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(54) A laundry management system

(57) A laundry management system and a method for operating such a system are provided. Laundry that passes through the system is identified using radio frequency identification (RFID), while the operation of the laundry machines (20) is monitored. As a result, information relating to the identification of the laundry items (10) during operation of the laundry machine (20) can be combined with information regarding that operation, providing useful information regarding the laundry history of particular items (10). There is also provided a laundry machine (20) having an RFID reader with an antenna (26) located in such a position that the drum (22) of the machine acts to amplify signals originating from the laundry items (10).

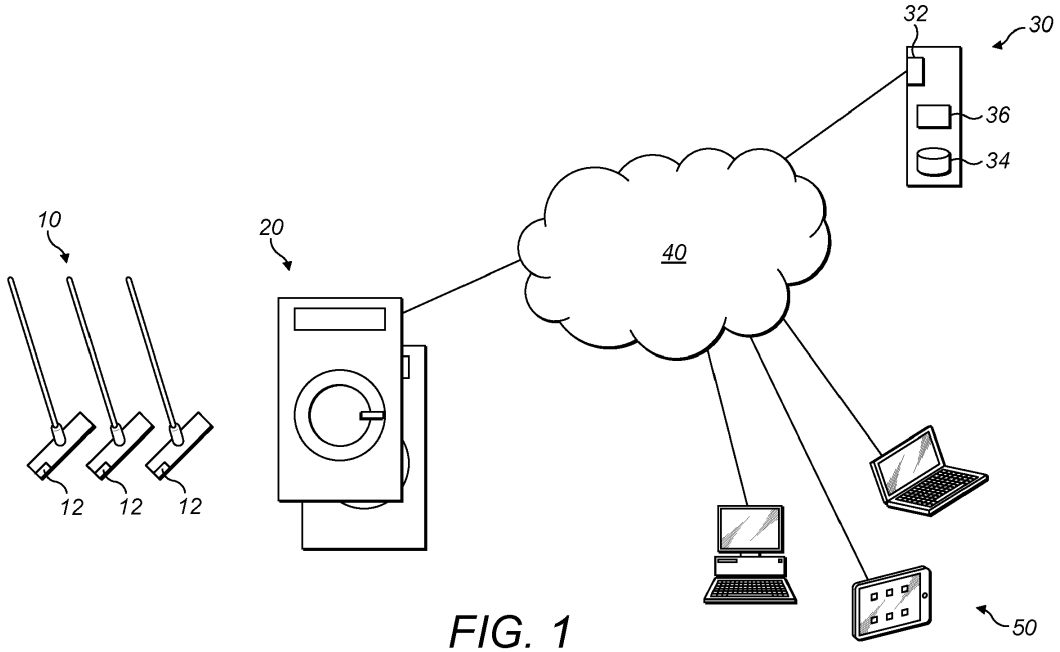

FIG. 1

EP 2 568 077 A1

Description

Field of the invention

[0001] The present invention relates to a system and method for managing laundry items. In particular, but not exclusively, the present invention relates to a laundry management system in which radio-frequency identification (RFID) is used to assist in providing a laundry history for particular laundry items.

Background to the invention

[0002] The cleaning of large buildings creates a substantial amount of laundry, in the form of re-usable mops, cleaning cloths and such-like which must be washed before they can be used again. The larger the building, or the cleaner it must be, the more difficult the logistical task of managing this laundry process becomes.

[0003] Perhaps the most challenging examples of laundry processes of this kind occur in hospitals, where the cleanliness of the building is not merely an aesthetic consideration but a matter of human health. In this context, it is essential that when cleaning products, such as mops, are laundered, this process is carried out efficiently and effectively. Indeed, in many instances, laundry processes are required not merely to clean the products but also to disinfect them.

[0004] So, in a hospital environment, large numbers of mops and cleaning cloths must be laundered each day to a required standard. This process must be distributed amongst available laundry machines and systems must be put in place to ensure that products that have not been adequately cleaned are not re-used. At present, such processes are managed manually and there is a risk of user error, either by failing to ensure all items are placed in the laundry machines or that the laundry machines are correctly used. Moreover, there is the risk that laundry machines will malfunction.

[0005] When errors occur, there is no way to identify their origin and as a result no way to predict the potential consequences. For example, if a particular mop is found to be infected, then one might surmise that the cleaning process has failed, but it is not clear what aspect of the process has failed and therefore it is impossible to make a judgment as to the risk of infection in other cleaning products.

[0006] With the aim of mitigating some of the above difficulties, laundry machines have been proposed which give a reading regarding their status and the effectiveness of their operation. For example, a laundry machine may give a reading at the end of a wash cycle as to whether a temperature high enough to thermally disinfect products within the machine was achieved during that cycle. This might be in the form of a simple "pass" or "fail" reading given to a user. When the user comes to retrieve items from the laundry machine, it is clear whether those products have been satisfactorily cleaned.

[0007] Although valuable for the management of individual loads placed in each laundry machine, this approach is still vulnerable to user error. For example, users must ensure that the correct "pass" or "fail" reading is heeded. Moreover, there remains the risk that the "pass" or "fail" reading is itself incorrect. This approach fails to allow such problems to be traced if an individual item is found to be infected at a later stage.

[0008] It has been proposed to manage the tracking of laundry items using radio frequency identification (RFID) technology. For example, the "MopLog" system proposed by Vermop Salmon GmbH suggests that an RFID tag is introduced to each laundry item, and that the laundry items are scanned before they are placed in the laundry machines. This allows the location of particular laundry items to be identified relatively quickly, and can assist in tracing the history of particular laundry items. However, the system requires the laundry items to be scanned prior to their placement in the laundry machine, which introduces a time consuming step during the laundry process. Moreover, while it is possible to locate laundry items, the system provides no information which indicates whether items have been washed at all.

