

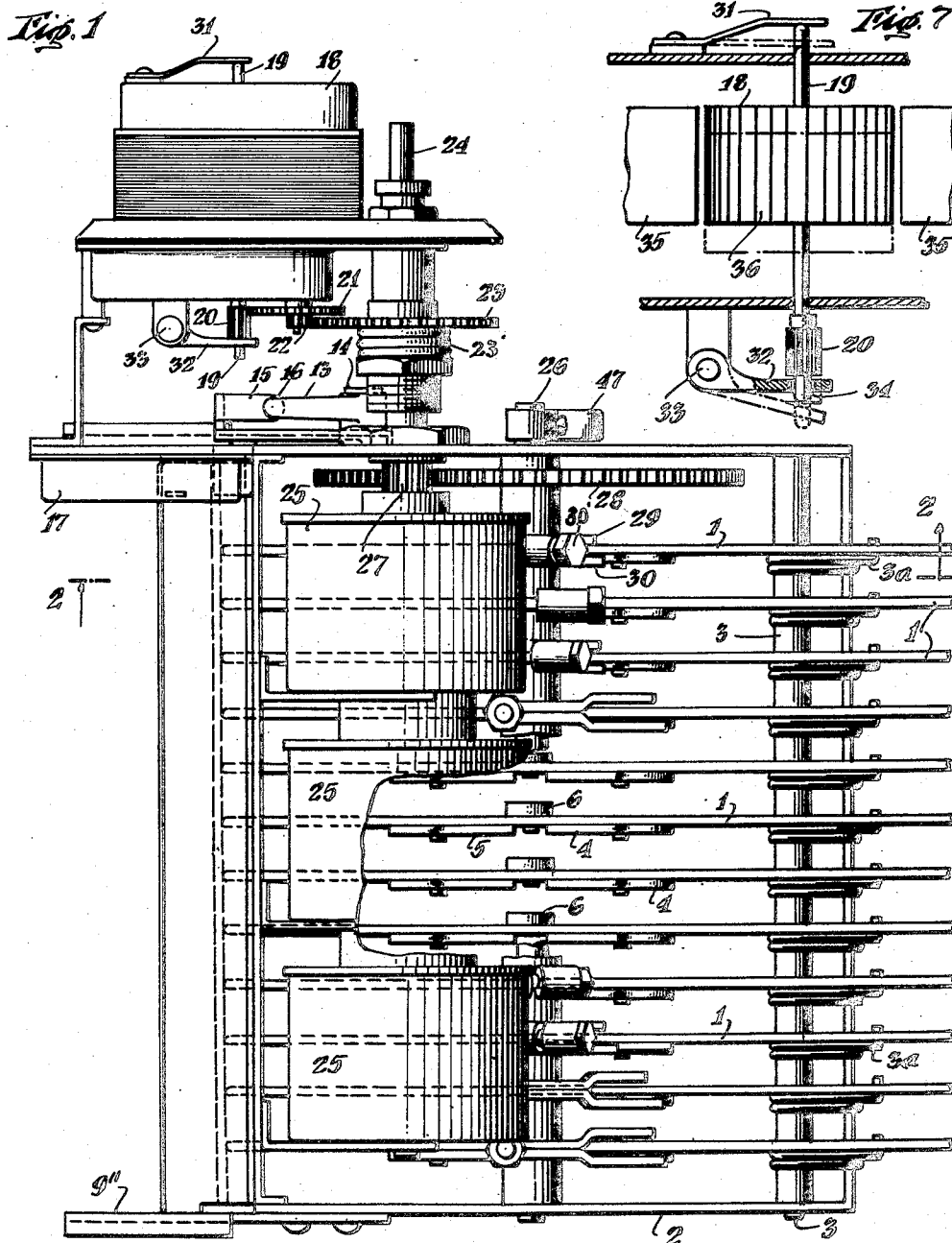
Aug. 29, 1950

P. WARE ET AL  
MOTOR-DRIVEN PUSHBUTTON TUNER

2,520,749

Filed Jan. 11, 1947

3 Sheets-Sheet 1



