April 28, 1931. M. CARUSO 1,802,459

MECHANICAL MOVEMENT

Filed March 4, 1927

FIG. 1.

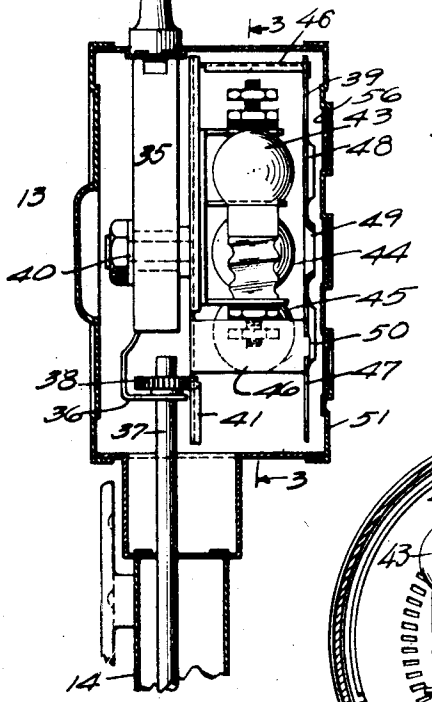


FIG. 4.

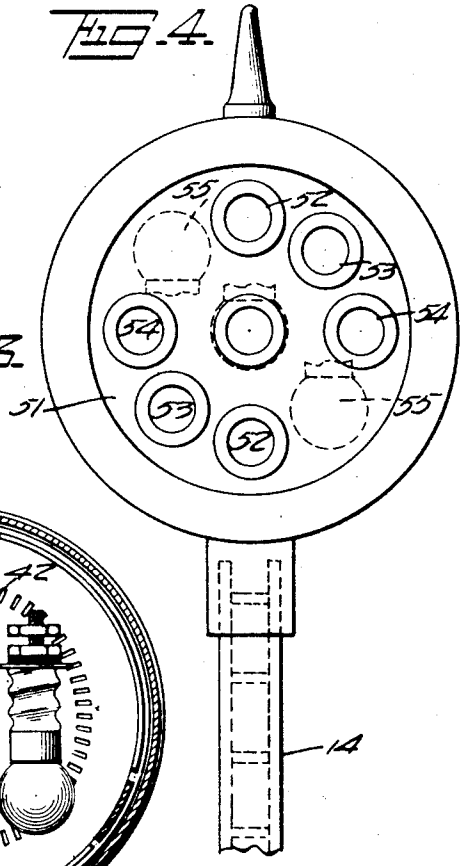


FIG. 5.

