally-threaded extension 52, which in practice will be connected with a suitable support 53, which will be provided with an axial passage to accommodate the conductors leading to and from the motor. Another pair of conductors 54 is arranged to supply current to the field-windings of the motor, these conductors being likewise arranged to extend out through the passage 51, also as shown clearly in Fig. 5.

Each member of the outer shell 10 is desirably constructed with removable sections, as 55 56, respectively, which constitute doors through which access may be had to the interior of the shell without separating the members thereof. These removable sections 55 and 56 are conveniently made approximately circular in outline and seated within suitable rabbets, as indicated at 57, and held in position by means of screws 58, as best indicated in Fig. 2.

The operation of the motor constructed as described is probably entirely obvious, but may be briefly recapitulated. The several parts having been properly assembled and adjusted, the admission of current to the motor through the electrical conductors connected therewith causes the armature to revolve within the inner fixed shell, thereby through its armature-shaft and pinions 25 and 26 imparting rotation to the gears or friction-rings 27 and 28 and the shell within which the latter are mounted. Should it be desired to increase the bearing-pressure between the pinions and their respective gears, so as to prevent slipping, this is accomplished by simply loosening the set-screws 35 and adjusting the lower outer shell member upwardly within the upper shell member, thereby approaching said annular gears relatively to each other and correspondingly increasing the bearing engagement between the gears and their respective pinions.

The construction of the motor is such that it can be readily assembled and taken apart, and access can be had for oiling and inspection by simply opening the doors or removable sections 55 and 56.

In describing the present invention I have used the terms "gears" and "pinions" in describing devices which have frictional driving engagement with each other only, and I wish to be understood as using said terms generically and as applying to either frictionally-engaged elements, such as hereinbefore described, or to racks and pinions.

It will be obvious that a positive driving engagement, such as is afforded by a rack and pinion, might be readily substituted for the frictional drive described herein, and in Fig. 3 I have shown a pair of annular racks constructed precisely like those hereinbefore described in connection with the motor, with the exception that they are provided with rack or gear teeth 59 upon their proximate faces adapted for positive driving engagement with correspondingly-toothed pinions 60, mounted upon the armature-shaft 24. Such racks and pinions may obviously be substituted for the frictional drives when it is desired to secure a positive driving engagement between the armature and the part driven thereby. In this connection it will be equally obvious that the same features of adjustment to vary the depth of mesh between the pinions and racks which are provided in the modified construction hereinbefore described would be applicable.

It will be seen from the foregoing description that a motor embodying my invention is of a special utility when embodied in an electric fan, since it affords an extremely compact and symmetrical construction which may be conveniently suspended or supported in any desired relation to the wall or ceiling, and owing to its extreme compactness and symmetry will not only present a sightly appearance and occupy a minimum amount of space, but will at the same time minimize the vibration which is usually present in devices of this character when supported freely at the end of a relatively long support, as is often necessary with devices of this character. I have therefore claimed the invention both generically and as embodied in an electric fan, and in this connection I do not wish to be understood as limiting myself to the details of construction shown, except to the extent that they are made the subject of specific claims.

I claim as my invention—

1. In an electric motor, the combination of a rotary armature, a drive-shaft rotating therewith, a pinion on each end of said shaft and a surrounding driven member provided with duplex parallel annular gears having their pinion-engaging surfaces facing toward each other and respectively engaged with said pinions in diametrically opposite relation, whereby the driving moment of the motor is simultaneously imparted to said driven element through both pinions.

2. In an electric motor, the combination of a rotary armature, a drive-shaft rotating therewith, a friction-pinion on each end of said shaft and a surrounding driven member provided with duplex parallel annular friction-surfaces arranged to face each other and respectively engaged with said pinions in diametrically opposite relation whereby the driving moment of the motor is simultaneously imparted to said driven element through both pinions.

3. In an electric motor, the combination of a rotary armature, a drive-shaft rotating therewith, a pinion on each end of said shaft, a surrounding driven member provided with duplex parallel annular gears having their

pinion-engaging surfaces facing each other and respectively engaged with said pinions in diametrically opposite relation, said gears being adjustable toward and from each other whereby the engagement of the pinions therewith may be adjusted, substantially as described.

4. In an electric motor, the combination of a rotary armature provided with a drive-shaft rotating therewith, a pinion on each end of said shaft, a relatively stationary frame within which the ends of said armature-shaft are journaled, and whereby the armature is held in fixed relation to the frame, and a surrounding driven element journaled upon said frame, and provided with duplex parallel annular gears having their pinion-engaging surfaces facing each other and respectively engaged with said pinions in diametrically opposite relation, whereby the driving moment of the motor is simultaneously imparted to said driven element through both pinions.

5. In an electric motor, the combination of a rotary armature provided with a drive-shaft rotating therewith, a pinion on each end of said shaft, a relatively stationary frame within which the ends of said armature-shaft are journaled, and whereby the armature is held in fixed relation to the frame, and a surrounding driven element journaled upon said frame, and provided with duplex parallel annular gears having their pinion-engaging surfaces facing each other and respectively engaged with said pinions in diametrically opposite relation, whereby the driving moment of the motor is simultaneously imparted to said driven element through both pinions, said driven element being separable and the members thereof adjustably united, and each of said members carrying one of the gears, whereby the latter may be adjustable relatively to each other for the purpose set forth.

6. In an electric motor, the combination of a relatively stationary frame of hollow construction, a series of field-pieces supported upon the interior of said frame, an armature having an armature-shaft journaled within said frame and provided at each end externally of the frame with a pinion, a shell-like driven member inclosing said stationary frame and journaled to rotate thereon, a pair of parallel, annular gears having their pinion-engaging surfaces facing each other, rigidly mounted within said shell and respectively engaged with the pinions of the armature-shaft, and means for adjusting one of said gears relatively to the other, for the purpose set forth.

7. In an electric fan, the combination of a relatively stationary frame of hollow construction, a series of field-pieces supported upon the interior of said frame, an armature having an armature-shaft journaled within said frame and provided at each end externally to the frame with a friction-pinion, a shell-like driven member inclosing said stationary frame and journaled to rotate thereon, a pair of parallel, annular friction-gears having their pinion-engaging surfaces facing each other, rigidly mounted within said shell and respectively engaged with the pinions of the armature-shaft at diametrically opposite points, means for adjusting one of said gears relatively to the other, fan-blades mounted upon said outer shell and suitable electric connections for the motor, substantially as set forth.

8. In an electric fan, the combination of a hollow stationary frame member provided at diametrically opposite points with trunnion-like journal-bearings, an armature provided with an armature-shaft journaled in said stationary frame with its axis inclined slightly from a position at right angles to the axis of said trunnion-like journals, a friction-pinion upon each end of said armature-shaft, an inclosing shell having its opposite sides journaled upon said trunnion-like journals and provided upon its interior with a pair of parallel, annular friction-surfaces, said shell being made of two-part construction and separably in a plane extending between said annular friction-surfaces, means for adjusting one shell member upon the other to approach or separate said annular friction-surfaces and fan-blades mounted upon the exterior of the shell, substantially as described.

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