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(71) Applicant: **ELECTROLUX PROFESSIONAL S.p.A.**
33170 Pordenone (IT)

(72) Inventor: **DRAGAN, Raus**
33080, Porcia (PN) (IT)

(74) Representative: **Giugni, Valter et al**
PROPRIA S.r.l.,
Via Mazzini 13
33170 Pordenone (IT)

(54) Arrangement for cleaning inner surfaces of cooking ovens

(57) The present invention refers to an arrangement for cleaning a cooking cavity of an oven comprising: first storage means for containing the cleaning substances, second means adapted to pump out said substances and control the flow thereof through pre-defined flowpaths, third means for directing said substances against the inner walls of the oven, fourth means adapted to enable said third means to be temporarily and removably installed inside said oven cavity, and control means adapted to allow for at least a cleaning programme to be automatically performed and carried through, wherein said first and said second means and said control means are so arranged and are adapted as to be able to operate and/or be operated outside said oven cavity, and said third and fourth means are so arranged and are adapted as to be able to operate and/or be operated inside said oven cavity.

Said first means comprise a reservoir holding the detergent or washing product and a reservoir provided to hold the rinsing aid, whereas said second means comprise respective conduits that are connected to said two reservoirs, are provided with respective electromagnetic valves, and eventually converge to meet into a single delivery conduit provided with a respective delivery pump.

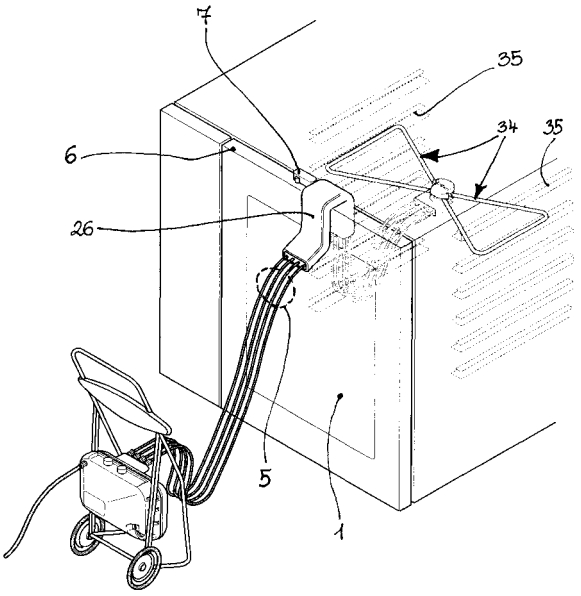

FIG.2

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Description

[0001] The present invention refers to an improved arrangement intended for use in cleaning inner surfaces of cooking ovens, in particular cooking ovens for professional kitchens and mass catering applications.

[0002] Cooking ovens, as used in both residential or consumer applications and mass catering applications in professional kitchens, are generally known to be systematically subject to soiling, i.e. becoming dirty to an even heavy extent owing to a number of factors, as this is well-known to all those skilled in the art.

[0003] The substances that tend to settle onto the walls of an oven during cooking mostly include cooking debris and residues, such as small fragments of food, spices or flavours, which, owing to the intense heat which the food being prepared is submitted to, keep bursting at the surface of the food to splash and settle onto the very hot walls of the oven cavity, where they eventually get scorched and charred within a very short period of time.

[0004] These cooking residues tend further to accumulate, thereby giving rise to three major kinds of drawbacks:

- a first drawback lies here in the fact that the scorched food residues piling up on the inner walls of the oven is a quite unappealing, off-putting view to an outside viewer, i.e. a view that tends to arouse a feeling of sloppiness and poor hygiene in cooking and food preparation operations in general, thereby conferring a rather poor overall impression, as this on the other hand generally occurs with all other cooking implements when left unclean;

- a second, much more concrete drawback derives from the fact that the presence of food residues inside the cooking cavity of the oven - although generally scorched and charred - is quite likely to give rise, at least in the long run, to serious hygienic problems as all those skilled in the art are readily capable of figuring out, so that they shall not be dealt with here any longer;

- a third drawback derives from the fact that food residues settling onto the walls of the oven may undergo further charring and/or even be reduced to ashes during subsequent cooking operations done at a high temperature, so that they may give rise to even heavy smoke development that most obviously would not assist in completing a regular cooking operation, and - upon opening the oven door - would moreover escape into the surrounding environment with easily imaginable detrimental effects.

[0005] Therefore, in view of being able to ensure a regular, systematic cleaning of the inner walls of the oven, various processes, methods and arrangements have been devised and implemented, all of which may be subdivided into two main categories.

[0006] The first one of these categories includes those solutions that share the basic fact of making use of cleaning arrangements that are entirely incorporated in the structure and the other functional devices and parts of the oven, and that are activated to operate through working cycles normally residing in the operating programmes provided in the control unit of the same oven; these solutions are generally exemplified in EP 0 652 405 A1, as well as the patent documents cited as references thereto.

[0007] This kind of solutions to the oven cleaning problem is usually quite effective and befitting in ensuring a sufficient cleaning effect; it however has an unfortunately non-avoidable drawback in that it implies the necessity for the complexity of the oven and, as a result, the overall costs thereof, to be increased to a significant extent.

[0008] In addition, this kind of solution requires being integrated in the design and engineering process of the oven, i.e. being co-designed and engineered, so that, when an existing oven of a traditional kind has at a later time to be fitted with means for cleaning the interior thereof, it is practically impossible for this solution to be implemented.

[0009] The second above-mentioned category includes on the contrary those solutions which call for the implementation and use of external add-on means that must each time be preliminarily installed inside the oven cavity, and that - upon completing the cavity cleaning process - must therefore be again removed from the oven cavity and suitably stored somewhere else.

