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(54) **CLOTHES WASHING OR DRYING MACHINE WITH IMPROVED CONTROLS**

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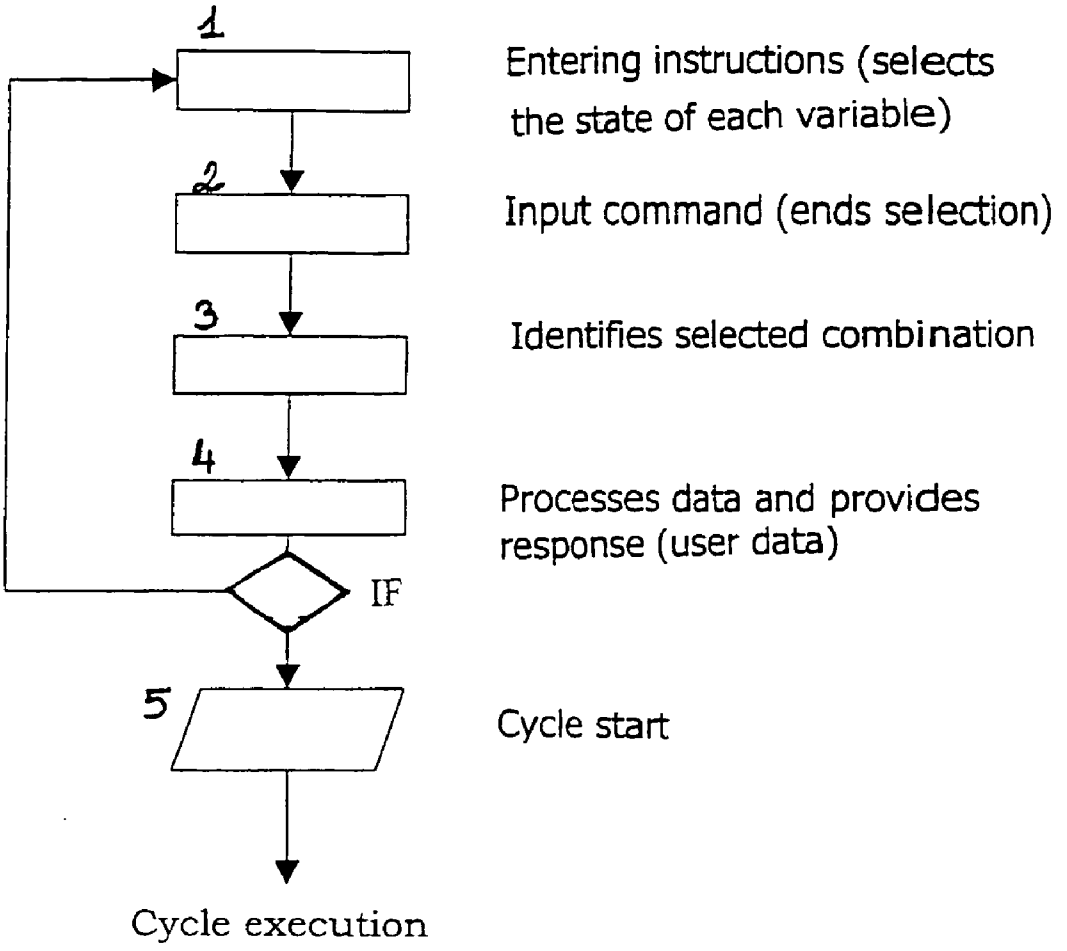
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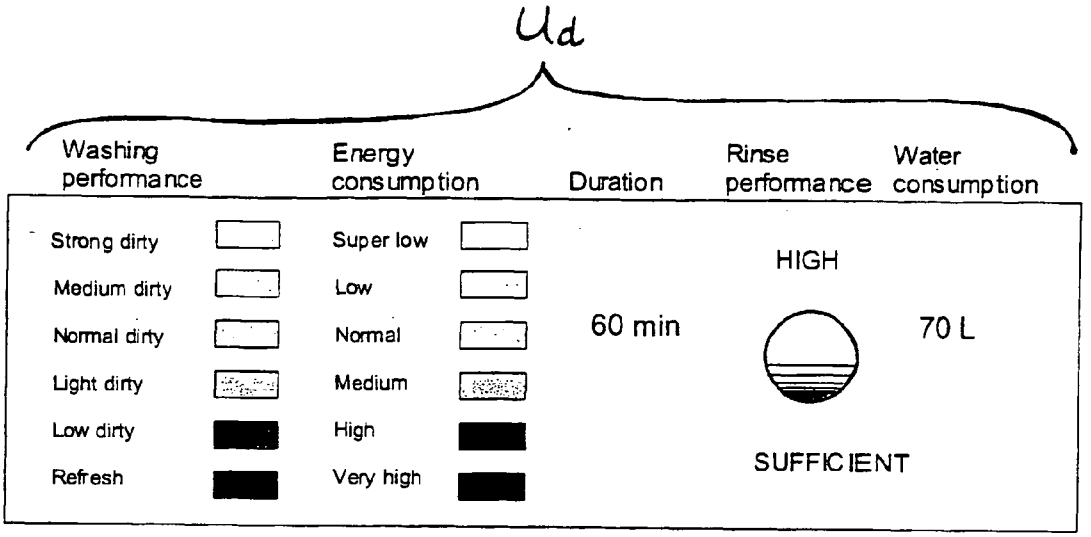
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(57) **ABSTRACT**

