May 1, 1962 W. HOLZER 3,032,617

APPARATUS FOR CONTROLLING FULLY AUTOMATIC WASHING MACHINES

Filed July 22, 1959

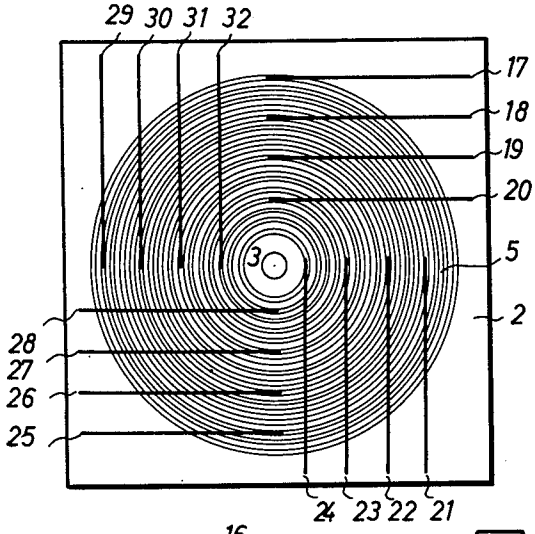

FIG. 1.

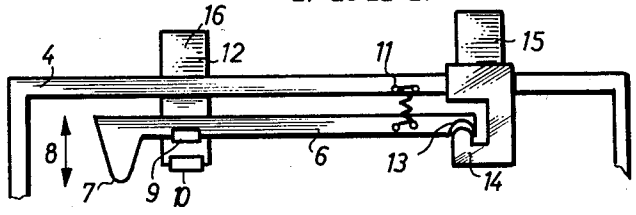

FIG. 2.

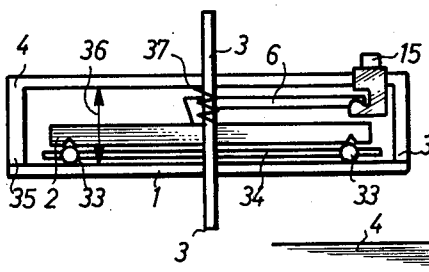

FIG. 3.

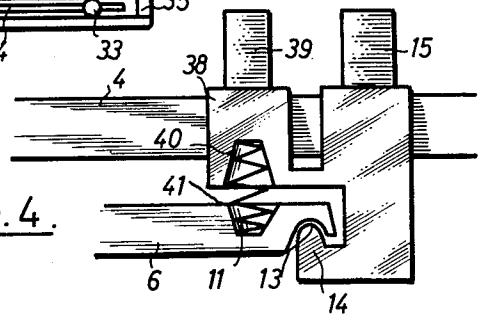

FIG. 4.

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APPARATUS FOR CONTROLLING FULLY AUTOMATIC WASHING MACHINES

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The invention relates to an apparatus for controlling fully automatic washing machines wherein cam operated switches are used for this control.

Control units for controlling fully automatic washing machines are known in which cams moving in adjacently disposed concentric tracks operate resilient contact levers mounted at one end.

The disadvantage of this arrangement consists in the great difficulties encountered in manufacture, since if the movable contacts are disposed in close formation it is difficult to maintain the minimum current leakage path. Moreover, it is necessary for the control discs to be accurately mounted and machined to present additional difficulties during manufacture.

It is an object of this invention to eliminate the disadvantages of these known arrangements by constructing the control disc with contacts and housing so that the metal parts can be produced by means of non-cutting operation and the housing and control disc are made of pressed material such as plasters. A further object is to provide a mounting of economical and simple design, but sufficiently accurate to insure a high degree of operational safety and accuracy particularly in the case of washing machines where much vibration occurs.

The solution of the problem according to this invention comprises resiliently mounting the upright rigid contact arms in semi-open bearings and the rigid control disc is adapted to run resiliently on balls which support the control disc over the greater part of its diameter.

In accordance with this feature, the contact arms are not rigid but resilient. The control disc is also resilient. The accuracy in the co-operation between contact levers and control disc is achieved by a ball mounting, i.e. balls running in a cage, and the control disc is resiliently urged against these balls.

It is then unnecessary for the control disc to be mounted in the exact center. The control disc is externally retained so that contact surfaces concentric with one another are formed in a satisfactory manner.

With reference to achieving large insulation air gaps, a further feature consists in the fact that the circular control disc is mounted on a square base plate. The adjacently disposed contact arms extend in groups parallel to the edges of the base plate, contact arms running on adjacent cam tracks each being offset by 90°.

By means of this arrangement, the control disc is loaded uniformly and symmetrically by the contact arms, and the operation of the contact arms is such that there are always adequate insulation air gaps. The spacing of the adjacently disposed contacts no longer determines the insulation air gaps but the contacts are arranged offset and the air gap corresponds approximately to a quarter of the diameter of the control disc. This air gap is always sufficiently great, hence affording a considerable reaction in the cost of manufacture.