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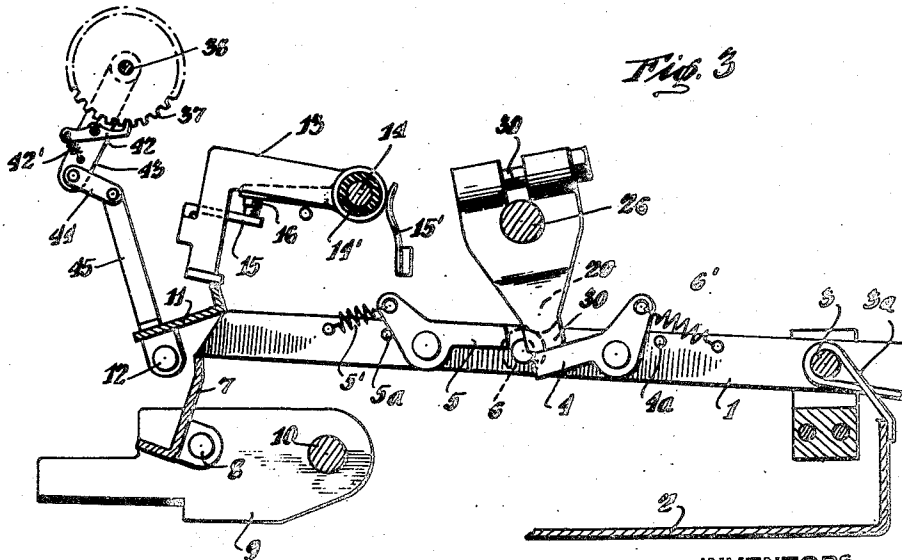
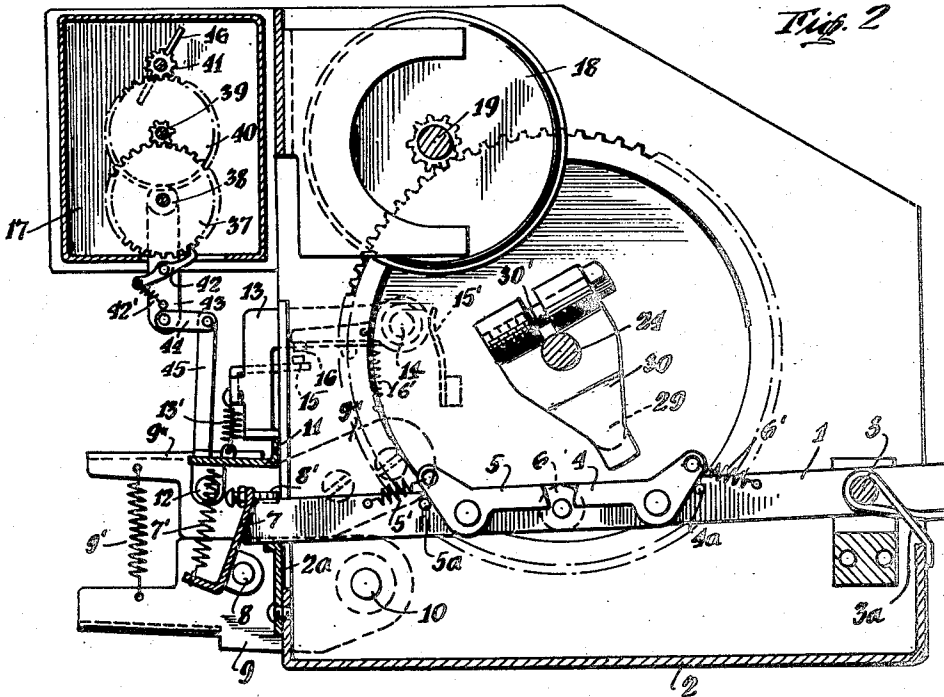
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2,520,749

