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I-20145 Milano (IT)(54) **Safety door lock structure particularly for washing machines with built-in electronic system.**

(57) The safety door lock structure particularly for washing machines with built-in electronic system is provided with an electromechanical device (2) which is contained in a containment body which can be associated with the cabinet of the washing machine; the device includes a power microswitch (5) for starting the washing machine and an electromagnet (6) connected to a mechanical means (7) for bloc-

king and releasing the door (12) of the washing machine; the means has a first slider member (8) and a second slider member (9) which are activated, in contrast with, and by virtue of, the action of a first elastic means (10), both by the door to automatically block it in closed position and by the electromagnet to instantly release the door from the closed position to an open position.

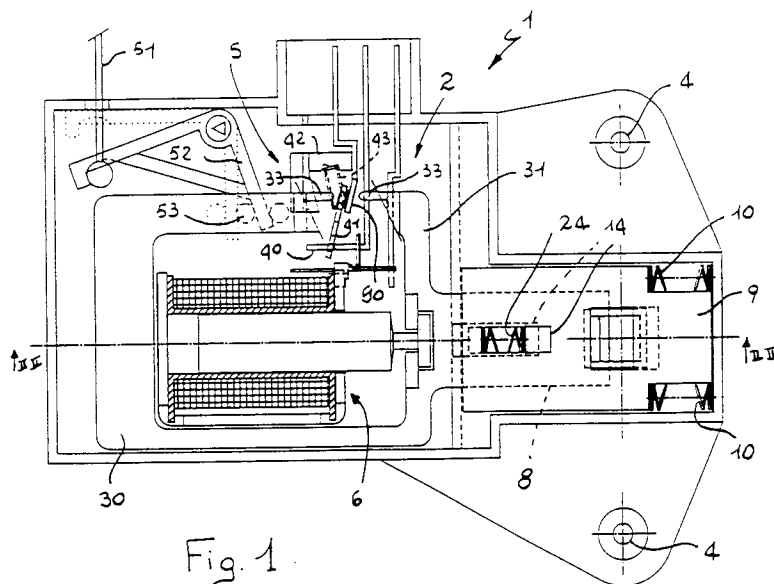


Fig. 1

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The present invention relates to a safety door lock structure particularly for washing machines with built-in electronic system.

As is known, current statutory provisions prescribe, in the specific case of washing machines with a rotating basket, that these machines must be equipped with a means which allows to open the door (possibly provided with a window) only when the machines are switched off and when the basket is not moving or almost motionless.

Various devices have been provided for this purpose which use the expansivity of solid bodies or the expansion of substances with a high expansion coefficient contained in telescopic cells.

Other devices instead use a magnetic field generated by energized coils which move part of the magnetic circuit and are suitable to instantly block the slider and thus the door of the washing machine.

Devices are also known in which the delayed release of the door opening system is obtained by using the slow and controlled return of a bellows into the inactive position; the bellows is similar to a pneumatic device which can be quickly compressed during startup and the slow expansion of which is controlled by the rate at which air is vented or drawn in.

It is also known that currently the most sophisticated washing machines have an electronic system which supervises the operation of the machine and thus, among other things, also controls the blocking and release the door of the washing machine.

In these kinds of machine with a built-in electronic system, and most of all in washing machines of the combined washing and drying type, the above described safety devices are generally poorly effective, since for example the use of bimetallic members, like the use of expanding materials, does not allow the device to block the slider of the door of the machine instantly.

This fact depends on the inertia of the device and on any settings, which farce compromise solutions between the time set for blocking the slider of the door of the machine and the time for its release, which must be delayed until the basket of the machine is not moving or almost motionless.

Essentially, all commercially available devices have more or less important drawbacks which are due to the fact that their operation always entails a compromise between the slider blocking time, which must be extremely short, and the slider release time, which must be delayed by a preset amount to allow the total stopping of the moving parts of the machine.

As already mentioned, these drawbacks are also further aggravated if the device are applied on washing machines of the combined washing and

drying type.