Clothes washing or drying machine comprising: means for setting and controlling the operating cycle of the machine, response and user information means, means for processing the commands received from said control and setting means. The control and setting means comprise: selection devices associated to specific control variables that can be selected independently from a plurality of different states, and said response means comprise a plurality of user-information display devices, each one of which is adapted to take a respective multiplicity of states, to each one of which there corresponds a particular combination of the states taken by said control variables. Each combination of said plurality of distinct states of said control variables is associated to a pre-determined set of instructions and programmes residing in said data storage means and adapted to act on respective operating devices of the machine.




Ud
Washing performance
Energy consumption
Duration
Rinse performance
Water consumption
Strong dirty
Medium dirty
Normal dirty
Light dirty
Low dirty
Refresh
Super low
Low
Normal
Medium
High
Very high
60 min
HIGH
70 L
SUFFICIENT

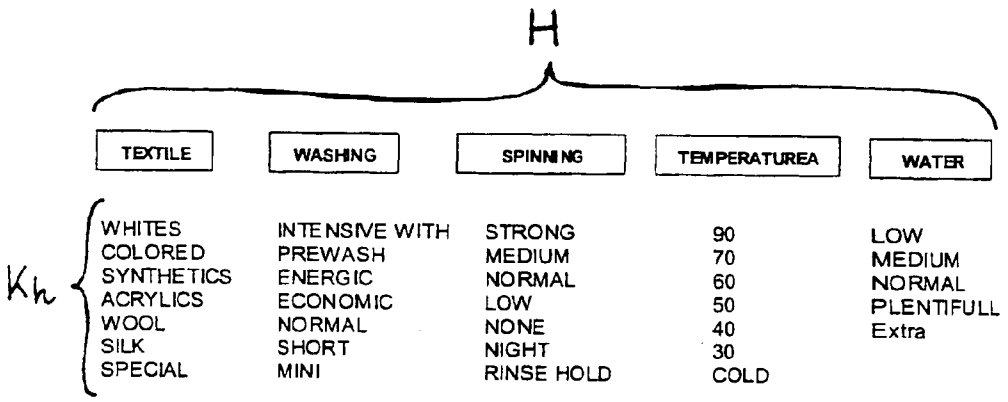
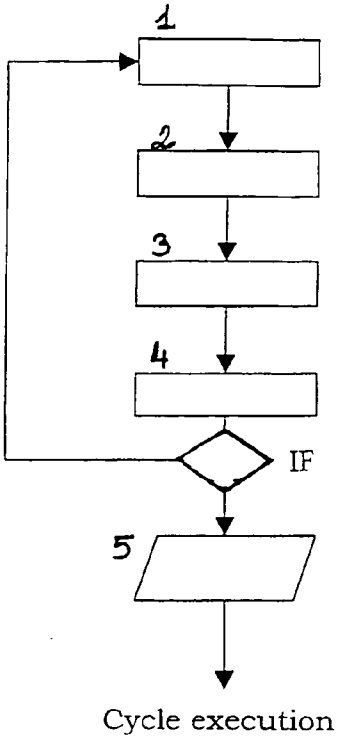