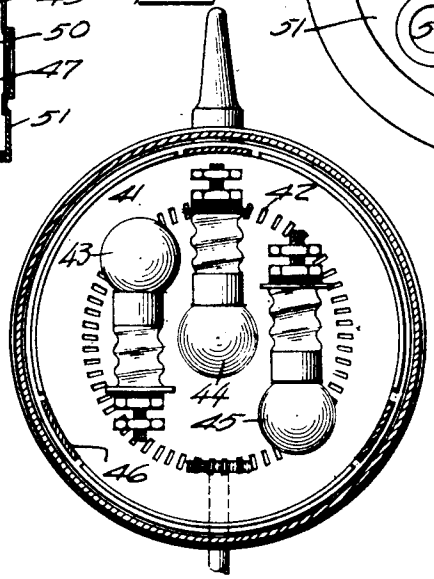
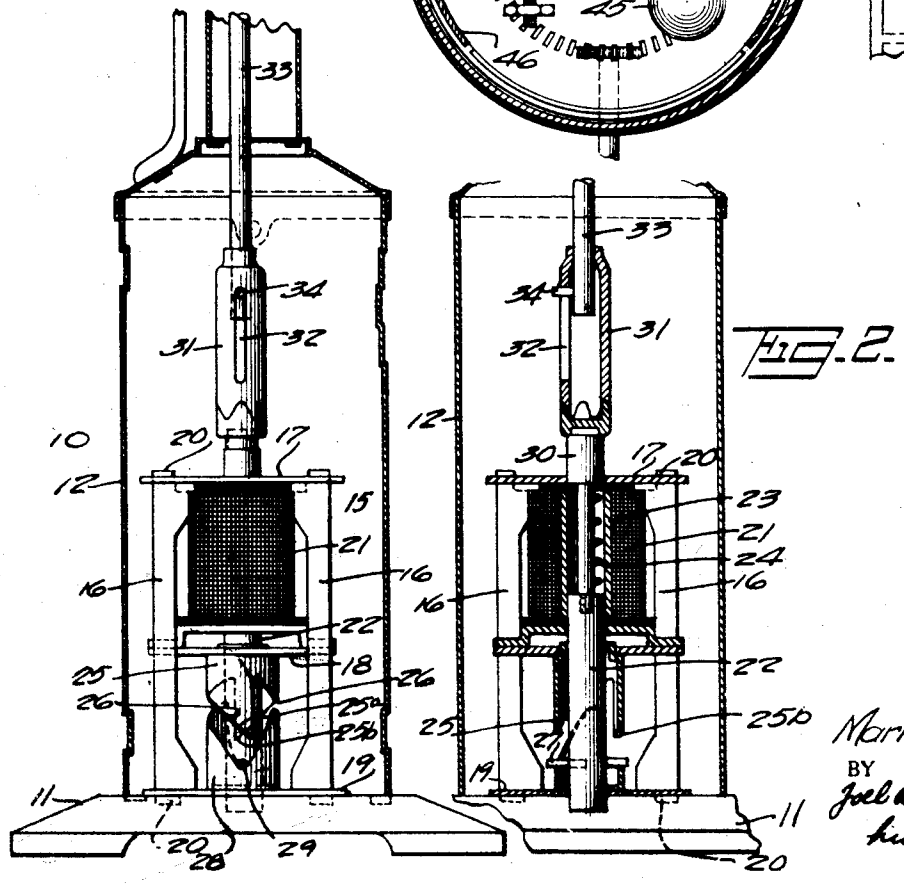


FIG. 2.



INVENTOR
Mario Caruso
BY
Joel B. Liberman
his ATTORNEY

Patented Apr. 28, 1931 1,802,459

UNITED STATES PATENT OFFICE

MARIO CARUSO, OF IRVINGTON, NEW JERSEY, ASSIGNOR TO THE LIONEL CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

MECHANICAL MOVEMENT

Application filed March 4, 1927. Serial No. 172,778.

The present invention relates to mechanical movements and is more particularly directed toward mechanical movements suitable for producing a step by step rotary movement of a shaft in response to repeated closing of an electric circuit. Such mechanical movements are found to be useful in the toy railroad art for operating mechanical signals and electric switches.

This invention contemplates an electrically operated mechanical movement which is so arranged that a shaft or other device is angularly advanced a part of the revolution as the coil is energized, and remains stationary when the coil is de-energized and until it is again energized.

An object of the present invention is to provide a mechanical movement wherein a solenoid coil acts on a freely movable plunger to attract it when the coil is energized and move it along the axis of the coil, there being provided suitable fixed or stationary devices cooperative with the moving plunger for effecting an angular movement of the plunger when the coil is energized, these devices permitting the plunger to return to its normal position when the coil is de-energized and causing it to assume a definite pre-determined angular position.

While the present invention will be described more in detail as adapted for operating a signal such as is useful for use in toy railroads, it will be understood that the mechanical movement may be used for operating various other devices.

The accompanying drawings show, for purposes of illustrating the invention, one of the many possible forms in which the invention may be embodied, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a vertical sectional view through an automatic signal tower for toy railroads, the outer parts being shown in section;

Figure 2 is a vertical sectional view through the base of the signal of Figure 1 showing the mechanical movement in section;

Figure 3 is a view taken in the plane 3—3 of Figure 1 looking in the direction of the arrow; and

Figure 4 is an elevational view of the signal taken in the direction of arrow 4 of Figure 1.

