July 5, 1938. W. K. KEARSLEY 2,123,052

TIMER

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Fig. 1.

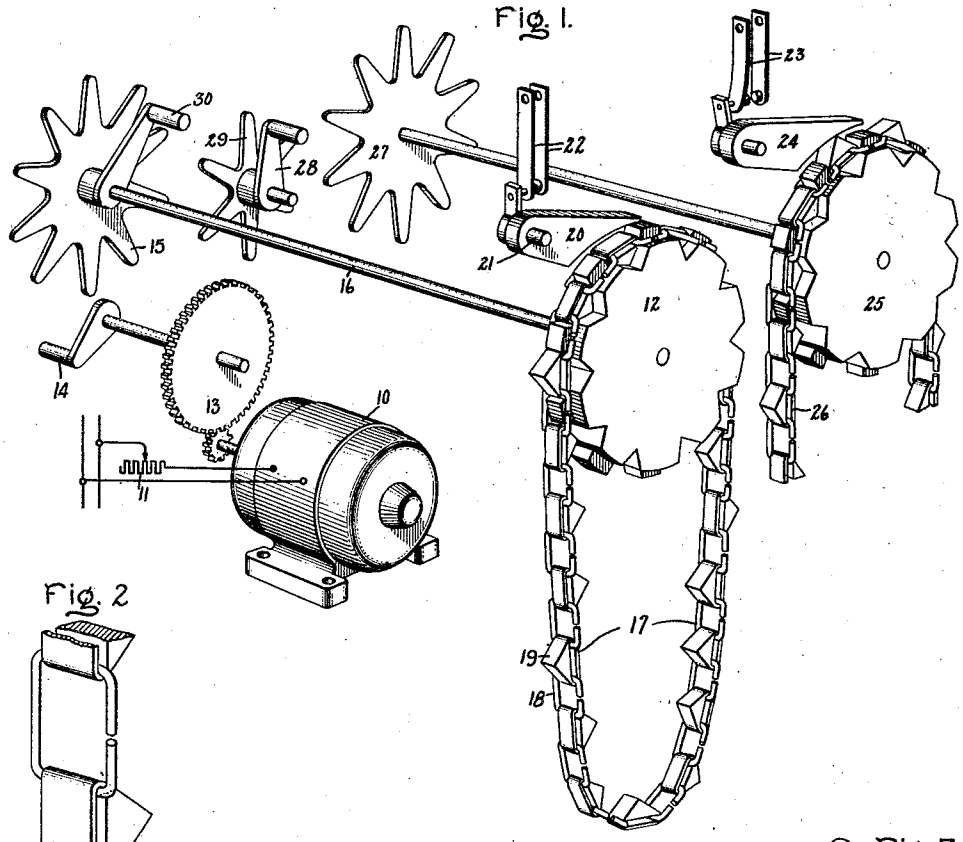


Fig. 2

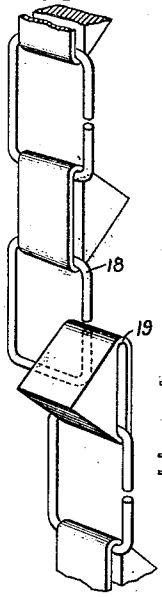


Fig. 3.

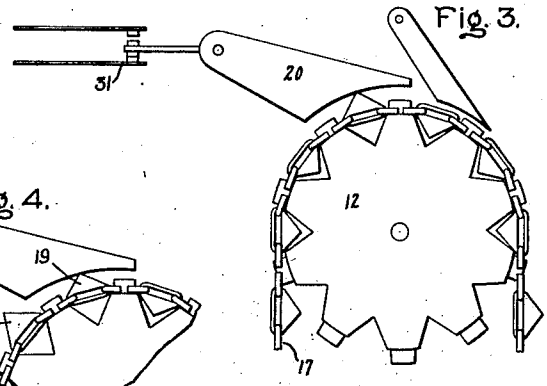
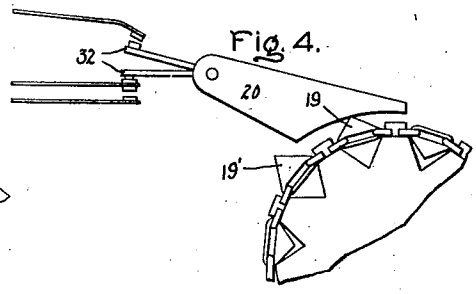


Fig. 4.