H
TEXTILE
WASHING
SPINNING
TEMPERATUREA
WATER
Kh
WHITES
COLORED
SYNTHETICS
ACRYLICS
WOOL
SILK
SPECIAL
INTENSIVE WITH PREWASH
ENERGIC
ECONOMIC
NORMAL
SHORT
MINI
STRONG
MEDIUM
NORMAL
LOW
NONE
NIGHT
RINSE HOLD
90
70
60
50
40
30
COLD
LOW
MEDIUM
NORMAL
PLENTIFULL
Extra

Fig 1



Entering instructions (selects the state of each variable)

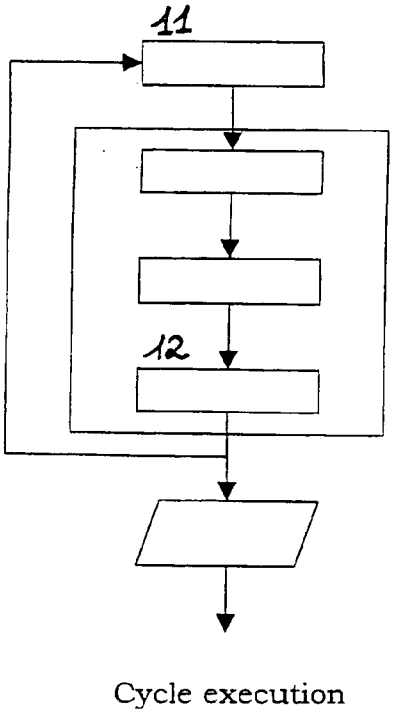
Input command (ends selection)

Identifies selected combination

Processes data and provides response (user data)

Cycle start

FIG 2



Entering instructions (selects the state of each variable)

Selected combinations are identified, data processed and user-data updated automatically

Cycle start

FIG 3

CLOTHES WASHING OR DRYING MACHINE WITH IMPROVED CONTROLS

[0001] The present invention refers to an improved kind of clothes washing or drying machine, preferably of the type intended for use in households, adapted to perform washing or drying cycles that are in a particular manner intended to adhere to and comply with the user's preferences in as close as possible manner.

[0002] While reference is made to a household-type clothes washing machine throughout the following specification, owing to the particular advantages of the present invention being most obvious and apparent in such kind of machine, those skilled in the art will be readily capable of appreciating that the general teaching of the present invention can also be applied to a clothes drying machine in a very simple manner through just a slight adaptation of the control means.

[0003] Clothes washing machines are generally known in the art as being washing appliances that are capable of performing working cycles, i.e. washing programmes, in accordance with operating instructions that are entered each time by the user.

[0004] Such operating instructions are basic, very simple ones, relating generally to those process characteristics or parameters that have a direct influence on or directly affect either the actual performance of the machine in terms of ultimate washing or rinsing results (eg. the degree of soil to be removed from the clothes, the type of fabrics involved in the operation, the spin-extraction intensity, and the like) or, more generally, the way in which the machine goes through the required operating cycle (energy usage, time to complete the cycle, and so on).

[0005] This manner of conceiving clothes washing machine is generally known in the art and adopted universally.

[0006] However, clothes washing machines of this kind are not capable of providing any indication relating to some of the operating or process parameters that are a consequence of the particular control settings, i.e. the particular commands entered by the user, so that the latter is practically in a position in which he/she has to set the controls almost "blindly", in the sense that he/she has to rely solely upon his/her ability in setting the controls in a properly accurate manner based on his/her being more or less familiar with the ways and modes of operation of the machine.

