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Timer especially for household appliances

This invention relates to a timer to control the operating time of electric circuits, especially electric circuits for household appliances.

With reference in particular to timers which control the operating cycles of domestic appliances such as washing machines, cooking appliances and so on, the operating cycles need to be varied with reference to the successive operations actuated in each case. The control of said operations selected by the user requires timers, the structures and operation of which are rather complex, especially if the capacities of the user are considered. A typical, but not exclusive case is the operating control of washing machines, in which the timer must control the operating time of circuits involving thermal sources, and devices to vary the quality and/or flow rate and/or the circulating intensity of washing and treatment liquids, depending on the material involved in each case.

In DE—A—2 746 312, which is acknowledged in the first part of claim 1, a timer is disclosed the features of which partially meet those ones just discussed. More precisely, axial movement of the timer shaft can cause an auxiliary cam to operate a switch independent of the main cam switches. The auxiliary cam is formed with a portion of large radius which can operate the auxiliary switch, and a small radius portion which will not inter-act with the cam follower.

In the timer disclosed in DE—A—2 512 900 an auxiliary cam can move axially into a position in which it engages a cam follower to operate a switch. However, the cam shaft is not axially movable, axial cam movement being effected by cooperating camming surfaces on the cam and a flange mounted on the shaft. The cam follower in this disclosure cannot as in the present invention prevent an axial movement of an auxiliary cam wheel for a selected delay period after which an auxiliary program given by cams proceeds normally.

The purpose of this invention is to avoid the above drawbacks and at the same time to meet rationally and without difficulty all the requirements normally attainable by the full utilization of the machine controlled by the timer.

The timer according to this invention, in which a motor rotates a main cam and a shaft rotationally coupled to an auxiliary cam, said shaft being movable both rotationally to select an auxiliary program and axially to energize the motor, such axial movement bringing about an axial translation of the auxiliary cam relative to a control lever operating a switch concerned with the auxiliary program the auxiliary cam having a circumferential profile which determines the auxiliary program and which includes a smaller radius portion dimensioned not to be engageable with said control lever and a larger radius

portion which can engage the lever is characterized in that when either a rotational movement to select an auxiliary program, or a motor-drive rotation, of the shaft and hence the auxiliary cam, brings about an axial alignment of its smaller radius portion with the control lever, said axial translation of the auxiliary cam wheel is permitted, and thereafter the auxiliary program is run, with said control lever now operating as a cam follower on the auxiliary cam.

The invention will now be described with reference to accompanying drawings illustrating the preferred embodiment of the timer, the camshaft of which is axially movable to actuate the general switch in said timer.

In the drawings:

Figure 1 is an axial cross section of the interior of the timer according to the invention;

Figure 2 is a cross section taken on lines II—II in figure 1;

Figures 3 to 6, (similar to Figure 2) show the different positions of the timer in the various operating phases controlled by it.

In the drawings like parts are identified by like reference symbols; the timer illustrated is of the known type and its control shaft is actuated, for example, by a synchronous motor via a suitable clutch.

One of the ends of control shaft 10 is provided with an actuating button (not shown) to impart to the shaft both an angular motion and an axial motion in the direction of arrow "X" in Figure 1, so as to actuate the main switch (not shown) of the timer in the usual known manner.

For this purpose, shaft 10 is secured to a collar 12 provided with suitable peripheral shaped notches 14 and 16 in either of which an elastic segment 18, in turn axially held by a ledge 20 in a hollow tube 22, can engage to axially position the shaft.

A flange 24 on shaft 10 terminates with a crown 26, the ends of which are provided with apertures 28, through which pass the axial projections 30 of tube 22 which are always in engagement with the fixed part K of the timer, for example, the cover thereof.

Hollow tube 22 is caused to rotate by shaft 10 whilst it remains axially fixed with respect to same.

A collar 32 is secured to hollow tube 22. One of the ends of said collar terminates with a flange 34 to hold and actuate a set of cams 36 which cooperate, in the required sequence, with switches (not shown), to control the different electric circuits.

A spring 38 is interposed between collar 32 and a disc 40 supported and elastically urged by spring 38 against crown 26 of flange 24 to form in this manner a driving and coupling means for said 40.

The periphery of disc 40 is shaped with sets

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of differing radial profiles to form shoulders between the groups of contiguous profiles which act as axial stops. In the case illustrated, the periphery of perforated disc 40 has two radial profiles 42 and 44 of different radii; the second profile 44 is provided with at least one notch 46 to form a cam. Notch or cam 46 is offset by an angle α from starting point O of the timer, as shown in drawings from 3 to 6.

