June 24, 1958 J. M. MARTIN 2,840,672

UNIDIRECTIONAL ROTARY ELECTRIC SWITCH

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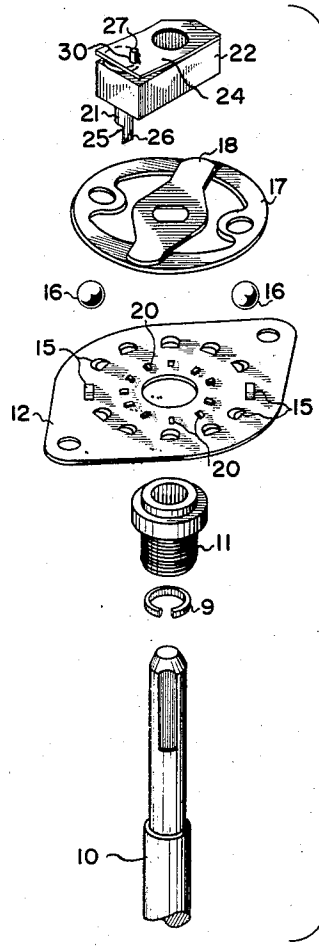

Fig.1

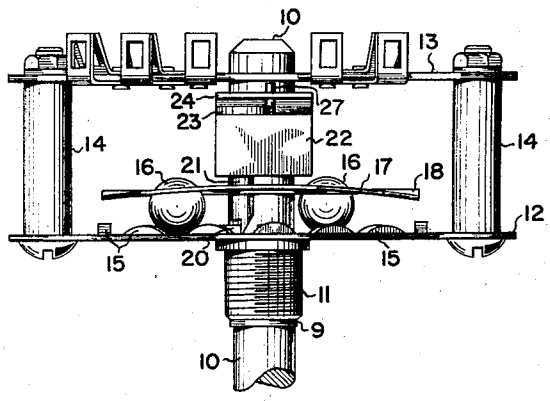

Fig.2

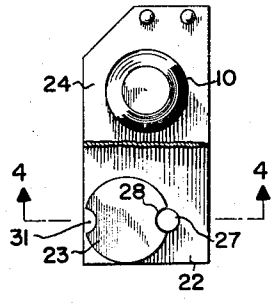

Fig.3

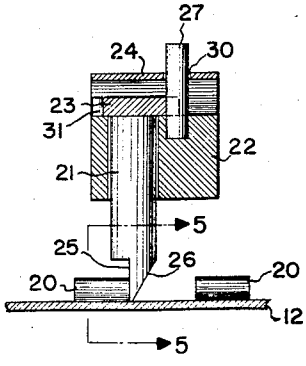

Fig.4

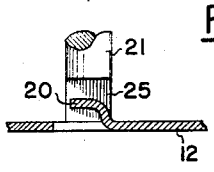

Fig.5

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UNIDIRECTIONAL ROTARY ELECTRIC SWITCH

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8 Claims. (Cl. 200—155)

The present invention relates to electrical switches of the unidirectional sequentially operated type and more particularly to a locking control for such or other type of switch.

In the use of unidirectional switches arranged for sequential operation in such complicated mechanisms as electronic computers, accounting and line controlled printing mechanisms, it is of vital importance that the sequence be not interrupted to thereby upset the precise cycle operations.

An object of the present invention is to provide a control for a rotary switch wherein the switch closing contactor is prevented from turning in a direction opposite to that required to close a circuit.

Another object is to provide a lock to prevent a unidirectional rotary switch from turning in other than a predetermined direction.

Another object is to provide a lock for association with unidirectional switches whether intended for either clockwise or counterclockwise rotation.

A further object is to provide a detent mechanism for switches arranged to formation in synchronism with the switch make and break assembly to permit free unrestrained turning of a contactor to close a circuit while also operative to prevent reverse turning of the contactor.

Further objects will appear hereinafter.

In the accompanying drawings:

Fig. 1 is an exploded view of the parts of a rotary switch control embodying one form of the present invention;

Fig. 2 is a side elevation as assembled;

Fig. 3 is a detail view in plan of the control element with a part broken away;

Fig. 4 is a section view taken on line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary section taken on line 5—5 of Fig. 4.

Referring to the drawings, the switch control or movement limiting means of the invention is shown for example as an incorporated part of a rotary unidirectional switch of the type wherein a rotatable contactor is concentrically arranged with respect to a plurality of terminal contacts and including a yielding means for holding the switch in any one of its sequential close circuit positions. As illustrative of this type of switch reference can be had to United States Letters Patent Nos. 2,012,492, 2,186,949 and 2,186,950.

For understanding the present invention the description of the switch will be limited to those related parts believed novel. These parts include the contactor operating spindle **10** which is journalled in an externally threaded switch mounting bushing **11** for attachment to a suitable panel or the like. A locking clip **9** is disposed between the bushing **11** and a shoulder on the spindle **10** to prevent axial movement of the spindle under biasing action of a spring switch part juxtaposed to the non-rotatable detent plate **12**. A switch plate **13** of insulating material is keyed to the spindle **10** and

carries the contactor ring and concentric row of fixed contacts including circuit wire connectors **13'** as common to this type of switch. The switch plate **13** is supported by spacer posts **14** from the plate **12**. The upper face of the plate **12** is provided with a circular row of rounded projections **15** having the spindle **10** as a center and juxtaposed to the path of travel of a pair of ball detents **16**. The ball detents are carried by a rotatable ball retaining cage ring **17** which is connected to the spindle **10** for joint rotation therewith by means of a transverse strip **18** fixed to the spindle **10**. The ring **17** is of spring material and, as assembled, biases the caged detents **16** to seat between any pair of projections corresponding to a selected closed circuit.

