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MODEL TRAIN CONTROL ACTUATING MECHANISM

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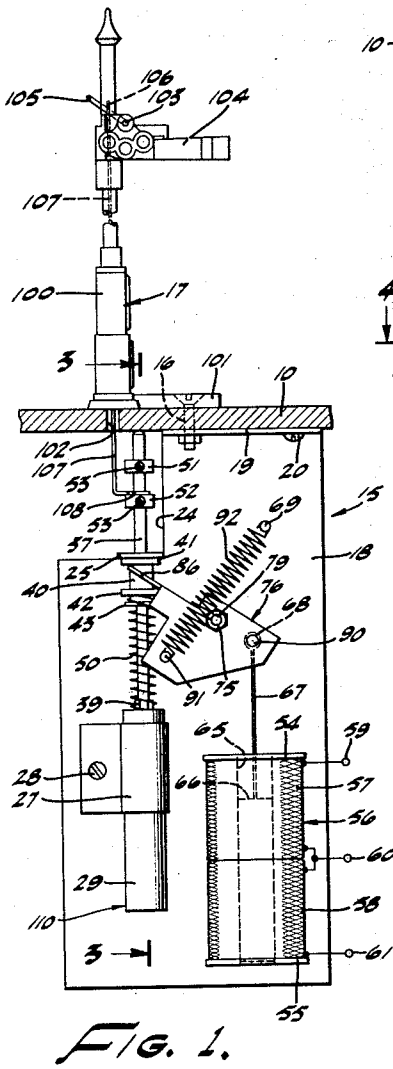


FIG. 1.

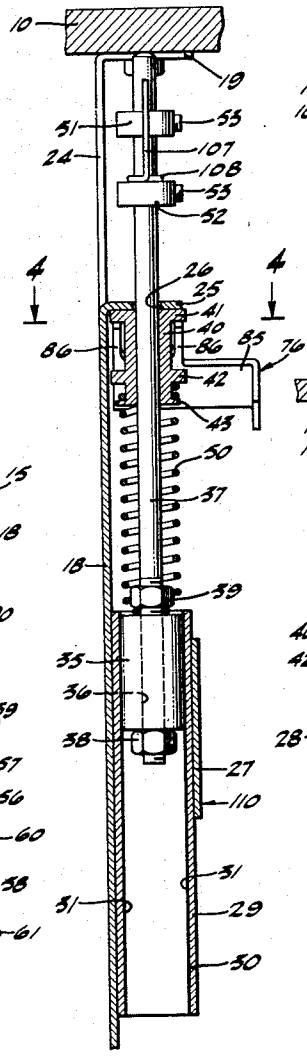


FIG. 3.

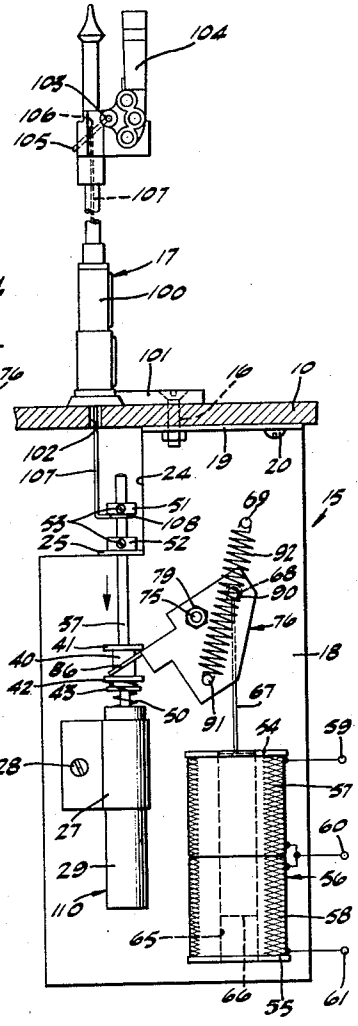


FIG. 2.

