G. M. MAYER.

ELECTROMAGNETIC MOTOR.

APPLICATION FILED JUNE 5, 1911.

1,054,783.

Patented Mar. 4, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

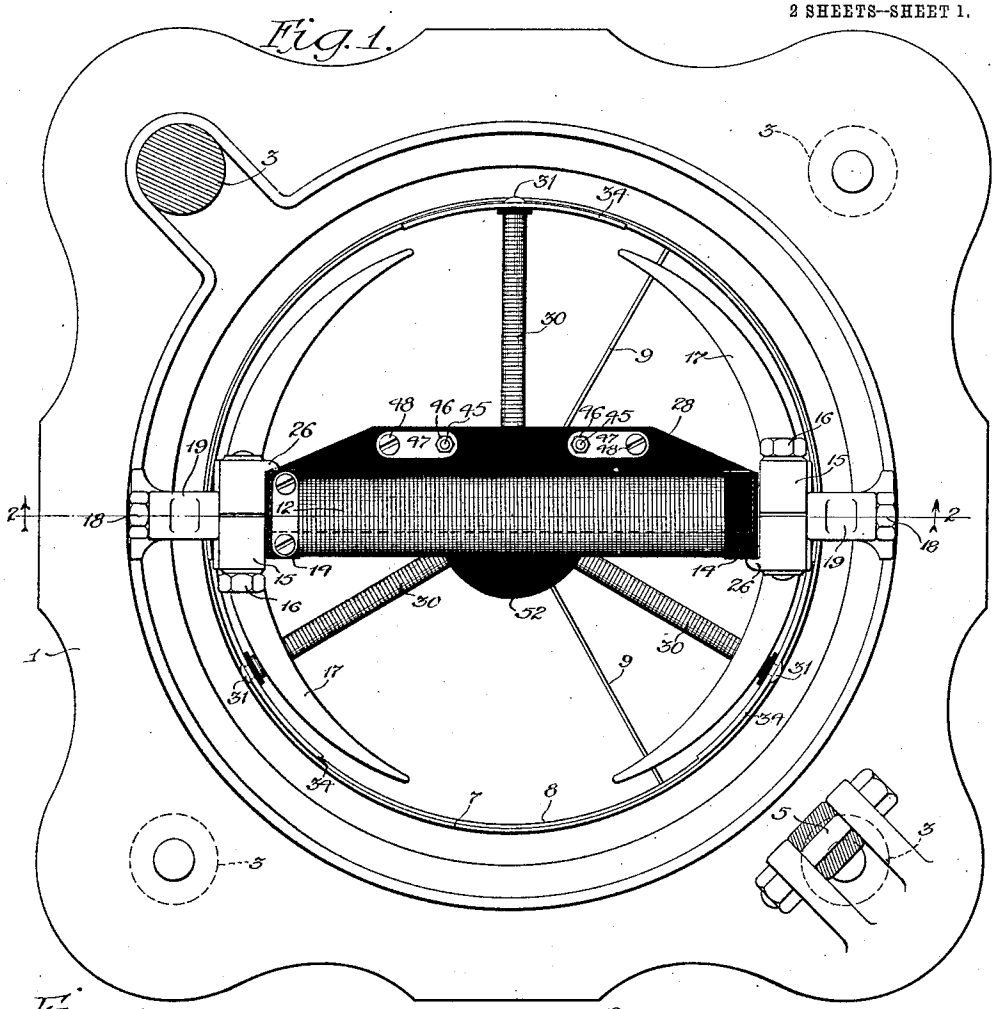
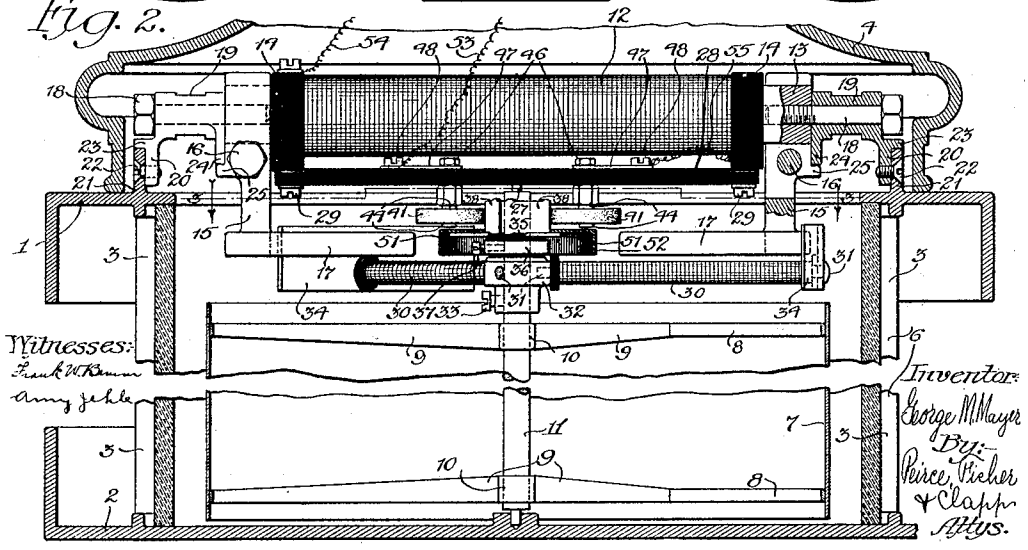


