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(54) **A LAUNDRY WASHING/DRYING SYSTEM**

(57) The present invention relates to a laundry washing/drying system (1) comprising a drying machine (4) having a condenser which dehumidifies the drying air and a collection tank (3) wherein the condensate formed in the condenser (2) is collected; a washing machine (7) having a tub (5) wherein the washing process is per-

formed, a mains line (6) through which the mains water is taken and at least one feeding line (22) which carries the water to be delivered to the tub (5); and a delivery line (8) which enables the condensate in the collection tank (3) to be delivered to the washing machine (7).

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## Description

**[0001]** The present invention relates to a laundry washing/drying system wherein the water consumption is decreased.

**[0002]** The effects of global warming and climate changes are felt more and more every day. With the technological developments, energy and water consumption increases uncontrollably and regulations are drafted in various sectors to reduce the same. One of these sectors is the white goods sector. Today, white goods are used in every home and various systems are designed to reduce water consumption. In particular, there are various embodiments to reduce the water consumption of washing machines. In one of said embodiments, when the washing machine and the drying machine are used together, the condensate formed in the drying machine is stored in the collection tank and sent to the washing machine as washing water. Thus, less mains water is used in the washing machine. When the drying machine is positioned above the washing machine, the condensate stored in the collection tank can be sent to the washing machine by gravity via a transmission line, without the need for any water transmission member. When the washing machine and the drying machine are positioned side by side, the condensate is sent to the detergent dispenser or directly to the tub via a pump in the washing machine, thus saving water. However, the use of pumps leads to an increase in the carbon footprint of the product by increasing both extra cost and electricity consumption.

**[0003]** In the state of the art Korean Patent Application No. KR20010024952, it is disclosed that the water stored in the drying machine is transferred by means of a pump when the washing machine and the drying machine are positioned side by side.

**[0004]** In the state of the European Patent Application No. EP 1548173, the water transfer between the washing machines and the drying machines is realized by means of pumps and valves.

**[0005]** The aim of the present invention is the realization of a laundry washing/drying system wherein the water delivery between the washing machine and the drying machine is performed in a cost-effective manner and with lower energy consumption.

**[0006]** The laundry washing/drying system realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, a washing machine and a drying machine which are connected to each other by means of a delivery line; and a water delivery member having a casing, a condensate inlet pipe connected to the delivery line which transfers the condensate stored in the collection tank in the drying machine to the washing machine, a mains water inlet pipe connected to a mains line where the mains water taken from the mains to the washing machine is carried, a mains water drive wheel which rotates with the effect of the mains water coming from the mains line hitting a plurality of first blades thereon, a shaft that determines

the rotational axis of the mains water drive wheel and rotates around its own axis together with the mains water drive wheel, a condensate drive wheel which is located on the same shaft, whereon a plurality of second blades are provided and which rotates with the shaft so as to push the condensate coming from the delivery line, and at least one discharge pipe through which the condensate, pushed by the drive wheel, is fed into a supply line for feeding into the washing machine tub. Thus, especially when the washing machine and the drying machine are positioned side by side, the water in the collection tank is enabled to be delivered to the washing machine without consuming electrical energy and to be used as washing water. Consequently, it is ensured that the washing machine draws less water from the mains and both energy and water consumption of the laundry washing/drying system is reduced.

**[0007]** In an embodiment of the present invention, the water delivery member has a mains water receptacle which is filled with the mains water coming from the mains line, a condensate receptacle which is filled with the condensate coming from the delivery line, a first discharge pipe through which the mains water exits the mains water receptacle to be sent to the tub, and a second discharge pipe through which the condensate exits the condensate receptacle to be sent to the tub.

**[0008]** Thus, the mains water and the condensate passing through separate receptacle are sent through separate pipes, thereby reducing the pressure loss.

**[0009]** In another embodiment of the present invention, the laundry washing/drying system comprises an inner wall which is provided in the casing, which isolates the condensate receptacle and the mains water receptacle from each other without any water communication and which is disposed between the receptacles, a shaft opening on which is arranged on the inner wall and which enables the shaft to extend through the receptacles and provide motion transmission, and a sealing member which is positioned between the shaft and the shaft opening. Thus, the dynamic pressure of the mains water is transmitted to the condensate to be sent to the tub in the most efficient manner.