Summary of the invention

[0009] According to a first aspect of the present invention, there is provided a laundry management system, comprising:

a plurality of laundry items, each item incorporating a radio-frequency identification tag;
one or more laundry machines for receiving laundry items therein; and
a server,
wherein each laundry machine comprises:

a radio frequency identification reader for reading the radio frequency identification tags in the laundry items, thereby allowing identification of the laundry items in the laundry machine; and
a monitoring device for monitoring operation of the laundry machine; and

wherein the server comprises

an interface for receiving information from the radio frequency identification reader and the monitoring device; and
a data store for storing the received information.

[0010] So, the first aspect of the present invention is able to combine information from both the radio identification frequency reader and the monitoring device in the data store. As a result, information relating to the identification of the laundry items during operation of the laundry machine can be combined with information regarding that operation. Accordingly, at a later stage, it is possible

to discover information relating to particular laundry items regarding their laundry history. Similarly, at a later stage, it is possible to discover information relating to particular laundry machines, such as the laundry items they have operated on and the features of their operation.

[0011] Operation of the laundry machine in this context typically refers to a washing operation or other operation in which the laundry machine acts on the laundry items.

[0012] In preferred embodiments, the monitoring device monitors at least one of the temperature, the ozone level, the time and the duration of the operation of the laundry machine. This allows the server to receive information relating to these aspects of the operation of the laundry machine. This might, for example, allow the server to receive information as to whether the laundry machine had reached a temperature or ozone level for thermal disinfection. Thus, were a laundry item subsequently to be found to be infected, it would be possible to identify whether this occurred prior to or after the operation of the washing machine. Moreover, it would further be possible to identify which other laundry items were placed in the laundry machine together with the infected laundry item, and thus to make further investigations if necessary.

[0013] In some embodiments, the system comprises a network over which the laundry machines and the server communicate. The network may be any suitable data communications network, such as the internet, a local area network, or a wide area network.

[0014] In preferred embodiments, the radio frequency identification reader is arranged to read the radio frequency identification tags in the laundry items during operation of the laundry machine. As such, there is no separate step of reading the radio frequency identification tags which must occur prior to or after the operation of the laundry machine, ensuring that the laundry process as a whole is time efficient.

[0015] Preferably, the server further comprises a processing unit for generating one or more reports based on the information stored in the data store. Such reports may provide a readily accessible visual display of the items that have been washed in a particular laundry machine, for example. Alternatively or additionally, the reports may display the history of a particular laundry item, such as how often it has been washed and in which laundry machines, for example. One or more client devices may be provided to allow access to the reports generated by the server. For example, the server may generate reports in response to a request from a client device and may transmit the report to the client device. The client device and the server may communicate over a network, such as the internet. The network may or may not be the same network as that used in communications between the laundry machines and the server.

[0016] The radio-frequency identification (RFI D) reader is preferably an ultra-high frequency (UHF) RFID reader. UHF RFID systems are able to identify a plurality of RFID tags simultaneously over relatively long distances and thus provide particular advantages in the context of the present invention. For example, the user is not required to present each laundry item individually to the RFID reader when placing them in the laundry machine but can instead allow identification of the laundry items to occur automatically. In preferred embodiments, the RFID reader is a dual-band RFID reader.

[0017] In preferred embodiments, each laundry machine comprises a drum for receiving the laundry items during a washing operation, wherein the drum acts to magnify electromagnetic signals originating with the laundry items in the location of an antenna of the RFID reader. That is, the antenna of the RFID reader is placed in a position in which the signal it receives is magnified by the action of the drum. Accordingly, the present invention may take advantage of the conventional structure of laundry machines (which typically include a drum) to enact RFID more efficiently and reliably. In particular, because the drum acts to magnify the RFID signal in the region of the antenna of the RFID reader, less power is required by the RFID system to identify the laundry items.

[0018] Indeed, this feature is considered new and inventive in itself, and according to a further aspect of the present invention there is provided a laundry machine, comprising:

> a drum for receiving laundry items during a washing operation; and
> a RFID reader for identifying laundry items in the drum,

wherein the drum acts to magnify electromagnetic signals originating with the laundry items in the location of an antenna of the RFID reader.

[0019] In preferred embodiments, the drum is a stainless steel drum. Drums formed of stainless steel are effective to reflect a significant proportion of electromagnetic signals originating within the laundry items while simultaneously being relatively cheap to manufacture and durable. However, in alternative embodiments the drum may be formed of other materials as appropriate.

[0020] In preferred embodiments, the laundry machine further comprises a door arranged to provide access to the drum, wherein the antenna of the radio frequency identification reader is disposed on the door. Preferably, the antenna of the radio frequency identification reader is disposed on an outer surface of the door, and more preferably is disposed in a central position of the door.

[0021] The antenna of the radio frequency identification reader may be integrally formed with the door, or may be mounted on the door by separate mounting means. In preferred embodiments, the mounting means is transparent to allow visual inspection of the contents of the laundry machine.

[0022] Preferably, the laundry machine further comprises a shield arranged to inhibit electromagnetic signals arriving at the antenna of the radio frequency identification reader from outside the drum. For example, the antenna of the radio frequency identification reader may be

disposed between the drum and the shield. In preferred embodiments, the shield is metallic. The shield can enhance the ability of the radio frequency identification reader to read signals originating from within the drum by avoiding interference from outside the drum. The shield may alternatively or additionally have an effect or reflecting signals originating from within the drum towards the antenna of the radio frequency identification reader.

[0023] Preferably, the laundry machine further comprises a monitoring device for monitoring operation of the laundry machine. Moreover, preferred embodiments of the laundry machine further comprise an interface for transmitting information relating to the identification of the laundry items and the operation of the laundry machine over a network.

[0024] According to a further aspect of the present invention, there is provided a method for operating a laundry management system, comprising:

identifying laundry items in a laundry machine by reading RFID tags in the laundry items;
monitoring operation of the laundry machine;
receiving and storing information regarding the identity of the laundry items and the operation of the laundry machine; and
storing the received information.

