April 29, 1958 R. M. MANNING 2,832,408

TIMING MECHANISM

Filed Dec. 27, 1954 2 Sheets-Sheet 1

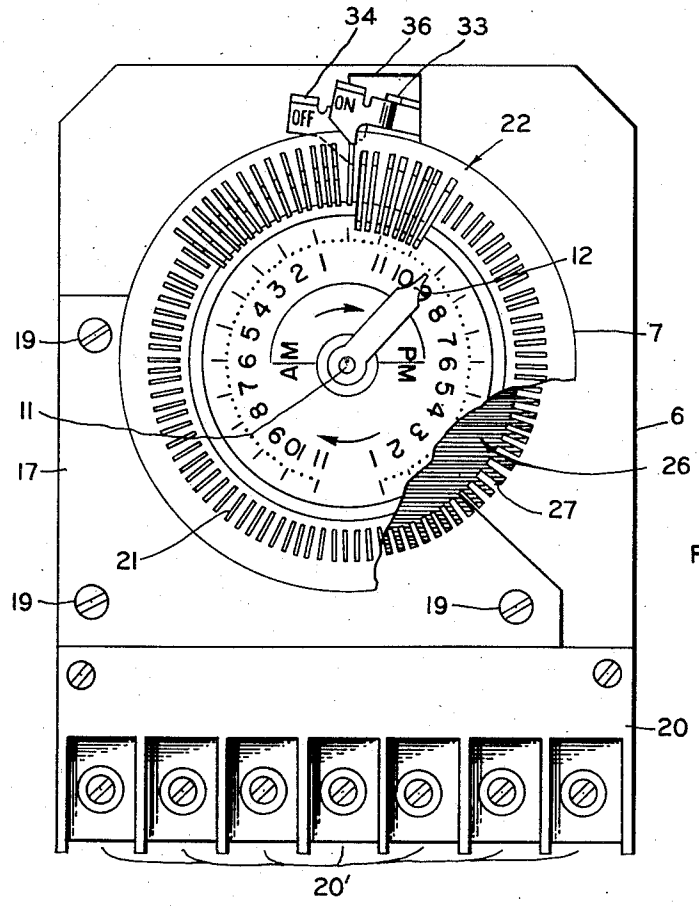



Fig.1

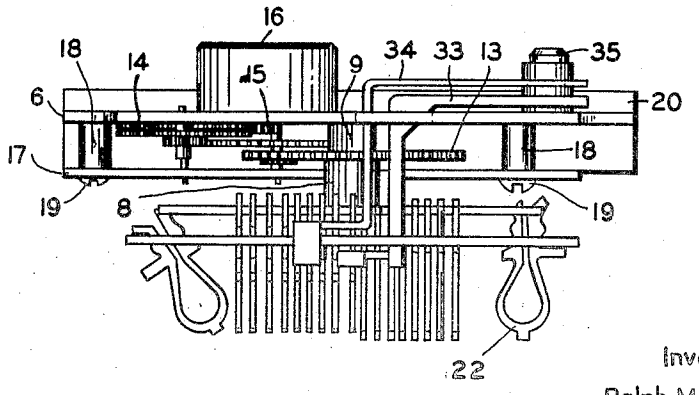



Fig.2

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TIMING MECHANISM

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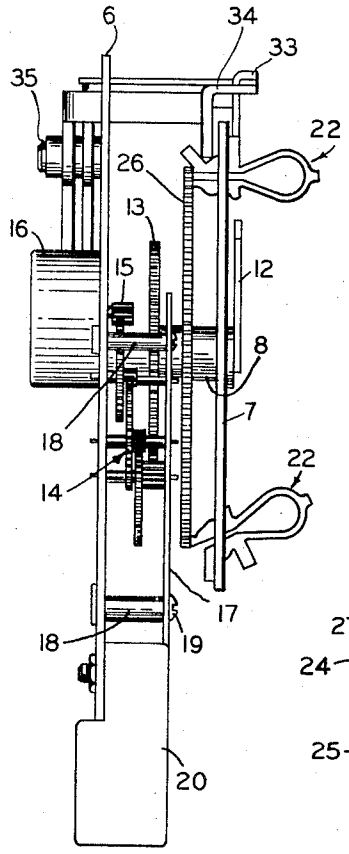