In this type of machine, the temperature at the end of the operating cycle is in fact extremely high and therefore decisively affects for example devices for releasing the slider of doors which use, for their operation, the expansivity of solid bodies or the expansion of a substance which has a high expansion coefficient.

The aim of the present invention is to eliminate the drawbacks described above by providing a safety door lock structure particularly for washing machines with built-in electronic system which allows immediate startup of the machine as soon as the door has been closed and no delay at the end of the cycle, when the basket has stopped.

Within the scope of this aim, an important object of the invention is to provide a safety door lock structure particularly for washing machines with built-in electronic system which allows immediate startup of the machine as soon as the door is closed, both during drying and during inspection of the dried clothes, even if the cycle of the machine has not ended.

Another object of the invention is to provide a safety door lock structure particularly for washing machines with built-in electronic system which, in addition to being applicable indifferently to any model of washing machine, allows the immediate blocking of the door latch, once the door has been closed, and keeps it blocked for all programmed functions, such as for example the rpm rate of the basket, the water level, the water temperature, etc.

This aim, these objects and others are achieved by a safety door lock structure particularly for washing machines with built-in electronic system which has an electromechanical device, contained in a containment body which can be associated with the cabinet of the washing machine, which includes a power microswitch for starting the washing machine and an electromagnet which is connected to a mechanical means for blocking and releasing the door of the machine, characterized in that the mechanical means has a first slider member and a second slider member, both of which are activated, in contrast with and by virtue of the action of a first elastic means, both by the door to block it automatically in closed position and by the electromagnet to instantly release the door from the closed position to an open position.

Further characteristics and advantages will become apparent from the detailed description of a door lock structure according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a plan view of the door lock structure according to the invention;

Figure 2 is a sectional view, taken along the plane II-II of Figure 1, of the door lock structure

according to the invention; and

Figures 3, 4 and 5 are views of the various steps of the movement of the slider members during the blocking of the latch of the washing machine door.

With reference to the above described figures, the door lock structure according to the invention, generally designated by the reference numeral 1, includes an electromechanical device, generally designated by the reference numeral 2, which can be associated with the cabinet or with the frame of the washing machine by means of the two holes 4.

The electromechanical device 2 includes a power microswitch 5 for starting the washing machine; the microswitch is connected to a mechanical means for blocking and releasing the door 12; the door is partially shown in the drawings, and the means is formed by a first slider member 8 and by a second slider member 9.

The mechanical means 7 is conveniently activated, in contrast with and by virtue of the action of a first elastic means, more precisely of two springs 10, both by the latch 11 of the door 12, so as to block the door in a closed position, and by the electromagnet 6, in order to release the latch 11 and thus allow the door 12 to move from a closed position to an open position.

Advantageously, as more clearly shown in Figures 3, 4 and 5, the first and second slider members 8 and 9 include a means to allow their offset movement during blocking and release of the door 12.

The movement means is formed by a second elastic means and more precisely by a second spring 24 accommodated in a first and second seats 14 which are formed in the first and second slider members one above the other and mutually communicating.

In particular, the spring 24 is on one side retained between the wall 15 of the second slider member and on the other side by the wall 16 of the first slider member respectively.

Furthermore, the end of the wall 15 is engaged in the first seat 14 of the first slider member 8 and abuts the wall 17 of the slider member. The end of the wall 16 is engaged in the second seat 14 of the second slider member 9 and abuts the wall 60 of the second slider member. In this manner the first and second slider members can slide selectively in contrast and by the action of the two springs 10 and of spring 24. It is apparent that the use of only one spring 24, for operating both the first and second slider members, allows to reduce considerably the size of the mechanical means for locking and releasing the door.

Furthermore, at least the second slider member 9 includes an opening 19 inside which the latch 11 of the door 12 engages.

The opening 19 has an inclined wall 20 which during door closure engages, so that it can slide, the inclined wall 21 of the latch 11 to move the second slider member to the right.

During the movement of the second slider member, it can be seen, as shown in Figure 4, that the first slider member has not moved at all, since its wall 22 is blocked by the wall 23 of the latch 11.

In this condition, the spring 24 accommodated in the seats 14 is compressed, allowing exclusively the movement of the slider member 9 with respect to the first slider member 8.