[0007] So for instance, if the user regards the clothes in the washload as being heavily soiled, or if he/she is of the opinion that the same clothes in the washload are synthetics rather than woollens, or vice-versa, he/she will set the controls accordingly and the machine will accurately follow the resulting commands. However, at the present time there is no washing machine available that is capable of informing the user about the effects that are altogether expected to be brought about as a result of such commands being so entered. In other words, no information is provided to the user about the time needed to complete the selected cycle, the expected energy usage, the required amount of water, the final rinsing performance, and the like, or even about a possible inconsistence in the commands entered. For example, an inconsistence may exist if a command is entered for the machine to perform an intensive washing programme at a very low temperature of the washing liquor, since an intensive washing programme is specifically intended for use in connection with heavily soiled washloads that require being generally handled with hot water, i.e. at a very high temperature of the washing liquor.

[0008] As a further example that can be cited in this connection is washing woollens—which is largely known to require a special cycle involving particular process parameters—at a very high temperature of the washing liquor, which is certainly not the ideal one for handling woollens.

[0009] Still another example relates to the economy of the selected cycle. In other words, a given washing result on a given washload may be obtained both with a prolonged washing cycle performed at a low temperature and with a quicker, shorter washing cycle performed at a much higher temperature and, therefore, at a much higher cost. However, the ability to select in a proper manner in such case is by no means unimportant, since the user might be in a position as to decide to select either one or the other of these cycles depending on his/her own particular preference and the particular circumstances existing at the moment; for example, under normal circumstances a user is quite likely to decide to select the most economic one between the two cycle options, whereas the quickest, i.e. shortest cycle would be the preferred option in certain other cases, notwithstanding the higher cost penalty.

[0010] Briefly, there is practically no way for a user to know in advance which result his/her settings for the selection of a given washing cycle will produce, actually. Therefore, he/she is practically given no judgment possibility at all to tell in advance whether the result that is going to be obtained through a particular cycle setting will actually be the best possible one in view of the priorities he/she wishes to comply with at that particular moment. In other words, there is practically no way for a user to appropriately alter or modify cycle settings so as to introduce an optimising effect in those performance results and those operating parameters and conditions that are the preferred ones in that particular moment and under the particular circumstances, while consciously "sacrificing" other possible results.

[0011] In view of improving this limiting situation, the washing machines of the so-called "input system", i.e. provided with dialogue-based electronic control systems, have in the meantime been introduced by the appliance industry.

[0012] In all cases, these are machines that are designed so as to enable the user to set and enter not only the final process parameters of the machine (eg. the spin-extraction speed, the washing temperature, the type of clothes in the washload, and so on), but also some additional information which—as appropriately processed by the control unit of the machine—contributes to a more accurate definition of the washing cycle to be performed.

[0013] Machines of this kind can certainly be considered as a significant improvement, since they actually enable the user to at least partly define the desired priorities. However, it must be stressed that, even in this case, the user fails to be appropriately informed in advance on which effects his/her settings or selections will actually bring about, i.e. which results can ultimately be expected from the particular selection made by him/her, so that he/she is practically unable to

intervene in order to modify the settings accordingly, in the case that these turn out to be inappropriate in view of his/her preferences, priorities or requirements at that particular moment.

[0014] It would therefore be desirable, and it is actually a main object of the present invention, to provide a clothes washing machine that is able not only to be entered and receive information of a functional nature concerning some main parameters and conditions of the washing process, but also to process said information so as to provide the user—prior to starting the washing cycle—an information feedback concerning:

[0015] the specific washing performance

[0016] and also the characteristics and parameters of the washing cycle expected as a result of the whole set of inputs entered by the user.

[0017] Therefore, should the user decide that the information processed by the machine—and provided to him/her prior to he washing cycle being started—fail to fully comply with his/her own requirements, or anyway allow for some improvement to be introduced, he/she is able to modify all or part of the inputs entered until an operating cycle or programme is eventually defined, which more effectively fits his/her own preferences or reaches the best possible compromise among the various performance options.

[0018] According to the present invention, these and further aims are reached in a particular kind of clothes washing machine provided with operating and control means as described below by way of non-limiting example with reference to the accompanying drawings, in which:

[0019] **FIG. 1** is an overall, exemplary overview of the various variables and the states which each one of such variables can take;

[0020] **FIG. 2** is a schematical view of a logical and symbolical flow-diagram of the operating mode of the present invention;

[0021] **FIG. 3** is a schematical view of a logical and symbolical flow-diagram of an improved operating mode of the present invention.