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Fig. 5.

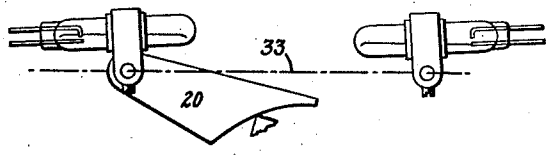


Fig. 6.

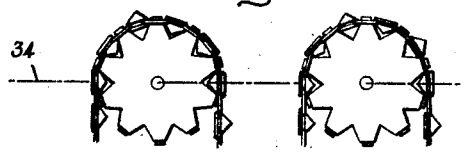
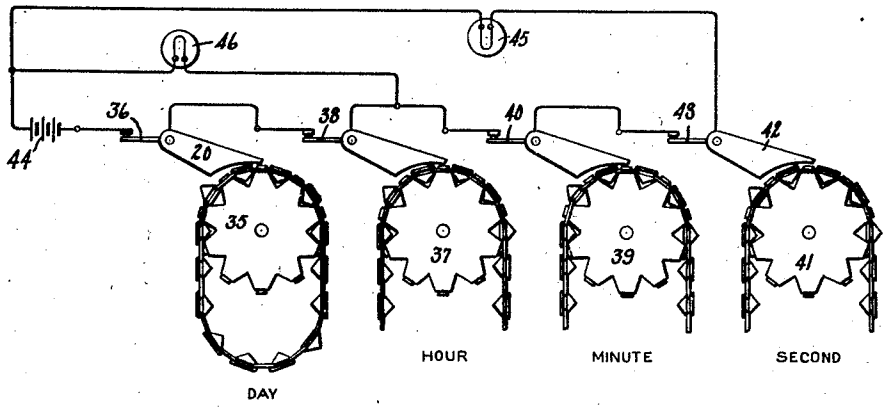


Fig. 7.



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UNITED STATES PATENT OFFICE

2,123,052

TIMER

William K. Kearsley, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application April 28, 1936, Serial No. 76,791

10 Claims. (Cl. 200—30)

My invention relates to a timing interval apparatus suitable for operating time switches or for performing other timed operations, and its object is to provide apparatus of the character described which is easily adjusted for a wide variety of timing operations.

In carrying my invention into effect in its preferred form, I employ a chain which is driven through a sprocket wheel by a suitable motor. The links of the chain correspond to time interval units, are of special construction, and are easily removable and reversible so that the chain may be quickly adjusted as to its length and selected links therein reversed in the chain. The links have projections on one side so arranged that, when moved past a given point, the projection, if extending in the proper direction, serves to operate a switch or the like. If a link is reversed so that its projection extends in an inoperative direction, the link will pass the switch-operating position without performing any switching operation. By varying the length of the chain, the disposition of the links therein, and the speed of the driving motor, a wide variety of timing intervals and sequences may be obtained with simple inexpensive apparatus.

The features of my invention which are believed to be novel and patentable will be pointed out in the claims appended hereto. For a better understanding of my invention, reference is made in the following description to the accompanying drawings, Fig. 1 of which is a perspective view of a time-switch mechanism involving my invention employing two chains; Fig. 2 shows the manner in which the chain links may be removed and inserted; Figs. 3, 4, and 5 represent, by way of example, different forms of switch contacts that may be employed; Fig. 6 shows two chains driven from the same shaft; and Fig. 7 represents a four-chain program instrument by means of which any desired one-second switching program during a week may be obtained.

Referring now to Fig. 1, I have shown an electric motor 10 which is assumed to be a constant-speed motor but one which may have its speed adjusted to different desired values by means of the variable resistance 11 in its supply circuit. The motor is arranged to drive a sprocket wheel 12 through suitable gearing 13, a Geneva drive having parts 14 and 15, and a shaft 16. The parts 14 and 15 convert the constant rotary motion from the motor to an intermittent step-by-step rotary motion at sprocket wheel 12, which is desirable to obtain quick make and break switch operation. It will be noted that the number of teeth in sprocket wheel 12 and in the Geneva wheel 15 are the same and thus it will be evident that the sprocket wheel 12 will be advanced in steps, each the distance of exactly one tooth by this arrangement.

