No. 726,461. PATENTED APR. 28, 1903.

G. T. RENNERFELT.

SELF ADJUSTING FRICTION GEAR.

APPLICATION FILED AUG. 2, 1902.

NO MODEL.

Fig. 1.

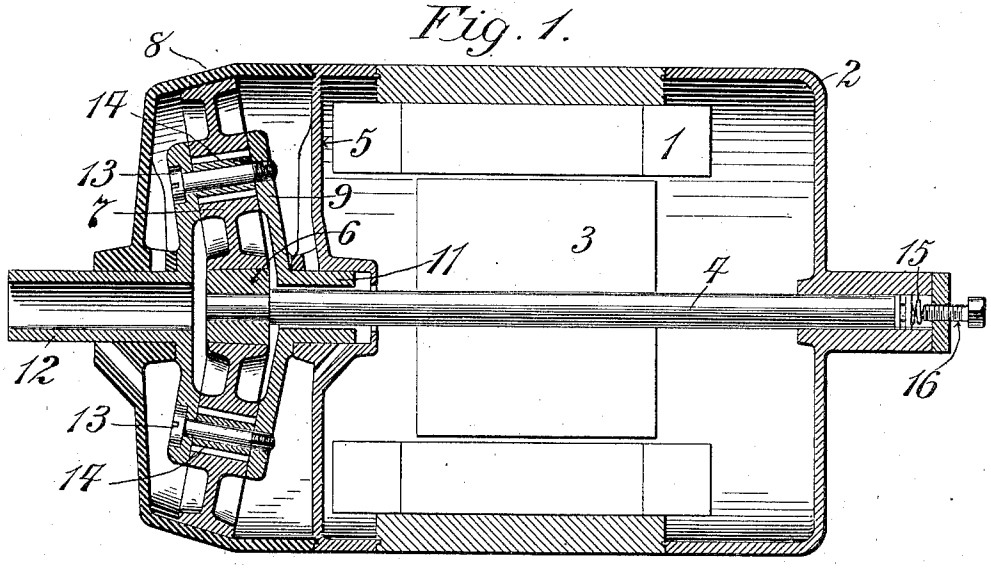


Fig. 2.

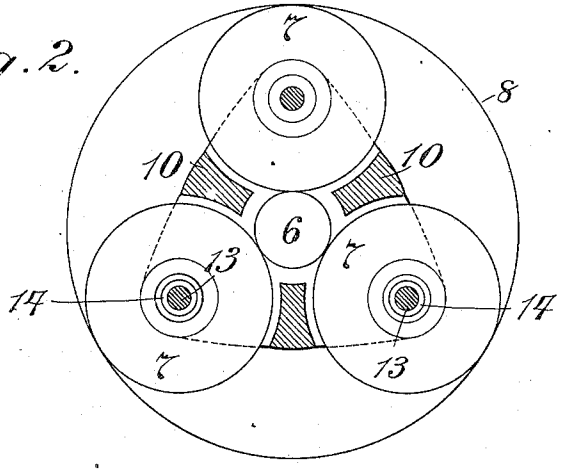
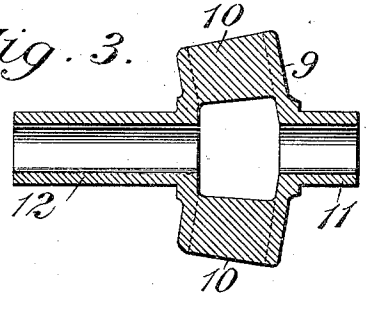


Fig. 3.



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SELF-ADJUSTING FRICTION-GEAR.

SPECIFICATION forming part of Letters Patent No. 726,461, dated April 28, 1903.

Application filed August 2, 1902. Serial No. 118,063. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV T. RENNERFELT, a subject of the King of Sweden and Norway, residing in the borough of Brooklyn, city of New York, State of New York, have invented a new and useful Improvement in Self-Adjusting Friction-Gear, of which the following is a specification.

My invention has particular reference to speed-reducing gears acting through frictional contact between the peripheries of the wheels employed.

One advantage of importance incident to the use of this invention lies in the absence of any bearing at the working end of the high-speed shaft. The lessening in loss of power thus accomplished is obvious.

In my invention I employ a sun-and-planet gear so arranged that the planet-wheels have no fixed bearing within the yoke which carries them, but "float," so to speak, within said yoke, thus constituting a direct support between the central driving or driven gear and the outer gear or track on which said planet-wheels roll. By this expedient I am enabled to compensate for wear on the peripheries with certainty of constant efficient action, since the perfectly compact interaction and mutual support of all the parts is independent of differences in rate of wear at different points.

My invention also involves in its preferred forms certain details of construction hereinafter pointed out and set forth clearly in my claims hereto appended.

One form of my invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a section through a combined electric motor and friction-gear constructed in accordance with said invention. Fig. 2 is a face view of my planet-wheels, showing their supporting-yoke in section; and Fig. 3 is a detail view in section of the middle portion of said yoke.

In the drawings I have shown my invention as applied to reduction of the speed of an electric motor, whose stationary member (field-magnet) 1 is fixed within the casing 2 and whose rotating member (armature) 3 is carried by the driving-shaft 4. The casing 2 is divided into two compartments by the partition 5, through which the shaft 4 passes, carrying on its extremity the frictional driving-wheel of conical shape 6. The ideal apex of the cone-wheel 6 is far to the left in the figure, and the angle between diametrically-opposed elements of said cone is made quite small, so that a small end pressure on the driving-shaft may produce a considerable pressure between said driving-wheel and the three or more planet cone-wheels 7, which surround the wheel 6.

