



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**08.11.2017 Bulletin 2017/45**

(51) Int Cl.:  
**B67C 3/02 (2006.01)**

(21) Application number: **16168359.4**

(22) Date of filing: **04.05.2016**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
 Designated Extension States:  
**BA ME**  
 Designated Validation States:  
**MA MD**

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(54) **FILLING LINE FOR A LIQUID OR SEMI-LIQUID FOOD PRODUCT**

(57) The present invention relates to a filling line (10) for a liquid or semi-liquid food product. The filling line comprises: a tank (12) adapted to contain amounts of the liquid or semi-liquid food product (14); at least two filling machines (16a-b) adapted to fill said product into

packages; piping including a ring main (18) for supplying said product from the tank to the at least two filling machines; and at least one damper (26) provided on the ring main and adapted to dampen pressure fluctuations.

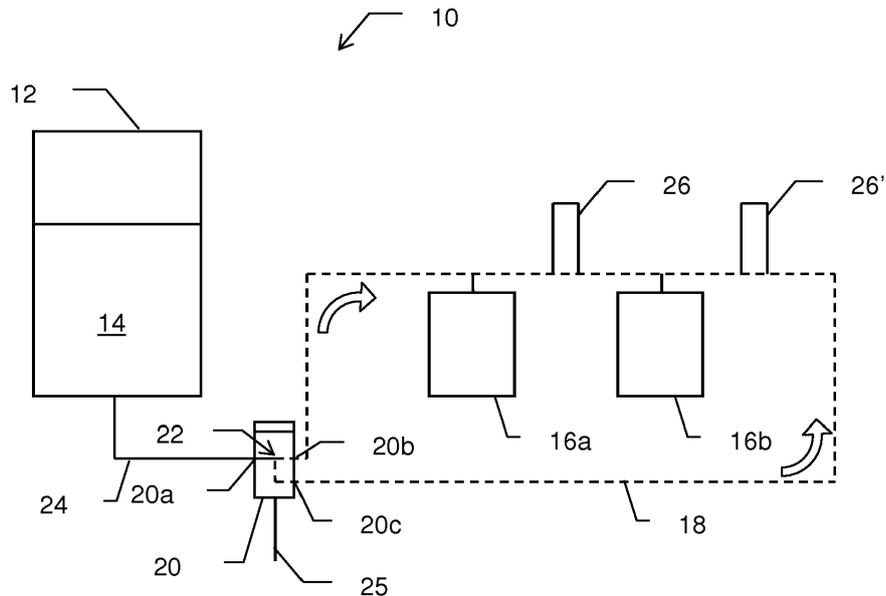


Fig. 1

## Description

### Field of the invention

**[0001]** The present invention relates to a filling line for a liquid or semi-liquid food product, such as UHT milk.

### Background

**[0002]** When using different types of filling machines in the same filling line, problems with pressure fluctuations may occur. This in turn means that there is a risk that the filling machines are interfering each other, causing one or several filling machines to go out of production.

### Summary of the invention

**[0003]** It is an object of the present invention to provide an improved filling line which may overcome or at least mitigate the aforementioned drawbacks.

**[0004]** According to a first aspect of the invention, there is provided a filling line for a liquid or semi-liquid food product, the filling line comprising: a tank adapted to contain amounts of the liquid or semi-liquid food product; at least two filling machines adapted to fill said product into packages; piping including a ring main for supplying said product from the tank to the at least two filling machines; and at least one damper provided on the ring main and adapted to dampen pressure fluctuations.

**[0005]** A 'ring main' may here be construed as a loop or ring in which the product may flow, circulate or otherwise be present. 'Semi-liquid' means that the product may have the qualities of both a liquid and a solid.

**[0006]** The ring main in combination with the at least one damper provides a significant improvement (reduction) in pressure fluctuations. This has been shown by simulations. The ring main in combination with the at least one damper further enables use of a larger variation of filling machines in combination.

**[0007]** The at least two filling machines may be connected to the ring main, wherein the tank is in fluid communication with the ring main via a valve configured to selectively provide a three-way junction between the tank and the ring main.

**[0008]** The filling line may be configured such that during production said product flows from the tank, into the ring main, and both clockwise and counter clockwise in the ring main to the at least two filling machines. No pump is typically provided on the ring main. Even if there is a pump, it would be deactivated.

**[0009]** It should be noted that WO 2016/001144 A1 discloses a system with a first flow path and a second flow path that provide a circulation flow part, but only together with a single filling machine. Further, the product in WO 2016/001144 A1 is circulated clockwise using in a pump.

