

Device for the transfer of a medium

5 The present invention concerns the transfer of media, such as liquids, into or from a container.

 It is especially important, in particular in the field of pharmaceuticals and biotechnologies to be able to take off samples to analyze them, for example to perform microbiological verifications in culture tanks, for counting cells, for
10 chemical analysis, etc.

 Such taking off must be performed while minimizing as much as possible the risks of contamination of the taken-off sample and of the medium from which the sample is taken off.

 Devices are already known, in particular from European patent EP
15 0 858 589, for the transfer of a medium into or from a container comprising a substantially cylindrical magazine as well as several transfer elements for transfer of the medium, each disposed in a cavity of the magazine, each cavity issuing on the same face of the magazine which is adapted to cooperate with a wall of the container.

20 Each transfer element comprises a transfer duct provided at one end with a needle, a septum having a portion adapted to seal with the container and to be pierced by the point of the needle, and a needle driving device adapted to pass that needle from a waiting position in which it is situated within the cavity and isolated from the interior of the container by the septum to a working
25 position in which its point projects from the cavity by the portion of the septum that is adapted to be pierced.

 The transfer duct of each transfer element may be connected, at the opposite end from the needle, to a take-off bag to collect the sample coming from the container after it has passed through the transfer element.

30 The duct also has a bent portion which is accommodated in a window of the magazine body to keep the transfer element locked in its waiting position in order to prevent any risk of having the septum perforated by the

needle inadvertently (for example due to incorrect manipulation by the operator).

To unlock that transfer member, the operator makes the duct of that element rotate to free its bent portion from the window and place that portion
5 along the axis of a groove formed in the body of the magazine and along which, by pressing on the driving unit towards the container, the duct is adapted to slide to cause the needle to pass from its waiting position to its working position in order to allow the transfer of the fluid into or from the container.

The invention aims to provide a device that is also adapted to enable
10 the transfer of a medium but which at the same time is more economic, is more practical, and gives better performance

To that end it provides a device for the transfer of a medium into or from a container comprising a magazine and at least one transfer element for transfer of said medium received in a cavity formed in said magazine, said
15 transfer element comprising a transfer duct for transfer of said medium provided at one end with a needle, a septum having a portion adapted to seal with the container and to be pierced by the point of said needle, and a unit for driving said needle adapted to make said needle pass from a waiting position in which its point is situated within said cavity to a working position in which its point
20 projects from said cavity through said portion of the septum that is adapted to be pierced, said transfer element also comprising locking means adapted to cooperate with complementary locking means of said magazine to lock said needle in its waiting position; characterized in that said locking means belong to said driving unit and cooperate with said complementary locking means at a
25 location of the magazine that is distinct from the location through which, at the opposite end from the needle, said duct issues from the cavity.

In the device according to the invention, the locking function is no longer provided by a portion of the duct but by dedicated locking means which are present on the driving unit such that it is possible to dispense with the bent
30 portion of the duct which was necessary in the device of the prior art to provide the locking function.

The fact that dedicated locking means cooperate with complementary locking means at a location which is situated away from the location through which the transfer duct issues from the cavity (at the opposite end from the needle) makes it possible to provide a transfer duct of simpler form than that of the device of the prior art (for example of substantially rectilinear form).

The septum and the driving unit may thus, by virtue of the simple form of the transfer duct, be produced for example by overmolding around that duct so rendering the device according to the invention much easier and less costly manufacture.

The manufacture of the septum by overmolding makes that septum more resistant whether in terms of sealing or wear (caused by repeated sterilization operations of the transfer element for example).

The possibility of producing a duct of simpler form also leaves a greater possibility to choice of materials, in particular for the material which constitutes the needle (for example of polymer material).

According to features preferred for reasons of simplicity and convenience both with regard to manufacturing and with regard to use, said locking means and said complementary locking means are also adapted to lock said needle in its working position.

This makes it possible to improve the safety of use by avoiding any risk of having the needle return inadvertently to its waiting position due to the compression forces exerted by the septum against that needle.

