(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 687 761 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **95109280.8**

(22) Date of filing : **15.06.95**

(51) Int. Cl.[6] : **D06F 39/00**

(30) Priority : **16.06.94 IT TO940497**

(43) Date of publication of application :
20.12.95 Bulletin 95/51

(84) Designated Contracting States :
DE ES FR GR

(71) Applicant : **Merloni Elettrodomestici S.p.A.**
Viale Aristide Merloni, 47
I-60044 Fabriano (AN) (IT)

(72) Inventor : **Mariotti, Costantino**
Via Ermanno Caserta 4
I-06028 Sigillo (PG) (IT)

(54) Multiprogram washing machine with an electromechanical programmer and a digital microcontroller

(57) A multiprogram washing machine is described, comprising an electromechanical programmer (T, MT, A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}) for selecting a plurality of washing programs and an electronic microcontroller (ME,MP) for controlling, during said programs, the operation of a motor (M) being provided in said machine, wherein the programmer delivers control codes to said microcontroller ; the main characteristics of the described washing machine consists in that at least a control element (A) is provided for modifying the codes sent from the electromechanical programmer (T, MT, A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}) to the electronic microcontroller (ME,MP), in order to extend the number of washing programs available in the machine.

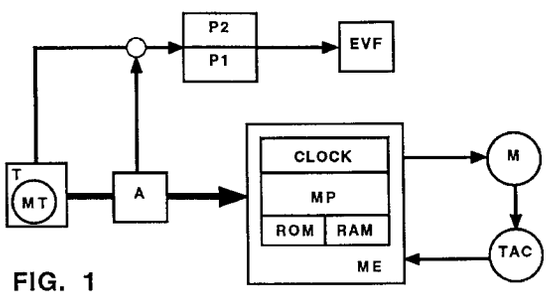

FIG. 1

EP 0 687 761 A1

The present invention refers to a multiprogram laundry washing machine comprising an electromechanical programmer and an electronic microcontroller for controlling, during said programs, the operation of a motor being provided in said machine, wherein the programmer delivers control codes to said microcontroller.

Usually, all household laundry washing machines have an electromechanical programmer or cycle sequencer consisting essentially of an electric motor actuating a cam set through a gear reducer, said cams controlling, in their turn, the machine components (inlet solenoid valve, outlet pump, heating element, etc.) by closing or opening a number of electric contacts.

Nowadays, many laundry washing machines are also using, besides the conventional electromechanical programmer, also an electronic device for the control of the rotation speed of the machine main motor, so as to change its speed within the required wide limits (washing, distribution and spinning speed, etc.); said electronic control device often consists of a digital microcontroller.

While the electronic control device is versatile and easily programmable, but subject to loose its memory in case of power cut-out, the conventional electromechanical programmer has little flexibility and cannot be easily modified, but it offers the great advantage of incorporating a mechanical memory preventing any problems in case of a power cut-out.

It is also known that the result (i.e. washing) of household washing-machines is determined by a mechanical action, a chemical action and a thermal action; all three actions can be obtained either jointly or separately during the various programs phases or washing cycle.

Mechanical action is obtained through the motion of the laundry, contained in the drum, within the washing liquid contained in the washing-machine tub; chemical action is obtained through a concentration of given quantities of detergents and additives in a proper volume of washing liquid; thermal action is based on the different temperatures of the washing liquid in the washing machine, considering that a hot liquid can remove soil better than a cold liquid; for the execution of all three actions above the characteristics of the clothes to be washed should obviously also be considered.

To this effect, modern washing machines are developed to provide for various types of washing programs controlled by one programmer, which can be selected by the user according to his specific needs, to the extent and type of soil to be removed and to the characteristics of the clothes to be washed.

Generally, a conventional electromechanical programmer of a household washing-machine has three basic programs:

- a washing program for normal laundry, such as cotton clothes; said program provides for liquid levels of about 7 to 8 litres in the tub, a strong laundry motion, high temperatures and high speed spinning;
- a washing program for synthetics: this program has substantially the same water levels as for the previous program but is characterized by a less strong motion of the laundry, it has no prewashing cycle and operates with low temperatures and mediurn speed spin cycles;
- wool washing cycle: this program has fluid levels in the tub in the order of 20 litres and a delicate washing motion, uses low temperature and slow spin cycles.

