METHOD AND PLANT FOR PACKAGING LIQUID PRODUCTS IN A FLEXIBLE BAG

The invention relates to a method for packaging a liquid or non-liquid, foodstuff or non-foodstuff, sterile or non-sterile product in a flexible bag. In the invention, a continuous strip is produced in at least two rows by superimposing and welding at least two films of a suitable synthetic material on a flexible bag, by successive stamping and welding operations at regular intervals. A plug is previously fitted to one of the films for filling, and the subsequent housing of a stopper and the strip of the flexible bag produced are packaged in a suitable sealed transport box. The invention further relates to a plant and a plug/tap unit for carrying out the method.
METHOD AND PLANT FOR PACKAGING LIQUID PRODUCTS IN A FLEXIBLE BAG

CROSS-REFERENCE TO RELATED U.S. APPLICATIONS

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

NAMES OF PARTIES TO A JOINT RESEARCH AGREEMENT

[0003] Not applicable.

REFERENCE TO AN APPENDIX SUBMITTED ON COMPACT DISC

[0004] Not applicable.

BACKGROUND OF THE INVENTION

[0005] 1. Field of the Invention

[0006] The invention relates to a method for packaging, in a flexible bag, liquid or non-liquid, foodstuff or non-foodstuff, sterile or non-sterile products.


[0008] Different solutions have been adopted until now for the packaging, in a flexible bag, of liquid or semi-liquid products, or other products, be it foodstuff or non-foodstuff products or also products subjected to sterilization constraints.

[0009] It is common to make flexible bags, also called “wine skins”, by superimposing and welding single-layer or multilayer films. Said wine skins are then connected to each other through a pre-cutting line, so as to form a strip. The latter facilitates the feeding of wine skins into the unit to ensure their filling at the factory manufacturing the product they should contain. During their production, these flexible bags are each equipped with a distribution tap. In particular, before assembling the films by welding, in one of them is punched, at regular intervals, an opening for inserting and welding a plug in which is partially snapped in the body of this distribution tap.

[0010] Thus, there is known U.S. Pat. No. 3,868,891, which describes a device for the continuous manufacturing of flexible bags equipped with a plug, packed in strips in a box. The manufacturing process permits continuous production of a strip of flexible bags from two plastic films, or more films in the case of multilayer bags. The bags are joined edge to edge so as to constitute a single tube, welded and punched at regular intervals, so as to incorporate, in particular, a plug designed for receiving a stopper.

[0011] Thus, on the wine-skin filling unit, a first operation consists of removing the tap from the plug through which the product is injected into the wine skin. In a next operation, the tap is re-inserted into the plug for a complete snapping-in.

[0012] It is obvious that such a solution, as described in U.S. Pat. No. 4,676,285 and U.S. Pat. No. 4,283,901, requires, during the production of the tap, to previously snap-in the latter into the plug that is subsequently welded or that has previously been welded on one of the walls of the wine skin. During the filling operation, one should first remove the tap in order to replace it one more time in the plug while ensuring its complete snapping-in. These operations of fitting and removing the tap are not only multiplied unnecessarily. Moreover, it should be noted that, during the successive steps of partial interlocking of the tap, its removal, then its complete snapping-in into the plug, particles can come off the body of said tap or of said plug, and the particles will subsequently be found in the content of the wine skin.

[0013] Also known, from French Patent No. 2,814,968, is the production of a strip in which each flexible bag is filled not through the opening designed to receive the tap, but through another opening dedicated to filling only. This design requires the addition of a sealing operation after filling. Besides, it complicates the handling of the wine skin because of the necessity to free the access to this second opening for its filling and its sealing.

[0014] In short, through a first inventive step, it became clear that because of the partial installation of the tap, normally aimed at avoiding the contamination of the content of the wine skin, the risks of depositing debris in the latter increase.

