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## (54) A PROGRAMMING DEVICE HAVING MANUAL CONTROL MEANS, AND A MACHINE INCORPORATING SUCH A PROGRAMMING DEVICE


(71) We, ESSWEIN S.A., a French Body Corporate, of 67, Quai Paul Doumer, 92400 Courbevoie, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—


The present invention relates to a manually adjustable programming device for controlling a machine to carry out predetermined operations, and to a machine which incorporates such a programming device.

Certain machines, such as machines for washing and/or spin-drying laundry, often include a programming device which causes the machines to carry out their various operations automatically following one or more pre-established operating programmes, the programming device also being provided with manually-operated buttons or knobs which enable these operations to be ordered one by one.

In an automatic machine for washing and/or spin-drying laundry for example, a high-speed spin-drying sequence, that is to say one in which the speed is usually between approximately 800 and 1000 revolutions per minute, is often provided at the end of the washing cycle. Spin-drying at such speeds makes it necessary for the laundry to be prepared beforehand, which chiefly involves lightening the laundry of its water to a high degree and distributing it as uniformly as possible in the machine so as largely to avoid any imbalance being created, which would be detrimental to the machine when operating at high speed. For this reason, the programming device of the machine is often set in such a way as to cause operations, such as the untangling of the laundry in the drum and the corresponding rise in the speed of rotation of the drum, which ensure that spin-drying takes place properly, to be carried out by following a pre-established order or programme.

If ordered directly and at the wrong time by setting manual control knobs or buttons on the programming device, without the laundry having been prepared beforehand as outlined above, high-speed spin-drying might result in considerable mechanical damage to the machine.

Also, there are certain operations other than the high-speed spin-drying (which has been taken as an example) which, if direct manual orders are given for them, could be incompatible with what is being done to the laundry at that time or could be harmful both to the laundry and the machine.

In machines other than machines for washing and/or spin-drying laundry which are equipped with a manually adjustable programming device, disdvantageous results might ensue similarly from one or more predetermined operations being ordered manually at the wrong time.

The present invention has as an object substantially to reduce or overcome the above disadvantages.

Accordingly the present invention consists in a programming device comprising an automatic cam-equipped control sub-assembly operative to actuate switches for causing a machine to perform various operations following a pre-established order or programme, a manually operable device for giving orders to initiate these operations respectively and selectively, and a sub-assembly for cancelling out manual orders for one or more predetermined operations by the machine, which sub-assembly comprises at least one cam and a switch connectable into an electrical circuit which controls said predetermined operation or operations, the sub-assembly being movable separately by the said automatic control sub-assembly and by said manually operable device and, when there is a direct manual order for a said predetermined operation, being operative to cancel the effects of this manual order by opening said switch.

In order that the invention may be better

understood, a number of embodiments thereof are described below, by way of example, and with reference to the accompanying drawings, in which:

Fig. 1 is a schematic perspective view of a machine incorporating a programming device according to the invention for washing and spin-drying laundry.

Fig. 2 is a schematic, exploded view of part of a first embodiment of programming device according to the invention for the machine of Fig. 1.

Fig. 3 is a schematic view of the successive positions A, B, C, D, E of part of the programming device of Fig. 1 in an operation triggered by a manual order.

Fig. 4 is a schematic view of the successive positions F, G, H, I, J, of the same part of the programming device as is illustrated in Fig. 3 in the course of the same operation when performed automatically under the automatic control of the programming device of Fig. 2,

Fig. 5 is a vertical section through part of a second embodiment of programming device according to the invention, and

Fig. 6 is an exploded view of part of the programming device of Fig. 5.

Referring to the drawings, a washing and spin-drying machine 1, as illustrated schematically in Fig. 1, consists of a cabinet 2, a tank 3, a laundry drum 4, a drive motor 5 and a programming device 6 which has a manually adjustable knob 7 for giving instructions for the machine to carry out operations and also a knob 8 for selecting programmes for dealing with the laundry. In the washing and spin-drying machine 1, the programming device 6 to be described in greater detail hereinafter automatically controls operations of the machine following pre-established programmes, thus ensuring that the machine is highly reliable in operation, and it automatically cancels out the effects of issuing manual instructions, by setting knob 7, for certain operations to be performed on the laundry at the wrong time without observing the safety precautions required by the machine.

An improved programming device according to the invention is intended to control the operation of a number of automatic machines such as certain machine tools, machines for washing and/or spin drying laundry and so on, in accordance with pre-established working programmes. In a machine, this improved programming device is able automatically to cancel out the effects of one or more manual orders being given for certain operations to be performed by the machine.

An embodiment of a programming device according to the invention comprises an automatic control sub-assembly which observes pre-established operating programmes, a device for giving manual orders, a sub-assembly for cancelling out the effects of one or more predetermined manual orders, and a system providing a mechanical connection between the foregoing parts.

