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(54) **MILK FROTHING DEVICE AND CORRESPONDING BEVERAGE DISPENSING MACHINE**

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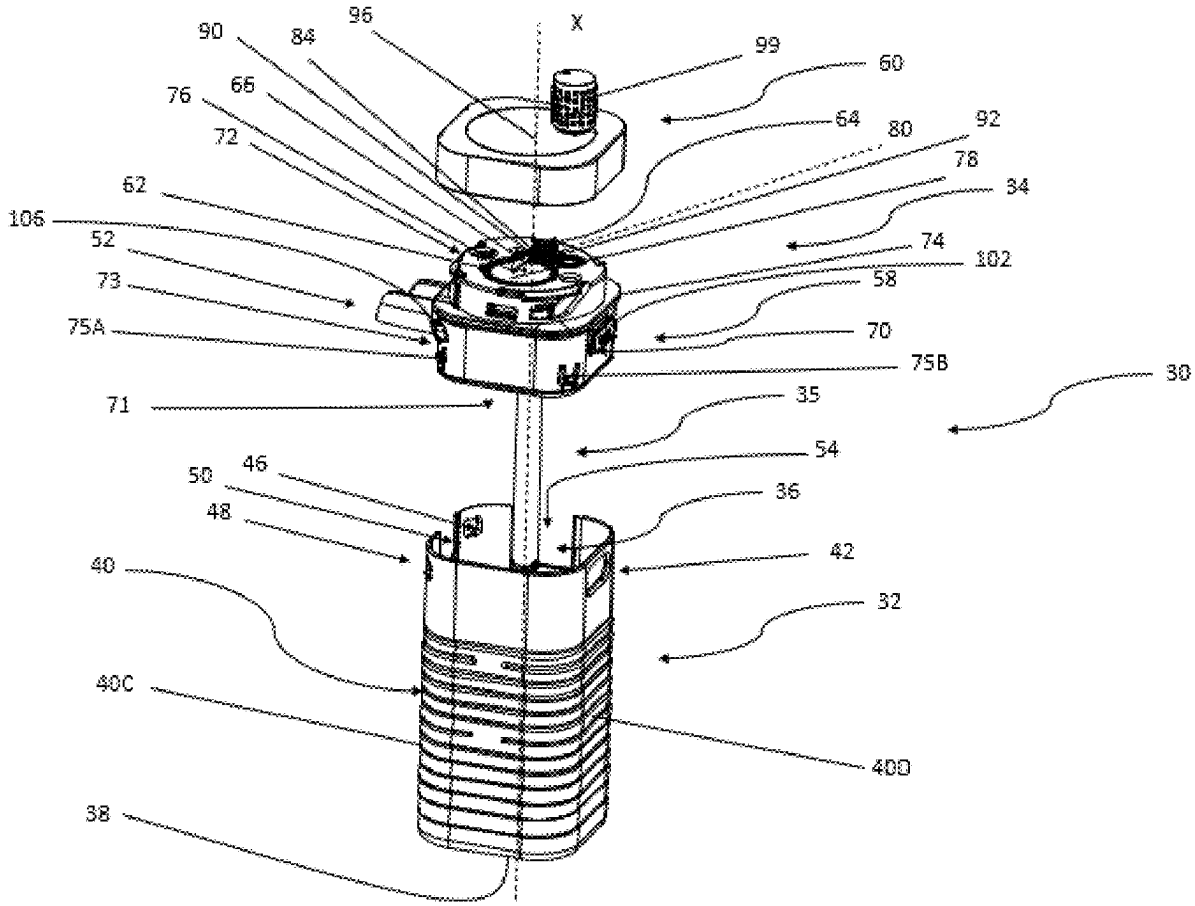
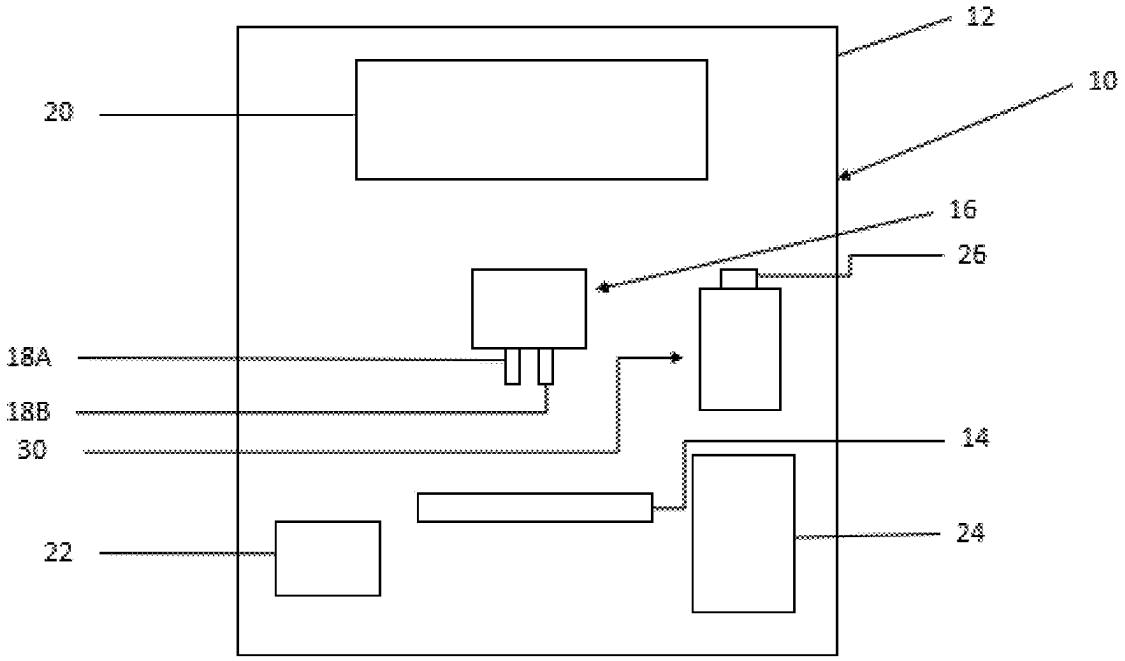
(57) **ABSTRACT**

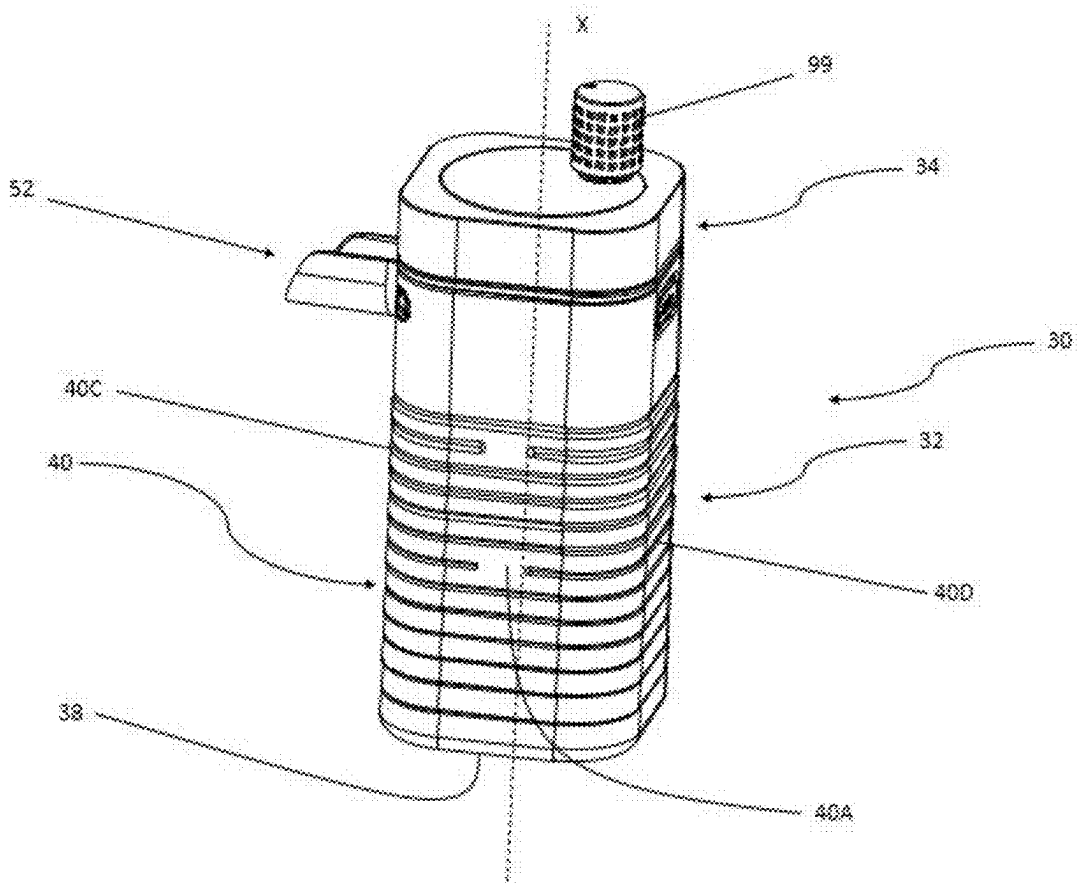
A milk frothing device includes a tank and a mixing element configured to be removably attached to the tank including. The mixing element includes a first locking member that can be moved between a locked position and an unlocked position. The mixing element also includes at least a second locking member configured to engage with a respective second fastening slot formed on the tank.



