# United States Patent

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[54] **PROGRAMMERS**
3 Claims, 3 Drawing Figs.


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[50] Field of Search ..... 74/3.5, 3.52, 3.54; 200/38 B



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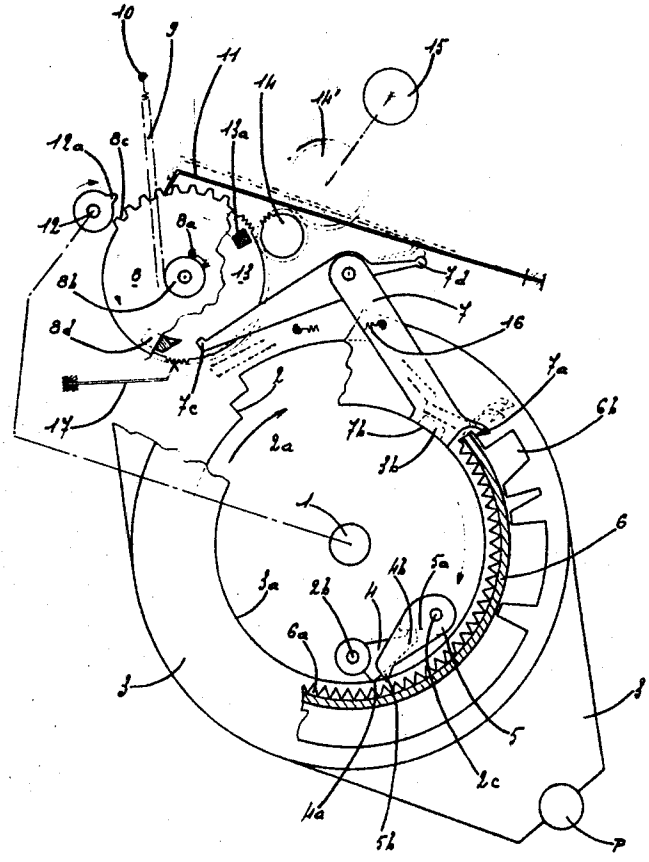
**ABSTRACT:** A programmer for automatic washing machines or the like, including a constant-speed reversing programming cam, an operating cam driven in stepwise manner by the programming cam, and means to selectively block the stepwise advancing of the operating cam for a predetermined length of time, whereby the operation of the machine may include a comparatively long rest period intermediate successive operating sequences within a cycle, as for a lengthy soaking stage. Following expiration of the predetermined time, the blocking means is released and the operating cam resumes its stepwise advancement for the remainder of the operating cycle.

