Claims

1. A transport method for high-quality fresh milk (P) in transport- and environment-critical transport conditions, comprising
   - storage of the high-quality fresh milk (P)
     - by filling a container (10) that has an undivided volume (V) of several cubic meters,
     - at a fresh milk temperature (T) that is lowered with respect to an ambient temperature,
     - with a headspace (10.1) in the container (10) that is supplied with a gaseous fluid (F*);
   - transportation of the high-quality fresh milk (P) using a transport means (TM) that is designed as an earthbound transport means (TM1) and/or as a ship (TM2);
   - emptying the high-quality fresh milk (P) from the container (10);

   characterized by the following steps:

   (A) filling the container (10) with the high-quality fresh milk (P) under sterile conditions and,

   within a storage time (Δt) that comprises a period of time from after filling to emptying of the container (10),

   (B) detecting an angle of inclination (+/-a) that is formed between a free surface (N) of the high-quality fresh milk (P) formed toward the headspace (10.1) and a reference system (BS) based on the container (10);

   (C) detecting a pressure (p) in the headspace (10.1);

   (D) increasing the pressure (p) depending on and in proportion to a magnitude of the angle of inclination (+/-a) by feeding a gaseous, sterile fluid (F) into the headspace (10.1) under sterile conditions and

   (E) emptying the high-quality fresh milk (P) from the container (10) under sterile conditions.

2. The transport method according to claim 1,
characterized by the following step:
(G) lowering the fresh milk temperature (T) during a final time stage (Δtx) of the storage time (Δt) from 3.5°C–4°C to 2°C–2.5°C.

3. The transport method according to claim 2,
characterized
in that the final time stage (Δtx) corresponds to one third of the storage time (Δt).

4. The transport method according to any one of claims 1 to 3,
characterized
- by predefining an angle of inclination range ($+/-\Delta a_{max}$), which is formed in each case between a maximum negative angle of inclination ($-a_{max}$) and a maximum positive angle of inclination ($+a_{max}$) for the angle of inclination ($+/-a$), and
- by predefining a permissible pressure range (Δp) between a minimum pressure (p_{min}) and a maximum pressure (p_{max}) for the pressure (p) in the headspace (10.1),
- the permissible pressure range (Δp) correlating with the magnitude of the angle of inclination range ($+/-\Delta a_{max}$).

5. The transport method according to claim 4,
characterized
in that the permissible pressure range (Δp) extends to 1.4 bar excess pressure.

6. The transport method according to any one of claims 1 to 5,
characterized
in that the pressure (p) only follows a temporal progression of the magnitude of the detected angle of inclination (+/-a) if a subsequent magnitude of the detected angle of inclination (+/-a) is equal to or greater than a previous magnitude.

7. The transport method according to any one of claims 1 to 6,
characterized
- in that the reference system (BS) is an orthogonal triaxial reference system (BS_{x-y-z}) consisting of an x, y and z axis,
- in that an inclination of the free surface (N) is measured in each case in a plane (E_{x-z}) spanned by the x and z axis and in a plane (E_{y-z}) spanned by the y and z axis and
- in that the angle of inclination (+/-a) is determined from these two orthogonal measurement values.

8. The transport method according to claim 7,
characterized
in that the orthogonal triaxial reference system (BS_{x-y-z}) is formed of a first main axis (L_x) of the container (10) oriented in the x direction, a second main axis (L_y) of the container (10) oriented in the y direction and a third main axis (L_z) of the container (10) oriented in the z direction.

9. The transport method according to claim 8,
characterized
in that either the first main axis (L_x) or the second main axis (L_y) is oriented in a direction of travel (FR) of the transport means (TM; TM1, TM2).

10. The transport method according to one of claims 1 to 3
characterized
in that the pressure (p) increase does not depend on the angle of inclination (+/-w).

11. The transport method according to any one of claims 1 to 10,
characterized
in that a fill level measuring apparatus (12) for detecting a fill level of the high-quality fresh milk (P) in the container (10) is designed to have two measuring probes (L1, L2) which are immersed in the free surface (N) at a distance from one another and which quantitatively determine a sloshing movement of the free surface (N) from a differing degree to which they are wetted.