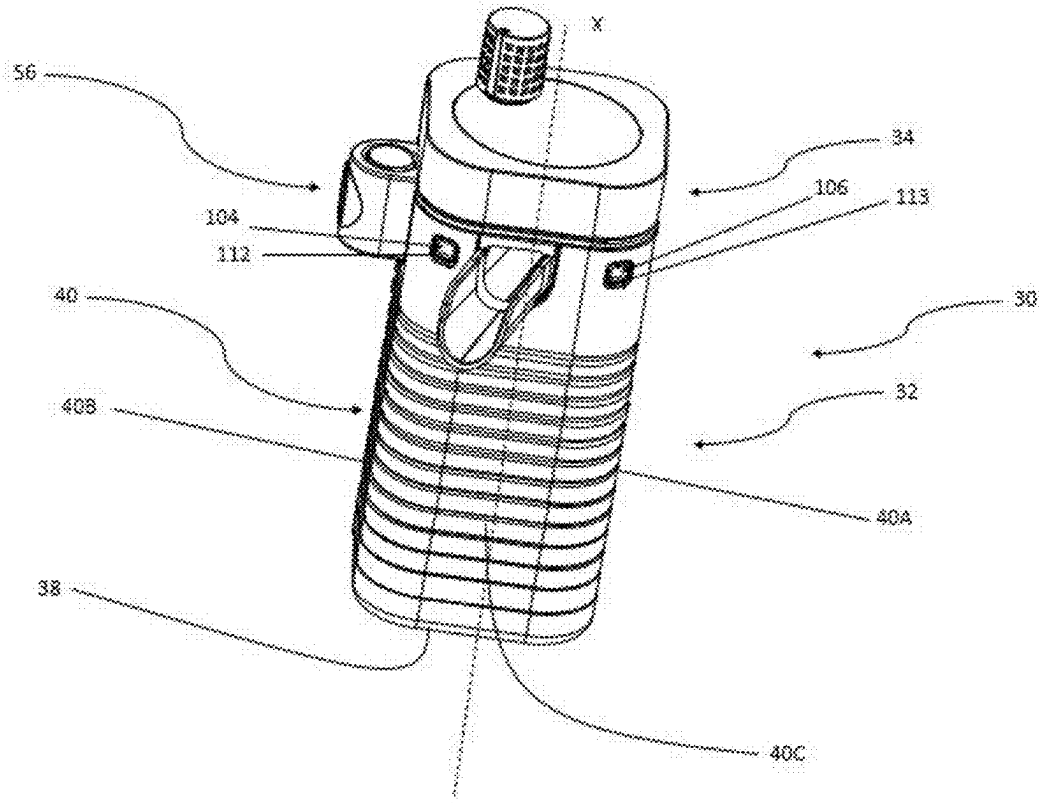
[Fig. 1]



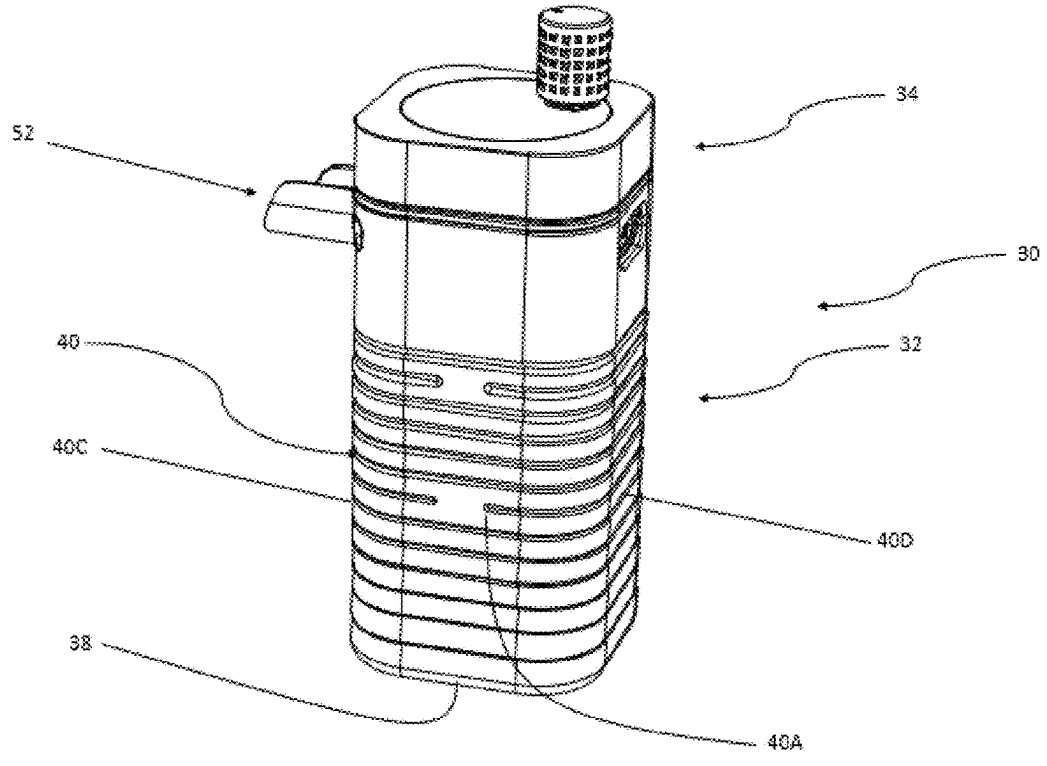
[Fig. 2]