A first embodiment of the invention, which is illustrated schematically and partially in Fig. 2, is an improved programmer 9 which controls the current supply to an electric motor M by connecting the windings of the latter to a current source L1, L2. In a machine, the programming device 9 would be able to control the operation of any electrical circuit or device other than the motor M. The electric motor M is able to drive a machine for washing and/or spin-drying laundry or any other machine. In the case where it drives a machine 13 for washing and spin-drying laundry, the motor M is mentioned in relation to Fig. 1 by the name "motor 5" and the programming device 9 is given another reference, namely "programming device 6".

Bearing in mind that the motor M is able to turn at a number of speeds, in order to clarify the explanation the description deals only with the motor M being supplied to give a high speed of rotation (Figs. 2, 3 and 4). This high speed of rotation by the motor M corresponds for example to the high spin-drying speed of the motor 5 in the washing and spin-drying machine 1.

During the operation of a machine driven by motor M, as a safety measure or so that the service given by the machine is of a high standard, acceleration of the motor M to high-speed is often governed by certain conditions. For example, in the case of the washing and spin-drying machine 1 in Fig. 1, the motor 5 must not be speeded-up to its high spin-drying speed unless the laundry in the drum 4 has first been prepared. Failure to observe this initial condition has the disadvantageous results already described in preceding paragraphs.

It is therefore necessary to avoid, prevent or cancel out direct manual orders for high-speed spin-drying.

The programming device to be described is able to cancel out such a manual order. Known programming devices on the other hand are able neither to prevent such orders nor to cancel them out.

The programming device 9 (Fig. 2) has, as its automatic control sub-assembly, a cam-carrier 10 which is driven by at least one known miniature motor (not shown), at least one cam 11 attached to the cam-carrier, a cam follower lever 12 which is pivoted at 13 and is at all times urged towards the cam 11 by a spring 14, and a switch 15 which is operated by the lever 12.

At its periphery the cam 11 has a radial projection or profiled section 16. When the follower lever 12 lifts onto the projection

16 it closes switch 15 and connects the windings of motor M to the current source L1, L2, provided switch 21 is closed.

The programming device 9 also includes, as a sub-assembly for cancelling out the effect of manual orders, a cam 17, a cam follower lever 18 which is pivoted at 19 and which is at all times urged towards cam 17 by a spring 20, and a switch 21 operated by lever 18. At its periphery the cam 17 has a radial projection or profiled section 22 which is of the same angular extent as the projection 16 of the cam 11 in the automatic control sub-assembly and in its central portion the cam 17 has an axial hole to receive a shaft and one or more part-circular openings 28. When the follower lever 18 lifts onto the projection 22, it opens switch 21 to break the connection between motor M and the current source L1, L2.

The manual device for adjusting the programming device 9 consists of a knob 25, whilst the mechanical connecting system which co-ordinates the movements of the automatic control sub-assembly, the cancelling sub-assembly and the knob 25 consists of a shaft 23, two movable fingers formed by axial spigots 29 on the cam-carrier 10, abutments associated with these fingers which are formed by opposing sides 32 and 33 of the part-circular openings 28 formed in cam 17, and a torsion spring 30. The cam 17 of the cancelling sub-assembly is attached to the central portion of shaft 23.

On its one end 24, the shaft 23 carries the knob 25 the position of which relative to the shaft is fixed, and on its other end 26 the shaft supports the cam carrier 10, which is free to rotate, end 26 being inserted in an axial bore 27 in the cam-carrier. When the cam-carrier 10 is slid onto shaft 23 and brought up against cam 17, the fingers or spigots 29 project through the part-circular openings 28 in cam 17 and are movable or displaceable in these openings. The range of movement available to fingers 29 between abutments 32 and 33, or in other words the size of the relative movement between cams 11 and 17, is defined by the dimensions of the openings 28 and of the movable fingers 29. On shaft 23, between the cam-carrier 10 and cam 17, is mounted the torsion spring 30, one of whose ends is engaged in a hole 31 in the cam-carrier 10 and whose other end is inserted in an opening 28. The spring serves to maintain in alignment the projections 16 and 22 on cams 11 and 17, the edges 32 of the two openings 28 being then pressed against the movable fingers 29. If desired, the mechanical connecting system may include only one finger 29 and only one part-circular opening 28.

In the embodiment illustrated by Figs. 2, 3 and 4, the projections 16 and 22 on cams 11 and 17 are of the same angular extent and the dimensions of the openings 28 and the movable fingers 29 allow the two cams 11 and 17 to move relative to one another for an angular distance which is the same as the angular extent of the projections 16 and 22. This distance is also reflected by the range of movement which the fingers 29 have in the openings 28.