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

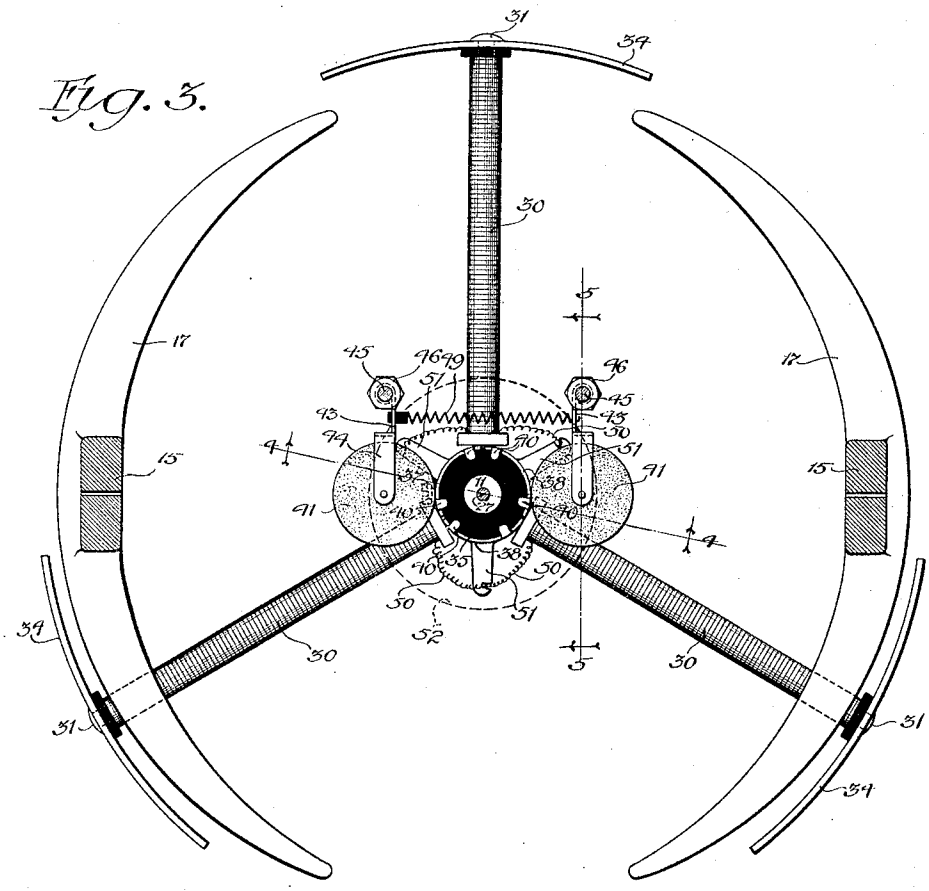


Fig. 4.