[0015] Between the filling unit and the one for producing said flexible bags, the latter, made in the form a strip, are packed in large-capacity boxes, through which said flexible bags can be, for the sterile applications, treated by irradiation. Thus, these wine skins, since they are contained in a sealed package, cannot be contaminated, regardless of their plug being closed or not by pre-fitting a distribution tap. Now, as a matter of fact, the very presence of this distribution tap increases the bulk of a wine skin. Therefore, a transportation box of a certain volume can only contain a limited number of bags. Furthermore, this distribution tap, though it is designed to avoid the presence of sharp edges, has nonetheless areas in relief that, in case of handling without too much precaution or during transportation, can damage such a flexible bag. In this respect, it should be noted that in case of detecting a defective wine skin on a filling line, this will cause the complete stop of the plant and an obvious production loss.

[0016] Referring back to the treatment by irradiation, its cost depends on the volume of a package box, rather than on its content. In short, if the package of a certain volume is capable of containing a more considerable number of wine skins, the cost of decontamination per wine skin will decrease. It should be noted here that the tap, although it undergoes the same decontamination treatment as the flexible bag provided with same, has necessarily to be re-treated, in the filling stage, before the complete snapping-in into the plug. Therefore, it can be considered that it unnecessarily undergoes a double decontamination treatment.

[0017] Furthermore, if, at the level of the unit for producing these flexible bags, one usually manages a sufficient width for producing several juxtaposed rows of wine skins, at the end of the production line, these rows are separated by cutting, in order to form single-row strips of flexible bags which, alone, are capable of being treated by the filling unit. As a matter of fact, this raises the problem of packaging in large-width boxes of these strips having only one single row of wine skins. In fact, it is usual to fold up several of these strips in these boxes, which, during transportation and because of the sliding nature of the materials which the flexible bags are made of, tend to pass over the edges of the container and even to get tangled, which raises the problem of their loading into the filling unit.

[0018] Therefore, such strips, including a single row of wine skins, are not stable, and the strips are difficult to be
arranged in this state in a package directly at the end of the production line. Besides, their inconvenient utilization downstream often disorganizes the production process.

Furthermore, depending on the nature or the destination of the product, and even the final customer, one can be inclined to fill, on a filling unit, wine skins that can be distinguished by their tap. It is obvious that the solution described above only permits change of the tap by replacing the strip of flexible bags feeding the filling unit. Therefore, such a change requires multiple handlings. Furthermore, a box containing a limited number of wine skins because of the pre-fitted tap, constrains the operator to intervene relatively often in order to ensure the reloading of the filling unit with a new strip of flexible bags.

The presence of pre-fitted taps, or of protuberances in general with respect to the surface of the wine skin before its filling, increases the difficulty of arrangement in a package.

In order to try to cope with the disadvantages of the solution described above, units have already been designed that are capable of producing the flexible bags and of filling them at the same time. One of these solutions, in particular described in U.S. Pat. No. 3,894,381, EP-A-0297814, EP-A-0312393 and WO-A-91 07320, consists of producing, from one or several films made of an appropriate material, a tube that a first welding unit subdivides, at regular intervals, through a first transversal welding line, the second transversal welding line, delimiting the volume of the wine skin and being made only after filling the latter.

In European Patent No. 0 297 814 the fitting of a tap on each wine skin is also described.

Finally, this known solution permits making, at the same place and continuously, of the package itself and packaging, in the latter, of the product, in particular liquid, foodstuff or non-foodstuff product. Therefore, if one can consider, at a first glance, that it solves the problem set forth, it has become clear that it has some disadvantages.

Thus, one encounters first of all the problem of the resistance of the first transversal welding at the time of filling the wine skin. As a matter of fact, the high production rhythms that a filling unit can maintain are absolutely incompatible with the welding constraints for plastic films.

Moreover, the filling operation can pollute the area of the second transversal welding, by splashing or the like, making this welding, also in this case, not very reliable.

Once again, it should be reminded that the slightest default on a filling unit immediately results into the stopping of the plant with, very often, serious consequences as regards production costs, in particular when foodstuff or even sterile products are treated.