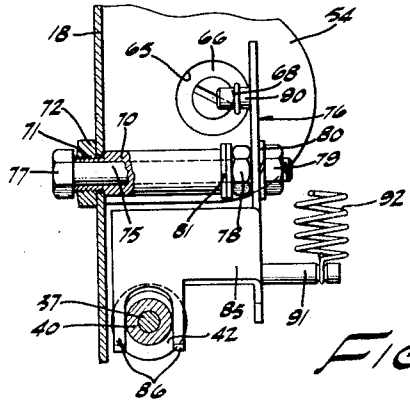


FIG. 4.

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MODEL TRAIN CONTROL ACTUATING MECHANISM

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8 Claims. (Cl. 246—479)

This invention relates to model train system signaling equipment and particularly to a novel mechanism for actuating the same.

The pseudo traffic control devices employed in miniature train systems are made to resemble the full size real traffic control device employed for regulating train traffic on commercial railways. One of the defects not heretofore eliminated from the pseudo traffic control devices of miniature railway systems is that these control devices, being solenoid operated, move from one extreme position to the other very rapidly. This action distinguishes the pseudo miniature devices from the full size commercial control devices in that the latter are motor operated and their movement from one position to the other covers a considerable time interval.

It is an object of the present invention to provide an inexpensive actuating mechanism for pseudo miniature railroad control devices which actuates the visible elements of the latter in a manner to consume practically the same time interval for said elements to shift from one extreme position to another as is required by the corresponding full size commercial control devices.

It is a further object of this invention to provide such an actuating mechanism which is simple and inexpensive to manufacture and which will be relatively free of maintenance troubles.

Still another object of the invention is to provide such an actuating mechanism, the assembly of which in proper operative relation with a miniature signaling device is simple, and may therefore be performed by inexperienced labor with few tools.

Devices heretofore provided for achieving the general object of the present invention have failed. I discovered that this failure was a result of their using a dash-pot for retarding the motion of a miniature railroad signal and that the reason for this failure is that the forces available for the actuation of these miniature signals are so small that the dash-pots employed in said devices were inoperative to exercise a satisfactory and uniform retarding action on said miniature signals.

It is also an object of the present invention to provide an actuating mechanism for miniature railroad signals which will include a motion dampener for said signals which will retard the motion of said signals in a given operation of the latter substantially uniformly from the beginning of said motion to the end thereof.

I also discovered that the lack of uniformity in the restraint provided by dash-pots used in prior miniature signal actuators resulted from the fact that each of these dash-pots necessarily embodied a stuffing box which made a tight packing around the stem of the dash-pot and the friction of this packing against the stem, if sufficient to prevent leakage of the liquid in the dash-pot, made the resistance to movement of said stem so great as to be beyond the power available for actuating the dash-pot in such a miniature signal actuator. I also noted that if the friction thus set up in the stuffing box of the dash-pot was reduced by loosening the same, a leakage of the fluid from the dash-pot would occur with the result that the dash-pot would soon be rendered inoperative by losses from the operating liquid therein.

Another important object of the present invention is therefore the provision of an actuating mechanism for miniature railroad signals which will include a motion dampener for said signals which will not require a stuffing box.

The manner of accomplishing the foregoing objects as well as further objects and advantages will be made manifest in the following description taken in connection with the accompanying drawings in which—

Fig. 1 is a diagrammatic vertical sectional view through the roadbed of a miniature railway system and illustrating a semaphore mounted on top of said roadbed and a preferred embodiment of the actuating mechanism of the invention mounted on the bottom face of said roadbed in association with said semaphore for the purpose of actuating the latter. This view shows said mechanism energized to shift said semaphore into "stop" position and with said semaphore positioned as at the conclusion of its response to said mechanism.

Fig. 2 is a view similar to Fig. 1 and illustrates said mechanism positioned as when actuated to move said semaphore to "go" position, and showing said semaphore at the conclusion of its movement to said position.

Fig. 3 is an enlarged sectional detailed view taken on line 3—3 of Fig. 1 and showing the manner in which a viscous liquid is employed to dampen the action imparted by said mechanism to said semaphore.

Fig. 4 is a horizontal fragmentary sectional view taken on line 4—4 of Fig. 3.