**[0010]** The valve may include a tank inlet and two ring main outlets, wherein the valve has a first valve position

and a second valve position, wherein in the first valve position the valve permits connection of said tank inlet to only one of the ring main outlets, and wherein in the second valve position the valve permits connection of said inlet to both said ring main outlets.

**[0011]** The at least two filling machines may be of different types. Alternatively they may be of the same type, but run at different speeds.

**[0012]** The at least two filling machines may comprise a first filling machine and a second filling machine, wherein the at least one damper comprises a damper connected to the ring main between the first filling machine and the second filling machine. Alternatively, the damper could be connected to the ring main before or after the first and second filling machines.

**[0013]** The filling line may further comprise another damper provided on the ring main before or after the first and second filling machines.

**[0014]** The filling line may comprise even more dampers, in particular if there are more than two filling machines.

**[0015]** The at least one damper may comprise two upright pipe portions interconnected at the top by a bridging pipe portion and connected at the bottom to the ring main. The damper may for example have an upside-down U-shape. The damper may be filled with sterile air when draining the tank after sterilization, and during production the air in the damper provides an (upper) air cushion which dampens pressure peaks.

**[0016]** A temperature transmitter may be provided at the bridging pipe portion. The temperature transmitter, which basically is a thermometer, may be used to monitor that a high enough temperature has been achieved during sterilization.

**[0017]** One of the two upright pipe portions may be connected to the ring main via a three-port valve. During production, the three-port valve is open. During cleaning in place (CIP) of the filling line, the valve is flipped to clean the seat of the valve.

**[0018]** The filling line may be aseptic, and the product may for example be UHT milk.

**[0019]** According to second aspect, there is provided a method of operating a filling line according to the first aspect, wherein the method comprises: flowing said product from the tank, into the ring main, and both clockwise and counter clockwise in the ring main to the at least two filling machines. This aspect may exhibit the same or similar features and technical effects as the first aspect, and vice versa.

### Brief description of the drawings

**[0020]** These and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing one or more embodiments of the invention.

Fig. 1 schematically illustrates a filling line according

to an embodiment of the present invention.

Fig. 2 is a schematic close-up side view of a damper of the filling line in fig. 1.

Fig. 3 shows the result of a simulation of the filling line of fig. 1.

#### Detailed description of the invention

**[0021]** Fig. 1 shows a filling line 10 to an embodiment of the present invention. The filling line 10 may be aseptic. The product handled by the line 10 may for example be UHT milk, other beverages, puddings, etc.

**[0022]** The filling line 10 comprises a tank 12. The tank 12 is adapted to contain a liquid or semi-liquid food product 14, such as the aforementioned UHT milk. The tank 12 may for example be Tetra Alsafe aseptic tank.

**[0023]** The filling line 10 further comprises a first filling machine 16a and a second filling machine 16b. Each filling machine 16a-b is adapted to fill said product into packages (not shown). The two filling machines 16a-b may be of different type, for example Tetra Pak A3/Speed and Tetra Pak A3/Flex. Alternatively, the two filling machines 16a-b may be of the same type, but run at different speeds (# of liters or packages per hour).

**[0024]** The filling line 10 further comprises piping including a ring main 18 for supplying said product from the tank 12 to the two filling machines 16a-b. Purely for illustration purpose, the ring main 18 is dashed in fig. 1. The ring main 18 may be construed as a loop or ring in which the product may flow or otherwise be present. The two filling machines 16a-b are connected to the ring main 18. Each filling machine 16a-b may for example be connected to the ring main 18 via a diversion valve. The tank 12 is in fluid communication with the ring main 18 via a valve 20. The valve 20 may form part of a valve cluster module associated with the tank 12. The valve cluster module generally directs product flow, sterile air, cleaning liquids and steam. The valve 20 is generally configured to selectively provide a three-way junction 22 between the ring main 18 and pipe 24 coming from the tank 12. Specifically, the valve 20 may include an inlet 20a connected to pipe 24, and two ring main outlets 20b-c, as shown in fig. 1. The valve 20 may further have a first valve position and a second valve position. In the first valve position, the valve 20 permits connection of inlet 20a only to ring main outlet 20b, but not to ring main outlet 20c. Also in the first valve position, ring main outlet 20c may be connected to pipe 25, which in turn may be connected to a drain or reclaim system (not shown). In the second valve position, the valve 20 permits connection of inlet 20a to both ring main outlets 20b-c, whereby the aforementioned three-way junction 22 in effect is formed. Also in the second valve position, ring main outlet 20c may be disconnected from pipe 25.