In this context of manufacturing and filling flexible bags at the same manufacturing place, one encounters the problem of the responsibility for manufacturing these flexible bags, on the one hand, and that of the filling operation, on the other hand. As a matter of fact, if a manufacturer of a product, for example, foodstuff, has, at the manufacturing place, all expertise connected directly with this product, it is difficult for the manufacturer to acquire the qualifications of an experienced specialist in manufacturing packaging such as flexible bags made of synthetic material.

Because of these constraints and due to the limitations of the technology, this solution of complete packaging at the same place is not completely satisfactory.

There is also known, from WIPO Publication WO-0043268, a method for producing and for filling continuously flexible containers such as wine skins. The method consists of continuously producing wine skins, providing each one of them with a tap partially snapped onto a plug, filling said wine skins through the plug after removing the tap, and then, finally fitting the latter before bringing the wine skins to a packaging and/or storage place.

Thus, the wine skins are made by simultaneous unrolling two multilayer complex films, a hole being punched in one of these films, at regular intervals, the hole for receiving and welding a plug on which a tap is pre-fitted. In a following step, the two films are welded one over the other so as to form the wine skins that are separated from each other through successive transversal cuts in a cutting unit specifically designed for this purpose.

Even in this case, the pre-fitting of the tap on the plug, its removal and the refitting are operations containing risks of introducing shavings of material into the flexible bags, not to mention that in order to remove the tap, the latter should be maintained perfectly. This maintenance is not connected with risks of impairment of the bag itself. This solution also raises the problem of decontaminating the wine skins before filling. Finally, it becomes clear that it is not adapted at all to the packaging of sterile products. This solution also raises the problem of the responsibility for manufacturing these flexible bags.

Furthermore, one also encounters some difficulties packing the filled flexible bags in cardboard protection packages. Thus, the wine skin, because of its filling weight, usually falls by gravity, directly or through a guiding funnel into a preformed cardboard box and remains open in its upper portion.

However, under the action of its fall and upon entering into contact with the cardboard, the wine skin can be impaired locally, increasing the risk of leaking.

Anyway, the opening in the lower portion of the funnel should be of a smaller section than that of the cardboard box in order to ensure the insertion of the bag alone without any tear through the opening preserved at the level of this cardboard box. As a matter of fact, in the case of small-volume flexible bags, the risk of their blocking in the funnel increases, since their weight is not sufficient to force their passing through the latter whose outlet opening has a reduced cross-section. In particular, in this case of a reduced passage, the friction of the wine skin against the walls of the funnel can also result into wear that can cause a leak, and even rupture, of the wine skin.

Furthermore, because of these known risks of impairment of the wine skin during its putting into cardboard boxes, the latter is often performed in a stop position, which can result into a reduction of the rhythm of the line.

In brief, risks of polluting and damaging the wine skins, before, during, and after filling, constantly exist in the existing systems.

BRIEF SUMMARY OF THE INVENTION

This invention pretend, finally, to cope with the disadvantages of the state of the art mentioned above.

Thus, this invention regards, in particular, a method for packaging, in a flexible bag, liquid or non-liquid, foodstuff or non-foodstuff, sterile or non-sterile products, characterized in that:
a strip of at least two rows of flexible bags is made continuously by superimposing and welding at least two films made of an appropriate synthetic material;
by means of successive operations of punching and welding at regular intervals, one of these films is previously provided with a plug for the filling and subsequent receiving a stopper; and
said strip of flexible bags thus made is packed in a suitable sealed transportation box.

At the filling place, the method according to the invention consists of the following steps:
inserting a strip of flexible bags into a cutting unit in order to separate these flexible bags;
positioning each of these flexible bags with its plug under a filling station;
finally fitting a stopper on said plug; and
conveying the filled flexible bags toward a packaging unit.

Furthermore, according to the invention, at the level of a packaging unit of a filled flexible bag:
a package cardboard box is preformed around a tubular shaping core extending an insertion funnel, this shaping core also serves as a distribution funnel;
a filled flexible bag is inserted through said funnel and said shaping core into the preformed package cardboard box;
the latter is removed from the forming core; and
the complete closing of the package cardboard box is proceeded to.