Special programs are derived from these three basic programs, and are currently possible starting from any basic program; said special programs are merely partial programs, comprising only a part of the basic program cycles (program with no prewashing, only rinse program, only spin program, etc.), so that the washing-machine can usually offer 12 or more washing programs on the market place.

However, there is a need for adding other dedicated programs to the ones listed above, such as an extra delicate program or a curtains washing program that, even if made of synthetic fabrics, requires more water, more or less like wool, special motions and no spinning cycles.

Adding such delicate programs to the electromechanical programmer entails costly changes; moreover, since due to commercial reasons not all machines should have the same programs, two are the options, i.e. either use two different programmers or incorporate a most complex programmer type on all machines, which would cause higher costs specially for less expensive machines.

Therefore it is the object of this invention to provide a laundry washing-machine with complete additional programs besides the three basic programs without costly changes and, specifically, without changing the electromechanical programmer.

This and other objects more apparent in the following description are obtained according to this invention through a multiprogram washing-machine incorporating the characteristics as per the annexed claims.

Further objects and advantages of the present invention will be apparent from the following description and annexed drawings, which are supplied only by way of an explanatory and not limiting example, wherein :

- Fig. 1 shows a simplified block diagram illustrating the operation principle of the machine according to this invention;
- Fig. 2 shows a simplified wiring plan of a machine programming device according to a possible embodiment of the invention;
- Fig. 3 shows a simplified block diagram of the machine operation principle according to a dif-

ferent embodiment of the invention;

- Fig. 4 shows, only by way of example, a comparison between two tables listing the motor motion sequence for the basic synthetics program and for the program according to the invention.

In Fig. 1, T indicates an electromechanical cycle sequencer or timer which provides for three basic washing programs (cotton, synthetics, wool); ME indicates an electronic digital module controlling a washing motor M; ME module comprises an electronic microcontroller MP including a counter or internal clock, CLOCK, associated with permanent memory means, ROM, and read-and-write memory means, indicated with RAM; permanent ROM memory contains the handling functional programs of washing-machine motor M, whereas RAM memory is used to store working parameters; TAC indicates a speedometer dynamo, i.e. a device capable of generating a signal representative of the speed reached by motor M; P1 and P2 indicate two level sensors, such as two pressure switches to control the fluid level in the machine washing tub; EVF indicates a solenoid valve for water inlet in the machine washing tub. Finally, A indicates a key located between the connecting lines from timer T to module ME and pressure switches P1 and P2.

The machine shown in Fig. 1 operates as follows:

In case of normal operation, i.e. without pressing key A, the user introduces the laundry in the machine drum, selects the desired washing program (eg. synthetics program) actuating the timer knob and starts the machine through its main ON/OFF switch. The machine executes the selected cycle in its usual known manner, requiring no further explanations for it. For a better understanding of the invention it should be cleared that during said cycle the programmer or timer T sends binary code signals to module ME; according to said binary codes microcontroller MP identifies within its ROM memory the motor M operative programs for the various cycle steps; in other words, based on said binary codes microcontroller MP knows how motor M should operate, i.e. activation and rest times for drum rotation, its speed during wash, its speed during spinning, etc.

Key A is practically a control element used to substantially modify a basic wash-cycle selected by the timer, by changing the binary codes sent by the timer to module ME; in the example shown in Fig. 1, key A also actuates pressure switches P1 and P2 to change the quantity of fluid the machine tub will take in against a basic program.

When using key A, machine operation is as follows. The user selects the synthetics program, loads the machine with the clothes to be washed according to that specific program or dedicated program (eg. curtains), presses key A and starts the machine. As mentioned above, pressing key A two changes of the synthetics cycle are possible though leaving the program step sequence unchanged :

- on one hand, it changes the washing liquid level by actuating pressure switches P1 and P2; practically, key A is excluding the first level pressure switch, so that solenoid valve EVF is requested to let more water in against the synthetics wash-cycle;
- on the other hand, it changes the binary codes sent by timer T to module ME; thus, according to said codes received by the timer the microcontroller MP searches in ROM memory the corresponding program to control motor M in a different way against the synthetics wash-cycle.