[0010] A good example of a solution of this kind is described in EP 1 270 096 A2. However, although generally effective and flexible, since it allows the described apparatus to be actually installed in a great variety of even quite different types of ovens, the solution being disclosed there meets with clear convenience limits in practical use, mainly due to the fact that the cleaning apparatus itself is very heavy and awkward to handle owing to all of the operating and functional parts thereof, along with the various reservoirs containing the cleaning agents, i.e. the detergent and similar products, are housed in the same apparatus.

[0011] In addition, the same considerable size and bulk of the apparatus create some difficulty in the capability of effectively reaching the entire inner surface of the oven, since some portions thereof may actually be kind of "masked", i.e. hidden by the large bulk of the apparatus itself.

[0012] It would therefore be desirable, and is actually a main object of the present invention, to provide an oven cleaning arrangement of the kind as described above in connection with the second category of solutions, which however is effective in doing away with the drawbacks and disadvantages of such solutions in connection with the use and operation thereof.

[0013] According to the present invention, these aims are reached in a particular type of arrangement for cleaning the inner surfaces of a cooking oven incorporating

the characteristics and features as recited in the appended claims, and described in greater detail below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective, partially see-through view of the main assemblies making up an oven cleaning arrangement according to the present invention;
- Figure 2 is a symbolical view of a one of the assemblies shown in Figure 1, in a resting, i.e. non-operative state thereof;
- Figure 3 is a symbolical, isolated view of two members of an oven cleaning arrangement according to the present invention;
- Figure 4 is a symbolical, schematical view of the liquid-carrying circuit of an oven cleaning arrangement according to the present invention;
- Figure 5 is a symbolical view illustrating the operation mode of the inventive oven cleaning arrangement when inserted inside the cooking cavity of the oven;
- Figure 6 is an enlarged, isolated view of the central spray body shown in Figure 5;
- Figure 7 is a view of an embodiment of a sub-assembly of the inventive oven cleaning arrangement and an installation mode thereof.

[0014] With reference to Figures 1 and 2, the present invention is substantially based on subdividing the cleaning members and devices described in the afore-cited patent EP 1 270 096 A2 into two physically separated assembles, wherein one of these assemblies is located inside the cooking cavity 1, while the other one is located outside. In an advantageous manner, this second assembly provided for installation outside the cooking cavity is brought together and contained inside an appropriate casing 2, which can in turn be mounted on a small transportable cart, so as to be able to be moved close to the oven when the latter has to undergo a cleaning operation, and then moved away therefrom to a more convenient resting position, or storage place, when it is not being used.

[0015] With reference to Figures 3, 4, 5 and 6, the assembly that is located inside the oven cavity is comprised of one or more distribution chambers 3, 4, which receive the liquid to be thrown against the oven walls, and which - via suitable rotary nozzles - spray such liquid against said walls at a sufficiently high pressure and, as a result, velocity.

[0016] The actual structure of this internal assembly shall be explained in greater detail further on; anyway, it is most obviously desirable that this assembly be adapted to distribute the swirling jet of liquid towards the entire, or at least almost the entire inner surface of the oven, and this can for instance be achieved by providing a single distribution chamber located at the bottom of the oven cavity and so arranged as to throw its swirling jet of liquid upwards against the walls of the same cavity, as this is illustrated by way of example in Figure 7.

[0017] This solution, however, proves scarcely an optimal one, owing to both the force of the jet being subject to gradually peter out, i.e. decrease as the distance of the surface of the cavity from the bottom thereof becomes smaller, and the practical impossibility for the portion of the cavity bottom, onto which said internal assembly is resting, to be washed and cleaned.

[0018] In view of improving this situation, it has therefore been found that it is particularly advantageous and effective if such internal assembly is located at an intermediate height within the oven cavity, and is further so arranged as to be able to direct two distinct swirling jets of liquid against the cavity walls, i.e. one jet both upwards and towards the central zone of the cavity and the other one downwards and, again, towards the central zone of the oven cavity, so as this is depicted by way of example in Figures 5 and 6.

[0019] The assembly that is located outside the oven cavity, and which shall be described in greater detail further on, is connected to the internal assembly via a plurality 5 of conduits that are adapted to transfer the cleaning liquid and, as it can be readily appreciated, have to pass through the access opening of the oven; during the cleaning operation, the oven door 6 must of course be kept duly shut so as to prevent liquid from splashing outside the oven cavity. Therefore, in order to allow for such conduits to pass into the oven cavity even when the oven door is closed, the same conduits are shaped and arranged in a flat manner so as to occupy the smallest possible thickness, i.e. to be as thin as possible when passing through the door sealing gasket.

[0020] In this connection and with reference to Figure 2, in view of ensuring that such configuration is maintained each time that the arrangement is used, and in order to facilitate said conduit to pass therethrough, there is provided and arranged a rigid protection member 126, which wraps around and encloses a small portion of the length of said conduits, and which is roughly in the shape of a reverse U and made in the form of a flat band or brace that is appropriately bent and curved so as to be able to sit stably astride of the upper edge of the oven door. This rigid protection member receives and acts as a sheath for the afore-cited conduits passing therethrough, which can therefore be run parallel to each other and following the contour of said protection member, in such manner as to enable the same conduits to occupy the smallest possible thickness, while being safely protected against unduly high pressures and stresses.

[0021] In an advantageous manner, this protection member 26 is provided with a proximity sensor or contact 7 adapted to detect - when said member is mounted on the door - if the oven door is closed or open depending

on said sensor or contact being or not in contact with, or adequately close to, an appropriate portion of a jamb of the oven. The signal issued by this sensor 7 is sent via an appropriate connection (not shown) to properly provided control means 30 associated to the external assembly.

