Feb. 28, 1928. 1,660,956

L. C. EPPLER

COIN OPERATED ROTARY TIME SWITCH

Filed March 19, 1923 4 Sheets-Sheet 1

Fig. 1.

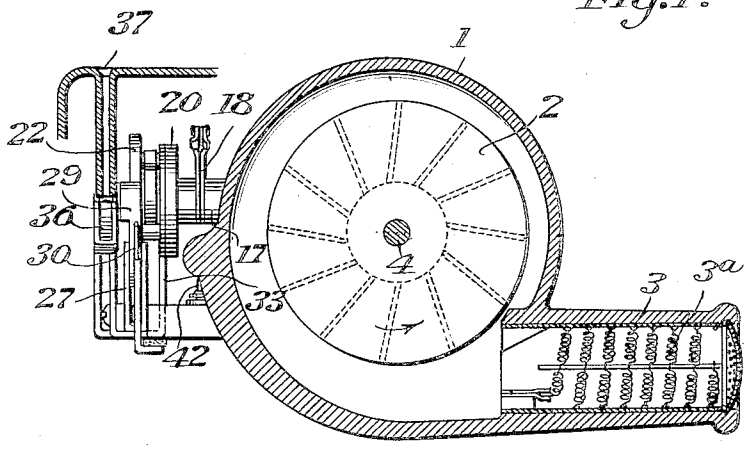
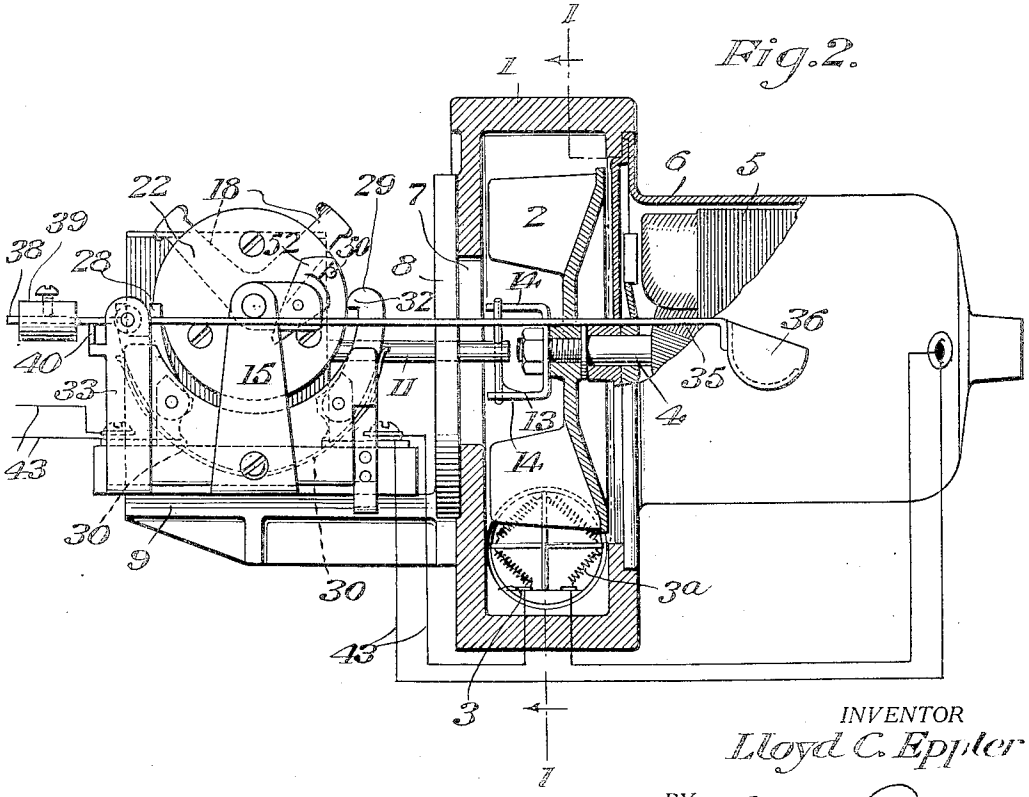


Fig. 2.



INVENTOR
Lloyd C. Eppler
BY
ATTORNEYS

Feb. 28, 1928. 1,660,956

L. C. EPPLER

COIN OPERATED ROTARY TIME SWITCH

Filed March 19, 1923 4 Sheets-Sheet 2

Fig. 3.

