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(54) Pair of cam followers for a modular timed programmer device.

(57) Pair of cam followers (20a-20b), each of which is suitable to be fitted so as to be able to oscillate on one of two adjacent modules (10) of a timed programmer device equipped with cam-forming means capable of being inserted in the modules (10) and capable of different speeds in the different modules, each of the modules (10) comprising at least one movable electrical conductor (13) and at least two stationary electrical conductors (12-14), the movement of at least one movable electrical conductor (13) depending on the position taken up by one of the cam followers (20a-20b) in relation to the movement of the cam followers (20a-20b) on the cam-forming means, whereby each of the cam followers (20a-20b) is equipped with an extension (22-23) protruding from the breadth dimension of each of the modules (10) and cooperating with the movable conductor (13) of the adjacent module in such a way as to carry out at the same time, starting with controlled movement of the cam-forming means acting on one of the modules (10), an operation of displacement of the movable electrical conductors (13) of both the modules (10).

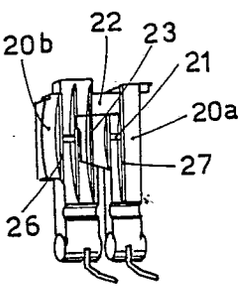

fig.4a

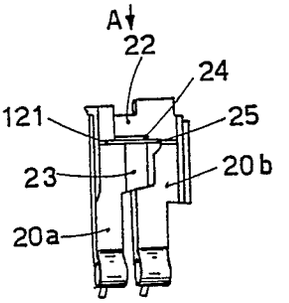

fig.4b

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PAIR OF CAM FOLLOWERS FOR A MODULAR TIMED PROGRAMMER DEVICE

This invention concerns a pair of cam followers cooperating with two cams of a timed programmer device. To be more exact, the invention concerns a pair of cam followers able to cooperate with two cams borne by a modular timed programmer device and to operate individually the electrical switching contacts borne by two adjacent modules.

Such a pair of cam followers finds its main application in the field of electromechanical components.

The invention concerns also a timed programmer device equipped with such a pair of cam followers.

The state of the art includes modular timed programmer devices which are employed generally in household appliances such as washing machines, ovens, etc.

Such devices consist of a plurality of hot-moulded plastic modules equipped with a set of electrical conductors the outputs of which are organized according to a pre-determined plan on one side of each module.

These electrical conductors form an integral part of electrical switches able, for instance, to invert the polarity of the motor of a washing machine tub and therefore to reverse the direction of rotation of the tub.

The common movable contact of these switches is actuated generally by a cam follower or feeler pivoted within a module and cooperating, on one side, with the movable contact and, on the other side, with the profile of a cam able to rotate about a shaft passing within the module.

Each timed programmer device can therefore be equipped with a plurality of cams able to rotate about several shafts and cooperating with various cam followers borne by the modules of the device;; these cam followers operate movable contacts of switches borne by the modules. The cams provided in the programmer device are capable of different speeds.

It is possible in general to define two adjacent modules, the cam followers of each of which cooperate respectively with a cam able to rotate at a relatively slow speed or able to advance step by step (called hereinafter a "slow cam") and with a cam able to rotate more quickly than the previous cam (called hereinafter a "quick cam").

The speeds of the cams are determined by the subsequent functions performed by the user apparatus, for instance the passage through the various washing cycles of a washing machine, different rotations in different directions of the tub within one and the same cycle, etc.

For each cam acting by interposition of the cam follower on the electrical switch it is possible to define a first "high" position in which the cam follower positions the movable contact against a first stationary contact of the switch, a second "low" position in which the cam follower positions the movable contact against a second stationary contact of the switch and a third "zero" position, between the two previous positions, in which the movable contact of the switch does not make any electrical connection.

Owing to operational requirements it is sometimes necessary for the slow cam to determine the actuation of the contacts of the module working under the control of the quick cam; in other words it is sometimes necessary for the actuation by the slow cam to prevail over the actuation by the quick cam to cut off the functions of the latter.

In such a situation (see Figs.1a and 1b), whenever the slow cam CL is in the "low" position, the actuation of the quick cam CV is not affected by that of the slow cam.

When the slow cam is in an intermediate position, the quick cam can act only between the "zero" and the "high" positions; lastly, when the slow cam is in the "high" position, the quick cam too can only keep the relative movable contact in the "high"position.

