

Jan. 30, 1934.

E. D. STIRLEN ET AL

1,945,091

TIMER AND SYSTEM

Filed April 1, 1930

3 Sheets-Sheet 1

FIG. 1.

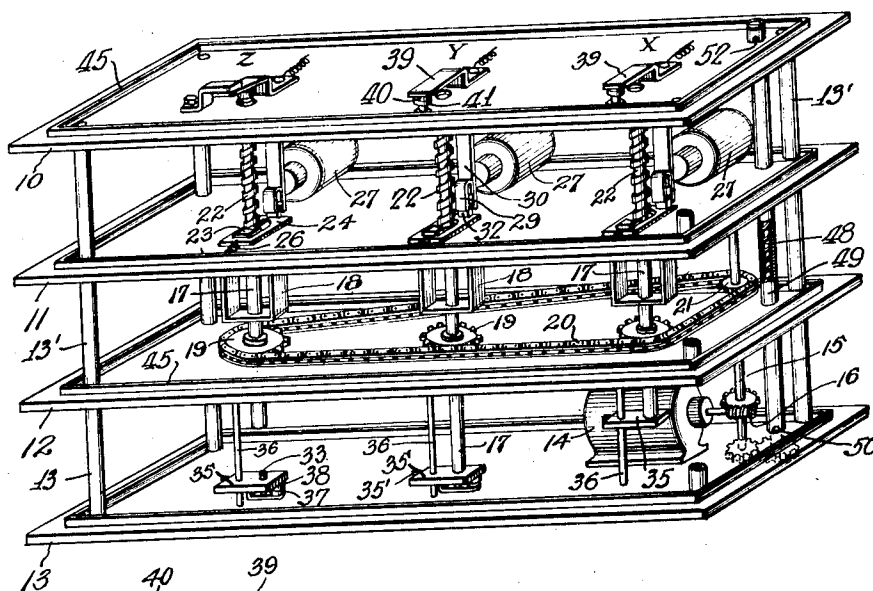


FIG. 2.

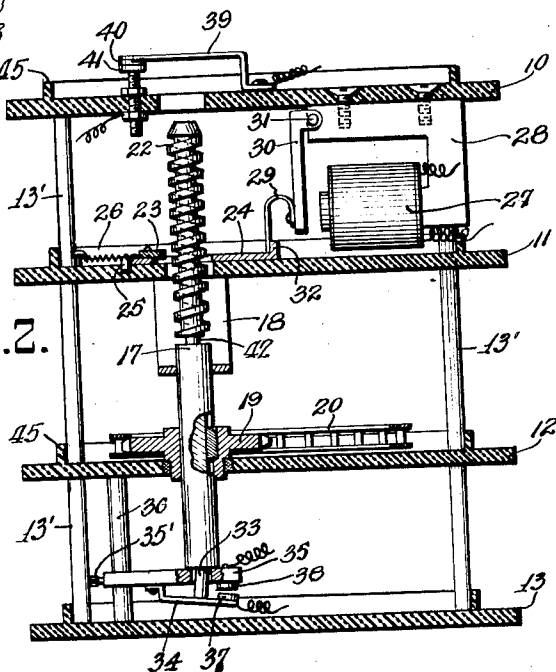
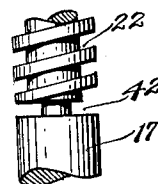


FIG. 3.



