Abstract: A method for tracking hand washing is assembled and integrated into a hygiene critical environment (100), comprising RFID readers (102), integrated into non-contact hand wash and dry systems (104), linked to electronic tags (103), worn by individuals (105), such tagging not infringing the rights of individuals, but ensuring compliance with strict hygiene sequence rules set out in individuals’ conditions of employment, whereupon should said hygiene sequence not be adhered to, individuals’ exit from a hygiene critical environment may be barred by electronic means until there is compliance, but such non-compliance reported and a line-manager, for example, informed at any location in the world.
A method for tracking hand washing.

FIELD OF INVENTION

The present invention relates to apparatus for tracking hand washing and hygiene control to minimise the spread of infection particularly within commercial premises where food is prepared and in hygiene critical arenas such as hospitals and nursing homes. It is generally recognised that the majority of bacterial infection is spread through an individual's hands by cross contamination whereby harmful germs are spread onto food from other food, surfaces or equipment. Guidelines by the Foods Standards Agency advise, for example, that hands should be always washed thoroughly after touching raw meat, poultry and unwashed raw vegetables, and before anything else is touched.

DESCRIPTION OF THE PRIOR ART

A common focus of attention by concerned manufacturers to reduce cross contamination is in the washroom area after an individual's visit to the toilet where these days no devices need to be actually touched to wash hands afterwards with soap and water and dry them. Appropriately placed infra-red detectors facilitate remote hand wash and rapid air dry. Infra-red detectors in public toilets allow an individual to wave a hand in front for automatic flush.

One drawback and shortcoming in the prior art is that responsibility is on the individual to carry out these remote, non-contact hygiene activities in the washroom. There is no compunction to do so and cross contamination can still occur, with the consequent spread of bacteria and virus.

A second drawback and shortcoming in the prior art is that hygiene control is incomplete in the washroom. The hygiene loop is not closed. All the remote tasks common in the prior art can be carried out but the door handle to the washroom remains unclean and still needs to be grasped and turned for the individual to exit. If one individual has not followed the hygiene recommendations correctly there may still be contamination on the door handle waiting to infect the diligent individual.
Designs of some cloakroom areas where there is high footfall and ample space eliminate the use of doors for entry and exit by use of angled walls, for example in motorway service areas. Hygiene control for the individual can be 100% in these situations.

However in smaller confined spaces such as in commercial kitchen environments doors to washrooms containing toilets are a necessity and provide the challenge to overcome cross contamination.

It is an object of the present invention to overcome the drawbacks and shortcomings in the prior art and close the hygiene loop by providing an effective method for reducing cross contamination after visits to the washroom / toilet and minimising the spread of infection.

It is a second object of the present invention to overcome the drawbacks and shortcomings in the prior art by providing a non-contact hand wash tracking system which instantly reveals in real-time an individual's hand wash non-compliance.

It is a third object of the present invention to overcome the drawbacks and shortcomings in the prior art by providing a non-contact hand wash tracking system which instantly reveals in real-time an individual's identity in the event of hand wash non-compliance.

It is a fourth object of the present invention to overcome the drawbacks and shortcomings in the prior art by providing a non-contact hand wash system that can be policed by a single individual monitoring any number of washrooms in any number of countries around the world simultaneously through satellite operations.

It is a fifth object of the present invention to overcome the drawbacks and shortcomings in the prior art by providing a non-contact hand wash system tailored to the needs of a variety of applications including the food industry, the NHS, nursing environments and typical busy restaurants and kitchens, which are often under pressure to deliver and where employees may be tempted to take short cuts regarding washing hands.
SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a method for tracking hand washing in which non-contact electronic hand wash and dryer systems incorporate RFID readers, preferably located in a hygiene critical environment to reduce cross contamination and minimise the spread of infection comprising a plurality of RFID readers attached to walls and ceilings; RFID readers linking up with remote tag receivers which are preferably attached to name badges affixed to individuals who need to use the hygiene critical environment, such RFID readers configured to monitor and track individuals' hand washing sequence and allow or deny exit from a hygiene critical environment depending upon whether the individual has washed hands or not.

According to a second aspect of the present invention there is provided in a food industry application a non-contact hand wash and dry tracking system preferably located in a washroom comprising a plurality of combination hand wash and dryers incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to, for example name badges affixed individually to any number of employees, a further RFID reader affixed adjacent to the entry and exit door of the same washroom which allows or denies access to adjacent food production areas depending upon whether the individual has washed their hands or not.