Furthermore, this is a way for the operator, knowing that he must lock the needle in its working position, of ensuring that he has indeed perforated the septum since he is thus induced to press on the actuating unit until it has reached that locked position.

According to other preferred features, said locking means and said complementary locking means are adapted to perform the locking by latching.

The locking by latching of the transfer element to the magazine (rather than by rotation) enables a considerable space to be freed to place, in a

magazine of the same diameter as in that of the prior art, more transfer elements (so increasing the number of take-off points from the container).

According to still other preferred features:

- said locking means of said driving unit are moveable radially relative to said complementary locking means of said magazine;
- said driving unit comprises a body fixed to said needle a driving key, and a flexible arm connecting said body to said key; and/or
- said key and said arm belong to said locking means.

According to still other preferred features, said key is radially offset relative to said duct.

The presence of a driving key which is offset radially relative to the duct enables a key of greater dimensions to be produced without it preventing the movement of the needle as far as its working position which makes it easier to drive the needle and pierce the septum thereby.

More particularly, to perforate the septum in most cases requires pressing strongly (ranging from 5 to 6 kilos), such that the presence of a key of large dimensions provides comfortable manipulation for the user to perforate the septum and bring the needle to its working position.

According to still other preferred features:

- said magazine comprises a body and a rib, said rib belonging to said complementary locking means and projecting laterally from said body with, in said waiting position, a portion of said key being situated facing an edge of said rib;
- in said working position, said portion of said key is situated facing another edge of said rib;
- the portion of said duct situated in said cavity is substantially rectilinear;
- said septum comprises, in addition to said portion adapted to be pierced, a sleeve surrounding said needle at least partially and having a portion adapted to deform like bellows on passage of said needle from its waiting position to its working position.

- said transfer element is obtained by molding said needle, said septum and said driving unit and/or

- the duct of said transfer element is adapted to be connected, at the opposite end from said needle, to a series of bags disposed one after the other and of which the reservoirs communicate with each other, whereby they are adapted to be filled one after the other on transfer of said medium through said duct.

The features and advantages of the invention will appear from the following description, given by way of preferred but non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a perspective view of a device according to the invention fixed to the wall of a container with one of the transfer elements of that device being represented in its working position to enable the transfer of the liquid whereas the other transfer elements are represented in their waiting position.

- Figure 2 is a similar view to Figure 1 but from a different angle and shown cut away in order to illustrate the inside of the device;

- Figure 3 is a perspective view presenting the device in isolation;

- Figures 4 and 5 are respectively a perspective view and a section view in elevation taken on a median plane of symmetry of the device in which only one of the transfer elements is represented disposed in its waiting position;

- Figures 6 and 7 are similar views to Figures 4 and 5 and represent that transfer element in its working position;

- Figure 8 is a perspective view illustrating that transfer element in isolation with the conformation that it assumes when it is in its waiting position;

- Figure 9 is a view in elevation illustrating that transfer element in the conformation it assumes when it is in that working position;

- Figure 10 is a perspective view illustrating that transfer element connected to a series of take-off bags;

- Figure 11 is a similar view to Figure 10 but for bags having a different conformation;

- Figure 12 is an enlarged view of the detail identified by XII in Figure 11, shown cut away; and

- Figure 13 is a similar view to Figure 11 but on which crimping pliers are also represented which are provided to detach the bags from each other.

The transfer device 1 illustrated in Figures 1 to 7 comprises a magazine 2 as well as five transfer elements 3.

As illustrated in Figure 1, the assembly formed by the magazine 2 and the five transfer elements 3 is to be joined to a coupling 4 which is fixed to a wall 6 of the container 8 in which five openings 7 are formed to enable the end portions of the transfer elements 3 to enter inside the container.

A tightening handle 5 to screw onto the coupling 4 enables the device to be pressed against that coupling to make the sealing connection to the container.

The magazine 2 of the transfer device is of cylindrical general form and has a body 14 and a rib 15 formed from five segments.