[0025] The method may further comprise reporting the received information. In particular, the method may comprise generating a report in response to a user input.

[0026] It can also be appreciated that the invention can be implemented using computer program code. Indeed, according to a further aspect of the present invention, there is therefore provided a computer program product comprising computer executable instructions for carrying out the method of the first aspect. The computer program product may be a physical storage medium such as a Read Only Memory (ROM) chip. Alternatively, it may be a disk such as a Digital Versatile Disk (DVD-ROM) or Compact Disk (CD-ROM). It could also be a signal such as an electronic signal over wires, an optical signal or a radio signal such as to a satellite or the like. The invention also extends to a processor running the software or code, e.g. a computer configured to carry out the method described above.

Brief description of the drawings

[0027] A preferred embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a schematic drawing of a laundry system according to a preferred embodiment of the present invention;
Figure 2 illustrates a laundry machine for use in the laundry system of Figure 1;
Figure 3 shows steps undertaken during operation of the laundry system of Figure 1;
Figure 4A shows a first exemplary report which may be generated by a server; and
Figure 4B shows a second exemplary report which may be generated by the server.

Detailed description

[0028] Referring to Figure 1, a laundry system according to a preferred embodiment of the present invention comprises, a plurality of laundry items 10, a plurality of laundry machines 20, and a server 30. A network 40 is provided to connect the laundry machines to the server 30. Additionally, one or more client devices 50 are provided, which may access the server 30 via the network 40.

[0029] The laundry items 10 may be any item which may be re-used after washing, but are typically textile items such as mops or cleaning cloths. Each laundry item comprises a radio frequency identification (RFI D) tag 12. The RFI D tag 12 acts as a transponder which may be interrogated by radio waves, providing a response. In the preferred embodiment, each tag 12 is encoded with a 16 digit number which uniquely identifies the laundry item 10 to which it belongs.

[0030] The RFID tags 12 may, for example, be sewn into or ironed onto the laundry items 10. However, the skilled person will appreciate that they may be incorporated into the laundry items 10 in other ways, as appropriate. The RFID tag 12 is designed to be resistant to degradation by chemicals typically encountered during laundry processes and to the relatively high temperatures. For example, in the preferred embodiment, the RFID tag 12 may be resistant to temperatures up to 130°C.

[0031] The RFID tag 10 of the preferred embodiment is design to operate in the ultra-high frequency (UHF) range. For example, the RFID tag 10 may operate between 865 and 928 MHz.

[0032] An exemplary laundry machine 20 is shown in more detail in Figure 2. The laundry machine comprises a drum 22 for receiving the laundry items 10 and a door 24 used to provide an opening to the drum 22. An antenna 26 for an RFID reader is provided on the door 24 in such a position that when the door 24 is closed, signals from laundry items 10 in the drum 22 are amplified by the reflectivity of the stainless steel drum surfaces in the location of the antenna 26. This effect reduces the power requirements of the RFID reader while increasing its reliability. The antenna 26 is preferably located on the outside of the door 24, i.e. on the opposite side to the drum 22, in order to protect the antenna 26 from damage during the washing of laundry items 10 in the drum.

[0033] Although not shown in Figure 2, a metallic shield may be disposed around the antenna 26 to reduced interference from signals originating outside the drum 22.

[0034] In the example shown in Figure 2, the antenna

26 is mounted to the outside of the door 24 by a dedicated mounting means. In preferred embodiments, this mounting means may be transparent in order to allow visual inspection of the contents of the drum 22. In other embodiments, the antenna 26 may be integrated with the door 24. For example, the antenna 26 may be embedded in the door 24. In preferred embodiments, the dimensions of the antenna 26 may be 17cm by 17cm or 24cm by 24cm.

[0035] The antenna 26 may be connected to further components of the RFID reader, which may also be mounted on the door 24, or may preferably be mounted elsewhere. The further components of the RFID reader may, for example, be mounted on a wall in the vicinity of the main body of the laundry machine 20.

[0036] The RFID reader operates in the same frequency such range as the RFID tag 12. That is, the RFID reader of the preferred embodiment operates in the UHF range, for example, between 865 and 928 Mhz. An example of a suitable type of RFID reader is available from FEIG Electronic GmbH under product no. MRU200.

[0037] By placing the antenna 26 in the appropriate position, at a power of 0.3W a read range of approximately 100cm van be achieved. Moreover, the rotation of the drum 22 during operation of the laundry machine 20 acts to ensure optimal tag/antenna alignment at some point thereby maximising opportunity for at least one tag read during the wash cycle. Accordingly, a reliable reading of laundry items 10 can be achieved.

[0038] The laundry machine 20 also comprises a monitoring device 28. The monitoring device monitors the operation of the laundry machine 20. For example, during a washing operation, the monitoring device 28 may monitor the temperature achieved in the drum 22 of the laundry machine 20. The monitoring device 28 may also monitor other aspects relating to the effectiveness of the laundry machine 20 in use. Examples of other characteristics that the monitoring device 28 may monitor may include the duration of a washing operation and the time at which it occurs. The monitoring device 28 may be implemented using known electronic circuitry and sensors.

[0039] Another characteristic of the operation of the laundry machine 20 may be the ozone level. Many modern laundry machines introduce ozone into the drum 22 during operation. The level of ozone introduced to the drum 22 may affect the required temperature for thermal disinfection to occur. For example, the required temperature for thermal disinfection when ozone is successfully introduced to the laundry machine 20 may be in the region of 70°C to 76°C, whereas in the absence of ozone the required temperature for thermal disinfection may be above 100°C.

[0040] The laundry machine 20 further comprises a network interface (not shown). This allows data to be passed between the laundry machine 20 and the server 30 via the network 40. The network interface is in communication with the RFID reader 26, and is therefore able to communicate information from the RFID reader 26 to the server 30. The network interface also receives information from the monitoring device 28 relating to the performance of the laundry machine 20 in use, and transmits this also to the server 30.

