Nov. 20, 1928. 1,692,409

J. W. HOBBS

OSCILLATING MOTOR

Filed May 21, 1927

Fig. 1.

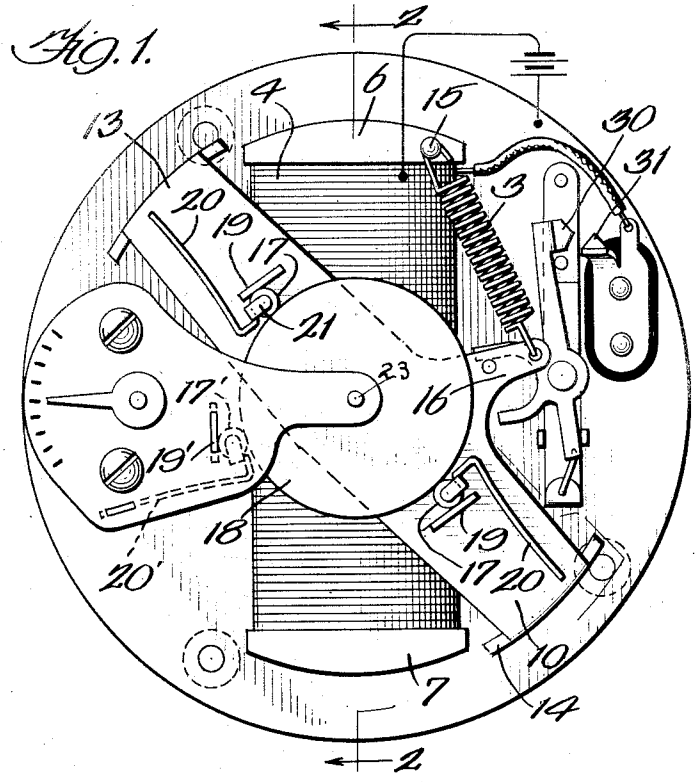


Fig. 3.

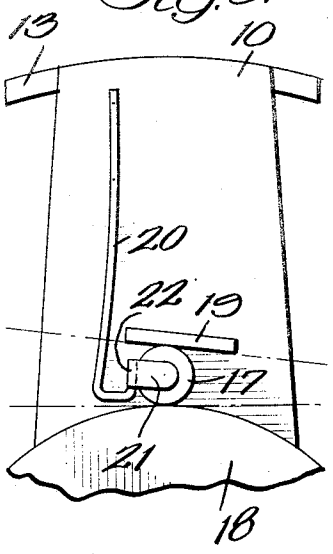


Fig. 4.

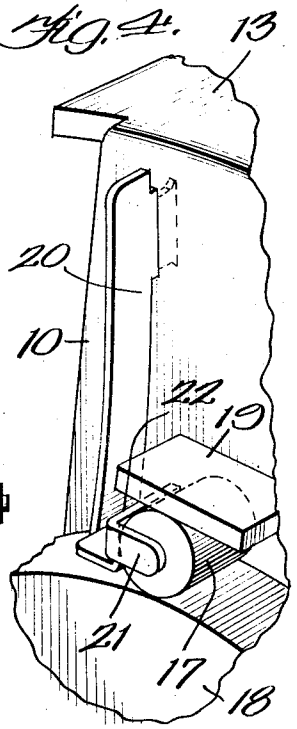
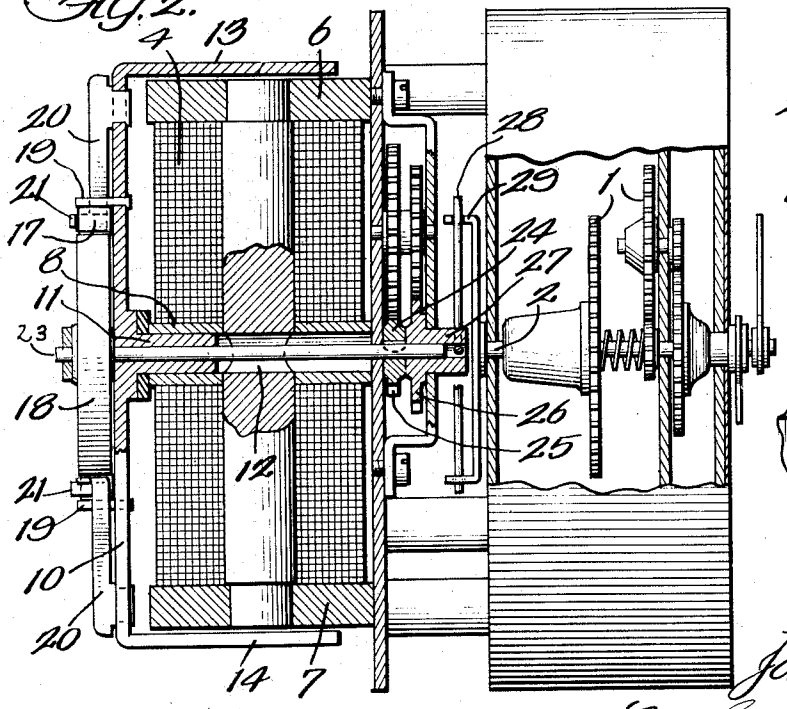


