SYSTEM AND METHOD FOR CONTINUOUSLY FORMING, SEALING AND FILLING FLEXIBLE PACKAGES

Abstract: A system and method of continuously forming, sealing (8), and filling (11) flexible packages with sterile beverages is disclosed wherein the forming, sealing, and filling is performed without stopping or indexing the packages in order to achieve high throughput rates and efficiency. A web feeding (6) device inputs sheet material into the system, which is continuously formed into a series of juxtaposed shaped packages in a forming unit. The packages are formed by a folding technique resulting in top and bottom gussets, and sealed side seams (8) with an open top for filling thereof with liquid. The entire web of formed packages is transported through a filling device (11), which continuously fills the packages while in web form. The top fill openings of the packages are then sealed (18) in a continuous process, and fabrication within an aseptic or ultra-clean environment is thereby completed. Post-treatment of the packages outside of the aseptic environment, but in a clean environment, then may proceed. Such post-treatment may include the securing of drinking straws (20) to the packages, severing (22) of the package into individual packages, and secondary packaging (30) of the individual packages into cases or multi-pacs.
SYSTEM AND METHOD FOR CONTINUOUSLY FORMING, SEALING AND FILLING FLEXIBLE PACKAGES

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a method and system for continuously forming, sealing and filling flexible packages with materials in order to achieve a rapid throughput of packages at the output of a conveyor system. More specifically, the present invention relates to a system and method for continuously forming, sealing and filling flexible packages with hot pasteurized or sterile beverages in an aseptic or ultra-clean environment, and post-treating the package emerging from the sterile environment in a clean environment in route to a case packer, or other secondary package-forming apparatus.

Description of Related Art

Heretofore, the forming, sealing and filling of flexible packages, and particularly aseptic packages, have been performed by various techniques and apparatus. But, due to the nature of the packages to be filled and formed, and the aseptic environment requirements, conventional systems have not had sufficiently rapid throughput to achieve the desired efficiencies in the assembly line.

Preferably, it is desirable to achieve 80 to 85% efficiency of the assembly line, but heretofore such efficiencies have not been achievable. Accordingly, a need in the art exists for a system and method for continuously forming, sealing and filling flexible packages at increased rates of speed as compared to prior techniques and systems.

SUMMARY OF THE INVENTION

Accordingly, it is a primary aspect of the present invention to provide a method and system for continuously forming, sealing and filling flexible packages at high efficiencies and throughput speeds.

It is another aspect of the present invention to provide a system that continuously forms the flexible packages from a continuous web of flexible
material fed from roll-stock, wherein the packages formed have bottom and
top gussets.

In another aspect of the present invention, the continuous web of
material is continuously formed and filled with liquid in continuous motion
without stopping or indexing the packages through various operational
stations of the conveyor system.

These and other aspects of the present invention are achieved by
providing a method of continuously forming, sealing and filling flexible
packages with materials comprising the steps of:

a) feeding a continuous web of plastic sheet material into a package-
forming unit;

b) outputting a continuous web of packages including a series of
juxtaposed shaped packages from the forming unit, the shaped packages
having a closed bottom; two open sides, and an open top defining a fill
opening;

c) sealing the open sides while continuously feeding the web of
packages through a side-seaming unit;

d) filling the packages with liquid through said open tops while
continuously feeding the web of packages through a filling unit;

e) sealing the open top of the respective packages while continuously
feeding the web of packages through a top sealing unit; and

f) severing the respective filled and sealed packages from the web to
form individual packages therefrom.

In the method of the present invention, a step of sterilizing the web may
be performed between the foregoing steps a) and b) if the packages to be
filled are to be sterilized.

In the method of the present invention, steps a) to e) described above
are preferably performed within an aseptic or ultra-clean environment. But,
the severing of the respective filled and sealed packages from the web to form
individual packages therefrom; securing a drinking straw to each package on
the web, and forming secondary packages are merely performed in a clean, rather than an aseptic or sterile environment.

The present invention also relates to a system including various means and units in combination for performing the above enumerated steps of the method of the present invention.