[0022] With reference to Figure 4, the liquid-carrying circuit of this external assembly includes:

- a detergent reservoir 9,
- a rinsing aid reservoir 10,

both of which are of course conveniently accessible from outside, and are further connected to two respective independent conduits 11 and 12, each one of which is provided with a first electromagnetic valve 13 and a second electromagnetic valve 14, respectively.

[0023] Downstream of said two electromagnetic valves 13 and 14, these two conduits 11 and 12 converge to meet into a single delivery conduit 15 provided with a delivery pump 16.

[0024] Downstream of said pump 16, said delivery conduit 15 divides again into two different and separate transfer channels 17 and 18, which are referred to in this way because they actually transfer the liquid flowing through them from said outside assembly into said distribution chambers 3 and 4 provided in the internal assembly, as this has already been described in part hereinbefore.

[0025] Each one of said transfer channels is furthermore provided with a third electromagnetic valve 19 and a fourth electromagnetic valve 20, respectively.

[0026] It can therefore be readily appreciated that, by selectively operating said four electromagnetic valves 13, 14, 19 and 20 and said delivery pump 16, the possibility is given for the liquid contained in each one of said two reservoirs 9 and 10 to be drawn off and optionally, i.e. selectively pumped towards either one of said distribution chambers 3 or 4, so as to perform the desired function of letting either washing liquid or rinsing liquid into each one of said distribution chambers, as required.

[0027] In said outside assembly there is branching out - for connection to the water supply mains - a water supply conduit 21 that is provided with a respective electromagnetic valve 26 and that - downstream of said valve - branches itself out into two distinct water supply conduits 22 and 23, which are in turn provided with a fifth electromagnetic valve 24 and a sixth electromagnetic valve 25, respectively.

[0028] Said electromagnetic valve 26 on the water supply conduit from the mains 21 will be referred to and indicated as seventh electromagnetic valve 26.

[0029] Said two water supply conduits extend outside said external assembly so as to reach up to and debouch in an independent manner into said two distribution chambers 3 and 4.

[0030] Again, it can therefore be readily appreciated that, by operating said three electromagnetic valves 23, 24 and 26 selectively, it is possible for liquid to be drawn off the water supply line for delivery to either one of said distribution chambers 3 or 4, so as to perform the desired function of letting liquid into each one of said distribution chambers, as required.

[0031] It will certainly have been noticed that the above-described liquid-carrying circuits do not have any pump of their own. The provision of such pumps is in fact made superfluous by the basic consideration that the water supply pressure from the mains is usually high enough to ensure the desired force of the water distributed from said distribution chambers 3 and 4.

[0032] Should however such pressure be too low, this inadequate circumstance can be advantageously detected by an appropriate pressure sensor 27 - of a type generally known as such in the art - to be located on said water supply conduit 21 downstream of the respective electromagnetic valve 26.

[0033] The signal generated by this pressure sensor 27 is then sent to a control unit 30, which will process this signal and compare it with a predetermined threshold value; should this comparison indicate that the detected signal is lower than a value corresponding to a minimum pressure P_{min} that is considered still acceptable in view of ensuring a sufficient level of cleaning effectiveness, and if this comparison is performed prior to the cleaning cycle being started, the afore-mentioned control unit will interrupt the cycle starting process and, as a result, prevent the cleaning cycle from going on; if such comparison is on the contrary performed after the cleaning cycle has been started, then the cycle itself is allowed to go on, however under activation of an external warning indication, which may be of any conventional kind, e.g. an optical or sound alarm.

[0034] On the water supply conduit 21 there is also installed a second pressure sensor 40, which is adapted to detect whether the pressure in said conduit is higher than a highest acceptable pressure. Should a comparison indicate that the signal generated by the sensor is higher than a value corresponding to a maximum pressure P_{max} that is considered still acceptable in view of preventing the safety and integrity of the liquid-carrying circuits from being jeopardized, following procedure is started: if said comparison is performed prior to the cleaning cycle being started, the afore-mentioned control unit will interrupt the cycle starting process and, as a result, prevent the cleaning cycle from going on; if such comparison is on the contrary performed after the cleaning cycle has been started, then the on-going cycle is interrupted automatically.

[0035] Additionally, in consideration of the fact that the liquid rinsing-aid product, which is contained in the reservoir 10, must only be used in small amounts, and must furthermore be preliminarily mixed with water prior to its being let into the two distribution chambers, there is provided an auxiliary conduit 28, which, as duly provided with an eighth electromagnetic valve 29 of its own, branches off the water supply conduit 21 downstream of the electromagnetic valve 26 thereof, and extends to de-

bouch into the conduit 12, which departs from the rinsing-aid reservoir 10, at a site upstream of the second electromagnetic valve 14 thereof.

[0036] In practical operation, when a rinsing cycle has to be carried out using the proper rinsing-aid product, this will be performed by just causing the electromagnetic valves 26, 29 and 14 to open so as to have water from the supply line flowing into the conduit 12 and, as a result, mixing up - in an appropriate proportion - with the liquid rinsing-aid product from the reservoir 10, wherein the resulting liquid mixture will then be pumped by the delivery pump 16 towards and into said distribution chambers, as this has already been explained hereinbefore.

[0037] With reference now to Figure 6, the above-mentioned distribution chambers 3 and 4 are two chambers that comprise two respective rotary nozzles, wherein it is the same pressure of the liquid to be sprinkled that causes said nozzles to be brought into a continuous rotary motion and, as a result, a corresponding swirling effect of the jet, or jets, of liquid being sprayed. Anyway, such contrivance is largely known to all those skilled in the art, so that there is no need for it to be explained any further in this context.

