Jan. 6, 1925. 1,522,260

W. J. O'LEARY

VIBRATION MOTOR

Original Filed May 29, 1920

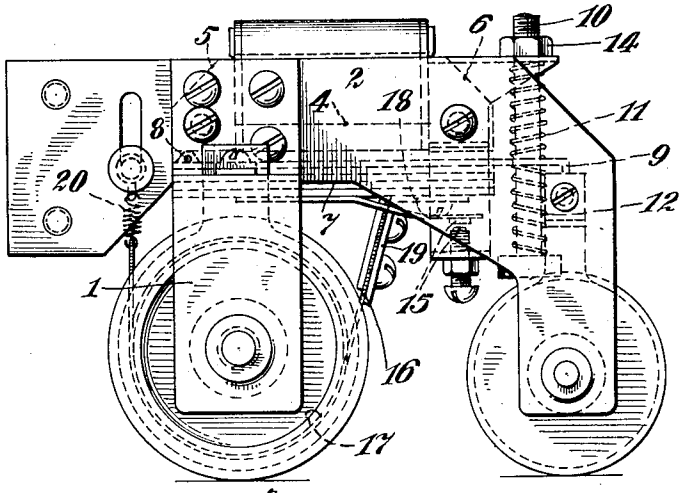


Fig. 1.

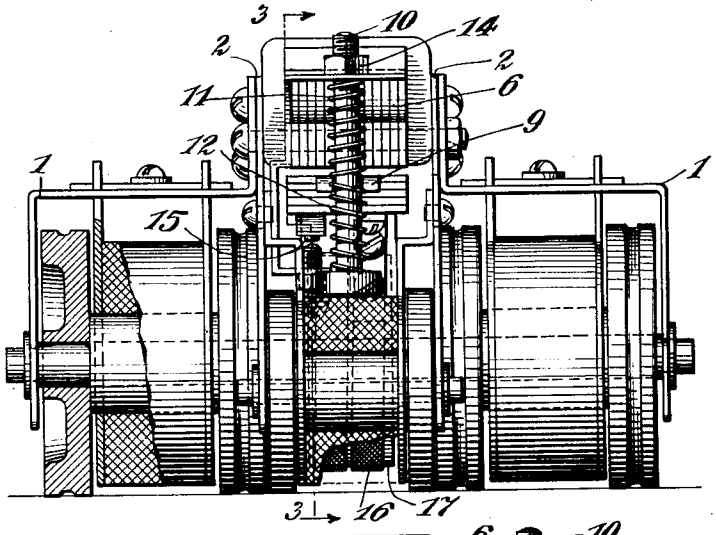


Fig. 2.

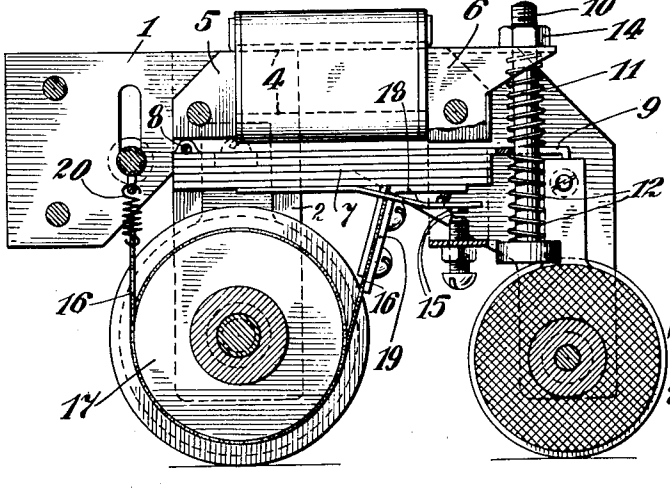


Fig. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM J. O'LEARY, OF MONTREAL, CANADA.

VIBRATION MOTOR.

Original application filed May 29, 1920, Serial No. 385,218. Divided and this application filed June 30, 1922. Serial No. 571,956.

To all whom it may concern:

Be it known that I, WILLIAM J. O'LEARY, a subject of the King of England, residing in Montreal, Canada, have invented certain new and useful Improvements in Vibration Motors, of which the following is a specification.

The present invention relates generally to motors and more specially to an electric motor, and comprises a division of my prior application Serial Number 385,218, filed May 29, 1920.