Patented Aug. 10, 1971 3,597,982

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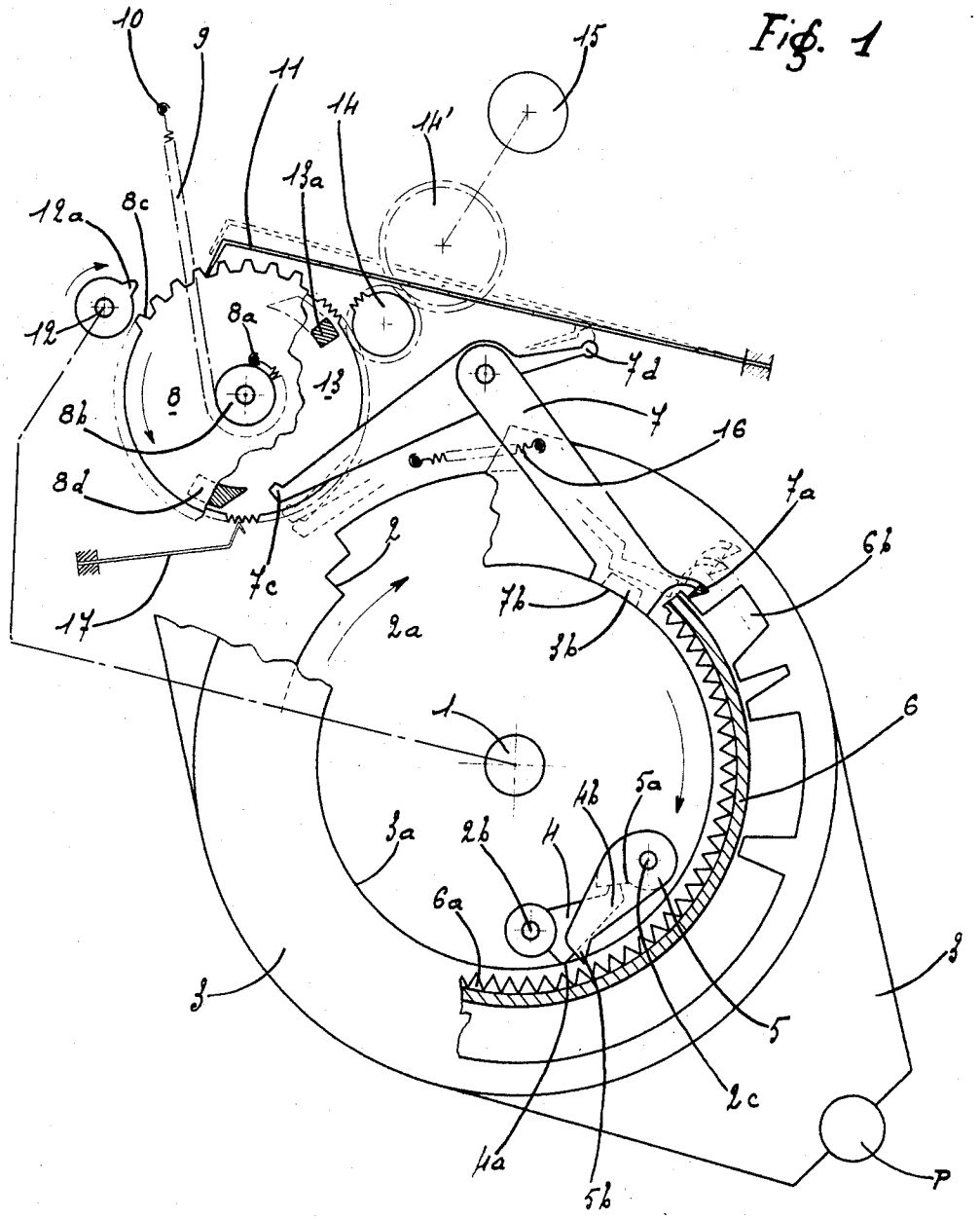


Fig. 1

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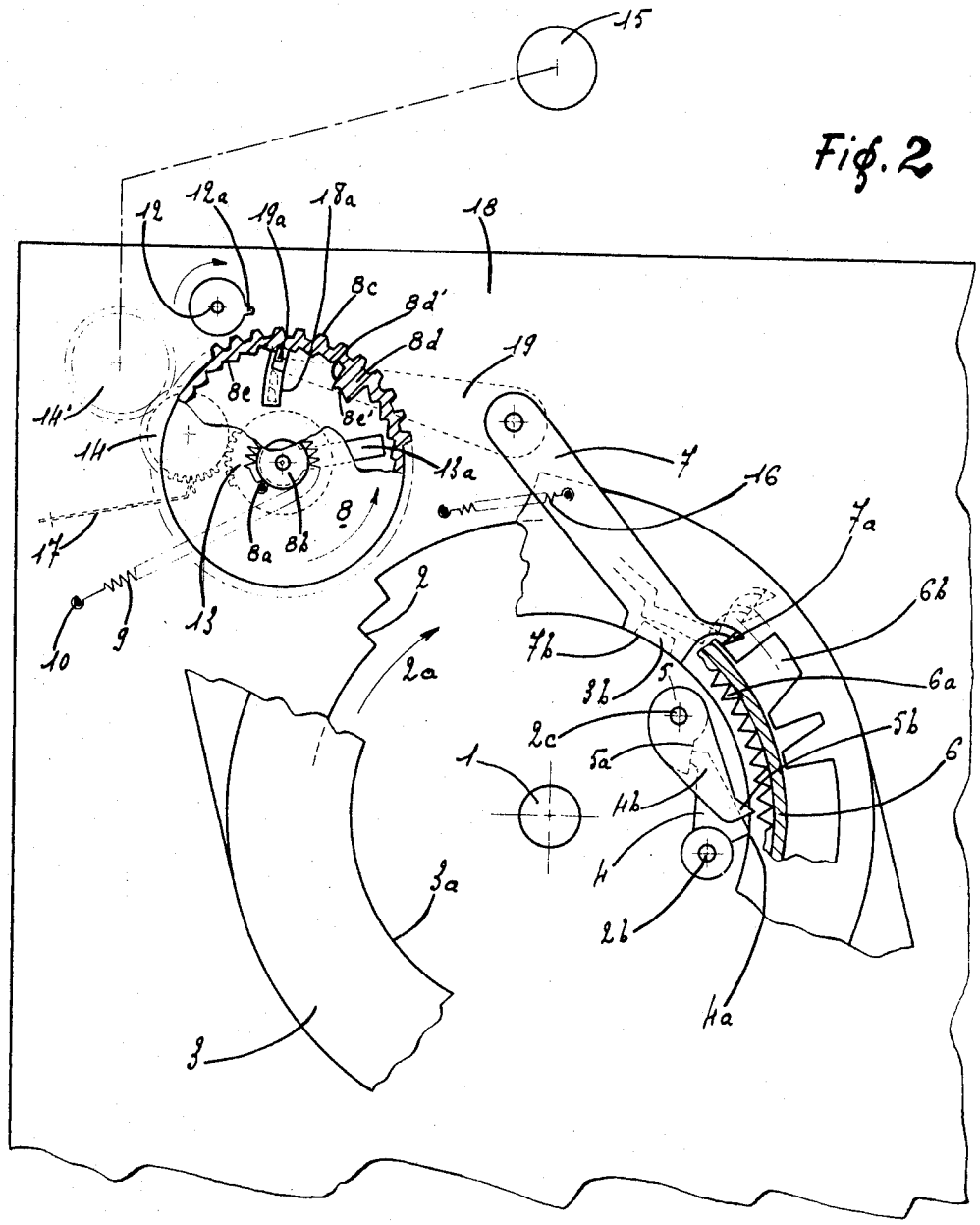


