

March 9, 1943.

H. C. HALL

2,313,064

TIME SWITCH

Filed Nov. 2, 1940

2 Sheets-Sheet 1

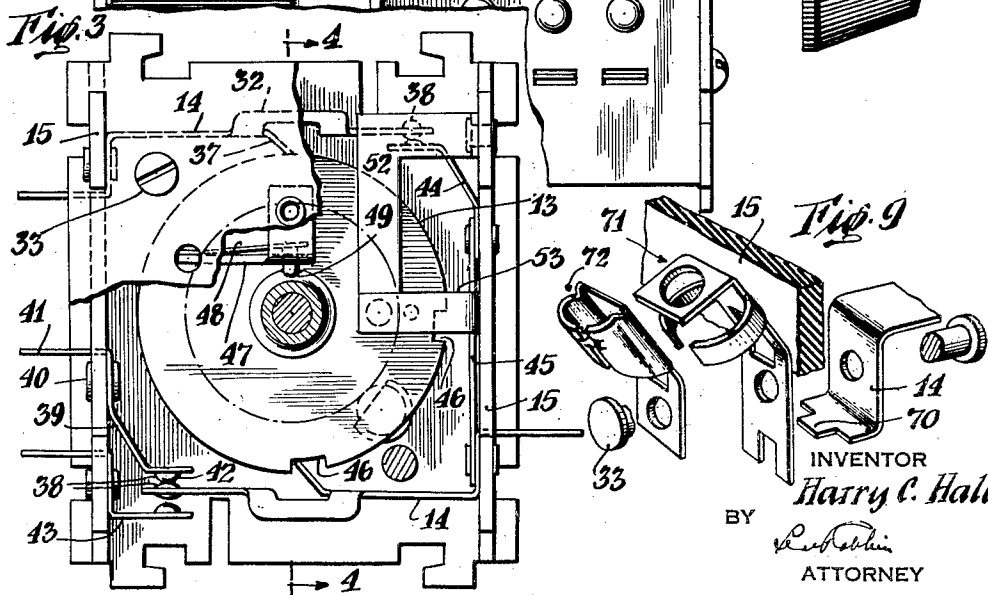
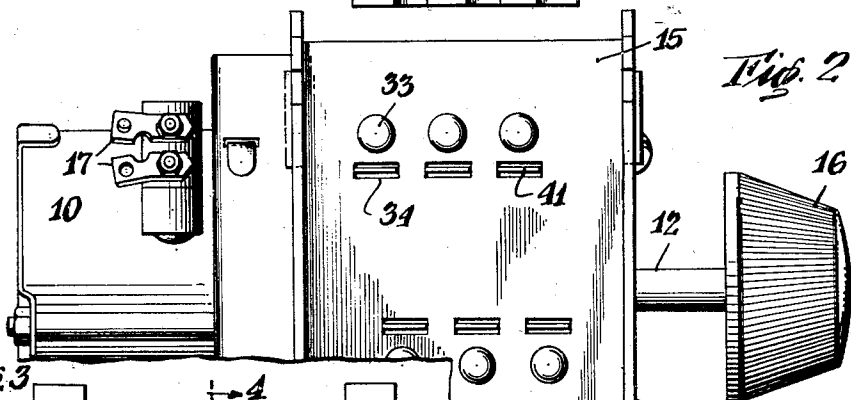
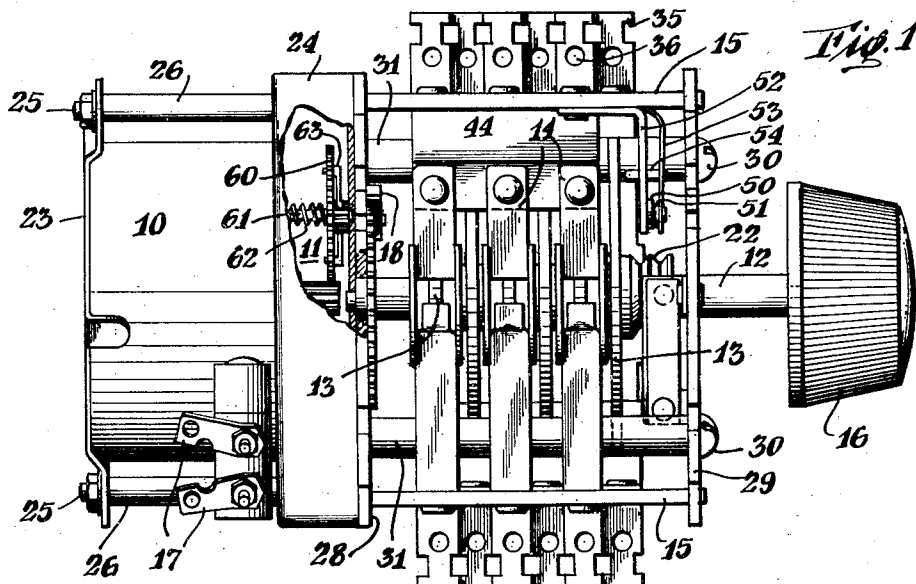


