SYSTEM AND EQUIPMENT FOR ALIGNING AND PLACING AMPOULES IN PRE-FORMED POCKETS

A pick and place system for controlled picking of a pre-determined count of ampoules from a magazine and placing them in pockets of an intermittently moving web is disclosed. The system includes picking means and placing means. The picking means includes a suction head and a gate. The suction head is having a plurality of suction cups for intermittently picking a pre-determined count of ampoules from the magazine. The gate is positioned between the suction head and the magazine to intermittently permit access to the suction cups for picking the ampoules. The placing means include a swiveling arm, fitting means, a first swiveling means, a second swiveling means and a releasing means. The first swiveling means swivels the suction head away from the magazine. The second swiveling means angularly displaces the set of picked and swiveled away ampoules to be aligned over the pockets of the intermittently moving web.
SYSTEM AND EQUIPMENT FOR ALIGNING AND PLACING AMPOULES IN PRE-FORMED POCKETS

Field of the Invention:

This invention relates to the field of systems and equipment for product packaging. More particularly, the present invention relates to a system and equipment for aligning and placing ampoules in pre-formed pockets, for packaging thereof.

Background of the Invention:

Ampoules are vials made of glass or plastic used for storage of solid or liquid samples. Typically, ampoules are used in the pharmaceutical industry and healthcare industry. Typical use in the healthcare industry necessitates its careful and sterile handling. Accordingly, the ampoules are required to be packaged in pre-formed pockets for protecting against unhygienic conditions and damage during transportation and handling. For purposes of protection and packaging, a set of ampoules are packed together. Typically, the packet in which the ampoules are packed may be a blister pack having a blister chamber. The ampoules must thus be located appropriately in the blister chamber. This action is either performed manually or serially i.e. one ampoule after another. Accurate positioning of ampoules in the blister chamber is of particular importance. Inaccuracy in positioning the ampoules during packaging thereof results in mis-packaging and waste thereby.
Both the methods of manual placement and serial placement of the ampoule in the blister chamber are restrictive procedures in measure of the time utilized. Accordingly, there is need to quicken this process, in an accurate and fail-proof manner.

**Objects of the Invention:**

An object of the invention is to provide an automated mechanism for loading a plurality of ampoules into individual pre-formed pockets of an intermittently moving web of pre-formed pockets.

Another object of the invention is to provide an ampoule pick and place system that accurately places ampoules into individual pre-formed pockets of an intermittently moving web of pre-formed pockets.

Still another object of the present invention is to provide an ampoule pick and place system that operates in synchronization with the movement of intermittently moving web of pre-formed pockets.

Yet another object of the present invention is to provide an ampoule pick and place system that hygienically handles the ampoules during packaging thereof.

Still another object of the present invention is to provide an ampoule pick and place system that quickens the packaging time.
Yet another object of the invention is to provide an ampoule pick and place system that improves throughput of packaging ampoules.

Still another object of the invention is to an ampoule pick and place system that is reliable.

Yet another object of the invention is to an ampoule pick and place system that reduces wastage due to erroneous placement of the ampoules in the preformed packaging.

Another object of the invention is to an ampoule pick and place system that is simple in construction.

Still another object of the invention is to an ampoule pick and place system that is compact in construction.

Still another object of the invention is to an ampoule pick and place system that is fully automated and thereby requires minimum human intervention.

Another object of the invention is to provide an ampoule pick and place system that delicately handles the ampoules without damaging the ampoules.
Summary of the Invention:

A pick and place system in accordance with an embodiment of the present invention is disclosed. The pick and place system includes means for controlled picking of a pre-determined count of ampoules from a magazine and placing the picked ampoules in pockets of an intermittently moving web. The pick and place system includes picking means and placing means. The picking means include a suction head and a gate. The suction head is having a plurality of suction cups for intermittently picking a pre-determined count of ampoules from an array of ampoules in the magazine. The gate is positioned between the suction head and the magazine to intermittently permit access to the suction cups for picking the ampoules. The placing means include a swiveling arm, fitting means, a first swiveling means, a second swiveling means and a releasing means. The fitting means fits the suction head to the swiveling arm. The first swiveling means swivels the suction head in an operative configuration in which it has picked the ampoules, away from the magazine. The second swiveling means angularly displaces the set of picked and swiveled away ampoules to be aligned over the pockets of the intermittently moving web. The releasing means releases the aligned set of ampoules into the pockets.

Typically, the pick and place system further includes a transfer conveyor for receiving, supporting and transferring a plurality of ampoules in a vertical configuration to the magazine.

