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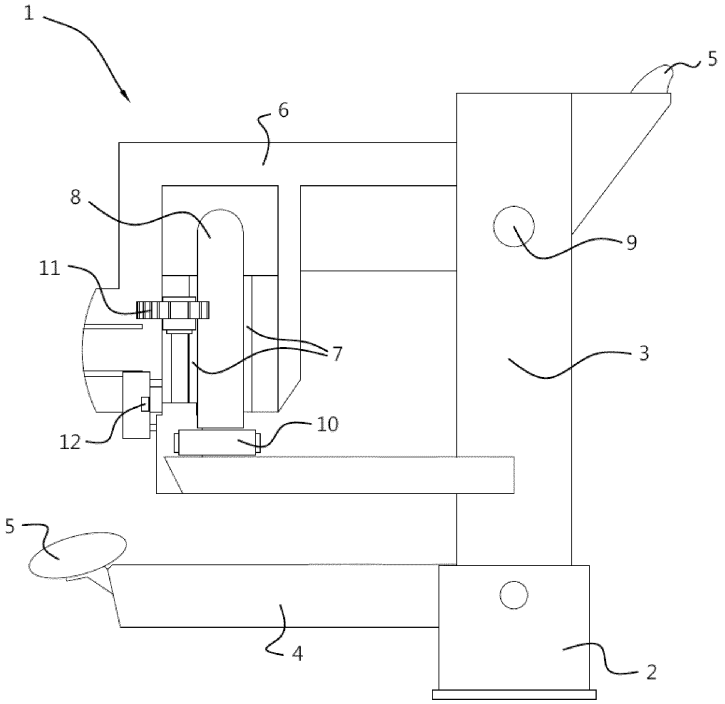
(54) **METHOD FOR SHAKING FOAM CANS, DEVICE THEREFOR AND FINAL PRODUCT OBTAINED**

(57) The invention relates to a method for shaking foam cans 8 following a production and filling process, wherein a shaking frame 6 is rotatable about a lying axis 9, wherein the foam cans move through a circular arc of at least 30° and at most 90° and wherein the shaking frame, after shaking the foam cans, lowers to a lying position for unloading the shaken foam cans. The invention further relates to a shaking device 1 for shaking cans, in particular foam cans, the shaking device comprising a shaking frame, wherein the shaking device comprises a first upright arm 3, a second upright arm and at least one rotatable arm 4. The invention furthermore relates to a use of a method and/or a shaking device for shaking foam cans. Finally, the invention relates to a final product obtained by a method, wherein the final product comprises a foam can.

Fig. 1



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Description

TECHNICAL FIELD

[0001] In a first aspect, the invention relates to a method for shaking foam cans following a production and filling process.

[0002] In a second aspect, the invention relates to a shaking device for shaking cans.

[0003] In a third aspect, the invention relates to the use of a method according to the first aspect and/or a shaking device according to the second aspect.

[0004] In a fourth aspect, the invention relates to an end product obtained by a method according to the first aspect.

PRIOR ART

[0005] A known method for shaking foam cans, following a production and filling process, is known per se. A known method comprises shaking the foam cans in a shaking frame whereby a liquid in the foam cans is given an impulse in a single direction. The impulse is given by vibrating a vibrating table wherein the shaking frame is releasably mounted on the vibrating table in a lying position. When the foam cans are loaded into the shaking frame, they are shaken in a standing position. The impulse is hereby given upwards and in a vertical direction to the liquid of the foam cans. This known method involves some problems and drawbacks.

[0006] A problem with the known method is that foam cans must be shaken a considerable number of times before all components present in the foam cans are mixed homogeneously. There is a need for a method that can shake foam cans in an economically efficient manner.

[0007] A drawback of the known method is that if foam cans are shaken for too long or if too strong an impulse is given to the foam cans, there is an increased risk of the foam cans exploding. There is therefore a need for a safe method of shaking foam cans wherein the number of times of shaking remains limited and impulses are given in a dosed manner.

[0008] A problem of the known method is that an impulse is only given in a vertical direction upwards. In the vertical downward direction, mixing of the liquid in the foam cans only occurs due to the influence of gravity. Consequently, the mixing of the liquid remains limited. There is a need for an improved method wherein the shaking effects a more efficient mixing of the liquid in the foam cans.

[0009] DE 195 04 748 describes a device for mechanical agitation of aerosols with limited miscibility. This device is disadvantageous because of a complex mechanical construction.

[0010] The present invention aims to find a solution for at least some of the above problems.

SUMMARY OF THE INVENTION

[0011] In a first aspect, the invention relates to a method for shaking foam cans according to claim 1. More specifically, the method according to the first aspect of the invention comprises that a shaking frame is rotatable about a lying axis, wherein a holder of the shaking frame is parallel to the lying axis, wherein the holder of the shaking frame is lifted after loading a predetermined number of foam cans by rotation about the lying axis to a first position, the first position being on a first side of a standing plane, wherein the lying axis lies in the standing plane, wherein the foam cans are shaken by moving the shaking frame from the first position to a second position and back a number of times, the second position being on a second opposite side of the standing plane, wherein the foam cans move through a circular arc of at least 30° and at most 90° and wherein the shaking frame, after shaking the foam cans, lowers to a lying position for unloading the shaken foam cans.