As here shown, a toy railroad signal tower is provided with a base 10, in the form of a bottom supporting stamping 11 and a lower housing 12, a top or head 13 made out of suitable sheet metal stampings, and a supporting column 14 extending from the base to support the top 13 of the signal. The base 10 acts to house the operating mechanism for the signal, while the top or head 13 of the signal tower provides the windows and houses the lighting means for the signal.

A subframe 15 is suitably mounted in the base 10. As here shown, this subframe comprises a plurality of substantially vertical longitudinal members 16, a top cross plate 17, an intermediate cross plate 18 and a bottom cross plate 19, the subframe being fastened together and to the bottom stamping 11 by prongs bent over as indicated at 20. A solenoid coil 21 is mounted between the cross members 17 and 18. A magnetizable plunger 22 is axially guided inside the solenoid. It passes through apertures in the cross plates 17 and 18 and is guided for reciprocation in the tube 23 about which the solenoid coil is wound. A spring 24 acts on the plunger to hold it in the lower position and prevents sticking.

A stationary cam member 25 is, as here shown, mounted on the lower side of the intermediate cross member 18. This cam member, as here shown, has two points 25*a* and 25*b* and ascending cam surfaces 26. A pin 27 extends from the plunger 22 in a position to engage with the cam surfaces 26 on the stationary cam 25. A second stationary cam member 28 is fastened to the lower cross member 19. The latter cam member has a V-shaped notch 29 spaced below the points 25*a* and 25*b* of the stationary cam member 25.

When the coil 21 is energized, the plunger will be moved upwardly against the spring 24 and the action of gravity. The pin 27

will engage with the cam surfaces 26 and will cause the plunger to turn angularly on its axis as it is raised. This turning is limited by the shape of the cam and, as is shown, the turning effect is substantially a semi-circle. Of course, a different number of teeth could be used if a different angular movement were desired.

When the coil is de-energized the plunger drops under the influence of gravity and the spring 24 to the lower position. In dropping down, the pin 24 engages with the upper surface on the cam 28 and acts on the plunger to turn it slightly so that the angular position of the plunger is accurately pre-determined each time the magnet releases it. The upper end 30 of the plunger carries a sleeve 31 slotted as indicated at 32. A vertical shaft 33 is provided with a pin 34 and the parts are so arranged that the plunger may move vertically relative to the shaft 33. The pin of course will cause the parts to turn together.

The head or upper housing of the signal 13 is, as here shown, provided with a fixedly mounted member 35 which has a foot 36 in which the upper end 37 of the shaft 33 is pivoted. A pinion 38 on the upper end of the shaft above the foot 36 acts to support the shaft 33. A lamp supporting cage 39 is provided with a shaft 40 rotatably mounted in the stationary member 35. This cage includes a plate 41 provided with a number of holes 42 into which the teeth on the pinion 38 pass. A number of electric lamps are suitably mounted in this cage, as here indicated at 43, 44 and 45. The back plate 41 has a number of forwardly bent members 46 which support a front plate 47 provided with a number of apertures 48, 49 and 50 in front of the lamps 43, 44 and 45. A removable cover plate 51 is mounted on the front side of the housing 13. This cover plate is, as here shown, provided with a number of apertures 52, 53 and 54 arranged as indicated and separated by an imperforate portion indicated at 55. Behind each of these apertures one may mount a transparency 56 of suitable color, if desired.

The current is supplied to the lamp by wiring arranged in any convenient manner, but omitted from the drawings for the sake of clearness. When the coil 21 is energized, the shaft 33 will be turned a half revolution and this will result in turning the cage 39 a partial revolution. The parts are so proportioned that the lamps 43 and 45 will be moved from the position indicated in dotted lines in Figure 4 to bring these lamps opposite one of the pairs of transparencies. The next energization of the magnet will advance the lamps another step and in this fashion the lamps can be operated to indicate any signal desired or to produce light emerging from the center lamp 44 only. It will be understood that the arrangement of three lamps with pairs of semaphore openings is optional and that a single lamp and a single set of openings may be used. The apertured front plate 47 acts as a screen to prevent stray light from escaping to the transparencies.