Fig. 9

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2 Sheets-Sheet 2

Fig. 4

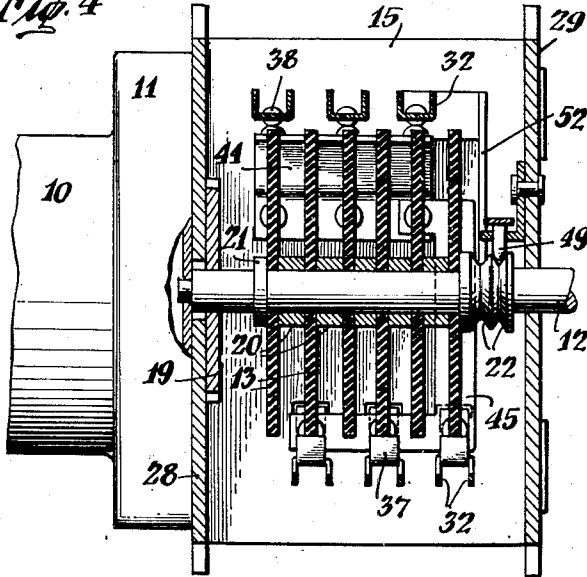


Fig. 5

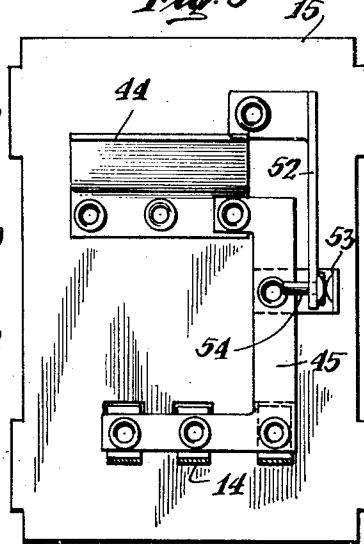


Fig. 6

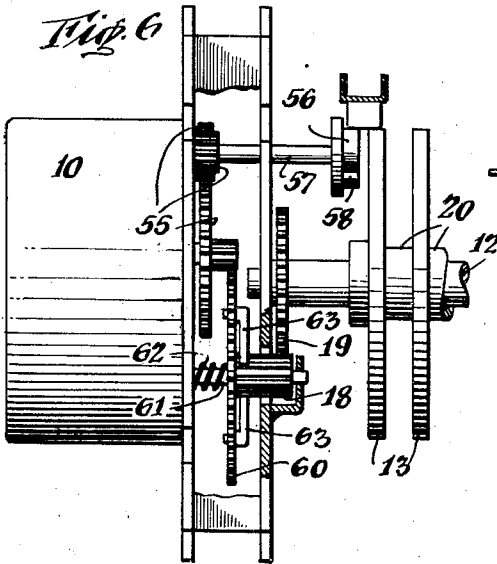
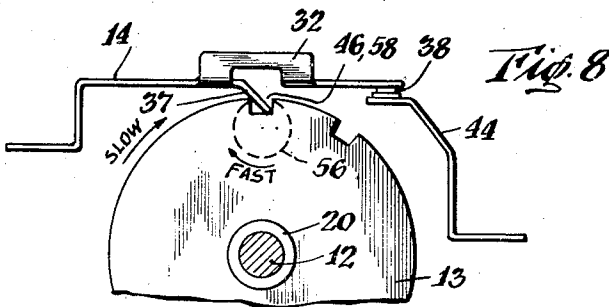
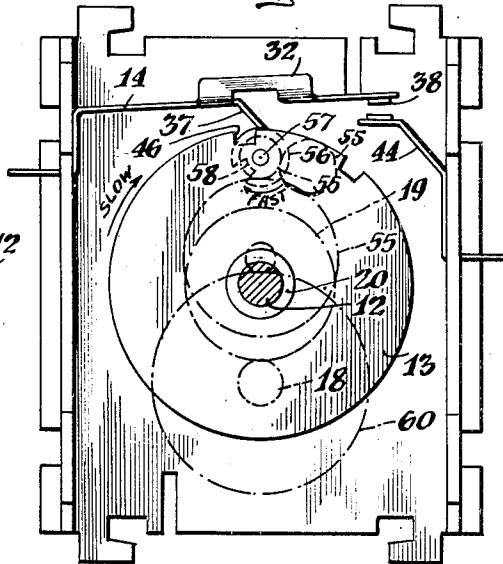