With reference to the contact arms, it is important for the contact arms to be mounted at one end to have the movable contact thereon adjoining the edge transmitting the switching movement. The movable contacts are pressed by a spring against a fixed stationary contact mounted in a vertical guide for the contact arm.

The contact arm is thus rigid and engagement of the contacts is not made by bending the contact lever, but by spring-loading the rigid contact lever at a selected point. The movable contact itself is not mounted on the tip of the contact lever, but at a different point inwardly of the cam follower on the end of the arm so that when the contact arm is urged upwardly by a cam of the control disc against the spring which acts on the contact arm, contacts are opened in a positive manner. The spring rapidly closes the contacts when the contact arm leaves the cam on the control disc.

A further possible modification consists in the fact that centrally pivoted contact arms extend radially with respect to the control disc and that the control disc has a guide axle on the side opposite to the feeler levers.

It is thus possible for the contact arms to be constructed as rocker arms having a common mounting in the center and making contact on both ends. It is also possible, of course, to use two-armed arms instead of one-armed two-ended arms, so that the contacts may be moved either in conjunction with or independently of the contact on the opposite end of the contact arms.

A convenient mounting for the contact arms consists in the fact that semi-open bearings of the contact arms consist of a notch with a counter bearing. The springs loading the contact arms are arranged a short distance from the mounting points and are supported on the housing.

The use of semi-open bearings makes it possible for stampings to be used, the pressure of the spring forcing the lever into the bearing providing sufficient accuracy with regard to the mounting.

A convenient arrangement for simple connection in a washing machine consists in the fact that all contact levers terminate on one side of the housing in soldering lugs or terminals or plug connections.

With the complicated structure of control circuits in washing machines in particular, it is important for the terminals to be readily and simply accessible.

This object is substantially achieved by means of terminals mounted on one side of the housing.

It is also convenient for all contact arms, fixed contacts, and the control disc to be accommodated in a closed housing of plastic material, the drive for the control disc entering on one side of the housing, while on the other side all terminals are accessible from the outside.

This design is operationally very safe, since the sensitive parts, the cam tracks and contacts, the balls, and the springs are protected from accidental contact and dirt by the enclosing housing. Only the contact terminals are located on one side of the housing, while on the opposite side the shaft for the connection of the drive projects therefrom.

Additional features comprise arranging balls in the housing for supporting the control disc and, if necessary, guided in a cage, while the springs urging the disc against the balls are supported in the housing.

This design involves the lowest conceivable effort in manufacture because it is not necessary for a cage with balls to be placed on a base plate, since a groove for the balls to run in has already been pressed in the base plate. The control disc is placed on these balls and the housing cover, on which the contacts with the springs are situated, is then placed in position. When the housing cover and base plate are secured or screwed together there is automatically acthieved the highest possible accuracy, since, particularly from the point of view of pressing technique, it is always insured that the distance from the inside of the housing cover, to the outer surface thereof remains constant, i.e. it is now possible to mass produce a component having a high degree of accuracy and operational reliability.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 shows diagrammatically a plan view of a control disc with base plate and contact arms arranged thereon;

FIG. 2 shows diagrammatically in side elevation the mounting of the contact arms and the contacts;

FIG. 3 shows diagrammatically the arrangement of these components in a housing; and

FIG. 4 is a detail of the spring-loading device of the contact arms.

The control disc 2 in FIG. 1 is mounted on a base plate 1, which is conveniently of square shape, this control disc 2 being maintained in an approximately central position by a spindle 3 passing through a bore in the base plate 1. The accuracy of operation of the control disc, however, does not depend upon the closeness of fit of the spindle 3 in the housing 4 or the base plate 1.

The control disc 2 is provided in a known manner with concentric cam tracks or paths 5. It is thus possible for ten or twenty such cam tracks to be arranged in close formation, i.e. with a clearance of one or two millimeters. The cam tracks are indicated only by means of circles. Within these cam tracks there are formed elevations and depressions in which the contact arms 6 engage with their cam followers 7, the contact levers 6 being thus moved up and down in the direction of the arrow 8. By this movement, the contacts 9 of the contact arms are either disengaged from the fixed contact 10 or, when the cam allows by means of a corresponding depression, pressed against each other by the contact arm spring 11.

The contact arms themselves are prevented from tilting by a vertical guide 12, and on this guide is located a fixed contact 10. A notch 13 and the corresponding projection 14 from a semi-open bearing, such semi-open bearing being fixed on the housing and provided for example with a metal lug or terminal 15 as soldering lug, or the whole component may be made of metal. The fixed contact 10 receives its electrical connection at the soldering lug 16.