[0038] The two chambers may be provided in the form of an arrangement in which they are physically separated from each other; however, in view of further simplifying the overall construction and installation, these two chambers are preferably joined together rigidly into a single body 31 and are so oriented as to have the upper chamber 3 generating a swirling jet 32 that is prevailingly directed upwards, as well as towards the zones lying at an intermediate height of the oven cavity, and the lower chamber 4 generating a corresponding swirling jet 33 directed prevailingly downwards, starting again from the intermediate areas of the oven cavity.

[0039] As far as the way in which said body 31 has to be properly positioned and supported at the desired height, it should be noticed hat this is most easily obtained in an appropriate manner by associating to said body 31 at least two support members 34 adapted to engage or rest upon respective runners or sliding guides 35 arranged in a substantially conventional manner on opposite side walls of the oven cavity.

[0040] The inventive oven cleaning arrangement is further provided with programme control means for controlling the sequence of the various operation cycles; upon the arrangement having been properly installed with its assemblies inside and outside the oven as indicated hereinbefore, the water and power connections having been completed, the detergent and rinsing-aid reservoirs having been filled, and so on, the control unit 30 is activated by the operator through the input of the selection corresponding to a desired cleaning cycle. Such control unit 30 is connected via generally known means to all said electromagnetic valves, said delivery pump 16 and said pressure sensor 27.

[0041] The control unit 30 is arranged so as to be adapted to sequentially send appropriate control signals to all said electromagnetic valve and the delivery pump 16, as well as to receive and process the signal from the sensor 27, so as to ensure that the cleaning cycle so selected by the operator is actually performed in an orderly, regular manner as programmed, according to techniques and procedures that are generally known as such in the art, since largely used in the operation of other appliances and equipment for both residential and professional use.

[0042] Among the various cleaning programmes that the inventive oven cleaning arrangement may be designed to carry out, the main one will of course include a first detergent distribution phase, i.e. a phase in which only liquid detergent product is sprayed onto the oven cavity walls, a second resting phase, i.e. a phase that is intended to allow the detergent to act on and condition the soil to be removed from the walls, and a third phase for spraying fresh water onto the walls so as to flush off and remove both detergent and soil residues. Basically, this third phase is a plain rinsing phase, while substances and debris being flushed off in this phase collect by gravity onto the bottom of the oven cavity, from which they can be then removed with generally known means.

[0043] It will be readily appreciated that the actual duration of such cleaning cycles can be programmable, i.e. adjustable in accordance with the characteristics and nature of the soil to be removed, as well as the desired cleaning effect.

[0044] Finally, a cleaning cycle may be followed also by a suitably selected and set final rinsing or "brightening" cycle consisting of a single working phase, in which the rinsing aid, or brightener product, from the corresponding reservoir is first mixed with fresh water flowing in from the water supply mains, and is then sprayed onto the walls of the oven cavity for a pre-set period of time. The various parts used to deliver and spray the detergent, i.e. valves, conduits, and the like, will of course not be used during this final rinsing cycle.

[0045] A further improvement derives from the fact that all said pumps and electromagnetic valves are operated on a rather low electric voltage, so as to avoid all risks connected with directly using the regular power supply voltage in an apparatus in which there are circulating water and other liquid substances.

[0046] To this purpose, a power-supply unit with a related storage battery, or accumulator, is associated to said liquid-carrying and flow control means, in which said unit and said accumulator are so provided and arranged as to enable said accumulator to be adapted to supply the required electric power with the necessary characteristics for the operation of said functional parts such as pump, electromagnetic valves, sensor, control unit 30, possibly provided indicator lights, and the like.

[0047] When the cleaning apparatus is not being used, the above-cited power-supply unit can be connected to the external power supply line so as to allow said storage battery, or accumulator, to be recharged without any particular urgency and, above all, without any danger.

Claims

1. Arrangement for cleaning a cooking cavity (1) of an oven for professional or mass catering applications, comprising:

   - first storage means adapted to contain the substances used for cleaning,
   - second means adapted to pump out said substances and control the flow thereof through selectively pre-defined flowpaths,
   - third means for spraying and directing said substances against the inner walls of the oven,
   - fourth means adapted to enable said third means to be temporarily and removably installed inside said oven cavity,
   - control means (30) adapted to allow at least a cleaning programme to be automatically performed and carried through,

   characterized in that said first and said second means and said control means (30) are so arranged as to be able to operate outside said oven cavity, and said third and fourth means are so arranged as to be able to operate inside said oven cavity.

2. Arrangement according to claim 1, **characterized in that** said first and said second means, and said control means are contained within a common casing (2), which is distinct and separate from said third and fourth means.

3. Arrangement according to claim 1 or 2, **characterized in that** said third and said fourth means are adapted to be installed at a predetermined height inside the cooking cavity of said oven.

4. Oven cleaning arrangement according to claim 2, **characterized in that** said common casing and said third means are fluidly connected with each other via a plurality of flexible liquid-carrying conduits (5).

5. Oven cleaning arrangement according to claim 4, **characterized in that** there is provided a rigid protection member (126) adapted to act as a sheath enclosing a limited portion of the length of said plurality of flexible liquid-carrying conduits.

6. Arrangement according to claim 3, **characterized in that** said rigid protection member (126) is at least partially in the shape of a reverse U, so as to be able to fitted and sit firmly astride of the upper edge of the door (6) of said oven.

7. Arrangement according to claim 6, **characterized in that** associated to said rigid protection member (126) there is provided a proximity sensor (7) adapted to detect a condition of proximity to or contact with a part of the body of said oven other than said door thereof.

8. Arrangement according to any of the preceding claims or combination thereof, **characterized in that** said first means comprise a detergent reservoir (9) and a rinsing aid reservoir (10), and that said second means comprise respective conduits (11, 12) connected to said two reservoirs, said conduits (11, 12) being provided with a first electromagnetic valve (13) and a second electromagnetic valve (14), respectively, in which said conduits (11, 12) are convergent so as to meet with each other into a single delivery conduit (15) that is in turn provided with a delivery pump (16).