**[0010]** In another embodiment of the present invention, the water delivery member comprises the mains water inlet pipe, the condensate inlet pipe, the first discharge pipe through which the mains water is sent to the tub and the second discharge pipe through which the condensate is sent to the tub, and the first discharge pipe and the second discharge pipe have different diameters from each other. Thus, the water flow rate in the pipes can be controlled only by mechanically changing the diameter values of the pipes.

**[0011]** In another embodiment of the present invention, the first blade and the second blade have a helix form. The helix geometry increases the driving power of the water and reduces the noise generated during the water delivery.

**[0012]** In another embodiment of the present invention,

the mains water drive wheel and the condensate drive wheel have different diameters and different numbers of blades. Thus, the optimum drive power is provided by changing the number of blades and/or diameter values.

**[0013]** By means of the present invention, in the washing machines and the drying machines which are positioned side by side and which are connected to each other in fluid communication, the condensate stored in the collection tank in the drying machine is transferred to the tub in the washing machine without the need for using a pump.

**[0014]** The laundry washing/drying system realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the schematic view of the laundry washing/drying system related to an embodiment of the present invention.

Figure 2 - is the perspective view of the water delivery member related to another embodiment of the present invention.

Figure 3 - is the sideways cross-sectional view of the water delivery member related to another embodiment of the present invention.

**[0015]** The elements illustrated in the figures are numbered as follows:

- 1- Laundry washing/drying system
- 2- Condenser
- 3- Collection tank
- 4- Drying machine
- 5- Tub
- 6- Mains line
- 7- Washing machine
- 8- Delivery line
- 9- Casing
- 10- Mains water inlet pipe
- 11- Condensate inlet pipe
- 12- Shaft
- 13- First blade
- 113- Second blade

- 14- Mains water drive wheel
- 114- Condensate drive wheel
- 15- Water delivery member
- 16- Mains water receptacle
- 116- Condensate receptacle
- 17- First discharge pipe
- 18- Second discharge pipe
- 19- Inner wall
- 20- Shaft opening
- 21- Sealing member
- 22- Feeding line

**[0016]** The laundry washing/drying system (1) comprises a drying machine (4) having a condenser which dehumidifies the drying air and a collection tank (3) wherein the condensate formed in the condenser (2) is collected; a washing machine (7) having a tub (5) wherein the washing process is performed, a mains line (6) through which the mains water is taken and at least one feeding line (22) which carries the water to be delivered to the tub (5); and a delivery line (8) which enables the condensate in the collection tank (3) to be delivered to the washing machine (7).

**[0017]** The laundry washing/drying system (1) of the present invention comprises a water delivery member (15) having a casing (9), a mains water inlet pipe (10) which is provided on the casing (9) and through which the mains water coming from the mains line (6) enters, a condensate inlet pipe (11) which is provided on the casing (9) and through which the condensate coming from the delivery line (8) enters, at least one discharge pipe (17, 18) which is provided on the casing (9) and which is connected to the feeding line (22), a mains water drive wheel (14) which is connected to a shaft (12), which has a plurality of blades (13) thereon and which rotates together with the shaft (12) as the water coming from mains line (6) hits the first blades (13), and a condensate drive wheel (15) which is connected to the shaft (12), which has a plurality of second blades (113) thereon, which rotates with the rotational movement of the shaft (12) so as to move the condensate coming from the delivery line (8) towards the discharge pipe (17, 18) by means of the second blades (113). The casing (9) forms the body of the water delivery member (15). The mains water inlet pipe (10) is provided such that the water coming from the mains line (6) can enter the casing (9). In addition, the condensate inlet pipe (11) is provided, through which the condensate from the transmission line

(8) stored in the collection tank (3) and used for washing the laundry in the tub (5) can enter. Pressurized water passing through the mains water inlet pipe (10) hits the first blade (13) on the mains water drive wheel (14) and rotates the shaft (12) on its own axis, whereon the first blade (13) is located. The condensate coming from the delivery line (8) is stationary with the effect of gravity. The dynamic pressure of the condensate accumulated in the second blade (113) on the condensate drive wheel (114) is increased with the rotational movement of the shaft (12). Thus, the dynamic pressure of the condensate coming from the collection tank (3) with the effect of gravity is increased without using a pump.