Fig. 7



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UNITED STATES PATENT OFFICE

2,313,064

TIME SWITCH

Harry C. Hall, Indianapolis, Ind., assignor to P. R. Mallory & Co., Inc., Indianapolis, Ind., a corporation of Delaware

Application November 2, 1940, Serial No. 363,967

11 Claims. (Cl. 200—33)

This invention relates to electric switches and particularly to cam controlled electric switching devices.

An object of the invention is to improve the construction of electric switches and cam control switching devices.

Other objects of the invention will be apparent from the following description and accompanying drawings taken in connection with the appended claims.

The invention comprises the features of construction, combination of elements, arrangement of parts, and methods of manufacture and operation referred to above or which will be brought out and exemplified in the disclosure hereinafter set forth, including the illustrations in the drawings.

In the drawings:

Figure 1 is a top view with the cover removed of a clock motor driven time switch embodying features of the invention;

Figure 2 is a side view thereof with parts broken away;

Figure 3 is an end view with parts cut away to show the mechanical details;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a face view of the inside of one of the insulating plates comprising part of the switch housing;

Figures 6, 7 and 8 illustrate details of a modified construction; and

Figure 9 is an exploded view of a modified terminal construction.

The present invention finds its principal application in a timing switch driven by a clock motor or the like and having a manual control knob for setting purposes. Such a switch finds application as a timing means for automatic washing machines, stoves and the like. The switch contacts are of novel design adapted to embody a cam following member and contacting portion and are constructed to have unusual strength and rigidity. Other features of the switch mechanism will be brought out in the following detailed description.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the construction of parts without departing from the spirit of the invention. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic

in their application to similar parts as the art will permit.