Fig. 3

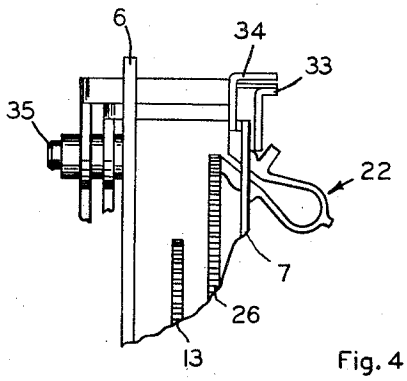



Fig. 4

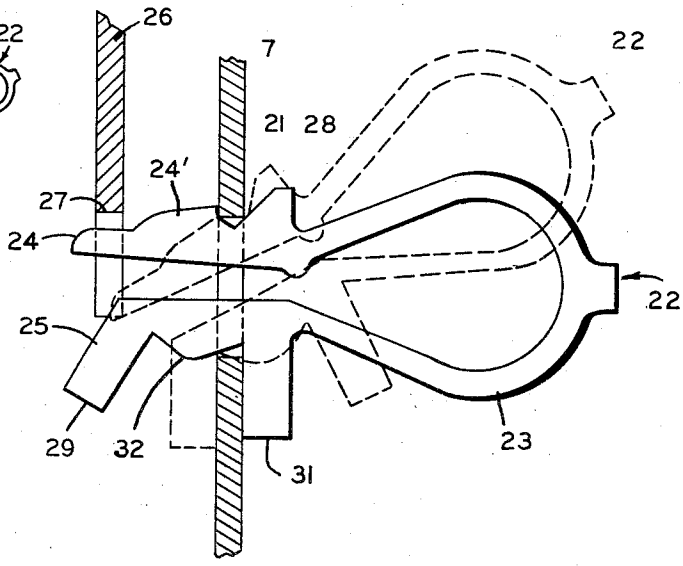



Fig. 5

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2,832,408

# TIMING MECHANISM

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Application December 27, 1954, Serial No. 477,903

5 Claims. (Cl. 161—1)

This invention relates generally to a timing mechanism and, more particularly, to improvements in the type of timing mechanism having a rotating timing dial on which are mounted control elements intended to control the actuation of suitable control arms forming a part of an electrical switch mechanism or other similar electromechanical device.

Heretofore, it has been common to provide such mechanisms in which the control elements are permanently mounted on the dial. Such form of construction normally required the manufacturer to select some predetermined number of elements and standardize on the manufacture thereof, thereby resulting in a device capable of complete but selective control through a twelve or twenty-four hour period, depending upon the dial used, but satisfying a need for far less capabilities. For example, with a twenty-four hour dial, it has been customary to provide the units with ninety-six control elements permanently located on the dial, whereas in many instances only a half-dozen or so would be required to handle the timing cycle under consideration.

Furthermore, such control elements should be readily adjustable to at least two control positions to give the associated mechanism desired versatility, which, in the case of an electrical switch mechanism, would comprise at least an "on" and "off" position for each control element used. Facility of use and simplicity of design are paramount considerations for this feature of the device so that economy of manufacture can be properly combined with excellent performance when the device is in use.

It is, accordingly, an object of this invention to provide a timing mechanism of the type described in which the number of control elements need not be fixed during manufacture thereof but can be selected at random by the user of the device.

It is another object of the invention to provide a timing mechanism of the type described in which the units are marketed with the readily insertable control elements furnished as an accessory thereof in preselected quantities in accordance with specific customer requirements, without sacrificing economies of manufacture so necessary to retain desirable cost levels.

It is yet another object of the invention to provide a novel form of control element for the type of mechanism described in which inserting, removal, and adjustment are extremely simple operations and yet not without the characteristics of positive positioning and locking when in use.

Briefly, the invention comprises a rotating timing dial provided with a plurality of evenly spaced apertures arranged annularly therein and intended to cooperate with a novel control element. This element includes a pair of fingers that may be moved toward each other against a resilient restraining force to permit insertion within the dial apertures after which the fingers are released to move tightly against opposite edges of the aperture to remain securely and positively in place. The elements are pivotally mounted on the dial such that portions thereof may



be selectively positioned at either a first or a second control position, there being a combined detent-cam portion which facilitates positioning and locking of the elements.