**[0018]** In an embodiment of the present invention, the water delivery member (15) has a mains water receptacle (16) which is provided in the casing (9) and which is filled with the mains water coming from the mains line (6), and a condensate receptacle (116) which is provided in the casing (9) and which is filled with the condensate coming from the delivery line (8). Thus, the mains water and the condensate are filled into separate receptacles so as to prevent them from mixing with each other. Here, it is aimed to prevent the reduction of the rotational speed of the shaft (12) and thus the driving power of the water delivery member (15) due to the collection of the high-pressure mains water in the same receptacle with the low-pressure condensate.

**[0019]** In another embodiment of the present invention, the water delivery member (15) has a first discharge pipe (17) through which the mains water filling the mains water receptacle (16) exits the casing (9) and a second discharge pipe (18) through which the condensate filling the condensate receptacle (116) exits the casing (9). It is provided that the condensate and the mains water exit the water delivery member (15) through separate pipes. Thus, the diameter values of the first discharge pipe (17) and the second discharge pipe (18) can be changed so as to adjust the dynamic pressures thereof, and pressure loss which would occur in the case an outlet pipe is used is prevented.

**[0020]** In another embodiment of the present invention, the water delivery member (15) has an inner wall (19) which separates the mains water receptacle (16) and the condensate receptacle (116) from each other as two separate compartments. By means of the inner wall (19), the mains water and the condensate are completely separated from each other, and the condensate is sent to the tub (5) only by the rotation of the condensate drive wheel (114). By means of this embodiment, it is observed that the dynamic pressure of the condensate increases more.

**[0021]** In another embodiment of the present invention, on the inner wall (19), there is a shaft opening (20) which allows the shaft to pass therethrough and extend from the mains water receptacle (16) to the condensate receptacle (116). Thus, the rotational movement of the mains water drive wheel (14) and the shaft (12) around its own axis is transferred to the condensate drive wheel (114) located in the condensate receptacle (116).

**[0022]** In another embodiment of the present invention, at least one sealing member (21) is placed between the shaft opening (20) and the shaft (12). Thus, the pressure in the mains water is used to send the condensate to the tub (5) at the optimum level.

**[0023]** In another embodiment of the present invention, the condensate inlet pipe (11) has a larger diameter than the diameter of the second discharge pipe (18). The smaller diameter of the second discharge pipe (18) causes the dynamic pressure of the condensate sent from the water delivery member (15) to the tub (5) to be increased, thus enabling the condensate to reach the tub (5) easily.

**[0024]** In another embodiment of the present invention, the first blade (13) and the second blade (113) have a curved form. The curved blade structure increases the water drive power and reduces the noise generated by the water hitting the blades (13, 113). In addition, the angles of the blades (13, 113) can be changed as desired so as to adjust the dynamic pressure values gained by the mains water and the condensate.

**[0025]** In another embodiment of the present invention, the condensate drive wheel (114) has more second blades (113) than the number of first blades (13) on the mains water drive wheel (14). Thus, the condensate is enabled to be better sucked from the collection tank (3) by the water delivery member (15) in addition to the effect of gravity.

**[0026]** By means of the present invention, the transfer of the condensate stored in the drying machine (4) to the tub (5) in the washing machine (7) is provided in a cost-effective manner without using any pump.

## Claims

1. A laundry washing/drying system (1) **comprising** a drying machine (4) having a condenser which dehumidifies the drying air and a collection tank (3) wherein the condensate formed in the condenser (2) is collected; a washing machine (7) having a tub (5) wherein the washing process is performed, a mains line (6) through which the mains water is taken and at least one feeding line (22) which carries the water to be delivered to the tub (5); and a delivery line (8) which enables the condensate in the collection tank (3) to be delivered to the washing machine (7), **characterized by** a water delivery member (15) having a casing (9), a mains water inlet pipe (10) which is provided on the casing (9) and through which the mains water coming from the mains line (6) enters, a condensate inlet pipe (11) which is provided on the casing (9) and through which the condensate coming from the delivery line (8) enters, at least one discharge pipe (17, 18) which is provided on the casing (9) and which is connected to the feeding line (22), a mains water drive wheel (14) which is connected to a shaft (12), which has a plurality of blades (13) thereon and which rotates together with the shaft

(12) as the water coming from mains line (6) hits the first blades (13), and a condensate drive wheel (114) which is connected to the shaft (12), which has a plurality of second blades (113) thereon, which rotates with the rotational movement of the shaft (12) so as to move the condensate coming from the delivery line (8) towards the discharge pipe (17, 18) by means of the second blades (113).

water drive wheel (14).