When giving manual instructions to the programming device 9, if the knob 25 is turned in the direction of arrow F, the two cams 11 and 17 are caused to turn at the same time with the edges 32 of the openings 28 in cam 17 urging the fingers 29 along with them as they rotate. The cams 11 and 17 move from their phase A positions to their phase E positions (Fig. 3). In phases A and B, since levers 12 and 18 have not yet reached the projections 16 and 22 of cams 11 and 17, switch 15 is open while switch 21 is closed. In phases C and D, since levers 12 and 18 have risen onto the projections 16 and 22 of cams 11 and 17 respectively, switch 15 is closed while switch 21 is open. In phase E, since levers 12 and 18 have moved clear of projections 16 and 22 respectively, switch 15 is open again and switch 21 is closed again. At no time during phases A to E are both the series-connected switches 15 and 21 closed at the same time and because of this, there is no supply to motor M. If the motor M is the motor 5 of the washing and spin-drying machine 1 (Fig. 1), the motor 5 is not provided with a supply to turn at a high spin-drying speed despite the fact that a manual order has been given by turning the knob 7 (Fig. 1) or 25 (Fig. 2) in the direction of arrow F.

With the programming device 9 exerting automatic control (Fig. 4), when the cam-carrier 10, driven by its miniature motor (not shown), rotates in the direction of arrow F, it causes cam 17 to turn in the same direction via the torsion spring 30. The cams 11 and 17 move from their phase F positions to their phase J positions. In phases F and G, the spring 30 which enables the cam 17 to be turned by the cam-carrier 10 continues to hold the edges 32 of openings 28 pressed against the fingers 29 of the cam-carrier 10. Switch 15 is open and switch 21 is closed. In phases H and I, cam 17 is locked by lever 18 while the cam carrier 10 and cam 11 continue to rotate while tightening spring 30. The movable fingers 29 move gradually further away from edges 32 of the openings 28 in cam 17. The gradient at the end of the protection 22 on cam 17, the co-efficient of friction of the lever 18 against the cam, the operating force exerted by the torsion spring 30 mounted between cam 11 and 17, and that exerted by the spring 20 which presses lever 18 against cam 17 are so calculated as to cause a limited period of dwell by cam

17 in the position shown in phases H and I in Fig. 4. Lever 12 rises onto the projection 16 of cam 11 and closes switch 15 whilst lever 18 remains in front of the projection 22 on cam 17 and holds switch 21 closed. Motor M, having been provided with a supply as a result of the simultaneous closure of the series-connected switches 15 and 21, turns at high speed. Given that the cam carrier 10, driven by its miniature motor, automatically brings about the various operations following a pre-established programme which provides for all the essential safety and protective measures etc., there is no danger in the motor M being automatically speeded up by the cam-carrier 10, that is to say by the programming device 9. If it is assumed that the motor M is the motor 5 of the washing and spin-drying machine 1 of Fig. 1, there is no danger in the motor 5 being automatically speeded up to the high spin-drying speed by the programming device 9, given that there is already provision in the pre-set programme of the programming device 9 for the laundry in the drum of the machine 1 to be prepared beforehand. The cam-carrier 10 and the cam 11 continue to turn on their own until, towards the end of phase I, the fingers 29 come into contact with the edges 33 of the openings 28 in cam 17. In phase J, fingers 29 push against the edges 33 and force cam 17 to turn at the same time as cam 11. Lever 18 is compelled to rise onto the projection 22 on cam 17. During this time lever 12 clears the projection 16 on cam 11 and cam 17, urged by the relaxation of spring 30 which was tightened during phases H and I, turns rapidly in the same direction F. When the edges 32 of the openings 28 in cam 17 abut against the fingers 29 of the cam carrier 10, lever 18 has also cleared projection 22. Towards the end of phase J, lever 12 in clearing projection 16 opens switch 15, whilst lever 18 opens switch 21 for the brief time during which it remains on the projection 22 of cam 17 and closes switch 21 again when it clears projection 22. During phase J, the electrical supply to the motor M is broken, given that switch 15 is open, whilst the series switch 21 is first open for a time and is then closed again.

In the programming device 9, the mechanical connecting system thus ensures that the cancelling and automatic control sub-assemblies move in harmony (Fig. 3), as a result of the co-operation of the movable fingers 29 and the abutments 23, so as to cause the effects of a manual order to be cancelled out, and in disharmony (Fig. 4), as a result of the action of the torsion spring 30 and co-operation between the movable fingers 29 and the abutments 33, to bring about normal operation under the control of the automatic control sub-assembly by annulling the effect of the cancelling sub-assembly.

When the programming device 9 controls the operation of a machine such as the washing and spin-drying machine of Fig. 1, its cam carrier 10 is also provided, in addition to cam 11, with other cams which bring into operation components of the machine 1 other than the motor 5.

For any given cam associated with the cam-carrier 10 which controls a given operation by the machine, it is possible to construct a corresponding cam similar to cam 17 to cancel out the effects of giving a manual order for this operation to take place.

Figs. 5 and 6 are schematic and partial illustrations of a second embodiment of the invention which is formed by an improved programming device 34 which, as in the case of the previous embodiment, controls the supply to a motor N by connecting the windings of the latter to the current source L1, L2 in order to cause it to turn at a high speed.