The invention will be best understood upon reference to the detailed description set forth below when taken in conjunction with the drawings annexed hereto, in which:

Figure 1 is a front view of a timing mechanism, with the timing dial partially cut away, and showing a plurality of control elements mounted on the upper section of the dial;

Figure 2 is a top view of the mechanism shown in Figure 1, with two additional control elements added to the dial on opposite edges thereof;

Figure 3 is a side view of the mechanism shown in Figure 1, but with only two control elements shown in the alternative control positions;

Figure 4 is a partial side view of the mechanism shown in Figure 3, showing the top control element in its alternative control position; and

Figure 5 is an enlarged view of a control element in one control position and parts of associated structure, together with a dotted view superimposed thereon to show the alternative control position of the element.

Referring now to Figure 1, there is shown a timing mechanism comprising a main support plate **6** on which is journalled for rotation the timing dial **7**, which in the embodiment illustrated is a twenty-four hour dial. The dial has rigidly affixed thereto the hub **8** which in turn surrounds and rotates on the post **9** which in turn may be rigidly attached to the plate **6**. The forward end of post **9** has a small threaded aperture therein to cooperate with a screw **11** provided to permit setting of the arrow **12** in any predetermined position. Although shown at a slight angle to the vertical axis, the normal position of the arrow is upright, and, in combination with the scale on the dial, it indicates the time.

The hub **8** has attached thereto the gear **13** which meshes with a suitable gear-train **14** interposed between gear **13** and pinion **15**. The pinion **15** is connected to the shaft of a suitable timing motor **16**, which may be either spring-wound or electric, and from this it is seen how the dial **7** is driven through its timing cycle. Shafts supporting the various gear assemblies making up the gear train **14** have one end journalled in the main plate **6** and their other end journalled in an auxiliary support plate **17** mounted on plate **6** and spaced therefrom by suitable spacer members **18** and cooperating screws **19**. An insulating block **20** may be attached, as shown, to the lower end of plate **6** by means of screws or the like, having suitable terminals **20'** therein for connection of the timing mechanism to any desired external circuit.

The dial **7** has a plurality of evenly spaced apertures **21** arranged annularly therein to selectively and individually receive therein the control elements **22**. Looking now at Figure 5, it is seen that the element **22** comprises a substantially key-shaped member having the outer manipulable portion **23** and the inner resilient portion comprising the outwardly extending juxtaposed fingers **24, 25**.

The fingers **24, 25** are formed such that there is some resiliency, whereby any squeezing or moving of the fingers together is against the resilient restraining force built into the fingers. The restraining force is insufficient to hamper quick and easy insertion of the elements into the dial apertures, but it is sufficient to hold the elements securely in place once they are properly positioned. As a matter of fact, little or no resiliency is necessary to prevent accidental drop-out once the elements is in place, as its design of the fingers normally prevents any tendency to drop out. The resiliency in the element **22**, in combination with the dimensioning of apertures **21**, provides a biasing force tending to spread said fingers away from each other against the abutting contiguous aperture edges.

A second dial **26** is provided, behind the dial **6**, having a series of open-ended slots **27** corresponding to the annularly arranged apertures **21** so that the extremities of fingers **24**, **25** rest thereon when the control elements are inserted into apertures **21**. The dial **26** is provided to reinforce the mounting arrangement of the elements and prevent any tendency of them to wobble.

The finger **24** is provided with a substantially V-shaped groove **28** cooperating with its contiguous aperture edge, and finger **25** has a pair of transversely extending portions in the form of inner and outer control ears **29**, **31** lying on opposite sides of dial **7** and spaced apart by the arcuate cam section **32**.

It is important to note the arrangement of the ears, i. e., the outer ear is perpendicular to the axis of the fingers, whereas the inner ear is at an acute angle with respect to this axis.

In the full-line or first control position shown in Figure 5, the control ear **31** is adjacent the dial **7**, whereas in the dotted line position corresponding to the second control position, the member **29** is adjacent plate **17**. In moving the control element away from the full-line position, motion of the element toward the dial center permits the cam section **32** to automatically squeeze the fingers together and permit finger **29** to pivot about its contiguous aperture edge and thereby allow the element **22** to move to its alternate position.