**[0025]** The filling line 10 further comprises a damper 26. The damper 26 is adapted to (further) dampen pressure fluctuations in the filling line 10. The damper 26 is provided on the ring main 18. In particular, the damper

26 is connected to the ring main 18 between the first filling machine 16a and the second filling machine 16b. Another damper 16' can be connected before or after the filling machines 16a-b, for example to the right of the second filling machine 16b as shown in fig. 1.

**[0026]** The damper 26 (or 26') is shown in more detail in fig. 2. The damper 26 comprises two upright, parallel pipe portions 28a-b. The height of the upright pipe portions 28a-b may for example be approximately 1500 mm. The upright pipe portions 28a-b may have the same width or diameter. At the top, the upright pipe portions 28a-b are interconnected by a bridging pipe portion 30. A temperature transmitter 32 may be arranged at the bridging pipe portion 30, for securing temperature during sterilization. The temperature transmitter 32 may for example be Pt100. At the bottom, the upright pipe portions 28a-b are connected to the ring main 18. One upright pipe portion 28b may be connected to the ring main 18 via a three-port valve 34. The three-port valve has an open valve position in which a T-shaped fluid passageway is created, and a closed valve position in which the ring main 18 between the upright pipe portions 28a-b is closed. The open valve position may be used during production. During cleaning in place (CIP), the valve 34 may be flipped, i.e. quickly switched between the open and closed valve positions, in order to clean the seat of the valve 34.

**[0027]** The present damper 26 has low complexity and low cost.

**[0028]** Upon operation of the filling line 10, the damper 26 may be filled with sterile air when draining the tank 12 after sterilization. During filling of the filling line 10, the valve 20 is in the first valve position, whereby the product 14 flows from the tank 12 via pipe 24 into the ring main 18, where it is transported clockwise. Superfluous amounts of the product returned to valve 20 may be drained or reclaimed via pipe 25. Then, during production, i.e. when the two filling machines 16a-b are filling the product 14 into the packages, the valve 20 is in the second valve position, whereby the product 14 flows from the tank 12 via the pipe 24 into the ring main 18, where it is transported both clockwise and counter clockwise (as illustrated by the two curved arrows in fig. 1) to the filling machines 16a-b. Hence the product may move bidirectionally in the ring main 18. To this end, the ring main 18 may be referred to as a double feed ring main. In the damper 26, the air provides an air cushion 36 which dampens pressure peaks.

**[0029]** Fig. 3 shows the result of a simulation of the filling line 10 wherein both the first and the second filling machine is a Tetra Pak A3/Speed, but where the former (A3\_1) is running at higher speed than the latter (A3\_2). The graph of fig. 3 shows the pressures at the filling machines' inlets. The time scale is in seconds. The pressure at the outlet of the tank 12 was 2.1 bar. The simulation shows that the ring main 18 in combination with the damper 26 provides a significant improvement (reduction) in pressure fluctuations, for example compared to a case where the damper 26 is omitted.

**[0030]** The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims. For example, the tank modified with both an outlet and an inlet could form part of the ring main. Further, the filling line could include additional filling machines and dampers.

## Claims

1. A filling line (10) for a liquid or semi-liquid food product, the filling line comprising:
  - a tank (12) adapted to contain amounts of the liquid or semi-liquid food product (14);
  - at least two filling machines (16a-b) adapted to fill said product into packages;
  - pipings including a ring main (18) for supplying said product from the tank to the at least two filling machines; and
  - at least one damper (26) provided on the ring main and adapted to dampen pressure fluctuations.
2. A filling line according to claim 1, wherein the at least two filling machines are connected to the ring main, and wherein the tank is in fluid communication with the ring main via a valve (20) configured to selectively provide a three-way junction (22) between the tank and the ring main.
3. A filling line according to claim 1 or 2, configured such that during production said product flows from the tank, into the ring main, and both clockwise and counter clockwise in the ring main to the at least two filling machines.
4. A filling system according to claim 2, wherein the valve includes a tank inlet (20a) and two ring main outlets (20b-c), wherein the valve has a first valve position and a second valve position, wherein in the first valve position the valve permits connection of said tank inlet to only one (20b) of the ring main outlets, and wherein in the second valve position the valve permits connection of said tank inlet to both said ring main outlets.
5. A filling line according to any preceding claim, wherein the at least two filling machines are of different types.
6. A filling line according to any preceding claim, wherein the at least two filling machines comprises a first filling machine (16a) and a second filling machine (16b), and wherein the at least one damper comprises a damper (26) connected to the ring main between
  - the first filling machine and the second filling machine.
7. A filling line according to claim 6, further comprising another damper (26') provided on the ring main before or after the first and second filling machines.
8. A filling line according to any preceding claim, wherein the at least one damper comprises two upright pipe portions (28a-b) interconnected at the top by a bridging pipe portion (30) and connected at the bottom to the ring main.
9. A filling line according to claim 8, wherein a temperature transmitter (32) is provided at the bridging pipe portion.
10. A filling line according to claim 8 or 9, wherein one of the two upright pipe portions is connected to the ring main via a three-port valve (34).
11. A filling line according any preceding claim, wherein the filling line is aseptic.
12. A method of operating a filling line (10) according to any preceding claim, wherein the method comprises:
  - flowing said product from the tank (12), into the ring main (18), and both clockwise and counter clockwise in the ring main to the at least two filling machines (16a-b).