It is clear that the radial contour 42 in disc 40 may be in the form of a cam, rather than circular, depending on specific service requirements to be met with by the timer.

Radial profiles 42—44 of disc 40 actuate one or more electric switches; in the case illustrated, the profiles actuate a selector switch, the movable contact of which consists of a flexible blade 48, one of the ends of which is secured to the base structure K of the timer and which is provided with a cam follower 50 cooperating both with the shoulder formed by profiles 42 and 44 and with cam 44. The other end of the blade 48 is provided with a contact 55 which cooperates alternatively with fixed contacts 52 and 54 thus forming a selector switch. The performance of the timer results clearly from the foregoing description. Taking into account that, when the timer is at a standstill, the main switch is open and the other parts of the timer are in the position shown in Figures 1 and 2, where the elastic segment 18 is in engagement with notch 16. The cutout of the main switch — and hence the start of the timer — is obtained by acting on shaft 10, to displace it axially in the direction of the arrow.

Supposing that the timer, according to this invention, is especially and advantageously used in connection with a washing machine for the household, in such a case the switch 52—54—55 controls two programs, the first one to wash the usual garments and the second one to wash delicate garments; during the last mentioned program the heating is performed at a reduced and controlled temperature both of the water used for washing and the rinsing water.

The realization of either one or the other of the two aforesaid cycles is carried out by acting upon shaft 10 of the timer, in order to impart, to the radial profiles of the disc, i.e. cams 42—44, the desired angular position and thereafter said shaft is drawn in the direction shown by arrow X, to close the main switch. From this instant onward, the timer is actuated by its own motor and by performing the usual cycle, since the device stops automatically, as soon as the cams 36 thereof have reached the desired angular position or the "Stop" of the program related to the first cycle.

To realize the second cycle, the same procedure is followed; however, in this case it is necessary to take the angular position into consideration (i.e. the starting position) which is shown by or is imparted to cams 42—44. More precisely, when notch 46 of cam 44 is near to,

or close to cam follower 50 (that is in the position shown in Figure 4), contact 52 will remain closed in relation to the bottom profile of the said notch 46, to be then opened, while successively and in relation with the profile of notch 46, contact 54 (Figure 5), closes.

On the other hand, if shaft 10 is displaced in axial direction (see arrow X), when notch 46 is displaced in respect to cam follower 50 (see Figure 3), in such a case said cam follower 50 of blade 48 follows the profile of cam 42, i.e. contact 52 remains closed, until cam 44 of disc 40 reaches, by the notch 46 thereof, cam follower 50 of blade 48. In this case, the action of spring 38 pushes disc 40, with cams 42 and 44, in the direction of the arrow so that cam follower 50 engages notch 46. From this instant onward, contact 55 effects the aforesaid cycle, determined by the profile of notch 46.

Figures from 3 through 5 show that, when a predetermined program is selected, which starts prior to the beginning of angle α and between α and β , the contact which remains closed is contact 54. On the other hand, when a program is selected, which is comprised between the angular width of $\alpha + \beta$, contact 52 is remaining closed.

What stated above confirms that the scope of the invention is fully achieved, in simple, rational and economic manner.

Moreover, the invention affords further advantages, in particular, the possibility to do away with the use of a pushbutton type switch on the device (washing machine or similar machine), whilst programming of the timer is performed in such a way that each program is operated in the best way. Actually, each program is a compromise, due to the programs which precede or follow the program considered.

On the contrary, by the timer according to this invention, it is possible to co-ordinate the operating cycles of the user, with proper criteria.

For example, in the case of a washing machine, it is possible to perform washing programs for woollen clothes (which contemplate static heating of the water and pumping of the water with limited movement), pre-washing for all programs, possibility to modify the water levels during a cycle, possibility to effect drying by cooling and/or drying and finally, the possibility to select the final phase when washing of delicate clothing is performed.

It is obvious that in addition to the modifications on the timer already considered according to the invention, further modifications and changes may be introduced to meet the desired conditions, without departing from the scope of the invention as defined in the appended claims.