Subsequently, as shown in Figure 5, when the door is in closed position, the second slider member is at its stroke limit and the first slider member, by virtue of the release of the spring 24, has moved below the wall 23 of the latch 11, thus blocking it.

In this closure position, the latch 11 furthermore compresses, for example, a third elastic means, and more precisely a third spring 25 which, during the opening of the door 12, facilitates the protrusion of the latch 11 from the opening 19.

As shown in Figure 1, it can furthermore be seen that the first slider member 8 is connected to the electromagnet 6 and has two arms 30 and 31 which extend perimetrically with respect to the electromagnet 6.

The ends of the two arms 30 and 31 thus face each other, are spaced and are suitable to actuate, by means of two fingers 33, the microswitch 5 during their movement from left to right and vice versa, respectively during the blocking of the door 12 and during its release.

The power microswitch 5 includes a first fulcrum member 40 of a moving contact 41 and a second fulcrum member 42 of a spring 43.

The spring 43 engages a pin which is located at one end of the rod which forms the moving contact, whereas the opposite end of the spring is rounded and engages the first fulcrum member 40.

In this manner, the moving contact 41 is moved from a first position to a second position and vice versa, with a transfer speed which is independent of the movement speed of the two end fingers 33 of the arms 30 and 31 of the first slider member.

This solution advantageously allows to close and open the electrical contacts with no sliding between the moving contact and the slider and thus without friction and wear.

The closure of the contact furthermore has a snap action without uncertainties, thereby limiting the forming of microwelds between the moving contact and the fixed contact 50.

Furthermore, if the first slider member 8 does not move due to interruption of the coil or to sticking of the contacts, the device in any case

maintains its block on the latch 11 and does not allow to open the door.

In these conditions it is then possible to act manually to release the latch 11 by means of a traction member 51 which is connected to a rod 52 which is pivoted to the body 3 and engages the first slider member 8 by means of two pins 53.

The fact should also be stressed that when the door is in closed position, and thus the latch 11 is blocked, the moving contact 41 closes the circuit and rests on the fixed contact 50.

In case of release, i.e. in a position opposite to the one shown in Figure 1, the moving contact 41 can rest on the side of the body 2 or on a second fixed contact, not shown in the drawings, which allows for example to activate a light-emitting signal which is suitable to indicate that it is possible to access the inside of the machine.

The operation of the door lock structure according to the invention is evident from what has been already described and illustrated.

In particular, with reference to the figures shown, operation can be summarized in three steps.

In the first step (door open, Figure 3), the power microswitch is open, and the first slider member 8 and the second slider member 9 are in release position.

In this condition, the power microswitch 5 does not allow the machine to start.

In step 2, the door is closed and the latch 11 is thus blocked.

In this step, the latch 11 performs its closure stroke and presses on the inclined wall 20 of the second slider member 9, moving it to the right (Figure 4).

This movement loads the spring 24 which, in turn, pushes the first slider member 8 below the tooth of the latch 11 only and exclusively when it has performed a further stroke of at least 0.5-1 mm.

In this condition, the latch 11 is blocked and the microswitch switches from normally-open to normally-closed, allowing to start the machine.

In the third step, for releasing the latch 11 and thus for opening the door, the coil 6 is energized by means of an external button, not shown in the drawings, which is present on the panel of the machine.

When the coil is energized, it generates a magnetic field which attracts its core, which is fixed to the first slider member 8, which in this case moves to the left, releasing the latch 11 and simultaneously switching the power microswitch 5 from the closed-contact position to the open-contact position. At the same time, since the latch 11 is disengaged from the second slider member 9, the thrust of the spring 25 expels the latch from its

seat, resuming the conditions of step 1.