Referring specifically to the drawings, the invention is there shown as embodied with a horizontal deck-board **10** which constitutes the roadbed of a miniature railway system. The track (not shown) of said system is mounted on top of deckboard **10** and the miniature train travels on said track and is energized by electricity supplied to the rails of said track. Various pseudo traffic control devices simulating actual control devices used in commercial railway systems are mounted on the deckboard **10** alongside said track, giving the appearance of reality to the operation of miniature trains on said track. Such control devices include semaphores, crossing barrier arms, etc.

The invention comprises a control device actuating mechanism **15** which, for illustrative purposes, is shown in the drawings as secured to the bottom face of deckboard **10** by a bolt **16** which also secures to the upper face of said deckboard a semaphore control device **17**.

The mechanism **15** has a frame plate **18** and an attaching flange **19** which is bent from the upper edge thereof and apertured to receive the bolt **16** and a screw **20** which cooperates with the bolt **16** to hold the mechanism **15** firmly mounted on the deckboard **10**. The plate **18** has a notch **24** formed in an upper corner thereof, a bearing ear **25** being bent from said plate therefrom along the horizontal edge of said notch. The bearing ear **25** has a bearing aperture **26** which is concentric with a cylindrical clamp **27**, the latter being secured to plate **18** by a screw **28**. Mounted in clamp **27** is a cylindrical tube **29** which is open at opposite ends and has a smooth bore **30**. A substantial portion of the surface of said bore is covered by a highly viscous fluid **31**. A fluid suitable for this use is known by the trade-name "Silicone," and is made by the Dow Corning Corporation, said fluid being produced in various viscosities varying between 0.65 and 1,000,000 centistokes. Silicone of the "Dow Corning 200" series with a viscosity of 1,000,000 centistokes is preferable for use for the fluid

31. This fluid also has the property of remaining at substantially uniform viscosity under widely varying conditions of temperature and humidity. It is technically referred to in chemical literature as a dimethylsiloxane polymer.

Only a very thin layer of the fluid 31 need be applied to the bore 3 of the tube 29, the viscosity of said fluid being such that it will not flow from said tube but will remain in adhering relation therewith even though said tube be disposed vertically by the mounting of the mechanism 15 and be open at both ends.

Slidable in the cylinder 29, and spaced therefrom by a thin film of fluid 31, is a piston 35 having an axial bore 36 in which a piston rod 37 is secured as by nuts 38 and 39. The piston rod 37, which constitutes a signal actuating member, extends slidably through the bearing opening 26 and has a yoke-spool 40 slidable thereon beneath the bearing ear 25.

The yoke-spool 40 has major flanges 41 and 42 and a secondary flange 43. Coiled about the rod 37 and having one end fastened to the piston 35 by the nut 39 and the other end secured to the spool 40, by being wound about the lower end of the latter above the flange 43, is a signal actuating coil spring 50, this spring being of a diameter which permits it to readily fit within the bore 30 without its contacting the layer of viscous liquid 31. In other words the outside diameter of the spring 50 is slightly less than that of the piston 35.

Mounted on the piston rod 37 where this extends above the bearing 25 is a pair of collars 51 and 52 which are adjustably held in place on said rod by screws 53.

Mounted on head plates 54 and 55 fixed on the plate 18 is a solenoid 56 comprising coils 57 and 58. These coils are supplied with electricity through terminals 59, 60 and 61 whereby they may be independently and alternately energized by electrical circuits including switches (not shown) which are mounted on deckboard 10 close to said track so as to be closed by a miniature train passing thereover. The coils 57 and 58 are in abutting coaxial relation so as to have a common bore 65 in which an armature 66 is freely slidable. Fixed on the armature and extending coaxially upward therefrom is a flexible wire link member 67, the upper end of which terminates in an eye 68.

The plate 18 also has mounted thereon a spring post 69 (Fig. 2) and a lever axle bearing 70 (Fig. 4). Bearing 70 comprises a tube with one end 71 thereof turned down and threaded to receive a nut 72 after said end has been extended through a suitable hole provided in the plate 18. The nut 72 is tightened to draw the shoulder formed by the end portion 71 against the plate 18 and thus rigidly mount the tubular bearing 70 on said plate.