Fig. 2

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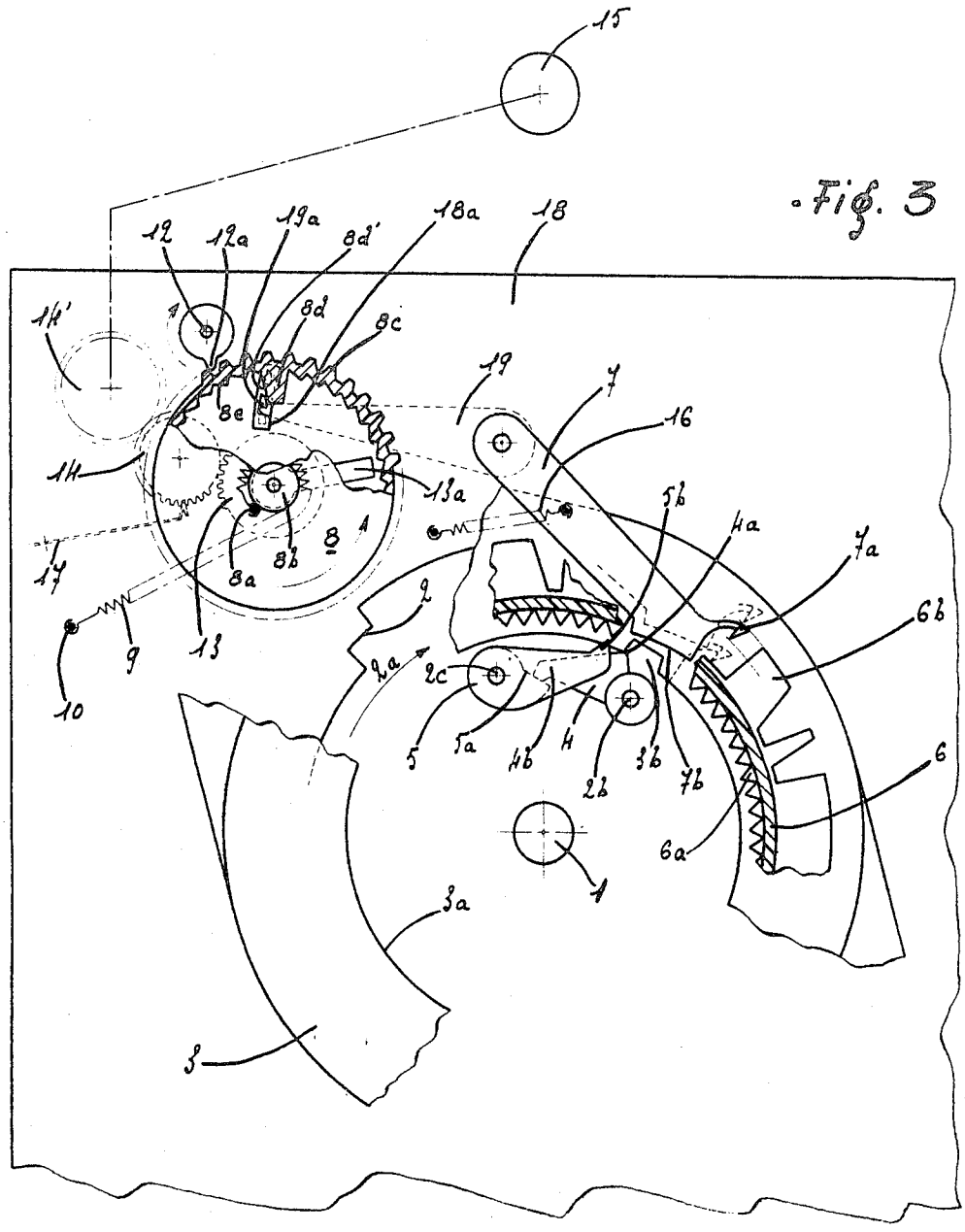