It is evident how the use of key A can change the synthetics cycle to obtain a dedicated cycle with very different characteristics.

Fig. 2 shows a simplified wiring plan of the programming device for a washing machine according to a variant embodiment of the present invention.

In said Fig. 2 a common symbology used for similar washing-machine wiring plans has been applied; therefore, for simplification' sake only the significant circuit section for this invention will be described.

As in the case of Fig. 1, the programming device shown in Fig. 2 consists of:

- a standard electromechanical timer with three basic washing programs (cotton, synthetics, wool);
- an electronic digital module controlling the washing motor and connected to said timer by 4 wires through which it receives a 4-bit binary code.

In Fig. 2, I1 indicates the machine ON/OFF key, whereas 12 indicates the spin exclusion key; 13 indicates the "Economy" program (half load) and A indicates the key to execute the dedicated program according to the invention, i.e. "extra delicate wash-program" or "curtains wash-program".

The timer has 4 commuting contacts sets indicated by symbols A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}. These contacts are controlled by a cam system made to rotate by the entraining motor MT.

The timer also controls operation of both pressure switches P1 (first level) and P2 (second level), of the inlet solenoid valve EVF, of an outlet pump PS and of a heating element RR to heat the washing liquid inside the washing-machine tub.

The electronic module ME has a first terminals set (power contacts) connecting the module to the washing motor windings (terminals 2,3,4) and to power (terminals 6,7) and a second terminals set (signal contacts) connecting the module to the pressure switches (terminals 9-11), to the speedometer TAC (terminals 19-20) and to the timer (code contacts 13,14,15,16; spin enable contact 18).

As to Fig. 1, module ME comprises a microcon-

troller, i.e. a central control unit (MP), coupled with a read-only memory (ROM) containing the motor handling operative programs and with a read-and-write memory (RAM) for working parameters storage. The module also includes some power actuators (TRIAC) for washing motor control.

Through terminals 13,14,15,16 the timer transmits to the module a 4-bit code related to the characteristics with which the motor has to be controlled during each washing phase, in particular the rotation speed (rpm) and the motion/stop ratio (duty cycle), i.e. the type of motion (eg. 80%, if the motor is activated 12 secs against 15 secs).

The main control unit of module ME provides, according to the code received from the timer, for searching the corresponding program in the ROM memory, eg code 1000 corresponds to "motor still stand", code 1001 corresponds to 55 rpm speed, 80% duty cycle, and so on.

According to the invention key A comprises two parts, i.e. 4 contacts which are closed in pairs when the key is pressed down; key A is located between the circuit of both pressure switches P1 and P2 on one side and between the timer circuit and terminals 13,13,15,16 of the electronic module ME, on the other side (more precisely, in the wiring plan, between timer contact B_1 and terminal 15 of the electronic module ME).

When key A is pressed down, it provides with its first section to maintain the information, for the inlet solenoid valve EVF (through contacts 21-22 of P2), to allow water loading, also after the first pressure switch P1 has changed its position (from contact 12 to contact 14), so that water will continue entering the tub - even if the washing motor starts rotating - till the second pressure switch P2 does not switch in. On the other side, the second section of key A adds a bit to the code transmitted by the timer to the module (which will go eg. from 1001 to 1101), with the result of enabling a different program, i.e. to decrease washing speed (eg. from 55 rpm to 35 rpm) and the motion/stop ratio (eg. from 80% to 20%). Thus, in respect to the normal basic program (in the specific case the one for synthetics) we can globally obtain a decreased mechanical washing and creasing action through the lower speed, the shorter motor activation and the higher volume of inlet water. By so doing the fabrics will not get creased and their subsequent ironing can be avoided. Practically, without changing in any way the electromechanical timer a fourth basic program is inputted by a simple pressure of a key (A), which in the specific case is most delicate and suitable eg. for the washing of curtains,