Fig. 2.



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UNITED STATES PATENT OFFICE.

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OSCILLATING MOTOR.

Application filed May 21, 1927. Serial No 193,368.

My invention relates to motion transmitting mechanism and, in one aspect thereof, is inclusive of an electro-magnet having an oscillating armature turned in one direction by the magnet, a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet, a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch, a wheel which is to be turned by the armature when the armature is moved by the spring, a clutch member carried by the armature and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet, a roller carried by the armature and engageable at the same time with said clutch member side and the rim of the wheel, and a spring urging the roller into engagement with said clutch member side and the rim of the wheel. In the preferred embodiment of this feature of the invention the spring is a leaf spring which is anchored at one end upon the armature and has a portion in the plane of bodily movement of and engaging said roller which is disposed between said spring portion and the narrower end of the space between the wheel and said clutch member. Said spring also has a portion extending transversely of the axis of movement of the wheel and lapping and in close proximity to the roller. The wheel is held from reverse rotation by a clutch similar to the foregoing excepting that the roller engaged clutch member has a stationary mounting or anchorage as does the spring which presses upon the roller.

My invention finds particular utility when employed in conjunction with a spring motor which is wound periodically by a magnet, the wheel being coupled with the load such as the gear train of a clock and being driven, to operate such load, by the spring of the spring motor, the driving force of the spring being transmitted by the magnet armature to the clock train through the intermediation of the device of my invention. When the force of the spring of the spring motor has been spent to a predetermined extent, a switch is automatically operated to energize the magnet and attract the armature, the armature being then uncoupled from the aforesaid wheel so that it may freely move and will not cause reverse operation of the clock train. In order that the wheel may be held from turning while thus uncoupled from the armature, another device similar to my aforesaid device serves to couple the wheel with a stationary member.

I will explain my invention more fully by reference to the accompanying drawing in which Fig. 1 is an elevation of a spring motor having a spring winding magnet and equipped in accordance with my invention; Fig. 2 is a sectional view of the structure shown in Fig. 1 on line 2—2, a portion of the armature and parts thereat being, however, shown in elevation, a clock train, driven by the spring motor, being also shown; Fig. 3 is an enlarged view of a part of the structure shown in Fig. 1; and Fig. 4 is a perspective view of a part of the structure appearing in Fig. 3.

The gear train 1 of the clock has its initial shaft 2 coupled with the motion transmitting mechanism through which the main spring 3 functions, as hereinafter set forth. The electric motor illustrated is inclusive of a stationary field magnet whose winding 4 is disposed about a magnetizable core and between the polar extensions 6 and 7 of the core. The winding space between the polar extensions 6 and 7 is divided into two equal parts by a block of brass or other non-magnetic material 8.