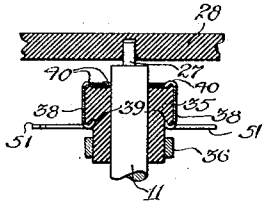
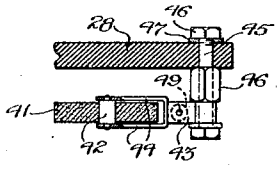


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC MOTOR.

1,054,783. Specification of Letters Patent. **Patented Mar. 4, 1913.**

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To all whom it may concern:

Be it known that I, GEORGE M. MAYER, a citizen of the United States, and a resident of Highland Park, Lake county, Illinois, have invented certain new and useful Improvements in Electromagnetic Motors, of which the following is a full, clear, and exact description.

The invention relates to electromagnetic motors and seeks to provide a simple, inexpensive motor of low power, which can be operated at varying speeds and by alternating or direct current and which can be advantageously used for moving light parts, such as advertising signs, toys, or the like.

The invention consists in the features of improvement hereinafter set forth, illustrated in the preferred form in the accompanying drawings and more particularly pointed out in the appended claims.

Figure 1 is a plan view of the improved motor as employed for rotating the cylindrical advertising sign, together with the casing for the sign and motor. In Fig. 1 the cap plate for the motor casing is omitted. Fig. 2 is a vertical section on the line 2—2 of Fig. 1. Fig. 3 is a horizontal plan section on the line 3—3 of Fig. 2. Figs. 4 and 5 are detail sections on the line 4—4 and 5—5 of Fig. 3.

The improved motor, as stated, is particularly designed for rotating or shifting portions of advertising signs or other light parts and is illustrated in connection with a rotary advertising device mounted directly upon the motor shaft. The casing for the advertising sign and motor may be of any suitable form. That shown comprises upper and lower plates 1 and 2 connected by corner posts 3. The upper plate 1 is annular in form and is provided with a cover plate 4 which is connected thereto at one point by a hinge pintle 5. A glass cylinder 6 is held in place between the top and bottom plates 1 and 2 and a rotating cylinder 7 of paper or the like is displayed through the glass cylinder. The cylinder 7 is fixed at its upper and lower ends upon rings 8 which are carried upon the outer ends of a series of spider arms 9 that are provided at their inner ends with hubs or sleeves 10 mounted upon a vertical, upright shaft 11. This shaft, in the form shown, constitutes the armature shaft of the improved motor.

The improved motor comprises a single spool field magnet 12 which is arranged in the plane of and substantially at right angles to the motor shaft 11, and, in the form shown, extends across the upper end of the shaft. The coil of the field magnet 12 is wound upon a core 13 between a pair of rectangular collars 14 of fiber or other suitable insulating material. The ends of the core 13 project beyond the collars 14 and a pair of laterally projecting or depending arms 15 are secured thereto. In the preferred form illustrated, the hubs of the arms which are carried upon the outer ends of a core 13 are split and are clamped upon the core by bolts 16. The arms 15 terminate in a pair of segmental pole pieces 17 which are arranged upon one side of and in a plane substantially parallel to the axis of the field magnet 12. Each of these segmental pole pieces extends through approximately 120° and they preferably taper toward their ends, as shown in Figs. 1 and 3. The field magnet and pole pieces are held in position in any suitable manner. In the construction shown, through bolts 18 are axially threaded into the ends of the core 13 and sleeves 19 on these bolts are provided at their outer ends with depending lugs 20 which are connected to upwardly projecting lugs 21 on the top plate 1 by screws 22. To prevent the rotary displacement of the parts, the sleeves 19 are provided at their outer end with projecting offsets 23 (see Fig. 2) which overlap the upper ends of the lugs 21, and, at their rear ends the sleeves are provided with depending lugs 24 which engage offset shoulders 25 on the hubs of the arms 15. The hubs of the arms 15 are also provided with offset lugs 26 which overlap the side faces of the rectangular collars 14 (see Fig. 1). By this arrangement, the parts described can be readily and economically assembled and properly held in position.