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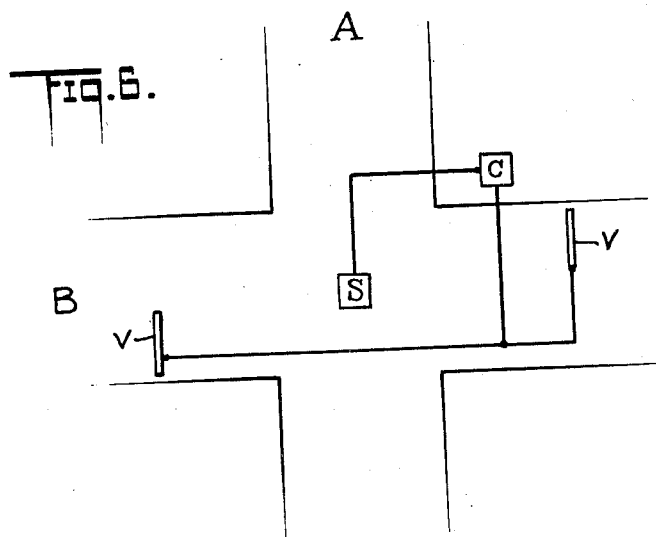
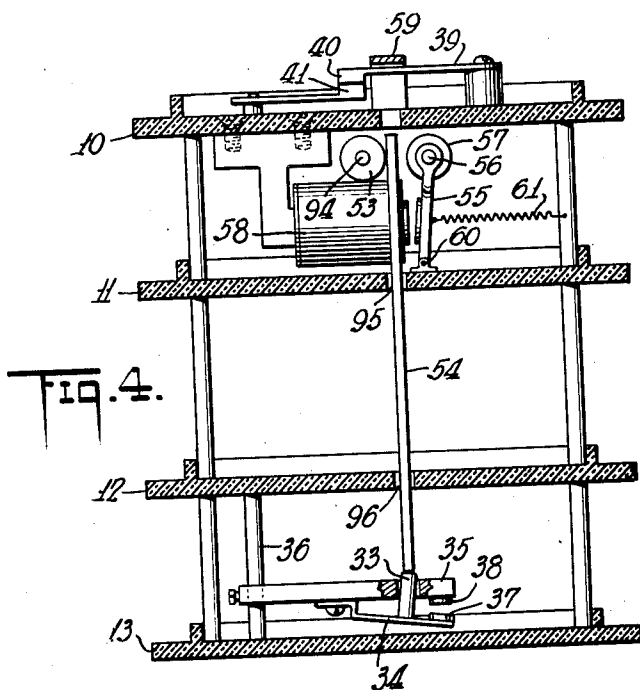
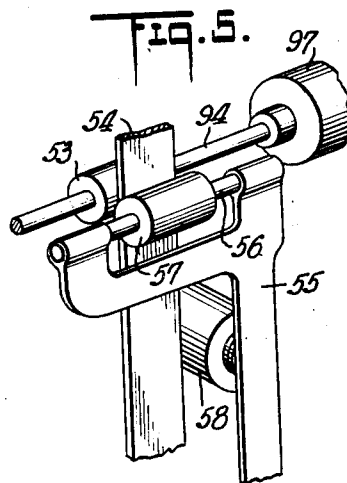
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3 Sheets-Sheet 2



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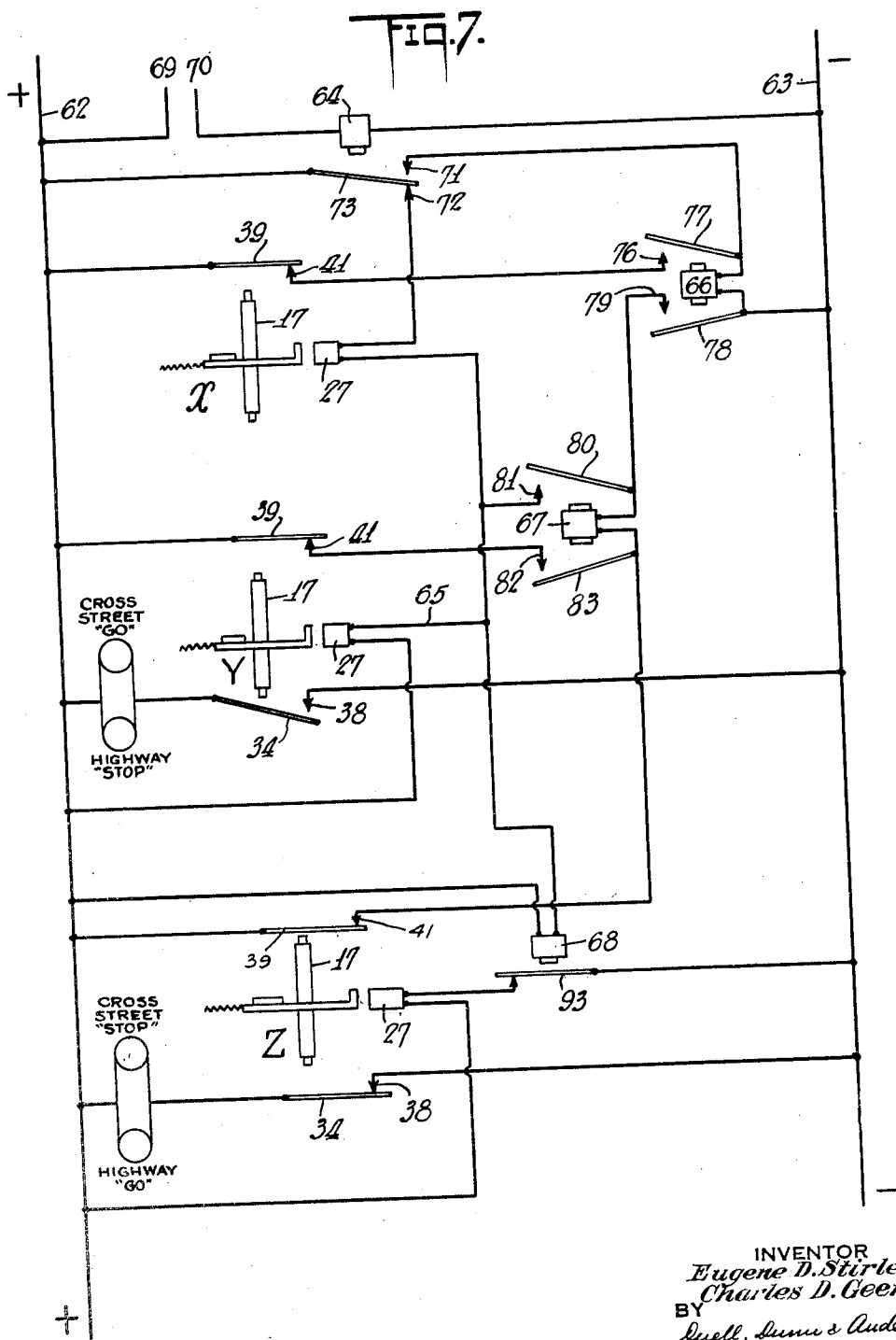
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Filed April 1, 1930