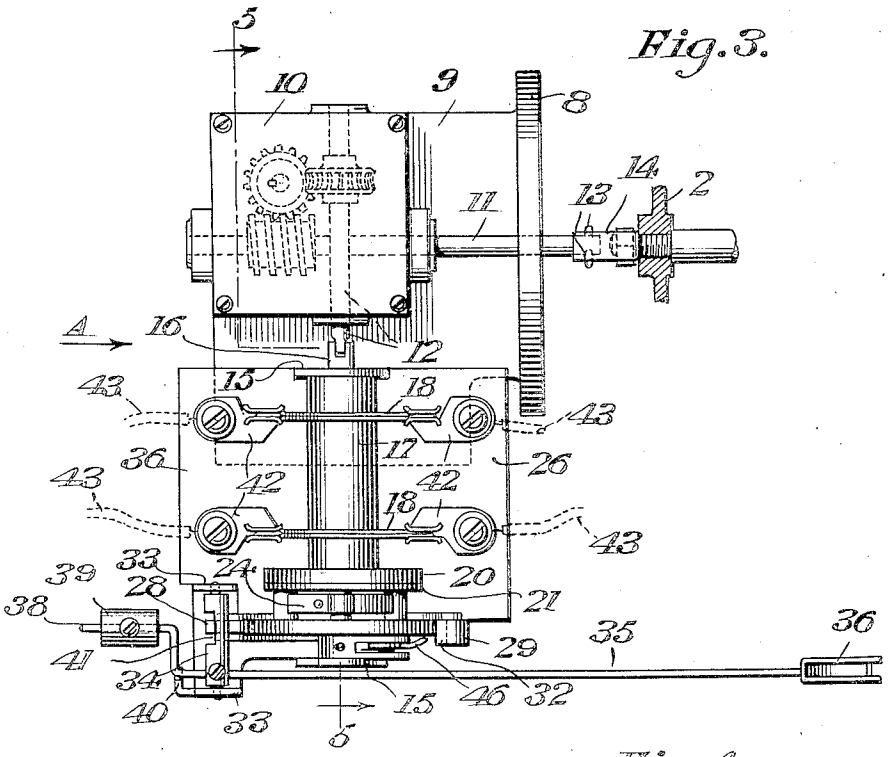
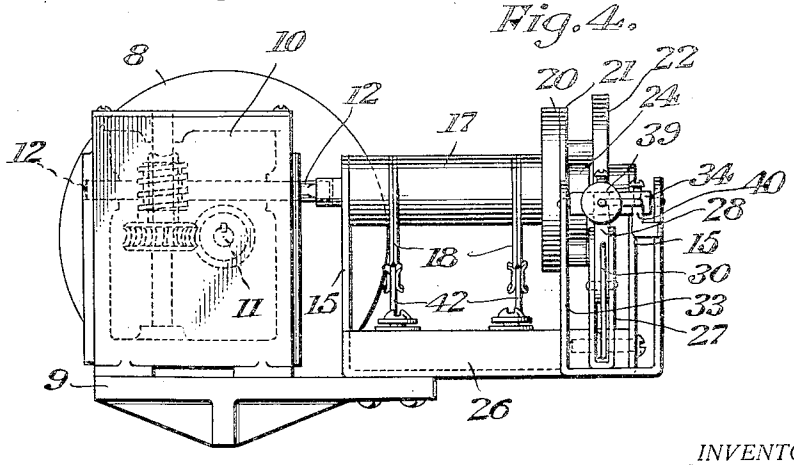


Fig. 4.



INVENTOR
Lloyd C. Eppler

BY Davis & Davis

ATTORNEYS

Feb. 28, 1928. 1,660,956

L. C. EPPLER

COIN OPERATED ROTARY TIME SWITCH

Filed March 19, 1923 4 Sheets-Sheet 3

Fig. 5.

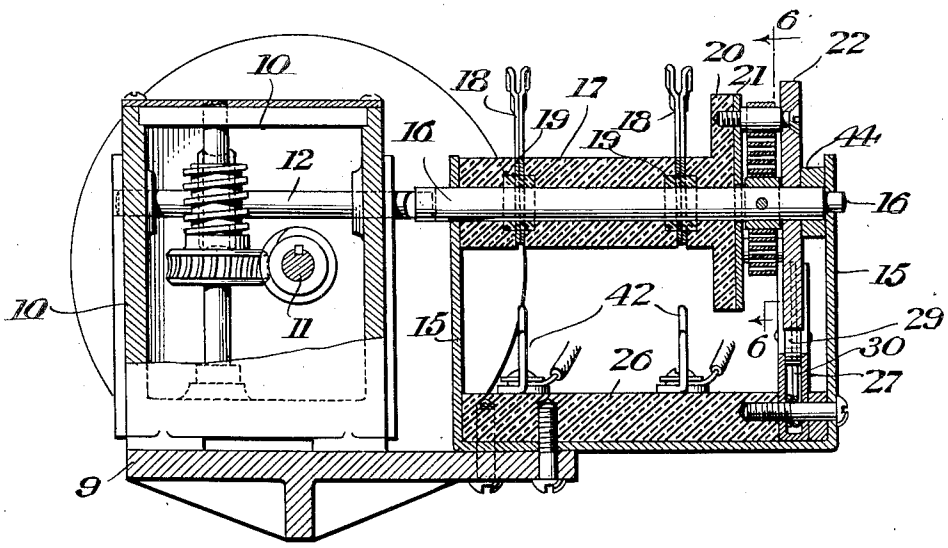


Fig. 6.

