Aug. 31, 1926. 1,597,851

R. J. WENSLEY

TIME LIMIT RELAY

Filed Sept. 3, 1919 2 Sheets-Sheet 1

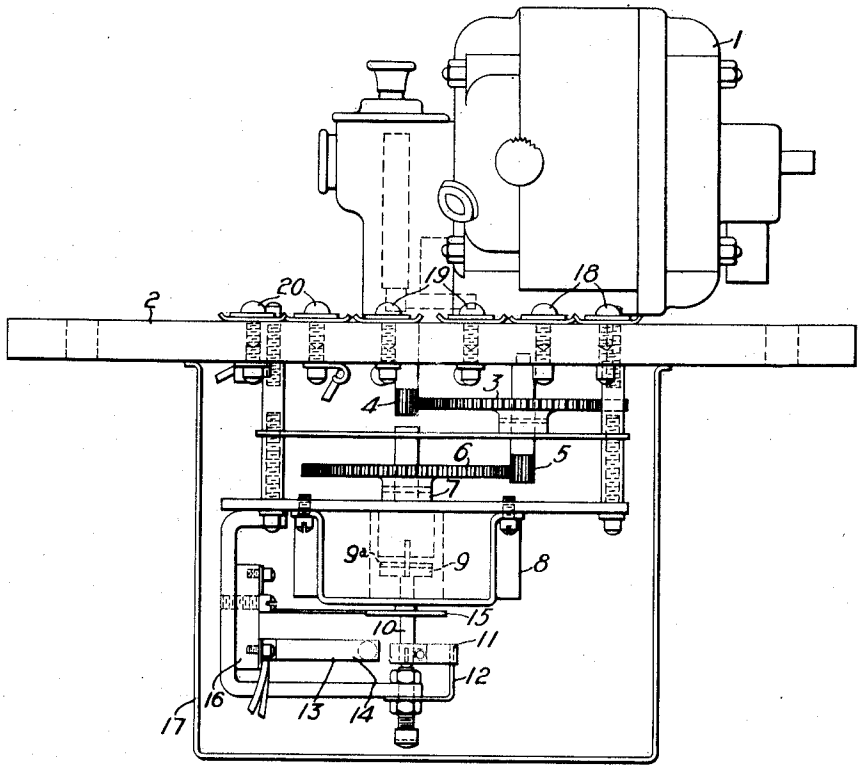


Fig. 1.

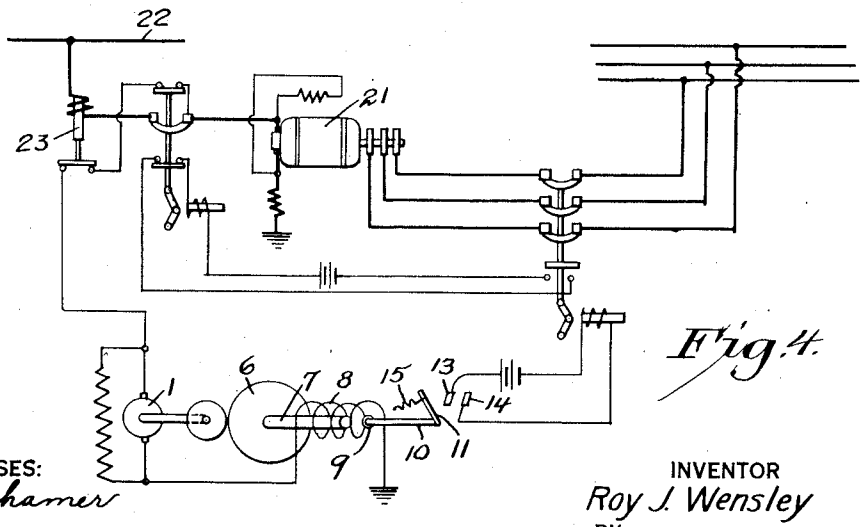


Fig. 4.