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UNITED STATES PATENT OFFICE

1,945,091

TIMER AND SYSTEM

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Application April 1, 1930. Serial No. 440,701

3 Claims. (Cl. 200—27)

This invention relates to a functionally and structurally improved timer.

It is an object of the invention to provide a mechanism of this character capable of use in numerous different associations and primarily intended to be employed for the purpose of controlling circuits. In such association, one aspect of the invention is that of furnishing a timer which is of particular utility when combined with a traffic control system.

A further object of the invention is that of furnishing a timer, the parts of which will be relatively few in number and individually simple and rugged in construction, these parts being assembled to provide a compact unit operating over long periods of time with freedom from mechanical and electrical difficulties.

Another object is that of constructing a timer which will operate automatically and in a positive manner and which when combined with a traffic control system, will effectively operate the latter to control the movements of traffic with maximum efficiency.

Another object is that of providing a device of this character, the several parts of which may be adjusted readily to accord to the conditions of installation in any given instances, and in which the parts, when once set, will continue to operate in accordance with the conditions imposed by such setting.

With these and further objects in mind, reference is had to the attached sheets of drawings, illustrating practical embodiments of the invention, and in which:

Fig. 1 is a perspective view of one form of timer;

Fig. 2 is a transverse view taken through the apparatus as shown in Fig. 1;

Fig. 3 is a fragmentary view of a mechanical detail;

Fig. 4 is a view similar to Fig. 2, and showing a slightly different form of apparatus from that illustrated in the former figures;

Fig. 5 is a fragmentary perspective view of one of the units of the timer as shown in Fig. 4;

Fig. 6 is a diagrammatic representation of the layout of a control system; and

Fig. 7 shows the circuit embodied in such system and combined with a timing unit of the type illustrated in Figs. 1 and 2.

Referring primarily to Fig. 6, A indicates a main vehicle lane or highway, and B a second vehicle lane in the present instance embracing a street intersecting the highway. It will be understood that while, for the purposes of thus illus-

trating the latter vehicle lane has been shown as continuing beyond the highway, this need not necessarily be the case in that the lane B might terminate at its point of communication with the highway. In any event, adjacent the point of intersection of the two vehicle lanes—or as otherwise may be convenient—a right of way signal is provided as has been indicated at S. This signal or control may be of any desired type but conveniently includes the more or less conventional form of signal casing having "Stop" and "Go" designations visible along the paths of approach of the several vehicle lanes. This signal in the usual manner preferably embraces sources of illumination, by means of which these designations may be brought to the attention of an approaching vehicle.

