station, etc.) wherein the robotic arm acts as a conveying device between stations for different types of receptacles.

Using the same robotic arm to act on different type of receptacles requires that the robotic arm comprises a clamp that can act on a vial with vial diameter from approximately 15 to 55 millimeters while maintaining the accuracy. This kind of clamping requires complex programming and a program instruction for each type of receptacle further to the hazard that represents acting directly on a breakable material as in the case for glass vials. Furthermore, it is extremely difficult and expensive to find the adequate clamps for this kind of work.

Therefore, it is already too complex to convey different kinds of receptacles for a device as disclosed in US2008/0199353 A1 for intending to, in addition, perform actions such as moving the piston of a syringe or agitating a vial.

~~It is an object~~ Embodiments of the invention seek to provide a machine for the automatic preparation of intravenous medication, as described in the claims.

According to a first aspect of ~~the machine~~ of the present invention, ~~the~~there is provided a machine for the automatic preparation of intravenous medication, comprising: ~~comprises~~ a starting products area ~~where the base products from which the required medication is generated are disposed~~ further comprising at least one receptacle with base products, a transfer tools area ~~where at least one syringe that is used to prepare the required medication is disposed~~ further comprising at least one transfer tool, a prepared products area ~~to house the prepared medication~~ further comprising at least one

container to house the prepared medication; and, ~~and at least one robot to communicate the different areas with each other~~ one robot with holding means for transporting the receptacle, the transfer tool and/or the container; wherein the robot is adapted to transport the receptacle, the transfer tool and/or the container between the areas, wherein the receptacle further comprises a head with an elastomeric portion, a neck and a body and the machine further comprises a holding device between the receptacle and the robot's holding means, said holding device comprising elastic means for fixation to different sizes/forms of receptacle, and wherein the elastic means are disposed to hold the receptacle by its neck.

The robot, the starting products area, the transfer tools area, and the prepared products area are

disposed in the same cabinet or chamber of the machine, so that said robot is adapted to communicate said areas with each other in said chamber, transporting the receptacles, the syringe and/or the container from one area to another to prepare the required medication. Furthermore, the robot according to embodiments of the present invention is capable of actuating on a receptacle by the addition of a holding device adapted to provide a better grip to a receptacle.

As a result, as all the operations for the preparation of the intravenous medication can be carried out in the same cabinet or chamber, the different areas are not isolated from each other and, for example, in the event of the machine breaking down a user can access said chamber and carry out the preparation of said medication manually, being able to make use of the space occupied by the machine for the same medication preparation function even when said machine is not working. In addition, as it does not comprise storage members and/or carrousels where different receptacles and containers are stored, for example, there is no need to use additional movement tools to position the required receptacles and containers in a final position adapted for the preparation of the intravenous medication in progress as, in the machine in embodiments of the invention, they are already disposed in said final position.

Surprisingly, a device according to embodiments of the present invention may diminishes the need and quantity of different stations for each of the actions that have to be performed on the receptacles. For example, the holding device can provide a better grip to a vial allowing the robot to transport and agitate the vial, therefore eliminating the agitation station from the prior art vials. Another action on vials could be the reconstitution of a lyophilized

medication, a robot with a holding device according to embodiments of the present invention could press the vial against a needle, a spike or any means for perforating the elastomeric part of a vial in order to inject dissolutive fluid into the vial, therefore replacing the fixed reconstitution station for a peristaltic pump that performs a more accurate, precise and faster dosification of the reconstitution solvent. In addition, such a holding device works as an standardization device given that it may hold receptacles of different sizes/forms while maintaining a common exterior shape so the robot does not need to detect the size/form of every vial prior to its manipulation. Furthermore, such a device may provide a "centering" of the vial, this is, that every vial's elastomeric portion (the portion meant to be penetrated by a needle) have the same position in respect to the holding device or, at least, maintain one common coordinate.

Also, the holding device may be a device adapted for transfer tools wherein said holding device comprises gripping means and a plunger actuator so that the actuation of the transfer tool can occur anywhere in the chamber, only limited by the arm's capability to get to the point where the actuation is required.

~~According to a second aspect of the present invention~~As disclosed, the machine can comprise at least two robotic arms, being one of the said robotic arms dedicated for the transport and/or actuation of receptacles and another one of the said robotic arms dedicated for the transport and/or actuation of transfer tools. Such an invention may provide faster procedures given that, for example, while one of the arms performs actions on a vial the other can measure, remove caps of syringes, etc. Surprisingly, the use of an arm for each of the receptacles may provide~~s~~ more

safety, given that more adequate holding means can be provided for each of the robots (e.g. different sizes or shapes of the clamps).