Other variations in the present invention may include a step for attaching a spout to the fill opening of the packages; filling the packages with low acid, beverages, or foods such as milk products higher acid beverages such as citrus juices; particulate material including citrus pulp, or fruit particles; and use of foil-plastic and plastic-plastic laminates for the web material.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:
Fig. 1 is a schematic block diagram of a system and method for filling flexible packages in an aseptic environment according to the present invention;

Fig. 2 is a schematic block diagram showing further details of the forming, filling and sealing system of Fig. 1;

Fig. 3 is a perspective view showing one possible embodiment of the apparatus for performing the method of the system of Fig. 1;

Fig. 4 is a diagrammatic illustration of a forming portion of the flexible packages of the system of Fig. 1 showing the detail of formation of top and bottom gusset structures for the flexible packages; and

Fig. 5 is a perspective view showing a rotary filling turret and nozzle assembly for filling flexible packages formed in a continuous web in accordance with the aspects of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to Fig. 1, there is illustrated a complete system for filling and sealing flexible packages, in an aseptic or ultra-clean environment followed by a clean environment for post-treatment of the packages and secondary packaging.

A source of pasteurized juice or other beverages 10 is provided to feed liquid to a cold filling rotary filler 14 disposed within an aseptic enclosure 12. A continuous aseptic web-fed pouch forming machine 16 forms packages in the web in juxtaposed positions at a rate of about 600 ppm for 200 ml packages and 300 ppm for 330 ml packages. The pouch forming machine 16 includes a gusset forming mechanism to be described hereinafter, as well as a side sealing mechanism 8 and a top sealing mechanism 18.

External to the aseptic or ultra-clean environment, but within a clean environment, there is provided a straw application device 20, a product die-cutting and code-dating device 22, and a hi-speed pick and place case erecting, packing and closing mechanism 30 at the output to the system. A product transfer conveyor system 24 is provided between the output of the aseptic web forming machine 16 and secondary packaging device 30, and
such a conveyor system may include package weight monitoring detectors and surge protectors 28 to provide an even, continuous throughput of formed and filled packages.

Fig. 2 discloses more detail of the package forming and sterilization mechanisms for use in the system of Fig. 1, and like reference numerals therein refer to like parts of the respective figures. The sheet material from which the web W is formed may be provided on a package roll-stock feeder 6. The web W then proceeds through a sterilization mechanism 7, which preferably treats the web material with not hydrogen peroxide, ultraviolet radiation and heat. The web W emerges from sterilizer 7, and travels through a pouch side-sealing turret 8, which forms side seams of the pouches P to be illustrated in more detail hereinafter with reference to Fig. 5. The web W passes around an idler roller 9 to the perimeter of a cold pouch filling machine 11, also depicted more completely in Figs. 3 and 5. Filled pouches on the web W emerging from filler 11 pass on through a continuous ultrasonic top sealer 18, which seals the top opening of the filled packages. At this point, the packages may pass from the aseptic or ultra-clean environment to merely a clean environment because the packages with sterile liquid or other materials therein have been hermetically sealed. Emerging from sealer 18, web W passes through a straw applicator 20, which may secure a straw to each package. The web W then passes through a die 22 puncture or cutter, and the sealed packages are separated into individual packages for processing by secondary packages 30, which may form cases, multi-pacs, and so forth at speeds of about 720 ppm.

Fig. 3 is a perspective view showing one embodiment of the physical shape and inner connection of the components of the system of Fig. 2. As depicted in Fig. 3, the roll-stock material 6 is provided on a spool which feeds the web W sheet material into and through a sterilizer, a gusset former, a side seal turret 8, and a rotary filling turret 11; and is output through a conveyor and straw applicator, and die-cutting turret 22 described hereinbefore.
Various physical forms of the components of the system in Fig. 3 may be utilized without departing from the spirit and scope of the present invention.

Referring to Fig. 4, there is illustrated an embodiment of a gusset forming mechanism for forming top and bottom gussets of the flexible packages P in accordance with the present invention. The web W is fed through a metal plow 13, including a funnel-shaped channel with an output slot defined by a pair of plates 15. A bottom gusset BG emerges from the slot and passes with web W into a station for forming a top gusset TG of the package P. The top gusset forming mechanism includes a top gusset folding plate 16, which forms top gusset TG in web W. The packages P with gussets formed therein is then transported to the side seam forming mechanism 8 of Fig. 2.