Cam followers or feelers are known which enable these types of functions to be carried out. An example of these cam followers is shown in Figs.2a and 2b, which show a pair of cam followers 28-29, of which the former 28 is equipped with two protrusions 128-228, while the latter 29 is provided with two recesses 129-229 able to accommodate with a fixed joint the two protrusions 128-228.

The two cam followers 28-29 thus rigidly united form in practice one single element able, starting from the drive provided by the cam of a module, to act on the electrical switch contacts of the same module and of an adjacent module normally operated by another cam.

This type of disclosure of the state of the art entails drawbacks and shortcomings due essentially to the fact that the two cam followers are rigidly united. In fact, this type of union does not allow optimum setting of the pressure on the switch contacts.

In this connection it is necessary to bear in mind that an adequate setting of the pressure on the contacts of the switch could be obtained by using blades having high flexibility properties, such as copper-beryllium blades for instance, as movable switch contacts.

This type of blades, however, entails the serious drawback of a very high cost, which restricts

severely its employment as regards mass production of timed programmer devices; the present tendency is towards the use of low cost blades, made of brass for instance, which possess high rigidity properties.

This leads to a set of problems since, as the cam followers are rigidly coupled together and are arranged individually with a given play on their respective rotation pivots, when a cam exerts force on one of the cam followers, the latter transmits a thrust to the movable contact positioned on the same plane; but owing to the aforesaid play and to the relative rigidity of the contact blades, the assemblage of the two cam followers bends and the force transmitted to the coupled cam follower is considerably smaller and does not ensure a perfect contact, with possible resulting formation of sparks between the contact rivets and speedy wear of the rivets.

To obviate these drawbacks, the state of the art proposes to increase slightly the breadth of the protrusion provided on the cam follower coupled to the cam follower on which the force of the cam is exerted; the purpose of the extra breadth of this protrusion is to compensate the loss of force due to the bending of the coupled cam follower.

However, during design work it is not always possible to foresee which of the two cam followers will undergo the action of the cam directly and which instead will be merely coupled, and therefore this solution too seems to possess a doubtful effectiveness and practicability.

The employment of rigidly coupled cam followers implies also high costs of assembly of the timed programmer device owing to pressure which has to be applied to the modules to achieve an accurate, secure coupling of the cam followers to each other.

This invention has the purpose of obviating the short comings and drawbacks of the state of the art and therefore of providing a pair of cam followers for a modular timed programmer device in which the direct action applied by the cam to one of the cam followers causes a transmission of pressure on the coupled cam follower such as to ensure a precise, sure contact between the movable contacts and the relative stationary contacts of two switches belonging to adjacent modules.

These and other purposes are achieved with a pair of cam followers having the features of the main claim, whereas the dependent claims describe preferred forms of embodiment of the invention.

The invention provides for each of the cam followers to be equipped with an extension able to operate on the movable contact of a switch located on a module adjacent to that belonging to the cam follower in question on which pressure has been exerted by the cam, the two cam followers having complementary forms and dimensions but being fully free of relative constraints and acting independently of each other.

In this way the situation is achieved whereby either of the two cam followers can be connected equally well to the slow cam prevailing over the quick cam, thus avoiding the necessity of predicting exactly which type of cam follower will be actuated by the slow cam.

Each of the two cam followers is equipped with a protrusion acting on the movable contact of the switch of the module belonging to the cam follower in question and on the movable contact of the adjacent module respectively.

The breadth of this protrusion in the zone defined by this extension and intended to perform the transmission of force to the movable contact of the adjacent module will be greater advantageously than the breadth of the protrusion in the zone of direct contact between the cam follower and the blade of the movable contact of the module in question.

In this way both the bending due to the play with which the cam follower is inserted on its own pivot and also the bending of the cam follower itself are compensated, and both the movable contact blades undergo a substantially equal force.

The fact that the cam followers are not subject to any mutual physical constraint implies a further advantage as regards the costs of assembly of the timed programmer device. In fact, the various modules no longer have to be pressed against each other so as to enable the cam followers to be coupled, for it is enough that the modules should be placed next to each other to achieve their operational assembly.