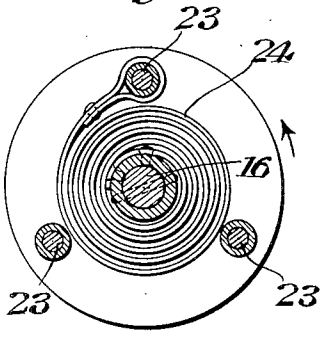


Fig. 7.

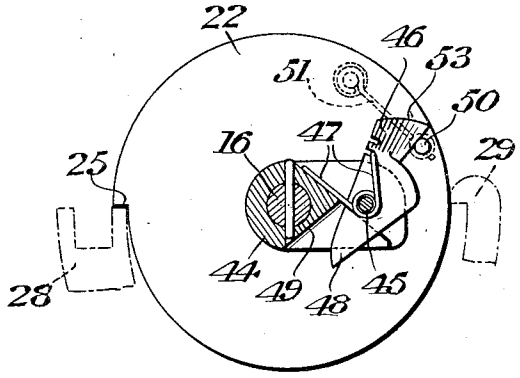
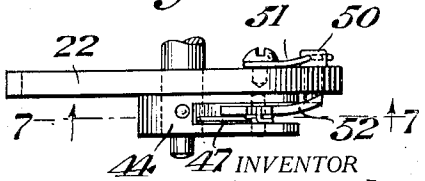


Fig. 8.



INVENTOR

Lloyd C. Eppler

BY

ATTORNEY

Feb. 28, 1928. 1,660,956

L. C. EPPLER

COIN OPERATED ROTARY TIME SWITCH

Filed March 19, 1923 4 Sheets-Sheet 4

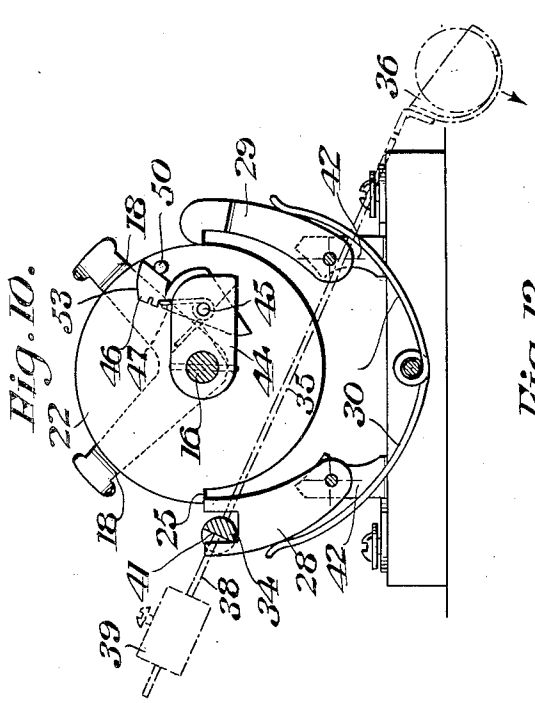


Fig. 10.

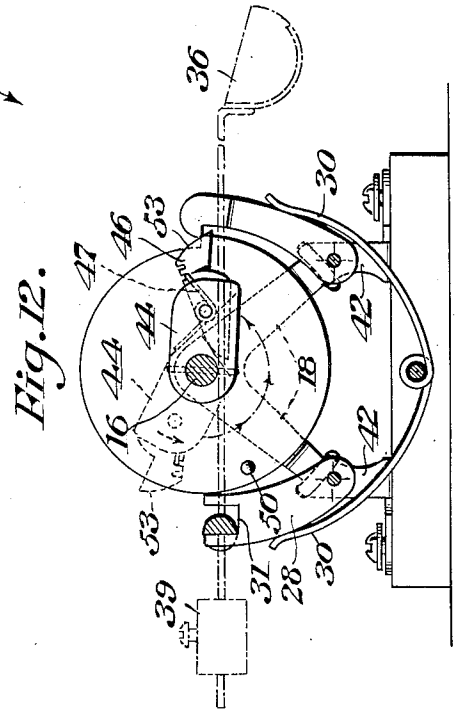


Fig. 12.