The right of way signal thus furnished or any desired substitute therefor, is operated automatically by being connected to a controller or timer indicated at C, and this timer may in turn be operated by a vehicle actuated control. The latter may take numerous different forms including, for example, that indicated diagrammatically at V in the figure under consideration. If such a control is employed, it will include usually—as is well understood by those skilled in the art—a member which is actuated by the passage of a vehicle to close the gap in a circuit, and as exemplified, one each of these controls is disposed in the vehicle lane B suitably in advance of its intersecting the vehicle lane which provides the highway.

Now referring to Figs. 1 to 3, the numerals 10 to 13 indicate respectively a plurality of supporting members or decks spaced from each other by means of supports 13'. Conveniently associated with one of these supports as for example the lowermost one, is a motor 14 which serves to rotate, by means of a worm drive 16, a shaft 15. Extending through openings formed in the supports 11 and 12 are shafts 17 which may have rotatable bearing with brackets 18. These shafts carry gears 19 which are incapable of rotation with respect thereto although freely movable longitudinally of the bodies thereof. To this end, the gears may be slidably keyed one to each of the shafts as has been shown in Fig. 2.

A constant rotation of the shafts is assured as for example by utilizing a sprocket chain 20, the links of which mesh with the teeth of the gears 19, and this chain passes around a pinion 21 affixed to the drive shaft 15 thus achieving the results desired.

Each of the shafts 17 is threaded as at 22 and if

the shafts are to have upward movement (as shown), the last and lowermost convolution of the thread merges into and is continued in the form of an annular groove 42. Disposed in the present instance upon the support 11 are a series of apertured plates 24, each of which mounts a tooth 23 extending into the plate aperture. The plates correspond in number to the number of shafts 17 provided, and the latter pass one through each of the apertures thereof. These apertures are of sufficient area that neither the teeth nor the edge portions of the plates engage the shafts with which they are associated, and in order to assure this result, a plate retracting means may be provided by utilizing springs 26 which have their outer ends anchored and their inner ends secured to the plates, movements of the latter beyond predetermined points being prevented by means of stops 25. In order to positively shift the plates to points at which the teeth carried thereby may extend into the thread convolutions, solenoids 27 may be disposed adjacent each of the same. These solenoids may form a part of cores 28 and an armature 30 is pivotally secured as at 31 to be shifted when the solenoid is energized. The armatures are each coupled to the plates preferably by springs 29, the outer ends of the latter engaging behind lips 32 forming parts of the plates. By means of the yielding connection thus provided, it will be obvious that if the armature should be shifted to correspondingly move the plate against the influence of the spring 26, and if the tooth is not in line with the thread groove, no damage will occur, but the tooth will be snapped into position as soon as the shaft 17 has reached a point where such groove is in line with the tooth end.

Disposed between the supports 12 and 13 are further supports which may be in the nature of posts 36 and each of these posts carries a rest member 35, one of which underlies each of the shafts 17. These members may be adjusted along posts as, for example, by providing a set screw connection 35'. Two of these members in the embodiment illustrated carry circuit breakers which may embrace operating pins 33 secured to a breaker arm 34, the latter carrying adjacent its outer end a contact element 37 for cooperation with a similar element 38 carried by the member 35. It is obvious that when one of the shafts is resting against the operating pin underlying the same that the circuit breaker will be open and when the shaft is elevated the circuit breaker will close. When sufficiently elevated, the shafts serve to open in each instance circuit breakers operated by their upper ends. These latter units may include spring strips 39 carrying contact elements 40 cooperating with similar elements 41 and overlying openings in the upper plates 10, it being thus apparent that when any particular shaft has been raised to an adequate extent, it will bear against the strip 39 to open the circuit embracing the elements 40—41.

At this time, it will be noted that the supports 10 to 13 preferably have ribs 45 extending adjacent their outer edges so that the upper face of each of these supports provides a pan structure. Also, the lower support 13 is in communication with the intake end 50 of a pump provided for example by enclosing within a tube 49 a screw 48, and driving the latter constantly from the shaft 15 to thus elevate fluid and discharge the latter through the outlet opening 52 of the pump on to the upper surface of the support 10. Thus, the entire apparatus may be provided with lubri-

cant which will run down the shafts and the several parts in association with the latter, and will be picked up by the pump and returned to the upper end of the unit.