The movable element of the motor is in the form of armature 10, in the embodiment of the invention illustrated. This armature is formed with a hub extension 11 which turns within one end of an opening 12 extending through the block 8 that serves as a bearing for the armature. The armature is formed with polar extensions 13 and 14 which project into the zone of the field magnet, the armature being mounted to oscillate and having its range of oscillation limited so that when the polar extensions 13 and 14 are furthest removed from the deenergized field magnet it will be within the range of attraction of the field magnet, when the field magnet is energized. As will hereinafter appear, the main spring 3 functions to operate the gear train of the clock during the time that the field magnet is deenergized and ceases to have this function during each of the short periods

when the magnet is energized to replenish power in the spring, such energization of the magnet occurring consequent upon each operation of the clock train by the spring.

The spring may be attached, at one end, to the field magnet pole 6 by means of the pin 15 and is attached, at its other end, to the ear 16 projecting from one side of the armature 10. Two floating clutching cylindrical rollers 17 are employed to couple the armature with a wheel 18 when the spring 3 functions to drive the clock train, said wheel being in driving relation with the clock train, as will appear. Two members 19, one individual to each roller, are in the zone of the wheel member 18 and beyond the periphery of this member 18, the members 19 being provided upon the armature 10. The portions of the armature which extend radially inward from the members 19 constitute parts of such members in the relation thereof to the rollers 17. The members 19, proper, that are in the zone of the wheel 18, are at obtuse angles with respect to radii of the wheel that intersect the members 19 whereby tapering spaces intervene between the wheel member 18 and the opposed flat sides of members 19, which slope toward the wheel in the direction of rotation of the wheel, the floating rollers 17 being bodily movable along these tapering spaces. Leaf springs 20 are carried by the armature 10, being thus anchored in connection with the members 19. These leaf springs serve to press the rollers toward the narrower ends of the tapering spaces between the member 18 and the members 19 that receive these rollers and when these springs thus function, the members 19 are coupled with the member 18 so that the motor spring 3 may turn the member 18 to operate the clock train, the spring 3 serving to turn the armature 10 counterclockwise when the spring thus functions. Each leaf spring 20 is formed with an ear 21 that engages the outer end of the corresponding cylindrical roller 17 and maintains the other end of this roller in proximity to the portion of the armature 10 that intervenes between the adjacent member 19 and the member 18. The rollers are thus trapped in the tapering spaces that intervene between the wheel member 18 and the members 19, the narrower ends of these spaces preventing egress of the rollers thereat, the armature and the ears 21 preventing axial displacement of the rollers, and the base portions 22 of the ears 21 preventing egress of the rollers at the larger ends of said tapering spaces, said base portion being in the plane of bodily movement of the roller, the end portion of the ear that laps the roller extending transversely to the axis of wheel 18 and being in close proximity to the roller.

The wheel member 18 is fixed upon a shaft 23 which is journaled at one end in the hub extension 11 of the armature 10. This shaft extends through the opening 12 into connection with the hub 24 of a pinion 25 which constitutes the initial member of a motion transmitting gear train whose final wheel 26 has a hub 27. A spring wire 28 passes through the hub 27 and engages the angular ends of a bar 29 which is secured at its mid portion upon the inner end of the inner shaft 2 of a clock train of gears. The spring wire 28 is disclosed in my application Serial No. 153,577 filed December 9, 1926, and a division thereof, Serial No. 191,400, filed May 14, 1927. As set forth in said applications, during the time that the main spring 3 drives the clock train, the spring 28 is placed under increased tension, this spring being thereby enabled to continue the operation of the clock when the armature is attracted to replenish power to the main spring. When the armature is thus attracted, it moves in a clockwise direction whereby the rollers 17 are moved toward the larger ends of the tapering spaces in which they are contained so that the armature is free to move unchecked by these rollers. While the rollers 17 are thus out of coupling relation with the wheel member 18 and the members 19, a similar roller 17′ establishes a coupling relation between the wheel member 18 and the stationary member 19′, pressed upon by a stationarily anchored spring 20′ and which member 19′ has a relation to the wheel member 18 similar to the relation of the members 19, to said wheel. The roller 17′ is thus a detaining roller and it is assembled with the spring 20′ in a manner similar to the assembly of the rollers 17 with the springs 20.