According to a third aspect of the present invention there is provided in a NHS / health care application a non-contact hand wash and dry tracking system preferably located in one or more wards of a hospital or nursing home incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to, for example name badges affixed to any number of nursing staff, a further RFID reader affixed adjacent to the entry and exit doors preferably in the ceiling of the same ward area which allows or denies access to patients depending upon whether the individual has washed their hands or not.

According to a fourth aspect of the present invention there is provided an automatic lock out incorporated into the system of a non-contact hand wash tracking system, whereby in a plurality of stations should one individual fail to hand wash, all the occupants of that location at that moment in time are automatically prevented from exiting, until the negligent individual has accomplished the essential protocol.
According to a fifth aspect of the present invention there is provided a non-contact hand wash and dry tracking system linked to a monitoring computer sited anywhere in the world, whereby should an individual fail to undertake the correct hand wash procedure and attempt to exit the area a warning indicator of 'exit denied' will be posted and recognised immediately on a computer screen in real time resulting in whatever disciplinary action is deemed suitable.

In order that the nature of the present invention may be clearly understood an embodiment will now be described, by way of example only, with reference to the accompanying drawings in which:

Figures 1a and 1b depict schematic plan views of a method for tracking hand washing in a sequential process in a typical restaurant / kitchen / staff application according to aspects of the present invention.

Figure 2 depicts a schematic plan view of a method for tracking hand washing in a sequential process in a typical food industry application according to aspects of the present invention.

Figures 3a and 3b depict schematic plan views of a method for tracking hand washing in a sequential process in a typical NHS/ nursing application according to aspects of the present invention.

Figure 4 depicts a diagram showing an electronic wiring method for tracking hand washing according to aspects of the present invention.

Figure 5 depicts an outline drawing of UK, Scandinavia, Europe and Africa according to aspects of the present invention.

DETAILED DESCRIPTION

In figure 1a a schematic plan view of a typical washroom 100 and toilet 101 depicts a method for tracking hand washing in a sequential process shown by the arrows in which RFID reader 102 automatically identifies and tracks ID tag 103 containing electronically
stored information which is attached, for example to individual X, who is entering the washroom at point A and identified by RFID 102. When individual X has finished at the toilet 101 their correct movement is to progress towards hand wash system 104 in the direction of the arrow where electronic tag 103 activates the non-contact hand wash and dry system 104 after which another RFID 102 located in the hand wash system reads the individual's tag giving clearance to exit at point A where sensors positioned preferably on the wall or ceiling automatically open exit A, thus completing the hygiene loop without the individual touching any common object.

In figure 1b the hand wash tracking system is on red alert due to the individual Z not progressing towards and using the non-contact hand wash system 104 and thus breaking the hygiene loop as shown by the arrows. RFID reader 102 sends an alarm to a monitoring computer 106 indicating that the individual, who is identified by electronic tag 103, did not use the hand wash system and exit A remains closed until the hygiene loop has been successfully completed.

Figure 2 depicts a schematic view of a food industry application containing a strict hygiene control centre 107, leading to a cordoned-off food production area 108. Individual Z has entered through open door B, neglected to present hands for non-contact wash and dry and is now waiting to enter food production area 108 via closed door 109. Meanwhile individuals X and Y have presented their hands for wash and dry and have made their way to access door 109 expecting to go through to the food production area. Because of individual Z's negligence ceiling mounted reader 110 maintains closure of access door C+ to all. In addition the identity of Z is conveyed in real time to a monitoring computer 106 for line-manager discipline.

In figure 3a a schematic plan view of an infection control unit designed to track hand washing and thereby minimise the risk and spread of infection is shown in a sequential process in a plurality of typical NHS/ nursing applications. Individual X has entered Ward 111 by access point A and progressed immediately to non-contact hand wash and dry system 104, where their electronic ID tag 103 is read at 102. The individual is then free to move around arena 111, which may be a ward in a hospital. In order to progress to another arena 112 the tag 103 is read by RFID reader 110, which may be sited in the ceiling, and the
individual moves to wash hands at unit 104 in arena 112 and so on through the nursing institution as and when required.