Hung on the sprocket wheel is a chain 17 having a link spacing fitting the spacing of the sprocket wheel teeth so that the chain may be driven by such sprocket wheel. The chain is made of link units having alternate loops 18 and connecting bands 19. The loops 18 are spaced so as to fit over the teeth in the sprocket wheel 12 to establish the driving connection. The connecting bands 19 have pyramidal extensions on one side and, as shown in Fig. 2, the loops are easily removable so that the bands 19 may be easily removed and replaced with the projections on the inside or outside of the chain as desired. The depressions in the sprocket wheel are sufficient to accommodate such projections when on the inside of the chain so that these projections produce no interference with the smooth driving action of the chain however they are placed (see Fig. 3).

Adjacent the upper periphery of the sprocket wheel is a shoe member 20 pivoted at 21. The shoe rests on the periphery of the sprocket wheel over the chain so that it will be raised and lowered as bands having projections on the outside of the chain pass this point. The shoe preferably has a sufficient peripheral contacting length so that it will more than bridge the space between two consecutive bands 19 in the chain and so that, if two or more adjacent bands 19 in the chain have their projections outward, the shoe will remain in the raised position while such bands pass beneath the shoe.

Use is made of the movement of the shoe to operate some device such as a valve or switch member. A switch 22 is represented by way of example and is arranged to have its contacts closed when the shoe is lowered, as shown at the left in Fig. 1, and to have its contacts open when the shoe is raised, as shown in the second switch member 23 at the right in Fig. 1.

This second switch member 23 is operated by a second shoe 24, sprocket wheel 25, and chain 26, the sprocket wheel 25 being driven by a second Geneva driving connection comprising parts 27, 28, 29, and 30 operated from shaft 16 and so arranged that sprocket wheel 25 is advanced one tooth distance for each complete rotation of wheel 12. If it be assumed that the speed of motor 10 is adjusted to advance wheel 12 one step per second, gear wheel 29 will be advanced one step every ten

seconds with the driving ratio represented and wheel 25 will be advanced once per minute.

The chains may have any convenient length and their link units may be arranged with the projections in or out in any desired relation so as to obtain any desired sequence of switching operation. The chain 17 is arranged to have every fourth link unit with its protection outward in operating position so that the switch 22 will be closed for three seconds and opened every fourth second, assuming wheel 12 is advanced once per second. If the chain 17 is now simply turned over on the sprocket wheel, the switch 22 will be closed every fourth second and remain open for intervals of three seconds. Link units may be added or removed from the chain and the bands 19 reversed from operating to inoperating position or vice versa as desired to make up any desired switching program.

The same kind of adjustments may be made with the chain on sprocket wheel 25. The time interval period of this second wheel 25 is ten seconds under the conditions assumed; that is, the chain of wheel 25 is advanced in steps every ten seconds and the switch 23 will remain open or closed a minimum of ten seconds, depending on the arrangement of the projecting bands in its chain.

In addition to these adjustments, we may vary the speed of the driving motor. We may manually advance or turn back the intermediate driving member 28—29, the wheel 27, or the wheel 15 to temporarily alter the automatic operation and change the sequence of the switching programs performed by the two chains. Likewise, we may lift off a chain and advance or set it back one or more steps or turn it over.

More than one and different lengths of shoes may be provided (see Fig. 3). Thus, if the shoe is reduced in length, it will open and close the switch contacts 22 every time the chain is advanced even though all bands 19 have their projections outward in operating position. Fig. 3 represents the shoe 20 as operating a double-throw switching device 31. In the position shown, the lower contact is closed. When the chain is advanced, the upper contact will be closed and the lower contact opened.