The programming device 34 has, as its automatic control sub-assembly, a cam-carrier 35 driven by a known miniature motor (not shown), a cam 36 attached to the cam-carrier, a cam follower lever 37 which is pivoted at 38 and is at all times urged towards cam 36 by a spring 39, and a switch 40 operated by lever 37. The cam 36 has a radial projection or profiled section 41. When the follower lever 37 lifts onto the projection 41 it closes switch 40 to connect the motor N to the current source L1, L2.

The programming device 34 also includes, as its sub-assembly for cancelling out the effects of manual orders, a switch 42 connected in series with switch 40, and a system of cams which control the opening and closing of this switch 42 via a lever 43 which is pivoted at 44 and is at all times urged by a spring 45 to close the switch 42. The cam system consists of a fixed cam 46 which is secured to a fixed plate 47 and which is provided, at its centre, with a hole 48 and at the periphery with a part-circular axially extending projection or profiled section 49, a movable cam 50 coaxial with the fixed cam which is also provided with a central hole and, on one face, with a part-circular axially projecting projection or nose 51 which, as it rotates, slides over the fixed cam 46 following a circular path in which lies the projection 49 of the latter. The movable cam 50 has on its second face, with a split tubular collar 55. The cam system also includes a disc 52 co-axial with cams 46 and 50, a shaft 53 and a compression spring 54, with shaft 53 sliding freely in the central holes in the fixed and movable cams and

acting as an attachment support for disc 52 and transmitting the axial movement of the movable cam 50 to disc 52. As it moves, the disc 52 raises or lowers the lever 43 which opens or closes switch 42. When the nose 51 on the movable cam 50 rises onto the projection 49 on the fixed cam 46, the disc 52 follows the upward movement of the movable cam 50 and raises lever 43 to open switch 42 and thus break the connection between the motor N and the current source L1, L2. When the nose 51 descends from projection 49, disc 52 follows the downward movement of the movable cam 50 and lowers lever 43 to close switch 42. The manually operable device for giving orders to the programming device 34 comprises a knob 56 which is provided with a central cut-out 57 and with an axial spigot or finger 58, whilst the mechanical connection system comprises a shaft 53, which is also the shaft of the cam system above, an attachment and travel-limiting part 59, a torsion spring 60, axial drive spigots 61 formed on the cam-carrier 35, and openings 62 formed in the disc 52 of the same cam system in which these spigots 61 slide.

Part 59 has, on one of its sides, a split tubular end which incorporates a retaining ridge 63, and on the other side, a tubular boss containing a half-moon shaped axial hole 64, and, in its central portion, a ring 65 interrupted by a cut-out. The extremities 71 and 72 of the cut-out in the part-ring 65 form abutments to restrict the movement of finger 58. That end of the shaft 53 which carries a flat 66 and which passes freely through spring 54, plate 47, fixed cam 46 and movable cam 50, carries on the one hand the attachment and travel limiting part 59, on which the knob 56 is a clip fit, and on the other hand, between part 59 and the movable cam 50, the torsion spring 60. Part 59, which holds the flatted end 66 of shaft 53 fitted into its half-moon shaped hole 64, is attached to shaft 53 by a screw 67 and a washer 68. The manual instruction knob 56 is retained axially by the ridge 63 but is able to turn on part 59. The axial spigot or finger 58 on knob 56 engages in the slot in the split collar 55 on the movable cam 50 through the missing portion or cut-out in the part-ring 65 on part 59, whilst spring 60 is mounted with one of its ends inserted in the slot in the split collar 55 and the other end engaged in the cut-out in the incomplete ring 65.

When the knob 56 is turned, its finger 58 causes the movable cam 50 to turn by pressing against collar 55, and part 59 and shaft 53 to turn by pressing against abutment 71. Since the cam-carrier 35 is mounted to slide on end 69 of shaft 53 by virtue of its axial bore 70, and since the spigots 61 on the cam-carrier 35 are slidably engaged in the openings 62 in the disc 53 secured to shaft 53, when shaft 53 turns, disc 52 also turns and takes with it the cam carrier 35 and the cam 36. Because of this, when knob 56 is turned cam 36 is also turned.

When giving manual instructions to the programming device 34, if knob 56 is turned in direction of arrow F the movable cam 50 is turned on the fixed cam 46 and, at the same time, the disc 52, the cam-carrier 35, and the cam 36 are also turned, cams 46, 50, 36 being so adjusted that the nose 51 on cam 50 and the follower lever 37 respectively arrive before the boss 49 on cam 46 and the boss 41 on cam 36 at the same time. Since levers 43 and 37 are not raised, switch 42 remains closed and switch 40 remains open and there is no supply to motor N. If the rotation of knob 56 continues, nose 51 rises onto projection 49 and at the same time causes shaft 53 and disc 52 to rise, the latter raising arm 43 and causing switch 42 to open, whilst follower lever 37 lifts onto the projection 41 of cam 36 as it rotates and closes switch 40. The manual order for switch 40 to close and to put motor N into operation is thus cancelled out by the opening of switch 42. When follower lever 37 clears the projection 41 on cam 46 to re-open switch 40, spigot 51 is also descending from the projection 49 of cam 46 and shaft 53 and disc 52, which follow it in its downward movement, release or lower lever 43 to close switch 42 again. In this phase there is no longer any supply to motor N.

