

CLEANING METHOD AND APPARATUS

Field of the Invention

The invention relates to systems for cleaning articles such as crockery, cutlery and
5 related articles including trays and bowls. In particular, the invention relates to systems
arranged to clean such articles in large volumes on an industrial scale.

Background

The cleaning of articles used in cooking and eating such as crockery, cutlery and related
10 articles is performed in high volume when associated with restaurants, food courts and
commercial aircraft.

A particular difficulty is handling large articles. In the food industry this may include
trays for serving and platters for serving food directly to consumers, though it will be
15 recognized this is an issue in many industries.

Because of the size of these articles, placing them within racks mounted to a conveyor
system is not practical given their large size and the requirement to keep such articles
secure during the cleaning process. A serving tray is substantially larger than a
20 conventional plate. A system arranged to clean both plates and serving trays would
have design parameters controlled by the size of the serving tray rather than the plate
even though there will be relatively few serving trays compared to the number of plates.
Accordingly, it will be beneficial if a different form of cleaning system and method was
incorporated to manage serving trays and similar sized articles.

Further, if the cleaning system is arranged to wash plates and trays in same machine, then, if the tray faces upward on the conveyor belt, the washing water will be collected by the tray and be carried for the whole process. This could be a trouble for rinsing and
5 drying. If the tray faces downward, then the tray will be covered by the conveyor belt, cannot be washed.

Summary of Invention

In a first aspect the invention provides a method for cleaning an article, the method
10 including the steps of: engaging said article in a conveyor arrangement; applying a water jet to said article; moving the article in a reciprocal motion forward and backward by said conveyor arrangement then; disengaging said article from the conveyor arrangement.

15 In a second aspect, the invention provides a cleaning apparatus for cleaning an article including: a housing having an entrance and exit bay for receiving and delivering an article; a conveyor arrangement for engaging the article; a water jet arranged to direct at the article engaged by the conveyor arrangement; said conveyor arrangement arranged to move in a reciprocal movement for a pre-determined number of cycles prior to
20 moving said article to the exit bay.

In one embodiment, the engaging step may include engaging the article onto rails, such as at edges. The article, such as a tray, may enter the apparatus by pushing until it is engaged with the conveyor arrangement which is located above the article or at the back

side of the article. The article's movement may then be guided by the pair of rail tracks during the process

Accordingly, the application of a water jet to a front face of an article and then
5 reciprocally moving the article forward and backward allows the water jet to be applied
to the article as frequently as is required in order to clean and remove embedded
particles. The water jet's pressure and angle may be determined according to the
article's shape and size and other cleaning specifications. For instance, the water jet
may be directed vertically upward (that is 90° to the horizontal). The angle may vary up
10 to 30° to the horizontal depending upon the application. In many applications, the angle
may be as small as 5° to the horizontal.

And the distance between water jet nozzle and the washing effective surface may also
be determined depending on the application in order to get the best coverage and
15 cleaning effect. As a non-binding example, this distance may be 250 mm.

This has several advantages. For instance, the system may allow several cycles of a
reciprocating movement of the article to ensure cleaning of the article.

20 Further, this may reduce the coverage area of the water jet required as the reciprocal
movement of the article may repeatedly pass every point on the article over the water jet.
To this end, in one low cost embodiment, a single water jet may be used, with the
cleaning action applied to the whole article through the reciprocal movement.

This is distinct from having a water jet having an array of sub jets directed to the entire article simultaneously. It follows therefore that the operator may select the number of reciprocating cycles, as well as the period of each cycle, an article will require before exiting the apparatus.