In Fig. 4, I have represented bands 19 and 19' in the chain 17 having different sized projections. The shoe 20 operates a switch mechanism 32 having three positions, the illustration showing it in its intermediate position with the intermediate contacts closed. When the chain is advanced one step, the lower contacts will also be closed and, when the chain is advanced a further step, the upper contacts will be closed and the lower and intermediate contacts opened. Thus, by having link bands 19 and 19' with different sized projections, a further selective operation may be obtained.

Fig. 5 represents a pair of mercury tube switches on the same shaft represented by dotted line 33 operated by one shoe 20. As represented, one switch is open when the other is closed.

Fig. 6 represents how two or more sprocket wheels similar to those previously described may be mounted on the same driving shaft 34. These wheels will thus be advanced at the same average rate, but their chains may be adjusted to perform different switching operations.

In Fig. 7, I have represented more or less diagrammatically a program instrument for obtaining any desired one-second interval program during a week. In this figure, let it be assumed that wheel 35 is advanced once per twenty-four hour day and has a fourteen-band chain with every seventh band turned with its operating projection outward. A fourteen instead of a seven-band chain is specified because the wheel is too big to accommodate a seven-band chain. Its shoe 20 may open the switch 36 every Sunday and keep it closed the remaining six days of the week, for example. Let it be assumed that gear wheel 37 is advanced one step per hour and that it carries a chain having twenty-four bands. Thus, this section may be arranged to maintain its switch 38 closed during any one or more selected hours each day. Let it be assumed that gear wheel 39 is advanced once per minute and carries a sixty-band chain arranged to keep its switch 40 closed during any desired selected minute or group of minutes each hour. Let it be assumed that wheel 41 is advanced one step per second and carries a sixty-band chain arranged to keep its switch 43 closed during any second or group of seconds during each minute. The switches 36, 38, 40, and 43 are in series with a source 44 and a lamp or other device 45, whereby the circuit will be closed in accordance with the weekly, hourly, minute, and seconds program determined by the arrangement of the bands in the four chains since the lamp 45 will only be energized when all four switches are closed.

A second circuit including a lamp 46 and switches 36 and 38 only is represented, and this circuit will be energized in accordance with the weekly and hourly program only.

In some cases, the lengths of the chains may be shortened. For example, if the minute program is to be one minute on and nine minutes off, a chain having ten or twenty link units will suffice.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A timer mechanism comprising a plurality of linked together link members forming a chain, means for driving said chain at a predetermined average rate in a continuous path, said link members being removable from said chain and some of them having projections extending from one side thereof, which link members may be reversed in said chain so that the projections may extend in either of two directions from said chain; and movable means biased to project into the path of movement of such projections as extend in one of said directions so as to be moved thereby out of such path during passage of such projections past said means.

2. A timer mechanism comprising a chain, means for driving said chain in a continuous path at a predetermined average speed, and a movable member adjacent such path, said chain being formed of linked together chain members which have projections extending from one side thereof, said chain members being removable and reversible in said chain such that the projections thereof may extend in either an operative direction or an inoperative direction with respect to said movable member, whereby those chain members which are assembled in said chain with their projections extending in said operative direction cause op-

eration of said movable member when passing thereby.

3. A timer mechanism comprising a sprocket wheel, means for driving said wheel, a chain driven by said wheel, said chain being formed of interlinked link members some of which have projections extending from one side thereof, which link members are removable from the chain and reversible in the chain so that the projection of such link members may be assembled with the projections on the inside or outside of the chain, and a movable member mounted adjacent the periphery of said sprocket wheel and having a contacting surface normally biased to rest on the periphery of said wheel over the chain thereon such that movement of the chain past said member causes it to be raised by those link members whose projections are assembled on the outside of said chain.

4. A timer mechanism comprising a chain having uniformly distributed link members comprising connecting links in said chain each having a projection on one side thereof, said link members being removable and reversible in said chain to enable the projections thereon to extend in an operative direction or an inoperative direction, a device to be operated pivoted adjacent said chain and having a shoe normally biased towards said chain, and means for moving said chain in a continuous path past said pivoted device to cause the operative positioned projections in said chain to contact with said shoe and move said device about its pivot away from said chain as a projection approaches and comes against said shoe and to permit said member to return to its normally biased position as a projection leaves said shoe, said shoe being of sufficient length, however, to be engaged by operatively positioned projections in two consecutive link members in said chain in which case the pivoted member does not return to its normally biased position until all operatively positioned projections in consecutive links have passed thereby.