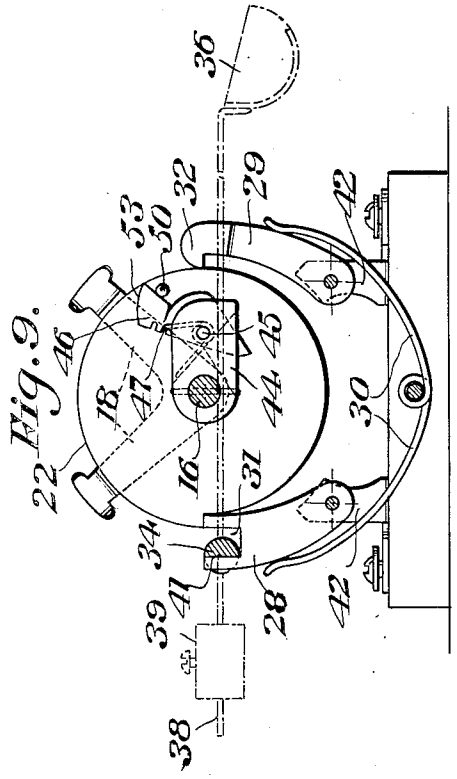


Fig. 9.

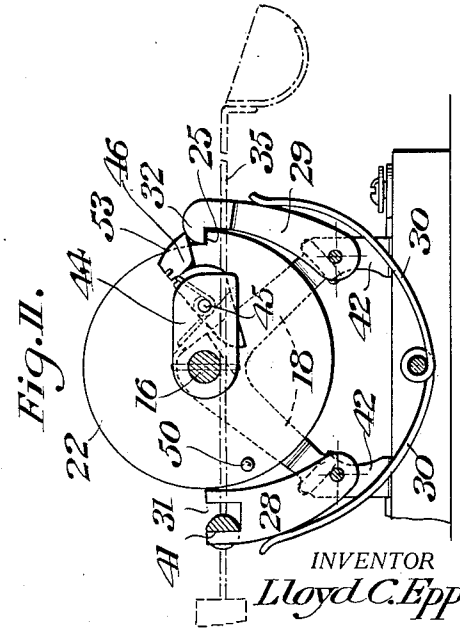


Fig. 11.

INVENTOR
Lloyd C. Eppler
BY
ATTORNEYS

Patented Feb. 28, 1928. 1,660,956

UNITED STATES PATENT OFFICE.

LLOYD C. EPPLER, OF GROTON, NEW YORK, ASSIGNOR TO AIRDRY CORPORATION, OF GROTON, NEW YORK, A CORPORATION OF NEW YORK.

COIN-OPERATED ROTARY TIME SWITCH.

Application filed March 19, 1923. Serial No. 626,104.

The main object of this invention is to provide a simple apparatus in which a coin operated mechanism is adapted to close an electric circuit and maintain the same in closed position throughout the lapse of a predetermined period of time. The apparatus is specially designed for closing an electric motor circuit but the apparatus is capable of use in a variety of relations and the invention therefore is not limited with respect to use.

Another important object of the invention is to provide means whereby the motor drives means for operating the switch to open the motor circuit after a predetermined time and reset the apparatus for actuation by the insertion of another coin.

The invention is designed especially for use in connection with a hand drying machine in which an electric motor is arranged to drive a fan or blower, the air from the said fan passing over a heating coil and being then discharged through a nozzle, it being desirable with this class of machines to operate them for a predetermined time and then automatically open the motor circuit, the switch operating parts being left in position to be again actuated by the insertion of another coin.

As shown and described herein the invention consists of a coin operated means for tripping a locking dog to permit the switch to snap into its circuit closing position. The motor fan operates for a predetermined time and trips a holding dog to permit the switch to snap to its open position and reset the coin operated means for actuation by the insertion of another coin.

In the drawings, Fig. 1 is a vertical sectional view of a portion of a fan blower casing showing the invention applied thereto;

Fig. 2 a side elevation of the switch operating mechanism connected to the shaft of a motor blower, the blower casing and the motor casing being shown partly in sectional view to more clearly show the construction thereof;

Fig. 3 a plan view of the switch operating mechanism;

Fig. 4 an end elevation thereof looking in the direction of the arrow A in Fig. 3;

Fig. 5 a vertical longitudinal sectional view of the switch operating mechanism taken approximately on the line 5—5 of Fig. 3;

Fig. 6 a detail vertical sectional view of the switch operating means, taken on the line 6—6 of Fig. 5;

Fig. 7 a detail vertical sectional view of the switch operating means taken on the line 7—7 of Fig. 8;

Fig. 8 a plan view of that portion of the switch operating mechanism shown in Fig. 7;

Fig. 9 a detail elevation of the switch operating means with the switch in its off-position;

Fig. 10 a view similar to Fig. 9 showing the coin operated trip being released by the weight of a coin;

Fig. 11 a view similar to Fig. 9 showing the switch mechanism after it has been released by the coin operating means and in its closed, or on-position; and

Fig. 12 a view similar to Fig. 11 with the parts in position to release the holding dog after the motor has operated a predetermined time.