[0041] Returning to Figure 1, the server 30 may be implemented using any appropriate data processing device or computer. In one example, the server 30 uses a known operating system, such as Microsoft Windows 2003 Server. The server 30 comprises an interface 32 arranged to receive data from the laundry machines 20 across the network 40. In the preferred embodiment shown in Figure 1, this interface 32 also enables the client devices 50 to access information stored on the server 30. The server 30 further comprises a data store 34 in which information received from the laundry machines, for example, may be stored. The server 30 also comprises a processing unit 36 which can generate reports from the data stored in the data store 34.

[0042] The network 40 may take any appropriate form for the transmission of data between the other elements of the system. For example, the network 40 may be a local area network (LAN), a wide area network (WAN) or the internet. Moreover, although only a single network 40 is shown in Figure 1, this may be formed of various constituent parts. For example, the server 30 may communicate with the laundry machines 20 via a LAN, and communicate with the client devices 50 via the internet.

[0043] The client devices 50 may be any network enabled device, such as a personal computer (PC), a smart mobile telephone, or a tablet device. The client devices 50 are arranged to receive information from the server 30 via the network 40 and display this to a user. Accordingly, the client devices 50 enable a user to view information relating to the laundry machines 20 which has been stored at the server 30.

[0044] The operation of the laundry system will now be described with reference to Figure 3, which illustrates the steps undertaken by the laundry machine 30, the server 40, and a client device 50.

[0045] The laundry system may, for example, be used in the context of a large public structure, such as a hospital. The hospital may create large amounts of laundry each day. The example of the laundry produced that will be used to explain the functioning of the present invention is that of mops used in cleaning the hospital. As such, the mops are the laundry items 10 described above, and each will contain an RFID tag 12 which uniquely identifies that mop.

[0046] When a mop 10 is cleaned, it is placed in a laundry machine 20. In fact, multiple mops will be placed in the laundry machine 20 for a given washing operation, at step s1.

[0047] At step s2, the washing operation of the laundry machine 20 is initiated. Conventionally, the washing operation will be initiated by manual user input, but alternatively it may be automated in some manner. For example, the laundry machine 20 may be programmed to initiate the washing operation at particular times. Alter-

natively, the laundry machine 20 may be controlled from the server 30, and may, for example, be controlled to initiate the washing operation when the number of laundry items 10 in the machine exceeds a threshold value.

[0048] During the washing operation, the RFID reader 26 of the laundry machine 20 reads the RFID tags 12 on the mops 10 which have been placed in the laundry machine 20, at step s3. Typically, details of the tags that have been read will be buffered at the RFID reader 26 for a predetermined time (e.g. one second) before being uploaded to the server 30. As mentioned above, the reading of the RFID tags 12 is assisted by the placement of the RFID reader 26 in such a position that signals from mops 10 within the laundry machine 20 are amplified by the drum 22.

[0049] The RFID reader may be activated by the closing of the door 24 of the laundry machine 20. That is to say, the RFID reader 26 may automatically read the RFID tags 12 all items in the drum 22 of the laundry machine 20 when the door 24 is shut. Alternatively, the RFID reader 26 may be activated in some other way, such as manually by a user of the laundry machine 20. In another alternative, the RFID reader may be permanently on, reading all tags available to it at any given time.

[0050] At step s4, the RFID reader 26 returns the information read from the RFID tags 12 to the server 30 across the network. This will occur regularly during the washing operation, each time providing information to the server 30 regarding the RFID tags 12 that have been identified since the last time information was uploaded. The information uploaded during step s3 will include the times at which RFID tags 12 have been identified, the identity of those RFID tags 12 and the identity of the RFI D reader 26.

[0051] A software operation at the server 30 then stores this information, at step s5. The information is stored in an accessible form so that it can be recovered at a later time. By storing information which associates RFID tags 12 with having been identified by particular RFID readers 26 at a particular time, one can later identify which laundry items 10 were in a given laundry machine 20 at a given time. The skilled person will appreciate that the server 30 may receive information from a plurality of different laundry machines 20 simultaneously, and may thus concurrently store information relating to the laundry items 12 which are in each of these machines 20.

[0052] As mentioned above, although Figure 3 shows steps s4 and s5 once only, these may be repeated a regular intervals during the washing operation.

[0053] At step s6, during the washing operation, various characteristics of the performance of the laundry machine 20 are monitored. For example, in a hospital it may be desired that the temperature and/or the ozone level within the drum 22 during the washing operation reaches a value sufficient to disinfect the laundry items 10. Accordingly, the temperature and/or ozone level within the drum may be measured during the washing operation. Other aspects of the washing operation may also be observed, such as its duration or power usage.

[0054] Although step s6 is shown in Figure 3 as occurring after steps s4 and s5, one skilled in the art will appreciate that these may take place in other orders or indeed concurrently. It should be appreciated, however, that steps s4 and s6 preferably occur during the washing operation.

[0055] At step s7, the laundry machine reports these characteristics of the laundry operation to the server 30 across the network 40, together with the times at which the laundry operation started and stopped. For example, the laundry machine 20 may generate an extended Markup Language (XML) file containing information relating to the characteristics of the washing operation and transmitting this to the server 30. In one example, the XML file will contain information relating to the start and stop times of the washing operation, whether the washing operation reached sufficient temperature to disinfect the laundry items and details identifying the laundry machine 20.

[0056] The server receives the washing operation characteristics and stores these at step s8. Moreover, at this point the server can associate the washing operation characteristics with the RFID readings carried out by the RFID reader 26 between the start and stop times of the washing operation. As such, the server can identify which laundry items 10 were in the laundry machine 20 during the washing operation. Moreover, the server 30 records the characteristics of the washing operations to which a particular laundry item 10 has been exposed. It is therefore easy to retrieve information which, for example, indicates whether a particular laundry item 10 was disinfected in a particular washing operation.