Generally, the magazine receives ampoules pushed thereto from the transfer conveyor and includes a plurality of parallel channels, wherein each channel is
receives a plurality of ampoules, thereby maintaining array of ampoules in parallel and spaced apart configuration.

In accordance with an embodiment of the present invention, the pick and place system further includes a lateral agitator for agitating the ampoules supported on the transfer conveyor for facilitating transfer of the ampoules from the transfer conveyor into channels of the magazine.

Preferably, the transfer conveyor is inclined with respect to ground.

Typically, the pick and place system further includes a drive for driving the transfer conveyor.

Additionally, the pick and place system further includes a pair of guides disposed on either side of the transfer conveyor for guiding movement of the ampoules along the transfer conveyor.

Preferably, the pick and place system further includes a pusher adapted to slide over the transfer conveyor for pushing the ampoules supported on the transfer conveyor.

Preferably, pusher is a dead weight pusher adapted to accelerate motion of said ampoules supported over said transfer conveyor.
Generally, the pick and place system further includes a sensor for detecting if the number of ampoules supported on the transfer conveyor has fallen short of a minimum quantity.

Typically, the swiveling arm has two degrees of freedom.

Generally, the pick and place system further includes pressure control means for controlling pressure and suction in the plurality of suction cups of the suction head.

Specifically, the pressure control means is a piston cylinder arrangement.

Generally, the first swiveling means is actuated by a drive means for swiveling the suction head.

Typically, the second swiveling means includes follower means functionally connected to a cam disposed of a housing of the drive means for angularly displacing the set of picked and swiveled away ampoules for aligning over the pockets of the intermittently moving web.

Typically, the gate is pneumatically operated.

Preferably, the suction cups are of synthetic resilient material.
Brief Description of the Accompanying Drawings:

The invention will now be described in relation to the accompanying drawings, in which:

Figure 1 illustrates an isometric view of an ampoule pick and place system, in accordance with an embodiment of the present invention;

Figure 2 illustrates another view of the ampoule pick and place system of Figure 2; and

Figure 3 illustrates a top view of the ampoule pick and place system of Figure 2.

Detailed Description of the Accompanying Drawings:

A preferred embodiment will now be described in detail with reference to the accompanying drawings. The preferred embodiment does not limit the scope and ambit of the invention. The description provided is purely by way of example and illustration.

In accordance with an embodiment of the present invention, there is provided an ampoule pick and place system that receives ampoules delivered there-to for aligning and placing the ampoules into individual pre-formed pockets of an intermittently moving web of pre-formed pockets. The web of preformed pockets is delivered by a forming station.

Referring to Figure 1- Figure 3 of the accompanying drawings illustrates a pick and place system 100 (hereinafter referred to as ampoule pick and place system 100). The ampoule pick and place system 100 includes a transfer conveyor 10, a
pair of guides 20a and 20b, a pusher 30, a magazine 40, a gate 50 and a swiveling arm 60. The swiveling arm 60 includes a suction head 62 and follower means 64.

More specifically, the ampoule pick and place system 100 includes picking means and placing means. The picking means includes the suction head 62 and the gate 50. The placing means includes swiveling arm 60, a first swiveling means, a second swiveling means and releasing means.

The transfer conveyor 10 receives, supports and transfers a plurality of ampoules in a vertical configuration. Referring to Figure 3 of the accompanying drawings, the transfer conveyor 10 is stacked with ampoules to be packaged by the ampoule pick and place system 100. Typically, the transfer conveyor 10 is completely filled with ampoules, without leaving any gap between the ampoules, such an arrangement imparts stability to the ampoules even while being moved on the transfer conveyor 10. The transfer conveyor 10 is inclined with respect to ground and runs continuously. The transfer conveyor 10 is driven by a conveyor drive 12 that includes an induction motor and its speed can be adjusted. The pair of guides 20a and 20b disposed on either side of the transfer conveyor 10 guides the movement of the ampoules along the transfer conveyor 10. The pusher 30 slides over the transfer conveyor 10 for pushing the ampoules supported on the transfer conveyor 10. More particularly, the pusher 30 maintains back-pressure on ampoules supported on the transfer conveyor 10. Further, the pusher 30 is a dead weight pusher that accelerates motion of the ampoules supported over the transfer conveyor. Either of the guides 20a and 20b may hold a sensor 22 which triggers an alarm when the number of ampoules supported on the transfer conveyor 10 reaches a minimum level, thereby signaling reloading of the transfer conveyor 10.
The magazine 40 is disposed at an operative front end of the transfer conveyor 10 and receives the ampoules pushed thereto from the transfer conveyor 10 by the pusher 30. The magazine 40 includes a plurality of parallel channels configured by a plurality of partition plates, wherein each channel receives a plurality of ampoules, thereby maintaining the ampoules in parallel and spaced apart configuration. The partition plates of the magazine 40 are spaced as per the layout of the web of pre-formed pockets.