The motor comprising the present invention is of the vibration type and is illustrated as being designed as a traction motor. The principle, however, may be utilized for any motive power, traction or otherwise. In vibration motors, particularly where utilized with alternating current, it is necessary that the vibrating element be synchronized with the cycles of the alternating current in order that the motor will operate properly. This synchronism may be obtained in many ways; one of which is to weight the vibrating member by means of an adjustable weight. This weight, however, is liable to become loosened and cause trouble. In view of the fact that vibrating motors of this type operate through a flexible band in which waves are propagated by the vibration member it is desirable that this member be operated with quickness and considerable strength.

The present motor is an improvement on the known prior art and more specially improves the prior art by means which control the vibrating member in such manner as to render this member easily tuned for circuits with which it is adapted to operate. One form of the construction comprises a pair of opposed springs on one end of the vibrating member and preferably the outer end thereof, which springs are adapted to be adjusted as to tension. The electric current operates the vibrating member in one direction and the springs operate the member in the other direction so that the tension on the springs controls the quickness of response of the vibrating member to normal position. Furthermore, adjustment of the springs controls the swing of the vibrating member and thereby the amplitude of the waves set up in the flexible band so that a speed control is also obtained.

Having generally described the motor, it may be stated that the principal object thereof is adjustment means controlling the movement of a pivoted armature in such manner as to control the amplitude of vibration when the armature is operating under a given force.

A still further object of the present invention is a synchronizing adjustment for a vibration motor comprising a means for increasing or decreasing the normal period of oscillation of the vibrating member to which the flexible band is attached.

A still further object of the present invention is mechanism for controlling the amplitude of vibration of a swinging armature which is connected to a flexible drive band whereby the character of the waves set up in the band may be controlled as desired.

A still further object of the present invention is mechanism for controlling the amplitude of vibration of a swinging armature by means of opposed springs bearing upon the free end thereof.

Other and further objects of the present invention will in part be obvious and will in part be pointed out hereinafter in the specification following by reference to the accompanying drawings forming a part of the specification.

It is realized the present invention may be embodied in structures other than those herein specifically illustrated and described so therefore the disclosure herewith is to be understood to be illustrative and is not to be considered in the limiting sense.

Figure 1 of the drawings is a side elevational view of one form of the invention.

Figure 2 is an end view of the motor shown in Figure 1;

Figure 3 is a sectional view of the motor shown in Figure 1.

Referring now to the drawings and more specially to Figures 1 and 2, it will be noted that the frame 1 and 2 carries an electromagnetic core 4 which is arranged to comprise two pole pieces 5 and 6 which extend toward and lie adjacent the vibrating member 7. This vibrating member 7 preferably is a laminated construction and is mounted upon a suitable pivot 8 which is carried by the frame. The end of the member 7 opposite the pivot extends upwardly and comprises a pair of fingers 9 between which an adjustment bolt 10 carries a pair of opposed

coil springs 11 and 12. The said bolt 10 is provided with a suitable adjustment nut 14 which maintains the adjustment bolt in position on the frame of the motor and also comprises a means of adjustment for the coiled springs. By tightening the nut 14 the coiled springs 11 and 12 are compressed on each side of the fingers 9 and thereby tend to limit the degree of movement of the vibrating member 7. By shortening the degree of movement the rate of oscillation of this device is increased and since the impulses which operate this member are determined by the make and break device 15 when the motor is constructed for use on direct current, it therefore follows that the tightening of the adjustment nut increases the number of oscillations of the vibrating member for a given time. This also controls the waves set up in the transmission band 16 and thereby directly controls the speed at which the rotating member 17 turns. It is to be understood that the rotating member 17 is partly encompassed by the vibrating band 16 and that the waves in the band cause the rotating member to turn. This adjustment therefore provides a speed regulation whereby the speed of the motor may be increased or decreased at the will of the operator while the motor is in operation or not as is desired.

The transmission band 16 is connected to the vibrating member by means of a bracket 18 which has a portion 19 which extends outwardly from the vibrating member so that when this member oscillates on its pivot 8 the portion 19 of the bracket extending along the traction band tends to swing transversely of a tangent line from the drum 17 to the bracket, when the bracket is in its normal position of rest. This transverse movement facilitates the establishment of the transverse waves in the transmission band. The band 16 is normally in contact with the drum 17 to the tension of the anchoring spring 20 which is adjustably mounted on the motor frame. The purpose of the anchoring spring is to maintain the band under tension and in contact with the drum 17, since the rotative movement as above stated is produced more specially by waves set up in said band.