WITNESSES:
H. J. Shelhamer
J. E. Foster

INVENTOR
Roy J. Wensley
BY
Wesley G. Carr
ATTORNEY

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R. J. WENSLEY

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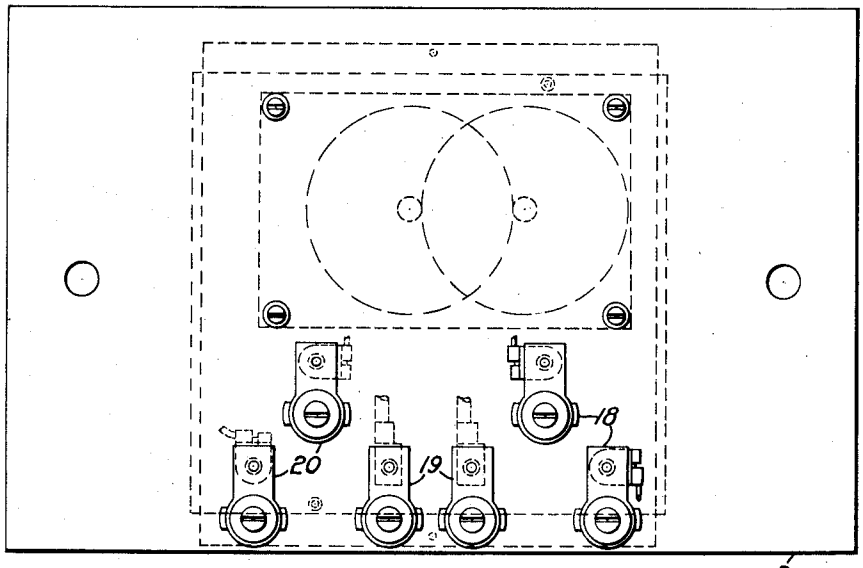


Fig. 2.

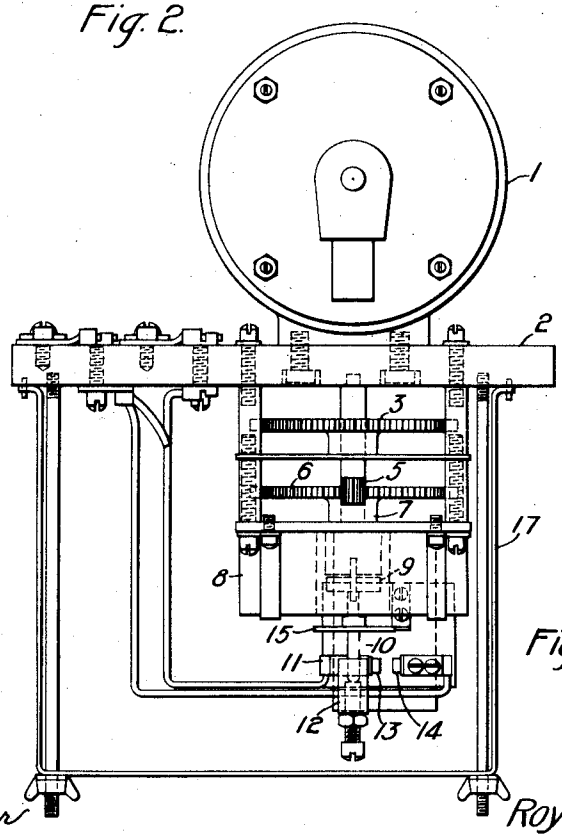


Fig. 3.

WITNESSES:
H. J. Shelhamer
J. B. Foster

INVENTOR
Roy J. Wensley
BY
Wesley G. Carr
ATTORNEY

Patented Aug. 31, 1926. 1,597,851

UNITED STATES PATENT OFFICE.

ROY J. WENSLEY, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

TIME-LIMIT RELAY.

Application filed September 3, 1919. Serial No. 321,409.

My invention relates to relays and particularly to time-limit relays.

The object of my invention is to provide a time-limit relay that shall be easy to construct, have great flexibility and reliability and be simple and positive in its operation.

As ordinarily used, an automatic synchronous converter substation is called upon for power during the operation of a train or trains within the district served by such station, but, while such trains are loading or unloading passengers or freight, no demand is made on the substation for energy. In order that movement of trains may not be delayed beyond the periods required for loading and unloading, a time-limit relay is provided to keep the substation operating during the loading and unloading periods.

When the trains leave a given district, the demand for energy is transferred to the substation serving the adjacent district, and since energy is no longer required from the first substation, it is permitted to shut down.

A further object of my invention is, therefore, to keep a substation operating over a predetermined length of time to take care of train stops and to obviate the necessity for re-starting the station when the train restarts and to permit the station to shut down after a definite time, when the train has left the district served by the station.

In practicing my invention, I employ a motor, a train of reducing gearing, a magnetic clutch for operating a shaft that supports a cam member, and two contacts, engagement of which is effected by the cam member to complete the circuit of a means for shutting down the substation.

The circuit of the motor and the coil of the magnetic clutch is completed by an underload relay when the current supplied to the circuit by the converter to be controlled decreases below a predetermined value.

In the accompanying drawings, Figure 1 is a front view, Fig. 2 a top view, and Fig. 3 a side view, of the relay embodying my invention; and Fig. 4 is a diagrammatic view of an electric system containing the relay of Fig. 1.