2. A laundry washing/drying system (1) as in Claim 1, **characterized by** the water delivery member (15) which has a mains water receptacle (16) which is provided in the casing (9) and which is filled with the mains water coming from the mains line (6), and a condensate receptacle (116) which is provided in the casing (9) and which is filled with the condensate coming from the delivery line (8). 5 10 15
3. A laundry washing/drying system (1) as in Claim 2, **characterized by** the water delivery member (15) which has a first discharge pipe (17) through which the mains water filling the mains water receptacle (16) exits the casing (9) and a second discharge pipe (18) through which the condensate filling the condensate receptacle (116) exits the casing (9). 20 25
4. A laundry washing/drying system (1) as in Claim 2 or 3, **characterized by** an inner wall (19) which separates the mains water receptacle (16) and the condensate receptacle (116) from each other as two separate compartments. 30
5. A laundry washing/drying system (1) as in Claim 4, **characterized by** a shaft opening (20) which is provided on the inner wall (19) and which allows the shaft to pass therethrough and extend from the mains water receptacle (16) to the condensate receptacle (116). 35
6. A laundry washing/drying system (1) as in Claim 5, **characterized by** at least one sealing member (21) which is placed between the shaft opening (20) and the shaft (12). 40
7. A laundry washing/drying system (1) as in any one of the Claims 3 to 6, **characterized by** the condensate inlet pipe (11) which has a larger diameter than the diameter of the second discharge pipe (18). 45
8. A laundry washing/drying system (1) as in any one of the above claims, **characterized by** the first blade (13) and the second blade (113) which have a curved form. 50
9. A laundry washing/drying system (1) as in any one of the above claims, **characterized by** the condensate drive wheel (114) has more second blades (113) than the number of first blades (13) on the mains 55