In practice it has been observed that the door lock structure according to the invention is particularly advantageous in that it allows the machine to start immediately as soon as the door has been closed and allows no delay at the end of the cycle, when the basket has stopped both during the drying step, if any, and for inspecting the dry clothes, even if the complete cycle of the machine has not ended.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Safety door lock structure particularly for washing machines with built-in electronic system, provided with an electromechanical device (2) contained in a containment body which can be associated with the cabinet of the washing machine, which comprises a power microswitch (5) for starting the washing machine and an electromagnet (6) which is connected to a mechanical means (7) for blocking and releasing the door (12) of said machine, said mechanical means having a first slider member (8) and a second slider member (9), both of which are activated, in contrast with and by virtue of the action of a first elastic means (10), both by said door to block it automatically in closed position and by said electromagnet to instantly release said door from said closed position to an open position, characterized in that said slider members (8; 9) comprise a movement means having a second elastic means, accommodated in superimposed and communicating seats (14) formed in said first and second slider members, wherein said second elastic means are constituted by a spring (24) arranged at said superimposed seats (14), an end of said spring engaging a wall (15) of said second slider member (9) and the opposite end of said spring engaging a wall (16) of said first slider member (8) for selectively moving said slider members (8,9) during the locking and release of said door.
2. Structure according to claim 1, characterized in that at least said second slider member (9)

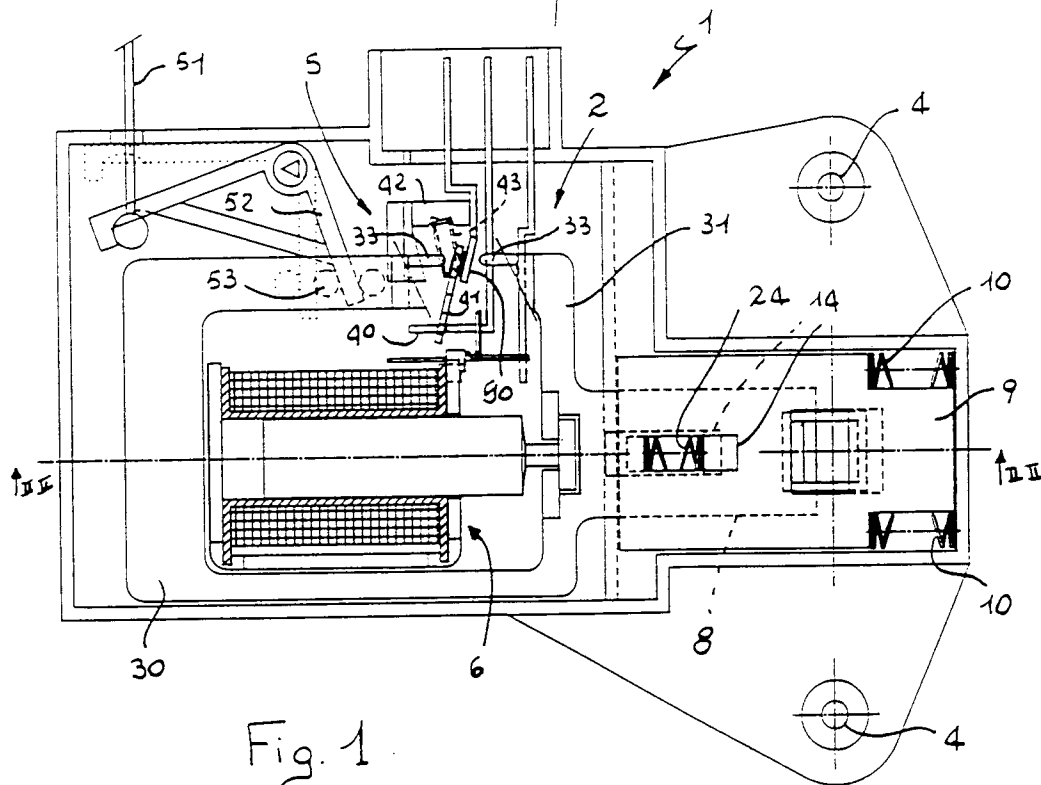
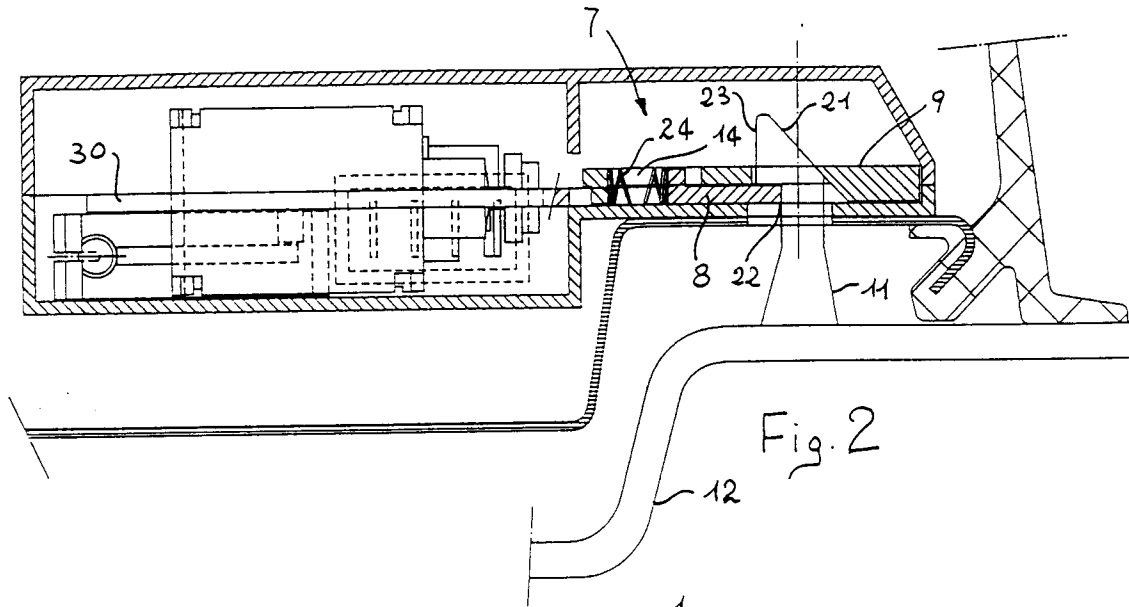
comprises an opening (19) inside which a latch (11) of said door (12) engages, said opening having at least one inclined wall (20) which engages, by sliding, an inclined wall (21) of said latch for the movement of said second slider member in contrast with, and by virtue of the action of, said first elastic means (10).