The armature shaft 11 is arranged at right angles to and in the plane of the axis of the field magnet 12. At its upper end it is provided with a reduced end or projecting journal 27 which engages a bearing socket in a horizontal bridge-piece 28. This bridge-piece extends between the ends of the field magnet 12, is preferably formed of fiber and is secured to the lower flat sides of the rectangular fiber collars 14 by screws 29.

The shaft 11 carries a series of radially

disposed, single spool armature magnets 30. The inner ends of the cores 31 of these magnets are threaded into a collar 32 which is mounted on the upper end of the shaft and is secured thereto by a set screw 33. A series of segmental pole pieces 34 are mounted upon the outer ends of the cores 31 and the ends of the cores are riveted over to hold the pole pieces 34 in position. Preferably, the radial armature magnets 30 are arranged in a plane on one side of the field pole pieces 17 and the outer ends of the armature magnets extend beyond the pole pieces 17, the armature pole pieces 34 being offset to overlap the outer faces of the field pole pieces 17. In the form shown, the armature magnets 30 extend below the field pole pieces 17 and the armature pole pieces 34 are projected vertically to overlap the outer faces of the field pole pieces. Preferably, the radius of curvature of the armature pole pieces 34 and of the path of movement thereof is greater than that of the outer faces of the field pole pieces 17, so that the latter faces slightly diverge, as shown, from the path of movement of the field pole pieces.

A commutator is mounted upon the shaft 11 above the collar 32. This commutator comprises a sleeve 35 of fiber or other suitable insulating material. The lower end of the sleeve is provided with a brass collar 36 through which extends a set screw 37 by which the sleeve is fixed on the shaft 11. The upper portion of the sleeve 35 is enlarged and the conducting segments of the armature comprise sheet metal plates 38 arranged upon the surface of the upper enlarged portion of the sleeve 35. These segment plates are provided at their upper and lower edges with ears 39 and 40 (see Figs. 3 and 4) which are bent over the shoulders at the upper and lower edges of the enlarged portion of the sleeve. The circumferential displacement of the plates is prevented by providing the lower shoulder with openings within which the ears 39 project and, to more securely hold the plates in position, the upper surface of the sleeve over which the ears 40 are bent, is preferably concaved or dished, as shown.

The brushes which engage the commutator are in the form of carbon rollers 41. These rollers (see Fig. 5) are provided with hub portions 42 having reduced end journals which engage openings in the forked outer ends of a pair of arms 43. Each of these arms is economically formed from a piece of sheet metal stamped and bent to the form indicated and having two outer end portions 44 between which the roller 41 is journaled. The inner ends of the arms 43 are twisted and bent around the lower ends of a pair of studs 45 which extend through the insulating bridge-piece 28 and are secured in place thereon by nuts 46. Conducting plates 47 are secured to the upper surface of the bridge-piece by the nuts 46 and by screws 48. The brush holding arms 43 are thus pivotally mounted upon the lower ends of the studs 45. These studs are arranged on one side of the commutator and the brush holding arms extend laterally in the same direction and the rollers 41 carried thereby engage opposite sides of the commutator on the armature shaft 11. A common spring 49 connects the arms 43 and presses the rollers against the segment plates 38 of the commutator.