Considering the general operation of the apparatus, it will thus be understood that there is presented in the embodiment under consideration three shafts which are constantly rotated and which tend normally to maintain positions at which their lower ends bear against the raised members. Each of these shafts, however, may be elevated by simply energizing the solenoid 27 disposed adjacent the same to thus effect a projection of the tooth 23 and initiate upward movement of the shaft. Upon the completion of upward movement, the circuit breaker adjacent the upper end of the shaft will be opened and the period of time required for the shaft to accomplish this result will be controllable aside from the possibility of varying the R. P. M. of the motor 14 by the height to which the rest member has been adjusted. No damage will occur when the shaft reaches its upper position for the reason that the tooth will continuously traverse the groove 42. As soon as the electro-magnet 27 is de-energized, the tooth will be withdrawn from engagement with the side walls of this groove, and consequently the shaft will drop, thus virtually instantaneously reestablishing the normal position of the circuit breaker 39—41 and opening the circuit between the contact elements 37 and 38.

A second form of apparatus constructed in accordance with the present invention has been illustrated in Figs. 4 and 5 in which a pair of friction rolls 53 and 57 may cooperate to elevate a shaft or rod 54. At this time, it will be understood that merely one unit of the timer has been illustrated, but that the same might include any desirable number of units as, for example, three in the manner shown in Figs. 1 to 3.

A motor 97 by means of a shaft 94 serves to drive the roller 53 in counter-clockwise direction. The roller 57 is mounted by a shaft 56 carried by a bracket 55 and an extension of the latter acts as an armature for a solenoid 58. This armature is pivotally mounted as at 60 and a spring 61 may serve normally to maintain the parts in the position shown in full lines, it being noted that the bar 54 extends through openings 95 and 96 in the supports. Insofar as the structure of the circuit breakers is concerned, they may duplicate substantially that of the mechanism illustrated in Figs. 1 to 3. Additionally, if desired, a stop member 59 may be provided to prevent too great a strain being imposed upon the arm 39 under the thrust of the bar as it ascends.

It is believed from the foregoing that the operation of this unit will be obvious. Briefly reviewing the same, it will be observed that as illustrated, the bar will normally tend to rest upon the operating member 33 thus breaking the circuit between elements 37 and 38, the circuit through elements 40—41 being maintained. As soon as the electro-magnet 58 is energized, it will attract the arm of the bracket 55 to press the face of the roller 57 against the bar and in turn force the latter into driven engagement with the roller 53. Consequently, the bar will begin to ascend and will continue this movement until the circuit through elements 40—41 is interrupted. Obviously, the time required for this ascent may be varied by simply adjusting the position of the rest member 35 to increase or decrease the path of travel of the bar. As soon as the circuit

through the solenoid 58 is interrupted, the bracket under the influence of the spring 61 returns to its normal position and the bar drops freely under the action of gravity to a point at which the circuit through the elements 37—38 is again interrupted.

Now referring to Fig. 7 in which the circuit has been shown in conjunction with an apparatus of the type illustrated in Figs. 1 to 3, it will be noted primarily that the three units of the timer have, for the sake of convenience, been designated as X, Y and Z respectively, and that current is supplied to the entire apparatus through leads 62 and 63 extending from a suitable source of current supply (not shown). As illustrated, the parts are in their normal position, and at this time, it is to be noted that the paths of travel of the shafts 17 of the three units have been limited so that ten seconds are required for the shaft of unit X to reach a position at which it elevates the arm 39 to break the circuit, and thirty seconds each are required to correspondingly operate the similar parts of the units Y and Z. A relay 64 is arranged between the leads 62 and 63, and is disposed in series with the vehicle actuated control B. This relay controls the armature 73 connected to the lead 62 and alternately connectible to leads 71 or 72. The former is in series with a magnet 66 connected to the leads 63 and this magnet controls armatures 77 and 78 connectible to leads 76 and 79. The former is in series with the upper circuit breaker of the unit X, and the latter is in series with the electro-magnet 67 of a relay and extends in series with the upper circuit breaker of the unit Z to the lead 62. The magnet 67 controls the action of armatures 80 and 83, the first of which is connected to lead 79, the second being connected to the lead which extends in series with the upper circuit breaker of the unit Z, and when these armatures are attracted, they close the circuit through leads 81 and 82 respectively. The former extends on one side in series with the solenoid 27 of the unit X and thence to the lead 72. On the other side, it has a branch 65 extending in series with the magnet 27 of the unit B, and thence to the lead 62. The lead 81 continues beyond this branch and is in series with an electromagnet 68 and extends thence to the branch 62. The lead 82 is in series with the upper circuit breaker of the unit Y. An armature 93 is disposed adjacent the electromagnet 68 and in its normal and unopened position is in series with a circuit extending from the lead 63 through the electro-magnet 27 of the unit C and thence to the lead 62. Finally, the signal which indicates highway right of way, i. e. for the vehicle lane A, and "Stop" for the vehicle lane B, is coupled to the lead 62 and in series with the lower circuit breaker of the unit Z, and thence connected to the lead 63 while that portion of the signal which indicates right of way to the cross street or vehicle lane and stop to highway traffic is connected to the lead 62 thence through the lower circuit breaker of the unit Y and so to the lead 63.