The inner surface of the casing 2 is formed into a conical track 8, surrounding and making frictional engagement with the wheels 7. The ideal apex of this conical track is substantially coincident with that of the driving-wheel 6, and the same is true of the conical planet-wheels. A yoke 9 is formed in two plates on opposite sides of the planet-wheels, said plates being joined by the integral cross-pieces 10 between the wheels. Extending outward from each of the cheek-plates of the yoke is a hollow shaft. These two shafts 11 and 12 are in alinement with each other. Shaft 11 has a bearing in the partition 5, while the shaft 12, which is not necessarily hollow, has its bearing in the outer casing. The driving-shaft 4 passes through the hollow shaft 11, but is so much smaller than the bore of said shaft as never to make contact therewith. Thus the working end of the driving-shaft is supported solely by the planet-wheels and conical track 8, all friction and consequent loss of power at the point 11 being thus avoided.

While the yoke 9 embraces the planet-wheels 7, it does not support them in any sense. As shown, the yoke carries screw-pins 13, preferably surrounded by antifriction-sleeves 14, and the planet-wheels are centrally bored out so widely as to leave a substantial space between said wheels and the pins around which they revolve. The only point of contact will of course be where the interior of the bore of each planet-wheel presses against the sleeve 14 to drive the yoke forward to impel the shaft 12.

Any desired means may be employed to press the shaft 4 and its wheel 6 toward the ideal apex of the wheel. In the drawings I have shown two of these—namely, the spring 15, adjusted as to tension by the set-screw 16 and bearing upon the end of the shaft 4, and the armature 3, set out of center with regard to the field-magnet 1—so that during oper-

ation of the motor the magnetic reaction between the two members thereof will tend to thrust armature and shaft to the left in the figure. I can use these together or one at a time, or in some cases gravity may be employed for this purpose without departing from my invention.

It will be clear on consideration that the tendency of the driving-wheel toward its own ideal apex will produce a strong pressure between said wheel and the planet-wheels 7, which is immediately transmitted to the track 8 without interference from the shaft or its pivots, since the mounting described permits of a substantial amount of free movement of the planet-wheels to and from the driving-wheel in their midst. Moreover, the shape of the wheels and their mutual arrangement are such that in proportion as wear occurs, either at the track 8 or at the wheel 6, it will be automatically and instantly taken up by longitudinal movement of the shaft 4 and wheel 6.

The angle made between the line of contact between each wheel 7 and the track 8 and the axis of said wheel should not be made too small, as this would require too fine workmanship on the wheels; but it should not be made greater than the angle of friction existing between the substances constituting the peripheries of the said wheels 6 and 7 and the said track 8. By restricting this angle, as above stated, there is practically no crowding tendency produced in the planet-wheels by the thrust of the driving-wheel, and thus I avoid all necessity of thrust-bearings between the hubs of the planet-wheels and the cheeks of the yoke 9, which would otherwise be required to keep the planet-wheels in position with a minimum of friction.

A variety of changes might be made in several parts of my device without departing from the spirit of my invention, and I am not to be understood as limiting myself to the details as herein shown and described.

What I claim is—

1. In means for transmitting power, a driving-shaft, a friction-wheel of conical periphery thereon and a transmitting-yoke so arranged that there is a free space between the end of said shaft and said yoke; in combination with conical planet-wheels carried by said yoke each having its ideal apex substantially coincident with that of said first-named wheel and its periphery in contact with that of said wheel, a conical abutment embracing said planet-wheels and means for pressing said driving-wheel along its axis in the direction of its ideal apex.

2. In means for transmitting power, a yoke formed of two parts in one piece, conical frictional planet-wheels between the parts of said yoke, a centrally-located friction-wheel making contact with all of said planet-wheels and a conical abutment surrounding said planet-wheels and in contact with their peripheries.

3. In means for transmitting power, two shafts in line, one of which is hollow, bearings for said shafts, a yoke joining said shafts, driven planet-wheels in said yoke, a conical abutment embracing said wheels, a central driving-wheel and a driving-shaft of materially less diameter than the bore of said hollow shaft supporting said wheel and passing through said hollow shaft.

4. In means for transmitting power, two shafts in line, one of which is hollow, bearings for said shafts, a yoke in one piece joining said shafts and integral with them, driven conical planet-wheels in said yoke, a conical abutment surrounding and making contact with said planet-wheels, a central conical driving-wheel making contact with said planet-wheels, a driving-shaft supporting said driving-wheel and passing through said hollow shaft and means for pressing said shaft and its wheel toward the ideal apex of the latter.

5. In self-adjusting friction-gearing, a central conical friction-wheel and conical planet-wheels surrounding the same and having a common ideal apex substantially coincident with that of said central wheel; in combination with a yoke carrying said planet-wheels on loose pivots permitting substantial movement to and from said central wheel and a conical abutment surrounding and making contact with said planet-wheels.

6. In self-adjusting friction-gearing, a conical driving-wheel, a shaft therefor having no bearings next said wheel a conical abutment and a set of conical wheels mounted to freely move to and from said driving-wheel and rolling within and against said abutment and affording the sole support for said driving-wheel.

7. In self-adjusting friction-gearing, a conical central driving-wheel, conical planet-wheels in contact therewith and a conical abutment surrounding said planet-wheels all so constructed and proportioned that each line of contact between said planet-wheels and abutment makes an angle with the axis of such wheel not greater than the angle of friction between the surfaces so in contact.

8. A driving-shaft, a conical friction-wheel thereon, conical planet-wheels surrounding said friction-wheel and each having its ideal apex substantially coincident with that of said friction-wheel and a conical abutment surrounding and making contact with said planet-wheels; in combination with an electric motor having a fixed member and a rotating member so mounted upon said driving-shaft as to tend by its magnetic effort to push said driving-wheel toward its ideal apex.

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