Where this motor is used with alternating current the make and break device may be short circuited or entirely omitted. The armature member then tends to vibrate in accordance with the frequency of the alternating current used. In prior types of vibrating motors utilizing tuning fork armatures or flat spring buzzer type motors the armatures had a predetermined period of vibration so that if the alternating current dropped or increased a few cycles per second the cycles would become out of tune with the normal period of the armature and thereby tend to stop the motor. This may have been due to the fact that the bending of the flexible member of the armature occurred in a very restricted area so that the limits of the natural period of vibration under the prior type of motors was quite limited and any substantial cycle change would go so far outside of its limits that the magnetic forces and the forces of elasticity became antagonistic. In the new type of motor herein disclosed, the armature is pivoted and the springs being on the vibrating end of the armature are of such a construction that they permit the armature to be adjusted so as to accommodate these vibrations to the frequency of the current being utilized and the motor therefore does not tend to stop or lose efficiency when the current cycle is changed. However, the adjustment nut 14 provides a means whereby the normal period of vibration of the armature may be predetermined and adjusted to correspond to various cycles. With this construction it is therefore possible to build one type of motor and by changing the springs, to accommodate this motor to several different cycles of frequency of current.

Another feature due to this construction is that which occurs when the adjusting nut is tightened, thereby tending to decrease the air gap and consequently increase the pull and power of the motor. Where direct current is used and the make and break device is included, the tensioning of the springs increases the periodicity of the armature and therefore tends to benefit both the speed and power factor of the motors. The adjustment construction may also be adjusted in such manner that the armature is very slightly out of tune with the alternating current. When this happens the motor tends to maintain constant speed under greatly varied current conditions and also an increased torque is obtained.

The arrangement of the armature with the pivot at one end and balance springs at the other end is useful in the electric art other than this particular motor, for example in such constructions as vibrators or vibratory indicators where constant vibration is desired and in many other places where the advantages to be obtained by the present construction may be useful.

Having thus described my invention, what I claim is:

1. An electric motor of the vibration type comprising a frame, an energizing coil carried by said frame, a vibration member, a drum, a transmission band connected to said vibration member and in engagement with said drum, and continuously opposed spring means for controlling the oscillation of said vibrating member by stiffening the action of said member.

2. In an electric motor of the vibration type comprising a frame, an energizing coil,

a vibration member, a transmission band connected to said member, a drum in contact with said band, and opposed coiled springs on each side of said vibration member.

3. In an electric motor of the vibration type comprising a frame, an energizing coil, a vibration member, a transmission band connected to said member, a drum in contact with said band, opposed coiled springs on each side of said vibration member and in contact therewith, and means to compress said springs.

4. A motor of the vibration type comprising a frame, an energizing coil carried by said frame, a vibration member, a drum, and a transmission band having an end connected to said vibration member and in contact with said drum, said end of the transmission band being supported along a line tangentially to said drum.

5. A vibration motor comprising in combination a frame, an energizing coil, a vibration member, a drum, a transmission band in engagement with said drum, a stiff bracket carried by the member and extending in the direction of the length of the band and connecting said band to said member to cause transverse waves in said band when said vibration member oscillates.

6. A vibration motor comprising in combination a frame, an energizing coil, a vibration member, a drum, a transmission band in engagement with said drum, and rigid means extending outwardly from said member and connecting said band to said member to cause transverse waves in said band when said vibration member oscillates.

7. An article of manufacture comprising an electromagnet, an armature pivoted adjacent said electromagnet, and a pair of coiled springs disposed on opposite sides of the free end of said armature whereby said springs are alternately compressed and relaxed when said electromagnet is energized by a pulsating current.

8. An electromagnet device comprising in combination an electromagnet, an armature pivoted adjacent said electromagnet, a pair of opposed springs, one on each side of said armature, and means for simultaneously increasing the tension of said springs.

9. In an electric motor of the vibration type the combination of a frame, an energizing coil carried by said frame, a vibration member pivoted at one end in said frame, a drum, a transmission band connected to said vibration member and in engagement with said drum, and opposed yielding means operative on the free end of said vibration member for limiting the oscillation of said member.

10. In an electric motor of the vibration type the combination of a frame, an energizing coil, a vibration member pivoted at one end in said frame and adapted to be operated by said coil, a transmission band connected to said member, a drum with which said band contacts, and a pair of opposedly coiled springs with one spring on each side of the free end of said vibration member.

11. In a motor of the vibration type the combination of a frame, an energizing coil carried by said frame, a vibration member adapted to be operated by said coil, a drum, a transmission band connected to said vibration member and in contact with said drum, means to positively whip said band transversely to set up transverse waves therein, and opposed spring means to adjustably control the period of vibration of said vibration member.

12. An electrical device comprising an electromagnet, an armature mounted for vibration adjacent said electromagnet, a make and break device associated with said armature, and continuously operative opposed spring means independent of said make and break to modify the vibration of said armature.

WILLIAM J. O'LEARY.