[0012] An advantage of a method according to the first aspect is that when the foam cans are shaken, by rotating the shaking frame about a lying axis from a first position to a second position and back, an impulse is given to the liquid in the foam cans twice. A first pulse is given at the start of the rotation from the first position to the second position and a second pulse is given at the rotation from the second position back to the first position. Because an impulse is given twice, the liquid is subject to much more thorough and uniform mixing compared to giving only one impulse. Both impulses are also given in an opposite direction, wherein both impulses are directed towards each other, making efficient use of the given impulses for mixing the liquid.

[0013] An additional advantage of a method according to the first aspect is that by moving the shaking frame through a circular arc of at least 30° and at most 90°, the liquid not only moves in an impulse direction, but also according to a direction of movement of the shaking frame over the circular arc. This also results in a more thorough mixing of the liquid.

[0014] A remarkable advantage of a method according to the first aspect is that a more efficient mixing of the liquid in the foam cans results in a lower number of times of shaking that is necessary to obtain a homogeneously mixed liquid. Consequently, the risk of explosion of a foam can is limited and this results in a safe method.

[0015] A surprising advantage of a method according to the first aspect is that such a method comprises a fully mechanical method. This results in a time-saving and cost-efficient method. In addition, such a method limits a need for human actions. This results in a safe method as human complications are avoided if an unwanted explosion of a foam can occurs.

[0016] In a second aspect, the invention relates to a shaking device according to claim 8. More specifically, the shaking device comprises a first upright arm, a second upright arm and at least one rotatable arm, which

first upright arm and second upright arm are attached to a base on a proximal side and are provided with an air-spring bellows at a distal end, wherein the distal end of the first upright arm and the second upright arm are located on a first side of a standing plane, wherein the rotatable arm is rotatable about a lying axis of rotation between a first arm position and a second arm position, wherein an air-spring bellows is attached to a distal end of the rotatable arm, the distal end of the rotatable arm in the first arm position and the second arm position being on a second opposite side of the standing plane, wherein in the first arm position the shaking frame is in a lying position and wherein, in the second arm position, the shaking frame is rotatable between the air-spring bellows of the first upright arm and the second upright arm and the air-spring bellows of the at least one rotatable arm, around a lying axis, the lying axis being in the standing plane.

[0017] An advantage of a shaking device according to the second aspect is that a rotatable arm in a first arm position is suitable for loading or unloading cans into the shaking frame and wherein the cans can be shaken in a second arm position. Moreover, such a shaking device has the further advantage that, by rotating a rotatable arm to the second arm position, the shaking frame can move during shaking through a circular arc of at least 30° and at most 90°.

[0018] An additional advantage of a shaking device according to the second aspect is that the shaking device is provided with air-spring bellows. Air-spring bellows are very advantageous as they can be expanded or contracted very quickly by changing the air pressure in the air-spring bellows. This makes them suitable for giving a large impulse to a liquid. In addition, both a first upright arm, a second upright arm and a rotatable arm comprise an air-spring bellows. As a result, the shaking device has the advantage that it is suitable for giving several impulses to the shaking frame. Being able to give impulses efficiently by means of air-spring bellows results in an economic advantage of the shaking device requiring fewer impulses until cans are completely homogeneously mixed.

[0019] In a third aspect, the invention relates to a use of a method according to the first aspect and/or a use of a shaking device according to the second aspect. In particular, use for shaking foam cans, which foam cans comprise at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas. An advantage of a use according to the third aspect is that foam cans can be homogeneously mixed in an economically efficient manner. An additional advantage is that the use is safe.

[0020] In a fourth aspect, the invention relates to a final product according to claim 15. Specifically, a final product comprising a foam can comprising at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas. An advantage of a final product according to the fourth aspect is that all components present in the final product are completely homogeneously mixed.

DESCRIPTION OF THE FIGURES

[0021]

Fig. 1 illustrates a schematic representation of a side view of a shaking device according to preferred embodiments of the invention, wherein the shaking frame is in a lying position.

Fig. 2 illustrates a schematic representation of a side view of a shaking device according to preferred embodiments of the invention, wherein the shaking frame is in a first position.

Fig. 3 illustrates a schematic representation of a side view of a shaking device according to preferred embodiments of the invention, wherein the shaking frame is in a second position.

DETAILED DESCRIPTION

[0022] Unless otherwise defined, all terms used in the description of the invention, including technical and scientific terms, have the meaning as commonly understood by a person skilled in the art to which the invention pertains. For a better understanding of the description of the invention, the following terms are explained explicitly.

[0023] The term "foam can" in this text is mainly intended to mean a cylindrical container or can with an opening in the top face and a closed bottom face, the opening being closed with a valve. The foam cans are filled with an insulating foam or an adhesive foam, for example a fraction of polyol and a fraction of methylenediphenyl diisocyanate (MDI), further provided with a propellant gas.

[0024] Under the present invention, an air-spring bellows comprises a rubber housing clamped at the top and bottom by steel crimp rings. These crimp rings are secured to a lower rolling piston and upper mounting plate of the air-spring bellows. Together, this forms an airtight construction in which compressed air is contained. By adjusting an air pressure in the air-spring bellows, the rubber housing rolls up or down over the lower rolling piston, which causes a change in height as the air-spring bellows expands or contracts.

[0025] Under the present invention, a base comprises any surface on which a proximal end of an arm rests and/or is attached.

[0026] Under the present invention, a sensor comprises an electronically, mechanically or software controlled sensing instrument which essentially measures a physical quantity and converts the measured quantity into a standardized signal.