For the purpose of preventing the spindle **10** from turning in the opposite direction to its selected unidirection, the plate **12** is provided with a row of upstanding stops **20**, concentric with respect to the projections **15**, and forming a circular hill and valley path for a spring pressed keeper **21**. The stops **20** lie respectively on the radii of the projections **15**. The keeper **21** is slidably mounted in an arm **22** keyed to the spindle **10** and projecting radially therefrom to locate the lower end of the keeper **21** in operative relation to the row of stops **20**. The upper end of the keeper **21** is provided with a head **23** seating upon the arm **22** and biased to stop engaging position by a flat spring **24** which is attached at its opposite end to the arm **22** to follow the turning motion thereof. The lower or stop engaging end of the keeper **21** is cut away on one side to provide a flat face **25** opposite to a cam surface **26** on the other side. If the switch is to operate in a clockwise direction the keeper **21** will be in the position shown in Fig. 4, but if counterclockwise is the direction, the keeper **21** will be turned to face the cam **26** in the opposite direction. When set for its unidirectional control the keeper **21** is locked against axial turning by a pin **27** projecting upwards from the arm **22** and seating in a recess **28** in the keeper head **23**. The pin **27** also freely traverses a hole **30** in the spring **24** to avoid interference with the spring action. When the keeper **21** is set for counterclockwise locking by turning a half revolution it is fixed by the pin **27** seating in a recess **31** diametrically opposite to the recess **28**.

In operation, and assuming the sequential closing of the switch circuits is clockwise as shown in the drawings, a turning of the spindle **10** to off-switch position causes the ball detents **16** to ride up on their respective adjacent projections **15** while simultaneously the cam **26** on the keeper **21** engages a stop **20** to lift the keeper **21**, against the pressure of the spring **24**, to ride over the stop which cammed it upward. Further turning the spindle **10** closes a required circuit and causes the detents **16** to drop between the adjacent pair of projections **15**, while simultaneously the spring pressed keeper **21** snaps in front of the next following stop **20**. In this position of the keeper **21** its flat face **25** is in the path of a reverse turning of the plate **12** to serve as a positive lock against counterclockwise turning of the switch spindle **10**.

Where unidirectional sequential switch operation in a counterclockwise direction is desired the keeper **21** can be turned one half revolution to position the cam **26** opposite to the position here shown, while also rearranging its relation to the arm **22** by seating the pin **27** in the recess **30** to lock the switch against clockwise turning.

It will now be apparent that a novel control for rotary switches has been devised whereby a plurality of circuits can be sequentially closed by the turning of the switch spindle in one direction while locking the spindle against reverse turning in each closed circuit position.

What is claimed is:

1. A control for unidirectional rotary switches, com-

prising a spindle for operating a switch to close and open a circuit, means actuated by turning said spindle in one direction for holding said switch in circuit closing position, a fixed stop means, a keeper carried by said spindle adapted to be intercepted by said fixed stop means, means mounting said keeper for sliding movement towards and away from said fixed stop means, spring means biasing said keeper toward said fixed stop means, a cam on the leading side of said keeper to shift said keeper past said stop means when said spindle is turned in one direction, and means on the trailing side of said keeper to abut said stop means to prevent shifting of said keeper when said spindle is turned in the reverse direction, whereby said spindle is locked against such reverse turning.

2. A control according to claim 1 wherein said fixed stop means is an arcuate row of fixed projections and spring pressed detents turnable with the spindle.

3. A control for unidirectional rotary switches, comprising a spindle for operating a switch to sequentially close and open a plurality of circuits, means actuated by turning said spindle in one direction for holding said spindle in circuit closing position, a circular row of stops, means mounting said stops with said spindle as a center and fixed against turning, each of said stops corresponding to a circuit closing position, a keeper carried by said spindle, means mounting said keeper for sliding movement towards and away from said stop row, spring means biasing said keeper towards said stop row, a cam face on the leading side of said keeper to shift said keeper past a stop when said spindle is turned in one direction, and means on the trailing side of said keeper to abut a stop when said spindle is turned in the opposite direction whereby said spindle is locked against turning in said opposite direction.

4. A control for switches according to claim 3 wherein said keeper mounting means is an arm radially attached to said spindle, and said keeper has a head seating on said arm to suspend said keeper.

5. A control for switches according to claim 4 wherein means prevents axial turning of said keeper.

6. A control for unidirectional rotary switches for sequential closing of electric circuits by rotating a contactor over fixed contacts through step-by-step turning of a spindle comprising means operated by turning of said spindle in one direction for yieldingly holding a circuit closed, and means carried by said spindle operative in said closed circuit position to prevent said spindle from turning in a reverse direction.

7. A control according to claim 6 wherein said reverse preventing means is a plurality of fixed stops, a keeper carried by said spindle and spring biased to ride over said stops in one direction of rotation of said spindle, and means on said keeper to prevent turning of said keeper in a reverse direction.

8. A control for rotary switches comprising a spindle, a bushing between the ends of said spindle forming a journal for said spindle, a fixed switch mounting plate carried by said bushing, a circular row of projections on one face of said plate, spring pressed means carried by said spindle to coact with said projection to hold said spindle in any switch position, a row of circular stops on said plate face concentric to said projections, a keeper, means carried by said spindle to mount said keeper for sliding movement, a spring biasing said keeper towards said stop row, a cam face on said keeper to engage a stop and raise said keeper in one direction of rotation of said spindle, and a flat face on said spindle opposite said cam face to engage a stop when said spindle is turned in the reverse direction to lock said spindle.

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