Fig. 4 shows only by way of example a comparison between two tables listing the motor motion steps sequence of the basic synthetic washing program and of the program suitable for extra-delicate or curtains washing according to the invention. In said tables the first column indicates the phase start foreseen by the selected program; the second column indicates the fluid level changes entering the washing tub (variable from first to second level), the third column indicates the timer step (representative of the cycle advancement) during which pre-set functions as specified in the fourth column are executed; finally, the fifth column represents the code sent by the timer to the electronic module ME to control the washing-machine motor and achieve the function shown in the fourth column. The meanings of the abbreviations reported in the tables in Fig. 4 are :

Car. = Water inlet in the washing tub
Lav.A = Washing at 55 rpm, motion 53% (eg. 8" motion / 7" stop)
Lav.B = Washing at 35 rpm, motion 20% (eg. 3" motion / 12" stop)
Lav.C = Washing at 55 rpm, motion 80% (eg. 12" motion / 3" stop)
Risc. = Wash fluid heating
Scar. = Water outlet from washing tub
Stop H_2O = Motor stop with water in the washing tub
Distr. = Clothes distribution inside the drum
Centr. = Spinning
STOP = End of program

Comparing both tables in Fig. 4 it appears how for the same timer steps the functions executed by the machine in both instances (key A either pressed or not) are substantially different. In particular, the extra-delicate (or curtains) program achieved in the example consists of a modification of the synthetics program, eg. with the following changes :

- 20 litres washing water inlet (constant II level) instead of 8 litres (I level)
- Drum rotation speed during the washing phases is 35 instead of 55 rpm; the binary code received from the electronic module is 5 instead of 1;
- Timing, or drum motion during washing equals 3" motion / 12" stop instead of 8" motion / 7" stop (code 5 instead of code 1).
- Suppression of all spinning phases (code 12 instead of 8, and 6 instead of 2).

From the above, we immediately realize how by pressing key A it is possible to fully change the functions normally foreseen by the basic synthetics wash-cycle, however without any changes to the timer cams. Taking into account that the majority of laundry washing-machines available in trade are equipped with a washing liquid temperature selector, it appears evident how the user has the opportunity of switching in also from this viewpoint. Obviously, the above description refers to a merely explicative and non limiting example both in respect to the circuit section and to the extra-delicate washing method. Many changes may in fact be introduced in the wiring plan shown by way of example : eg. the second section of key A may be inserted on terminal 16 of module ME instead of

terminal 15, acting on the most significant code bit. Moreover, the characteristics of the added dedicated program may be different from the above description to obtain specific programs for other laundry types or washing types.

The characteristics and advantages of the laundry washing-machine according to the present invention are clear from the above description. Specifically, it should be brought to evidence that according to the invention by adding a key to a laundry washing-machine equipped with an electromechanical timer allows development of a new basic program, in particular an extra-delicate program or a dedicated program for curtains washing, with irrelevant added manufacturing costs.

It should also be underlined, as the branch expert is surely aware, that the addition of a fourth basic program is a completely different thing with no relation at all with the so-called reduced programs as mentioned at the beginning of the present description, i.e. those partial programs achieved starting from any basic program.

In fig. 3 a simplified block diagram shows the machine operating principle according to the present invention in a particularly favourable embodiment.

In said figure the same references of Fig. 1 are used to indicate technical equivalent elements. In said Fig. 3 IC indicates a controlled electronic switch, such as a triac and MT indicates the timer control motor.

In the instance of Fig. 3, ROM memory also stores some tables used by microcontroller MP to determine, when key A is pressed, motor MT enable and disable times for timer T during the phases of the selected washing cycle.

Said tables in ROM memory and internal CLOCK allow microcontroller MP to monitor IC switch to deliver determined enable and disable times of timer motor MT, which according to the suggested modification can be pulse powered.

As to further details on how to pulse power the timer entraining motor, reference is made to the Italian patent application having for title "IMPROVEMENTS TO A WASHING AND/OR DRYING MACHINE", filed the same day by the same Applicant.

Operation of the laundry washing machine according to this invention and following the simplified diagram in Fig. 3 is as follows.

The machine user selects the start cycle, eg. the synthetics program, actuating the electromechanical sequencer knob and the specific extra-delicate program by pressing key A. Then the machine can be started through the main switch.