MOTOR-DRIVEN PUSHBUTTON TUNER

Filed Jan. 11, 1947

3 Sheets-Sheet 2



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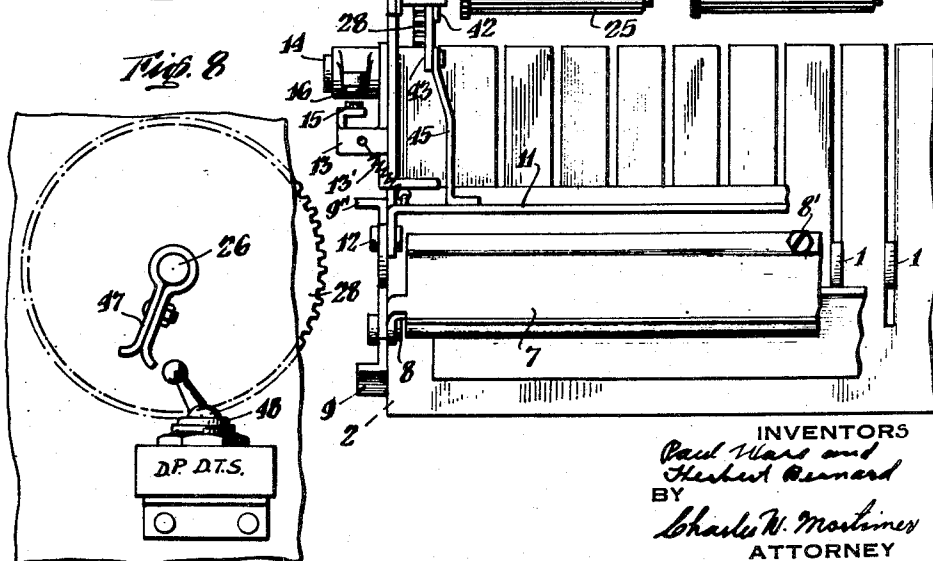
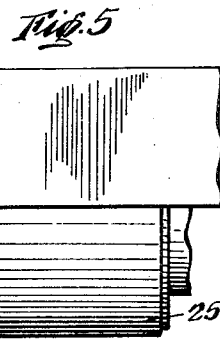
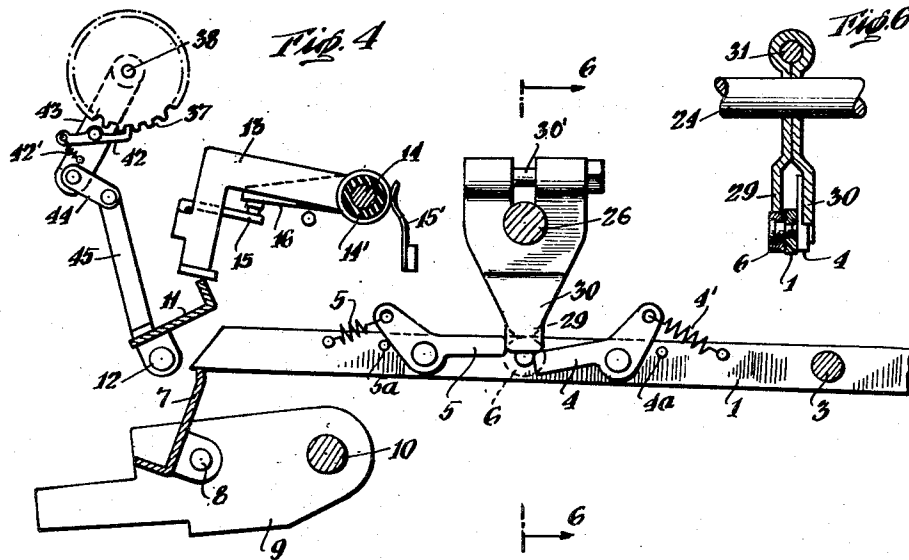
**P. WARE ET AL**

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## MOTOR-DRIVEN PUSHBUTTON TUNER

**Filed Jan. 11, 1947**

**3 Sheets-Sheet 3**



## UNITED STATES PATENT OFFICE

2,520,749

## MOTOR-DRIVEN PUSH-BUTTON TUNER

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Application January 11, 1947, Serial No. 721,634

12 Claims. (Cl. 318—265)

1

This invention relates to a motor driven push button selector for predetermined positions of a variable element.