An ordinary fan motor 1 is mounted upon a base 2. A shaft, extending through to the under side of the base 2, actuates a gear wheel 3 by means of a pinion 4. This gear wheel 3, by means of a second pinion 5, actuates a second gear wheel 6. A hub 7 of the gear wheel 6 is surrounded by a coil 8, which, when energized, attracts a disc member 9 to the hub 7, such disc member being coaxially mounted upon a shaft 10 so that rotation of the gear wheel 6 rotates the shaft 10. A cam member 11, mounted on the shaft 10, normally rests against a backstop 12, but, when actuated, moves with the shaft 10 to cause two contact members 13 and 14 to engage each other. A spiral spring 15, wound about, and having one end fastened to, the shaft 10, has its other end fastened to a frame support 16 so that, after the coil 8 has become de-energized and the disc member 9 is released from the hub 7, the tension of the spring 15 will turn back the shaft 10 until the cam member 11 rests against the back stop 12. A casing 17 encloses the mechanism on the under side of the base 2. Six terminal members 18, 19 and 20 are mounted on the base 2 near the motor 1. Two terminals 18 are for the motor, two terminals 19 for the coil 8 and two terminals 20 for the contact members 13 and 14.

In the system illustrated in Fig. 4, energy is transformed by the synchronous converter 21 from alternating-current energy, drawn from the alternating-current system, to direct-current energy which is transmitted to the direct-current trolley conductor 22. Since the converter 21 is operated to transform the alternating-current energy to direct-current energy only while the demand for such energy is made on the particular station by a passing train within the district served by that station, the relay 23 serves to indicate the condition when a small amount of energy is drawn from the associated station by reason of the train having passed into a district served by an adjoining substation. Since the train may make several stops within the district served by the converter 21, it is essential that the converter 21 shall not be disconnected from the system by the relay 23 because the train has stopped to take on, or discharge, passengers or freight.

In order to prevent the premature disconnection of the converter from the system, the time-limit relay is employed to disconnect the converter only after low-current condi-

tions have been indicated by the relay 23 for a predetermined interval, as, for example, three to twenty minutes. Under such conditions, the converter may be disconnected from the system since it is then obvious that the low demand for energy is due to the fact that the train has passed from the district supplied by the converter 21 to an adjoining district.

By varying the position of the back-stop 12, against which the insulated cam 11 rests, in the deenergized position of the relay, this relay may be made to keep a substation operating during the loading or unloading periods of trains, that vary from three to twenty minutes.

I do not limit my invention to the structure shown, as various modifications may be made without departing from the spirit and scope of the appended claims.

When the current supplied by the converter 21 to the trolley circuit 22 decreases below a predetermined value, an underload relay 23 closes the circuit of the motor 1 and the coil 8 of the magnetic clutch. After an interval of time corresponding to the adjustment of the cam member 11 relative to the contact members, the converter is disconnected from the system.

The hub 7 of the gear wheel 6 and the disc member 9 are constructed of magnetizable material. A disc member 9^a of non-magnetizable material, such as leather or brass, is interposed between the magnetizable members and prevents their sticking together after the coil 8 is de-energized. The disposition of the magnetizable members in a vertical plane permits the force of gravity to separate the same when their engagement is no longer desired.

The cam member 11 comprises a laterally disposed arm that is mounted on the shaft 10. The movement of the shaft 10, and, consequently, of the cam member 11 is controlled by the movement of the disc member 9 in accordance with the movement of the hub 7. The two contact members 13 and 14 are resiliently mounted adjacent each other in the path of movement of the cam member 11 and are caused to engage each other when that member is turned through a predetermined distance.

I claim as my invention:

1. In a time-limit relay, the combination with a base and a motor mounted on one side thereof, of an auxiliary base supported from the other side thereof, a train of gears disposed between the main and the auxiliary bases, a coil mounted on the auxiliary base, a magnetizable member disposed within the coil and controlled by one of the gears, a movable magnetizable member disposed adjacent the gear-controlled member and controlled thereby when the coil is energized, a shaft supporting and controlled by the movable magnetizable member, a supporting member for the shaft, a plurality of adjacent contact members mounted on the supporting member, a cam member mounted on the shaft for effecting engagement of the contact members, a back stop for determining the initial position of the cam member and means for returning the cam member to its initial position.

2. In a time-limit relay, the combination with a horizontally disposed motor and a base therefor, of a coil for a magnetic clutch disposed on the opposite side of the base with its axis in a vertical plane, a magnetizable member disposed within the coil, a train of gears connected between the motor and the magnetizable member to rotate that member at a predetermined rotative speed, a movable magnetizable member actuated by the gear-controlled magnetizable member when energized by the coil and normally removed therefrom by gravity, a shaft supporting and controlled by the movable magnetizable member, a cam member mounted thereon, a plurality of contact members, engagement of which is controlled by the cam member, means for adjusting the cam member and the shaft to determine the initial position thereof and means for returning the cam member to its initial position.

In testimony whereof, I have hereunto subscribed my name this 25th day of Aug. 1919.

ROY J. WENSLEY.