Eventually, before or after this complete closing of the package cardboard box, the providing with a transportation handle can be proceeded to.

Advantageously, after the filling of a flexible bag, a tightness check operation can be performed, in particular by prior compression and weighing.

According to an advantageous embodiment of the invention, during the production of the flexible bags, there is made, by superimposing at least two films made of a suitable synthetic material, a strip including two or more rows of juxtaposed bags, and this strip of multiple rows of flexible bags is packed in a sealed transportation box.

At the filling place, said multiple-row strip is inserted into a longitudinal and transversal cutting unit in order to separate the flexible bags. Thanks to an appropriate streamlining, this cutting unit ensures the protection of the flexible bags against any foreign body.

The advantages derived from this invention consist, first of all, of avoiding the pre-fitting of the stopper, such as a distribution tap, onto the filling plug. One avoids the penetration into the flexible bags of debris resulting from the successive removal and fitting of said stopper in said plug.

Furthermore, though the plug and the body of the stopper, in particular the tap, were to be designed capable of permitting a pre-fitting with a view to a subsequent removal of the stopper, these features are no longer necessary in the solution according to the invention. In other words, the height of the plug and the length of the body of the tap can be smaller in order to permit just a final fitting of one into the other. This results into an obvious saving of material. This also significantly reduces the quantity of trapped oxygen, thus contributing to a better preservation of the packaged products sensitive to oxidation. Furthermore, the bulk is decreased for the packaging.

In the embodiment consisting of making, in a first step, a strip of several rows of flexible bags, the packaging of such a strip, directly at the end of the production line, in a large-size sealed transportation box is made easier. In particular, by permitting the zigzag arrangement, in alternate folds and in the cardboard box, the smaller protruberances that the filling plugs define are alternately arranged.

As a matter of fact, for this strip whose width can be adapted to that of said box, there is absolutely no risk of getting entangled during transportation. It should also be noted that the package of a multiple-row strip, without any distribution tap, can be automated much more easily than the package of a strip including just one row of wine skins, and moreover, pre-equipped with a distribution tap.

Another advantage of the invention resides in reducing the waste during the manufacturing of the layers. As a matter of fact, manufacturing several rows permits reduction of the excess widths, compared with traditional manufacturing machines producing only in single rows.

Furthermore, the separation of the flexible bags, starting from a multiple-row strip, at the filling place is an operation that is conducted not only very easily, but it avoids making pre-cutting lines as was required in the past.

Furthermore, by pre-shaping the package cardboard box for a flexible bag directly around a tubular shaping core serving as an insertion funnel for said flexible bags, one maximizes, for a package cardboard box with a certain cross-section, the cross-section for the passing of the flexible bag through the funnel. This permits, hence, to advantageously cope with the problem of the passing of said flexible bags through the funnel, but also the risk of burning at the contact with the package cardboard box.

Other aims and advantages of this invention will appear during the following description referring to an exemplary embodiment given indicatively and not restrictively.

The understanding of this description will be facilitated by referring to the attached drawings.

**BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

**FIG. 1** is a schematic view of a production line showing the method for making a strip having several rows of flexible bags equipped with a filling plug without distribution tap.
**FIG. 2** shows a schematic view of the step of packaging said plug in a suitable package box.
**FIG. 3** shows a schematic view showing the plant for filling the flexible bags arriving from a multiple-row strip.
**FIG. 4** shows a schematic view of the steps of packaging of a filled flexible bag in a cardboard box formed around a tubular shaping core crowned by a funnel for inserting a flexible bag.
**FIG. 5** shows a top schematic view of the synchronized transfer of the distribution taps toward the rotary filling machine via a transfer star.
**FIG. 6** shows another top schematic view of the rotary filling machine having two stations for feeding flexible bags.
**FIG. 7** shows a sectional view of a tap during its final fitting on a plug, after filling the flexible bags, since said tap and said plug according to the invention do not permit precapping.
FIG. 8 is a sectional view similar to FIG. 7 showing, during their fitting, a plug and a tap, called standard, permitting pre-capping.