Referring to the various parts by numerals, 1 designates a fan or blower casing in which is mounted a rotary fan 2. The blower casing is provided with a discharge nozzle 3 through which the air is driven by the fan. An air heating coil 3^a is arranged in this discharge nozzle and said coil is in circuit with the motor. The fan 2 is rigidly connected to the end of a shaft 4 of the electric motor 5. This motor is enclosed in a casing 6 rigidly connected to the side of the fan casing. The fan casing, opposite the motor casing, is open as illustrated at 7 in Fig. 2. It is obvious that when the motor is energized the fan will be rotated and a blast of air will be driven through the nozzle 3, the fan operating to draw air in through the opening 7.

Rigidly secured to the side of the fan casing, opposite the motor casing 6, is a bracket 8 having a horizontal supporting table or member 9. On the table 9 is rigidly secured a box 10 in which is arranged a double reduction worm gearing comprising a high speed shaft 11 and a low speed shaft 12. The reduction worm gearing is interposed between these two shafts. It is obvious that the worm gearing may be so arranged to secure the desired reduction in speed between the high speed shaft 11 and the low speed shaft 12. The high speed shaft 11 is mounted in suitable bearings and is provided at

its inner end with a cross pin 13 which is adapted to loosely engage the arms 14 of a yoke secured to the fan and motor shaft 4. The end of the high speed shaft 11 carrying the cross pin 13 extends into the fan casing and is loosely engaged with the yoke within the casing. The purpose of this loose connection is to avoid the necessity of accurately aligning the high speed shaft of the reduction gearing with the motor shaft and also to permit the parts to be readily assembled. It is obvious that the cross pin 13 must engage the arms 14 of the yoke on opposite sides in order that the high speed shaft will be driven by the motor shaft. It is obvious that the box containing the reduction worm gearing may be filled with any suitable form of lubricant to insure the easy running of the gears.

On the table or horizontal bracket member 9 is mounted a pair of standards 15 which form bearings for a trip shaft 16, said shaft being axially aligned with the low speed shaft 12 of the speed reduction mechanism. These two shafts 12 and 16 are coupled together. As shown the end of the shaft 12 is squared and reduced in thickness and fits in a slot formed in the connected end of the shaft 16. It is manifest that any form of self-aligning coupling means may be employed. On the trip shaft between the standards 15 is loosely mounted a tubular switch drum 17 which is adapted to rotate independently of the trip shaft. The switch drum is formed of insulating material and carries two pairs of switch contact arms 18, the arms of each pair being radial with respect to the trip shaft and at substantially right angles to each other. The arms 18 are insulated from the trip shaft by means of bushings 19 of insulating material, as shown clearly in Fig. 5. The switch drum at one end is provided with a radial circular flange 20 which is faced on its outer side for strength with a metal plate 21. Loosely mounted on the trip shaft, near its outer end, and spaced a suitable distance from the flange 20 of the switch drum is a locking cam 22. This cam is rigidly connected to the flange 20 of the switch drum by bolts 23 so that the cam plate will rotate on the trip shaft and with the switch drum. These two parts rotate independently of the trip shaft. Rigidly connected to the trip shaft between the locking cam and adjacent the end of the switch drum is a coil or clock spring 24. The inner end of this spring is connected to the trip shaft, as shown clearly in Fig. 6, and the outer end thereof is connected to one of the bolts 23 so that the outer end of the said spring is permanently connected to the cam plate and the switch drum, and the inner end thereof is permanently connected to the trip shaft. The spring is so disposed around the trip shaft that when said shaft is rotated through the operation of the electric motor 5 the coils of the spring will be tightened and the tension of the spring will be increased. The result of this is that when the locking cam is released, as will be fully hereinafter described, the tension of the spring 24 will cause the switch drum to rotate rapidly.

The locking cam is formed with a stop shoulder 25 on its periphery which is adapted to engage a locking dog and a holding dog as hereinafter described.

