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(54) Mechanical device suitable for power output in microwave type cooking appliances.

(57) The proposed device comprises: a wheel (1) in continuous rotation, having a drum (12) comprising at least one suitably shaped notch (13) in its lateral surface; a lever (3) pivoted on a pin (31), having one end (32) in contact with the outer lateral surface of said drum (12) and the opposite end (33) suitable for operating a pair of microswitches (4, 5) by pressing down relevant operanting keys (41, 51); a pair of microswitches (4, 5) positioned at a different distance with respect to the pin (31) , each microswitch (4, 5) having an operating key (41, 51); a spring (6) surrounding the portion of the pin (31) opposite the front end (35) , suitable for the traverse of the lever (3) in the direction of the axis of the pin (31); a cam (7) integral with a rotating hand grip (72) suitable for setting the cooking power value, said cam being provided with a shaped profile (71), in contact with the front end (35) of the pin (31), the profile (71) consisting of a set of points making up a curve and placed at different distances (D) from the surface (72a) of the hand grip (72).

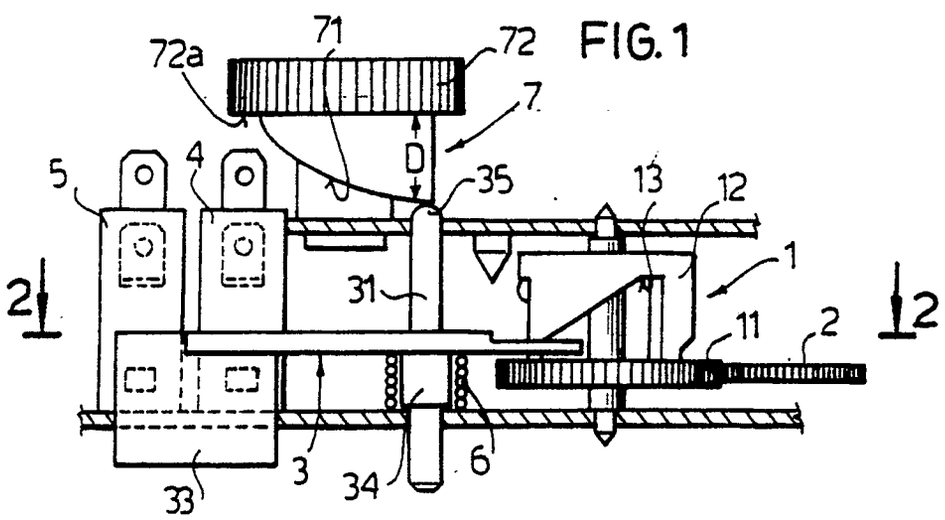

FIG. 1

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MECHANICAL DEVICE SUITABLE FOR POWER OUTPUT IN MICROWAVE TYPE COOKING APPLIANCES

The present invention applies to the field of power output regulators for cooking appliances, particularly microwave ovens.

The high value of the current absorption peak is known, which occurs on the insertion of the microwave generator. The said insertion can take place only at the beginning of cooking, in the case where power is selected equal to 100% of that which is the output of the oven, or at the beginning of each cooking cycle (10 - 40 secs), when cooking is carried out at reduced power. Many realizations of devices are already known, of electromechanical nature, suitable for limiting these current peaks; some of these comprise a pair of cascade connected relays, which insert a curent limiter resistance for brief instants, others, on the other hand, adopt a double laminate switch. Both the devices described give performances which are not always satisfactory in terms of cost, lasting qualities and reliability; in addition, the manufacture of doble laminate switches is difficult.

The aim of the present invention, therefore, is to avoid the disadvantages described, by realizing an electromechanical power regulator device, comprising a cooking duration timer and a power output variator, which has better reliability properties, and a long usable life, and is simple to carry out at moderate cost.

The said aim has been achieved by realizing a regulator device according to the enclosed claims.

The present invention will now be described more clearly with reference to the enclosed drawings, in which:

figure 1 shows a horizontal section of the device, according to the present invention, in a first working position;

figure 2 shows a horizontal section of the device, taken along the line 2-2 in figure 1;

figure 3 shows a horizontal section of the device, according to the present invention, in a second working position;

figure 4 shows a detail of the section in figure 3, taken along the line 4-4 in figure 3;

figure 5 shows a detail of the section in figure 3, seen from the opposite direction.