Also, embodiments of the present invention may allows a better cleaning of a machine given that the number of fixed stations is lowered, and robotic arms can be moved around the machine in order to let water through critical spots of the machine, therefore allowing a better cleaning in its most important areas.

These and other advantages and characteristics of the invention will be made evident in the light of the drawings and the detailed description thereof.

Figure 1 shows a perspective view of an embodiment of the machine of the invention.

Figure 2 shows a front view of a chamber or cabinet of the machine of FIG. 1, where the automatic preparation of medication is carried out.

Figure 3 is a perspective view of the chamber or cabinet of FIG. 2.

Figure 4 shows an example of a receptacle among those used in the machine of FIG. 1.

Figure 5 shows an example of a container among those used in the machine of FIG. 1.

Figure 6 shows a tool for a robot of the machine of FIG. 1, which is adapted to pick up and handle transfer tools, with a transfer tool.

Figure 7 shows drainage means of the machine of FIG. 1.

Figure 8 shows an example of a starting products area according to the present invention.

Figure 9 shows a tool for engagement/centering of vials.

CLAIMS

1. Machine for the automatic preparation of intravenous medication, comprising:

- a starting products area further comprising at least one receptacle with base products;

- a transfer tools area further comprising at least one transfer tool;

- a prepared products area further comprising at least one container to house the prepared medication; and

- one robot with holding means for transporting the receptacle, the transfer tool and/or the container;

wherein the robot is adapted to transport the receptacle, the transfer tool and/or the container between the areas, wherein the receptacle further comprises a head with an elastomeric portion, a neck and a body and the machine further comprises a holding device between the receptacle and the robot's holding means, said holding device comprising elastic means for fixation to different sizes/forms of receptacle, and wherein the elastic means are disposed to hold the receptacle by its neck.

2. Machine, according to claim 1, wherein the robot is adapted to transport a receptacle from one area to another.

3. Machine, according to anyone of claims 1 or 2, wherein the holding device further comprises a groove that matches the elastomeric portion of the receptacle regardless the receptacle's form and/or size.

4. Machine, according to anyone of claims 1 to 3, wherein the robot is adapted to agitate the receptacle.

5. Machine, according to claim 4, wherein the agitation performed by the robot is a periodic movement with a frequency of at least 1 Hz.

6. Machine, according to claim 5, wherein it comprises a tool that is fixed to the robot and which is adapted to hold and handle the transfer tool.

7. Machine, according to claim 6, wherein the tool fixed to the robot further comprises a plunger actuator.

8. Machine, according to anyone of the preceding claims, wherein it further comprises a second robot wherein the first of the robots is designated to actuate on receptacles and the second of the robots is designated to actuate on transfer tools.

9. Machine, according to claim 8, wherein the first robot comprises a holding device and the second robot comprises a plunger actuator.

~~1~~10. Method for the automatic preparation of intravenous medication in a machine according to claims 1 to 9, ~~characterized in that~~wherein at least one receptacle with base products from which the required medication is generated is disposed manually in the starting products area of a cabinet or chamber of a machine, at least one transfer tool that is used to prepare the required medication is disposed manually in a transfer tools area of the chamber, and at least one container is disposed manually in a prepared products area of the chamber, characterised in that by means of a robot the receptacle, the transfer tool and/or the container are transported

from one area to another within the same chamber automatically, for the preparation of the required medication .

~~2~~11. Method according to claim ~~1~~10, ~~characterized in that~~wherein once the receptacle, the transfer tool and the container have been disposed in their corresponding areas the robot carries out a preparation operation wherein it picks up a transfer tool from the transfer tools area, transports said transfer tool to the starting products area, handles or operates the transfer tool using a plunger actuator disposed on the robot causing it to fill partially or completely with a specific amount of a base product present in a corresponding receptacle, transports said transfer tool with said base product to the prepared products area, and empties said transfer tool partially or completely in a corresponding container, said robot carrying out as many preparation operations as are necessary to prepare or complete the required medication, using a different transfer tool disposed in the transfer tools area for each different base product.

~~3~~12. Method according to claim ~~2~~11, ~~characterized in that~~wherein the receptacle is disposed in a substantially vertical position in the starting products area, the robot disposing the transfer tool in a substantially vertical position and facing said receptacle to cause, by the use of the plunger actuator located in the. robot, the total or partial filling of said transfer tool with the base product of said receptacle.

~~4~~13. Method according to claims ~~2~~ 11 or ~~3~~12, ~~characterized in that~~wherein if the contents of a receptacle are powdered or lyophilised, said receptacle, by means of the robot or by means of a second robot, is transported from the starting products area to a reconstituting area with a reconstituting liquid where the second robot~~s~~ performs a periodic movement to agitate the receptacle thereby dissolving the contents of the receptacle and is returned to said starting products area again.