As the ampoules are traveling along the transfer conveyor 10, the ampoules enter in to the channels of the magazine 40 and form queues of ampoules. Accordingly, rows of ampoules are formed inside the magazine 40, such rows of ampoules are separated by partition plates of the magazine 40. Referring to Figure 3 of the accompanying drawings rows of ampoules separated by the partition plates of the magazine 40 are illustrated. In order to facilitate entry of the ampoules into the channels configured on the magazine 40, a lateral agitator 32 is provided. The lateral agitator 32 is mounted just before the entry of the ampoules into the magazine 40. The lateral agitator 32 agitates the ampoules supported on the transfer conveyor 10 for facilitating transfer of the ampoules from the transfer conveyor 10 into channels of said magazine 40. The lateral agitator 32 agitates the ampoules in the direction perpendicular to the direction of their advancement over the transfer conveyor 10. The lateral agitator is actuated by means of a pneumatic cylinder. The gate 50 is disposed at an operative front side of the magazine 40. The gate 50 includes a plurality of openings that selectively open and close for respectively allowing and restraining passage of a pre-determined count of ampoules conveyed thereto by the magazine 40.
The ampoule pick and place system 100 further includes control means for facilitating opening or closing of the plurality of openings of the gate 50 for respectively allowing and restraining passage of the pre-determined count of ampoules through the openings based on atleast one of pre-defined time period and pre-defined sensed parameter. The ampoule pick and place system 100 further includes pressure control means for controlling pressure and suction in the plurality of suction cups of the suction head.

The swiveling arm 60 includes the suction head 62 and the follower means 64. The suction head 62 includes a plurality of suction cups that grip the pre-determined count of ampoules in vertical configuration from the magazine 40 and release the predetermined count of ampoules into individual pre-formed pockets of the intermittently moving web of pre-formed pockets 90 when the pre-determined count of ampoules are being moved in the horizontal configuration. Referring to Figure 3 of the accompanying drawings a suction cup 66 out of the plurality of the suction cups is illustrated. The suction head 62 along with each of the plurality of the suction cups are connected to a pair of pneumatic cylinders 68a and 68b, the pneumatic cylinders 68a and 68b supplies compressed air or suction to each of the plurality of the suction cups depending on the requirement. More specifically, when the suction cups are required to grip the pre-determined count of ampoules in vertical configuration from the magazine 40, the pistons of the pneumatic cylinders 68a and 68b undergoes an expansion stroke thereby creating vacuum inside the pneumatic cylinders 68a and 68b, the vacuum generated in the pneumatic cylinders 68a and 68b is supplied to the suction cups for enabling gripping of the ampoules by the suction cups.
Similarly, when the pre-determined count of ampoules are being moved in the horizontal configuration and the suction cups are required to release the pre-determined count of ampoules into individual pre-formed pockets of the intermittently moving web of pre-formed pockets 90, the pistons of the pneumatic cylinders 68a and 68b undergoes a compression stroke thereby building pressure inside the pneumatic cylinders 68a and 68b, the pressure generated in the pneumatic cylinders 68a and 68b is supplied to the suction cups for enabling release of the ampoules by the suction cups.

The follower means 64 is functionally connected to a cam and swivels the suction head 62 for converting the vertical configuration of the pre-determined count of ampoules held by the suction head to the horizontal configuration, thereby aligning the pre-determined count of ampoules gripped by the suction head inline with the pre-formed pockets of the intermittently moving web of pre-formed pockets 90. More particularly, the swiveling arm 60 is having two-degrees of freedom. The swiveling arm 60 is driven by a drive means 69, as the drive means swivels the swiveling arm 60, simultaneously the follower means 64 functionally connects with a cam and swivels the suction head 62. Accordingly only one drive means 69 is required to attain two degrees of freedom.