The machine executes the extra-delicate washing program as described above with reference to Figs. 1 and 2, however in this case also the times dictated by the cycle sequencer and established according to the known state of the art can be amended.

From the modified binary codes by pressing key A and sent from timer T to module ME and through the data of the additional tables stored in ROM memory, microcontroller MP is in a position to establish enable and disable times of timer motor MP for one or more different phases for the selected washing cycle.

For instance, if key A is pressed, upon detection of a modified code being received (eg. code 5 in the above table) and using the data of the stored table, microcontroller MP will feed timer motor MT through switch IC for 12 secs and stop feeding for 48 secs, for a given number of times.

A concrete example can be made with reference to a sequencer cam, eg. the one enabling a rinse phase execution, assuming the profile of said cam to be capable of keeping closed the electric contact enabling motor M rotation for 3 minutes under continuous rotating condition of timer motor MT. In the above instance where key A is pressed, said 3 minutes cam reading can be "extended" according to the data contained in ROM memory. According to the invention we obtain this practically by pulse powering motor MT of the electromechanical sequencer, so that also the cams of interest advance by pulse as soon as the relevant contacts are enabled.

In the specific case, microcontroller MP can have timer motor MT powered through switch IC for 12 secs, stop feeding for 48 secs. then feed it for another 12 secs and then stop it again for 48 secs, and so on till the cam profile of interest is not fully read by its sensor.

Such a system can obviously be used also to handle other phases of a laundry washing-machine, eg. to extend soaking, bleaching and spinning times, etc., i.e. microcontroller MP can modify or not duration time of each phase as a function of the modified code received.

Therefore it is obvious that according to the method described above it is possible to also change the time of the various phases of a washing cycle to obtain a dedicated program that differs from the three basic programs originally foreseen by the electromechanical timer.

It will also be clear to the skilled man how in the case of washing machines where washing fluid heating is time controlled (and not through a special thermostat), the system described above also allows to modify the machine working temperature. Therefore, in similar instances, pressing key A allows to modify the fluid level, the fluid temperature and the laundry motion, i.e. to modify the chemical action, the thermal action and the washing mechanical action in respect to one of the three conventional basic programs.

The invention described above can be easily applied also in the field of dishwashers, whenever there is a need to add some delicate washing programs and/or the need of allowing "extension" of substantial fixed times dictated by an electromechanical timer by

modifying a basic program (eg. to properly handle washing pump power in case of particularly delicate crockery or extend specific washing and/or rinse phases, in case of heavily soiled crockery).

Finally, it is clear that more than one key of the type indicated with A can be foreseen on the washing machine (eg. more keys for cycle change connected reciprocally in series) to select a plurality of special programs.

Claims

1. Multiprogram washing machine, comprising an electromechanical programmer (T, MT, A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}) for selecting a plurality of washing programs and an electronic microcontroller (ME,MP) for controlling, during said programs, the operation of a motor (M) being provided in said machine wherein the programmer delivers control codes to said microcontroller; characterized in that at least a control element (A) is provided for modifying the codes sent from the electromechanical programmer (T, MT, A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}) to the electronic microcontroller (ME,MP), in order to extend the number of washing programs available in the machine.

2. Washing-machine according to Claim 1, characterized in that said codes include the codes used by the electronic microcontroller (ME,MP) for handling the operation of a motor (M) provided in said machine.

3. Washing-machine according to Claim 1, characterized in that said control element (A) also modifies the quantity of washing liquid to be supplied in the machine washing tub, in particular by acting on a level sensor (P1,P2).

4. Washing-machine according to Claim 1, characterized in that said control element (A) also modifies the entraining times of a motor (MT) being part of said electromechanical programmer, with the purpose of changing the times of one or more handling phases provided by the selected washing program.

5. Washing-machine according to Claim 1, characterized in that said control element comprises a key (A) that, when it is pressed down, modifies the value of at least one bit of said codes sent to the microcontroller (ME,MP), said modified bit being in particular the most significant one.

6. Washing-machine according to Claim 1, characterized in that it is a laundry washing-machine and that said control element (A), when actuated, executes an extra-delicate program, in particular a dedicated curtains wash.