Further advantages of the invention will become clear upon reading the following description of one form of embodiment of the invention, the description being provided as a non-restrictive example with the help of the attached figures, which show the following:-

Figs.1a and 1b give respectively diagrams of the principle of the working of cooperating switch-cam follower-cam and of the result of the cutoff of the functions of a quick cam by a slow cam;

Figs.2a and 2b show respectively a view from above and a view from below of a pair of cam followers of the state of the art;

Fig.3 gives a plan view of a module of a timed programmer device;

Fig.4a and 4b show a view from above and a view from below respectively of a pair of cam followers according to the invention;

Fig.5 shows a view along the line A of the cam follower 20b of Fig.4b.

Fig.3 shows a module 10 belonging to a modular timed programmer device consisting of a plurality of equal modules placed next to each other by means of connection means 11.

The module 10 includes a free inner zone of a generally circular shape for the insertion of one or more generally cylindrical elements (not shown here) able to rotate about a shaft and bearing on their lateral surfaces some tracks which form a cam.

Three blade-type electrical conductors 12-13-14 equipped with three respective terminal tabs 12a-13a-14a aligned on a lateral surface of the module 10 are inserted in a lateral area of the module 10 in seatings arranged for the purpose.

The three conductors 12-13-14 form an electrical switch, in which the first 12 and third 14 are stationary whereas the conductor 13 is movable.

The movable electrical conductor 13 bears at one of its ends a pair of contact rivets 15-16 able to cooperate with corresponding contact rivets 17-18 borne by the tab 13a and third conductor 14 respectively.

The other end of the movable conductor 13 is connected electrically to the first stationary conductor 12; moreover, the contact rivet 15 under inactive conditions is permanently urged resiliently against the contact rivet 17 of the tab 13a and exerts thereagainst a preset contact pressure. In the specific case shown the movable conductor 13 is pre-shaped in such a way as to exert that pressure.

However, the scope of the invention includes embodiments in which the switch has a conformation other than that described above; for instance, the scope of the invention covers a form of embodiment in which the movable conductor is not pre-formed but cooperates with resilient means such as a helicoidal spring in performing the switching operation.

The scope of the invention covers also forms of embodiment in which the module is equipped with a plurality of switches, or in which each switch performs double switching, or else in which the movable conductor is not fixed at one end but is equipped with contact rivets at both its ends and is pivoted at its central zone on the module.

A cam follower 20 of an elongated form is pivoted at one end on a stationary pivot 19 and cooperates with the movable conductor 13 and with the cam-forming tracks of the cylindrical element (not shown) respectively.

This cam follower 20 is generally equipped with a first protrusion 21 able to follow the profile of the cam and with a second protrusion 121 located on the opposite side of the cam follower 20 and able to transmit to the movable conductor 13 the movement imparted by the cam.

In Fig.1a it can be seen that, when the first protrusion 21 of the cam follower 20 rests on the lower part of the cam, a contact is made between the movable conductor 13 and the first stationary conductor 12, whereas when the first protrusion 21 rests on the intermediate part of the cam, no contact takes place, while when the first protrusion 21 cooperates with the high part of the cam, the movable conductor 13 and third conductor 14 are in contact with each other.

According to the invention (see Figs.4a, 4b and 5) first 20a and second 20b cam followers belonging to two adjacent modules 10 are equipped near their free end with a transverse extension 22-23 protruding from the breadth dimension of each of the modules 10 and provided with a further protrusion 24-25 able to cooperate with the movable conductor of the adjacent module.

Moreover, the forms of the two cam followers 20a and 20b are made complementary inasmuch as the transverse extension 23 of the first cam follower 20a is inserted with a limited play in a recess provided in the second cam follower 20b, the two cam followers 20a-20b remaining free of any mutual constraint in all cases.

Fig.4a shows also a set of ribs 26-27 provided on both cam followers 20a-20b and having the tasks of guiding the surfaces of the cam and of reinforcing the cam followers themselves.

Fig.5 shows a cross section of the second cam follower 20b, in which can be seen three guiding and reinforcing ribs 26, the second protrusion 121, the transverse extension 22 and the further protrusion 24 of the second cam follower 20b.

It is possible to see that in relation to the vertical axis of Fig.5 the further protrusion 24 has a greater breadth than the second protrusion 121. As we said earlier, this permits compensation for displacements of the transverse extension 22 due to the play of the cam follower 20 on its pivot 19.