After each of the pre-formed pockets of an intermittently moving web of pre-formed pockets 90 is loaded with ampoules, the web of pre-formed pockets 90 is delivered to a sealing section, where a laminar foil is placed over the web of pre-formed pockets 90 and sealed thereto, thereby maintaining the ampoules inside the pre-formed pockets.
Technical Advantages and Economic Significance:

An ampoule pick and place system that accurately places ampoules into individual pre-formed pockets of an intermittently moving web of pre-formed pockets is disclosed in accordance with an embodiment of the present invention. The ampoule pick and place system hygienically handles the ampoules during packaging thereof. The ampoule pick and place system operates in synchronization with the movement of intermittently moving web of pre-formed pockets. The ampoule pick and place system utilizes an automated mechanism for loading a plurality of ampoules into individual pre-formed pockets of an intermittently moving web of pre-formed pockets. Further, the ampoule pick and place system that quickens the packaging time. Furthermore, the ampoule pick and place system improves throughput of packaging ampoules. Still further, the ampoule pick and place system is reliable. Furthermore, the ampoule pick and place system reduces wastage due to erroneous placement of the ampoule in the preformed packaging. Still further, the ampoule pick and place system is simple in construction. Furthermore, the ampoule pick and place system is compact in construction. Further, the ampoule pick and place system is fully automated and thereby requires minimum human intervention. Further, the ampoule pick and place system delicately handles the ampoules without damaging the ampoules.

Wherever a range of values is specified, a value up to 10% below and above the lowest and highest numerical value respectively, of the specified range, is included in the scope of the invention.
While considerable emphasis has been placed herein on the components and component parts of the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from the principles of the invention. These and other changes in the preferred embodiment as well as other embodiments of the invention will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.
Claims:

1. A pick and place system comprising means for controlled picking of a pre-
determined count of ampoules from a magazine and placing the picked
ampoules in pockets of an intermittently moving web; said pick and place
system comprising:

   • picking means comprising:
     
     o a suction head having a plurality of suction cups for
       intermittently picking a pre-determined count of ampoules from
       an array of ampoules in the magazine; and

     o a gate positioned between said suction head and said magazine
       to intermittently permit access to the suction cups for picking
       the ampoules; and

   • placing means comprising:

     o a swiveling arm;

     o fitting means to fit said suction head to said swiveling arm;

     o a first swiveling means to swivel the suction head in an
       operative configuration in which it has picked said ampoules,
       away from the magazine;

     o a second swiveling means to angularly displace the said set of
       picked and swiveled away ampoules to be aligned over said
       pockets of said intermittently moving web; and

     o releasing means to release said aligned set of ampoules into
       said pockets.
2. A pick and place system as Claimed in Claim 1, further comprising a transfer conveyor adapted to receive, support and transfer a plurality of ampoules in a vertical configuration to said magazine.

3. A pick and place system as Claimed in Claim 2, wherein said magazine receives ampoules pushed thereto from said transfer conveyor; said magazine comprising a plurality of parallel channels, wherein each channel is adapted to receive a plurality of ampoules, thereby maintaining array of ampoules in parallel and spaced apart configuration.

4. A pick and place system as Claimed in Claim 2, further comprising a lateral agitator for agitating said ampoules supported on said transfer conveyor for facilitating transfer of said ampoules from said transfer conveyor into channels of said magazine.

5. A pick and place system as Claimed in Claim 2, wherein said transfer conveyor is inclined with respect to ground.

6. A pick and place system as Claimed in Claim 2, further comprising a drive for driving said transfer conveyor.

7. A pick and place system as Claimed in Claim 2, further comprising a pair of guides disposed on either side of said transfer conveyor for guiding movement of said ampoules along said transfer conveyor.

8. A pick and place system as Claimed in Claim 2, further comprising a pusher adapted to slide over said transfer conveyor for pushing said ampoules supported on said transfer conveyor.
9. A pick and place system as Claimed in Claim 2, further comprising a sensor for detecting if the number of ampoules supported on said transfer conveyor has fallen short of a minimum quantity.

10. A pick and place system as Claimed in Claim 8, wherein said pusher is a dead weight pusher adapted to accelerate motion of said ampoules supported over said transfer conveyor.

11. A pick and place system as Claimed in Claim 1, wherein said swiveling arm has two degrees of freedom.

12. A pick and place system as Claimed in Claim 1, further comprising pressure control means for controlling pressure and suction in said plurality of suction cups of said suction head.

13. A pick and place system as Claimed in Claim 1, wherein said pressure control means is a piston cylinder arrangement.

14. A pick and place system as Claimed in Claim 1, wherein said first swiveling means is actuated by a drive means for swiveling the suction head.

15. A pick and place system as Claimed in Claim 14, wherein said second swiveling means comprising follower means functionally connected to a cam disposed of a housing of said drive means for angularly displacing said set of picked and swiveled away ampoules for aligning over said pockets of said intermittently moving web.

16. A pick and place system as Claimed in Claim 1, wherein said gate is pneumatically operated.
17. A pick and place system as Claimed in Claim 1, wherein said suction cups are of synthetic resilient material.