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CONTROL DEVICE

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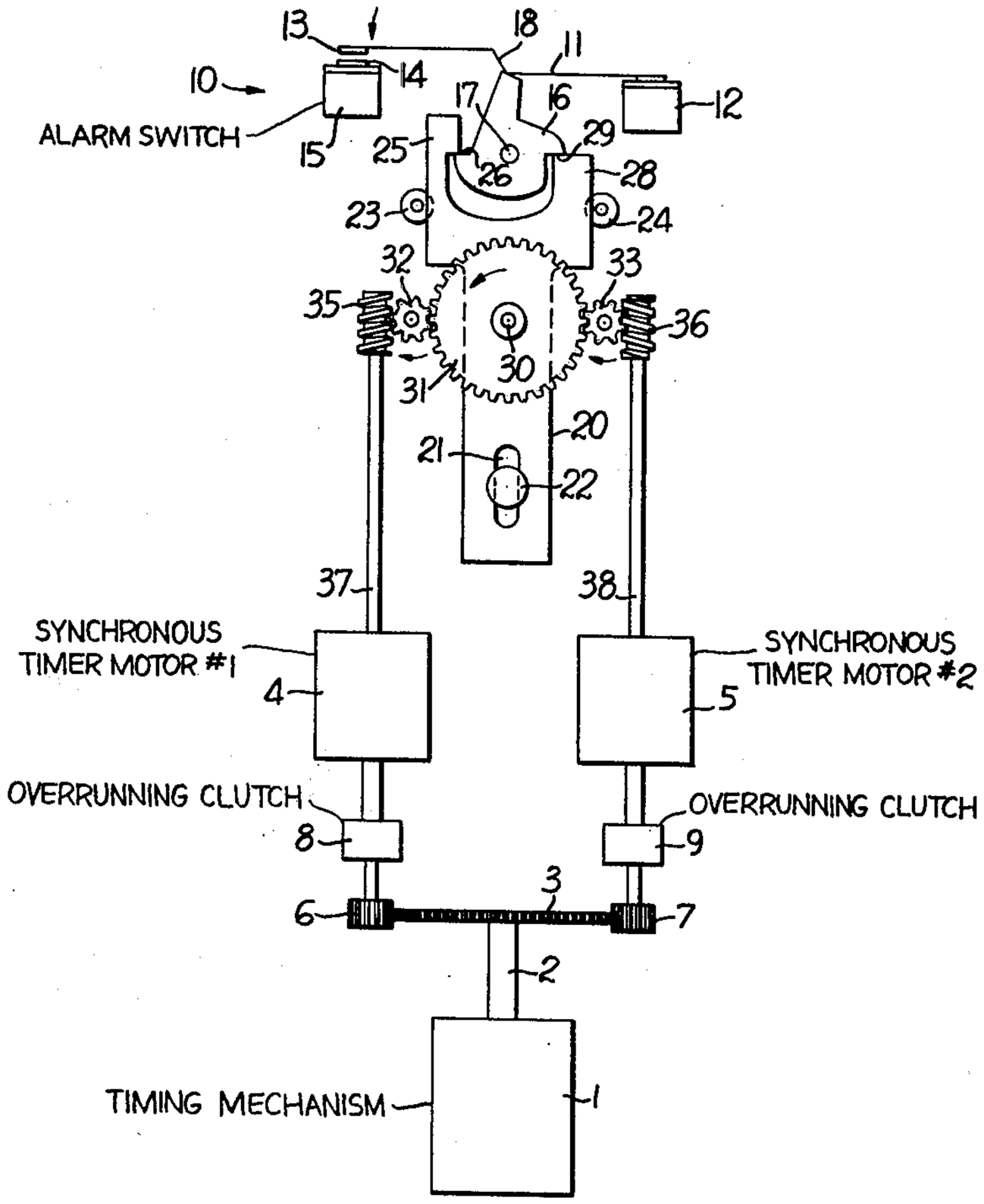

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CONTROL DEVICE

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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 swicth 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

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

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 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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