Journaled in the bearing 70 is an axle 75 of a lever 76. The axle 75 comprises a bolt, the head 77 of which abuts against the end portion 71 of bearing 70 while the threaded free end of the axle carries nuts 78 and 79 and a lock-washer 80, with said axle extending through a suitable aperture of the lever 76 so that the latter is clamped between the nut 78 and washer 80 to rigidly unite the lever 76 and the axle 75. A smooth washer 81 is placed on the axle 75 between bearing 70 and nut 78 to facilitate free rotation of said axle in said bearing.

The lever 76 comprises a flat plate having an arm 85 bent therefrom towards the plate 18. Yoke arms 86 are formed on the arm 85 with the arms 86 extending between the flanges 41 and 42 of the spool 40 so that rotation of the lever 76 about the axis of the bearing 70 shifts the spool 40 lengthwise on the piston rod 37.

Also fixed on the lever 76 are a short post 90, which extends inwardly therefrom and is notched to receive and retain thereon the solenoid eye 68, and a spring attaching post 91 which extends outwardly therefrom and is suitably notched to receive one end of a pre-loading coil spring 92 the opposite end of which loops around the post 69. As clearly evident from a comparison of Figs. 1 and 2 the post 69 is so located on the plate 18 with reference to the axis of spring 92 that the latter lies on opposite sides of the lever axle 75 when the lever 76 is disposed in its extreme positions shown in these two views. In other words, the axis of the tension applied by the pre-loading spring 92 to the lever 76 passes over dead-center each time the lever is shifted from one of its extreme positions shown in Figs. 1 and 2 to the other of said positions, spring 92 thereby operating to hold the lever 76 in either of said extreme positions to which it is shifted and pre-load actuating spring 50 in either an expansive or contractile, pre-loaded condition. Spring 92 is thus seen to operate as a detent means for retaining lever 76 in either of its extreme positions.

The semaphore device 17 comprises a die-cast standard 100 which is hollow and has a pedestal base 101 which is suitably apertured to receive the bolt 16 in order to mount the standard 100 on the deckboard 10, with the hollow interior of the standard 100 in vertical alignment with a hole 102 formed in said deckboard. Pivotally mounted on a shaft 103 which journals in a suitable bearing provided near the upper end of said standard is a semaphore arm 104. The shaft 103 has an arm 105 which extends through an eye 106 formed in the upper end of a wire 107 which extends downwardly through said standard and the hole 102. The lower end of said wire 107 has an eye 108 formed thereon which is bent into horizontal position so as to surround the piston rod 37 between the collars 51 and 52.

Operation

As already noted, the actuating mechanism 15 is responsive to the closing of switches (not shown) which are engaged by a miniature train at various points in its travel along a track mounted on the deck board 10. The semaphore 17 is located near one of said switches so that when the latter is closed it will energize the coil 58 of the solenoid 56 so as to rock the lever 76 into the position in which this is shown in Fig. 1. This results in the semaphore arm 104 being rotated 90° from the position in which this is shown in Fig. 2 to the position in which this is shown in Fig. 1. The horizontal position of the semaphore arm 104 shown in Fig. 1 is its "stop" position in which it warns following trains to halt because of their proximity to the train which closed the switch causing the semaphore to be shifted to this position.

When the leading train has advanced a certain distance beyond the semaphore device 17 it will engage another switch (not shown) which will energize the coil 57 through the terminals 59 and 60 which will rock the lever 76 from its position in Fig. 1 to its position in Fig. 2. This will result in the semaphore arm 104 being swung 90° into its upright position.

It is to be noted that each movement of the lever 76 between its two extreme positions shown in Figs. 1 and 2 by the energizing solenoid coils 57 and 58 is a very rapid movement taking place in a small fraction of a second while the movement of the semaphore arm 104 between its two extreme positions shown in these views is a relatively slow movement taking from two to four seconds. A simulation is thus effected in the operation of the semaphore arm 104 of the operation of corresponding semaphore arms in a real train signaling system where the semaphore arms are motor-driven through gears and move slowly.