A block 26 of insulating material is rigidly secured to the table 9 of the bracket and fits in between the bearing standards 15 of the trip shaft. Secured to this insulating block, in the plane of the locking cam, is a channel frame 27, the upper edge of said frame being concave and substantially parallel with the periphery of the circular portion of the locking cam. In this channel frame are pivoted a locking dog 28 and a holding dog 29, the free ends of said dogs being arranged to engage the periphery of the locking cam at diametrically opposite points. Mounted in the channel frame 27 is a two armed spring 30, the two ends of which engage the dogs 28 and 29 and force them inwardly to the periphery of the locking cam. These dogs are pivoted and their free ends are adapted to swing outwardly away from the locking cam and against the tension of the spring 30. The locking cam is symmetrical from the inner end of the stop shoulder 25 to a point diametrically opposite said symmetrical portion constituting a semi-circle. The remaining portion of the periphery of the plate 22 is excentric and forms a cam. The free end of the locking dog is formed with a broad slot 31; and the free end of the holding dog is formed with a hook 32 which is adapted to be engaged by the stop shoulder 25 of the locking cam in the "on" or closed position of the switch. In the "off" or open position of the switch the stop shoulder is adapted to engage squarely against the free end of the locking dog.

In the upper end of suitable standards 33 is mounted a short rock shaft 34 and rigidly secured to said rock shaft is a long arm 35 which carries at its free end a coin cup 36. Said cup normally is disposed below a coin chute 37 suitably arranged in the casing of the mechanism so that a coin dropped into the said chute will be directed into the coin cup. The weight of the coin will cause the cup to swing downwardly and thereby rock the shaft 34. The rock shaft 34 is provided with a short arm 38 on which a weight 39 is mounted, said weight being adjusted to slightly overbalance the weight of the coin cup so that said cup will normally be held close to the lower end of the coin chute and in position to receive a

coin. A stop or rest 40 is arranged in position to be normally engaged by the arm 38, whereby the cup 36 will be accurately positioned with respect to the coin chute. The rock shaft 34 extends through the wide open slot 31 formed in the free end of the locking dog, and where it passes through said slot it is cut away to form the flat and vertical cam face 41 which normally bears against the outer wall of the slot 31, as clearly shown in Figs. 9 to 12 inclusive. The cam face 41 is so located that when the locking dog is in its normal position against said cam face the upper end of said dog will be directly in the path of the stop shoulder on the locking cam. When a coin is dropped into the coin cup and the shaft 34 is rocked, the cam face 41 will force the locking dog outwardly, that is to say away from the locking cam, and will thereby release said dog from the stop shoulder. This operation is shown in Fig. 10 of the drawings. When the locking dog is fully released from the stop shoulder the spring 24 will snap the locking cam and the connected switch drum around to the position shown in Fig. 11 thereby bringing the stop shoulder into engagement with the holding dog. This one-half rotation of the switch drum will bring the switch arms 18 into engagement with the contact plates 42 mounted on the insulating block 26 and thereby complete the motor circuit. The circuit wires 43 are connected to the contact plates 42. The switch arms and the contact plates may be of any suitable form. As shown in the drawings the switch arms comprise thin spring plates which are adapted to embrace the knife like contact blades or contact plates 42, said blades fitting between the plates of the switch arms. These contact plates or blades and the switch arms are so constructed that the switch arms may snap past or over the blades to permit of the rotation of the switch drum.

When the motor circuit is completed by the closing of the switch, and when the parts of the switch mechanism are in the positions shown in Fig. 11 the motor will be energized and the trip shaft will be slowly rotated through its connection with the low speed shaft of the speed reduction mechanism. The switch opening mechanism is designed to operate to open the motor circuit upon one complete revolution of the trip shaft. On the end of the trip shaft and close to the outer side of the locking cam is rigidly secured a crank arm 44. This arm is slotted vertically and in said slot, on a horizontal pin 45, is pivoted a releasing pawl 46. This releasing pawl is normally held in a substantial radial position by means of a spring 47 which is coiled about the pin 45 with one of its ends engaging the pawl and the other engaging the rigid portion of the crank arm. This spring yieldingly holds the releasing pawl in its substantial radial position and permits it to swing upwardly on its pivot against the tension of said spring. The pawl 46 is formed with an extension 48 which is adapted to engage a rigid wall 49 at the inner end of the slot in the crank arm in order to stop the releasing pawl in its substantial radial position. Mounted in the locking cam is a loose pin 50 which projects through said cam and is supported by a spring 51, said spring permitting said pin to be forced outwardly in order to permit the releasing pawl to pass it as will be hereinafter described. The releasing pawl curves inwardly toward the outer face of the locking cam to provide a cam like face 52 which is adapted to wipe over and repress the pin 50 as the trip shaft is rotated by the motor.

