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(54) Lighting apparatus for laundry machines

(57) A laundry machine **(100)** for treating laundry items is proposed, the laundry machine **(100)** comprises an outer casing **(105)** rotatably housing a drum **(115)** for accommodating the items to be treated, said drum **(115)** has a drum opening for accessing the inside of the drum **(115)** for loading/unloading the items, and a door **(135)** including at least one door flap **(140a, 140b)** that is moveable from a closed position, which closes the drum opening, to an open position, which allows access to the inside of the drum **(115)**, the laundry machine **(100)** further comprises a lighting system **(165,302; 165,402; 165,505; 165,602)** for enlightening the inside of the drum **(115)**, in the solution according to the present invention, said lighting system **(165,302; 165,402; 165,505; 165,602)** comprises a light-emitting element **(165)**, mounted to the at least one door flap **(140a).**

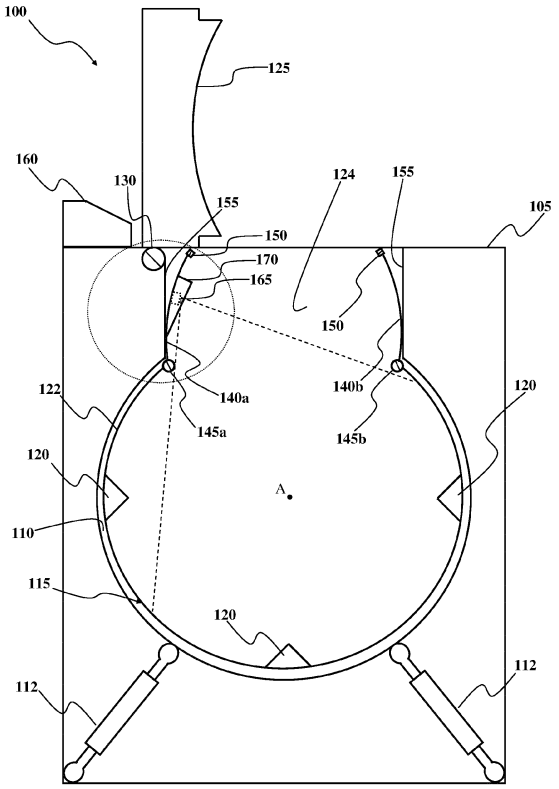

FIG.2

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Description

[0001] The present invention generally relates to electric appliances. In particular, the present invention is referred to laundry machines, such as top-loading washing machines, washing/drying machines and drying machines, both for domestic and professional use. More particularly, the present invention relates to drum lighting for such laundry machines.

[0002] Each household and professional laundry machine - such as washing machine, washing/drying machines and drying machines - typically comprises, among other components, an inner compartment (including a tub generally housing a rotatable drum) accessible by a user (*e.g.*, through a proper access door and/or lid) for loading/unloading the laundry.

[0003] As known, in laundry machines of the top-loading type, wherein the drum is accessible from the upper side of the laundry machine, the inside of the drum is scarcely enlightened by external environment especially when the user accesses the drum during the loading/unloading of the laundry. Therefore, laundry loading/unloading operations become difficult and uncomfortable for the user.

[0004] In order to solve this drawback, some laundry machines are provided with a lighting apparatus, which substantially comprises one or more light sources - incandescent light lamps, fluorescent light lamps, discharge light lamps or solid-state lighting devices *(e.g.,* high power LEDs) - acting as corresponding light sources for illuminating the drum, and a supply electric assembly - including electronic circuitry, such as rectifiers and controllers, and electrical wires - for generally supplying an operative electric power (from a power source of the machine) to each light source for the energization thereof.

[0005] According to a first known solution, the lighting apparatus may be arranged inside the drum *(e.g.,* in drum walls and/or in lifters inside the drum). Nevertheless, the Applicant has recognized that the approach providing the light source within the drum is intrinsically difficult to implement - substantially due to the fact that the light source, which is arranged on a portion of the machine (*i.e.*, the drum) adapted to rotate with respect to the casing of the machine, has to be electrically connected with the supply electric assembly, which is instead stationary with respect to the casing. Moreover, it may occur that laundry items stored inside the drum cover the light source, thus impeding a functional enlightenment of the drum.

[0006] According to a second known solution, the light source is provided in a frame or hopper provided in correspondence of the loading/unloading opening of the casing and encompassing the tub loading/unloading opening. The Applicant has found that this solution implies several drawbacks, too. For example, properly installing the light source within the frame/hopper is a difficult and time-consuming task. Furthermore, the frame/hopper robustness may be lowered by the insertion of the light source. Moreover, it is difficult to effectively direct the light radiation emitted by the light source towards the inside of the drum.

[0007] The drawbacks of the known solutions are exacerbated by the fact that, in order to meet users requirements, the drum of most of modern machines has increased size for ensuring the required high laundry-capacity, which has repercussions on energy consumption, reliability and complexity aspects of the lighting apparatus.

[0008] The Applicant has handled the problem of devising a satisfactory solution able to provide a satisfactory enlightenment of the inside of the drum, thus facilitating inspection thereof and laundry loading/unloading tasks, at the same time, overcoming the above-discussed drawbacks. Such solution is achieved by providing a light-emitting element in a door for opening/closing the drum, which when the door is opened, emits a light radiation substantially able to thoroughly enlighten the inside of the drum.

[0009] One aspect of the present invention proposes a laundry machine for treating laundry items. The laundry machine comprises an outer casing rotatably housing a drum for accommodating the items to be treated. The drum has a drum opening for accessing the inside of the drum for loading/unloading the items, and a door including at least one door flap that is moveable from a closed position, which closes the drum opening, to an open position, which allows access to the inside of the drum. Furthermore, the laundry machine comprises a lighting system for enlightening the inside of the drum. In the solution according to the present invention, said lighting system comprises a light-emitting element, mounted to the at least one door flap.

[0010] Preferred features of the present invention are set in the dependent claims.

[0011] In an embodiment of the invention, the light-emitting element may comprise at least one lighting device, generating a light radiation.

[0012] In an embodiment of the invention, the lighting system may further comprise a stationary element, stationary with respect to the outer casing, adapted to be coupled with the light-emitting element when at least one door flap is in the open position, said stationary element may supply electric power to said light-emitting element.

[0013] In an embodiment of the invention, the stationary element may be adapted to electrically couple with the light-emitting element without a physical contact.