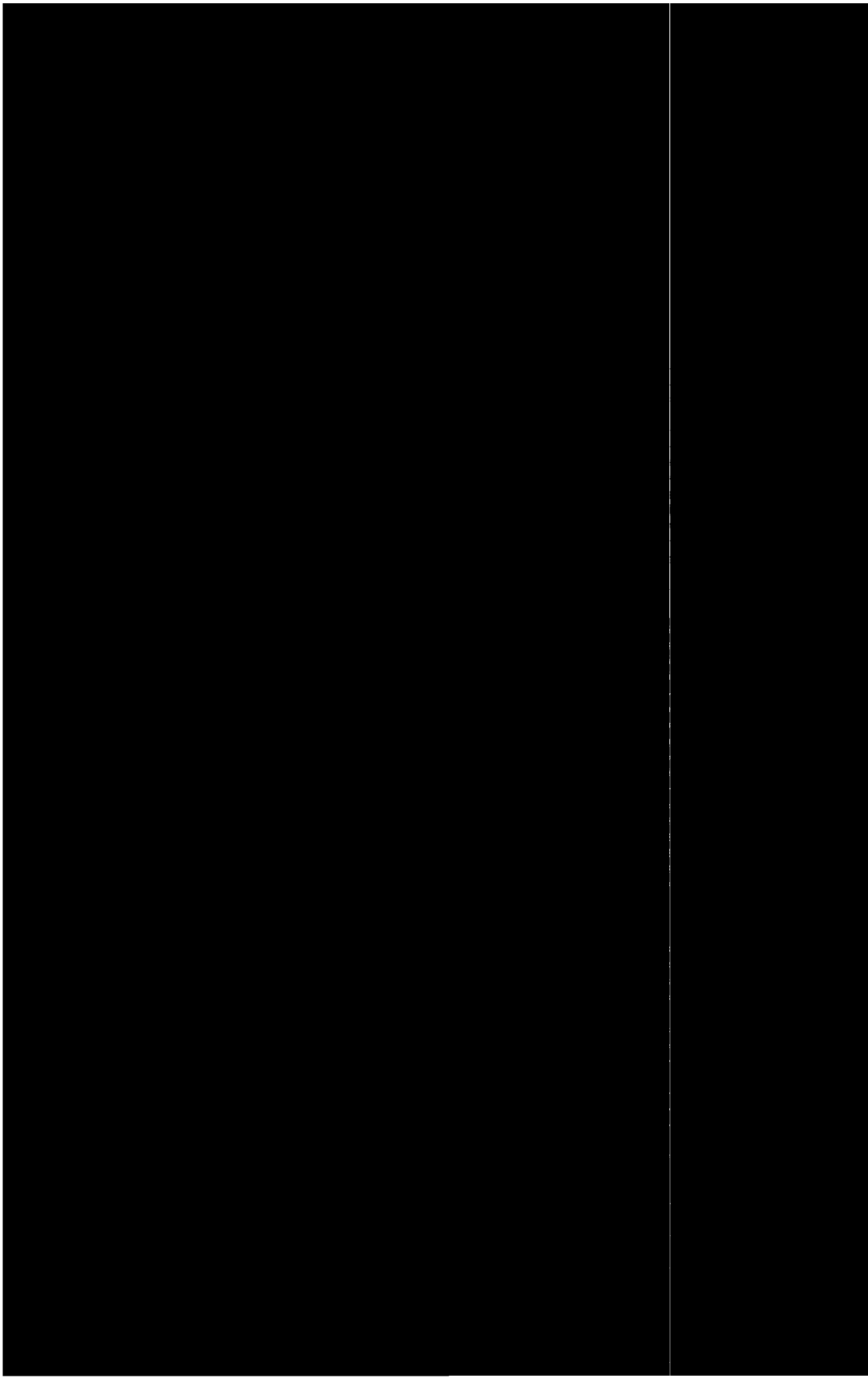
Referring to the drawings the time switch mechanism illustrated comprises an electric clock motor 10, a gear train 11 driven thereby and a shaft 12 carrying a series of cams 13 driven by the gear train. A series of cam following contact arms 14 are mounted upon insulating plates 15 comprising part of the switch housing and engage the cams so as to be controlled thereby. A manual control knob 16 is mounted upon the end of shaft 12 for manual setting of the shaft with its associated cams.

Considering the structure in greater detail the clock motor 10 may be mechanical or electrical but is preferably a small synchronous electric motor such as is quite extensively used for clocks and timing apparatus at the present time. A pair of electric terminals 17 mounted on the outside of the casing of clock motor 10 afford a means of connecting it to a suitable A. C. source.

Gear train 11 may preferably be the gear train shown and described in my copending application Serial No. 333,730, filed May 7, 1940, now Patent 2,227,133 issued December 31, 1940. As described in that application the clock motor drives a mechanism comprising part of the gear train which stores up energy of the motor for a predetermined period and then utilizes that energy to rapidly advance the last gear of the train for a short distance. Pinion 18, shown projecting from the case containing gear train 11, is mounted on the shaft of the last gear 60 of the train to rotate therewith and hence is also periodically advanced a short distance. Gear 19 rigidly attached to the inner end of shaft 12 meshes with the pinion 18 and hence is intermittently advanced thereby.

It will thus be evident that cams 13 which are rigidly mounted on shaft 12 are periodically advanced through a few degrees of their rotation by the clock motor and gear train mechanism. The rigid mounting of cams 13 on shaft 12 is shown most clearly in the section of Figure 4. As here evident the cams are spaced apart by sleeves 20 and clamped to rotate with the shaft by clamp nut 21 and annularly grooved sleeve 22. Cams 13 are of sheet insulating material such as sheet Bakelite or the like.