The body 14 has two main faces 16 and 17 and a lateral face 18 connecting said main faces together. A tubular central cavity 19 and five cavities 20 surrounding that central cavity 19 are formed in the body.

In each of the cavities 20 a transfer element 3 is received, those cavities issuing at the faces 16 and 17 as well as at the face 18 to form a slide track in which the transfer element accommodated therein is adapted to slide.

At the end of each cavity 20 an annular groove 21 is formed in the body 14.

The central cavity 19 also issues at the faces 16 and 17 and has three tubular portions 22, 23, 24 allowing the passage of a shaft of the handle 5 of which the end is threaded to be screwed to the coupling 4.

The rib 15 of the magazine is interrupted at each cavity 20 and thus has five segments situated in the neighborhood of face 17 and extending from an edge of one cavity 20 to the neighboring cavity.

A transfer unit 3 is described next with reference to Figures 1 to 9.

Each transfer unit 3 comprises a tube 30, a needle 31, a septum 32, a driving unit 33 for driving the needle 31 and a washer 34.

The needle 31 has a central portion 35, and on respective opposite sides of that portion, an end portion 36 and an end portion 37 delimiting a
5 channel 38 within that needle.

Portion 36 is engaged in the tube 30 and is provided with a set of teeth 39 to hold that portion to the tube 30. That portion 36 issues by an opening 40 into tube 30.

Portion 37 is engaged in the septum 32 and is provided with a set of
10 teeth 41 to hold that portion to the septum 32.

That portion 37 has a point 42 provided to perforate the septum on movement of the needle and a lateral opening 43 giving access to the channel 38.

The tube 30 delimits a channel 29 communicating with the channel
15 38 by the opening 40, the needle 31 and the tube 30 together forming a duct 45 for transfer of the liquid from the container to, for example, a series of bags to fill. That duct 45 is substantially rectilinear over the whole of the length of the section that is received in the cavity 20.

Tube 30 issues from cavity 20 at the opposite face 17 from face 16
20 and continues with a tubular portion which connects to a take-off bag.

The septum 32 is of silicone and comprises a solid portion in the form of a disc 50, a first tubular portion 51, a second tubular portion 52 and a frusto-conical portion 53.

The frusto-conical portion 53 is situated between the tubular portions
25 51 and 52 while tubular portion 51 is situated between disc 50 and frusto-conical portion 53.

The inner diameters of portions 51 and 52 are equal while the outer diameter of portion 51 is greater than that of portion 52, that portion thus being of greater thickness than that of portion 52.

30 Tubular portion 51 joins to disc 50 while being centered relative thereto.

Portions 51 to 53 thus form a sleeve in which portion 37 of the needle is received, with the edge of portion 52 abutting the edge of the central portion 35 of that needle.

5 The disc-shaped portion 50 is the portion of the septum which is pressed at a corresponding opening 7 (Figure 1) against the wall 6 of the container when the handle 5 is screwed to the coupling 4 in order to provide the sealing obturation of that opening until that portion 50 is perforated by the needle 31.

10 The washer 34 surrounds the tubular portion 51 and is accommodated, when the transfer element is placed in a cavity 20 of the magazine in an annular groove 21 matching that washer 34 and the disc 50 which are against each other.

The washer is of material which is strong and stiff in order to provide the homogeneous compression of the disc 50 against the wall 6 of the container
15 8 in order to ensure the sealing connection of the magazine to that container.

The driving unit 33 comprises a tubular body 60, a flexible arm 61 and a driving key 62.

The body 60 is connected to the key 62 via the flexible arm 61.

20 The body 60 partially surrounds portion 52 of the septum and thus portion 37 of the needle, entirely surrounds the central tubular portion 35 and also partially surrounds portion 38.

This driving unit 33 also has a reinforcing rib 63 between the key 62 and the arm 61 as well as a reinforcing rib 64 between the arm 61 and the body 60 (Figure 6) so as to ensure sufficient mechanical strength when the operator
25 acts on that unit.