[0014] In an embodiment of the invention, the stationary element may be adapted to electrically couple with the light-emitting element by means of a physical contact.

[0015] In an embodiment of the invention, the lightning system may comprise a stand-alone power supply unit provided in the at least one flap and coupled with the light-emitting element, said stand-alone power supply unit supplying electric power to said light-emitting element.

[0016] In an embodiment of the invention, the

light-emitting element may comprise at least one light-guiding member adapted to transfer light radiation into the inside of the drum, and the lightning system may further comprise a stationary element, stationary with respect to the outer casing, having at least one lightning device adapted to be coupled with the at least one light-guiding member when at least one door flap is in the open position, said at least one lightning device supplying the light radiation to said at least one light-guiding member.

[0017] In an embodiment of the invention, the light-emitting element may be adjustable in orientation in order to allow a user to manually orienting the light radiation emitted by the light-emitting element.

[0018] In an embodiment of the invention, the lighting system may further comprise an optical element coupled to the light-emitting element for optimizing the orientation of the light radiation emitted by said light-emitting element.

[0019] In an embodiment of the invention, the lighting system may further comprise a protective cover for preventing damages to the light-emitting element.

[0020] Another aspect of the present invention provides a method for enlightening the inside of a drum comprised in a laundry machine for treating laundry items. The laundry machine has an outer casing rotatably housing a drum for accommodating the items to be treated, the drum having a drum opening for accessing the inside of the drum for loading/unloading the items, and a door having at least one door flap moveable from a closed position, closing the drum opening, to an open position, allowing access to the inside of the drum. The method comprises the step of enlightening the inside of the drum. In the solution according to the present invention, said step of enlightening comprises enlightening the inside of the drum by means of a light-emitting element, mounted to the at least one door flap.

[0021] In an embodiment of the invention, the method may further comprises the step of supplying electric power to the light-emitting element by means of a stationary element stationary with respect to the outer casing.

[0022] In an embodiment of the invention, the step of supplying electric power to the light-emitting element may further comprise supplying electric power to said light-emitting element only when the at least one door flap is in the open position.

[0023] In an embodiment of the invention, the method may further comprise the step of supplying light radiation to the light-emitting element by means of a stationary element stationary with respect to the outer casing.

[0024] In an embodiment of the invention, the step of supplying light radiation to the light-emitting element may further comprise supplying light radiation to said light-emitting element only when the at least one door flap is in the open position.

[0025] These, and others, features and advantages of the solution according to the present invention will be better understood by reading the following detailed description of some embodiments thereof, provided merely by way of exemplary and non-limitative examples, to be read in conjunction with the attached drawings, wherein:

FIG.1 schematically shows a cross-sectional view of a top-loading laundry machine in which an embodiment of the present invention can be applied;
FIG.2 schematically shows a cross-sectional view of the top-loading washing machine of **FIG.1** with both an appliance lid and a drum door opened; and
FIG.3 to **FIG.6** schematically show cross-sectional views of an enlarged portion of the laundry machine of **FIG.2,** each with a lighting system according to a different embodiment of the present invention.

[0026] Considering **FIG.1** and **FIG.2** together, wherein cross-sectional views of a laundry machine **100,** in which an embodiment of the present invention can be applied, are schematically shown.

[0027] The laundry machine **100** is a machine for treating laundry (such has a laundry washing machine, a laundry washing/drying machine, a laundry drying machine *etc.*) of the top-loading type.

[0028] The laundry machine **100** comprises a substantially parallelepiped-shaped casing **105** that, preferably, although not necessarily, encloses a substantially cylindrical-shaped tub **110,** wherein the laundry is washed, along with any other component of the laundry machine **100** necessary for the operation (*e.g.,* hydraulic, electronic and electromechanical apparatuses well known in the art and, therefore, not shown in the figures nor herein described for sake of conciseness).

[0029] In detail, the tub **110** is preferably fixed to a frame (which substantially supports the casing **105** and any other component comprised in the laundry machine, and not shown in the figures), preferably by supporting elastic coils (not illustrated), and shock (and vibration) absorber elements, such as two shock absorbers **112** (which absorb jolts of the tub during operation).

[0030] Furthermore, the tub **110** houses a substantially cylindrical-shaped rotating drum **115,** which, in operation, rotates about an axis A in order to tumble the laundry to be washed. Preferably, although not necessarily, baffles or lifters **120** (three shown in the figures) are mounted on a drum wall **122** (parallel to a drum rotation axis A) in the inside of the drum **115** for enhancing the tumbling action performed in operation by the same.

[0031] In order to allow a user to access the tub **110,** an opening **124** is advantageously provided on the top of the washing machine **100.** The opening **124** is closable by a lid **125,** which is preferably, although not necessarily, hingeably connected to the casing **105** by means of a hinge **130.** The lid **125** is able to pivot from a closed position (shown in **FIG.1) -** wherein the lid **125** closes the opening **124,** impeding the access to the tub **110-**to an open position (shown in **FIG.2) -** wherein the lid **125** is pivoted to an angle, preferably, equal to, or greater than, 90° with respect to the closed position, allowing the access to the tub **110.**

[0032] Similarly, in order to allow a user to access the inside of the drum **115** (for loading/unloading the laundry), a drum opening is provided in the drum wall **122** and a door **135** is provided for closing the same during operation. Preferably, although not limitatively, the door **135** comprises a first flap **140a** and a second flap **140b.** In detail, the first flap **140a** is hinged to the drum **115** by a first flap hinge **145a,** while the second flap **140b** is hinged to the drum **115** by a second flap hinge **145b.** In a closed position (shown in **FIG.1),** interlocking elements **150** block the first and the second flaps **140a** and **140b** to one another, thus impeding any unwanted (and harmful) opening of the door **135** during operation (*i.e.*, when the drum rotates). Clearly, in a further embodiment, not illustrated, door **135** may comprise a single flap; the following description refers to a door comprising two flaps, but it can as well be applied to a door comprising a single flap (for example when, in the following, reference is made to the "first flap **140a",** it can be read also as "single flap" in case the door **135** comprises only a single flap).

[0033] In order to have the door **135** in an open position (shown in **FIG.2),** the laundry machine **100,** at the end of the operation, preferably aligns the door **135** with the opening **124 -** alternatively or in addition, the user may align the door **135** with the opening **124** manually -; then the interlocking elements **150** have to be unlocked; lastly, the user has to pivot both the first and second flaps **140a** and **140b** until they abuts - or reach a predetermined minimum distance from - lateral sidewalls **155** of the opening **124.**

[0034] Having the machine lid **125** and the drum door **135** both in the open position, the inside of the drum **115** is accessible (through the drum opening) by the user for loading/unloading the laundry stored therein.