[0027] In this document, "a" and "the" refer to both the singular and the plural, unless the context presupposes otherwise. For example, "a segment" means one or more

segments.

[0028] When the term "around" or "about" is used in this document with a measurable quantity, a parameter, a duration or moment, and the like, then variations are meant of approx. 20% or less, preferably approx. 10% or less, more preferably approx. 5% or less, even more preferably approx. 1% or less, and even more preferably approx. 0.1% or less than and of the quoted value, insofar as such variations are applicable in the described invention. However, it must be understood that the value of a quantity used where the term "about" or "around" is used, is itself specifically disclosed.

[0029] The terms "comprise," "comprising," "consist of," "consisting of," "provided with," "have," "having," "include," "including," "contain," "containing" are synonyms and are inclusive or open terms that indicate the presence of what follows, and which do not exclude or prevent the presence of other components, characteristics, elements, members, steps, as known from or disclosed in the prior art.

[0030] Quoting numerical intervals by endpoints comprises all integers, fractions and/or real numbers between the endpoints, these endpoints included.

[0031] In a first aspect, the invention relates to a method for shaking foam cans following a production and filling process. The method comprises the following steps:

- supplying foam cans by means of a conveyor belt;
- machine-loading a predetermined number of foam cans in a standing position into a holder of a shaking frame in a lying position;
- shaking the shaking frame mechanically;
- mechanically unloading the foam cans onto a conveyor belt, resulting in shaken foam cans,

wherein the shaking frame is rotatable about a lying axis, wherein the holder of the shaking frame is parallel to the lying axis, wherein the holder of the shaking frame is lifted after loading the predetermined number of foam cans by rotation about the lying axis to a first position, the first position being on a first side of a standing plane, wherein the lying axis lies in the standing plane, wherein the foam cans are shaken by moving the shaking frame from the first position to a second position and back a number of times, the second position being on a second opposite side of the standing plane, wherein the foam cans move through a circular arc of at least 30° and at most 90° and wherein the shaking frame, after shaking the foam cans, lowers to a lying position for unloading the shaken foam cans.

[0032] An advantage of a method according to the first aspect is that when the foam cans are shaken, by rotating the shaking frame about a lying axis from a first position to a second position and back, an impulse is given to the liquid in the foam cans twice. A first pulse is given at the start of the rotation from the first position to the second position and a second pulse is given at the rotation from the second position back to the first position. Because an impulse is given twice, the liquid is subject to much more thorough and uniform mixing compared to giving only one impulse. Both impulses are also given in an opposite direction, wherein both impulses are directed towards each other, making efficient use of the given impulses for mixing the liquid.

[0033] An additional advantage of a method according to the first aspect is that by moving the shaking frame through a circular arc of at least 30° and at most 90°, the liquid not only moves in an impulse direction, but also according to a direction of movement of the shaking frame over the circular arc. This also results in a more thorough mixing of the liquid.

[0034] A remarkable advantage of a method according to the first aspect is that a more efficient mixing of the liquid in the foam cans results in a lower number of times of shaking that is necessary to obtain a homogeneously mixed liquid. Consequently, the risk of explosion of a foam can is limited and this results in a safe method.

[0035] A surprising advantage of a method according to the first aspect is that such a method comprises a fully mechanical method. This results in a time-saving and cost-efficient method. In addition, such a method limits a need for human actions. This results in a safe method as human complications are avoided if an unwanted explosion of a foam can occurs.

[0036] In an embodiment of the present invention, the shaking frame is moved from a first position to a second position and back by cyclically increasing and decreasing an air pressure in at least two air-spring bellows. By increasing the air pressure in an air-spring bellows, the air-spring bellows expands and consequently an impulse is given to the shaking frame. When the air pressure decreases, the air-spring bellows is contracted. The cyclic raising and lowering involves appropriately and quickly increasing the air pressure in the air-spring bellows when the shaking frame rests against this air-spring bellows. This moves the shaking frame from the first position to the second position or from the second position to the first position. After this, the air pressure is reduced again until the shaking frame rests against the air-spring bellows again.

[0037] In a further embodiment, a first air-spring bellows are located on the first side and the second air-spring bellows are located on the second side of the standing plane, wherein when the first air-spring bellows and the second air-spring bellows are projected along the lying axis on a plane transverse to the lying axis, the projections of the first air-spring bellows and the second air-spring bellows are symmetrical with respect to the standing plane. An advantage of such an embodiment is that an air-spring bellows only has to give an impulse that is sufficient for the shaking frame to rotate beyond a vertical position of the shaking frame, wherein the shaking frame in the vertical position is parallel to the standing plane. An additional advantage is that the first air-spring bellows and the second air-spring bellows must give approximately the same magnitude of impulse and there-

fore have approximately the same effect.

[0038] In an embodiment of the present invention, the air pressure in an air-spring bellows is set in the range of 3.5-10 bar, preferably in the range of 4-9 bar and more preferably in the range of 5-8 bar. An air pressure higher than 10 bar will result in an impulse that is too strong, which can damage the shaking frame when the impulse is given. In addition, the impulse given at 10 bar poses too great a risk of explosion of the insulation cans. An air pressure lower than 3.5 bar will result in an impulse that is too weak, so that the shaking frame cannot move from the first position to the second position or from the second position to the first position or moves too slowly, so that thorough mixing does not occur.