One of the objects of the invention is to adapt push button selection to the type of device that requires many turns of its rotor to cover its very wide range of settings in contrast to the 180° range of the capacitative tuning element of the usual radio receiver. With this invention this can be accomplished with a very high degree of accuracy by means of push buttons. The tuning element is caused to stop at or very close to predetermined positions consistently by pushing corresponding buttons.

Another object of the invention is to accomplish this tuning with a device that is not too heavy, bulky or difficult to manufacture or adjust, and is durable in use.

These and other objects will be apparent to those skilled in the art. The invention will be particularly described in an embodiment in which a motor driven push button tuner for a high frequency wide band radio set is used.

The invention may be understood from the description in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of the device with three tuning units, one of these units and the cam shaft being partly broken away.

Fig. 2 is a section along line 2—2 of Fig. 1, partially schematic.

Fig. 3 is a detailed view of part of Fig. 2 at a later stage of the operative cycle.

Fig. 4 is a similar view showing parts later in the operative cycle.

Fig. 5 is a rear elevation view of the motor side of the unit.

Fig. 6 is a section along line 6—6 of Fig. 4.

Fig. 7 is a plan view partially in section of the motor to show the brake mechanism.

Fig. 8 is a side view to show a reversing switch that is used with the device.

In the drawings reference character 1 indicates a plurality of levers pivoted upon shaft 3 in a casing 2. Each one of these levers has its front end held up by a spring 3a on shaft 3. Each lever 1 has pawls or stops 4 and 5 pivoted on one side thereof to operate as stops. A roller 6 is mounted on the other side of each lever 1 midway between the pawls. These pawls are urged upwardly by springs 5' and 6' and adjustable stops 4a and 5a are provided to limit movement in one direction.

The inner end of each lever 1 rests upon stop 2a on casing 2 (Fig. 2). An elongated latch bar

2

7 extends across the inner end of all the levers 1. This bar is pivoted on pins 8 and is prevented from coming too far forward by an adjustable stop 8' which strikes the back side of casing 2. The bar 7 is turned clockwise on pivots 8 by a spring 7'. A threaded or adjustable pin 8' is mounted on plate 7. The inner end of each of two levers 9 is pivoted on shaft 10 in casing 2 near opposite sides of this casing. The rear end of each lever 9 is urged upwardly by spring 9' that has its upper end attached to a support 9'' on the back side of casing 2 as shown in Fig. 2.

The inner end of each one of the levers 1 is also adapted to strike an elongated lever bar 11 that is pivoted on pins 12 at opposite sides of casing 2. The lever bar 11 is adapted to contact with the lower end of a lever arm 13 (Figs. 3 and 4) that is pivoted on pin 14 by a sleeve 14' of insulating material. Arm 13 carries a switch arm contact 15 that is adapted to make and break contact with a switch contact 16 that is attached to pin 14. Contact 16 is urged downwardly by spring 16' (Fig. 2). The movement of arm 13 is retarded by a time delay mechanism 17 and the spring 15'. The lever bar 11 is kept in contact with the lever arm 13 by the spring 13'.

The switch contacts 15 and 16 control the current that is supplied to the motor 18 (Fig. 1). The shaft 19 of this motor is connected through gears 20, 21, 22 and 23 to the shaft 24 of the rotor of the tuning elements 25 through the slip clutch 23'.

The shaft 24 is connected to the shaft 26 by gears 27 and 28 (Fig. 1). This shaft 26 carries pairs of cams 29 and 30 that are clamped thereon by bolts 30' (Fig. 2). Cam 30 depresses the corresponding pawl 4 and is stopped by pawl 5, or the reverse depending upon the direction of rotation of the cam shaft 26. Each cam 29 strikes the corresponding roller 6 when the inner end of its lever 1 is up, and thus opens the switch 15—16.

The motor 18 is prevented from rotating by the brake mechanism shown in Fig. 7 when the power is off and is permitted to rotate freely when the power is on. This brake mechanism consists of spring 31 which acts on the motor shaft 19 to push it longitudinally and move the lever 32 that is pivoted on pin 33 and has a hole 34 in which shaft 19 binds. When current flows in the field coils 35 of motor 18 its armature 36 is moved from dotted line to full line position thus releasing shaft 19 from the binding action of lever 32.