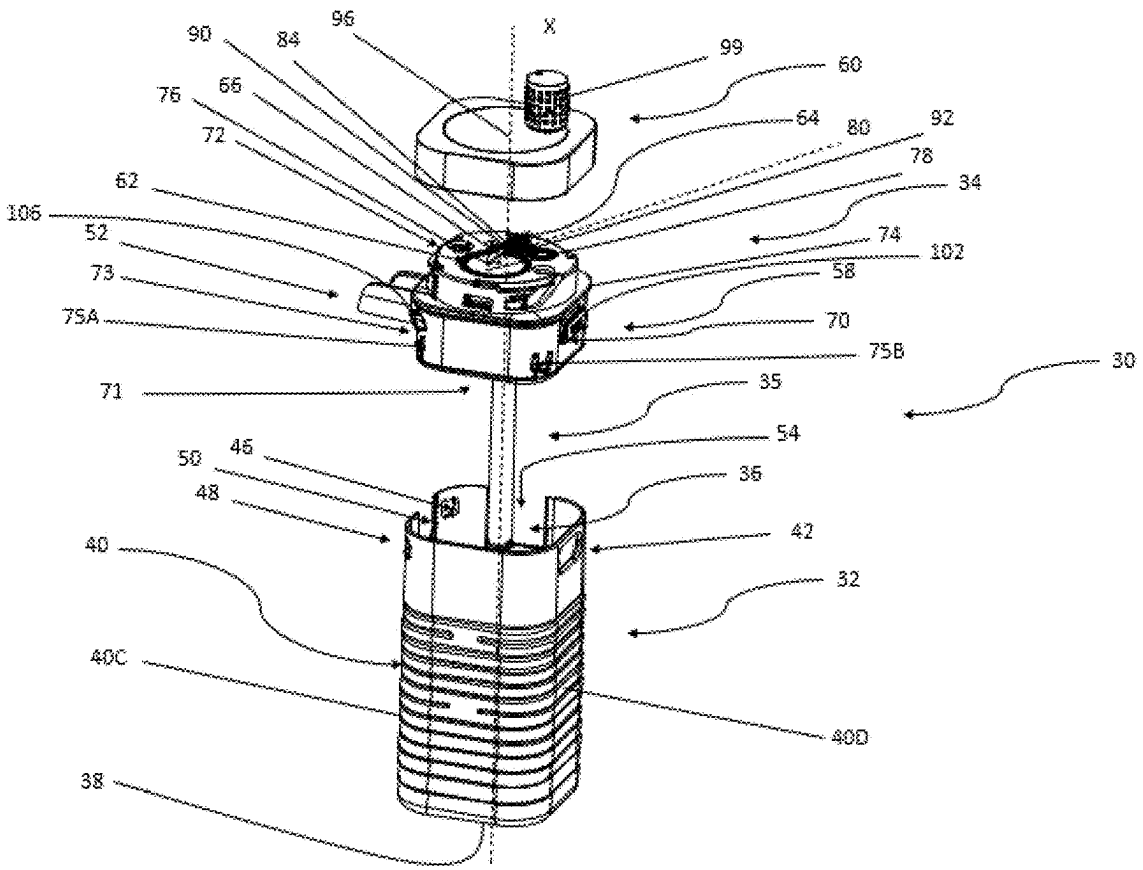
[Fig. 3]


X
56
34
106
113
104
112
40
30
32
40B
40A
38
40C

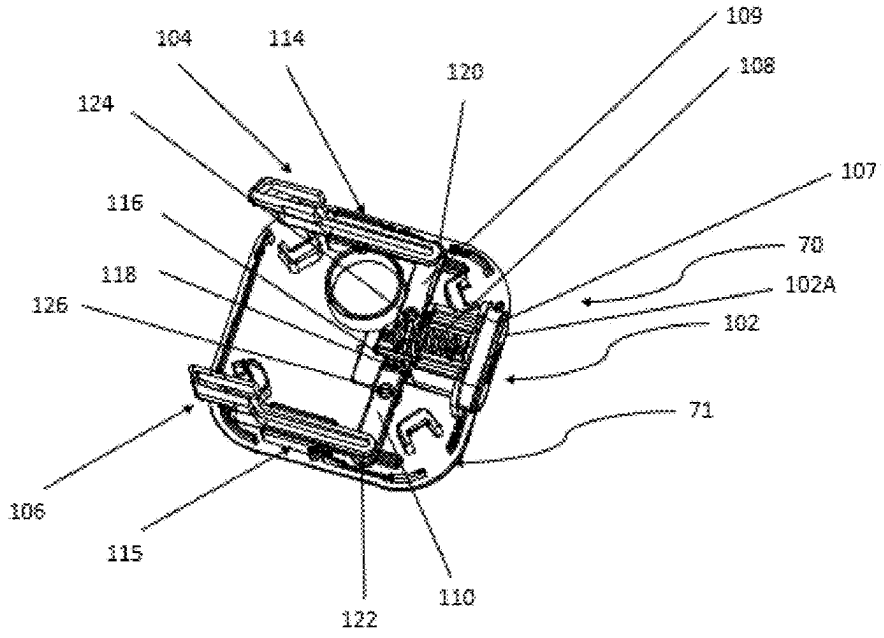
[Fig. 4]


34
52
30
40
32
40C
40D
38
40A

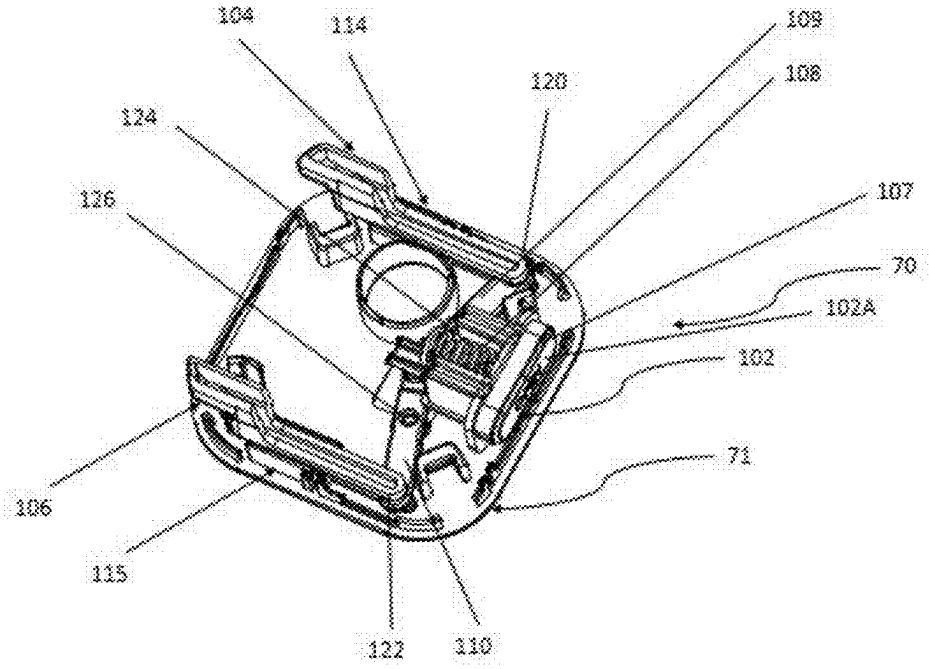
[Fig. 5]


96
X
90
84
99
60
66
76
64
80
92
72
78
62
34
106
52
74
102
73
58
75A
70
75B
30
71
35
54
50
46
36
48
42
40
32
40C
40D
38

[Fig. 6]


104
114
109
120
108
124
107
116
70
118
102A
126
102
71
106
115
110
122

[Fig. 7]



MILK FROTHING DEVICE AND CORRESPONDING BEVERAGE DISPENSING MACHINE

TECHNICAL FIELD

[0001] The present invention relates to the field of beverage dispensing machines and particularly coffee machines, preferably automatic coffee machines. More specifically, the present invention relates to the field of milk frothing devices designed to work in conjunction with beverage dispensing machines such as coffee machines. Such frothing devices, in particular when combined with a coffee machine, make it possible to prepare beverages from coffee and frothed milk.

Technical Description

[0002] Document CN210989735 U discloses a milk frothing device in the form of a milk jug comprising of a milk tank and a mixing element designed to be attached to the tank. In CN210989735 U the mixing element comprises of a system for attaching the mixing element to the tank in the form of a movable locking member designed to engage with a corresponding slot formed on the tank.

[0003] However, the frothing device according to CN210989735 U is nonetheless complex and its ergonomics, robustness, cleanability and dismantling still need to be improved.