[0039] Such an embodiment has the advantage that an air pressure in the range of 3.5-10 bar gives an impulse that is powerful enough to move the shaking frame from the first position to the second position or from the second position to the first position without damaging the shaking frame or creating an explosion hazard and where thorough mixing takes place.

[0040] In an embodiment of the present invention, foam cans are shaken at a shaking frequency in the range of 20-500 shakes per minute, preferably in the range of 50-300 shakes per minute, more preferably in the range of 75-250 shakes per minute and most preferably in the range of 100-200 shakes per minute. Herein, one shake comprises moving the shaking frame from the first position to the second position or from the second position to the first position. A frequency higher than the specified range will result in too great an explosion hazard for the foam cans. In addition, insufficient mixing occurs because the liquid has insufficient time to move in the direction of the impulse, because an impulse is already being given in the opposite direction. A frequency lower than the specified range is not economically relevant as the insulation cans must be shaken for a considerable time before they are homogeneously mixed.

[0041] In an embodiment of the present invention, the number of times the shaking frame is moved from the first position to the second position and back is in the range of 20-750 times, preferably in the range of 20-500 times, and more preferably in the rangeof 20-400 times. Several times higher than the specified range will result in too great an explosion hazard for the foam cans. Several times lower than the specified range will result in no homogeneous mixing of the foam cans.

[0042] In an embodiment of the present invention, during machine loading of foam cans, at least two insulation cans are loaded into the holder of the shaking frame. An advantage of such an embodiment is that it is not economically relevant to shake only one foam can.

[0043] In an embodiment of the present invention, the predetermined number of foam cans is counted by a sensor before loading. The foam cans are supplied by means of a conveyor belt, where a sensor is provided before loading. In a particular embodiment, a supplied foam can that no longer belongs to a certain quantity is stopped by a star wheel so that it is not loaded. Such embodiments have the advantage that the desired number of foam cans is always loaded mechanically.

[0044] In a second aspect, the invention relates to a shaking device for shaking cans, in particular foam cans, the shaking device comprising a shaking frame, the shaking frame being provided at a distal end with a holder for holding at least one can, and wherein the shaking frame is movable back and forth, wherein the shaking device further comprises a first upright arm, a second upright arm and at least one rotatable arm, which first upright arm and second upright arm are attached to a base on a proximal side and are provided with an air-spring bellows at a distal end, wherein the distal end of the first upright arm and the second upright arm are located on a first side of a standing plane, wherein the rotatable arm is rotatable about a lying axis of rotation between a first arm position and a second arm position, wherein an air-spring bellows is attached to a distal end of the rotatable arm, the distal end of the rotatable arm in the first arm position and the second arm position being on a second opposite side of the standing plane, wherein in the first arm position the shaking frame is in a lying position and wherein, in the second arm position, the shaking frame is rotatable between the air-spring bellows of the first upright arm and the second upright arm and the air-spring bellows of the at least one rotatable arm, around a lying axis, the lying axis being in the standing plane.

[0045] An advantage of a shaking device according to the second aspect is that a rotatable arm in a first arm position is suitable for loading or unloading cans into the shaking frame and wherein the cans can be shaken in a second arm position.

[0046] An additional advantage of a shaking device according to the second aspect is that the shaking device is provided with air-spring bellows. Air-spring bellows are very advantageous as they can be expanded or contracted very quickly by changing the air pressure in the air-spring bellows. This makes them suitable for giving a large impulse to a liquid. In addition, both a first upright arm, a second upright arm and a rotatable arm comprise an air-spring bellows. As a result, the shaking device has the advantage that it is suitable for giving several impulses to the shaking frame. Being able to give impulses efficiently by means of air-spring bellows results in an economic advantage of the shaking device requiring fewer impulses until cans are completely homogeneously mixed.

[0047] In an embodiment of the present invention, in the second arm position, the shaking frame is rotatable through a circular arc of at least 30° and at most 90° between the air-spring bellows of the first upright arm and the second upright arm and the air-spring bellows of a rotatable arm. Particularly advantageous values are circular arcs of 60° and 80°. Such an embodiment has the advantage that by rotating a rotatable arm to the second arm position, the shaking frame is moved during shaking over the circular arc described above. As a result,

the foam cans are shaken at an angle, so that the liquid in the foam cans is mixed more efficiently.

[0048] In an embodiment of the present invention, one or more shaking plates are mounted on an inner surface of the shaking frame, the shaking plates comprising a top face and a bottom face, the top face and the bottom face making an angle of at least 15° and at most 45°. Such shaking plates provide the shaking frame with a parallel contact surface with the air-spring bellows, for an optimal distribution of a given impulse over the shaking frame, as well as provide an angle that allows the cans to be shaken at an angle of at least 15° and at most 45° for efficient mixing. In a further embodiment, a shaking plate comprises a cylindrical disc the top face and the bottom face making a discrete angle of 30° or 40°.

[0049] In an embodiment of the present invention, the shaking device comprises a compressor, in which the compressor delivers a pressure of at least 8 bar when in operation. The compressor supplies an air-spring bellows with a required air pressure in the air-spring bellows so that the air-spring bellows is able to give an impulse to the shaking frame when expanded.

[0050] In an embodiment of the present invention, in the second arm position, projections of the air-spring bellows of the first upright arm and the second upright arm and the air-spring bellows of the at least one rotatable arm according to the direction of the lying axis on a plane transverse to the lying axis are symmetrical with respect to the standing plane.