5

Brief Description of Drawings

It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other arrangements of the invention are possible and consequently, the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Figures 1A and 1B are elevation views of a system according to a further embodiment of the present invention, and;

Figures 2A to 2D are sequential steps in a method according to one embodiment of the present invention;

Detailed Description

20

The invention provides for reciprocal motion of the article to ensure a high degree of cleaning compared to prior art systems. In the prior art, for an article to achieve the same level of cleanliness, it will need to pass through a cleaning apparatus in its entirety several times. In essence, the invention may provide for a more efficient use of cleaning

time by maximising the time under the water jet, compared with the amount of time an article is processed by the apparatus

It will be appreciated that the water jet may be infused with detergent or other such
5 cleaning materials to enhance the cleaning process.

Figures 1A and 1B show elevation views of an apparatus according to one embodiment of the present invention. Here the cleaning apparatus 5 includes a water jet 10 directed into a space into which an article 40 is directed.

10

The water jet 10, in this case, comprises an array of nozzles 15 to project sub jets 20 into the space for cleaning of the article 40.

15

A conveyor arrangement 35, in this case a belt drive, is arranged to convey the article 40 in both a reciprocal action as well as progressing the article from the entrance 25 to the exit 30. To supply the water jet 10, pumps 45 may be included in the overall apparatus 5 in order to yield a self-contained unit.

20

The conveyor arrangement may alternatively involve a series of rollers arranged to engage a rear 44 of the article 40. In either embodiment, the conveyor arrangement 35 provides a gripping force to the rear 44 which forces an edge 42 of the front of the article 40 onto a rail 46 such that the article moves through the apparatus 5 gripped between the conveyor arrangement 35 and the rail 46. In many applications, the side of the article requiring cleaning may that that side, or face, that comes into contact with

food or other articles. To this end, this may be the “front” of the article. Alternatively, the article may be inverted, such that the food engaging side may be engaged by conveyor arrangement, and so become the “rear”.

- 5 Figures 2A to 2D show a sequential representation of the cleaning process according to one embodiment of the present invention.

The article 40 enters through the entrance or loading bay 25 as shown in Figure 2A. The water jet contacts the article and pushes it upwards into engagement with the conveyor
10 arrangement, where the pressure of the water jet acts as a positive force so as to maintain engagement, such as through frictional force, as shown in Figure 2B. In some cases, the article may instead be engaged between the conveyor arrangement and the rail.

Once engaged, the article is then moved in a reciprocal action 55 so as to pass over the
15 sub jets 20. This ensures that every portion of the front of the article 40 is subjected to the sub jets 20 and further that they pass through several cycles of cleaning prior to exiting the device 5 through the unloading bay 30 following disengagement 60 from the roller arrangement.

- 20 The types of articles intended for an apparatus and method according to the present invention are myriad. However, there is advantage in using large articles that may not easily be managed by conventional dishwashing units. Such articles include serving trays, platters, collection buckets or trays (such as the one depicted in the figures). The ability to repeat the cleaning by having several cycles over the water jets may also be

very useful for conventional articles which have sticky or hard residue, and other deposits which are known to be difficult to remove using conventional processes.

In a further embodiment, the conveyor arrangement and the rail may be moved relative
5 to each other so as to accommodate articles of different sizes. For instance, if an operator wishes to extend the applicability of the cleaning apparatus 5 to smaller articles, for instance plates, then in this embodiment may be used. That is, to ensure a positive force is applied to the articles, the conveyor article and rails may be moved closer to each other so as to grip the article better.

10

This relative movement may be through the conveyor arrangement being mounted to a vertical rail, and so adjusted up and down through loosening the mounting.

Alternatively, the rail may be on a vertical rail, and similarly moved up and down. In a further alternative, there may be a series of parallel rails, with the operator selecting the
15 correct rail to match the articles being used for cleaning.

In a still further embodiment, articles may be self-selecting by engaging a rail that matches its shape, and so have different articles running along different rails based upon pre-set criteria. In this way, the conveyor arrangement may be fixed in place, with plates
20 running along a higher rail, and trays running along lower rails, within the same batch.

It will be appreciated that, the number of reciprocal cycles may be preset by the apparatus, such as for particular applications, such as from 1 cycle to 10 cycles.