Figure 1

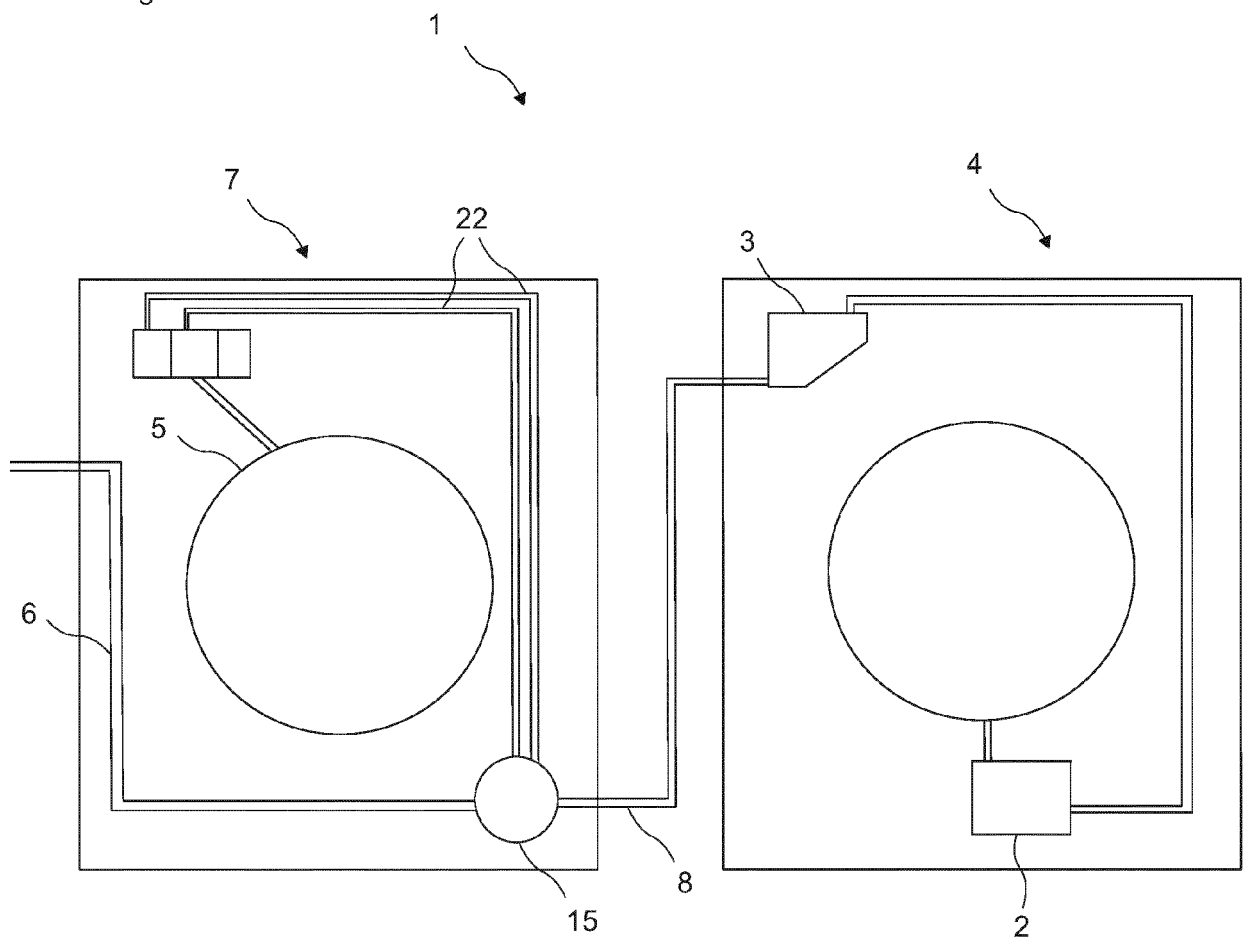


Figure 2

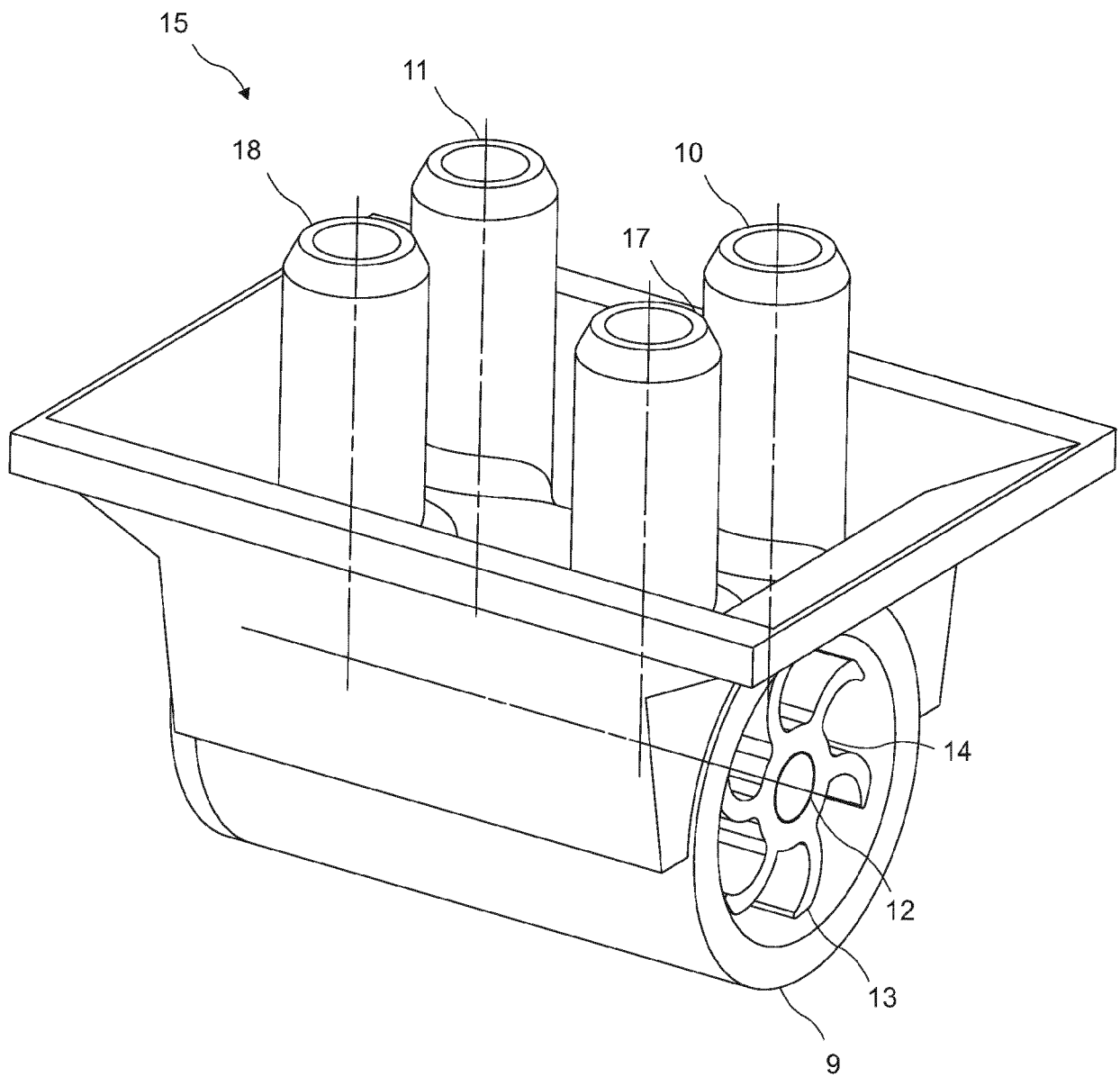
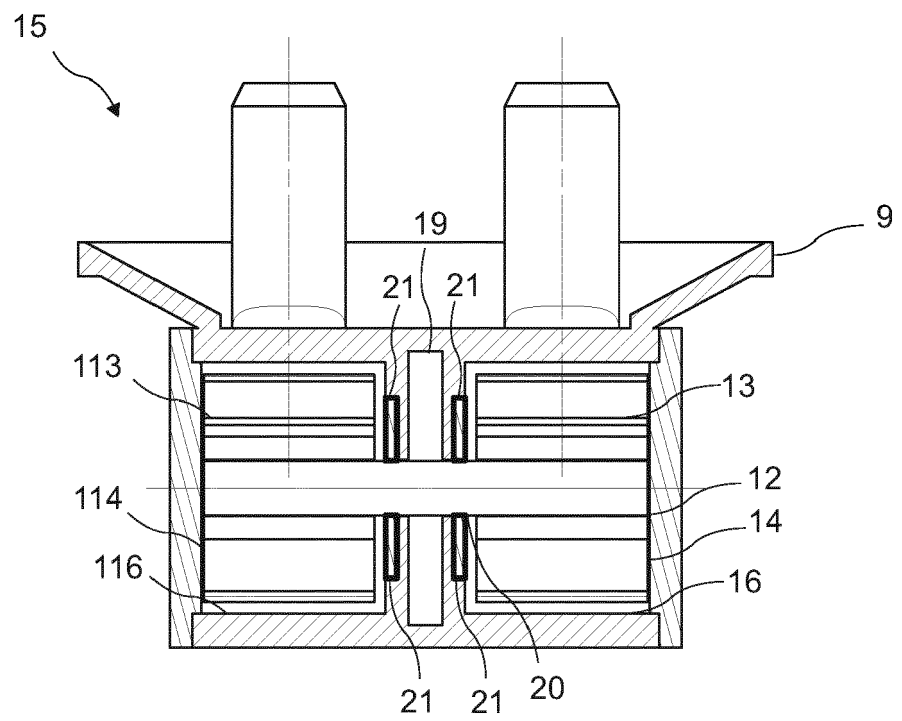


Figure 3





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Application Number

EP 23 16 5464

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EPO FORM 1503 03.82 (P04C01)

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                           |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                       |                                                                                            |
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| Category                                                                                                                                                                                                                                                      | Citation of document with indication, where appropriate, of relevant passages                                                                                   | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)                                                    |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                    |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                       |                                                                                            |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                              |                                                                                                                                                                 | Date of completion of the search<br><b>28 September 2023</b>                                                                                                                                                                                                                          | Examiner<br><b>Stroppa, Giovanni</b>                                                       |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                 | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                                            |

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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