[0051] An advantage of such an embodiment is that an air-spring bellows only has to give an impulse that is sufficient for the shaking frame to rotate beyond a vertical position of the shaking frame, wherein the shaking frame in the vertical position is parallel to the standing plane. An additional advantage is that the first air-spring bellows and the second air-spring bellows must give approximately the same magnitude of impulse and therefore have approximately the same effect.

[0052] In an embodiment of the present invention, the holder of the shaking frame has a capacity for up to thirty-two foam cans. Such an embodiment has the advantage that this capacity is an optimum capacity for processing a supply speed of foam cans originating from a production and/or filling process at an economically relevant speed.

[0053] One skilled in the art will appreciate that a method according to the first aspect is preferably performed with a device according to the second aspect and that a device according to the second aspect is preferably configured for performing a method according to the first aspect. Each feature described in this document, both above and below, can therefore relate to any of the four aspects of the present invention.

[0054] In a third aspect, the invention relates to a use of a method according to the first aspect and/or a shaking device according to the second aspect, suitable for shaking foam cans, which foam cans comprise at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas.

[0055] An advantage of a use according to the third aspect is that foam cans can be homogeneously mixed in an economically efficient manner. An additional advantage is that the use is safe.

[0056] In a fourth aspect, the invention relates to a final product obtained by a method according to the first aspect, wherein the final product comprises a foam can comprising at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas. An advantage of a final product according to the fourth aspect is that all components present in the final product are completely homogeneously mixed.

[0057] In what follows, the invention is described by way of non-limiting figures illustrating the invention, and which are not intended to and should not be interpreted as limiting the scope of the invention.

FIGURES

[0058] A shaking device according to an embodiment of the present invention is illustrated in Fig. 1, Fig. 2 and Fig. 3. The shaking device is suitable for carrying out a method according to the first aspect of the invention.

[0059] The shaking device 1 has a first upright arm 3 which is attached vertically along a proximal side to a base 2. An air-spring bellows 5 is attached to a distal side of the first upright arm 3 . A rotatable arm 4 is coupled along a proximal end to the first upright arm 3. An air-spring bellows 5 is attached to a distal end of the rotatable arm 4. A U-shaped shaking frame 6 is provided with a holder 7, which holder 7 is attached to an inner surface of the shaking frame 6. The holder 7 is suitable for holding cylindrical cans, in particular foam cans 8. The shaking frame 6 is rotatable about a lying axis 9 wherein the holder 7 is always positioned parallel to the lying axis 9. A foam can 8 is supplied by means of a conveyor belt 10 in a standing position. A sensor 12 is provided on the conveyor belt for counting the foam cans 8 before loading. A star wheel 11 is also provided on the conveyor belt for retaining foam cans 8.

[0060] For clarification, Fig. 1 illustrates a schematic representation of a side view of a shaking device. In Fig. 1, the shaking device 1 is illustrated in a first operative condition. In this first operative condition, the rotatable arm 4 is in a first arm position. Moreover, the shaking frame 6 is herein in a lying position. In this first arm position, a predetermined number of foam cans 8 can be loaded into the holder 7 of the shaking frame 6.

[0061] In Fig. 2, the shaking device 1 is illustrated in a second operative condition. In this second operative condition, the rotatable arm 4 is in a second arm position. In this second arm position, the shaking frame 6 rests on the air-spring bellows 5 of the rotatable arm 4. The shaking frame is in the first position.

[0062] In Fig. 3, the shaking device 1 is illustrated in a third operative condition. In this third operative condition, the rotatable arm 4 remains in a second arm position. Furthermore, the shaking frame 6 now rests against the

air-spring bellows 5 of the first upright arm 3. The shaking frame is in the second position.

[0063] During the shaking of the foam cans 8, the shaking device is alternately in the second and third operative condition. During the loading and unloading of the foam cans, the shaking device is in the first operative condition.

[0064] Below is an overview of the meaning of the numbers used in the figures:

1	shaking device
2	base
3	first upright arm
4	rotatable arm
5	air-spring bellows
6	shaking frame
7	holder
8	foam can
9	lying axis
10	conveyor belt
11	star wheel
12	sensor

[0065] The present invention should not be construed as being limited to the embodiments described above and certain modifications or changes may be added to the examples described without having to re-evaluate the appended claims.

Claims

1. Method for shaking foam cans (8) following a production and filling process, comprising the following steps:

   - supplying foam cans (8) by means of a conveyor belt (10);
   - machine-loading a predetermined number of foam cans (8) in a standing position into a holder (7) of a shaking frame (6) in a lying position;
   - shaking the shaking frame (6) mechanically;
   - mechanically unloading the foam cans (8) onto a conveyor belt (10) resulting in shaken foam cans (8),

   characterized in that the shaking frame (6) is rotatable about a lying axis (9), wherein the holder (7) of the shaking frame (6) is parallel to the lying axis (9), wherein the holder (7) of the shaking frame (6) is lifted after loading the predetermined number of foam cans (8) by rotation about the lying axis (9) to a first position, the first position being on a first side of a standing plane, wherein the lying axis (9) lies in the standing plane, wherein the foam cans (8) are shaken by moving the shaking frame (6) from the first position to a second position and back a number of times, the second position being on a second opposite side of the standing plane, wherein the foam cans (8) move through a circular arc of at least 30° and at most 90° and wherein the shaking frame (6), after shaking the foam cans (8), lowers to a lying position for unloading the shaken foam cans (8).