9. Arrangement according to claim 8, **characterized in that**, downstream of said delivery pump, said delivery conduit (15) branches out into two transfer channels (17, 18), each one of which being provided with a respective third electromagnetic valve (19) and a respective fourth electromagnetic valve (20).

10. Arrangement according to claim 9, **characterized in that** there is provided a water supply conduit (21) from the water supply mains, which diverges into two water supply conduits (22, 23), each one of which being provided with a respective fifth electromagnetic valve (24) and a respective sixth electromagnetic valve (25).

11. Arrangement according to claim 10, **characterized in that** said plurality of flexible liquid-carrying conduits (5) comprises said two transfer channels (17, 18) and said two water supply conduits (21, 22).

12. Arrangement according to claim 11, **characterized in that** in said mains water supply conduit (21), upstream of the point at which it branches out into said two separate water supply conduits (22, 23), there is provided a respective seventh electromagnetic valve (26).

13. Arrangement according to claim 12, **characterized in that** between said seventh electromagnetic valve (26) and said two respective fifth and sixth electromagnetic valves (24, 25) there branches off an auxiliary conduit (28) that extends to debouch, upstream thereof, into said second electromagnetic valve (14) corresponding to the rinsing-aid reservoir (10), and that is provided with a respective eighth electromagnetic valve (29).

14. Arrangement according to any of the preceding claims 10 to 13,
characterized in that in said mains water supply conduit (21), downstream of said seventh electromagnetic valve (26), there is provided a pressure

sensor (27) adapted to generate a signal that correlates with the detected pressure of the in-flowing water, wherein said signal is compared with a pre-defined value of a lowest acceptable pressure (P_{min}).

15. Arrangement according to any of the preceding claims 10 to 13,
characterized in that in said mains water supply conduit (21), downstream of said seventh electromagnetic valve (26), there is provided a second pressure sensor (40) adapted to generate a signal that correlates with the detected pressure of the in-flowing water, wherein said signal is compared with a pre-defined value of a highest acceptable pressure (P_{max}).

16. Arrangement according to any of the preceding claims,
characterized in that said third means comprise:

- a first distribution chamber (3) that supplies a first upper rotary spray nozzle adapted to direct a swirling jet of liquid (32) against the upper and intermediate areas of the inner oven cavity surface, and
- a second distribution chamber (4) that supplies a respective second lower rotary spray nozzle adapted to direct a swirling jet of liquid (33) against the lower and intermediate areas of the inner oven cavity surface, each one of said distribution chambers are to and supplied by a respective one of a pair of conduits, each one of which is formed of one of said transfer and one of said water supply conduits (17, 22; 18, 23).

17. Arrangement according to claim 16, **characterized in that** said first distribution chamber and said second distribution chamber are firmly associated to each other to form a single body (31), which is in turn firmly joined to and physically coupled with said fourth means.

18. Arrangement according to any of the preceding claims,
characterized in that said fourth means comprise support and resting members (34) adapted to slidably engage respective resting surfaces, preferably in the form of guide runners (35) arranged on opposite vertical surfaces in said oven cavity (1).

19. Arrangement according to any of the preceding claims or combination thereof, **characterized in that** said electromagnetic valves and said delivery pump are selectively operable by said control means (30), which they are electrically connected to.

20. Arrangement according to claim 19, **characterized in that** it is adapted to carry out a cleaning cycle that comprises following sequential scheme of individual phases:

(a) a detergent distribution phase to apply the detergent solution onto the surfaces to be cleaned;
(b) detergent reaction phase to allow the so applied detergent solution to react with the soil particles adhering to the surfaces to be cleaned;
(c) water spray or rinsing phase to flush off and remove both detergent and soil from the surfaces to be cleaned.

21. Arrangement according to at least one of the preceding claims,
characterized in that a power supply unit, preferably in the form of a rechargeable storage battery, or accumulator, and connectable to a battery charger when the oven cleaning arrangement is not operative, is associated to said first and second means and said control means (30).