The finger **24** is provided with the sloping or tapered edge **24'** to further facilitate insertion and removal of the element. The remove the element, it is only necessary to move it to the dotted position shown in Figure 5, press the fingers together, and then pull out by pivoting the element about its cam surface **32**. The sloping edge **24'** will clear the upper edge of its associated aperture and permit the element to be quickly removed. When inserting the element within the apertures, the reverse of the aforesaid procedure takes place, in that ear **29** would be inserted, after which the cam surface would press the fingers together, and the element would be moved upwardly and inwardly until the groove **28** snaps over the aperture edge and the cam section **32** snaps behind the dial.

The control elements are intended to selectively actuate first and second control arms in the form of "on" arm **33** and "off" arm **34**, both of which are pivotally mounted on the pivot shaft **35** carried on the reverse side of plate **6**. An aperture **36** is provided in the plate to permit the element engaging portions of the arms to come through, and it is seen that both of these portions are substantially wedge-shaped members. The control arms are contiguous to the apertured portion of dial **7**, they being arranged on opposite sides of the plate, as shown. Moreover, the control arms may have actuating portions extending downward from pivot shaft **35** to suitable control mechanism in the form of electrical contact members or the like. However, these parts have not been shown as they form no part of the subject invention and have, therefore, been omitted in the interests of brevity. Suffice to say that the control arms **33**, **34** are movable and thereby perform a control action. It is their forward end that is important to an understanding of the invention, and it has been shown for this reason.

Referring now to Figure 3, it is seen that the element **22** is in its relatively level or horizontal position, with control ear **31** contiguous to the face of dial **7**. The wedge portion of arm **33** hangs down in its path and when the dial moves the element relative to the arm **33**, the parts cooperate to move the arm about the pivot **35**. In this position, the control ear **29** extends outwardly at an angle behind the overhanging wedge portion of arm **34** and is thus completely out of contact therewith. The wedge portion fits neatly into the space between the ear **29** and cam section **32** such that no control action is obtained.

In Figure 3, element **22** is shown in its second control position, having been manually pivoted in the dial **7**, and



the reverse of the aforesaid action takes place. Thus, the control ear **29** engages the wedge portion of arm **34** to move it about pivot **35**, whereas the wedge portion of arm **33** fits neatly into the space between ear **31** and cam section **32**.

Thus, control element **22** has a first control position, in which one of its control arm engaging portions cooperates with one of the control arms to perform a first control action, and has a second control position, in which its other control arm engaging portion cooperates with the other control arm to perform a second control action.

From the above, it will be seen that a substantially improved timing mechanism has been achieved. The dial **7** may be provided with ninety-six apertures to permit control actions every fifteen minutes throughout a twenty-four hour period. However, it need not be manufactured with ninety-six permanently assembled control elements but, on the contrary, can be made with as few as two elements furnished as accessories and intended to perform one "on" action and one "off" action per day, in the case of a switch device or other similar unit. Greater numbers of elements up to ninety-six may be furnished with the mechanism to provide the range of control desired, there being a great flexibility in this respect.

Moreover, the configuration of the fingers with the groove in one and the control ears spaced by the cam section in the other provides an element that is extremely easy to manipulate for control setting purposes without detracting from its positive locking features.

Therefore, while a particular embodiment of the subject invention has been shown and described herein, it is in the nature of description rather than limitation, and it will occur to those skilled in the art that various changes, modifications, and combinations may be made within the province of the appended claims, and without departing either in spirit or scope from this invention in its broader aspects.

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

1. In a timing mechanism, in combination: a rotating timing dial having a plurality of spaced apertures arranged annularly therein, a plurality of insertable removably mounted control elements to be carried by said dial in said apertures and being selectively movable to first and second control positions, and first and second movably mounted control members contiguous to said dial on opposite sides thereof and adapted to move on contact with said control elements, said first control member moving when said elements are in said first control position and said second control member moving when said elements are in said second control position, each of said elements having first and second outwardly extending juxtaposed fingers movable together against a resilient restraining force to permit insertion thereof into said apertures, said fingers being biased outwardly against opposite edges of said apertures when in place, said elements being pivotally mounted whereby one of said fingers may be selectively moved to said first and second control positions, said one finger having control arm engaging portions arranged on opposite sides of said dial.