[0035] In addition, preferably, although not limitatively, a user interface **160,** for the selection of laundry treatment parameters (*e.g.,* a temperature of a treatment fluid, a maximum rotation speed of the drum **115,** *etc.*), is provided on the top of the casing **105.**

[0036] In the laundry machine according to the present invention, a lighting system is provided for enlightening the inside of the drum (preferably, when the drum door is in the open position).

[0037] Advantageously in the solution according to the present invention, the lighting system comprises a light-emitting element provided on at least one flap of the door of the drum, for lighting the inside of the drum, when the door of the drum is in the open position. The light-emitting element is stationary with respect to the door of the drum, thus the former rotates - with respect to the casing - together with the latter during the operation of the laundry machine **100.**

[0038] In the example at issue, a light-emitting element **165 -** depicted with a dashed line in the figures - is provided on the first flap **140a** of the door **135** and preferably, although not limitatively, is protected by a protective cover **170** (as will described in greater detail in the following). Advantageously, the light-emitting element **165** may be activated (*i.e.*, to emit a light radiation) when the door **135** is in the open position, with the first flap **140a** that abuts, or comes close to (*i.e.,* at a minimum distance), a portion of the sidewall **155.**

[0039] The light-emitting element **165** may comprise any suitable lighting device, such as an incandescent light lamp, a fluorescent light lamp, a discharge light lamp or a solid-state lighting device (*e.g.,* a LED - Light-Emitting Diode). It should be noted that the light-emitting element **165** might comprise more than just one of the lighting devices listed above (*e.g.,* the light-emitting element **165** may comprise a plurality of LEDs in a strip or a ring arrangement) in order to obtain a desired illumination intensity (*i.e.*, able to grant a satisfactory enlightenment of the drum **115).**

[0040] It is underlined that in present application expression "light-emitting element" has not to be interpreted only as a lamp or a similar "light-generating" device, but it refer to any device adapted to emit light, for example the edge of an optical fiber, or of a lightguide (for example the free edge of a cylinder made of transparent plastics or glass).

[0041] In some embodiments according to the present invention, the lightning system may comprise a stationary element fixed to the frame of the laundry machine. Therefore, such stationary element results, preferably, stationary with respect to the casing of the laundry machine. For example, in some embodiments of the invention, the stationary element is adapted to supply an electric power to the light-emitting element (as will be described in greater detail in the following).

[0042] Turning now to **FIG.3,** there is schematically shown a cross-sectional view of an enlarged portion of the laundry machine **100** of **FIG.2** according to an embodiment of the present invention.

[0043] According to this embodiment, a stationary element **302** is adapted to supply electric power to the light-emitting element **165,** with the latter that may, advantageously, be coupled with the former (as will be discussed below) when the drum door **135** is in the open position. Preferably, although not necessarily, the stationary element is positioned (fixed to the frame of the laundry machine **100)** substantially behind the portion of the sidewall **115** to which the first flap **140a** abuts, or comes close.

[0044] The stationary element **302** and the light-emitting element **165** may be coupled to one another by means of a contact-less (or wireless) coupling. The stationary element **302** may advantageously comprise a power supply unit **305.** For example, the power supply unit **305** receives electric power from a power source, such as the mains (not shown in the figures), a power circuit (not shown in the figures) of the laundry machine **100** or a battery arrangement (which may be provided within the stationary element **302,** not shown) and, in its turns, provides suitable (AC) voltages and currents to a transmission circuit **310.** The transmission circuit **310** is adapted to transfer electric power by means of an elec-

tromagnetic wave (for example, by comprising a radio-frequency transmitter or a wire winding) to the light-emitting element **165.** Clearly the power supply unit **305** and the transmission circuit **310** may be advantageously integrated in a single electronic component.

[0045] Advantageously, the lighting system may comprise a receiver circuit **315** (which comprises a radio-frequency receiver or a corresponding coupled wire winding) provided in the first door flap **140a** and electrically connected to the light-emitting element **165.** Preferably, although not necessarily, the lighting system also comprises an optical element, such as a lens **325** coupled to the light-emitting element **165** in order to optimize the orientation of the light radiation emitted by the same. The protective cover **170** may advantageously be provided in the lighting system for preventing damages to the light-emitting element **165** and to the lens **325** (*i*.e., elements of the lighting system exposed inside the drum).

[0046] When the flap **140a** abuts, or comes close to (*i.e.,* at a minimum distance), the sidewall **155** (*i.e.,* when the lid **125** and the door **135** are in the open position), the transmission circuit **310** transfers electric power (by means of the electromagnetic wave) to the receiver circuit **315,** which is adapted to properly provide such received electric power (*i.e.*, as suitable voltages and currents) to the light-emitting element **165** connected to the same.

[0047] Preferably, although not necessarily, the receiver circuit **315** and the light-emitting element **165** are mounted in an hermetically-sealed portion of the first door flap **140a,** in order to protect them from liquid and/or moisture present in the tub **110** during the laundry machine **100** operation.

[0048] The lens **325** is, preferably, coupled with the light-emitting element **165** in order to optimize the orientation of the light radiation emitted by the same inside the drum **115.** In this way, the inside of the drum **115** is thoroughly well lit, thus allowing easier loading/unloading operations. The lens **325** is made, preferably, of a durable and temperature-resistant transparent material, such as borosilicate glass (*e.g.,* Pyrex ®) or polymethyl methacrylate (*e.g.,* Plexiglas ®).

[0049] Alternatively, the lens **325** may be omitted and the light-emitting portion of the light-emitting element **165** may be, at least partly, directly exposed towards the inside of the drum **115.**

[0050] The protective cover **170** is adapted to prevent damages to the lens **325,** the light-emitting element **165** and the receiver circuit **315,** especially during the operation of the laundry machine **100.** The protective cover **170** may also provide preliminary orientation to the light radiation emitted by the light-emitting element **165;** for example, the protective cover **170** may be formed in such a way to shield the user from being directly hit by the light radiation emitted by the light-emitting element **165,** thus preventing glare and dazzling effects. The protective cover **170** may be made of any suitable material for the use in the drum **115** (such as metal or plastic) and may be formed integral with the first flap **140a.**

[0051] In addition, an internal portion of the protective cover **170** could be treated in order to reflect the light emitted by the light-emitting element **165,** thus achieving a better concentration of the light radiation toward the inside of the drum **115.** For example, the internal portion of the protective cover **170** could be polished (if made of metal) or covered with a light reflecting coating *(e.g.,* enamel painting).