With automatic control by the programming device 34, when the cam-carrier 35, driven by its miniature motor (not shown), turns in the direction of arrow F, cam 36 moves in the same direction, as also do shaft 53, part 59, spring 60, movable cam 50 and knob 56. Since projection 41 does not reach lever 37, which is holding switch 40 open, and since the nose 51, which is beyond the projection 49, does not raise the lever 43 which is holding switch 42 closed, there is no supply to the motor. When the projection 41 reaches lever 37, nose 51 butts against projection 49. Cam 36 continues to rotate, the follower lever 37 rises onto projection 41 and closes the switch, whilst part 59 turns with shaft 53, moves the abutment or extremity 71 of the cut-out in the part-ring 65 away from the spigot 58 on knob 56 and moves the abutment or extremity 72 of the said cut-out towards spigot 58, whilst tightening spring 60. The gradients of the projection 49 and of the nose 51, their coefficients of friction and the forces exerted by springs 54 and 60 are so calculated that, when it comes into contact with projection 49, the nose 51, i.e. the movable cam 50, is arrested by the projection 49 on the fixed cam 46. Disc 52 experiences no axial motion and since lever 43 is not lifted it holds switch

42 closed. Motor N has a supply through the closed switches 40 and 42 and turns. As part 59 rotates, when abutment 72 touches finger 58, lever 37 is also preparing to move clear of the projection 41 of the cam. In other words, the dimensions of the finger 58 on knob 56 and of the cut-out in the part-ring 65 on part 59 which defines the range of movement available to the movable finger 58 are so calculated that this range of movement is equal to the angular extent of the projection 41 on cam 36. When lever 37 descends from projection 41, it opens switch 40 and cuts off the supply to motor N. Part 59, via abutment 72, presses against the movable finger 58 and forces the movable cam 50 to rotate at the same time as knob 56 and forces nose 51 to lift onto projection 49. Spring 60 relaxes and forces the nose 51 of the movable cam 50 quickly to clear projection 49. In this phase, disc 52 is raised briefly and forces lever 43 to open switch 42 for a short time, switch 40 however being already open at the moment when lever 37 clears projection 41 and the supply to motor N being already broken for this reason.

During automatic control by the programming device 34, the motor N is supplied in the normal way for a period which is determined by the size of the angular extent of the projection 41 on cam 36. In this case, when the motor N is the motor 5 of the washing and spin-drying machine 1 of Fig. 1, programming device 34, which becomes the programming device 6, in automatic operation enables high-speed spin-drying to be triggered in the normal course of events and, if high-speed spin-drying is ordered manually at the wrong time, enable the effects of this manual order to be cancelled out, i.e. the supply to motor 5 to be broken.

In constructing the programming device 34, the projection 49 on the fixed cam 46 may incorporate a catch 73 which prevents the nose 51 on the movable cam 50 for moving backwards.

The mechanical connecting system thus allows the cancelling and automatic control sub-assemblies to move in harmony, as a result of the co-operation of the movable finger 58 and the abutment 71, in order to cancel out the effects of a manual order, and to move in disharmony, as a result of the action of the torsion spring 60 and the co-operation of the movable finger 58 and the abutment 72 to bring about normal operation under the control of the automatic control sub-assembly by negating the effect of the cancelling sub-assembly.

When the programming device 34 controls the operation of a machine such as the washing and spin-drying machine 1 of Fig. 1, its cam-carrier 35 is provided, in addition to the cam 36, with other cams which cause components of the machine 1 other than the motor 5 to come into operation.

For any cam associated with the cam-carrier 35 which controls a predetermined operation by the machine, it is possible to construct a cam system similar to the above cam system to cancel out the effects of a manual order for this operation to take place.

WHAT WE CLAIM IS:—

1. A programming device comprising an automatic cam-equipped control sub-assembly operative to actuate switches for causing a machine to perform various operations following a pre-established order or programme, a manually operable device for giving orders to initiate these operations respectively and selectively, and a sub-assembly for cancelling out manual orders for one or more predetermined operations by the machine, which sub-assembly comprises at least one cam and a switch connectable into an electrical circuit which controls said predetermined operation or operations, the sub-assembly being movable separately by the said automatic control sub-assembly and by said manually operable device and, when there is a direct manual order for a said predetermined operation, being operative to cancel the effects of this manual order by opening said switch.

2. A programming device acocrding claim 1, and comprising a mechanical connecting system between the automatic control and cancelling sub-assemblies, said mechanical connecting system comprising a torsion spring, at least one movable finger and two abutments and being arranged to allow the two sub-assemblies to move in phase as a result of the co-operation of the movable finger and one of the abutments, and to move out-of-phase as a result of the action of the torsion spring and co-operation between the movable finger and the second abutment.