Claims

1. Timer, especially for household appliances,

in which a motor rotates a main cam (36) and a shaft (10) rotationally coupled to an auxiliary cam (40), said shaft (10) being movable both rotationally to select an auxiliary program and axially to energize the motor, such axial movement bringing about an axial translation of the auxiliary cam (40) relative to a control lever (50) operating a switch (52, 54, 55) concerned with the auxiliary program, the auxiliary cam having a circumferential profile (44) which determines the auxiliary program and which includes a smaller radius portion (46) dimensioned not to be engagable with said control lever (50) and a larger radius portion (42) which can engage the lever; characterized in that when either a rotational movement to select an auxiliary program, or a motor-driven rotation, of the shaft (10) and hence the auxiliary cam (40), brings about an axial alignment of its smaller radius portion (46) with the control lever (50), said axial translation of the auxiliary cam wheel (40) is permitted, and thereafter the auxiliary program is run, with said control lever (50) now operating as a cam follower on the auxiliary cam (40).

2. Timer according to Claim 1 characterized in that the control lever has two positions operating respective switching conditions and is biased toward the first thereof, which is assumed whenever either the smaller radius portion of the auxiliary cam is axially aligned with the lever (50), or when the wheel has not been permitted said axial movement due to the axial alignment not having been attained since switch-on.

3. Timer according to Claim 1 or 2 characterized in that the axial movement of the shaft (10) past an axially fixed member (22) moves an abutment crown (26) away from said auxiliary cam (40) and permits said axial movement of the auxiliary cam (whenever said axial alignment exists) in response to a spring biased against said axially fixed member (22).

4. Timer according to Claim 1, 2 or 3 characterized in that said axially fixed member (22) is also rotated by the shaft (10) and carries therewith the main program cam or cams (36).

5. Timer according to Claim 4 characterized in that axially projecting portions (30) of the axially fixed rotating member (22) pass through apertures (28) in a flange (24) integral with the shaft (10), to abut the fixed timer housing (K), the flange (24) thereby rotating the axially fixed member (22).

6. Timer according to any of claims 1—5 characterized in that said control lever (50) is secured to a blade (48) which is flexible radially with respect to the auxiliary cam (40) and rigid axially with respect thereto whilst forming the movable portion (55) of an electric switch (52, 54), and in that the lever (50) cooperates with a shoulder of the larger radius portion (42) of said auxiliary cam to hold the latter axially against the action exerted by spring means (38).

7. Timer according to any of claims 1—6

characterized in that any auxiliary cam program that may be initiated by eventual axial alignment of the small radius portion (46) and the control lever (50), is integrated with a program of the main cam or cams (36).

Patentansprüche

1. Zeitschalter, insbesondere für Haushaltgeräte, mit einem eine Nockenscheibe (36) und eine drehbar mit einer Hilfsnockenscheibe (40) gekuppelte Welle (10) antreibenden Motor, wobei die Welle (10) sowohl zur Auswahl eines Zusatzprogramms drehbar und zum Anschalten des Motors axial bewegbar ist und die Axialbewegung eine axiale Verschiebung der Hilfsnockenscheibe (40) relativ zu einem Steuerhebel (50) zur Betätigung eines Schalters (52, 54, 55) für das Zusatzprogramm bewirkt und wobei das Umfangsprofil (44) der Hilfsnockenscheibe (40) zum Bestimmen des Zusatzprogramms einen Bereich (46) von vermindertem Radius aufweist, der einen Angriff an dem Steuerhebel (50) unmöglich macht, während ein Bereich (42) von größerem Radius einen Angriff an dem Steuerhebel (50) gestattet, dadurch gekennzeichnet, daß infolge entweder einer Drehbewegung zur Auswahl eines Zusatzprogramms oder einer von dem Motor veranlaßten Drehung der Welle (10) und damit der Hilfsnockenscheibe (40) der Bereich (46) von vermindertem Radius mit dem Steuerhebel (50) fluchtet und dadurch eine axiale Verschiebung der Hilfsnockenscheibe (40) ermöglicht ist und darauf das Zusatzprogramm anläuft, wobei der Steuerhebel (50) als Nockenstößel gegenüber der Hilfsnockenscheibe (40) wirkt.

2. Zeitschalter nach Anspruch 1, dadurch gekennzeichnet, daß der Steuerhebel (50) zwei Schaltstellungen aufweist und gegenüber der ersten Stellung vorgespannt ist, die er einnimmt, wenn entweder der Bereich (46) mit vermindertem Radius der Hilfsnockenscheibe (40) axial mit dem Steuerhebel (50) fluchtet oder wenn das Rad die Axialbewegung deshalb nicht auszuführen vermag, weil wegen des Anschaltens ein axiales Fluchten verhindert ist.