With reference to figures 1 and 2, it can be seen that the proposed device is composed of a reference wheel 1, which has a crown gear 11 and a drum 12, free to rotate around a pin 13. The wheel 1 is set into rotation at constant speed by means of a wheel gear 2, making up part of the timer device of the cooking appliance, which engages with the crown gear 11. The drum 12 is of hollow cylinder shape and has a plurality of notches 13 along its lateral surface, with variable profile and angular extention. In the drawings, the notches 13 are shown in a number equal to three, in the shape of a rectangular trapezium with its altitude located near the crown 11. Parallel to the pin 13 of the wheel 1 there is a pin 31, on which a tracer lever 3 is pivoted , having one of its ends 32 which slips along the outer surface of the drum 12. The lever 3 has its other end 33 in contact with a pair of keys 41 and 51 which operate a pair of microswitches 4 and 5 respectively. The microswitches are positioned side by side, and the microswitch 4 is positioned nearer the pin 31.

With reference once more to figure 1, it can be seen that the pin 31 consists of a shaft provided with a projection 34 in its central part, with a larger diameter. The lever 3 is in contact with the front surface of the projection 34. A spring 6 is located below the lever 3, so as to surround the pin 31. In this way, when the compression of the spring 6 varies, the pin 31 traverses along its own axis, drawing the lever 3 with it. The front end 35 of the pin 31 is in contact with the appropriately shaped profile 71 of a cam 7, integral with a hand grip 72. The shaping of the profile 71 is such that it consists of a set of points making up a curve, positioned at a variable distance D from the surface 72a of the hand grip 72. The rotation of the hand grip 72, which is carried out manually by the person who sets the cooking power, determines the rotation of the profile 71 and therefore the transverse motion of the pin 31 along its own axis; that is, it produces, in its turn, the variation in compression of the spring 6.

The device works as follows: during the continuous rotation of the wheel 1, the end 32 of the lever 3 slips along the outer surface of the drum 12; the end 33 determines for example, in these conditions, the "on" position of the microswitches 4 and 5, since the keys 41 and 51 are pressed down. When the end 32 meets one of the notches 13, this causes a slight rotation of the lever 3 around the pin 31; in this way, the end 33 releases the keys 41 and 51 (see figure 2) and the microswithches 4 and 5 come into the "off" position. In this way, a series of "on" - "off" cycles of the microwave generator, lasting from between 10 - 40 secs, and equal to the number of the notches 13, corresponds to each rotation of the wheel 1. It will be seen that the different distance of the microswitches 4 and 5 from the pin 31 causes the key 41 to be pressed down before the key 51, while the key 51 is released before the key 41. It is precisely this slight phase displacement between the moment of the operation of microswitches which operate the microwave generator (not shown in the

figures) which determines the insertion for brief instants of a current peak limiter resistance, which is also connected to the microswitches.

To obtain variation of the cooking power, as has been said, the hand grip 72 is operated. In the figures 1 and 2 the handle 72 is shown in the minimum power position; that is, the lever 3 is in its furthest back position, with its end 32, which slips on the drum 12 positioned near to the crown gear 11, in correspondence with which the width of the notches 13 (and therefore the duration of the "off" periods) is greater. By rotating the hand grip 72 in such a way as to set higher power, the compression of the spring 6 is decreased, the lever 3 traverses upwards (in figure 1) and the end 32 moves towards a region of the drum 12 in which the notches 13 are of smaller width.

If it is desired to set a cooking power equal to 100% of the power output of the oven, the situation which is shown in figures 3 and 4 occurs; the spring 6 is in the minimum compression position and the end 32 of the lever 3, which is in the position P1, tends to slip along the outer wall of the drum 12 in a zone without notches 13. In order to reduce the wear on the end 32 which would thus result (it must be considered that in about 70% of cases cooking is carried out at 100% of the power), a cylindrical shaped peg 8 (see figure 5) having a conical point is introduced, fastened to the outer wall P of the support frame of the device. By rotating the hand grip 72 towards the maximum power position, the arm of the lever 3 nearest the end 32 slides along the conical point of the peg 8 and comes into a position in which the end 32 is slightly separated from the outer surface of the drum 12.