When the switch is closed and the parts are in the positions shown in Fig. 11 the rotation of the motor shaft will slowly rotate the trip shaft and carry the crank arm 44 around in the direction of the arrow in Fig. 11. The releasing pawl will be carried around with the crank arm. As it passes the pin 50 said pin will be forced inwardly against its spring 51 to permit the releasing pawl to rotate without interference. The releasing pawl is formed with a cam surface 53 which is adapted to engage the nose of the holding dog and force it outwardly to disengage it from the stop shoulder 25. This operation is shown clearly in Fig. 12. When the holding dog is wholly released from the stop shoulder the spring 24 will snap the locking cam and the switch drum to its "off" or open position. This will bring the stop shoulder again into engagement with the end of the locking dog, as shown in Fig. 9. The pin 50 is so located in the locking cam that it will engage the under edge of the releasing pawl just before the stop shoulder 25 engages the locking dog and will swing said releasing pawl upwardly on its pivot and out of the path of the holding dog, as shown clearly in Fig. 9. This permits the holding dog to swing inwardly against the periphery of the locking cam and into position to be again engaged by the stop shoulder upon the next release of the locking dog. When the releasing pawl is in engagement with the holding dog the extension 48 of said pawl will be in engagement with the rigid wall 49 of the crank arm and the said pawl will then act as a rigid extension of the crank and will be held rigid while forcing the holding dog out of engagement with the stop shoulder.

The weight of the coin in the cup 36 will depress said cup sufficiently to permit the coin to drop therefrom whereupon the counterbalance 39 will return the cup to its normal receiving position and will rotate

the rock shaft sufficiently to permit the outer wall of the slot 31 to engage the cam 41 of the rock shaft and thus place the locking dog in position to be engaged by the stop shoulder when the holding dog is released.

When the mechanism is assembled the spring 24 is placed under sufficient tension to cause a quick snap movement of the switch drum to its "on" or closed position. Thereafter the rotation of the trip shaft by the motor will place the said spring under tension and thereby ensure subsequent operations of the switch mechanism.

What I claim is:

1. A time switch for electric motors comprising a motor, a reduction gearing including a high speed shaft and a low speed shaft, means for coupling the said high speed shaft to the motor shaft, a trip shaft, means for coupling the trip shaft to the said low speed shaft, a switch drum loosely mounted on the trip shaft, contact arms carried by said switch drum, fixed contacts adapted to be engaged by the contact arms on the switch drum, a spring connected to the trip shaft and to the switch drum and normally tending to move the switch drum to close the motor circuit, a locking cam rigidly connected to the switch drum and provided with a stop shoulder, a pivoted locking dog adapted to engage the stop shoulder to hold the switch in its open or "off" position, a pivoted holding dog adapted to be engaged by the stop shoulder of the locking cam to hold the switch in its "on" or closed position, a rocking cam for releasing the locking dog from the said stop shoulder, means to rock said cam to release the locking dog and permit the said spring to rotate the switch drum and the locking cam to bring the stop shoulder into engagement with the holding dog, and a releasing pawl carried by the trip shaft and adapted to disengage the holding pawl from the said stop shoulder after the motor has operated a predetermined time, the rotation of the trip shaft increasing the tension of the said spring.

2. A time switch for electric motors comprising a motor, a reduction gearing including a high speed shaft and a low speed shaft, means for coupling the said high speed shaft to the motor shaft, a trip shaft, means for coupling the trip shaft to the said low speed shaft, a switch drum loosely mounted on the trip shaft, contact arms carried by said switch drum, fixed contacts adapted to be engaged by the contact arms on the switch drum, a spring connected to the trip shaft and to the switch drum and normally tending to move the switch drum to close the motor circuit, a locking cam rigidly connected to the switch drum and provided with a stop shoulder, a pivoted locking dog adapted to engage the stop shoulder to hold the switch in its open or "off" position, a pivoted holding dog adapted to be engaged by the stop shoulder of the locking cam to hold the switch in its "on" or closed position, a rocking cam for releasing the locking dog from the said stop shoulder, means to rock said cam to release the locking dog and permit the said spring to rotate the switch drum and the locking cam to bring the stop shoulder into engagement with the holding dog, a releasing pawl pivoted to move in one direction only and carried by the trip shaft and adapted to disengage the holding pawl from the said stop shoulder after the motor has operated a predetermined time, the rotation of the trip shaft increasing the tension of the said spring, and a pin carried by the locking cam and adapted to engage the releasing pawl and swing it out of the path of the holding dog when the holding dog is released from the stop shoulder.

3. A time switch for electric motors comprising a motor, a reduction gearing including a high speed shaft and a low speed shaft, means for coupling the said high speed shaft to the motor shaft, a trip shaft, means for coupling the trip shaft to the said low speed shaft, a switch drum loosely mounted on the trip shaft, contact arms carried by said switch drum, fixed contacts adapted to be engaged by the contact arms on the switch drum, a spring connected to the trip shaft and to the switch drum and normally tending to move the switch drum to close the motor circuit, a locking cam rigidly connected to the switch drum and provided with a stop shoulder, a pivoted locking dog adapted to engage the stop shoulder to hold the switch in its open or "off" position, a pivoted holding dog adapted to be engaged by the stop shoulder of the locking cam to hold the switch in its "on" or closed position, a device for releasing the locking dog from said stop shoulder to permit the spring to rotate the switch drum and the locking cam to bring the stop shoulder into engagement with the holding dog, and a releasing pawl carried by the trip shaft and adapted to disengage the holding dog from the stop shoulder of the locking cam.