12. A transport apparatus for high-quality fresh milk (P) in transport- and environment-critical transport conditions, comprising

- a container (10), which has an undivided volume (V) of several cubic meters for storing the high-quality fresh milk (P);
- a filling and emptying apparatus (30*) for filling the container (10) with and for emptying the high-quality fresh milk (P) from the container (10);
- a headspace (10.1) in the container (10) that can be supplied with a gaseous fluid (F*),
- a temperature measuring apparatus (14) for detecting a fresh milk temperature (T) in the container (10),
- a fill level measuring apparatus (12) comprising a first measuring probe (L1),
- a cooling apparatus (40*), which at least keeps the fresh milk temperature (T), lowered with respect to an ambient temperature, constant,
- a transport means (TM) for transporting the container (10) in the form of an earthbound transport means (TM1) and/or a ship (TM2),

characterized by

- the container (10), which, in conjunction with a filling and emptying apparatus (30), is designed such, that the high-quality fresh milk (P) can be treated in a comprehensive and sterile manner;
- a first apparatus (60) having at least one inclinometer (62) for detecting an angle of inclination (+/-a) that is formed between a free surface (N) of the high-quality fresh milk (P) formed toward the headspace (10.1) and a reference system (BS) based on the container (10);
- a second apparatus (16) for detecting a pressure (p) in the headspace (10.1);
- a third apparatus (50) for feeding a gaseous, sterile fluid (F) into the headspace (10.1) under sterile conditions;
- a control apparatus (70), which can control an increase of the pressure (p) depending on and in proportion to a magnitude of the angle of inclination (+/-a) by feeding a gaseous, sterile fluid (F) into the headspace (10.1).

13. The transport apparatus according to claim 12,
characterized
in that the control apparatus (70) has a data memory (72) in which
- an angle of inclination range (+/-Δa_{max}) between a maximum negative angle of inclination (-a_{max}) and a maximum positive angle of inclination (+a_{max}) for the angle of inclination (+/-a) is stored,
- a permissible pressure range (Δp) between a minimum pressure (p_{min}) and a maximum pressure (p_{max}) for the pressure (p) is stored,
- the permissible pressure range (Δp) correlating with the magnitude of the angle of inclination range (+/-Δa_{max}).

14. The transport apparatus according to claim 12 or 13,
characterized
- in that two inclinometers (62, 64) are provided in the reference system (BS), which is an orthogonal triaxial reference system (BS_{x-y-z}) consisting of an x, y and z axis,
- in that the first inclinometer (62) measures an inclination of the free surface (N) in a first plane (E_{x-z}) spanned by the x and z axis and
- in that a second inclinometer (64) measures the inclination of the free surface (N) in a second plane (E_{y-z}) spanned by the y and z axis and
- in that the control apparatus (70) determines the angle of inclination (+/-a) from the two orthogonal measurement values of the first and the second inclinometer (62, 64).

15. The transport apparatus according to claim 14,
characterized
in that the orthogonal triaxial reference system (BS_{x-y-z}) is formed of a first main axis (L_x) of the container (10) oriented in the x direction, a second main axis (L_y) of the container (10) oriented in the y direction and a third main axis (L_z) of the container (10) oriented in the z direction.

16. The transport apparatus according to claim 15,
characterized

in that either the first main axis (L_x) or the second main axis (L_y) is oriented in a direction of travel (FR) of the transport means (TM; TM1, TM2).

17. The transport apparatus according to any one of claims 14 to 16,
characterized
in that the container (10) is designed to be elongate in the x direction and is arranged horizontally in this direction.

18. The transport apparatus according to any one of claims 12 to 17,
characterized
in that the volume (V) of the container (10) is equal to or greater than 20 m^3 ($V \geq 20\ m^3$).

19. The transport apparatus according to any one of claims 12 to 18,
characterized
in that the fill level measuring apparatus (12) comprises a second measuring probe (L2), the first and the second measuring probe (L1, L2) being arranged at a distance from one another and engaging with the free surface (N) of the high-quality fresh milk (P) via the headspace (10.1).

20. The transport apparatus according to any one of claims 12 to 19,
characterized
in that a buffer receptacle (52) having a buffer volume matched to the size of the headspace (10.1) is provided, which buffer receptacle is optionally connected to the headspace (10.1) and in which the gaseous, sterile fluid (F) is stored at an excess pressure of 4 bar.

21. A system (100) having a transport apparatus (1) according to any one of claims 12 to 20,
characterized
- in that the system (100) has a filling and emptying platform (200),
- in that the filling and emptying platform (200) comprises the following functional apparatuses (210, 230, 240, 250):
  - a fourth apparatus (210) for providing cleaning agents (RM),

- filling and emptying lines (230),
- a fifth apparatus (240) for providing coolant (K) and
- a sixth apparatus (250) for providing gaseous, sterile fluid (F),

and in that, via an intersection and coupling point (S),

- the fourth apparatus (210) is connected to the cleaning agent ports (a, b, c),
- the filling and emptying lines (230) are connected to the filling and emptying apparatus (30),
- the fifth apparatus (240) is connected to the cooling apparatus (40) and
- the sixth apparatus (250) is connected to the third apparatus (50).