



METHOD AND APPARATUS FOR CLEANING ARTICLES

Field of the Invention

- 5 The invention relates to the cleaning of articles, in particular, needles following their manufacture and prior to their assembly.

Background

- 10 Following the manufacture of a needle but prior to the assembly into a subsequent syringe, parenteral cannula devices, or similar said needles, require cleaning. The cleaning may include the removal of burrs and grease as a result of the manufacturing process or other materials such as cutting fluid etc. The current process involves collecting a plurality of the needles, such as around 10,000, and wrapping said needles
15 in an elastic band to undergo the cleaning process.

The elastic band is intended to prevent the separation of individual needles so that the cleaning process can be applied to the needles on en masse.

- 20 However, the application of an elastic band does not provide a controlled application of compression. Accordingly, cleaning the needles is prevented if the elastic band holds the plurality of needles too tightly and if held too loosely, cannot prevent separation/ floating of individual needles.



Further, without a controlled compression of the needles preventing the retention of moisture between the needles during the cleaning process becomes more difficult.

For the overall process, the present processes to wash said needles involve a pre-treatment process prior to electro-polishing followed by a post-treatment prior to detergent washing. The washed and polished needles are then passed through several rinsing tanks before being blown dry prior to oven drying and packaging. The process therefore involves significant infrastructure as well as an extended processing time.

10 **Summary of Invention**

In a first aspect the invention provides a system for cleaning a plurality of needles, the system comprising: a conveyor for conveying a plurality of jigs through a series of stations, each jig arranged to contain at least some of said needles; said stations including: a pre-treatment station for the removal of detritus from said needles; an electronic polishing station; a post-treatment station for removal of material from the surface of said treated needles; a cleaning station for cleaning said needles; a drying station and; an unloading station for unloading said needles from said jigs.

20 In a second aspect the invention provides A method of cleaning a plurality of needles, the method comprising the steps of: conveying a plurality of jigs through a series of stations, each jig arranged to contain at least some of said needles; pre-treating the needles for the removal of detritus; electro-polishing the needles; post-treating the

needles to remove material from the surface of said treated needles; cleaning said needles and; drying the needles.

Accordingly, in one aspect the needles are held in a jig, sized to contain a predetermined
5 amount of needles. The tolerance of the jig is such that a number greater or less than the predetermined number will adversely affect the controlled compression, but a balance between “washability” and containment provided.

Further, the needles may be physically restrained within the jig. In one embodiment, a
10 lid is applied to the jig which may be selectively applied or removed. In a further embodiment, the lid may be interconnecting section such that the jig and section are engaged in a complimentary inverted arrangement.

Brief Description of Drawings

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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
20 preceding description of the invention.

Figure 1 is a flow chart of a process for the cleaning of articles according to one embodiment of the present invention;

Figure 2 is an elevation view of a needle cleaning device according to one embodiment of the present invention;

Figure 3 is a plan view of the needle cleaning device of Figure 2.

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Figure 4A to 4C are isometric views of a basket and jig for containing needles according to a further embodiment of the present invention.

Detailed Description

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Figure 1 shows a flow chart of a process for the cleaning of manufactured needles according to one embodiment of the present invention. Here the process 5 commences with a pre-treatment cycle such as a high pressure jet spray 10 and/or wash 15 of the needles prior to treatment. The purpose of the pre-treatment is to ensure that when the needles are presented into the electro-polishing 20, detritus does not contaminate the electrolyte solution used for the electro-polishing as well as ensuring an effective electrolysis process in which foreign particles may interfere.

Following the electro-polishing 20, the needles undergo a post-treatment 25 such as emersion into a nitrite acid bath, to remove metal particles from the surface and other residue from the electro-polishing process.

Next, having undergone a rinse and blow-dry, the needles are placed in a washing station which may go through a path of an ultrasonic pre-wash 30 prior to an ultrasonic

detergent wash 35. The needles then undergo a first ultrasonic rinse 40 and if necessary a second ultrasonic rinse 45 with the second ultrasonic rinse being at an elevated temperature, say 90°C.

5 The needles then undergo a drying sequence of a blow-dry 50 followed by an oven-dry 55 and finishing with a vacuum oven 60 so as to fully remove moisture from the needles. The drying process is facilitated by elevating the rinse water 45 such that any moisture still trapped within the bundle of needles following the blow dry is at an elevated temperature and so the ovens and vacuum oven can more efficiently dry the needles
10 because of the reduced differential temperature of the water as compared to the evaporation temperature.