3. A programming device according to claim 2, wherein the movable finger is formed by a projecting part or spigot on either the cancelling or automatic control sub-assembly or on the manually operable device, the two abutments associated with this movable finger being formed by two opposing edges of an opening or cut-out in either the other sub-assembly or the manually operable device, the torsion spring having ends which are attached to the sub-assemblies and the manually operable device in such a way as to bias the said movable finger towards one of the said abutments.

4. A programming device according to either claim 2 or claim 3, wherein the cam of the cancelling sub-assembly has a radial

projection or profiled section which has the same angular extent as the radial projection or profiled section of the corresponding cam in the automatic control sub-assembly which brings about the same predetermined operation, and the range of movement available to the movable finger between two abutments of the mechanical connecting system also has this angular extent.

5. A programming device according to any one of claims 2 to 4, wherein the cam of the cancelling sub-assembly includes two diametrically opposed part-circular openings whose terminal edges form the abutments for the movable finger and the cam-carrier in its automatic control sub-assembly has, at one end, two diametrically opposed axial spigots which form two movable fingers which co-operate with the two part-circular openings in the cam of the cancelling sub-assembly.

6. A programming device according to claim 1, wherein the cancelling sub-assembly includes a cam system comprising a fixed cam having an axial projection on one side thereof, a movable cam co-axial with said fixed cam and having an axial projection which slides over said fixed cam along a path in which the axial projection of the fixed cam lies, a disc co-axial with the fixed and movable cams located on the side of the fixed cam remote from said movable cam, a compression spring which biases the fixed cam and disc apart, a shaft freely slideable in central holes in the fixed and movable cams and serving as an attachment support for the disc and to transmit axial movement of the movable cam to the said disc as it moves axially and which opens or closes the said switch.

7. A programming device according to claim 6, and wherein the cancelling sub-assembly further comprises a mechanical connecting system which comprises on one side of the cam system a split tubular collar which is secured to said movable cam, an attachment and travel limiting part having a ring with a cut-out in the central zone thereof and having tubular ends, which part is firmly attached to a flattened end of the shaft of the cam system, a finger provided on said manually operable device which engages in the cut-out in the ring of the attachment and travel limiting part and which fits into the slot in the split tubular collar, and a torsion spring whose ends are attached to the sub-assemblies and the mechanical connecting system so as to urge the said finger towards one of the two abutments formed by the extremities of the cut-out in the ring of the attachment and travel limiting part, and wherein the other side of the cam system includes at least one axial spigot which is secured to the cam carrier of the automatic control sub-assembly and an opening formed in the disc of the cam system which receives the said axial spigot and allows it to slide axially with respect thereto.

8. A programming device according to claim 7, wherein the attachment and travel limiting part has a split tubular end having a radial ridge, which carries a freely rotatable knob of the device for giving manual orders.

9. A machine incorporating a programming device according to any of claims 1 to 8.

10. A washing machine incorporating a programming device according to any one of claims 1 to 8.

11. A programming device substantially as hereinbefore described with references to Figs. 2 to 4, or Figs. 5 and 6 of the accompanying drawings.

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Sheet 1

FIG 1

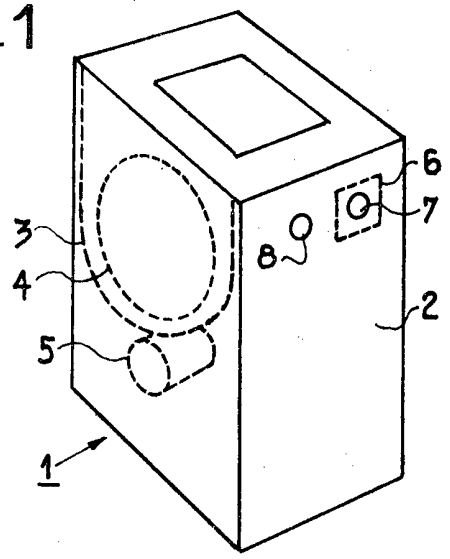
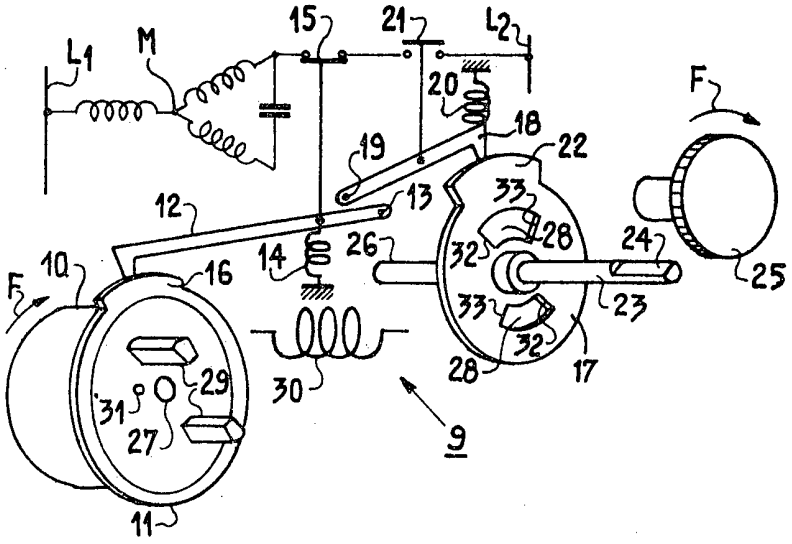