[0057] Taking advantage of the information stored on the server 30, a client device 50 may make a request to the server 30 for a report, at step s9. The report may, for example, detail the operation of a particular laundry machine 20 or the history of a particular laundry item 10. The request is transmitted from the client device 50 to the server 30 across the network 40 and may include authentication information enabling the server 30 to authenticate the client device 50. The request preferably specifies the information desired by the user of the client device 50.

[0058] On receiving the request from the client device 50, the server 30 generates a report as specified, at step s10. The report is then returned to the client device 50 across the network 40, at step s11, at which point it can be viewed by the user of the client device 50. The user of the client device may thus be able to confirm whether a particular laundry item 10 was sufficiently disinfected, for example. In another example, the user of the client device 50 may be able to establish the number of washing operations undergone by a particular laundry item.

[0059] Exemplary reports are shown in Figures 4A and 4B. The report shown in figure 4A gives information relating to the activity of a particular laundry machine 20 (referred to as "Machine 1"). The report shows that Ma-

chine 1 carried out two washing operations on 17 January 2011 and lists the laundry items (identified by the "Tag-ID") that were present during each washing operation. In addition, the report indicates a "Pass" for each of these washing operations. The "Pass" indicates that the washing operation was successful. For example, "Pass" may indicate that a temperature was reached that was sufficient to disinfect the items in the laundry machine 20 during the washing operation.

[0060] Figure 4B shows another type of report that may be generated by the server 30. In this case, the report presents information relating to each individual laundry item (identified by the "TagID"). This information includes the nature of the item ("Item Type") which may have been manually or otherwise entered for each laundry item 10 to which an RFID tag 12 has been applied. Furthermore, the information shown includes the times at which the RFID tag 12 was first and most recently read by an RFID reader 26. This allows information to also be presented on the age of the laundry item. Finally, the report shows the number of time that each laundry item 10 has been washed. It may be, for example, that a particular laundry item is advertised a continuing to function for a certain number of washes. Using the report shown in Figure 4B, one can quickly establish how many more washes a particular laundry item should be able to withstand 10, or alternatively whether such details of a laundry item 10 are being accurately advertised.

[0061] The skilled person will recognise that reports may be generated which display data in other ways, depending, for example, on the needs of the user of the client device 50. By combining information relating to both the characteristics of the washing operation and the laundry items 10 contained in the laundry machine 20 at the time, comprehensive reports can be generated relating to all aspects of the laundry system. This allows effective management of the system. For example, the reports generated by the server and accessible over the network 40 by the client devices 50 can help to ensure that laundry items 10 are washed to an appropriate standard as well as ensuring that any lapse in such standards can be traced back to its source.

[0062] Variations and modifications of the preferred embodiment described above will be apparent to the skilled person. Such variations and modifications may involve equivalent and other features which are already known and which may be used instead of, or in addition to, features described herein. Features that are described in the context of separate embodiments may be provided in combination in a single embodiment. Conversely, features which are described in the context of a single embodiment may also be provided separately or in any suitable sub-combination.

[0063] It should be noted that the term "comprising" does not exclude other elements or steps, the term "a" or "an" does not exclude a plurality, a single feature may fulfil the functions of several features recited in the claims and reference signs in the claims shall not be construed as limiting the scope of the claims. It should also be noted that the Figures are not necessarily to scale; emphasis instead generally being placed upon illustrating the principles of the present invention.

Claims

1. A laundry management system, comprising:

a plurality of laundry items, each item incorporating a radio frequency identification tag;
one or more laundry machines for receiving laundry items therein; and
a server,
wherein each laundry machine comprises:

a radio frequency identification reader for reading the radio frequency identification tags in the laundry items, thereby allowing identification of the laundry items in the laundry machine; and
a monitoring device for monitoring operation of the laundry machine; and

wherein the server comprises

an interface for receiving information from the radio frequency identification reader and the monitoring device; and
a data store for storing the received information.

2. A system according to claim 1, wherein the monitoring device monitors at least one of the temperature, the ozone level, the time and the duration of the operation of the laundry machine.

3. A system according to either claim 1 or claim 2, wherein the radio frequency identification reader is arranged to read the radio frequency identification tags in the laundry items during operation of the laundry machine

4. A system according to any one of the preceding claims, further comprising a network over which the one or more laundry machines and the server communicate.

5. A system according to any one of the preceding claims, wherein the server further comprises a processing unit for generating one or more reports based on the information stored in the data store.

6. A system according to claim 5, further comprising one or more client devices, wherein the reports generated by the server are accessible by the one or more client devices.

7. A system according to either claim 5 or claim 6, wherein at least one of the one or more reports indicates whether one or more of the laundry items has been disinfected.

8. A system according to any preceding claim, wherein the radio frequency identification reader is an ultra-high frequency radio frequency identification reader.

9. A system according to any preceding claim, wherein the one or more laundry machines comprise a drum for receiving the laundry items during a washing operation, wherein the drum acts to magnify electromagnetic signals originating with the laundry items in the location of the radio frequency identification reader.

10. A laundry machine, comprising:

a drum for receiving laundry items during a washing operation; and
a radio frequency identification reader for identifying laundry items in the drum,
wherein the drum acts to magnify electromagnetic signals originating with the laundry items in the location of an antenna of the radio frequency identification reader.

11. A laundry machine according to claim 10, further comprising a door arranged to provide access to the drum, wherein the antenna of the radio frequency identification reader is disposed on the door.

12. A laundry machine according to claim 10 or claim 11, further comprising a shield arranged to inhibit electromagnetic signals arriving at the antenna of the radio frequency identification reader from outside the drum.

13. A laundry machine according to any one of claims 10 to 12, further comprising an interface for transmitting information relating to the identification of the laundry items and the operation of the laundry machine over a network.