The coils of the armature magnets 30 are connected in series by conductors 50 and the segment plates 38 of the commutator are provided with laterally projecting arms 51, each of which is connected to one of the conductors 50 between two adjacent armature magnets. A flanged insulating disk 52 preferably sets loosely over the arms 51, as shown in Fig. 2. One of the main conductors 53 is connected to one of the brushes and the other main conductor 54 is connected to one end of the coil of the field magnet 12 (see Fig. 2). The other end of the coil of the field magnet is connected by a conductor 55 to the other brush. In any position of the armature, the current passes through two of the three armature coils 30 in series in one direction and through the other armature coil in the reverse direction. The segment plates of the commutator are so arranged that as one of the armature pole pieces 34 reaches a central position with reference to one of the field pole pieces, the flow of current through the corresponding coil is reversed. The armature pole pieces are thus alternately attracted and repelled by the field pole pieces and the armature rotated.

The improved magnetic motor is simple, inexpensive and effective in operation. It can be run at widely varying speeds and will operate with either direct or alternating current. Moreover, with the arrangement of the two field pole pieces, the odd number of armature coils and pole pieces and a commutator arranged to reverse the flow through the armature coil as it passes the center of each field pole piece, the motor is self starting from any position. The construction of the armature and roller brushes is simple and inexpensive, and at the same time will effectually prevent sparking. It should be noted that the diameter of the roller brushes is large relative to that of the commutator, so that the gaps between the commutator plates are easily bridged by the carbon rollers thus avoiding sparking. The arrangement of the two roller brushes pressed upon opposite sides of the commutator by a common spring firmly holds the brushes in engagement with the commuta-

tor, but the spring does not exert any pressure upon the bearing of the armature shaft, the upper end of which is journaled in the fiber bridge-piece 28. The shaft thus rotates with little friction. The lower end is supported in any suitable manner, as, for example, in a bearing in the lower frame plate 2.

I claim as my invention:

1. An electromagnetic motor comprising a single spool field magnet, projecting arms secured to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane substantially parallel to the axis of said field magnet, a shaft in the plane of and at right angles to said field magnet, and a series of radial, single spool armature magnets fixed to said shaft and having segmental pole pieces at their outer ends, substantially as described.

2. An electromagnetic motor comprising a single spool field magnet, projecting arms secured to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane substantially parallel to the axis of said field magnet, a shaft in the plane of and at right angles to said field magnet, and a series of radial, single spool armature magnets fixed to said shaft and having segmental pole pieces at their outer ends, the faces of said field pole pieces adjacent the path of movement of said armature pole pieces being slightly divergent from such path, substantially as described.

3. An electromagnetic motor comprising a single spool field magnet, laterally projecting arms fixed to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane parallel to the axis thereof, a shaft arranged in the plane of and at right angles to said field magnet, an odd number of arms fixed to said shaft and extending on one side of and beyond said field pole pieces, coils on said arms and segmental pole pieces on the outer ends thereof overlapping the outer faces of said field pole pieces, substantially as described.

4. An electromagnetic motor comprising a single spool field magnet, laterally projecting arms fixed to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane parallel to the axis thereof, a bridge piece extending between the ends of said field magnet, a shaft journaled at one end in said bridge piece, and a series of radial, single spool field magnets fixed on said shaft, substantially as described.

5. An electromagnetic motor comprising a single spool field magnet, laterally projecting arms fixed to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane parallel to the axis thereof, a bridge piece extending between the ends of said field magnet, a shaft journaled at one end in said bridge piece, a commutator on the end of said shaft, brushes mounted on said bridge piece and engaging said commutator, and a series of radial, single spool armature magnets fixed to said shaft adjacent said commutator, substantially as described.

6. An electromagnetic motor comprising a single spool field magnet, laterally projecting arms fixed to the ends of the core of said magnet and terminating in segmental pole pieces arranged in a plane parallel to the axis thereof, a bridge piece extending between the ends of said field magnet, a shaft journaled at one end in said bridge piece, a collar fixed to said shaft, a series of single spool armature magnets having their cores threaded at their inner ends into said collar, and segmental pole pieces secured to the outer ends of the cores of said armature magnets, substantially as described.

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Witnesses:
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