The frame supporting and enclosing the various parts comprises a motor clamping plate 23 clamped against the rear face of motor 10 and the gear train housing 24 clamped to the front face of the clock motor housing, the two being clamped together by clamping bolts 25 and



thus opening the desired circuit. When the cams have been set to the desired position for the start of a cycle the shaft 12 is pushed inward to re-engage gear 19 with pinion 18. Gear 60 and pinion 18 are slidably mounted on shaft 61 and normally are held at the outermost position by compression coil spring 62. Should gear 19 and pinion 18 not be in a relation to enable meshing when shaft 12 is pushed in, the gears slide back on the shaft 61 but snap into mesh as soon as the drive motor has advanced them to meshing position. Pinion 18 is driven by gear 60 through a pair of leaf spring pawls 63 but should anyone attempt to advance cam 13 without first pulling shaft 12 out spring pawls 63 will permit relative rotation and hence prevent damage to the gear train.

In the operation of the switch the cams are advanced intermittently by the gear mechanism 11 and notches 46 are brought opposite cam following arms 37 in a sequence determined by the position of the notches on their respective cams. Rapid operation of the contacts is obtained by the periodic advance, as cams 13 are momentarily advanced rapidly, thus rapidly lifting the cam following arm 37 out of a co-operating notch rather than slowly as would be the case if cams 13 were slowly advanced.

In the modification illustrated in Figures 6, 7 and 8 a feature is added to those previously described. The gear train may be similar to that illustrated in my co-pending application Serial No. 333,730, filed May 7, 1940, now Patent #2,227,133 or may comprise that shown in the drawings wherein gears 55 comprise merely a speed reducing gear arrangement driving gear 19 mounted on shaft 12 through pinion 18. If the previously described arrangement is used shaft 12 is periodically rapidly rotated through a predetermined angle and remains at rest between the periods of rotation. If the arrangement shown in Figure 6 is used the shaft 12 rotates slowly and continuously.

The improvement illustrated in Figures 6 to 8 is applicable to either arrangement and comprises the use of an additional small cam 56 mounted on a shaft 57 which is rotated comparatively rapidly by the motor 10. Shaft 57 may preferably comprise the shaft upon which the first driving pinion of the gear train is mounted and may comprise the armature shaft of the motor 10 or be driven by it. Small cam 56 is provided with a single notch 58. The cam is supported closely adjacent one of the large cam discs 13 with its edge aligned with the edge of cam 13 at one point, that point being the point of contact with cam following arm 37. Arm 37 is of sufficient width to rest upon the peripheries of large cam 13 and small cam 56 simultaneously.

Since large cam 13 advances slowly or intermittently the cam controlled contacts would ordinarily be closed for a substantial time interval whenever one of notches 46 comes opposite cam following arm 37. The present arrangement provides for a more rapid make-and-break of the contacts where such is required. This is accomplished in the following manner: The small cam 56 rotates much more rapidly than large cam 13. When a notch 46 in large cam 13 comes opposite cam following arm 37 the arm is not permitted to fall into the notch until notch 58 in small cam 56 also comes opposite the cam following arm. When this occurs the contacts are momentarily closed but since the cam 56 is rotating rapidly the contacts are closed only mo-

metarily and are then reopened by the further travel of cam 56. By the time notch 58 again comes opposite arm 37, however, large cam 13 has advanced its notch 46 out of position for co-operation with arm 37, and hence the contacts remain open. Where intermittent advance of cam 13 is obtained from the gear mechanism it is preferred that small cam 56 be rotated one revolution for each advance of cam 13.

While the present invention, as to its objects and advantages, has been described herein as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A time switch comprising a drive motor, a gear train driven thereby, and a cam shaft carrying the last gear of said train, cams on said shaft and electric contacts controlled thereby, manual control means for said shaft, said shaft being slidable longitudinally to bring about disengagement of the last gear of said train from the preceding gear thereof and thereby enable manual control of said cams, and a two position index mechanism for indexing said shaft in or out of gear.