14. A method for operating a laundry management system, comprising:

identifying laundry items in a laundry machine by reading RFID tags in the laundry items;
monitoring operation of the laundry machine;
receiving information regarding the identity of the laundry items and the operation of the laundry machine; and
storing the received information.

15. A computer program product comprising computer executable instructions for carrying out the method of claim 14.

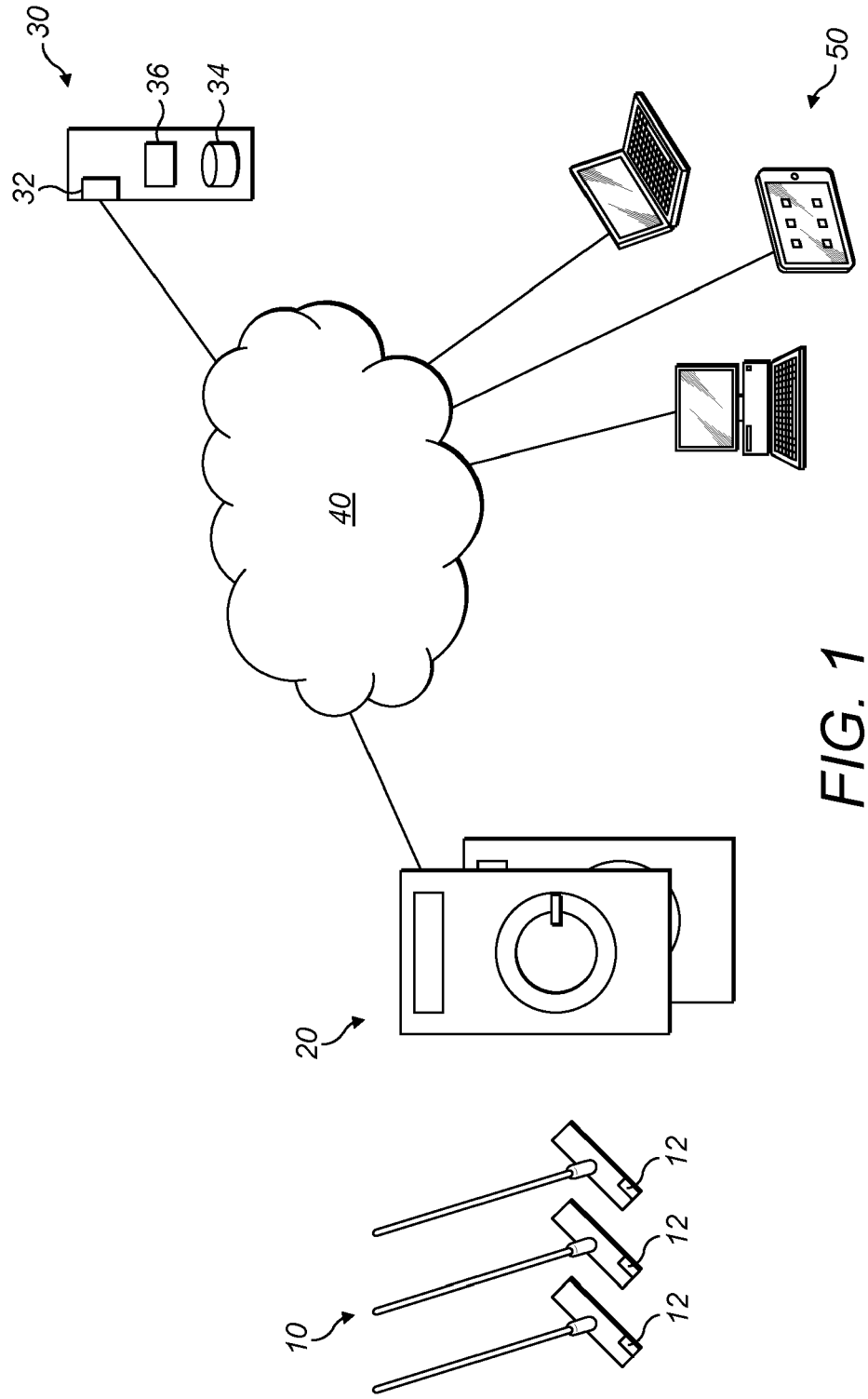

FIG. 1

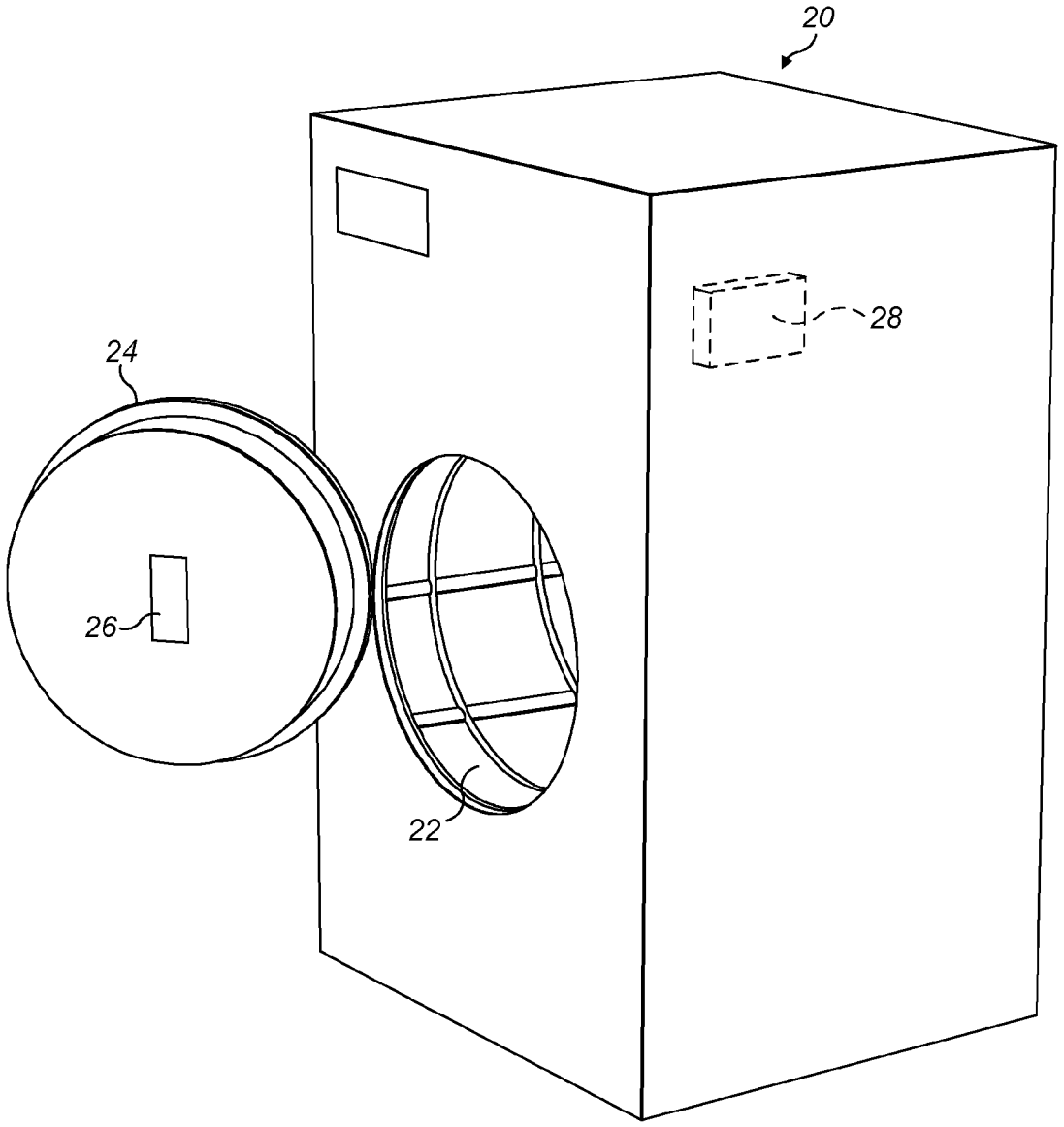

FIG. 2

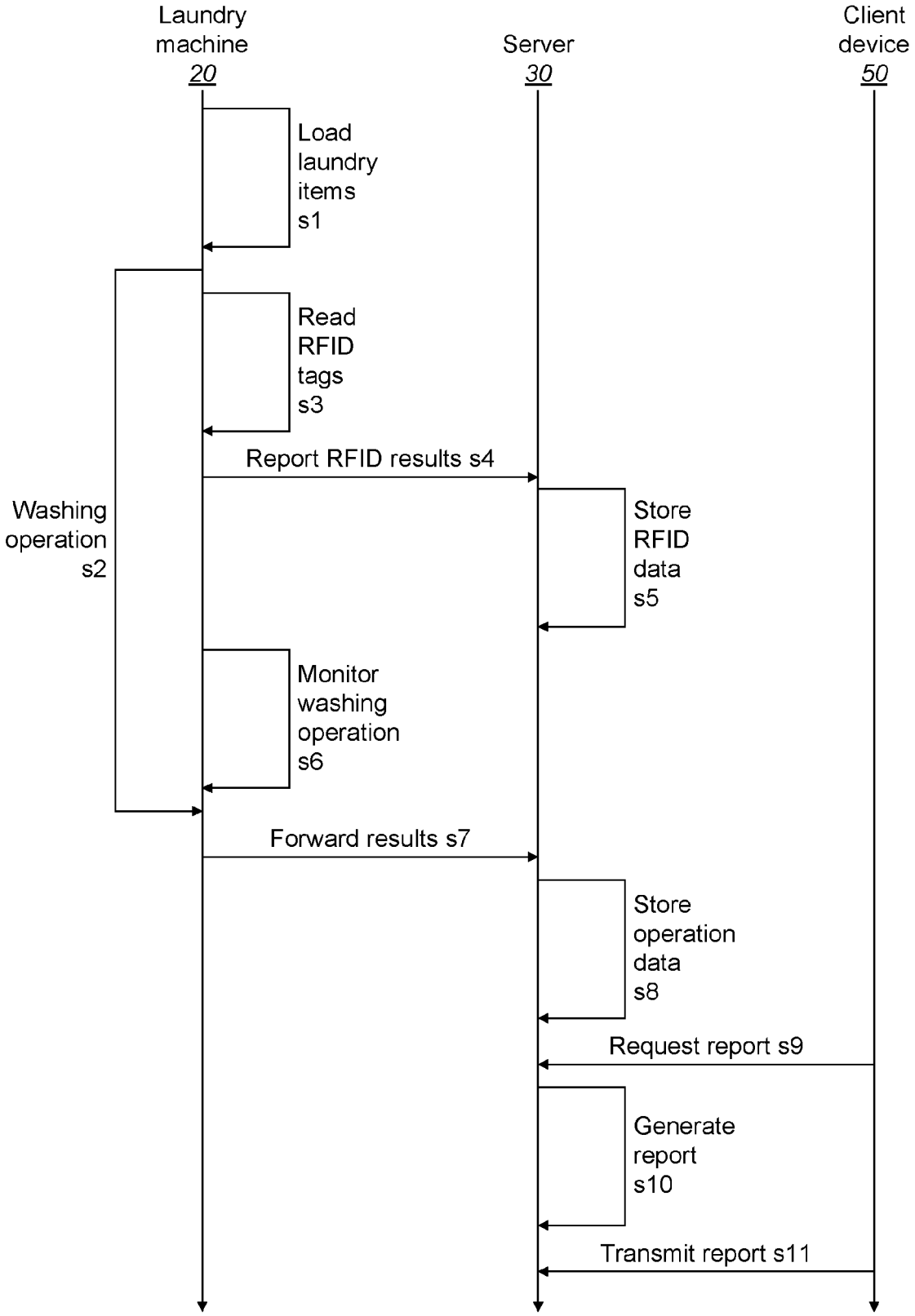
Laundry machine 20
Server 30
Client device 50
Load laundry items s1
Read RFID tags s3
Report RFID results s4
Washing operation s2
Store RFID data s5
Monitor washing operation s6
Forward results s7
Store operation data s8
Request report s9
Generate report s10
Transmit report s11