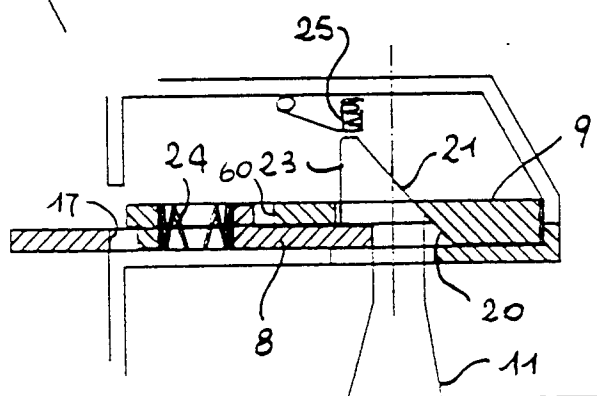
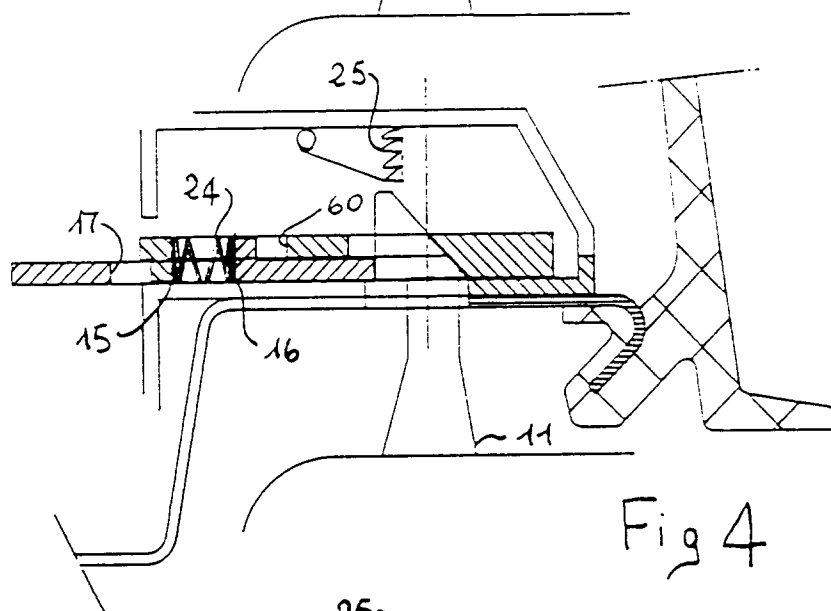
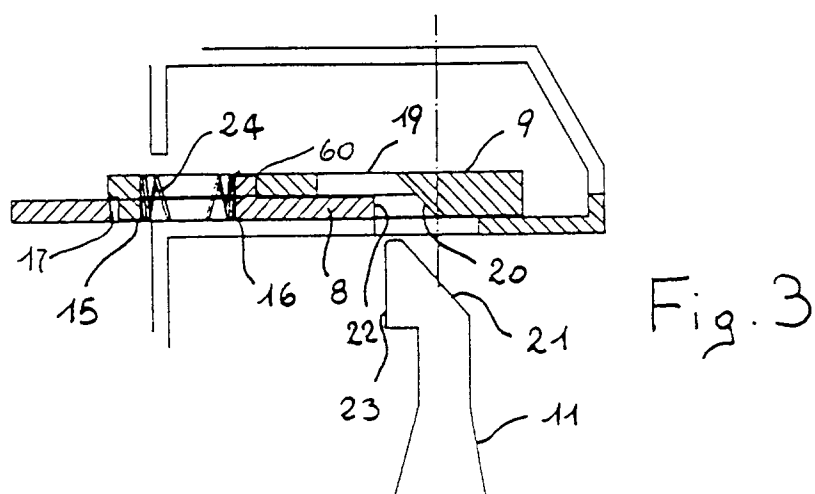
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3. Structure according to claim 1, characterized in that said first slider member (8) is connected to said electromagnet (6) and has two arms (30; 31) which extend perimetrically with respect to said electromagnet and the ends of which face each other and are spaced; said ends are suitable to actuate said power micro-switch (5) during their movement. 10 15
4. Structure according to claim 1, characterized in that it comprises a lever with a traction member (51) which is pivoted to said body (3) and engages at least one of said arms (30; 31) for its manual movement. 20
5. Structure according to claim 1, characterized in that said microswitch (5) comprises a first fulcrum member (40) of a moving contact (41) and a second fulcrum member (42) of a spring (43) which engages an end of said moving contact which is opposite to said first fulcrum member in order to move said moving contact from a first position to a second position and vice versa with a movement speed which is independent of the movement speed of said ends of said arms (30; 31). 25 30 35
6. Structure according to claim 5, characterized in that said moving contact (41) comprises a rod in which one end portion, which engages said first fulcrum, is rounded and the opposite end, which engages said spring, is provided with a pin. 40
7. Structure according to claim 2, characterized in that said latch of said door engages with, and disengages from, said openings in contrast with, and by virtue of the action of, a third elastic means (25). 45

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EUROPEAN SEARCH REPORT

Application Number
EP 93 11 9089

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)
Y	GB-A-1 604 581 (SERVIS DOMESTIC APPLIANCES LTD) * page 2, line 54 - page 3, line 34; figures 1,2,3 *	1,2	D06F37/42
A	---	3	
Y	EP-A-0 439 849 (ROCCHITELLI, O.) * column 3, line 40 - column 6, line 49; claim 1; figures 1,3 *	1,2	
A	---	4	
A	FR-A-2 165 554 (FABBRICA EQUIPAGGIAMENT MECCANICO ELETTRICI) * the whole document *	1	
A	---	1	
A	EP-A-0 347 592 (ELLENBERGER & POENSGEN GMBH) * page 4, line 48 - page 5, line 19; figures 2-5 *	1	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			D06F
Place of search		Date of completion of the search	Examiner
THE HAGUE		8 March 1994	Munzer, E
CATEGORY OF CITED DOCUMENTS			
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