2. A time switch comprising a drive motor and a gear train driven thereby, the last gear of said train being longitudinally slidable along its axis to a meshing position where it is capable of meshing with the preceding gear and a non-meshing position where it is incapable of so meshing, manual control means for longitudinally sliding said last gear, the preceding gear of said train being longitudinally slidable along its axis between a meshing position, for meshing with said last gear when said last gear is also in meshing position, and a non-meshing position without disengagement from the preceding drive means, spring means urging said preceding gear into meshing position, cams driven by said last gear and electric contacts controlled by said cams.

3. A time switch comprising a drive motor, a gear train driven thereby, a cam shaft having cams thereon driven by the last gear of said train, and electric contacts controlled by said cams, means for moving said shaft longitudinally to uncouple the drive connection between said shaft and the gear train and index means for indexing said shaft in either coupled or uncoupled relation with said gear train.

4. A time switch comprising a drive motor, a gear train driven thereby, a cam shaft having cams thereon driven by the last gear of said train, and electric contacts controlled by said cams, means for moving said shaft longitudinally to uncouple the drive connection between said shaft and the gear train and index means for indexing said shaft in either coupled or uncoupled relation with said gear train, said index means comprising a sleeve on said shaft having a plurality of circumferential grooves therein and a stationary spring pressed projection normally resting in one of said grooves.

5. A time switch comprising a drive motor, a gear train driven thereby, a cam shaft driven by the last gear of said train and at least one cam plate mounted on said shaft for rotation therewith, means for moving said shaft longitudinally to uncouple the drive connection between said shaft and the gear train, an index device for indexing said shaft in coupled and uncoupled positions, a cam following electric con-

tact control engaging the edge of said cam plate in both the coupled and uncoupled position of said shaft, and a second contact control means actuated by axial movement of said plate.

6. A time switch comprising a drive motor, a gear train driven thereby, a cam shaft driven by the last gear of said train and at least one cam plate mounted on said shaft for rotation therewith, means for moving said shaft longitudinally to uncouple the drive connection between said shaft and the gear train, an index device for indexing said shaft in coupled and uncoupled positions, a cam following electric contact control engaging the edge of said cam plate in both the coupled and uncoupled position of said shaft, and a second contact control means actuated by axial movement of said plate, said second control means comprising a contact carrying spring arm having a portion thereof engaging the face of said plate.

7. A time switch comprising a drive motor, a gear train driven thereby, and a cam driven by said gear train, a second cam driven at a different speed by said gear train and electric contacts simultaneously under control of both said cams whereby actuation of said contacts in one direction is possible only when permitted by both cams jointly.

8. A time switch comprising a drive motor, a speed reducing gear train driven thereby and a fast and slow cam both driven by said gear train, said fast cam being mounted on one of the more rapidly rotating parts of said train and said slow cam on a more slowly rotating part, a cam following arm engaging the cam faces of both said cams to be controlled jointly thereby and a pair of electric contacts controlled by said cam.

9. Means for obtaining a short contact operation period in a timing switch which comprises a timing cam having a cut out portion on its cam surface and means for advancing said cam at a

predetermined rate, a cam following arm engaging said cam surface and electric contacts controlled thereby, and a second more rapidly rotating cam having a cut out portion on its cam surface and means for rotating said cam, said cam following arm also similarly engaging said second cam's surface, whereby said arm is operated to control said contacts only when said cut out portions simultaneously come opposite said cam following arm.

10. A time switch comprising a drive motor and a gear train driven thereby, the last gear of said train being longitudinally slidable along its axis to a meshing position where it is capable of meshing with the preceding gear and a non-meshing position where it is incapable of so meshing, manual control means for longitudinally sliding said last gear, a spring index to index said gear in either meshing or non-meshing position whichever is manually selected, the preceding gear of said train being longitudinally slidable along its axis between a meshing position, for meshing with said last gear when said last gear is also in meshing position, and a non-meshing position without disengagement from the preceding drive means, spring means urging said preceding gear into meshing position, cams driven by said last gear and electric contacts controlled by said cams.

11. A time switch comprising a drive motor, a gear train driven thereby, a cam shaft having cams thereon driven by the last gear of said train and electric contacts controlled by said cams, means for moving said shaft longitudinally to uncouple the drive connection between said shaft and the gear train, index means for indexing said shaft in either coupled or uncoupled relation with said gear train, and a pair of co-operating electric contacts operated by movement of said shaft longitudinally.

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