Fig. 3

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# PROGRAMMERS

This invention is concerned with improvements to programmers and especially programmers of the type employed in automatic washing machines whereby the step-by-step pulses of the cam unit can be suppressed over any desired period of time which may either be fixed or variable, the interruptions of the step-by-step motion during a cycle being determined as a function of a program cam or selecting cam which is rigidly fixed to the cam unit.

One of the main objects of the invention is to permit the fully automatic use of new detergents and of the new method of washing which is commonly referred to as "biological washing" wherein, after an initial portion of the cycle such as a prewash, the articles being washed are allowed to soak for a fairly long period of time which may amount to several hours and during which the machine remains motionless prior to resuming an active portion of the washing cycle.

One aim of the invention is therefore to permit the possibility of intercalating between two steps of a program at least one time interval which is much longer than the other time intervals of the program or, in other words, to represent by means of a single one-step movement an operation having a duration which would have required several steps in programmers of known types.

The invention is particularly useful when it is carried out so as to permit variation of the time during which step-by-step movements are suppressed since it is then possible to have a standard program comprising the usual sequence of operations of a washing cycle and to change in this program the duration of either one or a number of operations. For example, it follows from the foregoing that, in the complete cycle, the duration of the washing operation can be either reduced or increased depending on the articles being washed and how soiled they are.

It should be noted that the invention is applicable to all the programmers of the type comprising a motor which drives continuously a first cam unit consisting of so-called reversing cams and constituting the source of power for producing the step-by-step motion either by setting a spring or by direct mechanical coupling or again by electromechanical coupling.

A number of designs of programmers are already known in which a movable member is capable of taking up two positions controlled by means such as a cam, an electromagnet and so forth; one of these positions corresponds to the case in which the step-by-step movements take place normally whilst the other position corresponds to the case in which the step-by-step movements are stopped. Resumption of the stepping movements is then usually produced independently of time by the change of state of an external device such as a thermostat or a pressostat.

As has already been disclosed in French Pat. No. 1,533,219 of Dec. 23, 1966 and in the relevant French Pat. of Addition No. 93,558 to which reference can usefully be made, the present Applicant has already devised a system which comprises on the one hand a two-position movable member controlled by a program cam or selecting cam which is rigidly fixed to the cam unit and either permits or prevents one or a number of rotational stepping movements once per revolution of the reversing cam so that only a single pulse is permitted to remain each time the reversing cam carries out one revolution and, on the other hand, a two-position movable member which is controlled by an electromagnet so as to permit or prevent said single stepping pulse for an indeterminate period of time.