The time delay mechanism 17 (Figs. 2, 3 and 4) consists of the gears 37, 38, 39, 40 and 41 which

3

are actuated by the ratchet 42 that is operated by the lever system 43, 44, 45 from lever bar 11. This gear train operates vane 46 against air resistance to delay opening of the switch contacts 15 and 16.

The reversing switch 48 is operated by the cam 47 (Fig. 8) which is attached to the shaft 26 and so positioned on it as to operate this double pole double throw switch 48.

The operation of the device is as follows:

One of the levers 1 is depressed according to the station to which the tuning elements are to be tuned. This raises stops 4 and 5 into the path of cam 38 and also raises the roller 6 into the path of cam 29. The inner end of this lever 1 pushes back latch bar 7 thus turning it until this lever clears this bar. The spring 7' then pulls the latch bar 7 forward under the lever 1 thus holding it in position as shown in Figs. 3 and 4. The adjustable pin 8' prevents the latch bar 7 from turning too far clockwise because it is stopped by striking the casing 2. The end of lever 1 also turns a lever bar 11 on pivot 12. This bar 11 strikes and turns lever 13 on shaft 14 so that the switch contact 15 carried by lever 13 is brought into contact with stationary contact 16 mounted on shaft 14 thus closing this switch. Closing the switch contacts 15 and 16 causes current to flow from a source of power through the windings of the motor 18 through leads, not shown. This motor 18 then starts and its shaft 19 drives the tuning shaft 24 (Fig. 1) which turns the rotor of tuner 25 through a gear train consisting of the gears 20, 21, 22 and 23. The cam shaft 26 is driven by the tuning shaft 24 through the one to ten ratio gears 27 and 28.

When the tuner 25 reaches the position at which it is resonant at the desired frequency, the cam 38 (Fig. 3) depresses pawl 4 on lever 1 and comes to a stop against pawl 5 as shown in Fig. 4 or the reverse depending upon the direction of rotation of the shaft 24 which in turn depends upon the position of the reversing switch 48 (Fig. 8).

The motor 18 continues to turn while the shaft 24 is held in position due to the slip clutch 23'.

At the same time that the cam 38 depresses pawl 4 the cam 29 rides up on the roller 6 thus depressing the rear end of the lever 1 as shown in Fig. 4. The rear tip of lever 1 then presses down the lever bar 7 against the action of spring 9', (Fig. 2) thus causing the lever 9 to turn on pivot 10 and change its position from that shown in Fig. 3, tilted somewhat upwardly, to that shown in Fig. 4, tilted somewhat downwardly. This removes the support from lever bar 11, but this lever 11 is delayed from being pulled down by the spring 7' and breaking the contact at switch points 15—16 because of the action of the time delay mechanism 17 (Figs. 2 and 4) operating through the lever system 43, 44 and 45. This time delay mechanism consists of the ratchet 42 and the gear train 37, 38, 39, 40 and 41 and the vane 46. This gear train and vane cause delay in the movement of lever 11 that would otherwise open the switch points 15 and 16 and stop the motor 18 too soon.

When the lever 11 finally moves downwardly sufficiently to permit the switch points 15 and 16 to open the motor 18 stops promptly due to an additional braking action on this motor which is caused by the action of the spring 31 (Fig. 7) and the lever 32 on the shaft 19 of the armature 36 of the motor 18.

4

While the motor 18 is operating, current through the field coils 35 causes a solenoid action on the armature 36 that is mounted so as to permit free axial movement. This action holds the armature in the position shown by solid lines in Fig. 7 against the pressure of spring 31. In this position the bracket 32 is at right angles to the armature axle 19 and permits it to turn freely in the hole 34. However, when the current ceases to flow through the windings 35 there is no solenoid action to keep the armature 19 in this position and the spring 31 forces it into the position shown by dotted lines in Fig. 7. In this position the bracket 32 is no longer at right angles to the axle 19 and the shaft 19 therefore binds against the sides of the hole 33 preventing the motor from turning.

