

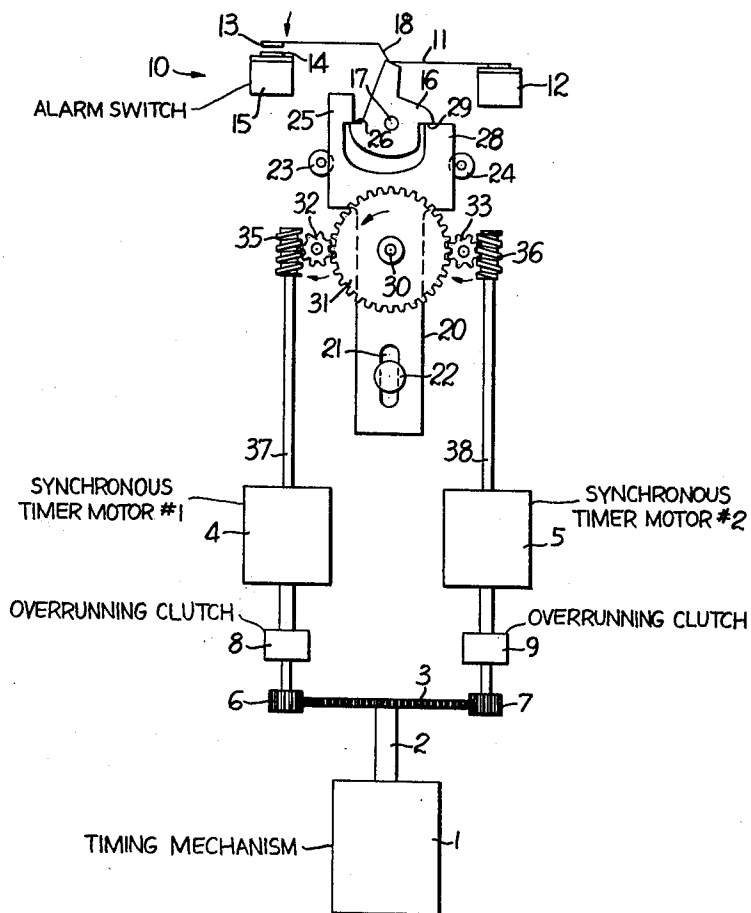
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CONTROL DEVICE

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CONTROL DEVICE

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7 Claims. (Cl. 74-1)

This invention relates to timers of the synchronous motor operated type.

Synchronous motor operated timers are often used in applications where a timer motor failure can cause serious damage. For example, where a single timing unit is used for defrosting a number of supermarket frozen food cabinets, a large quantity of frozen food can be spoiled by the failure of the timer motor.

The primary object of the invention is to provide a synchronous motor operated timer for use in such critical applications and which eliminates the danger of damage by a timer motor failure.

The present invention utilizes two separate timer motors for driving a single timing mechanism. Each motor drives the timing mechanism through an over-running clutch so that if one motor should stop, the other motor can continue to drive the timing mechanism.

A further object of the invention is to provide a signal for indicating when one of the timer motors has failed. In accordance with the invention, each motor is used for checking the operation of the other. This is accomplished by a differential mechanism for operating a switch. As long as both motors operate at the same speed, the differential mechanism maintains the switch in open position. However, if one motor stops or slows down, the differential mechanism detects the relative difference in speed and actuates the signal.

For a full disclosure of the invention reference is made to the following detailed description and to the accompanying drawing, the single figure of which illustrates schematically one form of the invention.

Referring to the drawing, reference character 1 indicates a timer mechanism the construction of which is no part of the present invention. This timer mechanism may be of any desired type and includes a cam or drive shaft 2 which is driven by a gear 3. Reference characters 4 and 5 indicate completely independent synchronous motors for driving the timer mechanism 1. Motor 4 drives a pinion 6 meshing with the gear 3. Motor 5 drives a pinion 7 also meshing with the gear 3. A suitable over-running clutch 8 is interposed between the motor 4 and its pinion 6. Also an over-running clutch 9 is interposed between the motor 5 and the pinion 7.

From the description thus far it will be apparent that motors 4 and 5 both drive the timer mechanism 1. Due to the over-running clutches, if one motor should stop, the other motor can continue to drive the timer mechanism.

The invention also includes a signal for warning the user whenever one of the motors stops. This signal consists of a switch generally indicated as 10. This switch includes an offset switch blade 11 secured to a suitable bracket 12 and carrying a contact 13 which is adapted to engage a stationary contact 14, carried by a suitable contact bracket 15.

The switch 10 is normally held in open position as shown by means of a switch operator 16 which is pivoted at 17. It will be apparent that rotation of the switch operator 16 in a counter-clockwise direction from the position shown will result in this operator coming under the offset portion 18 of the switch blade, thus permitting this blade to lower and close contacts 13 and 14.

The switch operator 16 is operated by means of a slide 20 which is arranged for longitudinal movement. This

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slide includes a slot 21 which fits over a stud 22. The upper end of the slide 20 is retained and located by means of studs 23 and 24.

The slide 20 is formed so as to engage the switch operator 16 on opposite sides of its pivot 17. Thus an abutment 25 on the slide engages a surface 26 of the operator on the left side of the pivot 17. A similar abutment 28 on the slide engages a surface 29 of the switch operator which is on the right side of the pivot 17.