As has also been disclosed in French Pat. No. 1,493,769 of July 22, 1966 and in the relevant Pat. of Addition No. 91,145 as well as French Pat. No. 1,548,677 in respect of: "Improvements to preselecting programmers for washing machines", the present Applicant has also devised systems in which a program cam or selecting cam permits the production either of a single-step pulse each time the reversing cams perform one



revolution or of a single-step pulse which occurs only after a given number or revolutions of the reversing cam, said number of revolutions being determined by a movable revolution-counter flap which is reset to zero each time a pulse has been permitted.

The improved programmer in accordance with the invention is characterized in that it comprises a movable member which is capable of taking up three positions so as to interrupt the step-by-step pulses during a long period of time which can be either fixed or variable, said member being operated in dependence on elastic restoring means and in order to define two out of three positions thereof on a program cam or selecting cam which is rigidly fixed to the cam unit; a mechanism for counting the time of interruption of the step-by-step movements comprising a time wheel which is controlled by a spring for returning to zero, by a retaining pawl and by an intermittent driving lug which is rigidly fixed to a moving system whose movement of rotation is dependent on the synchronous movement of the reversing cam, a stop for defining the origin of the angle of rotation of said time wheel which is proportional to the time interval; a cam which is rigidly fixed to the time wheel so as to define upon expiration of the time interval one out of the three positions of the movable member which is not defined by the program cam; a stop which can be displaced concentrically with the time wheel and thus to vary the times of interruption of the step-by-step pulses, said stop being mounted on a control wheel which is coaxial with the time wheel; and finally a mechanism comprising a control knob, an intermediate gear train and a leaf spring.

The programmer in accordance with the invention can also be completed by an intermediate stepdown gearing system for counting very long time intervals.

The operation is as follows: when it is necessary to interrupt the step-by-step pulses during the cycle, the program cam (or selecting cam) brings the movable member into a first position in which it prevents the production of the pulse either by preventing a driving pawl from engaging with a set of teeth or by preventing a spring from being released or alternatively by holding open the supply circuit of an electromagnetic coupling unit.

Throughout the intended pulse-interruption period, the driving lug (which is rigidly fixed to the moving system, said system being driven in a suitable ratio which is a function of the total time to be counted from the time of synchronous driving of the reversing cam) causes the time wheel (or an intermediate wheel) which is maintained by the pawl to advance by one tooth per revolution of the moving system.

On expiration of the pulse-interruption period, that portion of the time wheel which forms a cam brings the movable member into a second position in which it no longer prevents the single-step pulse.

During the single-step pulse, the program cam brings the movable member into a third position in which the pawl of the time wheel is lifted so that, under the action of its restoring spring, the time wheel returns to its starting point on the origin stop.

If the following pulse also has to be delayed, the movable member is again brought to its first position by the program cam. On the contrary, if the following pulse does not have to be delayed, the movable member is maintained in the third position thereof.

In an alternative arrangement, the movable member which is capable of taking up three positions constitutes at the same time the member for retaining the time wheel (thereby making it possible to dispense with the pawl mentioned earlier).

In this alternative form, the movable member is provided with a nose which is adapted to cooperate with a set of teeth of the time wheel in order to prevent said time wheel from returning to zero as long as the movable member is located either in the first position in which the step-by-step pulses are stopped whilst the feeler finger is located on a short-radius portion of the program cam or in the second position which is controlled by a portion of the time wheel which forms a cam

and in which a step-by-step pulse is produced whereas, when the steptby-step pulse occurs and the feeler finger passes over a long-radius portion of the program cam, the movable member is brought into the third position thereof and the nose no longer cooperates with the set of teeth of the time wheel which returns to zero under the action of its restoring spring.

In another alternative form wherein the movable member also comprises a nose which cooperates with a set of teeth of the time wheel so as to prevent said time wheel from returning to zero as long as the movable member is located in the first position in which the step-by-step pulses are stopped whilst the feeler finger is located on a short-radius portion of the program cam, that portion of the time wheel which forms a cam brings the movable member for a short moment into the second position in which coupling is possible in order to produce a single-step movement whilst coupling means are set angularly with respect to the driving lug of the time wheel so that the beginning of the single-step driven motion of the cam unit should take place before the driven motion of the time wheel produced by the driving lug is completed in order that the feeler finger of the movable member should already be located on a long-radius portion of the cam at the moment when the driven motion of the time wheel comes to an end and so that said movable member should be in the third position in which the time wheel is not prevented from returning to zero (either as a result of the nose which cooperates with the set of teeth or by reason of the fact that the driving lug is still engaged).