[0022] The following discussion, although referred to a generally applying case, is used to also theoretically underpin the principles which the present invention is based on.

[0023] A clothes washing machine according to the present invention comprises a plurality of variables that can be commanded, i.e. controlled in a variety of manners so as to take different, independently selectable states. The variables that will be considered here are the information pieces entered by the user concerning both the characteristics and properties of the clothes loaded in the machine for washing and some operating modes and parameters of the machine itself.

[0024] These variably mainly, although not solely, include:

[0025] 1) the type of fabrics

[0026] 2) the type of washing process to be performed

[0027] 3) the spin-extraction intensity (speed)

[0028] 4) the washing temperature

[0029] 5) the amount of water to be used

[0030] 6) (further variable)

[0031] - . . .

[0032] n) (any other variable)

[0033] There are therefore "n" possible variables altogether that are considered here as being freely commanded, i.e. controlled into taking respective "values", which—for reasons of greater simplicity and in order to be consistent with the technical parlance used in statistics—shall be termed "states" here.

[0034] In fact, as this shall be seen at a later point in this description, not all variables can actually be commanded, i.e. controlled in an independent manner. This circumstance, however, will be better explained and defined further on.

[0035] Each one of said "n" variables is able to take a respective number of 6, states as commanded by the user. For instance, the variable "1) type of fabrics" can take following states corresponding to the different nature of the fabrics constituting the washload:

[0036] 1A) White fabrics

[0037] 1B) Coloured fabrics

[0038] 1C) Synthetics

[0039] 1D) Acrylics

[0040] 1E) Woollens

[0041] 1F) Silkens

[0042] 1G) Special fabrics

[0043] The variable "2) Type of washing process to be performed" can be selected according to one of following distinct states:

[0044] 2A) Intensive cycle, incl. pre-wash

[0045] 2B) Vigorous cycle

[0046] 2C) Economy or low-usage cycle

[0047] 2D) Regular cycle

[0048] 2E) Short cycle

[0049] 2F) Mini (very short) cycle

[0050] ---) etc.

[0051] m) (any further variable)

[0052] **FIG. 1** gives a general, although by no way limiting overview of the various variables and the related states, which each one of such variables can take.

[0053] These commands needed to select a given state for each variable can of course be materially embodied and entered using means that are largely known as such in the art, such as push-buttons, rotary multi-setting selector switches, linear position controls, and the like. However, the way in which said selected states are actually set or entered is of no relevance to the purposes of the present invention.

[0054] Altogether, if H is the number of the variables, and if each variable can take a respective number of states K_h,

then the number of the various possible combinations will be:

$$C=(k1)\times(k2)\times(k3)\times \ldots (kn)$$

where:

[0055] k1 is the number of possible states of the first variable,

[0056] k2 is the number of possible states of the second variable,

[0057] - . . .

[0058] kh is the number of possible states of the H^{th} variable, and wherein C indicates the number of said possible combinations.

[0059] Each control for each state of each variable is connected to a central control, storage and processing unit (not shown) that is adapted to perform an identification of each combination being set, i.e. selected by the user through the controls commanding said variables.

[0060] Upon having so selected the desired settings for the states of the various variables, said control unit identifies which one among the C possible combinations has been selected.

[0061] This identification and recognition process can be most easily be carried out using largely known data processing techniques and means.

[0062] The above-mentioned control, storage and processing unit is also provided with a memory, in which there are stored C groups or sets of distinct data.

[0063] Each one of these groups or sets of data comprises all machine instruction statements (parameters) that must be used by a common operating programme to carry out a distinct washing cycle.

[0064] Each one of these groups or sets of data further comprises, eg. in a separate storage register, a respective one of said combinations C.

[0065] From a logic point of view, the operations that are carried out are shown schematically in **FIG. 2**, where only the first tw blocks and the last two ones, i.e. IF and START, are actuated, set or controlled by the user by selecting the states of each variable (in other words, the user tells the machine what he/she prefers), whereas the following blocks are automatically executed by the machine.