The driving unit 33, the septum 32 and the duct 45 are produced by molding those members onto each other.

30 The arm 61 and the key 62 form locking means adapted to cooperate with a corresponding segment of rib 15 such that this cooperation takes place at a location of the magazine 2 which is distinct from the location by which the duct 45 issues from the cavity 20, at the opposite end from the needle 31 (on face 17 of the magazine).

The assembly of a transfer element 3 in the magazine 2 is carried out by inserting that element in the cavity 20 from the side where the opening of that cavity is, which is situated on face 16, then by sliding that element in the direction going from face 16 towards face 17.

5 The portion 65 of the key 62 thus comes into abutment with the edge 26 of rib 15 driving the radial displacement of the key 62 by elastic deformation of the arm 61, the portion 65 of that key thus moving away from the edge 26 to pass over that rib until it has gone past it and to arrive, by elastic return of the arm 61, on the same side as, and facing, the opposite edge 25 of that rib to the
10 edge 26.

In that waiting position illustrated in Figures 4 and 5, the transfer element 3 is thus locked by latching of the magazine within the cavity 20, the washer 34 is engaged in the annular groove 21 and only portion 50 of the disc projects from face 16 of the magazine 2. The needle 31 is entirely
15 accommodated in the cavity 20 with the portion 37 of the needle being entirely situated within the sleeve delimited by the tubular portions 51, 52 and 53 of the septum.

Once the transfer element has been thus assembled, the driving unit makes it possible to pass the needle 31 of that element from its waiting position
20 to a working position permitting the transfer of the liquid which is illustrated in Figures 6 and 7.

In this working position of the transfer element 3, the point 42 and a part of the opening 43 of the portion 37 of the needle project from the disc 50 such that the part of the opening 43 which projects from that disc communicates
25 with the inside of the container.

In this position, the part of the tubular portion 52 of the septum 32 which is not covered by the tubular body 60 of the unit 33 is folded bellows-fashion between the body 60 and the tubular portion 51.

In this position, part 65 of the key 62 is again situated facing and
30 against the edge 26 of the rib 15, pressed against that rib by the deformed septum 32, such that the needle is held locked by latching in its working position.

To pass from the waiting position to the working position, the operator lifts the key 62 by pressing on its face 66 so as to deform the flexible arm 61 to radially separate portion 65 of that key from the edge 25 of the corresponding segment of the rib 15 of the magazine. The operator also
5 presses on that face 66 towards the container 8 to drive the movement of the driving unit 33 and with it the needle 31. During the movement of the needle 31 the point 42 of that needle comes to press on then perforate at its center the silicone disc 50 of the septum.

The operator continues that movement until the needle reaches its
10 working position and then releases the key such that the portion 65 of that key comes into place facing the edge 26 of the rib 15 by elastic return of the arm 6.

The radial offsetting of the key 66 relative to the needle 31 by virtue of the arm 61 enables the key to have dimensions enabling it to be manipulated in good conditions and in particular in order to perforate the septum without
15 having to exert too much effort by virtue of the large contact surface 66 of that key.

When the needle is thus placed in its working position, it is possible to make the liquid pass from the container to attain one or more bags connected to the opposite end of the tube 30 to the needle 31.

20 Conversely and to once again isolate those bags from the container, it is also possible to pass back the needle from its working position to its waiting position, the material of the disc 50, here silicone, having sufficient elastic properties to enable it to sealingly close on itself again after the withdrawal of the needle even though it has been perforated.

25 The needle 31 and the tube 30 are thus once again isolated from the inside of the container so preventing the liquid contained by that container from flowing via that needle which avoids any risk of contamination by germs which could get back to the container via the transfer element 3 if it were not brought back to its waiting position.

30 A description will now be given with the aid of Figure 10 of an arrangement of bags to connect to a transfer element 3 to take off a liquid.