2. Method according to claim 1, **characterized in that** the shaking frame (6) is moved from a first position to a second position and back by cyclically increasing and decreasing an air pressure in at least two air-spring bellows (5).

3. Method according to any of the preceding claims, **characterized in that** an air pressure in an air-spring bellows (5) is set in the range of 3.5-10 bar, preferably in the range of 4-9 bar and more preferably in the range of 5-8 bar.

4. Method according to any of the preceding claims, **characterized in that** foam cans (8) are shaken at a shaking frequency in the range of 20-500 shakes per minute, preferably in the range of 50-300 shakes per minute, more preferably in the range of 75-250 shakes per minute and most preferably in the range of 100-200 shakes per minute.

5. Method according to any of the preceding claims, **characterized in that** the number of times the shaking frame (6) is moved from the first position to the second position and back is in the range of 20-750 times, preferably in the range of 20-500 times, and more preferably in the range of 20-400 times.

6. Method according to any of the preceding claims, **characterized in that** during the mechanical loading of foam cans (8) at least two foam cans (8) are loaded into the holder (7) of the shaking frame (6).

7. Method according to any of the preceding claims, **characterized in that** the predetermined number of foam cans (8) is counted by means of a sensor (12) before loading.

8. Shaking device (1) for shaking cans, in particular foam cans (8), wherein the shaking device (1) comprises a shaking frame (6), wherein the shaking frame (6) is provided at a distal end with a holder (7) for holding at least one can, and wherein the shaking frame (6) is movable back and forth, **characterized in that** the shaking device (1) further comprises a first upright arm (3), a second upright arm and at least one rotatable arm (4), which first upright arm (3) and second upright arm are attached to a base (2) on a proximal side and are provided with an air-spring bellows (5) at a distal end, wherein the distal end of the first upright arm (3) and the second upright arm are located on a first side of a standing plane, wherein the rotatable arm (4) is rotatable about a lying axis of rotation between a first arm position and

a second arm position, wherein an air-spring bellows (5) is attached to a distal end of the rotatable arm (4), the distal end of the rotatable arm (4) in the first arm position and the second arm position being on a second opposite side of the standing plane, wherein in the first arm position the shaking frame (6) is in a lying position and wherein, in the second arm position, the shaking frame (6) is rotatable between the air-spring bellows (5) of the first upright arm (3) and the second upright arm and the air-spring bellows (5) of the at least one rotatable arm (4), around a lying axis (9), the lying axis (9) being in the standing plane.

9. Shaking device (1) according to the preceding claim, **characterized in that** in the second arm position the shaking frame (6) is rotatable through a circular arc of at least 30° and at most 90° between the air-spring bellows (5) of the first upright arm (3) and the second upright arm and the air-spring bellows (5) of the rotatable arm (4).

10. Shaking device (1) according to any of the preceding claims 8-9, **characterized in that** one or more shaking plates are mounted on an inner surface of the shaking frame (6), the shaking plates comprising a top face and a bottom face, the top face and the bottom face making an angle of at least 15° and at most 45°.

11. Shaking device (1) according to any of the preceding claims 8-10, **characterized in that** the shaking device (1) comprises a compressor, in which the compressor delivers a pressure of at least 8 bar when in operation.

12. Shaking device (1) according to any of the preceding claims 8-11, **characterized in that** in the second arm position the air-spring bellows (5) of the first upright arm (3) and the second upright arm and the air-spring bellows (5) of the at least one rotatable arm (4) as seen in the direction of the lying axis (9) are symmetrical with respect to the standing plane.

13. Shaking device (1) according to any of the preceding claims 8-12, **characterized in that** the holder (7) of the shaking frame (6) has a capacity for a maximum of thirty-two foam cans (8).

14. Use of a method according to any of the preceding claims 1-7 and/or a shaking device (1) according to any of the claims 8-13, for shaking foam cans (8), which foam cans (8) comprise at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas.

15. Final product obtained according to a method according to any of the preceding claims 1-7, **characterized in that** the final product comprises a foam can, which comprises at least a fraction of polyol, a fraction of methylenediphenyl diisocyanate (MDI) and a fraction of propellant gas.