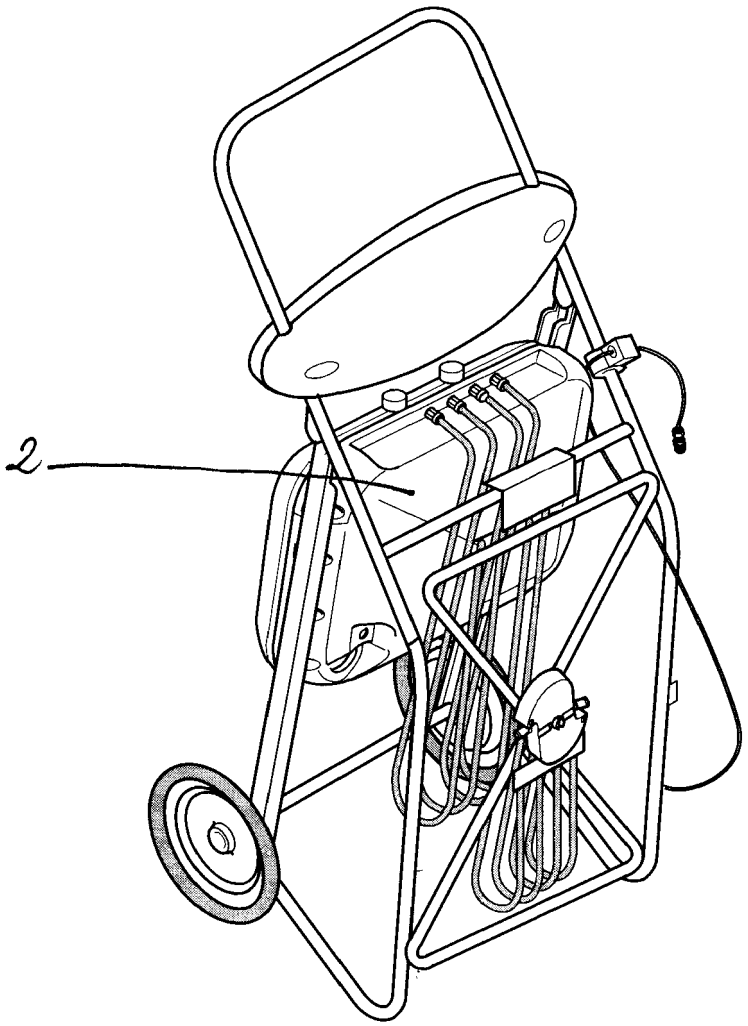

FIG.1

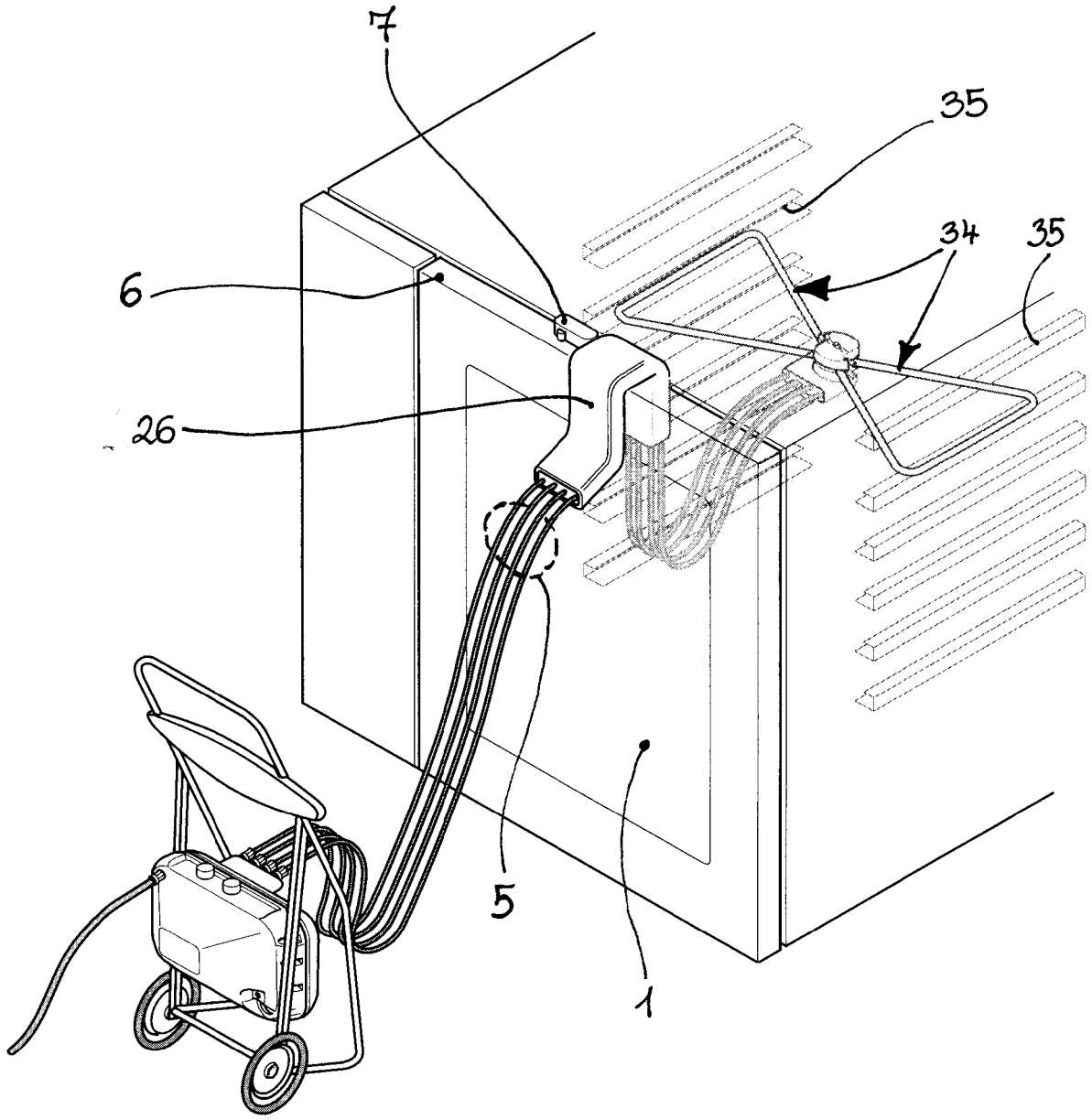

FIG.2

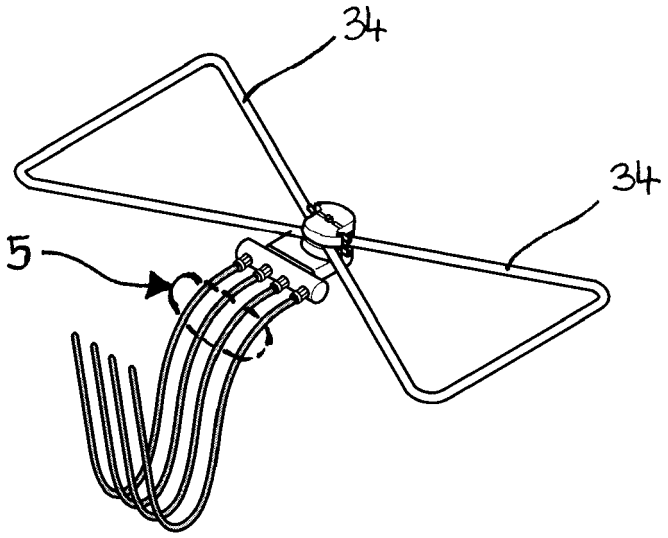