SUMMARY OF THE INVENTION

[0004] This invention aims to remedy these disadvantages.

[0005] The technical problem behind the invention is to provide a simplified milk frothing device that is easier to use, more robust and easier to disassemble.

[0006] To this end, the invention relates to a milk frothing device comprising of a milk tank comprising of an opening, and a mixing element, the mixing element being designed to be removably attached to the tank at the opening and comprising of a system for attaching it to the tank, the attachment system comprising of a first locking member that can be moved between a locked position, in which the first locking member is designed to be received in a first fastening slot formed on the tank, and an unlocked position, in which the first locking member is designed to be extracted from the first fastening slot. According to the invention, the attachment system also comprises of at least one additional locking member designed to engage with a respective additional fastening slot formed on the tank.

[0007] With this invention, the mixing element is easier to handle and its attachment to the tank is improved. Indeed, the additional locking member allows for the simple and improved attachment of the mixing element to the tank, thereby guaranteeing good frothing performance and robustness of the frothing device. Moreover, the first locking member and each additional locking member allow for simple attachment/separation of the mixing element from the tank for improved dismantling and use. In particular, simplifying the separation of the mixing element and the tank enables the user to clean these components easily.

[0008] According to advantageous but non-mandatory aspects of the invention, such a frothing device can incorporate one or more of the following features, taken in any technically permissible combination.

[0009] According to an advantageous feature of the invention, when the first locking member is moved between the locked and unlocked positions, the first locking member can be moved relative to each additional locking member.

[0010] According to an advantageous feature of the invention, the tank extends substantially along a central axis that is substantially vertical when the milk frothing device is in use, and the first locking member is moved from the locked position to the unlocked position in a direction of travel that is substantially perpendicular to the central axis and extends from the first locking member to each additional locking member so that the distance between the first locking member and each additional locking member is reduced.

[0011] According to an advantageous feature of the invention, each additional locking member is mechanically associated with the first locking member so that moving the first locking member between the locked and unlocked positions results in a corresponding movement of each additional locking member between a locked position in which the additional locking member is designed to be received in the respective additional fastening slot, and an unlocked position in which the additional locking member is designed to be extracted from the respective additional fastening slot.

[0012] This design allows for easy handling of the attachment system and therefore easy separation of the mixing element from the tank, while at the same time providing a reliable and robust attachment system guaranteeing user safety and good milk frothing performance.

[0013] According to an advantageous feature of the invention, the attachment system comprises of, for each additional locking member, an arm that can be rotated relative to the first locking member as it moves between the locked and unlocked positions, each arm being designed, as it rotates, to translationally drive the corresponding additional locking member so as to move it between the locked position and the unlocked position.

[0014] This design allows for efficient transmission of the movement from the first locking member to each additional locking member and thus makes it easier to handle the attachment system and separate the mixing element from the tank.

[0015] According to an advantageous feature of the invention, the first locking member is moved from the locked position to the unlocked position in a direction of travel extending from the first locking member to the additional locking members so that the distance between the first locking member and each additional locking member is reduced, and when the first locking member is moved from the locked position to the unlocked position, each arm is designed to move the corresponding additional locking member towards the first locking member.

[0016] This design provides a compact and robust attachment system.

[0017] According to an advantageous feature of the invention, each arm comprises of a first pivot connection with the first locking member and a second pivot connection with the corresponding additional locking member, the first and second pivot connections being positioned at opposite ends of the corresponding arm.

[0018] This design allows for efficient transmission of movement from the first locking member to each additional locking member.

[0019] According to an advantageous feature of the invention, for each arm the first and second pivot connections

respectively define substantially parallel first and second rotational axes extending in a substantially vertical direction.

[0020] This design provides a compact and robust attachment system.

[0021] According to an advantageous feature of the invention, the mixing element comprises of a main body and each arm comprises of an additional pivot connection with the main body, the additional pivot connection being positioned between the first and second pivot connections.

[0022] This design ensures that the attachment system is secured to the main body and therefore the mixing element.

[0023] According to an advantageous feature of the invention, the mixing element comprises of a main body and the main body comprises of, for each additional locking member, an additional projection designed to form a slide connection with the additional locking member.

[0024] This design allows each additional locking element to move freely between locked and unlocked positions and ensures that the attachment system is secured to the main body and thus to the mixing element.

[0025] According to an advantageous feature of the invention, the first locking member forms a bearing surface on which a force can be exerted to move the first locking member from its locked position to its unlocked position.

[0026] This design allows for easy handling of the attachment system and therefore easy separation of the mixing component from the tank.

[0027] According to an advantageous feature of the invention, the first locking member has a corresponding lock position return member.

[0028] This design ensures that the attachment system, and therefore the first locking member as well as each additional locking member, are kept in the locked position when no force is applied to the attachment system. The locking position is therefore the rest position of the attachment system.

[0029] According to an advantageous feature of the invention, the first locking member has a sloping edge forming a chamfer designed to engage with an upper edge of the opening when the mixing element is mounted on the tank, to move the first locking member to the unlocked position.

[0030] This design makes it easier to mount the mixing element on the tank.

[0031] According to an advantageous feature of the invention, each additional locking member has a sloping edge forming a chamfer designed to engage with an upper edge of the opening when the mixing element is mounted on the tank, to move each additional locking member to the unlocked position.

[0032] This design makes it easier to mount the mixing element on the tank.

[0033] According to an advantageous feature of the invention, the mixing element comprises of a mixing part, a hot water/steam inlet port and a main flow duct connecting the hot water/steam inlet port to the mixing part.

[0034] This design enables frothed milk to be prepared using the frothing device.

[0035] According to an advantageous feature of the invention, the mixing element comprises of a main body comprising of the mixing part, the hot water/steam inlet port, the main flow duct and a milk feed duct connected to the main flow duct, and a main body cover member that can be moved relative to the main body between a closed position in which the cover member closes and/or covers the mixing part and the main flow duct, and an open position in which the mixing part and the main flow duct are open and accessible to allow the mixing part and the main flow duct to be cleaned.

[0036] This design makes it easier to clean the mixing element and prepare frothed milk with the frothing device.

[0037] The invention also aims to provide a beverage dispensing machine comprising of a hot water/steam dispensing nozzle and a milk frothing device designed to be connected to the hot water/steam dispensing nozzle. According to the invention, the milk frothing device is as described above.

[0038] This design enables the beverage dispensing machine to be used to prepare beverages made from frothed milk simply and with improved robustness and ease of use. Indeed, the attachment system makes it easy to mount/remove the frothing device and ensures optimal attachment of the mixing element to the tank, thereby improving the reliability of the frothing device.

BRIEF DESCRIPTION OF THE FIGURES

[0039] The purposes, aspects and advantages of the present invention, according to the description given below of a particular embodiment of the invention presented by way of non-limiting example, will be better understood by referring to the attached drawings in which:

[0040] FIG. **1** is a very schematic representation of a beverage dispensing machine equipped with a milk frothing device according to one embodiment of the invention;

[0041] FIG. **2** is a perspective view of the frothing device in FIG. **1** comprising of a milk tank and a mixing element with the system for attaching it to the tank in a locked position;

[0042] FIG. **3** is a similar view to FIG. **2** from another point of view;

[0043] FIG. **4** is a similar view to FIG. **2**, with the attachment system in the unlocked position;

[0044] FIG. **5** is an exploded view of the frothing device in FIG. **2**;

[0045] FIG. **6** is a perspective view of the attachment system in FIG. **2** in the locked position;

[0046] FIG. **7** is a perspective view of the attachment system in FIG. **4** in the unlocked position.

[0047] Only those elements required in order to understand the invention have been depicted. In order to facilitate the interpretation of the drawings, the same elements are labeled with the same references across all the figures.