This arrangement 70 has a plurality of bags 71 disposed in series. Each bag is formed from two thermoplastics sheets sealed to each other by a weld bead 72 delimiting a reservoir 73. The bags are connected to each other by detachable borders 76 and 77. Each bag has an end piece 74 (here a
5 section of tube) provided to enable the filling of the corresponding reservoir 73 and an end piece 75 (also a section of tube) connected to the end piece 74 of the following neighboring bag (and formed from a single piece with it in the illustrated example) to enable the passage of the liquid from one bag to the other. The end piece 74 of the first bag of the series of bags 70 is connected to
10 the tube 30 of a transfer element 3 whereas a plug 83 is engaged in the end piece 75 of the last bag.

The transfer element 3 is also packaged in a bag (not illustrated) within which it is disposed to avoid any risk of contamination while it is not used, the element 3 only being extracted from that bag just before being installed in a
15 cavity 20 of a magazine 2.

Each bag also has, at the opposite end to the location of the end pieces 74 and 75, an end piece 78 for draining the reservoir 73 of which one end issues into the reservoir 73 and of which the other end issues into a space 79 situated between the two thermoplastics sheets which is closed but not
20 welded.

At the edge of the bags that is adjacent the end pieces 74 and 75 there is also fixed to those bags an extruded profile member 80 adapted to be received in a channel member 81 so as to hold those bags horizontal, those channel members 81 having at their end an elbow portion received in a
25 receiving receptacle 82.

When the transfer element 3 is engaged in its working position, the liquid coming from the container passes through the needle 31 then the tube 30 to enter by the end piece 74 of the first bag into the reservoir 73 of that bag. That reservoir 73 fills and the liquid, once that reservoir has been filled,
30 continues to flow through the second reservoir by flowing via end piece 75 of the preceding bag and so forth until it reaches the last bag 71.

The operator stops the flow of the liquid (by passing the transfer element back from its working position to its waiting position) as soon as he observes that the liquid occupies the reservoir 73 of the last bag 71 of the series of bags, so indicating to him that all the previous bags are already full of liquid and free of air.

The flow of the liquid is stopped before that last bag is entirely filled in order to avoid any risk of bursting, that last bag being used as an indicator of the filling of the preceding bags.

It is then possible to retrieve the bags one by one through use of a tool (not illustrated) adapted to obturate the end pieces 74 and 75 by heating them.

The content of each bag may then be taken off by separating the two thermoplastics sheets from each other to clear the access to the space 79 and to the take-off end piece 78 in order to connect to that end piece a take take-off device such as a syringe.

Another arrangement of the bags is illustrated in Figures 11 to 13.

Generally speaking, the same reference numbers increased by 100 are used for similar elements.

The arrangement 170 illustrated in these Figures is formed by a plurality of bags 171 disposed one after the other in order for them to fill successively.

Each bag 171 is provided with a perforable valve 185.

This valve has a first body 186, a second body 187 as well as a perforable septum of silicone 188 to enable the take-off of the liquid once the bag has been filled.

The septum 188 is compressed between the body 186 and 187, with the faces of the body 186 and of the septum 188 that are turned outwardly of the bag being covered by a peelable protective film 189. A metal tube 190 partially surrounds each pair of end pieces 174 and 175 (which are formed as a single piece in the illustrated example) as well as the end piece 174 which is connected to the tube 30.

A bar code 191 for identification is also present on each bag.

The bags are detached from each other using a crimping pliers 95 illustrated in Figure 13 that are provided for severing them by crushing the tubes 190 so as to provide the sealing disconnection of the bags from each other by compression of the end pieces 174 and 175.

5 The bags may all have a reservoir of the same capacity as for the embodiment illustrated in Figure 10 or capacities variable from one bag to the other as for the embodiment illustrated in Figures 11 to 13, depending on the conformation of the weld bead of each bag.

10 As a variant the locking means of the driving unit are only adapted to provide locking in the waiting position and/or those locking means are not latching means but any other type of locking means.