2. In a timing mechanism, in combination: a rotating timing dial having a plurality of evenly spaced apertures arranged annularly therein, a plurality of removably mounted control members adapted to be inserted into said apertures and being selectively movable to first and second control positions, and first and second movably mounted control arms having portions contiguous to said dial on opposite sides thereof in the path of said control elements and movable thereby upon engagement therewith, said first control arm moving when said control elements are in said first position and said second control arm moving when said control elements are in said second position, each of said control elements having a pair of outwardly extending juxtaposed fingers movable together against a resilient restaining force to permit in-

sertion of said fingers into said apertures, said fingers being biased outwardly against opposite edges of said apertures when in place, one of said fingers having a groove cooperating with its abutting aperture edge to form a pivotal mounting for the control element, the other finger having spaced transversely extending control arm engaging portions arranged on opposite sides of said dial and separated by a cam surface, said cam surface operating to move the fingers together to permit motion from one control position to the other.

3. In a timing mechanism, in combination: a rotating timing dial having a plurality of evenly spaced apertures arranged annularly therein, a plurality of removably mounted control members adapted to be inserted into said apertures and being selectively movable to first and second control positions, and first and second movably mounted control arms having portions contiguous to said dial on opposite sides thereof in the path of said control elements and movable thereby upon engagement therewith, said first control arm moving when said control elements are in said first position and said second control arm moving when said control elements are in said second position, each of said control elements having a pair of outwardly extending juxtaposed fingers movable together against a resilient restraining force to permit insertion of said fingers into said apertures, said fingers being biased outwardly against opposite edges of said apertures when in place, one of said fingers having a groove cooperating with its abutting aperture edge to form a pivotal mounting for the control element, the other finger having spaced transversely extending control arm engaging ears arranged on opposite sides of said dial and separated by an outwardly convex cam surface, said cam surface operating to move the fingers together to permit motion from one control position to the other.

4. In a timing mechanism, in combination: a rotating timing dial having a plurality of evenly spaced apertures arranged annularly therein, a plurality of removably mounted control members adapted to be inserted into said apertures and being selectively movable to first and second control positions, and first and second movably mounted control arms having portions contiguous to said dial on opposite sides thereof in the path of said control elements and movable thereby upon engagement therewith, said first control arm moving when said control elements are in said first position and said second control arm moving when said control elements are in said second position, each of said control elements having a pair of outwardly extending juxtaposed inner and outer fingers movable together against a resilient restraining force to permit insertion of said fingers into said apertures, said



fingers being biased outwardly against opposite edges of said apertures when in place, said inner finger being tapered and having a groove cooperating with its abutting aperture edge to form a pivotal mounting for the control element, said other finger having spaced transversely extending control arm engaging ears arranged on opposite sides of said dial and separated by an outwardly convex cam surface, said cam surface operating to move the fingers together to permit motion from one control position to the other.

5. In a timing mechanism, in combination: a rotating timing dial having a plurality of evenly spaced apertures arranged annularly therein, a plurality of removably mounted control members adapted to be inserted into said apertures and being selectively movable to first and second control positions, and first and second movably mounted control arms having portions contiguous to said dial on opposite sides thereof in the path of said control elements and movable thereby upon engagement therewith, said first control arm moving when said control elements are in said first position and said second control arm moving when said control elements are in said second position, each of said control elements having a pair of outwardly extending juxtaposed inner and outer fingers movable together against a resilient restraining force to permit insertion of said fingers into said apertures, said fingers being biased outwardly against opposite edges of said apertures when in place, said inner finger being tapered and having a groove cooperating with its abutting aperture edge to form a pivotal mounting for the control element, said other finger having spaced transversely extending control arm engaging inner and outer ears arranged on opposite sides of said dial and separated by an outwardly convex cam surface, said outer ear being substantially perpendicular to the axis of said fingers and said inner ear being at an acute angle with respect to said axis, said cam surface operating to move the fingers together to permit motion from one control position to the other.

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