The package P, in accordance with the preferred embodiment of the present invention, includes a bottom gusset BG, a top gusset TG, a fill opening FO, and a waist portion PW, which facilitates comfortable gripping and handling of the packages by a consumer. As illustrated in Fig. 5, liquid is introduced into openings FO by nozzles 11A of the rotary filler 11. Arrows A indicate the introduction of nozzles 11A into openings FO, and arrows B indicate the removal of those nozzles from the openings after filling is complete. In other words, the rotary filler permits the rapid and continuous filling of the packages P through the top openings FO without stopping or indexing the packages during the filling operation.

The packages P may be formed from plastic, laminates of plastic, flexible foil laminates, combinations of foil and plastic, or any other suitable flexible materials.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.
What is claimed is:

1. A method of continuously forming, sealing and filling flexible packages with materials comprising the steps of:
   a) feeding a continuous web of plastic sheet material into a package-forming unit;
   b) outputting a continuous web of packages including a series of juxtaposed shaped packages from the forming unit, the shaped packages having a closed bottom; two open sides, and an open top defining a fill opening;
   c) sealing the open sides while continuously feeding the web of packages through a side-seaming unit;
   d) filling the packages with liquid through said open tops while continuously feeding the web of packages through a filling unit;
   e) sealing the open top of the respective packages while continuously feeding the web of packages through a top sealing unit; and
   f) severing the respective filled and sealed packages from the web to form individual packages therefrom.

2. The method of claim 1 further comprising the step of:
   sterilizing the web between steps a) and b).

3. The method of claim 2 further comprising the step of:
   securing a drinking straw to each package on the web between steps e) and f).

4. The method of claim 1 further comprising the step of:
   securing a drinking straw to each package on the web between steps e) and f).

5. The method of claim 1 wherein the forming unit continuously folds said plastic sheet material along a longitudinal axis to form a longitudinal gusset that forms the package bottom.

6. The method of claim 5 wherein said forming unit then continuously forms a top gusset structure for each package.
7. A system for continuously forming, sealing and filling flexible package with liquid comprising:
   a) means for feeding a continuous web of plastic sheet material into a package forming a unit;
   b) means for outputting a continuous web of packages including a series of juxtaposed shaped packages from the forming unit, the shaped packages having a closed bottom, two open sides, and an open top defining a fill opening;
   c) means for sealing the open sides while continuously feeding the web of packages through a side-seaming unit;
   d) means for filling the packages with liquid through said open tops while continuously feeding the web of packages through a filling unit;
   e) means for sealing the open top of the respective packages while continuously feeding the web of packages through a top sealing unit; and
   f) means for severing the respective filled and sealed packages from the web to form individual packages therefrom.

8. The system of claim 7 further comprising:
   means for sterilizing the web between functions performed by means a) and b).

9. The system of claim 8 further comprising:
   means for securing a drinking straw to each package on the web between functions performed by means e) and f).

10. The system of claim 7 further comprising:
   means for securing a drinking straw to each package on the web between functions performed by means e) and f).

11. The system of claim 7 wherein the forming unit continuously folds said plastic sheet material along a longitudinal axis to form a longitudinal gusset that forms the package bottom.

12. The system of claim 11 wherein said forming unit then continuously forms a top gusset structure for each package.
13. The system of claim 7 further comprising:
means for maintaining a sterile environment around means b) to e).

14. The system of claim 13 further comprising:
means for maintaining a clean, but non-sterile environment around
means f).

15. The system of claim 9 further comprising:
means for maintaining a clean, but non-sterile, environment around
said means for securing a drinking straw.

16. The method of claim 1 further comprising the step of:
maintaining a sterile environment during steps b) to e).

17. The method of claim 16 further comprising the step of:
maintaining a clean, but non-sterile environment during step f).

18. The method of claim 3 further comprising the step of:
maintaining a clean, but non-sterile, environment during the securing of
a drinking straw.

19. The method of claim 1 wherein the package output is about 660
packages per minute for 200 ml pouches.

20. The system of claim 7 wherein the package output is about 660
packages per minute for 200 ml pouches.
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

### Patent family members are listed in annex.

**X** Special categories of cited documents:

- **X** document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search: 29 July 2002

Date of mailing of the international search report: 13/08/2002

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Hilpund
Tel: (+31-70) 940-2040, Tx: 31 651 epo nl, Fax: (+31-70) 940-3016

Authorized officer: Damiani, A
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