When the spring 3 has spent its force to a predetermined extent, the switch contacts 30 and 31 are engaged to energize the magnet and cause the clockwise spring winding movement of the armature 10. These switch contacts are disposed and arranged as set forth in the aforesaid applications.

Having thus described my invention, I claim:

1. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; a clutch member carried by the armature and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller carried by the armature and engageable at the same time with said clutch member side and the rim of the wheel;

and a spring urging the roller into engagement with said clutch member side and the rim of the wheel.

2. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; a clutch member carried by the armature and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring carried by the armature and urging the roller into engagement with said clutch member side and the rim of the wheel, said latter spring having a portion in the plane of bodily movement of and engaging said roller which is disposed between said spring portion and the narrower end of the space between the wheel and said clutch member.

3. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; a clutch member carried by the armature and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring carried by the armature and urging the roller into engagement with said clutch member side and the rim of the wheel, said latter spring having a portion in the plane of bodily movement of and engaging said roller which is disposed between said spring portion and the narrower end of the space between the wheel and said clutch member, said spring also having a portion extending transversely of the axis of movement of the wheel and lapping and in close proximity to the roller.

4. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; a clutch member carried by the armature and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller carried by the armature and engageable at the same time with said clutch member side and the rim of the wheel; and a spring carried by the armature and having a portion extending transversely of the axis of movement of the wheel and lapping and in close proximity to the roller.

5. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; means whereby the armature, when being turned by the spring, turns the wheel in one direction and permits the magnet to reverse the direction of movement of the armature without turning the wheel; a clutch member having a stationary mounting and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring urging the roller into engagement with said clutch member side and the rim of the wheel.

6. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring in functioning also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; means whereby the armature, when being turned by the spring, turns the wheel in one direction and permits the magnet to reverse the direction of movement of the armature without

turning the wheel; a clutch member having a stationary mounting and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring urging the roller into engagement with said clutch member side and the rim of the wheel, said latter spring having a portion in the plane of bodily movement of and engaging said roller which is disposed between said spring portion and the narrower end of the space between the wheel and said clutch member.

7. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; means whereby the armature, when being turned by the spring, turns the wheel in one direction and permits the magnet to reverse the direction of movement of the armature without turning the wheel; a clutch member having a stationary mounting and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring urging the roller into engagement with said clutch member side and the rim of the wheel, said latter spring having a portion in the plane of bodily movement of and engaging said roller which is disposed between said spring portion and the narrower end of the space between the wheel and said clutch member, said spring also having a portion extending transversely of the axis of movement of the wheel and lapping and in close proximity to the roller.

8. The combination with an electro-magnet having an oscillating armature turned in one direction by the magnet; of a spring operating upon the armature to reverse the direction of movement of the armature and connected with the armature and so disposed as to have its power increased when the armature is moved by the magnet; a switch in the magnet circuit, there being means whereby the magnet opens the switch and the spring, in functioning, also closes the switch; a wheel which is to be turned by the armature when the armature is moved by the spring; means whereby the armature, when being turned by the spring, turns the wheel in one direction and permits the magnet to reverse the direction of movement of the armature without turning the wheel; a clutch member having a stationary mounting and having a side opposed to the rim of the wheel and sloping toward the wheel in the direction of rotation of the armature that is effected by the magnet; a roller engageable at the same time with said clutch member side and the rim of the wheel; and a spring having a portion extending transversely of the axis of movement of the wheel and lapping and in close proximity to the roller.

In witness whereof, I hereunto subscribe my name.

JOHN W. HOBBS.