4. A time switch mechanism for electric motors comprising a motor, a trip shaft, a speed reduction gearing connecting the motor to the trip shaft, a rotary switch loosely mounted on the trip shaft, fixed contacts adapted to be engaged by said switch to close the motor circuit, a switch moving spring connected to the trip shaft and to the switch and normally tending to rotate the switch in the direction of rotation of the trip shaft, a locking cam rigidly connected to the switch to rotate therewith and provided at its periphery with a stop shoulder, a movable locking member adapted to engage said stop

shoulder to hold the switch in its open position, a movable holding member adapted to engage said stop shoulder to hold the switch in its closed position, spring means tending to hold said locking and holding members in engagement with the periphery of the cam at opposite sides of its axis of rotation, means adapted to be operated at will to move the locking member away from said stop shoulder to permit the said switch-moving spring to rotate the switch to closed position, and trip means carried by the trip shaft and adapted to move the holding member to release position at the end of a complete revolution of the trip shaft after the switch has been closed and thereby permit the switch-moving spring to open the switch.

5. A time switch mechanism for electric motors comprising a motor, a trip shaft, a speed reduction gearing connecting the motor to the trip shaft, a rotary switch loosely mounted on the trip shaft, fixed contacts adapted to be engaged by said switch to close the circuit, a spring connected to the trip shaft and to the switch and normally tending to rotate the switch in the direction of rotation of the trip shaft, a locking cam rigidly connected to the switch and provided with a stop shoulder, a movable locking member adapted to engage the stop shoulder to lock the switch in its open position, a movable holding member adapted to engage the stop shoulder of the locking cam to hold the switch in its closed position, means adapted to be operated at will to release said locking member to permit the said spring to rotate the switch to closed position and to bring the stop shoulder into engagement with the said holding member, a pivoted releasing pawl carried by the trip shaft, said pawl being adapted to disengage the holding member from the said stop shoulder after the motor has operated a predetermined time to thereby permit the said spring to open the switch, the rotation of the trip shaft restoring the tension of the spring, and means carried by the locking cam and adapted to engage the releasing pawl and swing it out of the path of the holding member when said holding member is released from the stop shoulder.

6. A time switch mechanism for an electric motor comprising a motor, a reduction gearing including a high speed shaft adapted to be driven by the motor and a low speed shaft, a switch rotatable to open and closed positions, means tending to rotate said switch, means for locking the switch in its open position, means for holding the switch in closed position, a cam adapted to be rocked into a position to release the said switch-locking means and permit said switch-rotating means to close the switch, means to rock said cam at will to said releasing position, means to automatically return the cam to a non-releasing position; and means operated by said low speed shaft to release the switch holding means and permit the switch-rotating means to open the switch.

7. In an electric time switch mechanism, a trip shaft, a switch rotatably mounted upon the trip shaft to move to open and closed positions, a spring tending to rotate the switch in one direction, a locking cam mounted to rotate with the switch and provided with a stop shoulder upon its periphery, a shiftably mounted locking member at one side of the cam axis, a shiftably mounted holding member at the opposite side of said axis, spring means tending to hold said members in contact with the cam periphery, the locking member being adapted to engage the stop shoulder and hold the switch open, and the holding switch being adapted to engage said shoulder and hold the switch closed, means operable at will to release the locking member and permit the switch to close, and trip means carried by the trip shaft to rotate with it and adapted to move the holding member to release the switch at the end of a complete revolution of the trip shaft occurring after the switch is closed and thereby permit the switch to open.

8. In a time switch mechanism for an electric motor, a trip shaft, a switch rotatably mounted upon said shaft, a spring tending to rotate the switch in one direction, a locking cam fixed to the switch to rotate with it and formed with a cam periphery provided with a locking shoulder, a shiftably mounted holding member to engage said locking shoulder at one side of the cam axis and hold the switch closed, a shiftably mounted locking member to engage said shoulder at the opposite side of the axis and lock the switch open, means yieldably holding said members in contact with the cam periphery, means operable at will to release the locking member and permit the switch to close, a driving connection between the motor and the trip shaft, a releasing pawl carried by the trip shaft and adapted to shift the holding member to release the switch when the trip shaft has rotated a predetermined degree, and means mounted to rotate with the switch and adapted to swing the releasing pawl out of the path of the holding member when the switch is opened.

In testimony whereof I hereunto affix my signature.

LLOYD C. EPPLER.