DETAILED DESCRIPTION OF THE INVENTION

[0048] In the remainder of this description, froth or frothing is understood to mean producing a froth from a liquid, whether only the froth of this liquid (i.e., milk froth) or a blend of this liquid and the froth of this liquid (i.e., a blend of milk and milk froth).

[0049] It will be noted that in this document, the terms "horizontal," "vertical," "lower," "upper," "top," "bottom," "front," "rear," "longitudinal" and "transverse" used to describe the beverage dispensing machine and its corresponding elements refer to the beverage dispensing machine and its corresponding elements when in use, sitting flat on a countertop.

[0050] In addition, the terms "upstream" and "downstream" or "inlet" and "outlet" are defined in relation to a flow direction of the beverage or of the steam in the beverage dispensing machine and in the milk frothing device.

[0051] The terms "external" and "internal" as well as the terms "outer" and "inner" are defined relative to a central axis of the beverage dispensing machine or of the milk frothing device. Therefore an internal/inner portion/part will be closer to the central axis than an external/outer portion/part.

[0052] The beverage dispensing machine shown in FIG. **1** is a coffee machine **10**. As a variant, the beverage dispensing machine is a hot water or tea dispensing machine.

[0053] The coffee machine **10**, shown very schematically in FIG. **1**, is advantageously an automatic coffee machine **10**.

[0054] The coffee machine **10** comprises of a frame **12**, a container stand **14** on which a container can be placed, and a beverage dispensing head **16**. The beverage dispensing head **16** comprises of at least one, preferably two, coffee dispensing nozzles **18**A, **18**B.

[0055] The coffee machine **10** comprises of a control circuit **20** for managing the preparation of a beverage based on the instructions given by a user. The coffee machine **10** also comprises of a boiler **22** producing hot water and/or steam and a tank **24** for holding cold water. The tank **24** supplies boiler **22** to produce hot water and/or steam.

[0056] The coffee machine **10** also comprises of a hot water/steam dispensing nozzle **26** designed to be supplied with hot water and/or steam from boiler **22**.

[0057] In a conventional manner not shown, the coffee machine **10** advantageously comprises of a coffee bean reservoir, an automatic bean grinder and a brewing chamber designed to receive the ground coffee beans and to be supplied with hot water by boiler **22**. The brewing chamber is fluidly connected to the dispensing head **16** such that the coffee machine **10** is designed to dispense a beverage made with coffee from the coffee dispensing nozzles **18**A, **18**B.

[0058] According to the invention, the coffee machine **10** also comprises of a milk frothing device **30** designed to be connected to the hot water/steam dispensing nozzle **26**.

[0059] As shown in FIGS. **2** to **5**, the milk frothing device **30** comprises of a milk tank **32**, a mixing element **34** designed to be attached to the tank **32** and a milk feed tube **35** for the mixing element **34** designed to extend between the tank **32** and the mixing element **34**.

[0060] The tank **32** is designed to receive milk to be frothed using the mixing element **34**, which forms a frothing member.

[0061] The tank **32** delimits an inner volume designed to contain milk and comprising of an opening **36**, preferably at the top.

[0062] For example, the tank **32** is generally cylindrical in shape and comprises of a base **38** and a circumferential wall **40** extending upwards from the base **38**. For example, the circumferential wall **40** forms a front side **40**A, a rear side **40**B, a left side **40**C and a right side **40**D.

[0063] The tank **32** extends substantially along a central axis X that is substantially vertical when the milk frothing device **30** is in use, in particular when connected to the hot water/steam dispensing nozzle **26**.

[0064] The opening **36** is advantageously an opening for filling the tank **32**.

[0065] The bottom **38** and the circumferential wall **40** together form the inner volume.

[0066] The tank **32** comprises of a first fastening slot **42** for attaching the mixing element **34** to the tank **32**. The first fastening slot **42** is formed on the circumferential wall **40**.

[0067] The tank also comprises of two additional fastening slots **46**, **48** for attaching the mixing element **34** to the tank **32**. Namely, a first additional fastening slot **46** and a second additional fastening slot **48**.

[0068] As a variant, the tank comprises of a single additional fastening slot or more than two additional fastening slots.

[0069] Advantageously, as shown in FIG. **5**, the additional fastening slots **46**, **48** are positioned opposite the first fastening slot **42**. In other words, the additional fastening slots **46**, **48** on the one hand and the first fastening slot **42** on the other hand are arranged on two opposite sides of the circumferential wall **40**. For example, the additional fastening slots **46**, **48** are arranged on the left-hand side **40**C, and the first fastening slot **42** is arranged on the right-hand side **40**D.

[0070] Advantageously, the first fastening slot **42** and the additional fastening slots **46**, **48** are pass-through in a direction substantially radial to the central axis X.

[0071] Advantageously, the tank **32** also forms a receiving slot **50** for a frothed milk dispensing member **52**, such as a spout, arranged for example on the left-hand side **40**C between the two additional fastening slots **46**, **48**.

[0072] Also advantageously, the tank **32** forms a receiving slot **54** for a member **56** for reversibly connecting the milk frothing device **30** to the hot water/steam dispensing nozzle **26**.

[0073] The receiving slot **54** is shown in FIG. **5** and is formed, for example, on the rear side **40**B.

[0074] The mixing element **34** is arranged in the opening **36**.

[0075] The mixing element **34** is designed to be removably attached to the tank **32** at the opening **36** and advantageously to close the opening **36**.

[0076] The mixing element **34** forms a frothing member and comprises of, as shown in FIG. **5**, a main body **58** and a cover member **60** for the main body **58**.

[0077] When attached to the tank **32**, the main body extends along a central axis corresponding to the central axis X of the tank. In the remainder of the description and the drawings, the central axis of the main body **58** coincides with the central axis of the tank **32**.

[0078] The main body **58** comprises of a mixing part **62**, a hot water/steam inlet port **64** and a main flow duct **66** connecting the hot water/steam inlet port **64** to the mixing part **62**.

[0079] The main body **58** comprises of a reversible attachment system **70** for attaching the mixing element **34** to the tank **32**, more clearly shown in FIGS. **6** and **7**.

[0080] The main body **58** advantageously comprises of the frothed milk dispensing member **52**, which is fluidly connected to the mixing part **62**. The frothed milk dispensing member **52** is designed to be positioned in the receiving slot **50**.

[0081] The main body **58** also advantageously comprises of the member **56** for connecting the milk frothing device **30** to the hot water/steam dispensing nozzle **26**.

[0082] The connecting member **56** opens onto a rear side of the frothing device **30** and is designed in particular to be

received in the receiving slot **54** formed on the rear side **40**B of the tank **32**. When the frothing device **30** is combined with the coffee machine **10**, the connecting member **56** is designed to be connected to the hot water/steam dispensing nozzle **26** so that it can be supplied with hot water/steam. The connecting member **56** is configured to attach/connect the frothing device to the coffee machine **10** and in particular to the hot water/steam dispensing nozzle **26**.

[0083] The hot water/steam inlet port **64** is fluidly connected to the connecting member **56** so that it receives hot water/steam delivered by the hot water/steam dispensing nozzle **26** when the connecting member **56** is connected to the hot water/steam dispensing nozzle **26**.

[0084] The main body **58** is designed to cover and close the opening **36** and comprises of a lower wall **71**, an upper wall **72** and a circumferential wall **73**.

[0085] In particular, the main body **58** comprises of a shoulder **74** designed to engage an edge of an upper end of the tank **32** when the mixing element **34** is attached to the tank **32**.

[0086] Advantageously, the main body **58** comprises of members **75**A, **75**B that bear against an inner side of the circumferential wall **40** shown in FIG. **5**. The bearing members **75**A, **75**B are designed to exert a radial bearing force against the inner side of the circumferential wall **40** to provide additional support for the main body **58** and in particular the mixing element **34** on the tank **32**. The bearing members **75**A, **75**B are, for example, elastically deformable tabs arranged on the circumferential wall **73**. Only two bearing members **75**A, **75**B are shown in FIG. **5**. Advantageously, the main body comprises of four bearing members evenly distributed along the circumferential wall **73**.