3. Zeitschalter nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die axiale Bewegung der Welle (10) gegenüber einem axial festen Teil (22) einen Anschlagring (26) von der Hilfsnockenscheibe (40) löst und, im Falle des axialen Fluchtens, die axiale Bewegung der Hilfsnockenscheibe (40) gegenüber einer sich an dem axial festen Teil (22) abstützenden Feder ermöglicht.

4. Zeitschalter nach einem der Ansprüche, 1, 2 oder 3, dadurch gekennzeichnet, daß der axial feste Teil (22) mit der Welle (10) drehbar ist und einem oder mehrere dem Hauptprogramm zugeordnete Nocken (36) trägt.

5. Zeitschalter nach Anspruch 4, dadurch gekennzeichnet, daß an dem axial festen drehbaren Teil (22) angeordnete, sich axial erstreckende Elemente (30) in einem an der Welle ange-

ordneter Flansch (24) vorgesehene Öffnungen (28) bis zum Anschlag an dem Schaltergehäuse (K) durchsetzen, wobei der Flansch (24) den axial festen Teil (22) in Umdrehung versetzt.

6. Zeitschalter nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Steuerhebel (50) an einer Blattfeder (48) befestigt ist, die radial flexibel und axial starr gegenüber der Hilfsnockenscheibe angeordnet ist und den beweglichen Teil (55) eines elektrischen Schalters (52, 54) bildet, wobei der Hebel (50) mit der Schulter des den größeren Radius aufweisenden Teils (42) der Hilfsnockenscheibe (40) zusammenwirkt, um diese gegen die Wirkung der Feder (38) abzustützen.

7. Zeitschalter nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß ein der Hilfsnockenscheibe zugeordnetes und bei einem axialen Fluchten des den kleineren Radius aufweisenden Bereichs (46) mit dem Steuerhebel (50) ausgelöstes Programm mit dem Programm des oder der Hauptnockenscheiben (36) integriert ist.

Revendications

1. Minuterie, en particulier pour appareils ménagers, dans laquelle un moteur fait tourner une came principale (36) et un arbre (10) couplé à rotation à une cam auxiliaire (40), l'arbre (10) pouvant être déplacé en rotation pour sélectionner un programme auxiliaire et axialement pour mettre le moteur sous tension, ce déplacement axial provoquant un mouvement de translation axial de la came auxiliaire (40) par rapport à un levier de commande (50) actionnant un interrupteur (52, 54, 55) se rapportant au programme auxiliaire, la cam auxiliaire présentant un profil circonferentiel (44) qui détermine le programme auxiliaire et qui comprend une partie de petit rayon (46) dimensionnée de manière à ne pas entrer en contact avec le levier de commande (50) et une partie de plus grand rayon (42) qui peut entrer en contact avec le levier, caractérisée en ce que lorsqu'un mouvement de rotation visant à sélectionner un programme auxiliaire ou un mouvement de rotation entraîné par moteur de l'arbre (10) et par conséquent de la came auxiliaire (40) entraîne un alignement axial de sa partie de petit rayon (46) avec le levier de commande (50), le mouvement de translation axial de la roue à came auxiliaire (40) est permis et ensuite le programme auxiliaire est réalisé, le levier de commande (50)

se comportant à présent comme un suiveur de came sur la came auxiliaire (40).

2. Minuterie suivant la revendication 1, caractérisée en ce que le levier de commande comporte deux positions actionnant des états de commutation correspondants et est rappelé élastiquement vers sa première position qu'il occupe chaque fois que la partie de petit rayon de la came auxiliaire est axialement en ligne avec le levier (50) ou que la roue n'a pas pu effectuer le déplacement axial parce que l'alignement axial n'a pas été atteint depuis l'actionnement de l'interrupteur.

3. Minuterie suivant la revendication 1 ou 2, caractérisée en ce que le déplacement axial de l'arbre (10) en regard d'un organe axialement fixe (22) déplace une couronne d'arrêt (26) en l'écartant de la came auxiliaire (40) et permet le déplacement axial de la came auxiliaire (chaque fois que l'alignement axial existe) en réaction à une sollicitation élastique exercée sur l'élément axialement fixe (22).

4. Minuterie suivant la revendication 1, 2 ou 3, caractérisée en ce que l'élément axialement fixe (22) est également entraîné en rotation par l'arbre (10) et entraîne avec lui la ou les cames (36) du programme principal.