[0052] In further embodiments according to the present invention, the light-emitting element **165** (and/or the lens **325)** may advantageously be made adjustable in orientation in such a way to allow the user to manually adjust an orientation of the light radiation emitted by the same according to her/his needs. For example, the light-emitting element **165** may advantageously be telescopic or comprise telescopic portions, in order to be extendable towards the inside of the drum **115** to a predetermined extension; alternatively or in addition, the light-emitting element **165** could be made rotatable about a predetermined rotation axis.

[0053] With the embodiment according to the present invention just described, it is possible to effectively enlighten the inside of the drum of the laundry machine; moreover it is possible to supply electric power to the light-emitting element in a relatively simple manner which is substantially free from safety issues (since there is no coupling during the laundry machine operation and until the user pivots the door flap in the open position).

[0054] Considering now **FIG.4,** there is schematically shown a cross-sectional view of an enlarged portion of the laundry machine **100** of **FIG.2** with a lightning system according to another embodiment of the present invention.

[0055] In detail, the embodiment depicted in the figure differs from the one described in **FIG.3** substantially in the fact that electric power is transferred from a stationary element **402** to the light-emitting source **165** through a physical contact (*i.e.,* a wired electrical connection).

[0056] Preferably, the stationary element **402** comprises an electric power source **405,** which provides voltages and currents to a transmission circuit **410** (clearly the electric power source **405** and the transmission circuit **410** may be advantageously integrated in a single electronic component). For example, the power supply unit **405** receives electric power from a power source, such as the mains (not shown in the figures), a power circuit (not shown in the figures) of the laundry machine **100** or a battery arrangement (which may be provided within the stationary element **402,** not shown). According to this embodiment, the transmission circuit **410** advantageously comprises first contact elements **415a** (*e.g.,* pins, needles, *etc.;* two shown in the figure) that are advantageously adapted to engage corresponding second contact elements **415b** (*e.g.,* pads for the pins, slots for the needles, *etc.;* two shown in the figure). For example, the first contact elements **415a,** preferably, protrude from the sidewall **155** in the opening **124,** while the second contact

elements **415b** are, preferably, provided on a backside (*i.e.*, the side facing the sidewall **155)** of the first flap **140a** of the door **135.**

[0057] The coupling between the transmission circuit **410** and a receiver circuit **420** (provided in the first flap **140a** of the drum **115),** is then provided through the physical contact formed by the reciprocal engagement of the first and second contact elements **415a** and **415b** that occurs when the door **135** is in the open position (with the first flap **140a** abutting, or close to, the side wall **155).**

[0058] Therefore, the receiver circuit **420** receives the electric power from the transmission circuit **410** and provides the same to the light-emitting element **165** thanks to the contact elements **415a** and **415b,** achieving similar benefits as with the embodiment described with reference to **FIG.3.**

[0059] Turning now to **FIG.5,** there is schematically shown an enlarged portion of the laundry machine **100** of **FIG.1** with a lighting system according to another embodiment of the present invention.

[0060] Advantageously, a stand-alone power supply unit **505** may be directly provided in the first flap **140a.** For example, the stand-alone power supply unit **505** may comprise a battery arrangement **505a** and a voltage/current regulator **505b** coupled one another.

[0061] Preferably, the voltage/current regulator **505b** is also coupled with the light-emitting element **165** and is adapted to properly provide working current and voltage to the same. The stand-alone power supply unit **505** is thus stationary with the door **135** of the drum **115** (*i.e.,* it rotates together with the drum **115** in operation).

[0062] Preferably, the stand-alone power supply unit **505** is mounted in a hermetically sealed portion of the first door flap **140a** together with the light-emitting element **165.**

[0063] Having the stand-alone power supply unit **505** housed within the first flap **140a,** allows achieving a more compact lightning system, removing the need for a stationary element fixed to the frame of the laundry machine **100.**

[0064] Turning now to **FIG.6,** there is schematically shown an enlarged portion of the laundry machine **100** of **FIG.1** with a lighting system according to another embodiment of the present invention.

[0065] The lighting system differs from the above-described lighting systems in what follows.

[0066] Advantageously, a stationary element **602** is provided (in a similar way as above-described, mounted to the frame of the laundry machine **100)** with an electric power supply unit **605** coupled to at least one lightning device **610.** The lightning device **610** may comprise any suitable lighting device, such as an incandescent light lamp, a fluorescent light lamp, a discharge light lamp or a solid-state lighting device (*e.g.,* a high power LED), or a plurality thereof.

[0067] According to this embodiment, the light-emitting element **165** advantageously comprises a light-guiding member, such as a prism, a mirror, or a mirrors set, or an optical fiber(s) assembly, adapted to receive light generated by the lighting device **610** and to guide the light towards a different portion of the light-emitting element **165,** for example to a free end of the light-emitting element **165** optically connected to a lens **325.** Preferably, the light-emitting element **165** is advantageously exposed (without hindering the rotation of the drum **115** in operation) on a backside (*i.e.*, the side facing the sidewall **155)** of the first flap **140a** of the door **135.** In this way, when the door **135** is in the open position (with the first flap **140a** abutting, or close to, the side wall **155),** the light-emitting element **165** engages a light-emitting portion of the lightning device **510** exposed on the sidewall **155.** Advantageously, in such a configuration of the lightning system, the light radiation emitted by the lightning device **610** is channeled by the light-emitting element **165** into the drum **115,** thus enlightening the inside of the drum **115.**

[0068] It should be noted that, in the just described embodiment of the present invention, no electric or electronic element are necessary in the door flap. Thus, the resulting lightning apparatus has an improved robustness against moisture and liquid contact than other solutions, since its electric and electronic elements can be fully isolated from liquid and/or moisture.

[0069] Moreover in this embodiment the lighting device **610** may be arranged in such a way to be able to generate light and to direct it towards the drum **122** also before the opening of the door **135,** so as to enlighten the drum **122** (and the door **135)** also before its opening, which may be useful in order to help the user to manually rotate the drum **122** for aligning the door **135** with the tub opening **124.**

[0070] Alternatively, the light-emitting element may advantageously comprise a plurality of waveguides, each for providing a different orientation of the light radiation towards the inside of the drum (in order to achieve a more complete illumination thereof) and/or for contacting a corresponding plurality of lighting devices in the stationary element.