[0087] The mixing part **62** comprises of a liquid inlet opening **76**, a liquid outlet opening, not shown in the figures, and a mixing chamber **78** extending between the liquid inlet opening **76** and the liquid outlet opening.

[0088] The mixing chamber **78** extends in a vertical direction parallel to the central axis X when the mixing element **34** is attached to the tank **32**.

[0089] The mixing chamber **78** comprises of an open upper end **80**. The open upper end **80** forms an access opening to the mixing chamber **78**.

[0090] The mixing chamber **78** opens into an upper side of the upper wall **72** of the main body **58**.

[0091] The mixing chamber **78** has a substantially circular cross-section perpendicular to the vertical direction.

[0092] The liquid inlet opening **76** opens into an upper part of the mixing chamber **78**, for example at an upper point of the mixing chamber **78**, and the liquid outlet opening is located in a lower part of the mixing chamber **78**, for example at a lower point of the mixing chamber **78**.

[0093] The open top end **80** is arranged on an upper side of the main body **58** and therefore of the upper wall **72**.

[0094] The liquid outlet opening is fluidly connected to the frothed milk dispensing member **52** so that the frothed milk dispensing member **52** can be supplied with frothed milk via the liquid outlet opening and dispense frothed milk into a cup positioned directly below the frothed milk dispensing member **52**.

[0095] The main flow duct **66** is arranged in the upper side of the upper wall **72** and opens into the mixing chamber **78** at the liquid inlet opening **76**.

[0096] The main flow duct **66** opens out substantially tangentially into the mixing chamber **78**, such that the mixing chamber **78** is of the cyclone type. Therefore, the liquid flowing into the mixing chamber **78** from the main flow duct **66** flows through the mixing chamber, swirling along the walls of the mixing chamber **78**.

[0097] As shown in FIG. **5**, the main flow duct **66** comprises of a cross-sectional constriction **84** located, for example, in a central portion of the main flow duct **66**. In particular, the main flow duct **66** comprises of a first duct portion that is located upstream of the cross-sectional constriction **84** and extends to the cross-sectional constriction, and a second duct portion that is located downstream of the cross-sectional constriction **84** and extends from the cross-sectional constriction **84** to the mixing chamber **78**. Advantageously, the first duct portion has a through section that decreases towards the cross-section constriction **84** and the second duct portion has a through section that widens towards the mixing chamber **78**.

[0098] The hot water/steam inlet port **64** opens into the first duct portion, more specifically opposite the mixing chamber **78**. The main flow duct **66** is thus configured to fluidly connect the hot water/steam inlet port **64** to the mixing chamber **78** and to allow a flow of hot water/steam through the main flow duct **66** and into the mixing chamber **78**.

[0099] The main body **58** also comprises of a milk feed duct **90** connected to the main flow duct **66**. When the mixing element **34** is attached to the tank, the milk feed duct **90** extends between the main flow duct **66** and the milk feed tube **35** so that it is fluidly connected to the inner volume of the tank **32**.

[0100] The milk feed duct **90** is fluidly connected to the main flow duct **66** and therefore configured to be fluidly connected to the mixing chamber **78** via the main flow duct **66**.

[0101] The milk feed duct **90** comprises of a substantially vertical portion that extends preferably from near the lower wall **71** and opens into the main flow duct **66** at the cross-sectional constriction **84**.

[0102] In FIG. **5**, only the part of the milk feed duct **90** that opens into the main flow duct **66** is shown.

[0103] The main body **58** also comprises of an air intake channel **92** in the main flow duct **66**.

[0104] Advantageously, the air intake channel **92** is arranged in the upper side of the upper wall **72** of the main body **58**.

[0105] The air intake channel **92** opens into the main flow duct **66** at the cross-sectional constriction **84**. The air intake channel **92** is thus configured to be fluidly connected to the mixing chamber **78** via the main flow duct **66**.

[0106] The previously described cross-sectional constriction **84** increases the speed of the steam flowing through the main flow duct **66**, generating a negative pressure in the milk feed duct **90** and in the air intake channel **92**. The cross-sectional constriction **84** is therefore more specifically configured to form a milk and air intake system based on the venturi effect. The main flow duct **66** is thus configured so that a flow of hot water/steam through the main flow duct **66** from the hot water/steam inlet port **64** to the mixing chamber **78** generates a negative pressure in the milk feed duct **90** and a negative pressure in the air intake channel **92**, and consequently causes milk and air to be drawn into the main flow duct **66** and the drawn milk and air to flow to the mixing chamber **78**.

[0107] In addition, the second duct portion, which has a through section that widens in the direction of the mixing chamber **78**, facilitates a first mixing of the steam, milk and air coming respectively from the hot water/steam inlet port **64**, the milk feed duct **90** and the air intake channel **92**, before they arrive in the mixing chamber **78**.

[0108] In addition, by positioning the main flow duct **66** relative to the mixing chamber **78**, the first blend of steam, milk and air undergoes a cyclonic movement when it arrives from the mixing chamber and swirls along the walls of the chamber **78**, further enhancing the mixing and obtaining a milk froth of optimal consistency. Thus, the mixing chamber **78** enables homogenization of the aforementioned blend and finalization of the mixing begun in the second duct portion.

[0109] The main flow duct **66**, the hot water/steam inlet port **64**, the air intake channel **92** and the mixing chamber **78** advantageously comprise an open upper end. In other words, they form liquid flow channels open to the exterior in their upper part.

[0110] The cover member **60** is designed to cover the upper side of the upper wall **72**.

[0111] The cover member **60** can be moved relative to the main body **58** between a closed position in which the cover member **60** closes and/or covers the mixing part **62** and the main flow duct **66**, and an open position in which the mixing part **62** and the main flow duct **66** are open and accessible to allow the mixing part **62** and the main flow duct **66** to be cleaned.

[0112] Advantageously, the cover member **60** is designed to be attached to the main body **58** in the closed position and to be separated from the main body **58** in the open position.

[0113] The cover member **60** can be attached to the main body **58** via a bayonet-type attachment mechanism shown in FIG. **5**.

[0114] In the closed position the cover member **60** closes and/or covers, in particular, the open upper end of the hot water/steam inlet port **64**, the main flow duct **66** and the mixing chamber **78**.

[0115] Advantageously, in the closed position, the cover member **60** also at least partially closes and/or covers the air intake channel **92** and in particular the open upper end of the air intake channel.

[0116] When in the open position, the cover member **60** allows access to the hot water/steam inlet port **64**, the main flow duct **66**, the mixing chamber **78** and, advantageously, the channel **92** for cleaning purposes. When in the closed position, it seals the hot water/steam inlet port **64**, the main flow duct **66**, the mixing chamber **78** and, advantageously, the channel **92**.

[0117] Advantageously, the cover member **60** forms a substantially flat cover designed to cover the upper side of the upper wall **72** and in particular the mixing part **62** and the main flow duct **66**.

[0118] The cover member **60** forms a lid on the main body **58** and is designed to be positioned over the opening **36** when the mixing element **34** is attached to the tank **32**.

[0119] The cover member **60** also comprises of a viewing window **96**, designed to be opposite the upper wall **72**.

[0120] The viewing window **96** is in particular designed to be opposite the mixing part **62**, particularly the mixing chamber **78**, and advantageously also the main flow duct **66** when the cover member **60** is in the closed position.

[0121] The viewing window **96** is designed to be opposite the open upper end **80** when the cover member **60** is in the closed position.

[0122] The viewing window **96** is, for example, formed by a portion of the cover member **60** made of a transparent material so that the user can view the inside of the mixing chamber **78** and advantageously the main flow duct **66** when the cover member **60** is in the closed position.