[0066] In practice, operations take place as follows:

[0067] in the first block **1**, the user sets one or more desired states referring to respective ones among the cited variables, such as type of fabrics, kind of washing process, spin-extraction speed, and the like;

[0068] in the second block **2**, which is indicated as INPUT, upon having completed the above-noted selection, the user enters—with the help of generally known, conventional means—an appropriate command that is read by the machine as an information that the preceding selection step is complete and it must therefore switch over to the subsequent processing step;

[0069] in the following third block **3**, upon said control, storage and processing unit having duly identified—through easily performed and per se known comparison and selection techniques of the <IF> and <AND> type—the particular combination of commands and, as a result, process variables selected by the user, the same unit goes on to associate to a general washing programme those instructions that are contained in the specidic group or set of data corresponding to the so selected and acknowledged combination.

[0070] All it takes at this point is to select—eg. on the basis of common laboratory experimental methods—the machine instruction statements (machine operating parameters) which, when imported and executed by a washing programme of a general type, but pre-arranged so as to be capable of importing said machine instruction statements (machine operating parameters), will enable the same washing programme to be tuned up and integrated to include all data and instructions required to allow it to fully and optimally adhere to the particular process conditions selected by the user in accordance with his/her preferences;

[0071] in the following fourth block **4**, the invention is completed with following functions and devices: each one of the above-mentioned groups or sets of data includes—further to the afore-defined machine instructions—also a second set of data, which shall be referred to as user data hereinafter (and which are referred to as "responses" in the appended claims). These user data are contained in appropriate storage registers associated to respective combinations, and provide respective information concerning the operating modes of the machine.

[0072] These modes of operation of the machine involve information on data and facts that most of all are of interest to the user, since they refer for instance to such indications as time required to complete the washing cycle, type of washing process to be run, energy usage, water usage, and the like.

[0073] The above-mentioned processing and control unit is also adapted to select and retrieve—in a way that is fully similar to the one used to select and retrieve the afore cited machine instructions, and upon the user having duly selected the various states of the variables—said user data, as well as transfer them onto appropriate display means for due user information.

[0074] With an appropriate selection of said user data for each one of the combinations that can be set, it will in this way be possible for the user to be informed in a practically immediate manner on some of the most interesting consequences of any selection that he/she may just have made by setting corresponding controls.

[0075] If, however, the results of the selections being so entered by the user would for any reason whatsoever be found as not being acceptable, the possibility is given for the just entered cycle settings to be cancelled and a new group of settings to be entered for real-time processing by said unit, exactly as this occurred in the case of the preceding one.

[0076] With reference to the IF block, if the result is accepted by the user, the latter can confirm the settings entered by him/her by actuating a proper control **5** provided on the machine; otherwise, even these settings can be cancelled and the above-described procedure can be gone through iteratively.

[0077] The controls used to cancel the settings entered by the user, or to confirm them (INPUT block), may be of a fully conventional kind, so that they shall not be described any further here.

[0078] It is fully within the ability of those skilled in the art to readily appreciate that other logic-type and data-processing modes are possible in view of performing the above-described procedures of recognition of the entered commands and selection of the related groups or sets of instructions; the above-illustrated example has solely been given to the purpose of illustrating a working method that is simple and easily understood by those skilled in the art.

[0079] Briefly, it can be stated that the present invention is essentially based on the capability provided by said control, processing and storage unit of converting the information concerning each single combination of user-set states into a corresponding—since recognized as such—group or set of machine instruction statements (machine operation parameters) to be used in the washing cycle.

[0080] The present invention allows for a number of further improvements to be embodied: in fact, the user can set one or more states of respective variables, but may intentionally decide to avoid considering other variables, simply because he/she is not interested in defining specific preferences or priorities in connection therewith.

[0081] In this case, the above-mentioned control, processing and storage unit is provided with standard default instructions, which are acquired as machine instruction statements (machine operation parameters) instead of the definition of the state(s) of the variable(s) that the user failed to define, and the procedure then goes on in the same way as illustrated above.

[0082] The command informing the machine to go on with the above-specified procedure even in the absence of a proper definition of the state for each variable, may be entered by using the same INPUT control as indicated above.