DETAILED DESCRIPTION OF THE INVENTION

As clearly appears from the attached figures and drawings, this invention refers to a method for packaging, in a flexible bag, liquid or non-liquid, foodstuffs or non-foodstuff, sterile or non-sterile products.

As shown in FIG. 1, this method consists of making a strip 1 of at least two rows 1A, 1B, 1C, 1D of flexible bags 2 by superimposing and welding at least two films 3, 4 made of an appropriate material.

In particular, it can be seen in FIG. 1 that the structure of the upper film 3 and the structure of the lower film 4, that are superimposed for welding, can actually be in the form of a multilayer complex based on several films 3A, 3B, 4A, 4B simultaneously unwound from reels 5 arranged in the upstream portion of the line 7 for manufacturing this strip 1 of flexible bags 2.

In fact, according to the method, before superimposing the films 3, 4, the upper one 3 is subjected to a punching operation at regular intervals so as to create at least two rows of openings for introducing and welding a plug 6 on which can be finally fitted, subsequently on the line for filling the flexible bags 2, a stopper 12, such as a distribution tap.

In the case of sterile applications, there can be contemplated, instead of a sterilization operation by irradiation in an outside place, performing the sterilizing of the materials (films, plug, closed by a synthetic cup or a flat plug, for example) on the line for manufacturing the strip 1 of flexible bags 2.

It should be noted that the punching operation of the upper films 3 is performed above sucking means permitting to recover the cut piece and eventual shavings that can pollute the films 3, 4 before assembling.

It should be noted that through the welding of the films 3, 4 one over the other, in particular by making longitudinal and transversal welding lines, the flexible bags 2 of the same row are restrained between them, but also with respect to those of the rows 1A, 1B, 1C, 1D of the adjacent flexible bags, as shown in FIG. 1.

Furthermore, in order to facilitate the cutting of the rows 1A, 1B, 1C, 1D with respect to each other or of a flexible bag 2 with respect to the next one at the level of the same row, the width of the longitudinal and transversal welding lines is determined so as to guarantee the tightness of the different flexible bags once they have been separated, like between two successive rows or two flexible bags following each other, a spaced double welding line can be made.

At the end of this production line 7, the strip 1 of flexible bags 2 including only one plug 6 is packed in a suitable sealed transportation box 8, as shown in FIG. 2. It should be noted that in the case of a multiple-row 1A, 1B, 1C, 1D strip 1, the width of this strip 1 can be substantially adjusted to that 10 of said box 8, which permits the orderly folding of said strip 1 in the latter, without any risk of entanglement during transportation.

In particular, this strip 1 can be folded in an automated manner in zigzag in the box 8.

In this connection, it should be noted that though it is usual to apply an electrostatic load on the films 3, 4 before assembling them by welding to make the strip 1, in order to avoid air trapping, it is just as usual to discharge again the remaining static electricity from said strip 1 at the end of the production line of the flexible bags. Within the scope of an advantageous embodiment of the invention, it is contemplated to leave, on the contrary, this strip 1 loaded with a view to its automatic folding in the transportation box 8 so as to maintain the films 3, 4 blocked between them and avoid the formation of folds and the entering of air into the flexible bags before filling, at least before separating said flexible bags 2 of the strip 1 at the filling place.

FIGS. 3 and 6 show the unit for filling 11 the flexible bags 2 at the place of manufacturing of the product that the latter should contain. According to the method, the bags 2 are separated from each other starting from the multiple-row strip 1, in order to position successively the plug 6 of each of said flexible bags 2 under a filling station. Considering that once a flexible bag filled with the product to be packaged, a stopper, in particular a distribution tap 12, is finally fitted on its plug 6.

It should be noted that after filling, the flexible bags 2 can be subjected to a tightness check operation, in particular by prior compression, then weighing, so that in the case of leaking, the risk of contamination is as low as possible. Said tightness check can also be carried out in a different way, in particular by putting the flexible bags in a vacuum chamber.