Alternatively, an operator may manually set the number of cycles, such as when dealing

with very dirty articles, or a single article that requires a larger number of cycles than other articles within a group or between groups. The duration of each cycle also could be set manually by adjusting the conveyor's speed. Thus, operating conditions of the process, and therefore the apparatus, including water pressure, number of reciprocating
5 cycles, the angle of the water jet and the period of each cycle may each or a combination thereof, represent important variable sot be determined for a particular application.

The water jet pressure and type of water jet nozzle could be selected according to the
10 washing articles. Whilst high pressure water jet may be important in some cases, in other cases a low pressure may be a better alternative. For instance, where hot water is being used, the need for high pressure jet is less, with cycle period being a more important variable than pressure. In the case where the article is light weight, a low pressure jet may be all that is required to keep the article in contact with the conveyor
15 arrangement.

Claims

1. A method for cleaning an article, the method including the steps of:
applying a water jet to said article;
5 engaging said article with a conveyor arrangement by a force applied by the water jet.;
moving the article in a reciprocal motion forward and backward relative to said water jet by said conveyor arrangement then;
disengaging said article from the conveyor arrangement;
10 wherein the water jet is directed upwardly at an angle to the vertical axis to the article.
2. The method according to claim 1, wherein the angle is zero, and so the water jet is vertical.
- 15 3. The method according to claim 1, wherein the water jet contacts said article and pushes said article upwards into engagement with said conveyor arrangement, wherein the applied force maintains engagement through frictional force.
- 20 4. The method according to any one of claims 1 to 3, wherein the engaging step further includes moving a rail relative to the conveyor arrangement so as to ensure the applied force is applied to the article.

5. The method according to any one of claims 1 to 4 including the step, after the reciprocal moving step, of:
repeating the reciprocal moving step at least twice prior to moving article forward.
- 5 6. The method according to any one of claims 1 to 5, wherein the engaging step includes the steps of:
gripping a rear, and edges of a front, of said article.
- 10 7. The method according to any one of claims 1 to 6, wherein said water jet includes a plurality of sub jets directed to said front, said reciprocal moving step including moving said article to move the article passed said plurality of sub jets.
- 15 8. The method according to any one of the preceding claims, further including the step of varying any one or a combination of water jet pressure, number of reciprocal cycles, the period of the cycle and angle of the water jet.
- 20 9. A cleaning apparatus for cleaning an article including
a housing having an entrance and exit bay for receiving and delivering an article;
a conveyor arrangement for engaging the article;
a water jet directed upwards at the article engaged by the conveyor arrangement
by a force applied by the water jet;
said conveyor arrangement arranged to move in a reciprocal movement relative
to the water jet for a pre-determined number of cycles prior to moving said
article to the exit bay.

10. An apparatus according to claim 9, wherein the water jet comprises an array of nozzles, said nozzles arranged to direct a plurality of sub-jets.
- 5 11. The apparatus according to claim 9, wherein the angle is zero, and so the water jet is vertical.
12. The apparatus according to any one of the preceding claims, wherein the water jet contacts the article and pushes the article upwards into engagement with the conveyor arrangement, wherein the applied force maintains engagement through frictional force.
- 10
13. The apparatus according to any one of the preceding claims, wherein a rail moves relative to the conveyor arrangement so as to ensure the applied force is applied to the article.
- 15
14. The apparatus according to any one of claims 9 to 13, wherein the conveyor arrangement comprises a driven roller and a belt mounted thereto.
- 20 15. The apparatus according to any one of claims 9 to 14 wherein the conveyor arrangement comprises a plurality of rollers in series, at least one of which is a driven roller.
- 25 16. The apparatus according to any one of claims 9 to 15, wherein operating conditions are varied, said operating conditions comprising any one or a

combination of: water jet pressure, number of reciprocal cycles, the period of the cycle and angle of the water jet.