FIG. 3

Tag Id	All		Location	R001B	Date From 01-Jan-2011
Item	All				Date To 31-Jan-2011

Location	Tag Id	Item Type	Read time	Total
Machine 01				
17-Jan-2011 13:43 to 17-Jan-2011 14:14 Pass	00000014	Flat Mop	17-Jan-2011 17:43	
	00000015	Flat Mop	17-Jan-2011 17:43	
	00000016	Flat Mop	17-Jan-2011 17:43	
	00000017	Cloth Red	17-Jan-2011 17:43	
	00000018	Cloth Red	17-Jan-2011 17:43	
	00000019	Cloth Blue	17-Jan-2011 17:43	
	00000020	Cloth Blue	17-Jan-2011 13:43	
			Total Wash Items	7
17-Jan-2011 17:43 to 17-Jan-2011 18:20 Pass	00000014	Flat Mop	17-Jan-2011 17:43	
	00000015	Flat Mop	17-Jan-2011 17:43	
	00000016	Flat Mop	17-Jan-2011 17:43	
	00000017	Cloth Red	17-Jan-2011 17:43	
	00000018	Cloth Red	17-Jan-2011 17:43	
	00000019	Cloth Blue	17-Jan-2011 17:43	
			Total Wash Items	6
			Machine 01 Items	13
			Total Items	13

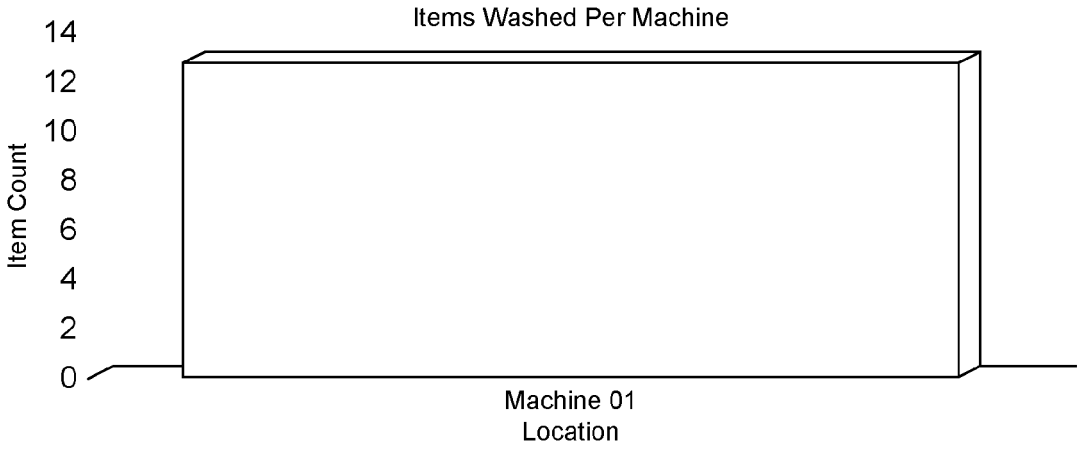

FIG. 4A

Tag Id	All	Location	All	Date From	01-Jan-2011
Item	All			Date To	31-Jan-2011

Tag Id	Item Type	First Read	Last Read	Age (Days)	Washes
00000001	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 15:10	0.06	2
00000002	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 15:10	0.06	2
00000003	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 15:10	0.06	2
00000004	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 15:10	0.06	2
00000005	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	3
00000006	Cloth Blue	17-Jan-2011 13:44	17-Jan-2011 17:44	0.17	3
00000007	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	3
00000008	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	3
00000009	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000010	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 13:43	0.00	1
00000011	Cloth Red	17-Jan-2011 13:43	17-Jan-2011 13:43	0.00	1
00000012	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:44	0.17	2
00000013	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000014	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000015	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000016	Flat Mop	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000017	Cloth Red	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000018	Cloth Red	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000019	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 17:43	0.17	2
00000020	Cloth Blue	17-Jan-2011 13:43	17-Jan-2011 13:43	0.00	1
			Total		41

FIG. 4B

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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 0818

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2006/025650 A2 (LG ELECTRONICS INC [KR]; CHOI SOUNGBONG [KR]) 9 March 2006 (2006-03-09) * paragraphs [0042] - [0062] * * paragraphs [0075] - [0081] * * paragraphs [0088] - [0131] * * figures 1-6 *	1-9,14, 15	INV. D06F95/00 D06F33/02 D06F39/00 D06F37/02
Y	WO 2004/055256 A1 (UNILEVER NV [NL]; UNILEVER PLC [GB]; LEVER HINDUSTAN LTD [IN]; BIRKER) 1 July 2004 (2004-07-01) * page 3, line 14 - page 10, line 30 * * claims 1-8; figure 1 *	1-9,14, 15	
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~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	17 January 2012	Weinberg, Ekkehard

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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1 EPO FORM 1503 03.82 (P04C01)

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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 0818

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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	Date of completion of the search	Examiner
Munich	17 January 2012	Weinberg, Ekkehard

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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1

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EP 11 18 0818

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-9, 14, 15

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 11 18 0818

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-9, 14, 15

   are directed to a laundry management system comprising a server with an interface for receiving information from the radio frequency identification reader and the monitoring device of each laundry machine, and a data store for storing the received information;

   ---

2. claims: 10-13

   are directed to a laundry machine comprising a drum acting to magnify electromagnetic singals originating with the laundry items in the location of an antenna of the radio frequency information reader.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 18 0818

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-01-2012

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