The slide 20 supports a movable bearing 30 for an idler gear 31 which meshes between gears 32 and 33 which are driven by motors 4 and 5 respectively. As shown by the arrows gears 32 and 33 are both driven in a clockwise direction by their respective motors. The manner in which these gears are driven by the motors is not important and for illustrative purposes they are shown as being rotated by worm gears 35 and 36 rotated by motor shafts 37 and 38 respectively.

Operation

The parts are shown in the normal positions occupied when both motors are running properly. At this time, the switch operator 16 is rotated to its clockwise limit of rotation which holds the signal switch open. At this time, the abutment 25 on the slide 20 is in engagement with the surface 26 of the switch operator. Also the abutment 28 of the slide is in engagement with the surface 29 of the switch operator. The slide at this time is in an intermediate position in which the movable bearing 30 for the idler gear 31 is in line with the centers of gears 32 and 33.

As long as both motors are operating at the same speed, the gear 31 merely idles between the gears 32 and 33.

If the motor 4 should fail, it will stop which stops rotation of the gear 32. The motor 5 will continue to drive the timer mechanism 1, the over-running clutch 8 permitting this motion without requiring rotation of the timer motor 4. The motor 5 continues to drive the timer mechanism and also to rotate the gear 33 in a clockwise direction. As the gear 32 is now stopped, the rotation of the gear 31 caused by gear 33 causes the slide 20 to move upwardly. The abutment 28 of the slide in engaging with the surface 29 of the switch operator causes counter-clockwise rotation of the switch operator for closing the signal switch 10. This same upward movement of the slide 20 also serves to dis-engage the gear 31 from the gear 33 so that the latter is free to rotate.

Closure of the signal switch will energize a light or other alarm device which warns the user that the timer motors should be replaced. When the motors are removed from the unit for replacing, the gears 32 and 33 are released from the unit may be reset simply by turning the switch operator 16 to its clockwise limit of rotation which returns the movable bearing 30 of the idler gear 31 back into alignment with the gears 32 and 33.

If the motor 5 should fail, the motor 4 will continue to drive the timer mechanism even though the motor 5 has stopped. At this time, the gear 33 has stopped while the gear 32 continues to be rotated in a clockwise direction by the timer motor 4. Due to the gear 33 having stopped, the action of gear 32 in driving the idler gear 31 clockwise is to cause downward movement of the slide 20. At this time the abutment 25 on the slide in engaging surface 26 of the switch operator causes this operator to move counter-clockwise and close the signal switch.

From the foregoing it will be seen that the present invention provides for independent driving of a single timer mechanism by two separate synchronous motors. It will also be apparent that each motor serves to check the operation of the other and a signal switch is closed whenever one or the other motor fails.

While a preferred form of the invention has been shown

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and described it will be apparent that many modifications may be made without departing from the spirit and scope of the invention. It is, therefore, desired to be limited only by the scope of the appended claims.

I claim:

1. In a synchronous motor driven timer, a timing mechanism, a first synchronous motor, a second synchronous motor, drive means between each of said motors and said timing mechanism whereby both of said motors drive said timing mechanism, said drive means including clutch means for permitting either motor to continue driving the timing mechanism after a failure of the other motor, a signal device, and means responsive to a differential in speed of said motors for operating said signal device.

2. In a synchronous motor driven timer, a timing mechanism, a first synchronous motor, a second synchronous motor, drive means between each of said motors and said timing mechanism whereby both of said motors drive said timing mechanism, said drive means including clutch means for permitting either motor to continue driving the timing mechanism after a failure of the other motor, a first gear driven by one of said motors, a second gear driven by the other motor and spaced from the first gear, an idler gear meshing with both of said gears, a movably mounted bearing for said idler gear, a signal device, and means actuated by motion of said bearing for actuating said signal device.

3. A device as defined in claim 2 in which motion of the movable bearing in either direction from an intermediate position actuates said signal device.

4. In a control system, a timing mechanism, a synchronous motor driving said timing mechanism, and means for indicating failure of said synchronous motor, said last mentioned means comprising a second synchronous motor, a signal device, and means responsive to a change in relative speed of said motors for actuating said signal device.

5. In a control system, a timing mechanism, a synchronous motor driving said timing mechanism, and means for indicating failure of said synchronous motor, said last mentioned means comprising a second synchronous

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motor, a first gear driven by one of said motors, a second gear driven by the other motor and spaced from the first gear, an idler gear meshing with both of said gears, a movably mounted bearing for said idler gear, a signal device, and means actuated by motion of said bearing for actuating said signal device.

6. A device as defined in claim 5 in which motion of the movable bearing in either direction from an intermediate position actuates said alarm device.

7. In a synchronous motor driven timer, a timing mechanism, a first synchronous motor, a second synchronous motor, drive means between each of said motors and said timing mechanism whereby both of said motors drive said timing mechanism, said drive means including clutch means for permitting either motor to continue driving the timing mechanism after a failure of the other motor, a first gear driven by one of said motors, a second gear driven by the other motor and spaced from the first gear, an idler gear meshing with both of said gears, a movably mounted bearing for said idler gear, a sliding member carrying said bearing and arranged for longitudinal movement in either direction from an intermediate position, and a pivoted control device arranged to be contacted by said sliding member on both sides of its pivot, so that movement of said sliding member in either direction from said intermediate position will rotate the pivoted member in the same direction.

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