Figures 2 and 3 show a plan view and elevation view of a system embodying the method of the present invention. The system 65 is divided into stations commencing
15 with a loading station 80 which delivers the bundle of needles to a pre-treatment station 85 followed by a treatment station 90. The needles then undergo a clean 95 prior to a drying station 100 and finally an unloading station 105.

In particular, the current system includes a conveyor for loading baskets having the jigs
20 placed therein. In order to save on the footprint of the device within the factory environment, the conveyor is placed at right angles to the direction of flow of the baskets through the process. The conveyor receives the baskets at a loading point and delivers the baskets at a first end of the device at the loading station 80. Further, the

length of the conveyor provides a buffer to supplement the rate which baskets are loaded into the device and the rate which they are processed.

The baskets are then delivered to the pre-wash where they undergo a dual-cycle 110,
5 115 of a high-jet spray followed by a rinse in order to remove detritus from the surface of the needles. From here the baskets enter the treatment station whereby the pre-washed needles undergo an electro-polishing process 120 followed by a pre-treatment through immersion in a nitrite-acid bath 130 with a high pressure jet spray and blow-dry intermediate the treatment and post-treatment steps. Finally, the needles are removed
10 from the nitric acid bath 130 and undergo a further high pressure jet spray and blow-dry before delivery to the cleaning station 95.

First, the needles undergo a pre-wash cycle in an ultrasonic bath 140 before delivery to an ultrasonic detergent bath 145 as a final clean of the needles before the rinse and
15 drying stations. The needles may be subjected to an agitating action of the jig within the basket. The agitation has the effect of loosening the needles so as to fit any dislodged needles back into place, and more importantly, to shake loose water which may have adhered to the needles following the ultrasonic detergent wash.

20 The needles then go through a further ultrasonic rinse 155 followed by a hot water rinse 160 prior to a 3-step blow-dry phase 165 so to yield relatively dry bundles of needles. The heated needles, having a small amount of water adhered thereto, go through a 3-cycled oven dry prior to a final vacuum oven dry 175. Finally, the needles are delivered

to the unloading zone 105 to be unloaded into the various packaging at the opposed end of the device 180.

In an alternative arrangement, the second ultrasonic rinse 160 may be replaced by a cold
5 rinse such as at 8-10°C. This has the effect of cooling the needles and therefore allowing shrinkage so as to provide greater gaps between the needles and so more effectively allow interstitial water between the needles to drain and a more efficient use of the blow-dry station 165 to remove moisture.

10 For the efficient transmission of the needles through the cleaning device according to the present invention, a basket 185 shown in Figure 4A may include brackets 187 to engage the conveyor for the conveying of the jigs 190 into which the bundles of needles fit 195. The basket 185 may further include locking lugs 189 so as to securely engage the jigs as shown in Figure 4C where 2 jigs are placed side by side and held in place by
15 the engagement lugs 189.

Claims

1. A system for cleaning a plurality of needles, the system comprising:
 - a conveyor for conveying a plurality of jigs through a series of stations, each jig
 - 5 arranged to contain at least some of said needles;
 - said stations including:
 - a pre-treatment station for the removal of detritus from said needles;
 - an electronic polishing station;
 - a post-treatment station for removal of material from the surface of said treated
 - 10 needles;
 - a cleaning station for cleaning said needles;
 - a drying station and;
 - an unloading station for unloading said needles from said jigs.
- 15 2. The system according to claim 1, wherein the pre-treatment includes applying high pressure jet spray to said needles.
3. The system according to claim 1 or 2, wherein said jigs are mounted to baskets arranged to engage the conveyor.
- 20 4. The system according to any one of claims 1 to 3, wherein the cleaning station is arranged to immerse the needles in an ultra sonic bath.

5. The system according to claims 4, wherein the cleaning station is further arranged to immerse said needles in a detergent bath.
6. The system according to any one of claims 1 to 3, wherein the post-treatment includes immersion in nitric acid bath..
7. A method of cleaning a plurality of needles, the method comprising the steps of:
conveying a plurality of jigs through a series of stations, each jig arranged to contain at least some of said needles;
pre-treating the needles for the removal of detritus;
electro-polishing the needles;
post-treating the needles to remove material from the surface of said treated needles;
cleaning said needles and;
drying the needles.
8. The method according to claim 7, wherein the drying step comprises:
blow drying and;
oven drying said needles.
9. A jig for containing a plurality of needles during a washing procedure, said jig comprising:
a containment into which the needles are placed, and;
a cap placed on said containment for preventing floating of the needles.

10. The jig according to claim 9, wherein the cap and containment are arranged so as to apply a known compression for a pre-determined number of needles within said jig.