[0071] As a further alternative, light-emitting element may advantageously comprise at least one waveguide split into two portion. A first portion may advantageously be connected to the lightning device (in the stationary element) and protruding from the sidewall of the tub opening. A second portion may advantageously be exposed on the backside of the first flap of the door. Advantageously, the first portion engages the second portion when the drum door is opened, thus channeling the light radiation from the lightning device into the drum as previously described.

[0072] A further embodiment of the present invention (not shown in the figures) may be provided with a light apparatus provided in the second flap of the drum door (preferably, with a corresponding stationary element arranged in a portion of the sidewall where the second flap abuts, or come close to, in the open position), instead of the first flap. In addition, another embodiment of the

present invention may advantageously comprise two lighting apparatuses, one being arranged on the first flap of the drum door, the other being arranged on the second flap of the drum door (each with a respective stationary element near the sidewall). In this way, the inside of the drum may be lit up with a more intense light.

[0073] Conversely, in a further embodiment according to the present invention, a drum door with a single flap may be provided. In this case, a light-emitting element is provided in the single flap of the drum door, preferably protected by a protective cover. The coupling between a stationary element and the light-emitting element in the single flap may be obtained either with (in a similar manner as described in relation to **FIG.4,** or to **FIG.6)** or without (in a similar manner as described in relation to **FIG. 3)** a physical contact between the two. Alternatively, a stand-alone power supply unit may be provided in the single flap (in a similar manner as described in relation to **FIG.5)** supplying electric power to the light-emitting element.

[0074] According to an even further embodiment of the present invention (not shown in the figures) the stationary element may advantageously comprise brush contacts that protrude from a lateral wall of the tub, which are configured for contacting an electrical track provided on the lateral wall of the drum for powering the light-emitting element on the flap of the drum door, when the drum is in the open position.

[0075] According to another embodiment of the present invention (not shown in the figures), the stationary element may advantageously provide electric power to the lightning apparatus by means of a wire, connected to the light-emitting element passing through a rotor shaft provided in the laundry machine connected to the drum and adapted to impart a rotation to the latter in operation (therefore, without the risk of wire tangling during operation). In such embodiment, the stationary element may advantageously be placed proximal to the rotor shaft.

Claims

1. A laundry machine **(100)** for treating laundry items comprising:

an outer casing **(105)** rotatably housing a drum **(115)** for accommodating the items to be treated, the drum **(115)** having a drum opening for accessing the inside of the drum **(115)** for loading/unloading the items, and a door **(135)** including at least one door flap **(140a, 140b)** moveable from a closed position, closing the drum opening, to an open position, allowing access to the inside of the drum, and

a lighting system **(165,302; 165,402; 165,505; 165,602)** for enlightening the inside of the drum **(115),**

characterized in that

said lighting system **(165,302; 165,402; 165,505; 165,602)** comprises a light-emitting element **(165),** mounted to the at least one door flap **(140a).**

2. The laundry machine **(100)** according to claim 1, wherein the light-emitting element comprises at least one lighting device, generating a light radiation.

3. The laundry machine **(100)** according to claim 2, wherein the lighting system further comprises a stationary element **(302; 402),** stationary with respect to the outer casing **(105),** adapted to be coupled with the light-emitting element **(165)** when at least one door flap **(140a)** is in the open position, said stationary element **(302; 402)** supplying electric power to said light-emitting element **(165).**

4. The laundry machine **(100)** according to claim 3, wherein the stationary element **(302)** is adapted to electrically couple with the light-emitting-element **(165)** without **(310,315)** a physical contact.

5. The laundry machine **(100)** according to claim 3, wherein the stationary element **(402)** is adapted to electrically couple with the light-emitting element **(165)** by means of a physical contact **(415a,415b).**

6. The laundry machine **(100)** according to claim 2, wherein the lightning system comprises a stand-alone power supply unit **(505)** provided in the at least one flap **(140a, 140b)** and coupled with the light-emitting element **(165),** said stand-alone power supply unit **(505)** supplying electric power to said light-emitting element **(165).**

7. The laundry machine **(100)** according to claim 1, wherein the light-emitting element **(165)** comprises at least one light-guiding member **(165)** adapted to transfer light radiation into the inside of the drum **(115),** and

wherein the lightning system further comprises a stationary element **(602),** stationary with respect to the outer casing **(105),** having at least one lightning device **(610)** adapted to be coupled with the at least one light-guiding member **(165)** when at least one door flap **(140a)** is in the open position, said at least one lightning device **(610)** supplying the light radiation to said at least one light-guiding member **(165).**

8. The laundry machine **(100)** according to any of the preceding claims, wherein the light-emitting element **(165)** is adjustable in orientation in order to allow a user to manually orienting the light radiation emitted by the light-emitting element **(165).**

9. The laundry machine **(100)** according to any one among the preceding claims, wherein the lighting

system **(165,302; 165,402; 165,505; 165,602)** further comprises an optical element **(325)** coupled to the light-emitting element **(165)** for optimizing the orientation of the light radiation emitted by said light-emitting element **(165).**

10. The laundry machine **(100)** according to any one among the preceding claims, wherein the lighting system **(165,302; 165,402; 165,505; 165,602)** further comprises a protective cover **(170)** for preventing damages to the light-emitting element **(165).**

11. A method for enlightening the inside of a drum **(115)** comprised in a laundry machine **(100)** for treating laundry items having an outer casing **(105)** rotatably housing a drum **(115)** for accommodating the items to be treated, the drum having a drum opening for accessing the inside of the drum **(115)** for loading/unloading the items, and a door **(135)** including at least one door flap **(140a)** moveable from a closed position, closing the drum opening, to an open position, allowing access to the inside of the drum, the method comprising the step of
enlightening the inside of the drum **(115),**
characterized in that said step of enlightening comprises:
enlightening the inside of the drum by means of a light-emitting element **(165),** mounted to the at least one door flap **(140a).**

12. The method according to claim 11, further comprising the step of:

supplying electric power to the light-emitting element **(165)** by means of a stationary element **(302; 402)** stationary with respect to the outer casing **(105).**

13. The method according to claim 12, wherein the step of supplying electric power to the light-emitting element **(165)** further comprises:

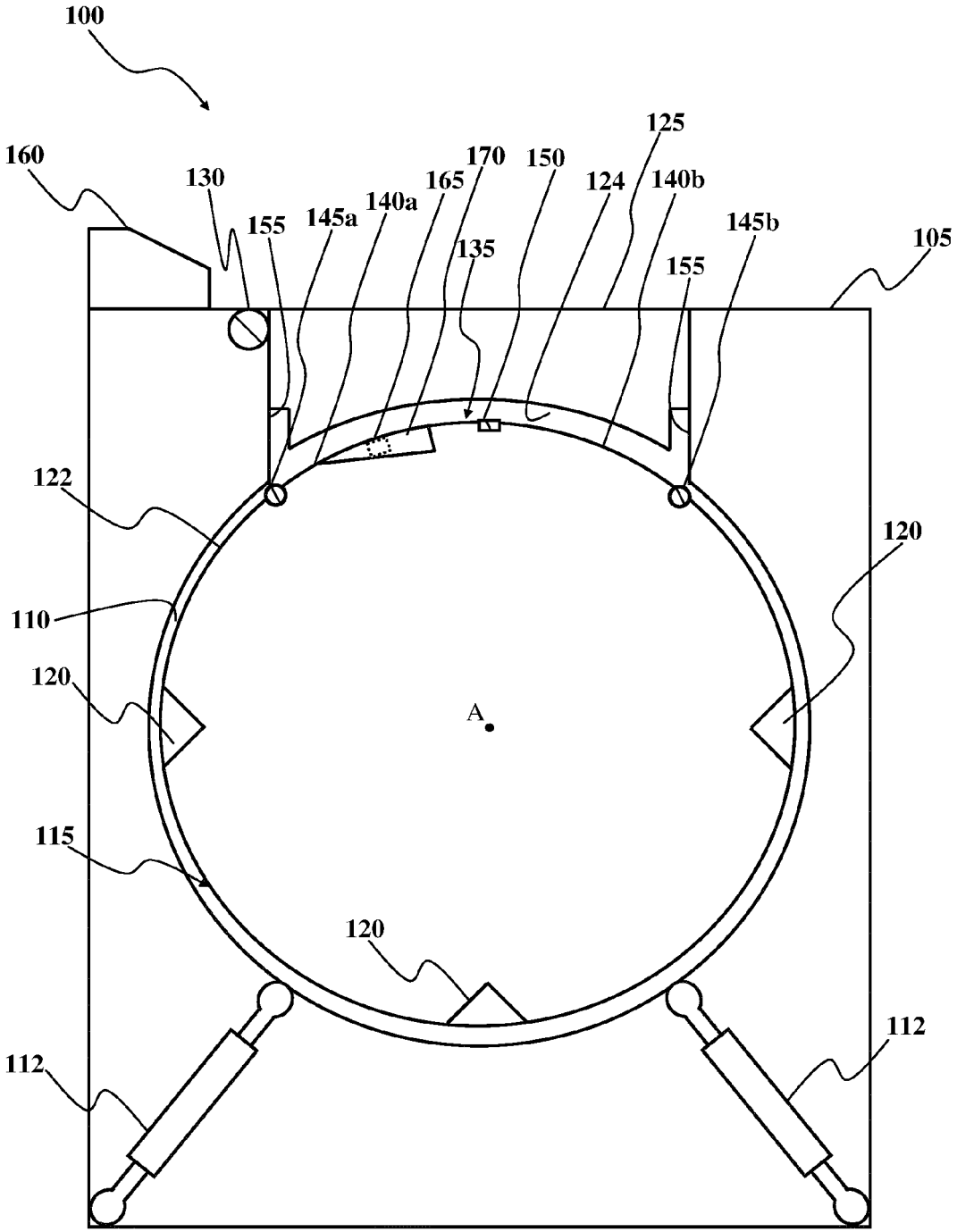
supplying electric power to said light-emitting element **(165)** only when the at least one door flap **(140a)** is in the open position.

14. The method according to claim 11, further comprising the step of:

supplying light radiation to the light-emitting element **(165)** by means of a stationary element **(602)** stationary with respect to the outer casing **(105).**

15. The method according to claim 14, wherein the step of supplying light radiation to the light-emitting element **(165)** further comprises:

supplying light radiation to said light-emitting element **(165)** only when the at least one door flap **(140a)** is in the open position.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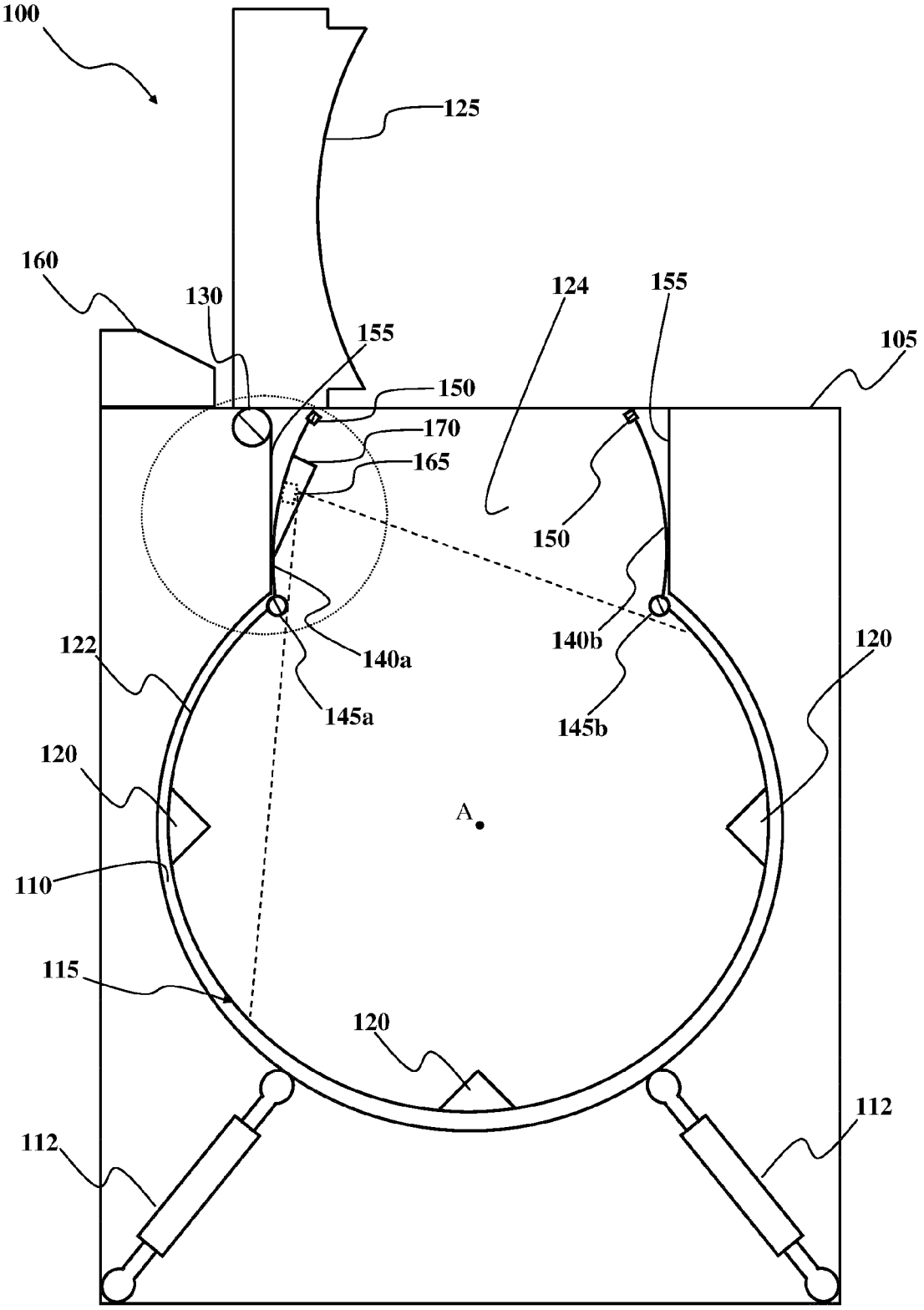
130
155
145a
140a
165
170
150
125
124
140b
145b
105
135
155
122
120
110
120
A
115
120
112
112