[0123] The viewing window **96** allows the user to see whether the frothing device **30** has already been used and whether it needs to be cleaned before making a beverage. In addition, the user can check the correct operation of the frothing device **30** through the viewing window by visually checking whether the milk is flowing through the main flow duct **66** and the mixing chamber **78** and has a cyclonic movement along the walls of the chamber **78**.

[0124] The cover member **60** also comprises of an air feed duct, not shown in the figures, connected to the air intake channel **92** when the cover member **60** is in the closed position so that it is fluidly connected to the main flow duct **66**.

[0125] The cover member **60** also comprises of an air flow adjustment device **99** configured to adjust an air flow rate through the air feed duct to the main flow duct **66**.

[0126] The air feed duct is, for example, an orifice passing through the cover member **60** in the vertical direction when the cover member **60** is in the closed position.

[0127] The system **70** for attaching the mixing element **34** to the tank **32** is shown in greater detail in FIGS. **6** and **7**. FIGS. **6** and **7** more specifically show the lower wall **71** of the main body, on the inner side of which the attachment system **70** is positioned.

[0128] The attachment system **70** comprises of a first locking member **102** designed to engage the first fastening slot **42**.

[0129] The attachment system **70** also comprises of two additional locking members **104**, **106** designed to respectively engage the corresponding additional fastening slot **46**, **48**.

[0130] The first locking member **102** and the additional locking members **104**, **106** form latches designed to engage the corresponding fastening slots **42**, **46**, **48**.

[0131] The first locking member **102** can be moved between a locked position, shown in FIG. **6**, in which the first locking member **102** is designed to be received in the first attachment slot **42** formed on the tank, and an unlocked position, shown in FIG. **7**, in which the first locking member **102** is designed to be extracted from the first fastening slot **42**.

[0132] In the locked position shown in FIG. **6**, the first locking member **102** extends in a radial direction relative to the central axis X, protruding from the main body **58** and in particular from the circumferential wall **73** of the main body.

[0133] In the unlocked position shown in FIG. **7**, the first locking member **102** extends in a radial direction relative to the central axis X, substantially recessed or plumb with the main body **58** and in particular the circumferential wall **73** of the main body.

[0134] The first locking member **102** is arranged, for example, at an opening formed through the circumferential wall **73**.

[0135] The locking position corresponds to a deployed position and the unlocked position to a retracted position.

[0136] The first locking member **102** is moved from the locked position to the unlocked position in a direction of travel substantially perpendicular to the central axis X, extending from the first locking member **102** to the additional locking members **104**, **106**, so that the distance between the first locking member **102** and each additional locking member **104**, **106** is reduced.

[0137] The first locking member **102** forms a bearing surface **102**A on which a force can be exerted by a user to move the first locking member **102** from its locked position to its unlocked position.

[0138] The first locking member **102** has a sloping edge forming a chamfer **107** designed to engage with an upper edge of the opening **36** when the mixing element **34** is mounted on the tank **32**, to move the first locking member **102** to the unlocked position. The mounting direction is substantially vertical.

[0139] Advantageously, the chamfer **107** extends, for example, around the edge of the first locking member **102** and comprises of an outer end closer to the central axis X than an inner end. The outer and inner ends are defined relative to a center of the first locking member. The chamfer is therefore also designed to engage an upper edge of the first fastening slot **42** when removing the mixing element **34** from the tank **32**, to move the first locking member **102** to the unlocked position. The removal direction is essentially vertical.

[0140] The first chamfer **107** is therefore designed to engage an inner side of the circumferential wall **40** both when mounting and removing the mixing element **34** on or from the tank **32** so that the first locking member **102** is moved to the unlocked position when the first locking member **102** translates along the circumferential wall **40** during the mounting and removal operations.

[0141] As a variant, the chamfer **107** extends only on a lower side of the first locking member **102**.

[0142] The attachment system **70** advantageously comprises of a return member **108** associated with the first locking member **102**. The return member **108** is configured to return the first locking member **102** to the locked position. The return member **108** is a spring, for example.

[0143] When the main body **58** is mounted on the tank **32**, if the first locking member **102** is placed opposite the first fastening slot **42**, it is held in the first fastening slot **42** by the return force exerted by the return member **108**.

[0144] Advantageously, each additional locking member **104**, **106** is mechanically associated with the first locking member **102** so that moving the first locking member **102** between the locked and unlocked positions results in a corresponding movement of each additional locking member **104**, **106** between a locked position in which the additional locking member **104**, **106** is designed to be received in the respective additional fastening slot **46**, **48**, and an unlocked position in which the additional locking member **104**, **106** is designed to be extracted from the respective additional fastening slot **46**, **48**.

[0145] For each additional locking member **104**, **106**, the attachment system **70** comprises of, for example, an arm **109**, **110** that can be rotated relative to the first locking member **102** as it moves between the locked and unlocked positions.

[0146] In the locked position, each additional locking member **104**, **106** extends in a radial direction relative to the central axis X, protruding from the main body **58** and in particular from the circumferential wall **73** of the main body.

[0147] In the unlocked position, each additional locking member **104**, **106** extends in a radial direction relative to the central axis, substantially recessed or plumb with respect to the main body **58** and in particular the circumferential wall **73** of the main body.

[0148] Each additional locking member **104**, **106** is arranged, for example, at a corresponding opening formed through the circumferential wall **73**.

[0149] The locking position corresponds to a deployed position and the unlocked position to a retracted position.

[0150] Each additional locking member **104**, **106** also has a sloping edge forming a chamfer **112**, **113** designed to engage with an upper edge of the opening **36** when the mixing element **34** is mounted on the tank **32**, to move the additional locking member **104**, **106** to the unlocked position.

[0151] Advantageously, each chamfer **112**, **113** extends only on a lower side of the corresponding additional locking member **104**, **106**. Each chamfer **112**, **113** comprises of an outer end closer to the central axis X than an inner end. The outer end and the inner end are defined relative to a center of the corresponding additional locking member **104**, **106**.

[0152] Each arm **109**, **110** is designed, as it rotates, to translationally drive the corresponding additional locking member **104**, **106** in order to move it between the locked position and the unlocked position.

[0153] Advantageously, the main body **58** comprises of, for each additional locking member **104**, **106**, an additional relief **114**, **115** designed to form a slide connection with the additional locking member **104**, **106**.

[0154] When the first locking member **102** is moved from the locked position to the unlocked position, each arm **109**, **110** is designed to move the corresponding additional locking member **104**, **106** in the direction of the first locking member **102**.

[0155] When the first locking member **102** is moved from the unlocked position to the locked position, in particular under the effect of the return member **108**, each arm **109**, **110** is designed to move the corresponding additional locking member **104**, **106** away from the first locking member **102**.

[0156] Each arm **109**, **110** comprises of a first pivot connection **116**, **118** with the first locking member **102** and a second pivot connection **120**, **122** with the corresponding additional locking member **104**, **106**.

[0157] Advantageously, each first pivot connection **116**, **118** is formed by an axial protrusion extending in the vertical direction from the first locking member **102** and a hole, preferably oblong, formed in the corresponding arm.

[0158] Advantageously, each second pivot connection **120**, **122** is formed by an axial protrusion extending in the vertical direction from the corresponding additional locking member **104**, **106** and a hole formed in the corresponding arm.

[0159] For each arm **109**, **110**, the first **116**, **118** and second **120**, **122** pivot connections are positioned at opposite ends of the corresponding arm **109**, **110**.

[0160] For each arm **109**, **110**, the first **116**, **118** and second **120**, **122** pivot connections respectively define substantially parallel first and second rotational axes extending in a substantially vertical direction.

[0161] Each arm **109**, **110** comprises of an additional pivot connection **124**, **126** with the main body **58** and in particular

the lower wall **71**. The additional pivot connection **124**, **126** is positioned between the first **116**, **118** and second **120**, **122** pivot connections.