[0083] A further, advantageous improvement is allowed for by the present invention to cater for a particular circumstance; it must be in fact considered that—not only in theory, but also in practice—it may well happen that not all states that can be set by the user for the various variables turn necessarily out as being compatible with each other; as a matter of fact, it may occur that some settings turn out as clashing with each other, i.e. contradicting each other. This would for instance be the case when the information entered concerning the type of fabrics is WOOLLENS, while the information entered concerning the kind of spin-extraction to be performed is STRONG: woollens are largely known to be unadvisable for spin-extraction, under the penalty of heavy felting and shrinking effects. Another case in point would be the one arising when a washing cycle of the "INTENSIVE WITH PRE-WASH"-type is selected along with a washing temperature set on COLD.

[0084] Now, this further improvement enables such incorrect or unsafe operating modes to be unfailingly and automatically prevented from being executed even if the user happens to accidentally or unintentionally set the related states.

[0085] Obviously it is fully possible for such mutually clashing settings to be selected in connection with any desired programme, since these are in fact included in the totality of possible combinations.

[0086] The above-mentioned improvement consists in ensuring that, whenever any of such "impossible" combinations is selected, the machine instruction statements (parameters) corresponding to these particular combination are programmed to process and work out the condition of impossibility for any viable washing cycle to be performed, and the corresponding information is conveyed outside for the benefit of the user by means of appropriate, possibly visual display or warning means.

[0087] It will be also appreciated that, in these cases, the machine may also be programmed so as to automatically stop, and switch over to a condition in which it is unable to perform any cycle at all, until a new combination of states concerning respective variables, and pre-defined as "acceptable", is eventually set and entered.

[0088] A still further improvement can be easily embodied in the following way: with reference to **FIG. 3**, this can be noticed to describe a quicker operating mode for selecting the various combinations and operation options and being immediately capable of taking notice of the "expected" result of such selection as processed out by the machine.

[0089] In the first block **11**, there is again performed a selection of the states of the respective variables, as this has already been set forth with reference to **FIG. 1**. The next, i.e. second block does however no longer represent an INPUT-type command to activate the machine, which is on the contrary provided with automatic processing means adapted to be readily activated by the simple command relating to the selection of the states of respective variables, even when just a single state is selected.

[0090] In practice, whenever a selection of said states is actuated, the machine automatically processes the related command and, on the basis of previously entered selections or, if no selection has already been entered, on the basis of the afore-mentioned default selections, works out a result that is automatically displayed as user data **12**, in a similar manner as in the afore considered case, however with the difference that, in this case, owing to the fact that the selection data are processed on a real-time basis, the man-machine dialogue, i.e. the dialogue between the user and the machine is a continuous and immediate one.

[0091] In good substance, the user proposes his/her own preferred selections and, each time that a selection is entered, the machine immediately processes the related command and responses in an equally immediate manner by proposing the respective user data.

[0092] When the user eventually identifies an acceptable or preferred solution, he/she stops entering new selections and sends in a START command—in a similar manner as already seen in connection with the previously considered case—so as to instruct the machine to start the washing cycle according to the last selection entered.

[0093] A decisive advantage deriving from such solution lies in the fact that the user is given the possibility of checking and accepting the results of his/her selections as soon as they are entered individually, i.e. before a cycle start command is eventually entered.

[0094] Fully apparent from the above considerations is therefore the significant advantage offered by the present invention: it in fact enables the user to really dialogue with the machine by asking it about the various operating possibilities and options available in response to various situations or requirements proposed by the user and, conclusively, selecting the option that he/she finds to lie closer to his/her preferences. This most effectively does away with the hitherto unavoidable drawback of having to activate washing programmes "blindly", i.e. based solely on simple instructions entered by the user, with just a rough estimate of the final result of such selections.

[0095] To merely illustrative purposes, a demonstrative example of an operating mode is given below:

[0096] 1st Setting

[0097] Fabrics=Coloured

[0098] Washing process=Vigorous

[0099] Spin-extraction=Normal spinning

The machine in turn proposes a cycle involving:

[0100] Temperature=60° C.

[0101] Water usage=42 litres

with following performance data:

[0102] Washing action: Normally soiled (Normal dirty)

[0103] Energy usage=Low

[0104] Duration=120 min.