A form of mechanical movement suitable for operating a rotary switch is shown in my copending application, Number 156,561, filed December 23, 1926.

It is obvious that the invention may be embodied in many forms and constructions, and I wish it to be understood that the particular form shown is but one of the many forms. Various modifications and changes being possible, I do not limit myself in any way with respect thereto.

What is claimed is:

1. A mechanical movement comprising a rotatably mounted member, a solenoid coil, a reciprocable plunger normally held in one extreme position and axially movable to another extreme position upon energization of the coil, a slidable non-rotatable connection between the plunger and the rotatably mounted member, and means to advance the plunger a partial revolution upon energization of the coil.

2. A mechanical movement comprising a rotatably mounted member, a solenoid coil, a reciprocable plunger normally held in one extreme position and axially movable to another extreme position upon energization of the coil, a slidable non-rotatable connection between the plunger and the rotatably mounted member, a stationary cam member, and an arm carried by the plunger and cooperative with the stationary cam member for advancing the plunger a partial revolution upon energization of the coil.

3. A mechanical movement comprising a rotatably mounted member, a solenoid coil, a reciprocable plunger normally held in one extreme position and axially movable to another extreme position upon energization of the coil, a slidable non-rotatable connection between the plunger and the rotatably mounted member, a stationary cam member, an arm carried by the plunger and cooperative with the stationary cam member for advancing the plunger a partial revolution upon energization of the coil, and a second stationary cam against which the arm engages when the plunger returns to its normal extreme position, for predetermining the angular position of the plunger.

4. A mechanical movement comprising a stationary framework, a member mounted therein to rotate about a vertical axis, a solenoid coil, a plunger carried in the coil and connected to the rotatably mounted member for longitudinal movement therealong and rotation therewith, a stationary cam surrounding the plunger, and an arm projecting from the plunger and engageable with the cam, the cam being so shaped that the

plunger is turned a partial revolution when the coil is energized.

5. A mechanical movement comprising a stationary frame-work, a member mounted therein to rotate about a vertical axis, a solenoid coil, a plunger carried in the coil and connected to the rotatably mounted member for longitudinal movement therealong and rotation therewith, a stationary cam surrounding the plunger, an arm projecting from the plunger and engageable with the cam, the cam being so shaped that the plunger is turned a partial revolution when the coil is energized, and a stationary V-shaped cam into which the arm drops when the coil is de-energized.

6. A mechanical movement comprising a stationary subframe including longitudinal members, cross members at the ends of the longitudinal members and an intermediate cross member, a solenoid coil mounted between two of the cross members, a plunger carried in the coil and mounted in the cross members for rotation about a vertical axis, an arm on the plunger, and a stationary cam surrounding the plunger and having a lower surface engageable with the arm when the coil is energized for turning the plunger a partial revolution.

7. A mechanical movement comprising a stationary subframe including longitudinal members, cross members at the ends of the longitudinal members and an intermediate cross member, a solenoid coil mounted between two of the cross members, a plunger carried in the coil and mounted in the cross members for rotation about a vertical axis, an arm on the plunger, a stationary cam surrounding the plunger and having a lower surface engageable with the arm when the coil is energized for turning the plunger a partial revolution, a stationary V-shaped cam carried below the first cam and into which the arm drops when the coil is de-energized.

8. A mechanical movement comprising a stationary subframe including longitudinal members, cross members at the ends of the longitudinal members, and an intermediate cross member, a solenoid coil mounted between the upper two cross members, a plunger carried in the coil and mounted in the cross members for rotation about a vertical axis, an arm on the plunger, a stationary cam mounted below the intermediate cam member and surrounding the plunger and having a lower surface engageable with the arm when the coil is energized for turning the plunger a partial revolution, a stationary V-shaped cam carried by the lower cross member and into which the arm drops when the coil is deenergized.

Signed at Irvington, in the county of Essex and State of New Jersey, this 25th day of February, 1927.

MARIO CARUSO.