5. Minuterie suivant la revendication 4, caractérisée en ce que les parties axialement saillantes (30) de l'élément tournant axialement fixe (22) traversent les ouvertures (28) prévues dans une bride (24) d'une pièce avec l'arbre (10) et viennent en contact avec le boîtier fixe (K) de la minuterie, la bride (24) faisant ainsi tourner l'élément axialement fixe (22).

6. Minuterie suivant l'une quelconque des revendications 1 à 5, caractérisée en ce que le levier de commande (50) est fixé à une lame (48) qui est flexible dans le sens radial par rapport à la came auxiliaire (40) et qui est rigide axialement par rapport à celle-ci, tout en formant la partie mobile (55) d'un commutateur électrique (52, 54) et le levier (50) coopère avec un épaulement de la partie de grand rayon (42) de la came auxiliaire pour maintenir celle-ci axialement à l'encontre de la sollicitation d'un ressort (38).

7. Minuterie suivant l'une quelconque des revendications 1 à 6, caractérisée en ce que tout programme de came auxiliaire qui peut être amorcé par un alignement axial final de la partie de petit rayon (46) et du levier de commande (50) est intégré à un programme de la ou des cames principales (36).

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FIG. 3

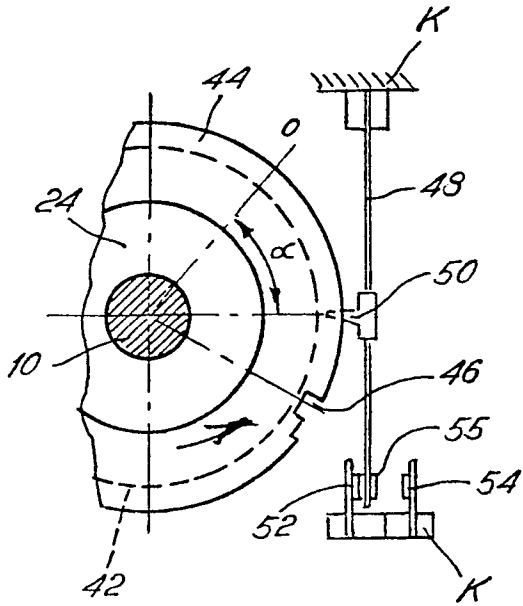


FIG. 4

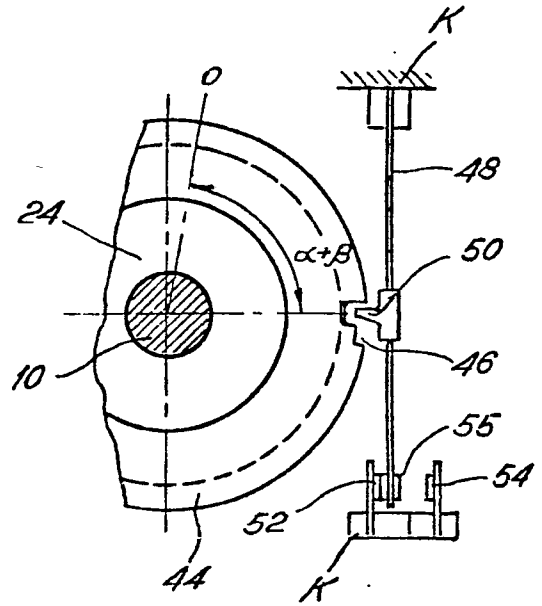


FIG. 5

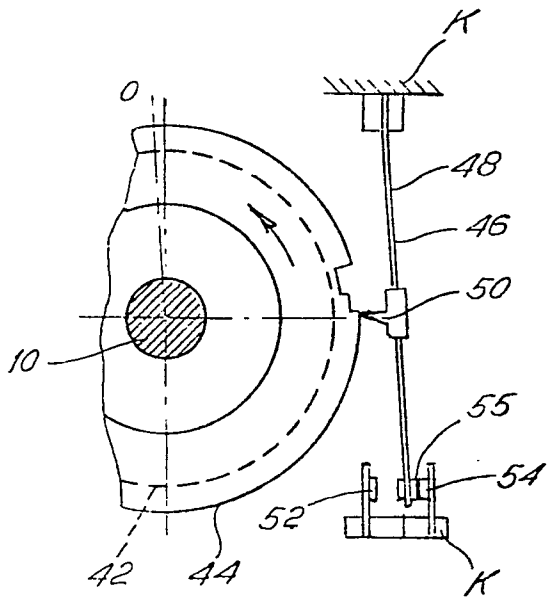


FIG. 6