7. Washing-machine according to Claim 6, characterized in that said extra-delicate program is derived from the synthetics washing program and includes inparticular:
   - an increased water inlet,
   - a decreased washing speed (35 rpm),
   - a shorter drum motion time (20%),
   - the suppression of the spinning phases,
   - the motor stop during predetermined phases (outlet).

8. Washing-machine according to Claim 4, characterized in that electric control means (MP,IC) are provided, which upon actuating said control element (A) are suitable to pulse power said motor (MT) of the electromechanical programmer (T, MT, A_1-A_{12}, B_1-B_{12}, C_1-C_{12}, D_1-D_{12}), i.e. alternating power phases of said motor (MT) to non power phases of said motor (MT).

9. Washing-machine according to at least one of the previous Claims, characterized in that said electric control means (MP,IC) comprise said microcontroller (MP), with associated counter means (CLOCK) and permanent memory means (ME) and an electronic switch (IC), in particular a triac controlled by said microcontroller (MP).

10. Washing-machine according to Claim 9, characterized in that said memory means (ME) contain information indicating powered and disabled times of motor (MT) when said control element (A) is actuated.

11. Washing-machine according to Claims 9 and 10, characterized in that said microcontroller (MP) controls as a function of a signal from said control element (A) and based on said information the controlled switch (IC) for pulse power to said motor (MT).

12. Washing-machine according to at least one of the previous Claims, characterized in that it is a laundry washing-machine and that said control element (A) extends one or more handling phases foreseen by the selected washing program, such as a soaking, bleaching or rinse phase.

13. Washing-machine according to at least one of the previous Claims, characterized in that it is a dishwasher machine and that said control element (A) modifies operation of a washing pump, eg. in the case of particularly delicate crockery, and/or extends determined washing and/or rinse phases, eg. in the case of heavily soiled crockery.

14. A method for delicate washing, in particular for curtains in a laundry washing-machine, similar to synthetics washing, but characterized by an increased water level, a decreased washing speed (35 rpm), a shorter drum motion time (20%) and longer stop times.

15. A method for delicate washing, according to Claim 14, characterized in that spin phases are also suppressed.

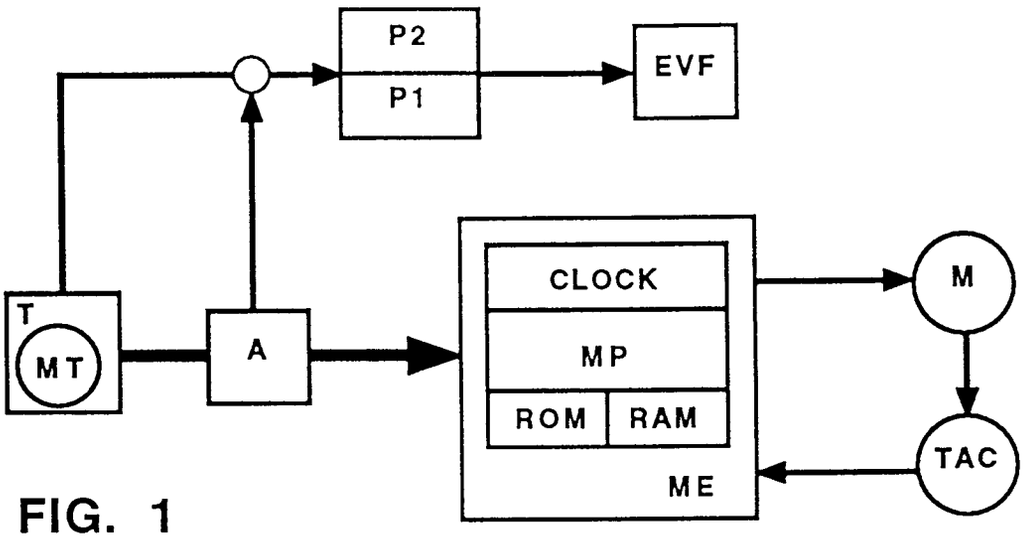
P2
P1
EVF
CLOCK
MP
ROM
RAM
ME
M
TAC
T
MT
A