Under the filling station and besides the filling operation itself, other operations can be performed too. Thus, during the placing of a plug 6 of a flexible bag 2 under the tapping head, a preliminary putting under vacuum can be carried out by the latter or an auxiliary head, in order to suck the air content in a flexible bag 2 before injecting therein the product to be packaged. The presence of air results into frothing the product, hampering the filling operation.

Also, once the latter has been carried out and before the installation of the stopper defined by the tap, the air, in particular oxygen, still contained in the flexible bag 2 can be neutralized by injecting an appropriate gas, such as nitrogen or the like.

In this connection, it should be recalled that the solution according to the invention permits significant limitation of the introduction of air trapped in the plug 6 and in the body of the tap 12.

In particular, FIGS. 7 and 8 respectively show a plug 6A and a tap 12A not allowing pre-fitting or pre-capping (a solution that can be implemented through this invention) and a plug 6B to which is adapted a tap 12B allowing pre-capping necessary in the operating modes of the state of the art. In the latter case, both the plug 6B and the body 25B of the tap 12B are of a more considerable height with respect to the plug 6A and the body 25A of the tap 12A shown in FIG. 7. Thus, it can clearly be seen from these figures that at the time of finally fitting the tap on the plug, therefore after filling the flexible bags 2, a much more considerable volume of air is trapped in the solution allowing pre-capping (FIG. 8), in comparison with that of the invention (FIG. 7).

The stopper 12 can also be subjected to a decontamination and in particular of sterilization operation in the case of sterile applications, immediately before its final fitting on a plug 6 of a flexible bag 2 after filling the latter.

According to FIG. 3, the filling unit 11 is preferably of the type with multiple stations mounted on a rotary table 14 permitting to subject a flexible bag to a series of operations in masked time in order to optimize the production rhythm. The transfer of the distribution tap 12 to this filling unit 11 in the form of a rotary table 14 advantageously occurs in a synchronized way by means of a transfer star 24 as shown in FIGS. 5.
and 6. FIG. 5 also shows that between the transfer star 24 and the filling unit 11, an identical profile allows perfect synchronization and that, therefore, the transfer star 24 permits supply of the distribution tap 12 at the maximum speed of the filling machine.

[0092] In a preferred embodiment, said filling machine, and more specifically the means of which it is comprised, are controlled by fixed or movable cams distributed around the axis of rotation of the rotary table 14. Furthermore, the stopper 12 and the plug 6 define per se cans for controlling the opening of jaws designed to seize, as the case may be, said stopper 12 or said plug 6.

[0093] At the outlet of the filling unit 11, the flexible bags 2 are evacuated toward a packaging station 13.

[0094] In this connection, though this packaging unit 13 can be linear, according to a particular design of the invention, it is in the form of a rotary table 15 having multiple stations for depositing the flexible bags 2 in cardboard box packages or the like.

[0095] According to a first embodiment, at the level of this rotary packaging unit 13, the package cardboard boxes 16 arrive preformed at the level of a station for feeding cardboard boxes in order to be transferred, afterwards, to the level of a loading station, under a funnel 18 for inserting a flexible bag 2. Thus, during the following step, a flexible bag 2 is poured by gravity, passing through the funnel 18, into said cardboard box 16 maintained open in its upper portion. Said cardboard box 16 is then brought toward the following station 22 where it can be directly evacuated, considering that said station can also ensure a certain finish, for example ensuring the closing of the upper portion of said cardboard box, while equipping it, should the case arise, with a gripping handle.

[0096] Advantageously, the funnel 18 for the insertion of a flexible bag 2 is extended in its lower portion by an insertion tube 17 designed capable of plunging into a packaging cardboard box 16, substantially along the full height of the latter. In particular, as the case may be, the cardboard box 16, while passing from the cardboard-box feeding station to the loading station is subjected to an upward movement in order to be put on said insertion tube 17, considering that it can also be contemplated to rather move the latter and the funnel 18 associated thereto in order to achieve the desired result.