Fig. 1

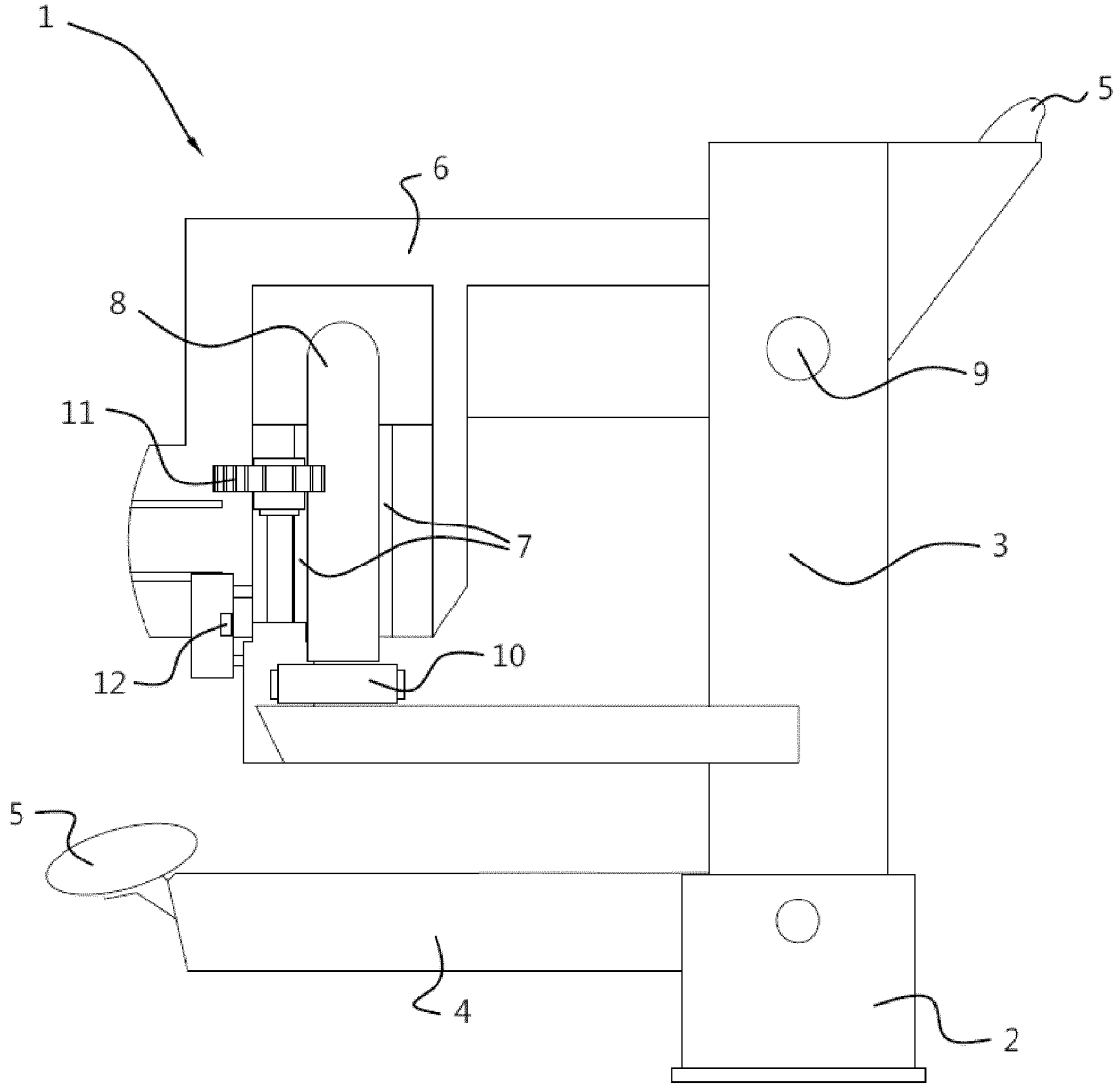


Fig. 2

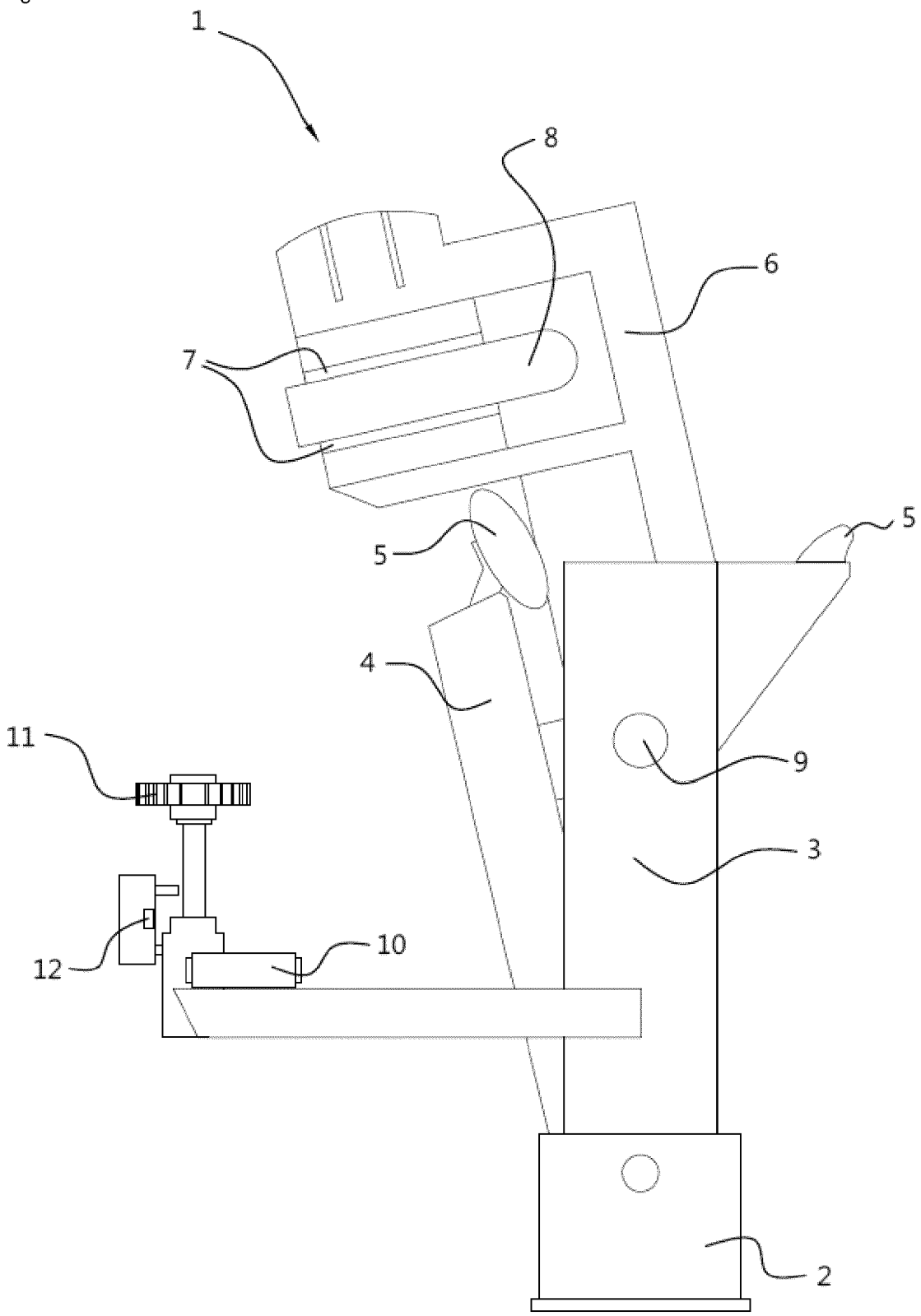
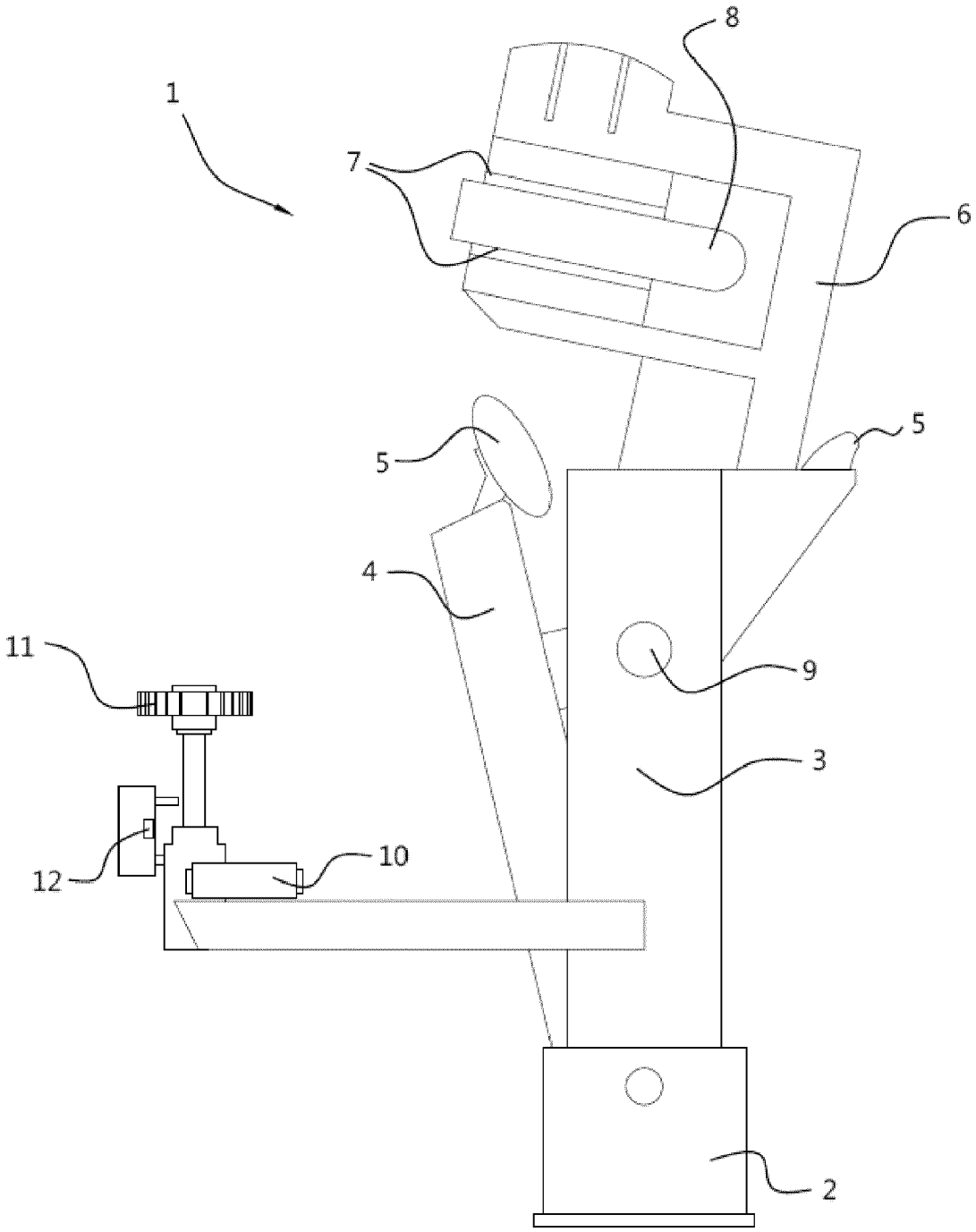


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 7151

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 195 04 748 A1 (RATHOR AG [CH]) 11 April 1996 (1996-04-11)	15	INV. B01F31/20
A	* abstract * * figures 1-8 * * column 1, lines 6-20 * * column 4, line 53 - column 8, line 38 *	1-14	B01F31/23
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TECHNICAL FIELDS SEARCHED (IPC)

B01F
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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	30 March 2023	Krasenbrink, B

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