FIG. 1

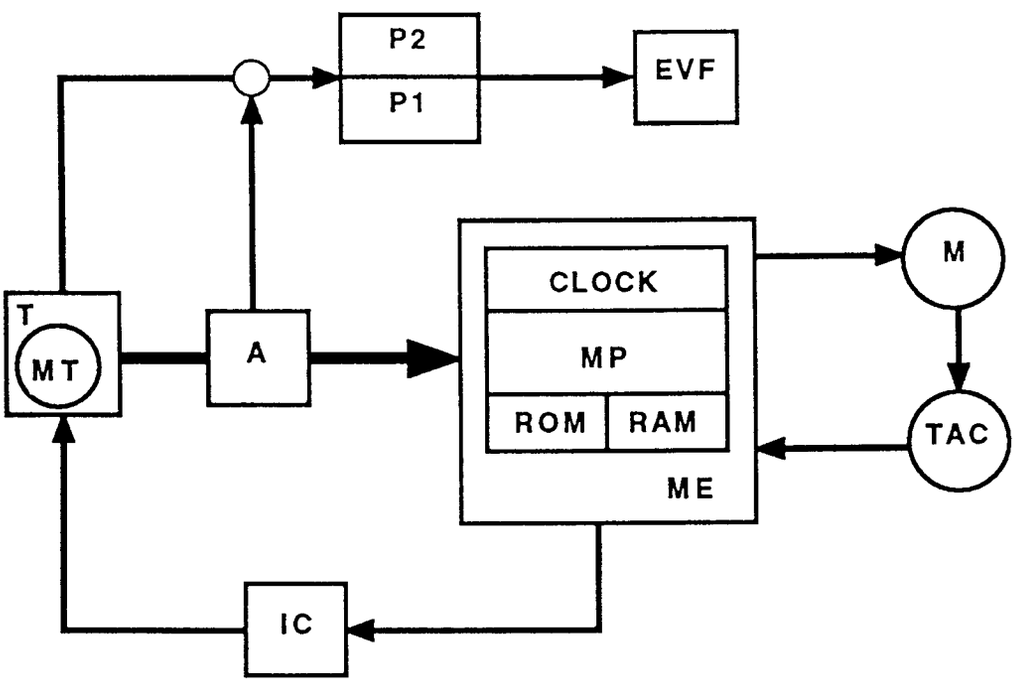
P2
P1
EVF
CLOCK
MP
ROM
RAM
ME
M
TAC
T
MT
A
IC