In another variant the medium to transfer is not a liquid but for example a gas to take off to analyze or any other type of fluid medium.

15 It is also to be noted that the device according to the invention makes it possible to perform the transfer of a medium not necessarily from the container to the bags but also, for example, from a bag pre-filled with medium to a container.

20 The device according to the invention is also intended for transferring a medium into or from any type of container other than a tank, such as containers with flexible walls such as a bag or a pipe, a connector being mounted on those containers adapted to cooperate with a magazine.

The present invention is not limited to the embodiments described and represented, but encompasses any variant form thereof.

CLAIMS

1. A device for the transfer of a medium into or from a container
5 (8) comprising a magazine (2) and at least one transfer element (3) for transfer
of said medium received in a cavity (20) formed in said magazine (2), said
transfer element (3) comprising a transfer duct (45) for transfer of said medium
provided at one end with a needle (31), a septum (32) having a portion (50)
10 adapted to seal with the container (8) and to be pierced by the point (42) of said
needle (31), and a unit (33) for driving said needle (31) adapted to make said
needle (31) pass from a waiting position in which its point (42) is situated within
said cavity (20) to a working position in which its point (42) projects from said
cavity (20) through said portion (50) of the septum (32) that is adapted to be
pierced, said transfer element (3) also comprising locking means (61, 62, 65)
15 adapted to cooperate with complementary locking means (15) of said magazine
(2) to lock said needle (31) in its waiting position; characterized in that said
locking means (61, 62, 65) belong to said driving unit (33) and cooperate with
said complementary locking means (15) at a location of the magazine (2) that is
distinct from the location through which, at the opposite end from the needle
20 (31), said duct (45) issues from the cavity (20).

2. A device according to claim 1, characterized in that said locking
means (61, 62, 65) and said complementary locking means (15) are also
adapted to lock said needle (31) in its working position.

3. A device according to any one of claims 1 or 2, characterized in
25 that said locking means (61, 62, 65) and said complementary locking means
(15) are adapted to perform the locking by latching.

4. A device according to claim 3, characterized in that said locking
means (61, 62, 65) of said driving unit (33) are moveable radially relative to said
complementary locking means (15) of said magazine (2).

30 5. A device according to claim 4, characterized in that said driving
unit (33) comprises a body (60) fixed to said needle (31), a driving key (62, 65),
and a flexible arm (61) connecting said body (60) to said key (62, 65).

6. A device according to claim 5, characterized in that said key (62, 65) and said arm (61) belong to said locking means (61, 62, 65).

7. A device according to claim 6, characterized in that said key (62, 65) is radially offset relative to said duct (45).

5 8. A device according to any one of claims 6 or 7, characterized in that said magazine (2) comprises a body (14) and a rib (15), said rib (15) belonging to said complementary locking means and projecting laterally from said body (14) with, in said waiting position, a portion (65) of said key (62) being situated facing an edge (25) of said rib (15).

10 9. A device according to claim 8, characterized in that , in said working position, said portion (65) of said key (62) is situated facing another edge (26) of said rib (15).

15 10. A device according to any one of claims 1 to 9, characterized in that the portion of said duct (45) situated in said cavity (20) is substantially rectilinear.

20 11. A device according to any one of claims 1 to 10, characterized in that said septum (32) comprises, in addition to said portion adapted to be pierced (50), a sleeve (51, 52, 53) surrounding said needle (31) at least partially and having a portion (52) adapted to deform like bellows on passage of said needle (31) from its waiting position to its working position.

12. A device according to any one of claims 1 to 11, characterized in that said transfer element (3) is obtained by molding said needle (31), said septum (32) and said driving unit (33).

25 13. A device according to any one of claims 1 to 12, characterized in that the duct (45) of said transfer element (3) is adapted to be connected, at the opposite end from said needle (31), to a series (70 ; 170) of bags (71 ; 171) disposed one after the other and of which the reservoirs (73 ; 173) communicate with each other, whereby they are adapted to be filled one after the other on transfer of said medium through said duct (45)..