Claims

1 - Pair of cam followers (20a-20b), each of which is suitable to be fitted so as to be able to oscillate on one of two adjacent modules (10) of a timed programmer device equipped with cam-forming means capable of being inserted in the modules (10) and capable of different speeds in the different modules, each of the modules (10) comprising at least one movable electrical conductor (13) and at least two stationary electrical conductors (12-14), the movement of at least one movable electrical conductor (13) depending on the position taken up by one of the cam followers (20a-20b) in relation to the movement of the cam followers (20a-20b) on the cam-forming means, the pair of cam

followers (20a-20b) being characterized in that each of them is equipped with an extension (22-23) protruding from the breadth dimension of each of the modules (10) and cooperating with the movable conductor (13) of the adjacent module in such a way as to carry out at the same time, starting with controlled movement of the cam-forming means acting on one of the modules (10), an operation of displacement of the movable electrical conductors (13) of both the modules (10).

2 - Pair of cam followers (20a-20b) as claimed in Claim 1, in which each of the cam followers (20a-20b) comprises means (21-121-24-25) cooperating respectively with the cam-forming means and with the movable electrical conductors (13) belonging to two adjacent modules (10).

3 - Pair of cam followers (20a-20b) as claimed in Claim 2, in which the cooperation means (21-121-24-25) consist of protrusions jutting from each of the cam followers (20a-20b).

4 - Pair of cam followers (20a-20b) as claimed in any claim hereinbefore, in which the profiles of the cam followers are complementary.

5 - Modular timed programmer device which comprises a plurality of standardized modules (10), at least two adjacent modules (10) of the device being equipped with a pair of cam followers (20a-20b) according to one of the claims hereinbefore.