FIG.3

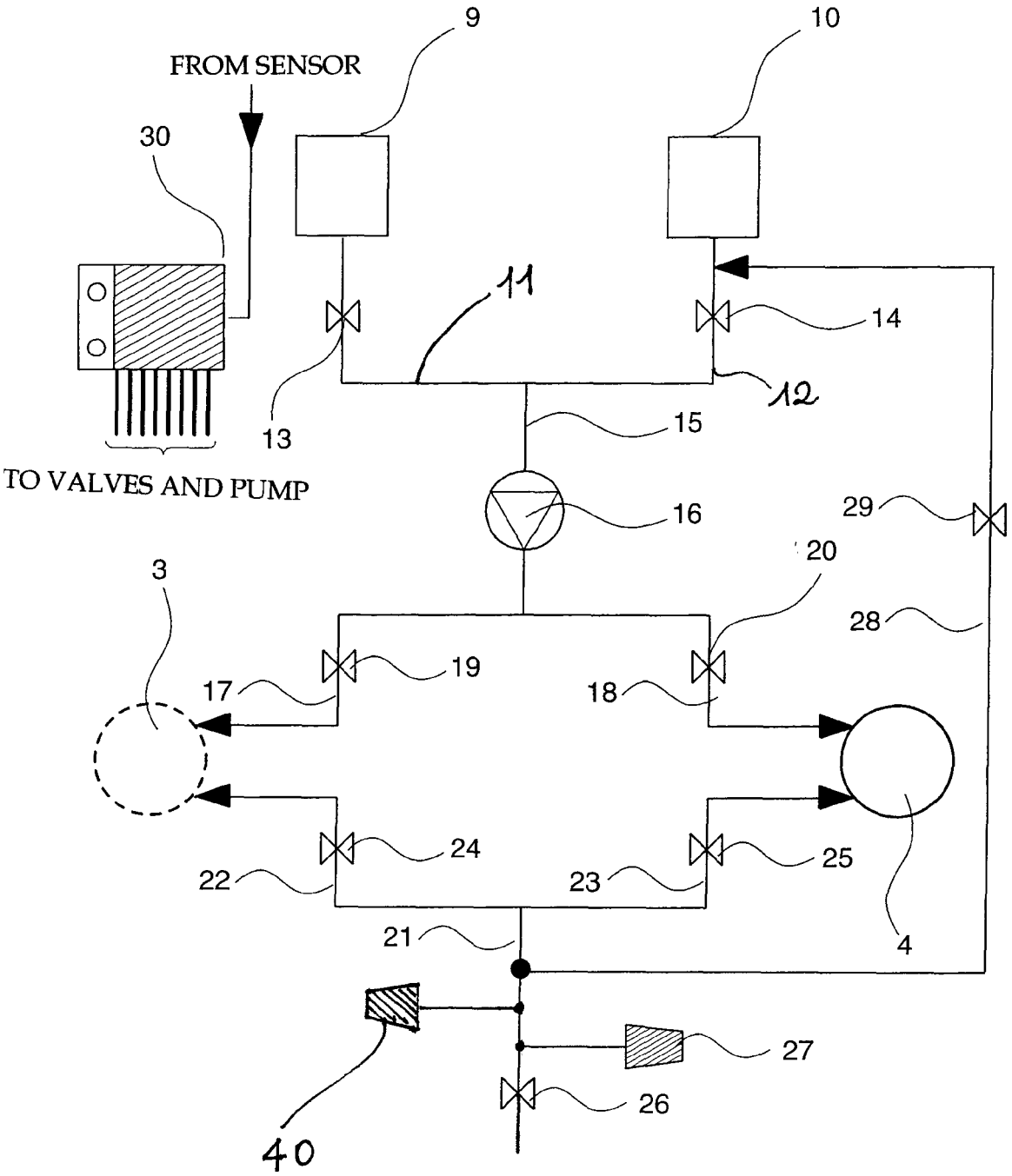
FROM SENSOR
TO VALVES AND PUMP
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FIG.4