[0097] The advantage of extending the funnel 18 by such an insertion tube 17 resides in that during the fall of the flexible bag 2 the latter does not rub along the walls of the cardboard box 16 and does not risk to be damaged by the latter, in particular at the junction with the flaps of said cardboard box 16.

[0098] According to another preferred embodiment of the invention, at the level of this rotary packaging unit 13, such a package cardboard box 16 is preformed around said insertion tube 17 substantially constituting a shaping core. Thus, at the level of this packaging unit 13 are conveyed the flexible bags 2 proceeding from the filling unit 11. It is also fed with cardboard box cut-outs 19.

[0099] As schematically shown in FIG. 4, one of said cut-outs 19 is first of all folded around the shaping core 17 so as to pre-shape the package cardboard box 16, that is furthermore closed in its lower portion. Beyond said pre-shaping station, said package cardboard box 16, in which the shaping core 17 is inserted, is placed under a station for loading filled flexible bags 2. Such flexible bag 2 falls by gravity into said packaging cardboard box 16, guided by the insertion funnel 18 and said insertion tube 17.

[0100] At the level of a finishing station and by a downward movement, this package cardboard box 16 is removed from the shaping core 17 with a view to its closing in the upper portion.

[0101] In a preferred embodiment, but not restrictively, the packaging unit 13 is designed in a rotary shape including several stations, each comprising a funnel 18 that extends an insertion tube 17, as well as a certain number of means as those necessary for picking up a pre-shaped cardboard box 16 or a cardboard box cut-out 19, and even finishing means. Like in the previous case, this packaging unit 13, in particular the means of each station, is controlled by cams. As to the rotary table 15 itself, it is driven by appropriate controlling means.

[0102] The continuous operation of such a rotary table 15 permits optimization of rates and productivity. This configuration also permits easy control of the movements by the cams, and therefore at a minimum cost and without any equipment such as jacks or the like, which is expensive as regards investment and maintenance.

[0103] At the level of the finishing station 22, by closing this cardboard box 16 subsequently, it can be equipped with a transportation handle. Also, it can receive all necessary advertising or regulatory labeling. Referring back to the filling unit 11, the latter is fed with flexible bags 2 through a unit for cutting and separating 23 said flexible bags from a multiple-row strip 1. In particular, this unit is streamlined in order to guarantee the protection of the flexible bags 2 against any foreign body.

[0104] Said cutting unit 23 can be equipped with cutting tools, both transversal and longitudinal. Advantageously, in order to correctly perform this cutting operation, the plugs 6 of the flexible bags 2 are used as marks, which necessarily keep between them a predefined distance both in the longitudinal and in the transversal direction at the level of the strip 1.

[0105] According to another embodiment, at the level of the production line 7 for making the flexible bags 2 are provided means for marking said strip by marks detectable by optical reading means or the like said cutting unit includes 23.

[0106] It should be noted that this cutting operation is performed on a reduced strip length, and therefore subjected to small deformation tensions. Therefore, through such locating means formed, as the case may be, by the plugs or the marks on the strip, it is possible to achieve a high precision level at the level of the cutting. In particular, such a cutting can be made at the level of a welding line, which permits optimization of the strip widths. It will be reminded, in this connection, that within the scope of the state of the art, the cutting was usually performed between two parallel welding lines, causing increased film consumption for an identical number of flexible bags produced.

[0107] As clearly appears from the preceding description, the method according to the invention and the plant permitting its implementation, advantageously cope with the disadvantages of previously known solutions.

[0108] In particular, the packaging unit 13, and the elements it is comprised of, as well as the eventual stations for pre-shaping the cardboard boxes upstream, or for finishing the filled cardboard boxes downstream, are designed to be controlled by fixed or movable cams. This solution is particularly economic, and of easy maintenance.