The slowing down of the movements of the semaphore arm 104 is accomplished in the present invention by the retarding effect of the viscous liquid 31 coating the bore 30 of the cylinder 29. The movement of the piston 35 in the cylinder is accomplished by the exertion thereagainst of a yieldable spring pressure through the spring 50 which is placed under tension by the spool 40 when

the latter is shifted either upwardly or downwardly by the solenoid **56**.

For example, when the piston **35** is in upward position in the cylinder **29** as shown in Fig. 3 and the coil **57** of the solenoid is energized the action of the latter is to swing the lever **76** to the position in which this is shown in Fig. 2, thereby very rapidly shifting the spool **40** from its upper position as shown in Fig. 1 to its lower position in which it is shown in Fig. 2. This pre-loads signal actuating spring **50** against the upper end of piston **35** and the passage of the pre-loading spring **92** over dead-center holds the lever **76** and spool **40** as thus positioned after the train has passed over the switch which energized the coil **57**, thereby de-energizing the latter.

The pressure of signal actuating spring **50** against the piston **35**, when said actuating spring is thus pre-loaded is insufficient to overcome the viscosity of the liquid **31** which engages and adheres to both the cylinder bore **30** and the piston **35**, excepting to effect a relatively slow movement of said piston downwardly in said bore. Thus two or three seconds are consumed by the piston **35** in its downward travel to the point shown in Fig. 2 where the collar **52** rests against the guide bearing **25**. In this movement the eye **108** is engaged by the collar **51** and the wire **107** pulled downwardly so that the eye **106** on the upper end of said wire, and through which the arm **105** extends, swings said arm downwardly and rotates the shaft **103** to swing semaphore arm **104** through an arc of 90°.

The collar **51** is positioned on the piston rod **37** at a level which will produce the precisely right amount of rotation of shaft **103** to swing the semaphore arm **104** exactly one-quarter turn upwardly as a result of the actuation of the mechanism **15** illustrated in Fig. 2. The rod **37** is of such length that when it is in its upper position as shown in Fig. 1, it will engage the deckboard **10** which forms an upward limit stop for the rod. The collar **52** is adjustably located on the rod **37** so that when this rod is in its upper position as shown in Fig. 1 the eye **108** will rest on top of said collar and the wire **107** will be elevated so as to just lower the semaphore arm **104** to the horizontal position in which this is shown in Fig. 1.

The cylinder **29**, piston **35** and viscous liquid **31** may be said to comprise a motion dampener **110**.

While the function of the motion dampener **110** in retarding the response of the rod **37** to the pre-loaded actuating spring **50** is similar to that which a dash-pot is ordinarily employed to perform, it performs this function in an entirely different way than a dash-pot and produces a successful actuator for miniature signal devices, such as a miniature train semaphore, where the amounts of power available for use are so small that a dash-pot would be wholly inoperative. The reason for the success of the present invention in performing this function is that it does not employ any packing, such as the stuffing box of a dash-pot, which stuffing box offers a very substantial resistance to movement of the piston rod through it, and this resistance varies with the tightness of the box.

The resistance of the motion dampener **110** to movement of the rod **37** is very slight, and it is almost absolutely uniform over long periods of time and under radical variations in temperature. No adjustments in the dampener **110** are required (nor is any possible) which can vary the resistance inter-posed thereby in the actuation of a miniature signal by the actuating mechanism **15** of the invention. This dampener thus entirely overcomes the handicaps of prior miniature signal actuators which rendered these inoperative, or at least impractical, for use for their intended purpose.

Although this invention is disclosed as employed in actuating a miniature semaphore, it is to be understood that it may be applied with equal effectiveness for operating any other miniature device which requires slowing down of movement to simulate the action of the prototype.