Further properties of the invention will be brought out by the following description in connection with three embodiments of said invention as represented very diagrammatically in the accompanying drawings which do not show all the components of a programmer of known type but, for the sake of enhanced clarity, only those elements which are necessary in order to gain a proper understanding of the invention.

In these drawings:

FIG. 1 shows the arrangement of the movable member and of the time wheel relative to the known elements of a programmer;

FIG. 2 is a view which is similar to the preceding and shows a first alternative embodiment;

FIG. 3 is a view which is similar to FIG. 1 and shows a second alternative embodiment.

For the sake of clarity of the description, the elements of a known programmer (as described in the above-cited French Pat. No. 1,533,219 and in the relevant Pat. of Addition No. 93,558 will first be briefly recalled.

In FIG. 1, the reference 1 designates the cam shaft; the reference 2 designates the reversing cam which is secured to the cam shaft and rotates in continuous motion in the direction of the arrow 2*a*; a stationary component 3 is centered on the assembly columns, only one one column P being shown in the figure; a continuous cylindrical surface 3*a* forms the track of an inner cam having a profile-break or recess 3*b*; an effort-multiplication lever 4 is pivotally mounted on a shaft 2*b* which is rigidly fixed to the reversing cam 2 and provided with a feeler heel 4*a* which is intended to follow the profile 3*a* and with an arm 4*b* for the purpose of actuating the heel 5*a* of a coupling pawl 5 provided with a nose 5*b* and pivoted about the pin 2*c* which is rigidly fixed to the reversing cam 2; the reference numeral 6 designates the cam unit 6, the front portion of which has been cut away in the operating drawings so as to show only the inner set of teeth 6*a* and the program cam or selecting cam means 6*b* both of which are rigidly secured thereto; a pivoted movable member 7 having a feeler finger 7*a* is adapted to cooperate with the cam means 6*b* and has a profile 7*b* which, in the position illustrated, closes off the recess 3*b* and ensures the continuity of the track 3*a*.

The whole of that part of the programmer which comprises the components 1 to 7 is known and operates in the following simple manner:

When the movable member 7 is located in the position shown in the figure, that is to say when the feeler nose 7*a* is located on a short-radius portion of the program cam 6*b*, the reversing cam 2 rotates together with the components 4 and 5 and no action is produced. On the contrary, when the nose 7*a* is displaced by and located on a long-radius portion of the selection cam 6*b*, the shoe 7*b* of the lever 7 is raised and no longer ensures continuity of the cylindrical track 3*a*; and when the heel 4*a* passes in front of the recess 3*b*, the lever 4 permits the pivotal motion of the pawl 5 under the action of a spring (not shown); the nose 5*b* cooperates with the set of teeth 6*a* and the pawl provides a temporary coupling between the reversing cam 2 and the cam unit 6, thereby rotating the cam unit 6 through one step. In the known system, the function of the member 7 can only be conceived in combination with another means for producing a single-step movement such as another recess which is similar to the recess 3*b* since the cam unit 6 would otherwise remain permanently motionless.

The present Applicant has already given consideration to the possibility of employing the continuous rotation of the reversing cam as a time base for the purpose of defining the time interval during which the cam unit of a programmer remains motionless (reference should be made to the above-cited French Pat. No. 1,493,769 and Pat. of Addition No. 91,445.

In this form of use, a movable flap is displaced angularly through an angle which is proportional to the time interval at the end of which a step-by-step pulse is produced and the flap is returned to zero.

In an alternative construction (as described in French Pat. No. 1,548,677 in respect of: "Improvements to preselecting programmers for washing machines" as cited earlier), a time counting element is displaced angularly and intermittently by means of a driving lug and through an angle which proportional to the time interval at the end of which a step-by-step pulse is produced and the time counter is returned to zero.

By virtue of the arrangement in accordance with the invention, it is possible in particular to set the angle through which the time counter rotates at any desired value, that is to say to vary the time during which the step-by-step pulses are suppressed.

The arrangement in accordance with the present invention comprises a time wheel 8 provided with a stud 8*a* to which is attached one extremity of a restoring spring 9, said spring being partially wound on the hub 8*b* of said wheel and the other extremity of said spring being attached to a fixed point 10 of the frame of the programmer.