FIG. 3

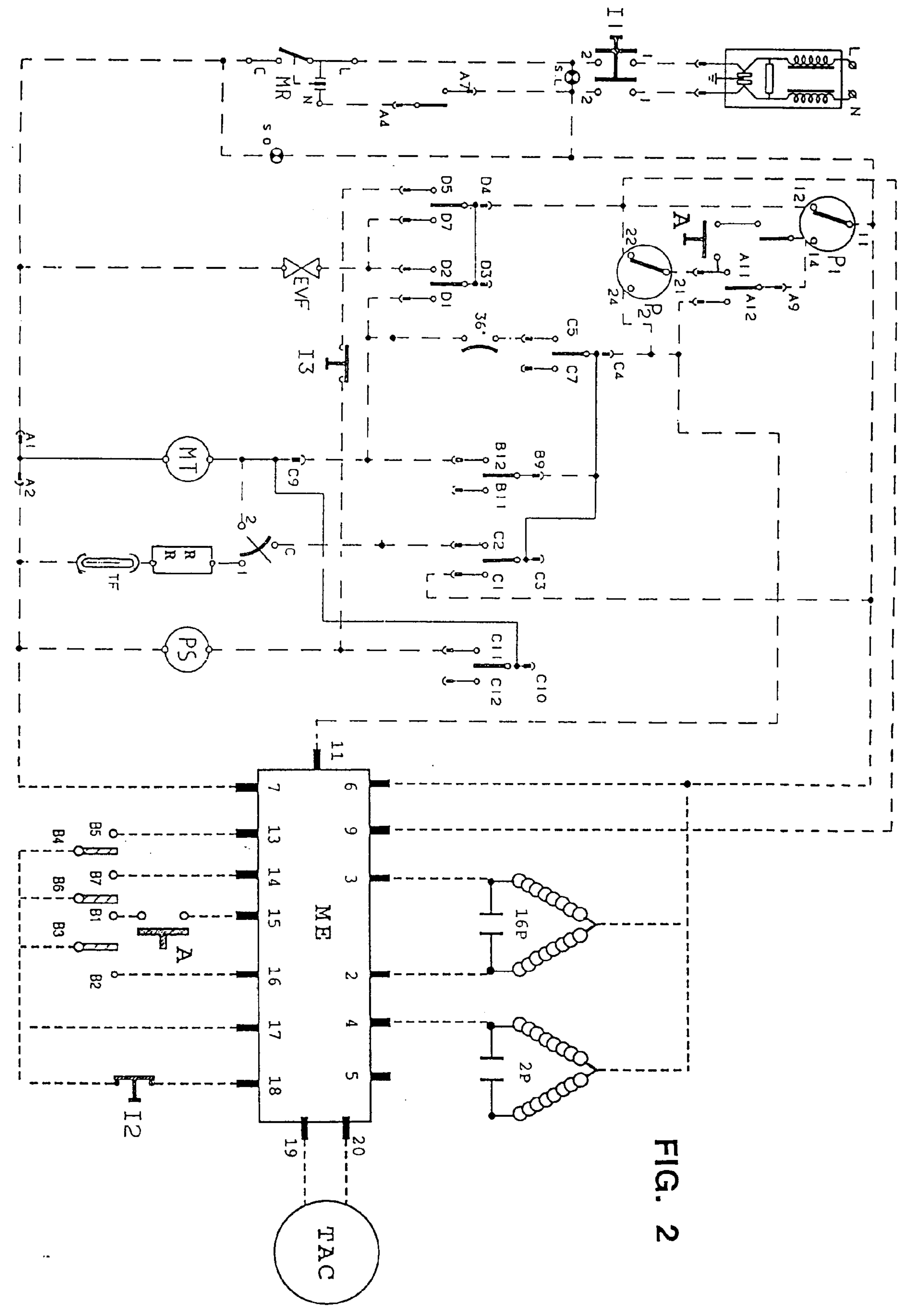

FIG. 2

FIG. 4

SYNTHETICS WASHING PROGRAM

phase	level	step	function	code
washing	I	31	Car. + Lav.A + Risc.	1
		32	Car. + Lav.A	1
		33	Pausa	
	II	34	Lav.A	1
		35	Scar. + Lav.C	9
rinses	I	36	Car. + Lav.A	1
		37	Scar.+Lav.C	9
	I	38	Car.+ Lav.A	1
		39	Scar.+ Distr.	8
		40	Scar.+ Centr.	2
softening	II	41	Car. + Lav.A	1
		42	Stop H_2O	
spinning		43	Scar.+ Distr.	8
		44	Scar.+ Centr.	2
		45	STOP	

EXTRA-DELICATE (OR CURTAINS) WASHING PROGRAM

phase	level	step	function	code
washing	II	31	Car. + Lav.B+ Risc.	5
		32	Car. + Lav.B	5
		33	Pausa	
	II	34	Lav.B	5
		35	Scar.	13
rinses	II	36	Car. + Lav.B	5
		37	Scar.	13
	II	38	Car.+ Lav.B	5
		39	Scar.	12
		40	Scar.	6
softening	II	41	Car. + Lav.B	5
		42	Stop H_2O	
spinning		43	Scar.	12
		40	Scar.	6
		45	STOP	

EP 0 687 761 A1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 9280

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	US-A-5 150 489 (HITACHI LTD.) * column 5, line 27 - line 42 * * column 6, line 40 - column 7, line 8; figures 1,3 *	1,2,5,9 6	D06F39/00
A	US-A-5 211 037 (RAYTHEON COMPANY) * abstract; figure 2 *	1,2,9	
A	FR-A-2 598 443 (CANDY ELETTRODOMESTICI S.P.A.) * claims; figures *	1,2,4,9	
A	DE-A-33 03 992 (MIELE & CIE GMBH) * claims; figure *	1,2,4,9	
A	EP-A-0 504 052 (CIAPEM) * claims; figures *	1,2,4,9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 September 1995	Courrier, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)