5. A timer mechanism comprising a chain, means for advancing said chain in a continuous path at a predetermined average rate, said chain having uniformly distributed interlinked members comprising links of said chain which are removable and reversible in said chain and which have projections on one side thereof, the direction in which a projection on a link member extends from the chain being reversible with such link member, and a device to be operated at predetermined times mounted adjacent one side of said chain, movable towards and away from said chain, and having a surface adapted to contact with the projections of said chain which extend toward such side when such projections are moved past such member to cause the operation of said member, said contacting surface being of sufficient length to simultaneously contact with operative positioned projections on two adjacent link members in said chain.

6. A timing mechanism comprising a chain, the linked chain elements of which include removable link members having projections extending from one side thereof, said link members being reversible in said chain to cause the projections thereon to extend in an operative direction or an inoperative direction from said chain, means for advancing said chain in a continuous path at a desired average speed, and a pivoted device mounted adjacent said chain and having a part normally biased into the path of movement of the operatively positioned projections in said chain whereby said device is moved by such projections as they pass such device, the projections on some of the members being shorter than on others whereby the extent to which said device is moved by the operatively positioned projection in moving past said device may be selectively predetermined by the order of the arrangement of the links in said chain.

7. A timer mechanism comprising a chain, said chain having link members which are removable and which have projections on one side thereof, said link members being reversible in said chain to permit assembling with the projections on either side of said chain, a movable device to be operated at predetermined times mounted adjacent said chain so as to be operated by those projections which extend in one direction from said chain when such projections are moved past said movable device, and means for intermittently moving said chain in a continuous path past said movable member at a predetermined rate, each such movement advancing the chain a distance corresponding to the spacing of said link members in said chain.

8. A timer comprising a sprocket wheel, means for driving said wheel at a desired rate in progressive steps each a distance corresponding to the tooth pitch on said sprocket wheel, a chain looped over said wheel and having a link spacing corresponding to the tooth spacing of said wheel, said chain including removable link members having projections on one side thereof, said link members being also reversible to bring the projections on the inside or outside of said chain, the tooth formation of said sprocket wheel being such as to have a driving fit with said chain with the projections on the link members either inside or outside, and a switch-operating member pivoted adjacent the periphery of said wheel and having a shoe portion resting on said periphery over the chain in such manner as to be raised and lowered by passage thereunder of an outwardly positioned projection on a link member of said chain as the wheel is turned, whereby changes in the length of said chain and the reversing of said link members therein determines the timing sequence of operation of said switch member.

9. A timer mechanism comprising a plurality of sprocket wheels, a timer motor for driving said sprocket wheels, means between said motor and wheels for causing said wheels to be driven at different rates in step-by-step movements, the lengths of such steps corresponding to the tooth pitches of the corresponding sprocket wheels, a chain driven by each sprocket wheel, said chains having removable and reversible link members whereby the lengths of said chains may be varied and selected links reversed, said link members having projections on one side thereof, reversible from the inside to the outside of the chain and vice versa by reversing the link member, and a switch adjacent the periphery of each wheel having an operating member extending into the path of movement of the outside projections in the chain thereon.

10. A timer mechanism comprising a plurality of sprocket wheels, a timer motor for driving said wheels, means between said motor and wheels for driving them at different rates by step-by-step movements, each step corresponding to the spacing between the teeth in the respective wheel, chains hung on each sprocket wheel and driven thereby, said chains having removable and reversible link members whereby the length of such

chains may be varied and selected link members therein reversed, each reversible link member having a projection on one side thereof which may be changed from the outside to the inside of the chain and vice versa by reversing the link member, a switch adjacent the periphery of each wheel, said switches having operating members extending into the paths of movements of the outside link projections of the chains on the corresponding wheels, so as to be operated thereby when an outside link projection moves past its operating member, and a circuit controlled by all of said switches.

WILLIAM K. KEARSLEY.