A pawl 11 which consists of a flexible strip prevents the wheel 8 from moving back under the action of the spring 9. The shaft 12 of a moving system which is rotationally coupled with the reversing cam comprises a driving lug 12*a* which is adapted to cooperate with the set of teeth 8*c* of the wheel 8 on order to cause said wheel 8 to advance by one tooth per revolution in the direction opposite to the elastic return of the spring 9.

A catch 8*d* is positioned on the wheel 8 and is adapted to come into abutment with a catch 13*a* which is rigidly fixed to a control wheel 13 when (the pawl 11 having been lifted) the wheel 8 has returned to its starting point under the action of the spring 9. A train of pinions 14—14' which couples the wheel 13 to a control knob 15 serves to set the starting point of the wheel 8.

The movable member 7 comprises an arm 7*c* which is located in the plane swept by the catch 8*d*. In a first position which is shown in the drawings and in which the profile 7*b* closes off the recess 3*b*, the extremity of the arm 7*c* penetrates into the circumference described by the catch 8*d* so that, during the rotation of the wheel 8, the catch 8*d* will subsequently produce action on the arm 7*c* in order to bring the arm 7*b* into a second position in which the recess 3*b* is uncovered and a step-by-step pulse will take place when the heel 4*a* subsequently comes in front of said recess 3*b*.

During the rotational movement which corresponds to one step, a projecting portion of the program cam 6*b* which cooperates with the feeler finger 7*a* brings the movable

member 7 into a third position. In this third position, another arm 7*d* which was not in contact with the pawl 11 in the two first positions lifts said pawl and thus frees the set of teeth 8*c*, with the result that the time wheel 8 is permitted to return to the starting point under the action of the spring 9.

If the following one-step rotational movement must also be delayed, the projecting portion of the program cam 6*b* has a small angular value and, after the rotational movement, the movable member has returned to the first position under the action of a restoring spring 16. On the contrary, if the following step does not require to be delayed, the projecting portion has an angular value which is greater than one step and the movable member 7 is maintained in the third position.

A leaf spring 17 ensures the correct setting of the wheel 13 in order that the initial pulse of the lug 12*a* should take place correctly without abutment.

In the alternative embodiment shown in FIG. 2 in which the same reference numerals have been retained in order to designate components which have already been described, the wheel 8 has the shape of a hollow cylindrical shell, the hollow side being placed against a mounting plate 18. The lateral internal surface of the hollow cylinder comprises a catch 8*d* which, when the wheel 8 is returned to zero by the spring 9, is applied against the stop 13*a*, said stop being rotationally coupled with the control wheel 13 which is placed behind the mounting plate 18 and coupled by means of the wheels 14—14′ to a control knob 15 so that it is thus possible to set the origin of the angle which is proportional to the time of rotation of the wheel 8. A leaf spring 17 is adapted to cooperate with the teeth of one of the wheels 13, 14 or 14′ in order that the stop 13*a* may be maintained stationary in the position which has been set.

The time wheel 8 comprises in this case an internal set of saw-teeth 8*e*. An arm 19 which is placed behind the mounting plate 18 is keyed on the shaft of the movable member 7. The arm 19 is provided with a stud or nose 19*a* which passes through a window 18*a* of the mounting plate 18 so as to cooperate with the set of teeth 8*e* of the wheel 8 and prevent said wheel from returning to zero under the action of the spring 9 when the step-by-step pulses are suppressed by reason of the fact that the feeler finger 7*a* is located on a short-radius portion of the program cam 6*b* and that the movable member 7 is located in the position in which its profile 7*b* ensures continuity of the profile 3*a* by closing off the recess 3*b*.

The catch 8*d* which is located internally of the wheel 8 has a hollow or concave portion 8*e*′ in which the nose 19*a* is capable of engaging in order to prevent the time wheel 8 from returning to zero when, on expiration of the set time interval, the face 8*d*′ of the catch 8*d* which forms a cam has moved the nose 19*a* and consequently the lever 19 and the movable member 7 into an intermediate position in which the profile 7*b* does not close off the recess 3*b* and permits the possibility of a stepping pulse as and when the feeler heel 4*a* of the lever 4 subsequently penetrates into the recess 3*b*, thereby permitting the nose 5*b* of the pawl 5 to engage in the internal set of teeth 6*a* of the operating cam unit 6.