[0162] The additional pivot connection **124**, **126** attaches the corresponding arm **109**, **110** to the mixing element **34** and in particular to the main body **58**.

[0163] Each additional pivot connection **124**, **126** is formed, for example, by a hinge pin, not shown, extending from an upper part of the main body **58** through a corresponding hole formed through the arm **109**, **110** and into a slot formed on an inner side of the lower wall **71**.

[0164] Advantageously, the main body **58** and in particular the lower wall **71** comprise stops designed to limit the movement of the locking members **102**, **104**, **106** between the locked and unlocked positions, therefore forming the locked and unlocked positions.

[0165] The operation of the frothing device **30** and in particular the attachment system **70** for making a frothed milk beverage will be explained below using the figures.

[0166] In a first step, the tank **32**, the mixing element **34** and the milk feed tube **35** are provided to a user.

[0167] In a next step, the user connects the milk feed tube **35** to the main body **58**, then fastens the cover member **60** to the main body **58**.

[0168] Then, in an assembly step, the user positions the mixing element **34** on the tank **32**, installing the milk feed tube **35** in the inner volume. During the assembly step, the main body **58** is positioned at the opening **36** and translates downwards relative to the tank **32**. The chamfers **107**, **112**, **113** that bear against an inner side of the circumferential wall **40**, so that the locking members **102**, **104**, **106** are moved from the locked position to the unlocked position. Then, at the end of the translational movement, the locking members **102**, **104**, **106** are positioned opposite the corresponding fastening slots **42**, **46**, **48** and are then moved from the unlocked position to the locked position under the effect of the return member **108** so that they are positioned through the fastening slots **42**, **46**, **48**.

[0169] Following the assembly step, the user can connect the frothing device to the coffee machine **10** and in particular the connecting member **56** to the hot water/steam dispensing nozzle **26**, so that beverages prepared with frothed milk can be made, the frothed milk being dispensed via the frothed milk dispensing member **52**.

[0170] When making a beverage, the user can check that the frothing device **30** is working properly via the viewing window **96**, and adjust the air flow delivered to the air intake channel **92** using the air flow adjustment device **99**.

[0171] Once the frothed milk beverage has been made, the user disconnects the connecting member **56** from the hot water/steam dispensing nozzle **26**.

[0172] Then, in a removal step, the user exerts an opposing force on the bearing surface **102**A of the first locking member **102**, so that the locking members **102**, **104**, **106** move from the locked position to the unlocked position. During the removal step, the locking members **102**, **104**, **106** are extracted from the fastening slots **42**, **46**, **48**. The user then exerts an upward translational movement on the mixing element and the locking members are kept in the unlocked position by contact with the inner side of circumferential wall **40**.

[0173] At the end of the removal step, the mixing element **34** is separated from the tank **32** by simply pressing on the first locking member **102** and performing a translational movement.

[0174] The user then separates the cover member **60** from the main body **58** and can put the various elements in the dishwasher for cleaning.

[0175] This new invention makes the ergonomics and handling of the milk frothing device **30** easier. In addition, cleaning is made easier and the robustness of the attachment of the elements making up the frothing device **30** is improved.

[0176] As a variant, the attachment system comprises of a single additional locking member or more than two additional locking members.

[0177] As shown in the figures, when moving the first locking member between the locked and unlocked positions, the first locking member **102** can be moved between each additional locking member **104**, **106**. In other words, when the first locking member is moved between the locked and unlocked positions, the first locking member **102** can be moved relative to each additional locking member, and in particular towards or away from each additional locking member.

[0178] Of course, the present invention is in no way limited to the embodiment described and illustrated, since this embodiment was only provided by way of example. Changes can still be made, particularly with regard to the constitution of the various elements or by substituting technical equivalents, without departing from the scope of protection of the invention.

1. A milk frothing device comprising:

a milk tank defining an opening; and

a mixing element, the mixing element configured to be removably attached to the tank at the opening and comprising

a first locking member that can be moved between:

a locked position wherein the first locking member is configured to be received in a first fastening slot formed on the tank, and

an unlocked position wherein the first locking member is configured to be extracted from the first fastening slot, and

wherein the mixing element further comprises at least a second locking member configured to engage with a respective second fastening slot formed on the tank.

2. The milk frothing device according to claim **1**, wherein when the first locking member is moved between the locked and unlocked positions, the first locking member is configured to be moved relative to the second locking member.

3. The milk frothing device according to claim **1**, wherein the tank extends substantially along a central axis that is substantially vertical when the milk frothing device is in use, and wherein the first locking member is moved from the locked position to the unlocked position in a direction substantially perpendicular to the central axis and extending from the first locking member to the second locking member so that the distance between the first locking member and the second locking member is reduced.

4. The milk frothing device according to claim **3**, wherein the second locking member is mechanically associated with the first locking member so that moving the first locking

member between the locked and unlocked positions results in a corresponding movement of the second locking member between:

a locked position in which the second locking member is designed to be received in the respective second fastening slot, and

an unlocked position in which the second locking member is designed to be extracted from the respective second fastening slot.

5. The milk frothing device according to claim **4**, wherein the mixing element comprises, for the second locking member, an arm configured to be rotated relative to the first locking member as the first locking member moves between the locked and unlocked positions; each arm being configured, as the arm rotates, to translationally drive the second each locking member so as to move it between the locked position and the unlocked position.

6. The milk frothing device according to claim **5**, wherein the first locking member is moved from the locked position to the unlocked position in a direction extending from the first locking member to the second locking members so that the distance between the first locking member and the second locking member is reduced, and wherein when the first locking member is moved from the locked position to the unlocked position, the arm is configured to move the second locking member towards the first locking member.

7. The milk frothing device according to claim **5**, wherein the arm includes a first pivot connection with the first locking member and a second pivot connection with the second locking member, the first and second pivot connections being positioned at opposite ends of the arm.

8. The milk frothing device according to claim **7**, wherein for the arm the first and second pivot connections respectively define substantially parallel first and second rotational axes extending in a substantially vertical direction.

9. The milk frothing device according to claim **7**, wherein the mixing element includes a main body and in wherein the arm comprises a third pivot connection with the main body, the third pivot connection being positioned between the first and second pivot connections.

10. The milk frothing device according to claim **1**, wherein the mixing element includes a main body and wherein the main body comprises, for the second locking member, a projection configured to form a slide connection with the second locking member.

11. The milk frothing device according to claim **10**, wherein the first locking member forms a bearing surface on which a force can be exerted to move the first locking member from the locked position to the unlocked position, and wherein the first locking member has a corresponding lock position return member.

12. The milk frothing device according to claim **10**, wherein the first locking member has a sloping edge forming a chamfer configured to engage with an upper edge of the opening when the mixing element is mounted on the tank to move the first locking member to the unlocked position, and wherein the second locking member has a sloping edge forming a chamfer designed to engage with an upper edge of the opening when the mixing element is mounted on the tank to move the second locking member to the unlocked position.

13. The milk frothing device according to claim **1**, wherein the mixing element comprises:

a mixing part; and

a hot water/steam inlet port and a main flow duct connecting the hot water/steam inlet port to the mixing part.

14. The milk frothing device according to claim **130**, wherein the mixing element comprises:

the main body including the mixing part, the hot water/steam inlet port, the main flow duct and a milk feed duct connected to the main flow duct, and

a cover member for the main body that can be moved relative to the main body between a closed position in which the cover member closes or covers the mixing part and the main flow duct, and an open position in which the mixing part and the main flow duct are open and accessible to allow the mixing part and the main flow duct to be cleaned.

15. A beverage dispensing machine including a hot water/steam dispensing nozzle and the milk frothing device according to claim **1** configured to be connected to the hot water/steam dispensing nozzle, wherein claim **1**.

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