FIG 2



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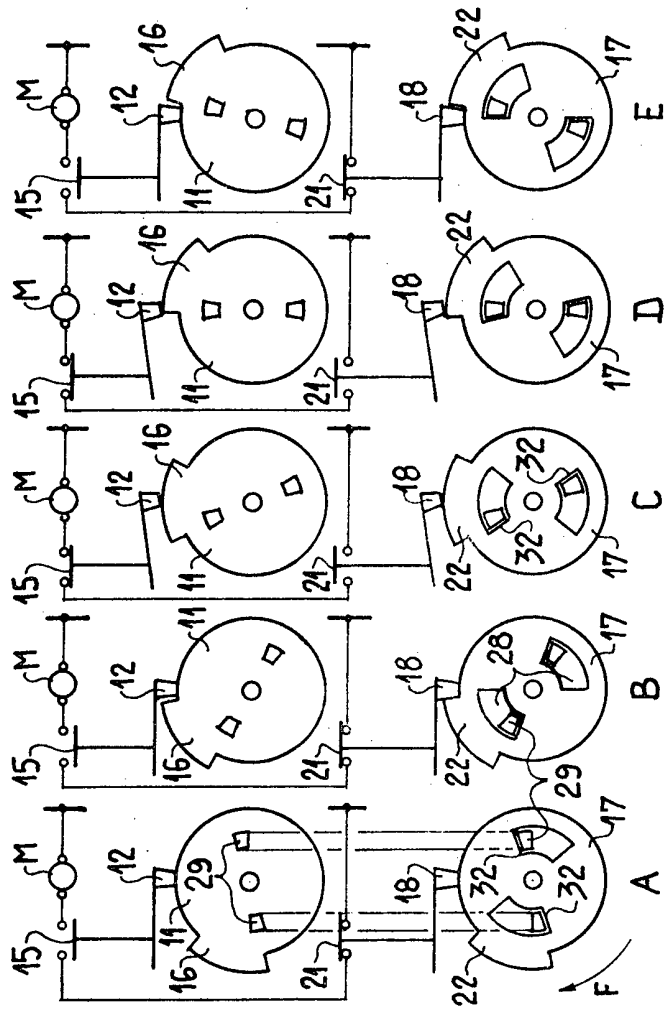
Sheet 2