During the one-step forward rotary motion, the feeler finger 7*a* passes at least temporarily over a long-radius portion of the program cam 6*b*, thereby bringing the moving system 7—19 into a third position in which the nose 19*a* is no longer located within the retaining recess 8*e*′ and in which the time wheel 8 is no longer retained and moves back to zero: in other words, the catch 8*d* is located against the adjustable stop 13*a* under the action of the restoring spring 9.

In the second alternative embodiment which is illustrated in FIG. 3 and in which the same reference numerals have been employed to designate components which have already been described, the movable member 7 takes up the second position only in a transient manner and the position of the heel 4*a* of the lever 4 is synchronized with the position of the driving lug 12*a* so that the coupling of the reversing cam 2 with the operating cam unit 6 (by means of the pawl 5) in order to control the one-step forward motion should take place when the nose 19*a* is displaced to a sufficient extent by means of the shoulder 8*d*′ of the catch 8*d* which forms a cam. In this manner, by reason of the fact that the one-step forward motion has already started, the feeler finger 7*a* is already acted upon by a large-diameter portion of the program cam 6 at the moment when the driving lug 12*a* which completes the driven motion of the set of teeth 8*c* moves away from this latter; the wheel 8 is no longer retained and accordingly returns to zero under the action of the spring 9.

I claim:

1. In a programmer for machines of the class of automatic washing machines, of the type comprising constant-speed driving means, a reversing cam continuously driven by said driving means; an operating cam unit driven from said reversing cam in stepwise manner; a movable member operatively interposed between said reversing cam and said operating cam unit in order to selectively actuate said operating cam unit and adapted to selectively permit the stepwise driven rotational movement of said operating cam unit or to block said movement, and a program cam rigidly fixed to said operating cam unit for actuating the movable member and having short-radius portions and long-radius portions, said movable member including a feeler finger engaging said program cam, said movable member being capable of taking up three positions of which the first and second positions are respectively defined by the program cam when said feeler finger engages a short-radius portion and a long-radius portion of said program cam, said movable member normally being biased by elastic restoring means towards said first position; a mechanism for counting the time of interruption of step-by-step forward movement, said mechanism comprising a rotatable time wheel, a restoring spring for returning said time wheel to a zero position, blocking means for selectively retaining said time wheel against such return movement and a lug for intermittent driving of said wheel; a moving system carrying said lug and adapted for rotational movement in conjunction with the movement of the reversing cam; a first stop secured to said time wheel for defining the origin of rotation of said time wheel, which angle is proportional to the selected time interval; cam means rigidly fixed to the time wheel and adapted to engage said movable member on expiration of the selected time interval to move said movable member to its third position, said movable member when in said third position moving said blocking means out of engagement with said time wheel to thereby permit said time wheel to return to its zero position; a second stop which can be rotationally displaced concentrically with the time wheel and to select the times of interruption of the step-by-step pulses, a control wheel which is coaxial with the time wheel and on which said second stop is mounted; and selecting means for said control wheel comprising a control knob and an intermediate gear train operatively connecting said control knob and control wheel, whereby said control wheel and said second stop may be rotated to a desired position by means of said control knob, and a leaf spring adapted to engage recesses in the periphery of said control wheel to thereby maintain the control wheel in a selected stationary position to permit the proper initial engagement of the intermittent-drive lug therewith.

2. A programmer in accordance with claim 1, wherein said blocking means comprises a nose secured to said movable member and adapted to engage a set of teeth of the time wheel so as to prevent said time wheel from returning to said zero position as long as the movable member is located either in the first position in which the step-by-step pulses are stopped whilst said cam means rigidly fixed to the time wheel and in which a step-by-step pulse is produced whereas, when the step-by-step pulse occurs and the feeler finger passes over a long-radius portion of the program cam, the movable member is brought into the third position thereof and the nose is raised out of engagement with the set of teeth of the time wheel which returns to its zero position under the action of its restoring spring.

3. A programmer in accordance with claim 1, wherein said blocking means comprises a leaf spring forming a pawl normally engaging teeth in the periphery of said time wheel, said movable member when in said third position engaging said leaf spring and moving said leaf spring out of engagement with said time wheel to permit said time wheel to return to its zero position.