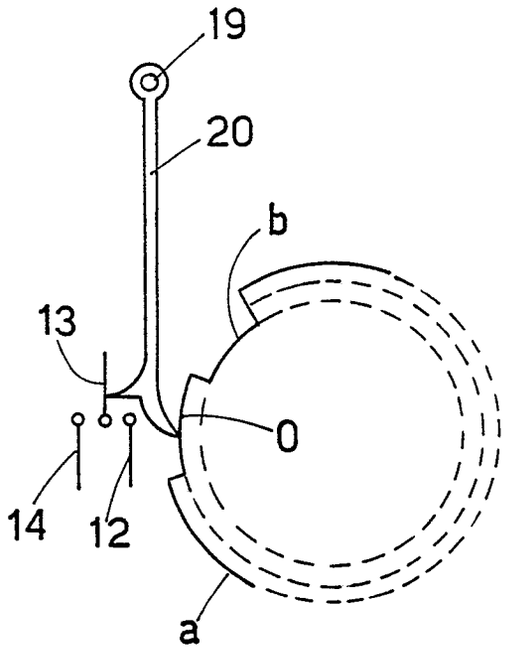

fig.1a

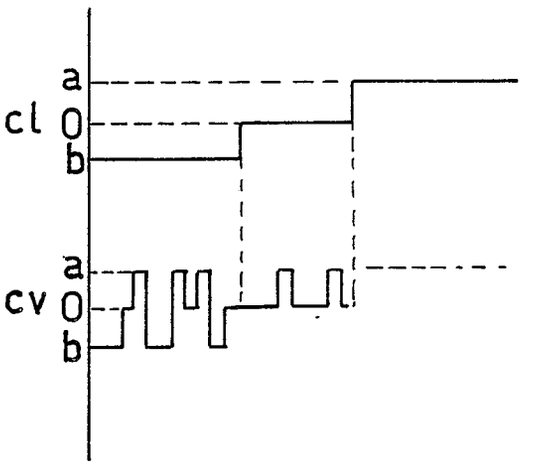

fig.1b

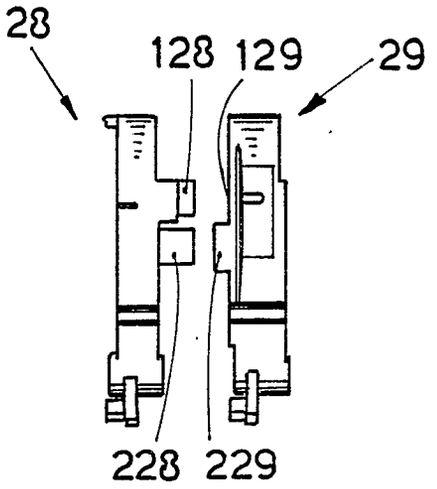

fig.2a

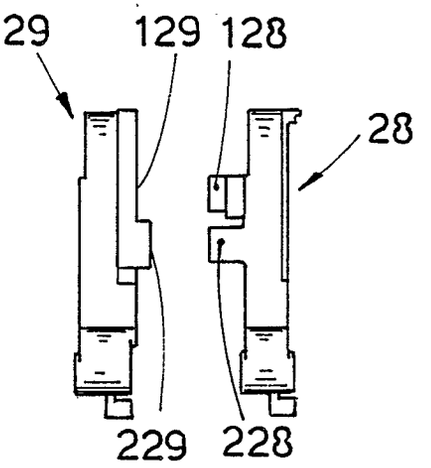

fig.2b

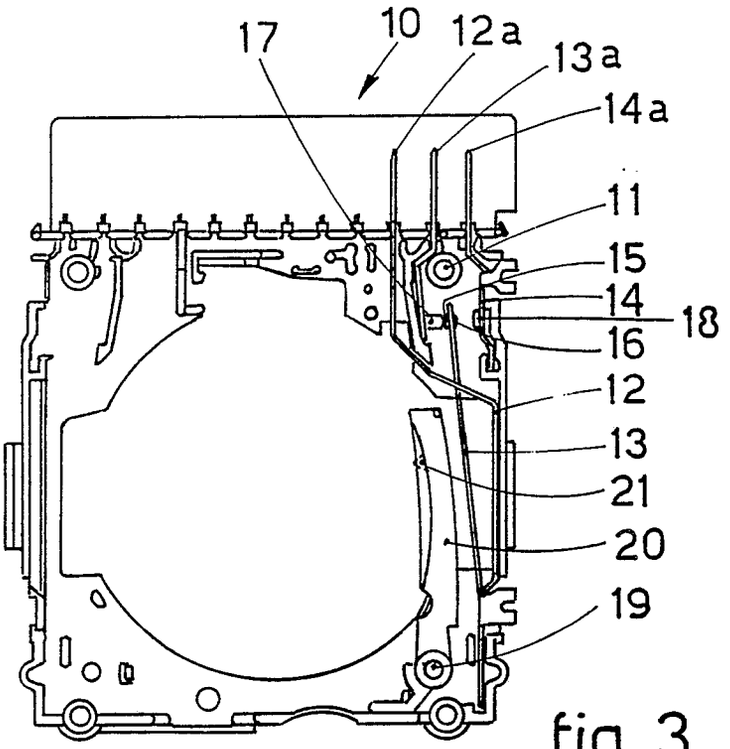

fig.3

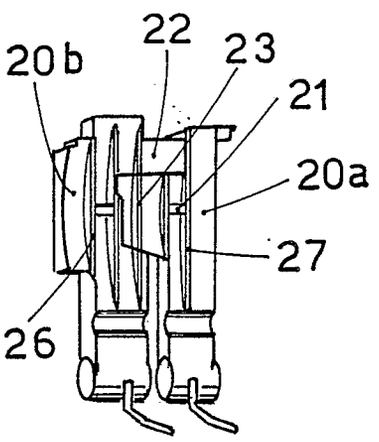

fig.4a

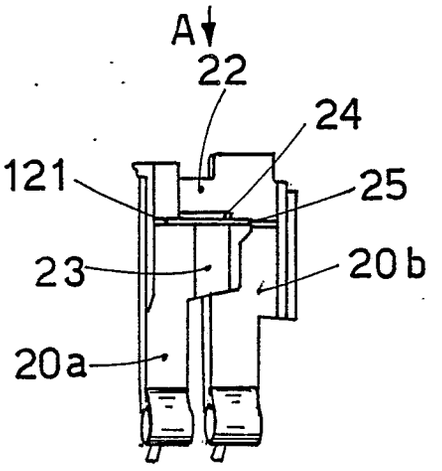

fig.4b

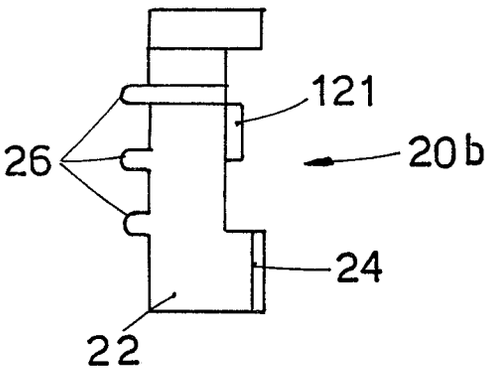

fig.5