FIG.1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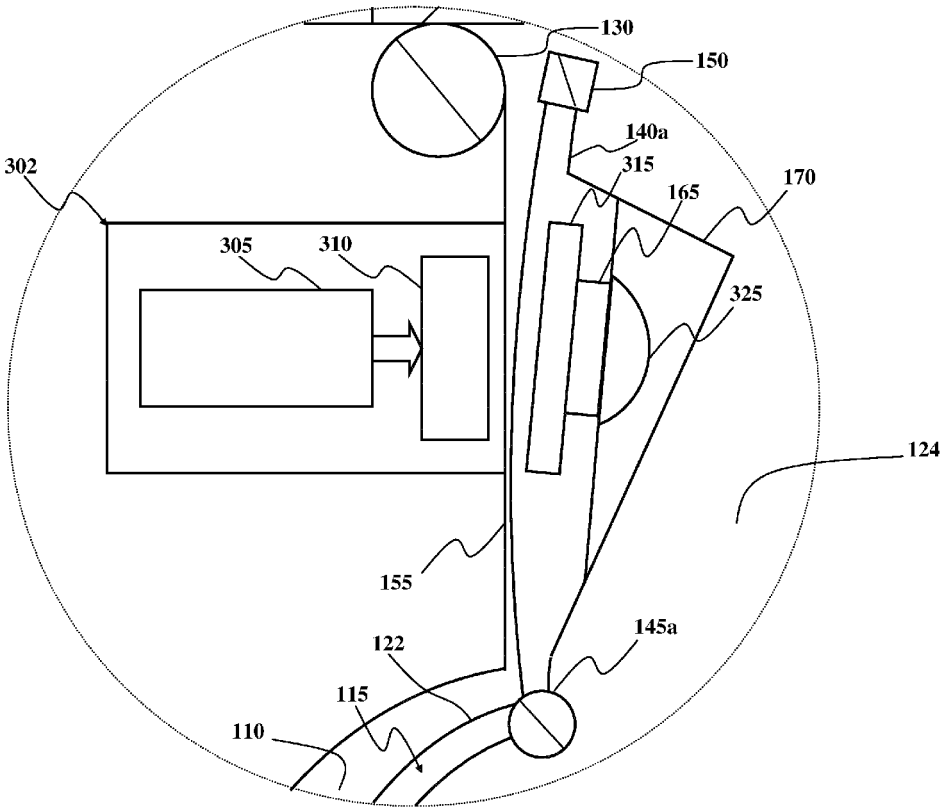
120
A
110
115
120
112
112

FIG.2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140a
315
170
302
165
305
310
325
124
155
145a
122
115
110

FIG.3

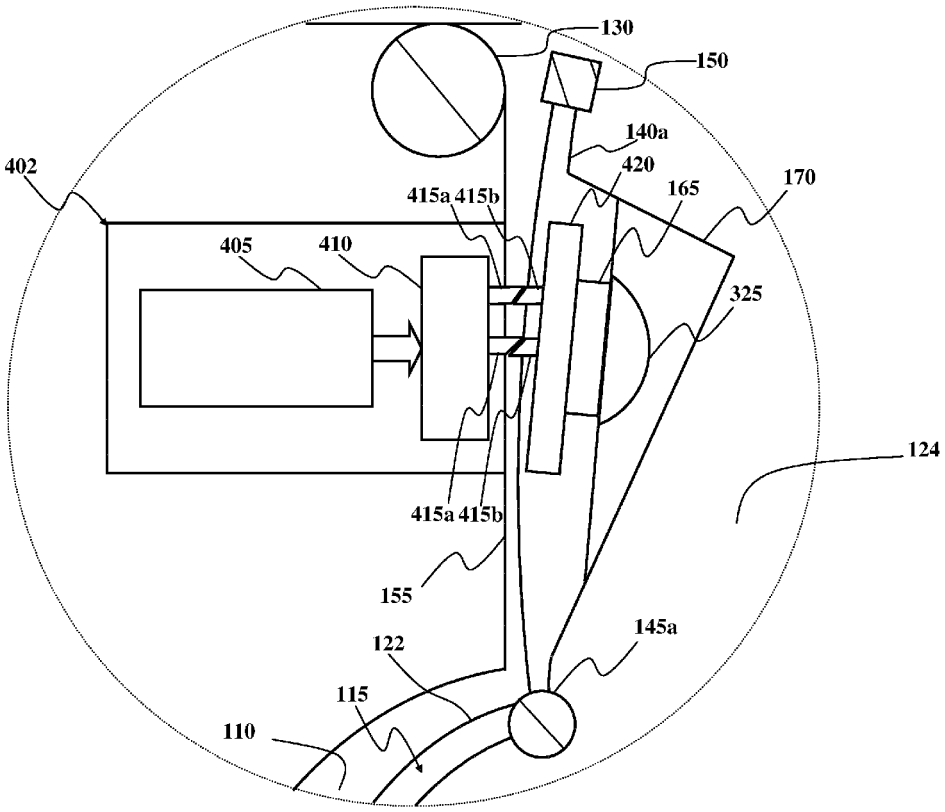
130
150
140a
420
165
170
402
415a 415b
405
410
325
124
415a 415b
155
145a
122
115
110