[0105] Rinsing performance=Sufficient

The user is not satisfied with the proposed option, since he/she has just a small amount of clothes to wash and not much time available, so that he/she wishes to reduce the duration of the washing programme.

Accordingly, he/she then changes the kind of washing action desired and selects:

[0106] 2nd Setting

[0107] Washing process=Short

In this case, the machine will propose a 60-min. washing cycle with a slightly higher water usage (in view of making rinses shorter), while the performance data change as follows:

[0108] Washing action: Slightly soiled (the washing perfomance is scaled down to a lower class: less washing action)

[0109] Energy usage=Normal (energy usage is scaled up to a higher class: more energy used)

[0110] Duration=Short

[0111] Rinsing performance=Sufficient (although the amount of water is increased, the rinsing performance will be not better than sufficient, since time is too short)

However, the user still feels that this does not really meet his/her expectations, since he/she desires a more effective rinsing performance. He/she then selects:

[0112] 3rd Setting

[0113] Water usage=Abundant

In this case, the machine will answer by proposing a 70-min. washing cycle with a water usage of 70 litres and following performance data:

[0114] Washing action: Slightly soiled

[0115] Energy usage=Normal

[0116] Duration=Short

[0117] Rinsing performance=Good (rinsing performance is scaled up to the immediately higher class)

[0118] At this point, it will be also readily appreciated that the present invention is fully applicable to other laundry machines, such as clothes dryers, provided that the variables and the related states being set or selected refer to programming modes and schemes that are typical of these machines (eg. type and amount of clothes in the drying load, final moisture content or degree of dryness desired, and so on). In the same way, the corresponding user data will be such as to generate indications that are effective in enabling the user to come to an appropriate final selection of the instructions to be entered, eg. the time required to complete the cycle, the energy usage, and the like).

1. Clothes washing or drying machine, preferably of the type intended for use in households, comprising:

means for setting and controlling the operating cycle of the machine,

response means adapted to generate user data and information generating means,

means for processing the signals and commands received from said control and setting means, and data storage means,

characterized is that said control and setting means comprise:

selection devices, each one of which:

is associated to a specific control variable (H),

which can be selected independently from a plurality of different states (K_h) that each such variable is capable of taking independently,

and said response means comprise a plurality of user information display devices,

each one of which is adapted to take a respective multiplicity of states, and

to each one of which there corresponds, even in a not-biunique relationship, a particular combination of the states taken by said control variables (H).

2. Clothes washing or drying machine according to claim 1, characterized in that each combination of said plurality of distinct states (Kh) of said control variables is associated to a pre-determined set of instructions and programmes residing in said data storage means and adapted to act on respective operating devices of the machine.

3. Clothes washing or drying machine according to claim 2, characterized in that if any of said selection devices associated to respective control variables (H) fail to be set by the user to select any state whatsoever, then the respective control variables are set automatically on a pre-determined default state.

4. Clothes washing or drying machine according to claim 2, characterized in that the processing function of the states of said control variables (H), as set through said selection devices, is started by the actuation of an appropriate control (INPUT) actuated by the user.

5. Clothes washing or drying machine according to claim 2, characterized in that the processing function of the states of said control variables (H), as set through said selection devices, is started automatically each time that any one of said states of respective control variables is selected.

6. Clothes washing or drying machine according to claim 1, characterized in that there is provided a sub-set of pre-determined "impossible" combinations of the states of a multiplicity of said control variables (H), and that all such "impossible" combinations in said sub-set are associated to a single instruction to which there corresponds a command to stop the machine or interdict the machine from starting any washing cycle whatsoever.

7. Clothes washing or drying machine according to claim 6, characterized in that when any one of said "impossible" combinations is selected, the machine automatically transmits an appropriate information and/or alarm signal outside.

8. Clothes washing or drying machine according to claim 1, characterized in that said control variables (H) comprise two or more of following variables:

type of fabrics in the washload

kind of washing action

spin-extraction speed

temperature of the washing liquor

amount of water to be used.

9. Clothes washing or drying machine according to claim 1, characterized in that said user data (U_d) and said information generating means provide information relating two or more of following programmed performance conditions:

type of washing process

energy usage

duration of washing cycle

rinsing performance

water usage.

* * * * *