As aforesaid, the normal condition of the parts has been illustrated in Fig. 7, and under this condition, it will be observed that highway traffic is given the right of way incident to the fact that the lower circuit breaker of the unit Z is in closed condition which occurs for the reason that the shaft 17 is elevated. This in turn is attributable to the fact that current is flowing from lead 62 through the electro-mag-

net of the lower unit, thence through the armature 93 and so to the lead 63. This condition of the parts will prevail until the vehicle actuated control is operated to close the circuit through the relay 64. When this occurs, the armature 73 will be attracted, thus closing the circuit through relay 66 and attracting the armatures 77 and 78. This will lock in the relay and will also result in an energization of the relay 67 to attract the armatures 80 and 83, and in turn cause a locking in of this latter relay. With lead 81 energized, a flow of current will result which will cause an actuation of the electro-magnets of the units X and Y, as well as an energization of the solenoid 68. As aforesaid in connection with the operation of these units, such energization of their magnets will initiate a raising of their shafts 17 and thus the lower circuit breaker of the unit Y will be closed to energize the signal providing for right of way of the vehicle lane B. However, before this has occurred, the electro-magnet 68 will have attracted the armature 93 thus breaking the circuit through the electro-magnet 27 of the unit Z. This will cause the shaft 17 of this unit to drop breaking the circuit through the signal controlled by this unit and which is heretofore provided for right of way in the traffic lane A. Simultaneously, it will be observed that the circuit through the upper circuit breaker of this unit is interrupted. If now no further actuation of the vehicle actuating control V is effected, the shaft 17 of the unit X will continue to rise and ultimately will serve to break the circuit by elevating the arm 39 of its circuit breaker. Obviously, the armature 73 of the relay 64 has returned to its normal position instantly after the vehicle which caused the initial operation has passed the control station, and with the circuit thus broken, the relay 66 is opened causing a corresponding actuation of the relay 67 and a consequent de-energization of the solenoids 27 of both the units X and Y. Accordingly, the shafts 17 of these units will drop to their initial positions and the shaft of the unit Y will cause the circuit breaker including the arm 34 to be opened thus interrupting the circuit which in the interim has been providing for right of way of the traffic lane B. Also the armature 93 will have dropped to its normal position and accordingly the solenoid 27 of the unit Z will have been energized to again initiate an elevating of the shaft 17 of the unit Y. This will cause a reestablishment of right of way to the traffic in vehicle lane A and a "stop" signal to the traffic in lane B. If under these circumstances, the vehicle actuated control is again operated, the relay 62 will of course attract the armature 73 and the latter, after the cessation of control actuation will drop back to its normal position. This actuation will cause a locking in of the relay 66 but due to the fact that the upper circuit breaker of the unit Z is in open condition no further operation results. However, as soon as the shaft 17 reaches its fully elevated condition (in the present instance thirty seconds from the time it began to ascend), the upper circuit breaker of this unit will be closed and thereupon the operation heretofore described will occur.