In figure 3b a schematic plan view of an infection control unit designed to track hand washing and thereby minimise the risk and spread of infection is shown in a sequential process in a plurality of typical NHS/ nursing applications where the hygiene loop has been closed due to negligence. Individual Z has entered arena 111 and not stopped by non-contact hand wash and dry 104. Immediately ceiling mounted reader 110 picks up the omission and alerts remote monitoring computer 106 for line-manager discipline.

In figure 4 a wiring diagram shows an electronic method for tracking hand washing featuring mains electrical supply XX to Earth Block 114, Negative Block 115, Power Transformer 117 and Mains Relay 118. From the foregoing, connections are made to a Lamps Relay 119, PLC 120, Germicidal Lamps 121, Soap Pumps 122, Sanitiser Pumps 123, Wetting Agent Pumps 124, Water Valves 125, Blowers 126, Blower Relays 127, and Sensors 128. A Kill Switch 129 activates a monitoring computer to non-compliance of the hand wash process, recognising the individual involved and the time and location where non-compliance occurred.

Figure 5 shows graphically how a multi-national head office, based for example in Prague, 130 can be linked via satellite to track in real time the non-contact hand washing and drying behaviour of employees in hygiene sensitive locations which have the present invention installed, giving confidence to customers of the system in any country of the world 131 that hygiene control for restaurants, kitchens, hospitals and / or nursing homes is being strictly enforced to minimise the risk and spread of infection through cross contamination by the hands.

It will be appreciated by those skilled in the art that any number of combinations of the aforementioned features and/or those shown in the appended drawings provide clear advantages over the prior art and are therefore within the scope of the invention described herein. The foregoing description details certain preferred embodiments of the present invention and describes the best mode contemplated. Therefore, the description
provided herein is to be considered exemplary, rather than limiting, and the true scope of the invention is that defined by the following claims and the full range of equivalency to which each element thereof is entitled.
Claims

1. A method for tracking hand washing in which there is provided non-contact electronic hand wash and dryer systems incorporating RFID readers, preferably located in a hygiene critical environment to reduce cross contamination and minimise the spread of infection comprising a plurality of RFID readers attached to walls and ceilings; RFID readers linking up with remote tag receivers which are preferably attached to name badges affixed to individuals who need to use a hygiene critical environment, such RFID readers configured to monitor and track individuals' hand washing sequence every time a toilet is visited and allow or deny exit from the hygiene critical environment depending upon whether the individual has their washed hands.

2. A method for tracking hand washing in which there is provided a non-contact hand wash tracking system according to claim 1 preferably located in a hygiene critical environment, for example a toilet of a restaurant kitchen, comprising a plurality of combination hand wash and dryers incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to, for example employee name badges affixed to individuals to monitor every visit, further RFID readers affixed adjacent to the entry and exit doors of the aforesaid hygiene critical environment which allow or deny access to adjacent food production areas depending upon whether the individual has washed their hands.

3. A method for tracking hand washing in which there is provided a non-contact hand wash tracking system according to claim 1 preferably located in a hygiene critical environment of a hospital ward, hospital operating theatre, nursing home and/or sensitive care area comprising a plurality of combination hand wash and dryers incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to, for example employee name badges affixed to individuals, further RFID readers affixed adjacent to entry and exit doors of the aforesaid hygiene critical environments which allow or deny access to adjacent patient care areas depending upon whether the individual has washed their hands.

4. A method for tracking hand washing according to claim 1 in which there is provided an automatic lock-out incorporated into the location of a non-contact hand wash tracking system whereby should one individual fail to undertake hand washing given a plurality of non-contact hand wash and dry stations available, all the occupants in that location at that
moment in time are automatically prevented from exiting, until the negligent individual has accomplished the essential protocol.

A method for tracking hand washing according to claim 1 whereby should an RFID reader post a warning indicator of 'access denied' or 'exit denied' to an individual full details are alerted immediately to a monitoring computer sited anywhere in the world.

A method for tracking hand washing according to claim 1 which is integrated into a hygiene critical environment of poultry farming to reduce the risk of spreading infection.

A method for tracking hand washing according to claim 1 which is integrated into any other hygiene critical environment to reduce the risk of spreading infection.