1. Method for packaging liquid or non-liquid, foodstuff or non-foodstuff, sterile or non-sterile products in that in a flexible bag, said method comprising the steps of:
superimposing and welding at least two films comprised of
a synthetic material at a bag manufacturing place, the
films forming a continuous strip of flexible bags in at
least rows, at least one film having a plug;
punching and welding one film in successive operation at
regular space intervals on the one film; and
packing said strip of flexible bags in an adapted sealed
transportation box.
2. Method according to claim 1, further comprising:
applying an electrostatic load on the films before welding,
wherein said packing is at an end of a production line,
said strip of flexible bags being left loaded, by automatic
folding in the transportation box, the films being main-
tained as blocked between each other and avoiding for-
mation of folds and introduction of air into the flexible
bags before filling.
3. Method according to claim 1, further comprising:
inserting said strip of flexible bags into a cutting unit at a
filling place, said cutting unit separating said flexible
bags;
positioning each of said flexible bags through a respective
plug under a filling station, and filling each of said flex-
ible bags;
fitting a stopper on said respective plug; and
conveying the filled flexible bags toward a packaging unit.
4. Method according to claim 3, for packaging of sterile
liquid products, said method further comprising:
completing an operation of sterilization of the flexible bags
by irradiation at the bag manufacturing place; and
completing an operation of sterilization of stoppers before
fitting on said respective plug and after filling the flex-
able bag.
5. Method according to claim 3, further comprising:
seizing a preformed cardboard box at a packaging unit for
the filled flexible bags;
putting the box on an insertion tube extending to an inser-
tion funnel;
pouring a filled flexible bag through said insertion funnel
and said insertion tube into the pre-shaped package card-
board box; and
removing the box from the insertion tube.
6. Method according to claim 3, further comprising:
seizing a cardboard box cut-out at a packaging unit for the
filled flexible bags;
pre-shaping a package cardboard box around an insertion
tube extending to an insertion funnel;
pouring a filled flexible bag through said insertion funnel
and said insertion tube into the package cardboard box;
removing the box from said insertion tube.
7. Method according to claim 5, further comprising:
closing the package cardboard box, the package cardboard
box having a transportation handle.
8. Method according to claim 5, further comprising:
completing a tightness check after filling a flexible bag,
said tightness check performed by prior compression of
the filled flexible bag followed by weighing.
9. Method according to claim 1, the step of superimposing
and welding further comprising:
making a strip of two or more rows of juxtaposed flexible
bags said strip of multiple-row flexible bags being
packed in a sealed transportation box having a width
adapted to said strip.
10. Method according to claim 1, said strip having a locating
mark detectable through optical reading means of a cut-
ing unit separating the flexible bags.
11. Plant for implementing the method according to claim
1, said plant comprising:
a production line for making a multiple-row strip of flex-
ible bags, each bag having a plug for filling and for
receiving a stopper.
12. Plant according to claim 11, further comprising:
a cutting unit for a multiple-row strip of flexible bags;
a filling unit for separated flexible bags to be filled, said
filling unit having a filling head, said flexible bags being
placed under said filling head for filling through respec-
tive plugs of said flexible bags, said filling unit having a
fitting head, a stopper being placed on a respective plug
of each flexible bag by said fitting head, after filling each
flexible bag.
13. Plant according to claim 12, further comprising:
a packaging unit being comprised of an insertion tube and
a funnel at an extended upper end, of said insertion tube,
each flexible bag being inserted in said funnel.
14. Plant according to claim 13, wherein said insertion tube
has a shaping core with a pre-shaped package cardboard box
wrapped around said shaping core before depositing a filled
flexible bag from the filling unit in said insertion tube.
15. Plant according to claim 13, said filling unit being linear
or said packaging unit being linear or both units being
linear.
16. Plant according to claim 13, said filling unit being
formed of rotary tables having multiple stations or said pack-
aging unit being formed of rotary tables having multiple
stations or both units being formed of rotary tables having
multiple stations.
17. Plant according to claim 16, further comprising:
a transfer star for transferring stoppers toward said filling
unit, in a synchronized way, said transfer star being
comprised of a rotary table.
18. The method according to claim 3, said stopper being in
snap-fit engagement for final fitting on said plug.

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