In this way an electromechanic device for regulating the power output of a microwave oven has been realized, which meets the aforesaid aim; its structure is simple, and easy and economical to produce; it has a high degree of reliability and long lasting qualities, thanks to the absence of electronic components or laminate switches.1

Claims

1. An electromechanical device suitable for regulating power output in cooking appliances of the microwave type characterized in that it comprises:

- a wheel (1) in continouous rotation, having a drum (12) comprising at least one notch (13) along its lateral surface, the said notch (13) having a suitable shape;
- a lever (3) pivoted on a pin (31), the said lever (3) having one end (32) in contact with the outer lateral surface of the drum (12) and the opposite end (33) suitable for operating a pair of microswitches (4, 5) by means of pressing down operating keys (41, 51);
- a pair of microswitches (4, 5) positioned at a different distance with respect to the pin (31), each microswitch (4, 5) being provided with an operating key (41, 51);
- a switch (6) surrounding the portion of the pin (31) opposite the front end (35), suitable for the traverse of the lever (3) in the direction of the axis of the pin (31);
- a cam (7) integral with a rotating hand grip (72) suitable for setting the cooking power value, said cam (7) being provided with a shaped profile (71), in contact with the front end (35) of the pin (31), the profile (71) consisting of a set of points making up a curve and positioned at different distances D from the surface (72a) of the hand grip (72).

2. A device according to Claim 1, characterized in that the notches (13) are of a number higher than one.

3. A device according to Claim 2, characterized in that the notches (13) have equal angular extensions.

4. A device according to Claim 2, characterized in that the notches (13) have different angular extensions.

5. A device according to Claim 2, characterized in that the notches (13) have profiles equal to each other.

6. A device according to Claim 2, characterized in that the notches (13) have different profiles.

7. A device according to Claim 2, characterized in that at least one of the notches (13) has a rectangular trapezium shaped profile with its altitude adjacent to the crown gear (11).

8. A device according to any one of the previous Claims, characterized in that it comprises a peg (8) having a cylindrical form and conical point, fastened to the outer wall (P) of the frame of cooking appliance, suitable for engaging with the arm of the lever (3) nearest the end (32), when this is in the position (P1), so as to keep the end (32) slightly separated from the outer surface of the drum (12).