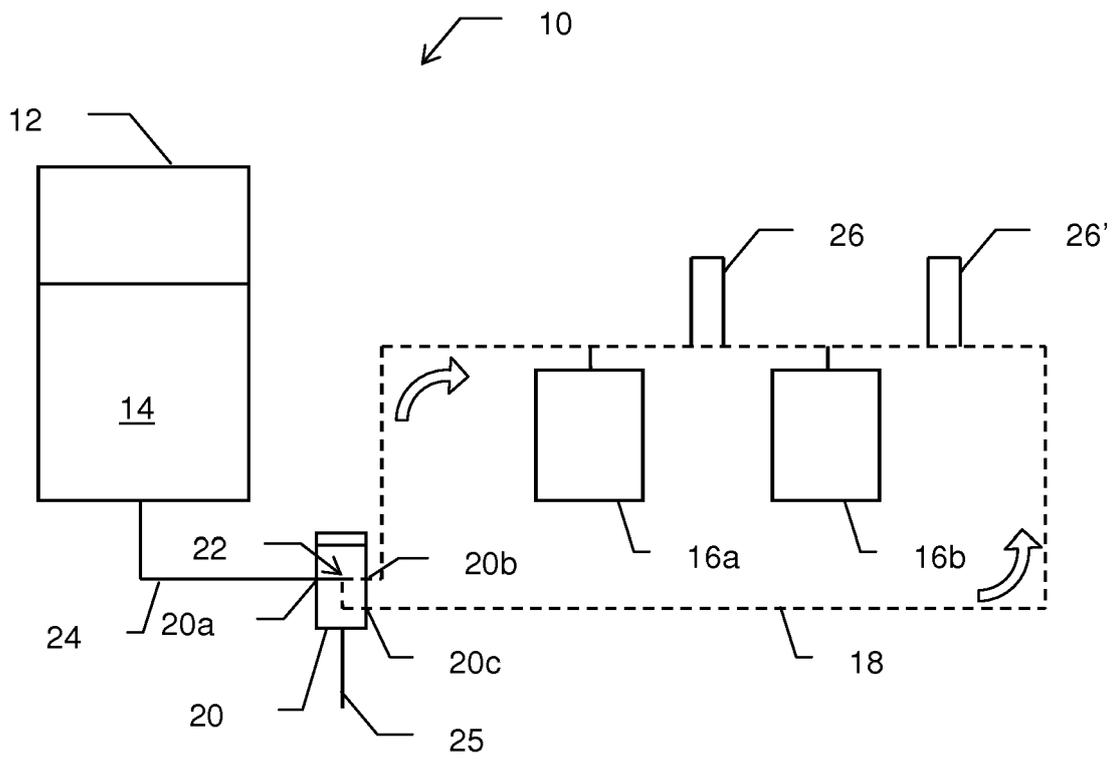


Fig. 1

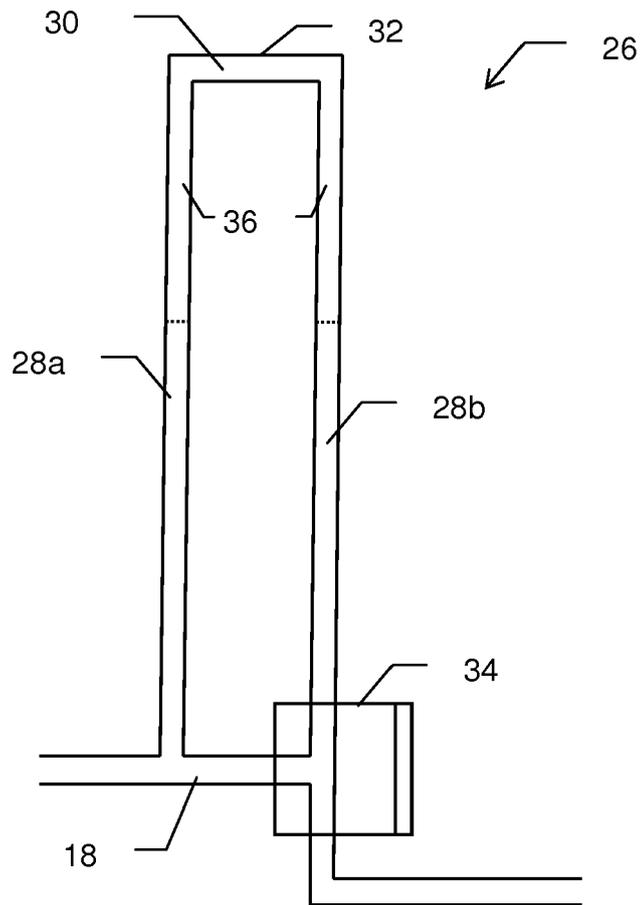


Fig. 2

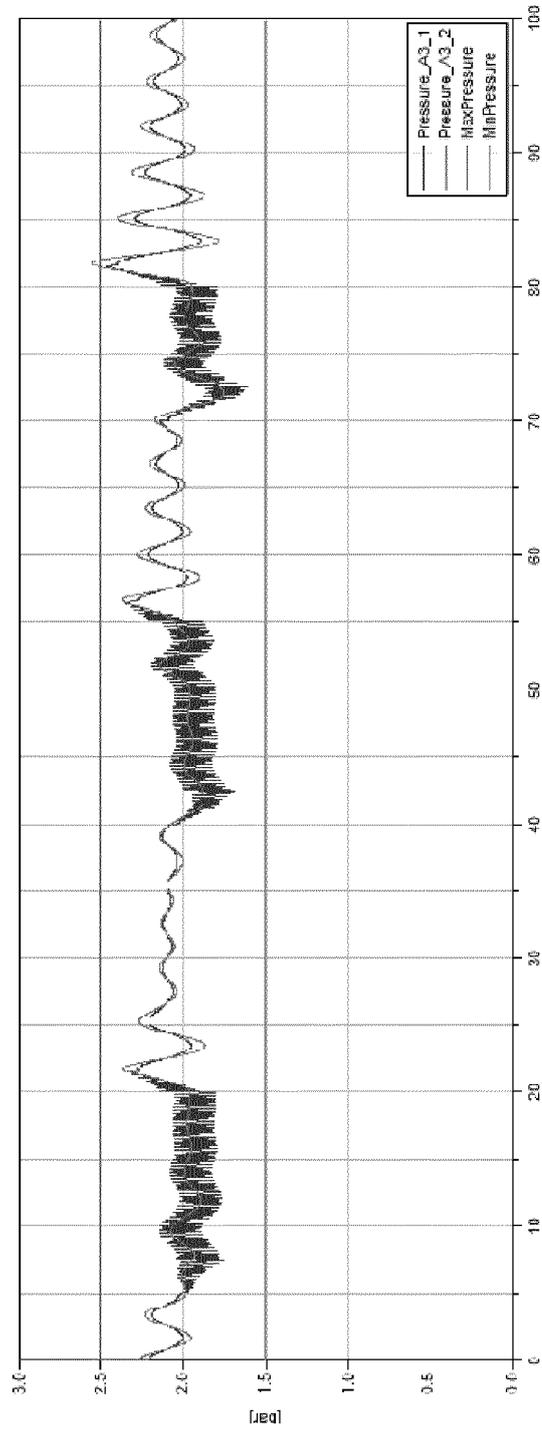


Fig. 3



EUROPEAN SEARCH REPORT

Application Number  
EP 16 16 8359

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 03/078083 A2 (SAUER KLAUS [DE]; MOSER GILBERT [AT]) 25 September 2003 (2003-09-25) * page 4, paragraph 3 - page 5, paragraph 6; figures 1, 2 *	1-12	INV. B67C3/02
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 September 2016	Luepke, Erik
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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