FIG 3



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Sheet 3

FIG_4

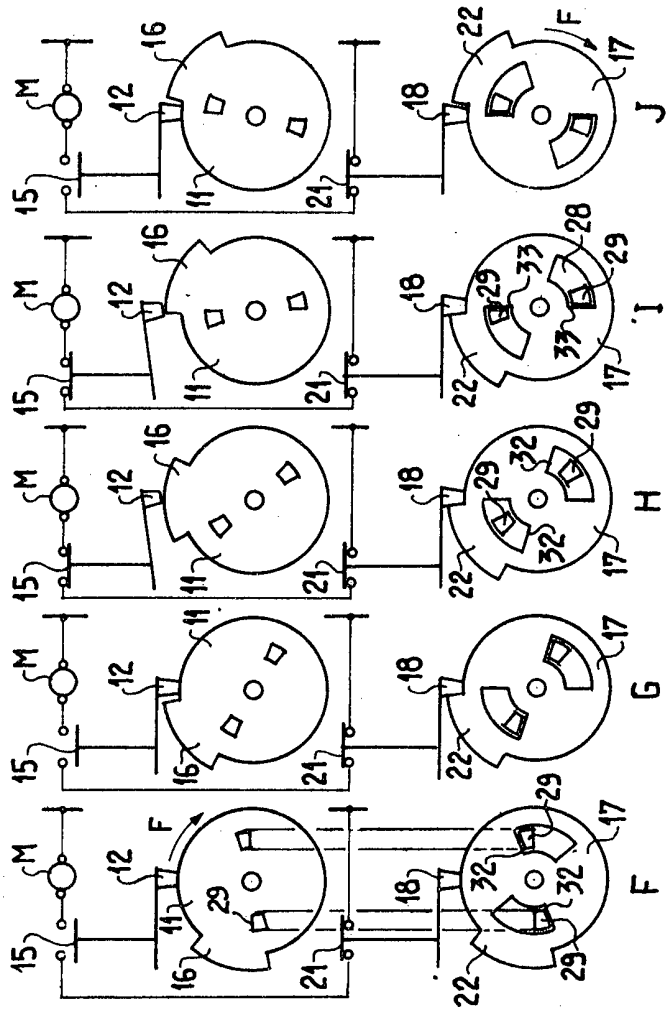

FIG. 5

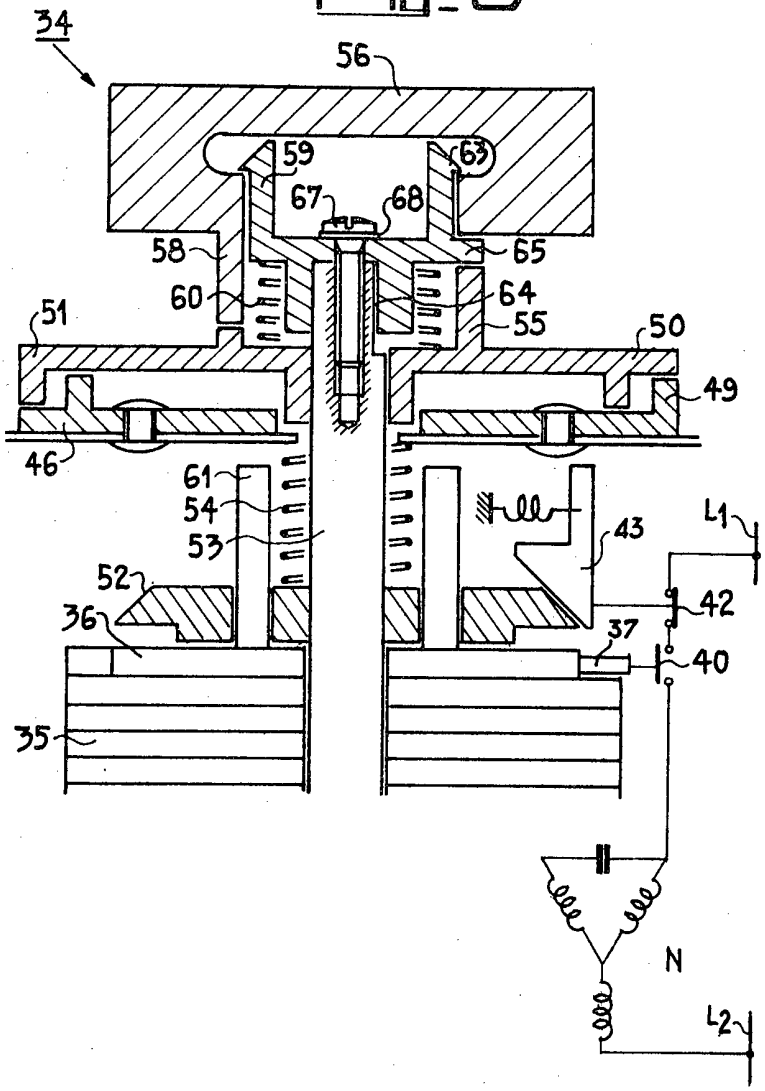
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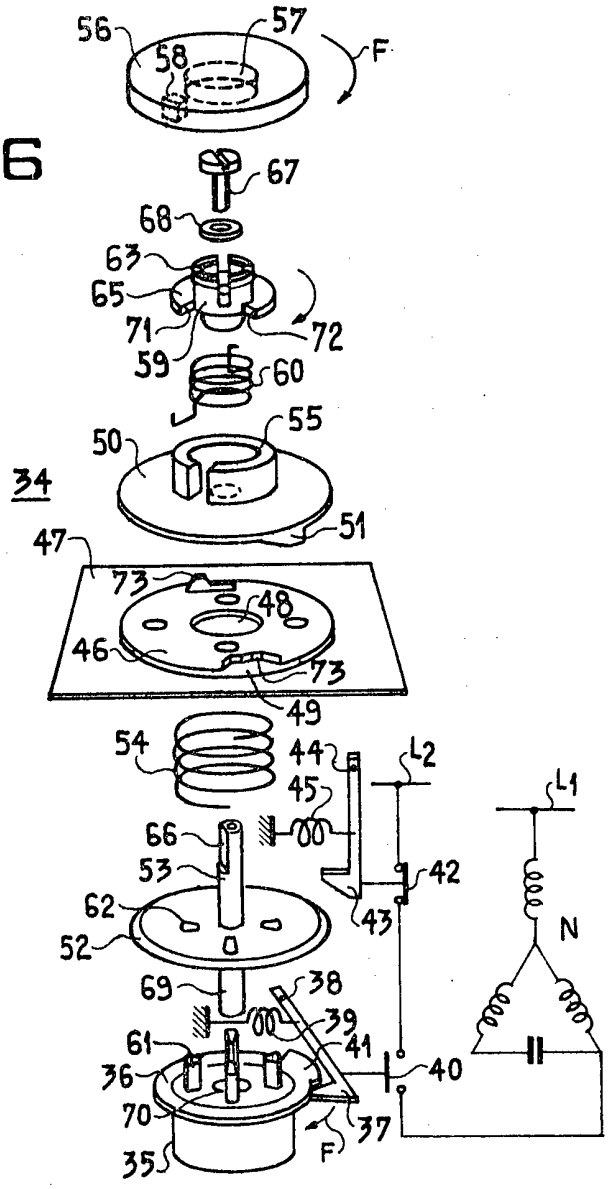
FIG. 6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