The contact arms 6 are combined in groups in such a way that in one group with arms numbered 17, 18, 19, 20 another group with arms numbered 21, 22, 23, 24, and subsequent groups with arms numbered 25, 26, 27, 28 and 29, 30, 31, 32 the differently numbered contact arms are all situated on different cam tracks. In accordance with the control circuit, the following contact arms run in adjacently disposed contact tracks: 17, 21, 25, 29 or 18, 22, 26, 30 or 19, 23, 27, 31 or 20, 24, 28, 32. It will thus be apparent that the insulation air gap between two adjacent contact arms thus amounts to approximately a quarter of the circle, which is an ample gap.

It is evident from FIG. 3 that the balls 33 which are provided and which, for example, are guided in a cage 34 or corresponding grooves in the base plate 1, insure that when the base plate 1 has been screwed together with the housing 4 at the mounting edge 35, the critical distance 36 between the inner surface of the housing and the inner surface of the base plate 1 remains constant. A spring 37 also serves to press the control disc 2 against these balls. It can also be seen from FIGURE 3 that the terminals are all provided on one side, only the metal lugs 15 and not the soldering lugs 16 being available in FIG. 3, while on the other side it is possible for the drive to be connected.

FIG. 4 also shows another possibility of mounting the contact arms. In the housing 4, integral with the metal part which pivots about the projection 14, i.e. forms open bearings for the notch 13 of the contact arm 6, there is provided a guide member 38, which terminates in a metal lug 39 on the housing. The metal lug 39 extends parallel to the metal lug 15 and facilitates the connection of parallel plug sockets. This guide member 38 has a recess 40. This recess 40, together with the recess 41 in the contact arm, forms the guide for the contact spring 11. The contact spring 11 is now situated parallel to the contact, which is formed by the contact surfaces to the notch 13 and the projection 14, so that these contact surfaces are kept apart by means of the parallel disposed spring. There has also been obtained a closed circuit between the contact spring 11 and the mounting of the notch 13 on the projection 14. This is particularly convenient when recesses for the guide of the spring loading the contact arm are provided in the housing and in the contact arm, the guide member accommodated in the housing forming a metallic live conducting unit with the semi-open bearing and the spring which participates in the current supply.

It is important for the guide member to terminate in a metal lug 15 or metal lug 39 in the housing.

Suitable fields of application of the present invention are all cases wherein it is intended to use concentric cam tracks for controlling fully automatic washing machines, and where it is necessary to obtain operational reliability and a cheap method of manufacture.

What I claim is:

1. A device for controlling automatic washing machines, comprising: a control disc; a plurality of concentric cam tracks on a face of said disc and having cam surfaces transverse to said disc; a plurality of flat contact arms corresponding to the plurality of said cam paths, said arms being arranged in groups around the center of the disc with the arms pertaining to each group being disposed in parallel relationship and arranged in tangential direction with respect to said disc, the flat surfaces of said arms being perpendicular to the plane of extension of the disc; a guide member for each of said contact arms and extending also transversely to said disc; a stationary contact on each of said guide members; a cam follower on a first end of each contact arm and engageable with a corresponding cam track whereby cam followers engaging adjacent tracks pertain to different groups; means for pivotally mounting the other end of each contact arm, the pivot axis for each contact arm extending in the plane of extension of said disc and transversely to the plane of extension of the flat contact arm; a movable contact at said first end of said contact arm and engageable with said stationary contact; spring means acting against said contact arm to urge the contacts into engagement; and means for supporting said disc near its circumference.

2. A device, as claimed in claim 1, wherein said mounting means comprises a rounded support with a groove in said contact arm other end engaging said rounded support, said spring means being spaced from said mounting means.

3. A device, as claimed in claim 1, and further comprising terminals for said stationary and movable contacts with said terminals being located on one side of said device.

4. A device, as claimed in claim 1, and further comprising a housing for said device, terminals for said stationary and movable contacts projecting from one side of said housing and means for driving said control disc on the opposite side of said housing.

5. A device, as claimed in claim 1, said supporting means comprising a plurality of ball bearings supporting the other face of said control disc, a cage retaining said ball bearings, and spring means urging said control disc against said ball bearings.

6. A device, as claimed in claim 1, and further comprising a housing, there being means in said housing defining recesses, there being opposing and cooperating recesses in said contact arms, said spring means being positioned within pairs of cooperating recesses, said recess defining means being connected to said mounting means and forming with said spring means a current conducting unit.

7. A device, as claimed in claim 6, and comprising a

terminal on each recess defining means and extending outwardly of said housing.

8. A device, as claimed in claim 6 and further comprising terminal pins extending from said recess defining means and the mounting means connected thereto to form a tubular contact.

9. A device, as claimed in claim 5, wherein said ball bearings engage said control disc adjacent the outer periphery thereof.

10. A device, as claimed in claim 1, with said cam tracks extending over the entire face of said control disc.

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