Presuming under the first described condition of operation, i. e. where the right of way has been given to the vehicle lane B, and traffic on the vehicle lane A has been brought to a halt and ten seconds have not elapsed, and if there-

upon control by a subsequent vehicle in the lane B is established to energize the relay 64, the armature 73 will again be energized in the usual manner. Due to the fact that the solenoid 27 of unit X is in series with this armature, such elevation will cause the solenoid to be momentarily de-energized and the shaft 17 of the unit X will accordingly drop back to its initial position. This is continued as often as a vehicle actuated the control B so long as the shaft 17 of the unit X has not opened the circuit breaker associated with this unit. However, a limitation is imposed upon the continuance of right of way to the vehicle lane B by the fact that the shaft 17 of the unit Y is continuing to rise during this operation and when finally—after thirty seconds—it reaches such an elevated condition that it shifts the arm 39 of its circuit breaker to open the latter, the relay 67 will instantly be opened—although the relay 66 may continue to be closed—, and this will cause a de-energization of the solenoid 27 of the units X and Y and a re-energization of the corresponding solenoid of the unit Z causing operation of the parts in the manner afore brought out.

From the foregoing it will be seen that a timer is provided which, according to one aspect of the invention may be employed in numerous different associations, and according to another aspect of the invention is of particular utility when combined with a traffic control system. In such latter connection, it will be obvious that a highway right of way will be afforded by means of a structure devised within terms of the present invention and that this right of way will be transferred to the side street, upon initiation of vehicle control actuation. Thereupon, sufficient time will elapse before highway right of way is reestablished to enable the vehicle to either cross the highway or to turn into the same. In the event that other vehicles are following the first vehicle, the right of way signal will be continued until a sufficient time has elapsed to enable the last vehicle to cross the highway or to turn into the same. If, however, vehicle actuation of the control continues beyond the time limit imposed by the setting of the unit Y or its equivalent, right of way to the vehicle lane B will be interrupted and transferred to the vehicle lane A and will not be reestablished until a time interval has elapsed in accordance with the setting of the unit Z or its equivalent.

However, in the interim, if the vehicle actuated control continues to operate, the relay 66 will be locked in so that the entire apparatus is potentialized to function immediately upon the shaft 17 of the unit Z reaching its elevated condition. Thus, it will be seen that the system embraces a control whereby right of way is normally given in favor of vehicles traversing the highway or lane A, but that if vehicles are also constantly seeking to traverse lane B, the control will operate to alternately transfer this right of way and, according to the setting of the parts as illustrated, such transfer will occur for equal amounts of time in favor of each vehicle lane.

From the foregoing, it will be understood that, among others, the several objects of the invention as specifically afore brought out are achieved. It will also be appreciated that numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims. For example, it will be observed that the upper circuit breakers associated with the units X and Y are of that type which are normally closed and are moved to open condition upon the ascending of the plungers to predetermined levels. On the other hand, the upper circuit breaker of the unit Z is of that type which is normally open with the plunger in lowered position and becomes closed only when it is deliberately shifted by the plunger. Obviously, the system might be arranged to have the reverse true if so desired.

In conclusion, it will be appreciated that the timer unit might be employed in numerous different associations; that a plurality of these units might be suitably combined to mutually cooperate, and while the timer according to the present invention is to be combined primarily with a traffic control system such as for example of the type illustrated, that it might advantageously be utilized in conjunction with any desired system of this general nature.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. A timer including a screw threaded shaft, means for rotating the same, means whereby said shaft may shift axially with respect to said rotating means, a circuit breaker to be operated by movement of said shaft to a predetermined extent, means engageable with the threads of said shaft to permit the latter to shift, and said threads terminating in a continuous groove whereby, upon said shaft having shifted to a predetermined extent, further axial movement thereof is prevented.

2. A timer including a shaft having screw threads terminating in a continuous groove, means for rotating the shaft, means whereby said shaft may shift axially with respect to said rotating means, a circuit breaker to be operated by movement of said shaft to a predetermined extent, means engageable with the threads of said shaft to permit the latter to shift and electromagnetic means for controlling said last mentioned means.

3. A timer including a shaft having screw threads terminating in a continuous groove, means for rotating the shaft, means whereby said shaft may shift axially with respect to said rotating means, a circuit breaker to be operated by movement of said shaft to a predetermined extent, means engageable with the threads of said shaft to permit the latter to shift, electromagnetic means for controlling said last mentioned means and a circuit breaker to be operated by the return of said shaft to its normal position.

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