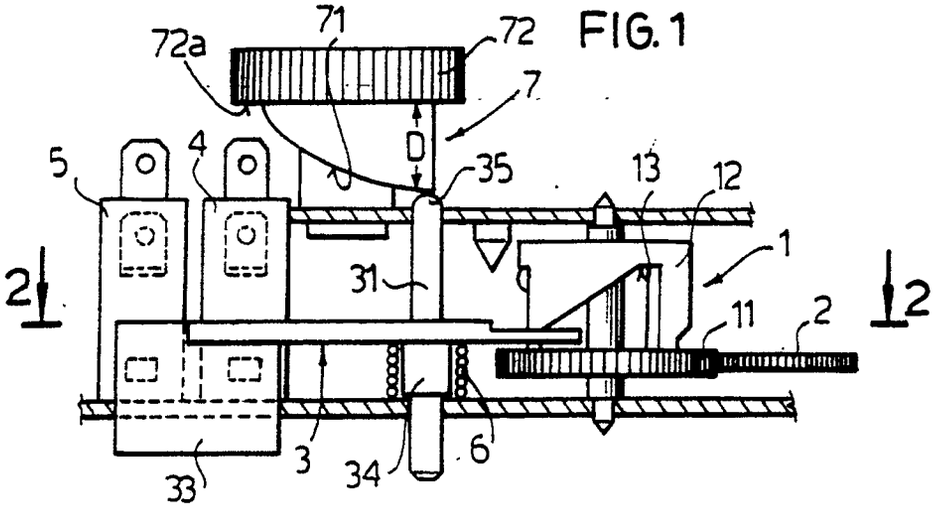

FIG. 1

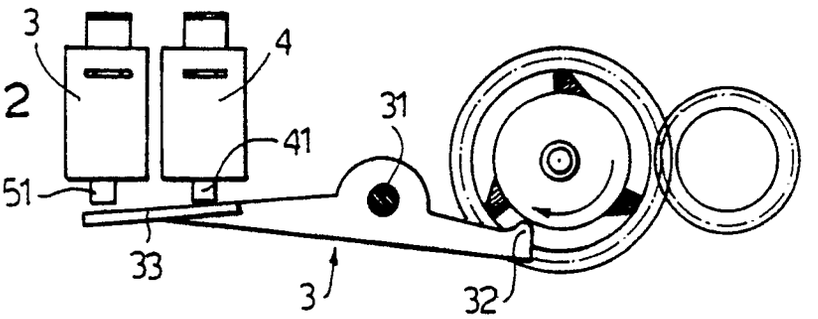

FIG. 2

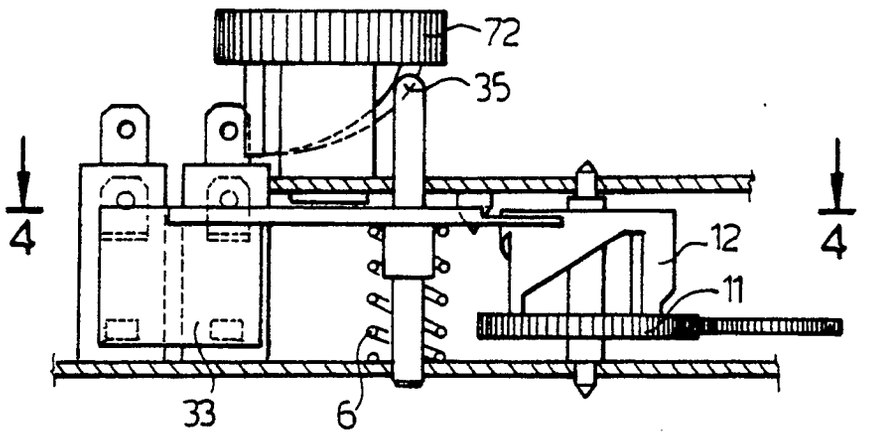

FIG. 3

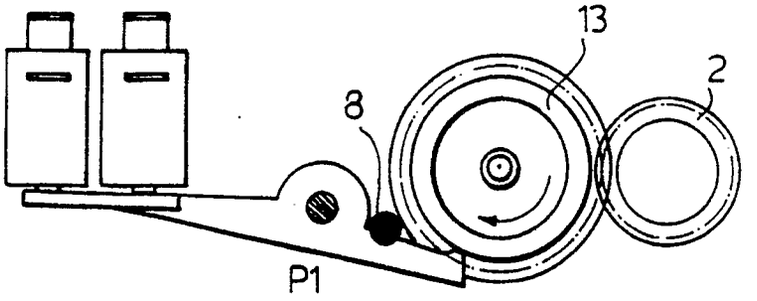

FIG. 4

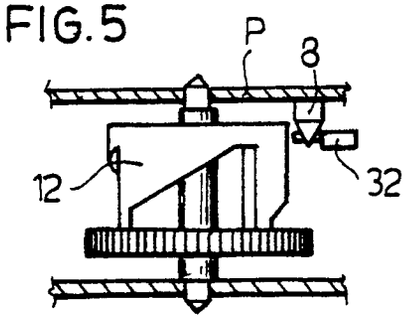

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 9329

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4133998 (OTANI) * column 4, line 18 - column 5, line 38; figures 5-8 *	1	H05B6/64 H05B6/80
A	FR-A-1465547 (CARPANO & PONS) * page 1, right-hand column, line 34 - page 3, left-hand column, line 9; figure 2 *	1, 7	
A	GB-A-2068182 (TOKYO SHIBAURA DENKI KABUSHIKI KAISHA) * page 2, line 107 - page 3, line 20; figure 5 *	1, 7	
A	US-A-4177370 (OTANI)		
A	US-A-4798970 (OKAMOTO ET AL.)		
A	DE-A-3603063 (ALFONS WEISS KG)		
A	US-A-3889091 (ISHIKAWA)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 JULY 1990	RAUSCH R.G.

CATEGORY OF CITED DOCUMENTS

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

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

& : member of the same patent family, corresponding document

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