The claims are:

1. A mechanism for the actuation of a miniature railway system traffic control device comprising: a cylinder, a piston slidable in said cylinder; a piston rod connected to said piston; a relatively highly viscous liquid means disposed between said piston and said cylinder; an actuating coil spring surrounding said piston rod with one end thereof connected to said piston; means connecting said piston rod to said traffic control device whereby linear movement of said rod actuates said device; a solenoid; and means connected to the opposite end of said actuating spring and operable by said solenoid to optionally stretch or compress said actuating spring to apply a resilient force to said piston to cause a linear shifting of said piston and rod in either direction between two positions of the same, the speed at which said rod shifts in either direction in its movement between said two positions being retarded by the viscous liquid means between said cylinder and said piston.

2. A combination as in claim 1 in which a lost motion means is provided between said rod and said means connecting said rod to said traffic control device, whereby an initial portion of each linear movement of said rod does not affect said device, movement of the latter being responsive only to the balance of said linear movement of said rod.

3. A combination as in claim 1 in which the means connecting said solenoid with said actuating spring comprises a lever pivotally mounted on an axis disposed at right angles to the axes of said rod and said solenoid, said solenoid having a core and a link member connecting said core to said lever; means connecting said actuating spring to said lever adjacent to the axis of said rod; a pre-loading spring connected to said lever and held in tension so as to swing across the axis of the mounting of said lever when said solenoid is actuated to swing said lever to stretch or compress said actuating spring, said pre-loading spring operating when shifted across dead-center by the rotation of said lever to hold said lever in the position to which the latter is shifted by said solenoid whereby said lever pre-loads said actuating spring in a stretched or compressed condition as the case may be.

4. A combination as in claim 2 in which said means for connecting said rod to said traffic control device comprises a wire with a loop circling said rod, and a pair of collars adjustably mounted on said rod in opposite directions from said loop whereby the period of said lost motion may be predetermined by the selection of the locations of said collars on said rod.

5. A mechanism for the exercise of a retarded control function comprising: a solenoid; a lever operatively connected to said solenoid for optional actuation thereby in either direction between two extreme positions; a pre-loading spring, one end of which is connected to said lever and the other end of which is anchored at a fixed point to cause said spring to be under tension along a line which crosses the rotational axis of said lever when the latter swings from one extreme position to the other; a control actuating member; an actuating spring connected at one end to said member and at the other end to said lever whereby the shifting of said lever to one of its extreme positions pre-loads said actuating spring under a contractile tension which is transmitted through said actuating spring to said actuating member whereas a shifting of said lever to its other extreme position pre-loads said actuating spring under an expansive tension which is likewise transmitted to said actuating member; and a motion dampener connected to said actuating member to substantially uniformly retard movement of said actuating member in response to either of said spring tensions applied to said actuating member by said actuating spring.

6. A combination as in claim 5 in which said motion

dampener comprises a tubular cylinder which is coated internally with a highly viscous liquid means, and a piston which makes a loose sliding fit within said cylinder so that said liquid means forms a layer separating said piston from said cylinder and adhering to both, and in which said actuating member comprises a piston rod for said piston and in which said actuating spring is coiled about said rod with one end of said spring connected to said piston and the other end of said spring connected to said lever.

7. A mechanism for the exercise of a retarded control function which comprises a solenoid; an element operatively connected to said solenoid and responsive to the energizing of the latter for the optional shifting of said element to either one of two extreme positions; detent means for retaining said element in whichever of said extreme positions said element is shifted by said solenoid; an actuating member; an actuating spring interposed between and connected at its opposite ends to said element and to said member whereby the shifting of said element into one of its extreme positions aforesaid pre-loads said

actuating spring under a tension which is transmitted through said actuating spring to said actuating member tending to move said actuating member to cause the latter to exercise a control function; and a motion dampener connected to said actuating member to retard the response of said actuating member to the tension imparted to said pre-loaded actuating spring by the shifting of said element.

8. A combination as in claim 7 in which said motion dampener comprises means providing two slidably related elements said means being connected to said actuating member to produce sliding movement between said elements in response to the aforesaid movement of said actuating member; and viscous liquid means occupying the space between said related elements and thus retarding said movement of said actuating member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,341	Garlick	Dec. 8, 1925
2,540,481	Heise	Feb. 6, 1951