A method for tracking hand washing substantially described herein and / or in the accompanying figures.
AMENDED CLAIMS
received by the International Bureau on 28 August 2014 (28.08.2014)

Claim

1. A method for tracking hand washing in which there is provided non-contact electronic hand wash and dryer systems incorporating RFID readers, located in a hygiene critical environment to reduce cross contamination and minimise the spread of infection comprising a plurality of RFID readers attached to walls and ceilings; RFID readers linking up with remote tag receivers which are attached to name badges affixed to individuals who need to use a hygiene critical environment, such RFID readers configured to monitor and track individuals' hand washing sequence procedure every time a toilet is visited and allow or deny exit from the hygiene critical environment depending upon whether the individual has their washed hands; an environment whereby a hygiene control centre leading to a cordoned-off food production area monitors the correct sequential procedure for hand washing and drying.

2. A method for tracking hand washing in which there is provided a non-contact hand wash tracking system according to claim 1 located in a hygiene critical environment, for example a toilet of a restaurant kitchen, comprising a plurality of combination hand wash and dryers incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to employee name badges affixed to individuals to monitor every visit, further RFID readers affixed adjacent to the entry and exit doors of the aforesaid hygiene entreat environment which allow or deny access to adjacent, cordoned-off food production areas depending upon whether the individual has washed their hands.

3. A method for tracking hand washing in which there is provided a non-contact hand wash tracking system according to claim 1 located in a hygiene critical environment comprising a plurality of combination hand wash and dryers incorporating a plurality of RFID readers, a plurality of remote tag receivers attached to, for example employee name badges affixed to individuals, further RFID readers affixed adjacent to entry and exit doors of the aforesaid hygiene critical environments which allow or deny access to adjacent patient care areas depending upon whether the individual has washed their hands.

4. A method for tracking hand washing according to claim 1 in which there is provided an automatic lock-out incorporated into the location of a non-contact hand wash tracking system whereby when several individuals enter a washroom randomly and the individuals
are at different stages in the sequence of hand washing, should one individual fail to undertake the correct sequential procedure for hand washing when several individuals enter a washroom randomly and the individuals are at different stages in the sequence of hand washing, any individual who is negligent in completing the sequence and attempts to exit the washroom, which can only be made via presenting their RFID tag, is automatically prevented until the closed hygiene loop sequence has been repeated correctly, such system allowing the other individuals to exit who have completed the sequence correctly.

5 A method for tracking hand washing according to claim 1 whereby should an RFID reader post a warning indicator of 'access denied' or 'exit denied' to an individual full details are alerted immediately to a monitoring computer sited anywhere in the world and reported to a line-manager for disciplinary action.

6 A method for tracking hand washing according to claim 1 which is integrated into a hygiene critical environment of poultry farming to reduce the risk of spreading infection.

7 A method for tracking hand washing according to claim 1 which is integrated into any other hygiene critical environment to reduce the risk of spreading infection.

8 A method for tracking hand washing according to claim 1 in which the rules for procedural sequence are set out in individuals' conditions of employment.
Abstract

A method for tracking hand washing is assembled and integrated into a hygiene critical environment 100, comprising RFID readers 102, integrated into non-contact hand wash and dry systems 104, linked to electronic tags 103, worn by individuals 105, such tagging not infringing the rights of individuals, but ensuring compliance with strict hygiene sequence rules set out in individuals' conditions of employment, whereupon should said hygiene sequence not be adhered to, individuals' exit from a hygiene critical environment may be barred by electronic means until there is compliance, but such non-compliance reported and a line-manager, for example, informed at any location in the world.

Use figure 1a
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. G08B21/24 G06F19/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G08B G06F G06Q G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal , WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C.

| X | See patent family annex. |

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance.

"E" earlier application or patent but published on or after the international filing date.

"L" document which may throw doubts on priority claim(s) or which may have to be established in order to establish the publication date of another application or other special reason (as specified).

"O" document referring to an oral disclosure, use, exhibition or other means.

"P" document published prior to the international filing date but later than the priority date claimed.

"R" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family.

Date of the actual completion of the international search: 24 June 2014

Date of mailing of the international search report: 02/07/2014

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

de la Cruz Valera, D

Authorized officer
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This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

   see FURTHER INFORMATION sheet PCT/ISA/210

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

□ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

□ No protest accompanied the payment of additional search fees.
Continuation of Box II.2

Claims Nos.: 8

The claim is not set up in terms of technical features delimiting its scope. The subject matter lacks clarity in the sense of Art. 6 PCT to an extent it is not searchable.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EP0 policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EP0, the applicant is reminded that a search may be carried out during examination before the EP0 (see EP0 Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.
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