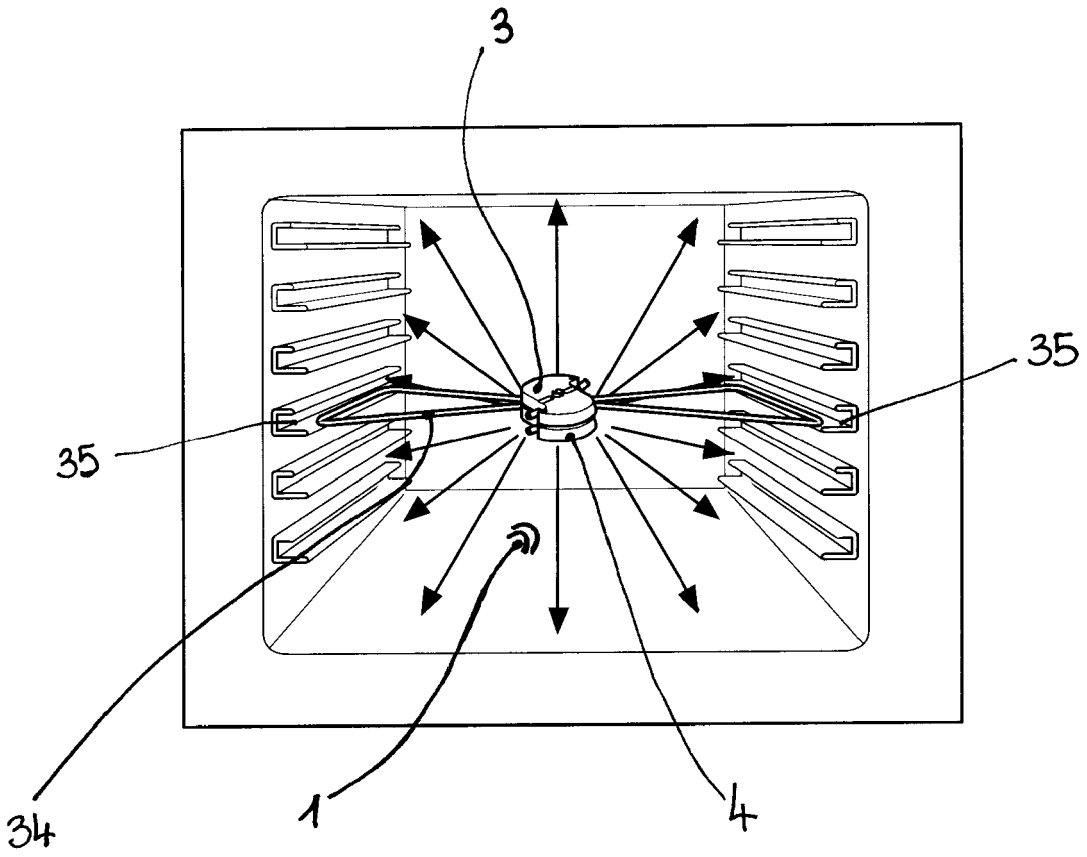

FIG.5

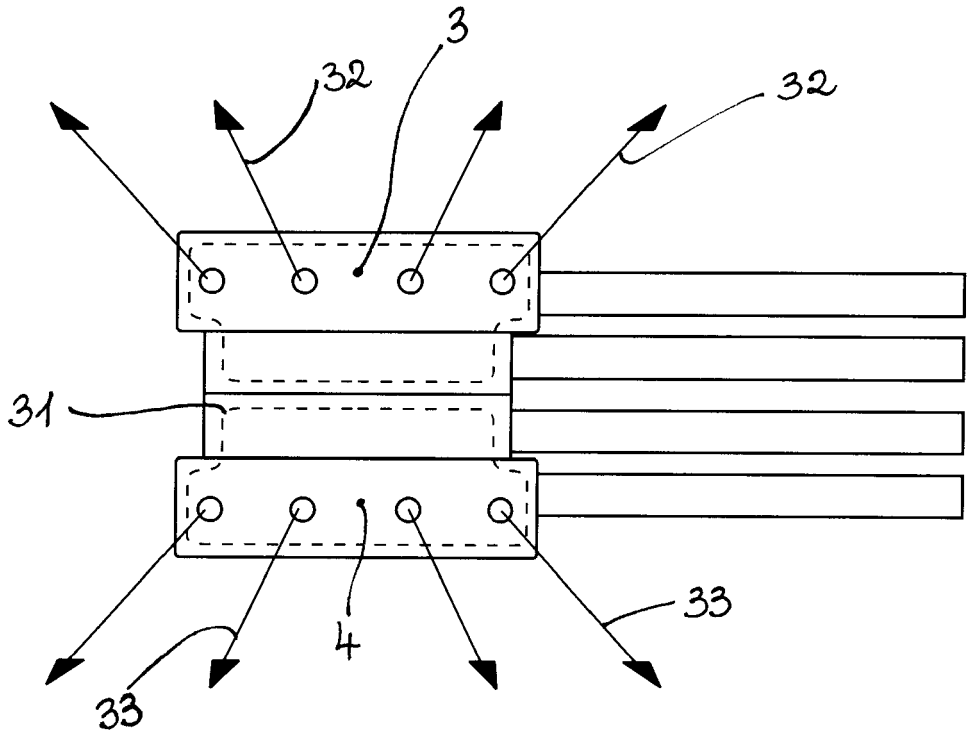

FIG.6

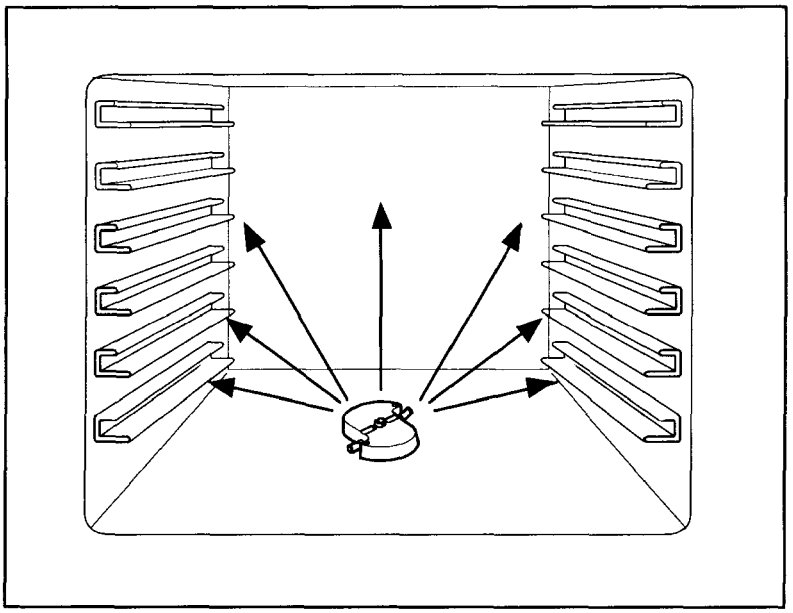

FIG.7