The cam 47 (Fig. 8) is located upon the cam shaft 26 of gear 28 in such a position that this cam shaft cannot turn a full revolution without the cam 47 engaging the arm of the toggle switch 48 and reversing the direction of rotation of the motor. The result is that regardless of the respective positions of the desired stations along the travel of the tuner units they can always be reached. If the device is in a position where if required to continue turning in the direction determined by the position of the reversal switch 48 the end of travel of the tuning unit would be reached before the desired station is reached, the revolution of the cam shaft 26 would be completed at the point where the tuner could no longer move and the cam 47 would engage the arm of the reversing switch 48 and reverse the motor and so approach the desired station from the opposite direction. The device will operate satisfactorily with only one pawl 4 or 5 on each lever and without a roller 6.

When any other lever 1 is depressed its load end in rising pushes the latch bar 7 backward and releases the first lever whereupon its spring 3a (Fig. 2) returns it to its original position. This sets the mechanism for the start of a new cycle and tunes to the corresponding station.

While this invention has been described with reference to its embodiment as a radio tuning device it may also be used for selecting and positioning other devices.

What is claimed is:

1. In a device of the character described, a motor, a shaft driven by said motor, said shaft having a plurality of axially and circumferentially spaced radially extending cams thereon, a device to close and open a circuit to said motor comprising a lever, and means carried by said lever to stop said shaft at predetermined positions, said means comprising spring operated pawls pivoted on said lever and extending in opposite directions.

2. In a device of the character described, a motor, a shaft driven by said motor, said shaft having a plurality of axially and circumferentially spaced radially extending cams thereon, a device to open a circuit to said motor comprising a cam, and a lever, and means comprising pivoted pawls carried by said lever to stop said shaft at predetermined positions.

3. In a device of the character described, a motor, means to brake said motor when current through it is cut off, a shaft driven by said motor, said shaft having a plurality of axially and circumferentially spaced radially extending cams thereon, a device to open and close a circuit to said motor comprising a lever, and means com-

5

prising pivoted pawls carried by said lever to stop said shaft at predetermined positions.

4. In a device of the character described, a plurality of pivoted levers each carrying pivoted pawls and stops therefor and springs which urge said pawls toward said stops on one side thereof and a roller on the other side thereof.

5. In a device of the character described, a plurality of pivoted levers each carrying pivoted pawls and stops therefor and springs which urge said pawls toward said stops on one side thereof and a roller on the other side thereof, a shaft transverse to said levers and cams on said shaft adapted to stop said shaft where said cams strike said stops.

6. In a device of the character described, a plurality of pivoted levers, each carrying pivoted pawls and stops therefor and springs which urge said pawls toward said stops on one side thereof and a roller on the other side thereof, a shaft, transverse to said levers, and cams on said shaft adapted to stop said shaft where said cams strike said stops, a cam on said shaft adapted to contact with said roller to depress the corresponding lever.

7. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller and depress the corresponding lever and springs mounted on said levers urging said pawls toward said cams.

8. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller and depress the corresponding lever and a switch adapted to be closed by any one of said levers and springs mounted on said levers urging said pawls toward said cams.

9. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller and depress the corresponding lever, a switch adapted to be closed by any one of said

6

levers and a delay mechanism to retard the opening of said switch and springs mounted on said levers urging said pawls toward said cams.

10. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller, and a motor to drive said cams and springs mounted on said levers urging said pawls toward said cams.

11. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller, a motor to drive said cams and a reversing switch for said motor and springs mounted on said levers urging said pawls toward said cams.

12. In a device of the character described, a plurality of levers each carrying a roller on one side and two pawls on the other side thereof, a shaft located transversely to said levers, two cams carried by said shaft for each lever, one of said cams being adapted to strike said pawls and the other one having a rounded end to strike said roller, a motor to drive said cams and a reversing switch for said motor operated by said shaft within one revolution of said shaft and springs mounted on said levers urging said pawls toward said cams.

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