FIG.4

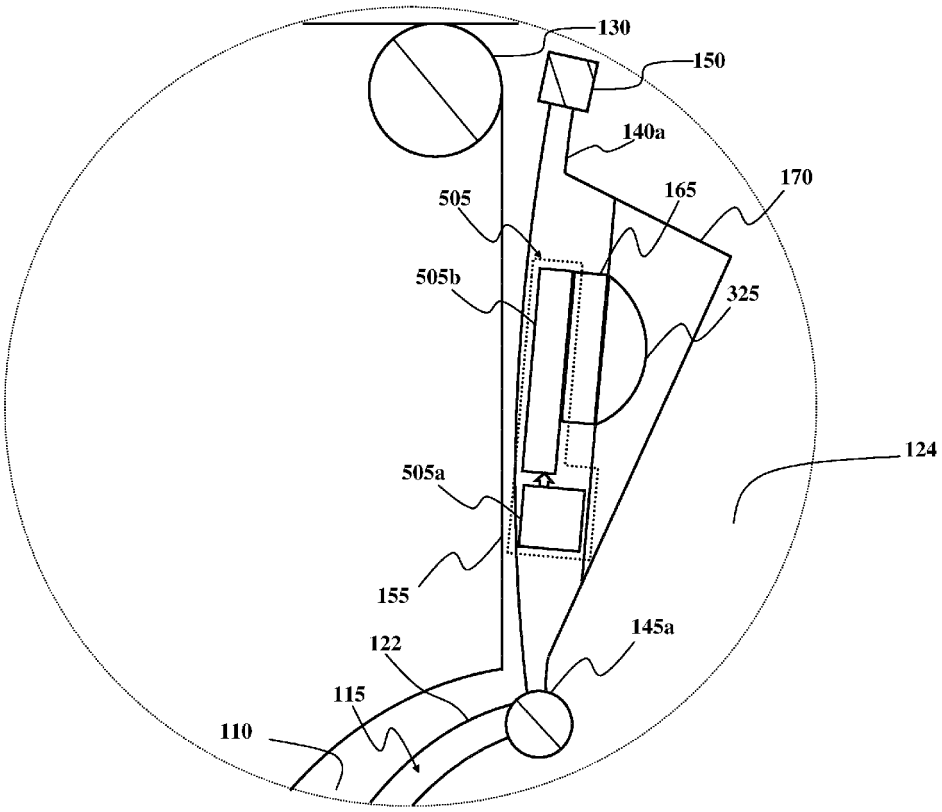

FIG.5

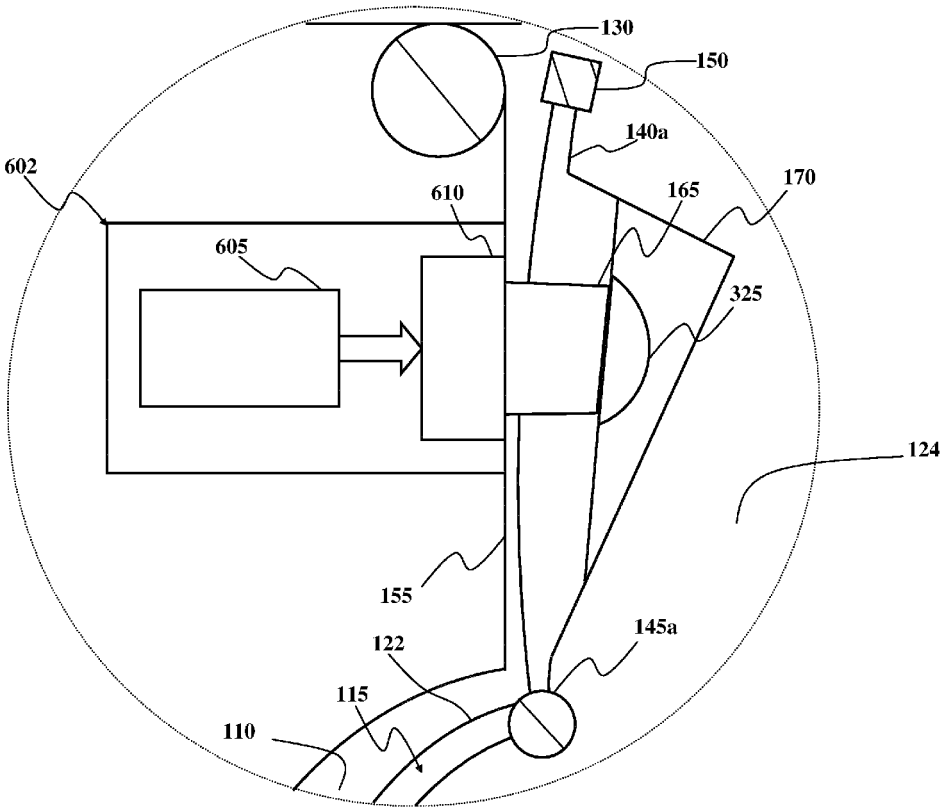

FIG.6

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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 3995

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	DE 10 2004 015081 A1 (MIELE & CIE [DE]) 20 October 2005 (2005-10-20) * paragraphs [0001], [0011] - [0015]; claims; figures * -----	1-3,5,9, 11,12,14 4,6-8, 10,13,15	INV. D06F37/10 D06F37/18 D06F39/14
X A	DE 196 49 039 C1 (BAUKNECHT HAUSGERAETE [DE]) 30 April 1998 (1998-04-30) * column 1, line 65 - column 2, line 41; claims; figures * -----	1,2,7,9, 11,14,15 3-6,8, 10,12,13	
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D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 May 2012	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

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16-05-2012

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