



(11)

EP 3 590 593 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.01.2020 Bulletin 2020/02

(51) Int Cl.:
B01F 5/10 ^(2006.01) **B01F 5/02** ^(2006.01)
B01F 13/00 ^(2006.01) **B01F 15/00** ^(2006.01)
F04D 13/02 ^(2006.01) **A62C 35/02** ^(2006.01)

(21) Application number: **18182202.4**

(22) Date of filing: **06.07.2018**

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

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(54) **DISMOUNTABLE MIXING DEVICE AND LIQUID MIXING METHOD**

(57) A dismountable mixing device (100) for mixing at least two liquids inside a tank of a mobile machinery equipment, the mixing device includes a pump unit (10), a suction hose (12), and a return hose (14). The pump unit has an inlet port and an outlet port. The suction hose has one end connected to the inlet port of the pump unit, and a sucking end inserted into the tank through a first opening. The return hose has one end connected to the outlet port of the pump unit, and a returning end inserted into the tank through a second opening. The pump unit is driven to suck the liquids from the tank via the suction hose, and return the liquids back to the tank via the return hose.

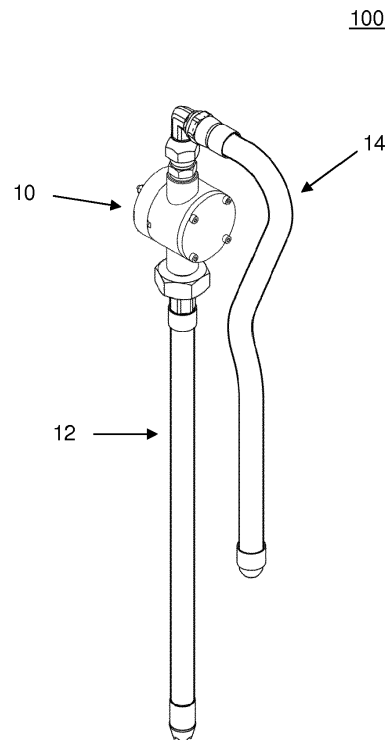


FIG.1

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Description

Field of invention

[0001] The present invention relates to a mixing device for mixing liquids in a tank of a mobile machinery equipment, and in particular, although not exclusively, to a portable mixing device for mixing a concentrated fire fighting agent diluted with other liquids of a fire suppression system.

Background art

[0002] Concentrated fire fighting agent diluted/mixed with water or other liquids is used within the fire suppression system in mobile machinery equipments, e.g., diesel powered mobile equipment or mining machines. It is common practice to mix the concentrated agent with water when the solution is filled into the fire suppression tank of the mobile equipment. By way of one example, the fire suppression system is pressurized and then either the tank is shaken or the motion of the mobile equipment during operation is used to stir the liquids together to complete the mixing. By way of another example, a portable mixing tool with retractable blade/propeller is inserted into the tank to stir the liquids by the rotation of the blade/propeller.

[0003] It is found that the above conventional method/mechanism will not mix the liquids inside the fire suppression tank sufficiently, and it cannot be guaranteed that the fluids will continue and stay in a mixed state over the fluid lifecycle, e.g., 6 months to 5 years. Liquids that are not fully mixed will in turn influence the fire fighting performance of the system. Accordingly, what is required is a mixing device that has better mixing performance. Additionally, as the tank is pressurised, any holes in the tank will weaken its structural strength, therefore the openings on the top of the tank are commonly small in diameter to limit the negative impacts the hole(s) would have on the structural strength of the tank. Thus, it is also required to have a mixing device that is capable of being inserted into the limited opening(s) without sacrificing the mixing performance.

Summary of the Invention

[0004] It is an objective of the present invention to provide a dismountable mixing device optimised to mix liquids held in a tank of a mobile machinery equipment. It is further a specific objective to drive the mixing device conveniently by using portable/handheld tool, and that the mixing device, as well as the driving means, can be applied in all kinds of tanks (with different capacities) of mobile machinery equipment. It is also a further objective to improve the mixing performed by the mixing device so that the liquids can be fully mixed by a limited driving force and within a limited period of time.

[0005] According to a first aspect of the present inven-

tion there is provided a dismountable mixing device for mixing at least two liquids inside a tank of a mobile machinery equipment. The mixing device comprises a pump unit, a suction hose, and a return hose. The pump unit has an inlet port and an outlet port. The suction hose has one end connected to the inlet port of the pump unit, and a sucking end inserted into the tank through a first opening. The return hose has one end connected to the outlet port of the pump unit, and a returning end inserted into the tank through a second opening. The pump unit is driven to suck the liquids from the tank via the suction hose, and return the liquids back to the tank via the return hose.

[0006] Preferably, the pump unit is detachably mounted to the tank. When the mixing is completed, the pump unit is dismounted, and the suction hose and return hose are removed from the tank of the mobile machinery equipment. The mixing device is then ready to be used on other tanks of other equipments.

[0007] In one embodiment, the pump unit comprises a shaft driven pump, and a shaft of the shaft driven pump is driven by a rotational tool. Advantageously, the rotational tool comprises a drill that rotates the shaft of the pump with a predetermined rotational speed to allow a liquid to be able to flow through the pump, and thus through the suction hose and return hose, and circulate in the tank. Preferably, the liquid flow through the pump is equal to or is greater than 40L/min, the predetermined rotational speed is equal to or is greater than 2000rpm, and the drill drives the shaft to rotation for at least one minute, that is, the liquids are mixed for a minimum time of one minute.

[0008] According to a preferred embodiment, the sucking end of the suction hose is inserted to be near the bottom of the tank, and the returning end of the return hose is inserted to be below and near the top level of the liquids in the tank, to allow for a thorough circulation/rotation of the liquids in the tank.

[0009] Optionally, in one embodiment, the mixing device further includes a flow control element located on the outlet port of the pump or in the return hose. The flow control element controls the flow velocity on the returning end of the return hose to be higher than the flow velocity on the sucking end of the suction hose. In another embodiment, a diameter of the return hose is smaller than a diameter of the suction hose, to allow for a higher flow velocity on the returning end of the return hose. Advantageously, the volume of liquid returned to the returning end will agitate the liquid in the tank sufficiently with a higher liquid flow velocity.

[0010] Optionally, the return hose is a transparent hose to enable the operator to monitor whether the liquids in the tank is fully mixed.

[0011] Advantageously, the liquids mixed by the mixing device can be used in a fire suppression system of a mobile machinery equipment, so that the fire suppression system may provide better fire suppression performance with sufficiently mixed fire fighting agent.

[0012] According to a second aspect of the present

invention there is provided a liquid mixing system used for a mobile machinery equipment, the liquid mixing system comprises a tank, a dismountable mixing device and a rotational tool. The tank holds a mixture of at least two liquids. The dismountable mixing device is used for mixing the liquids inside the tank. The rotational tool drives the pump unit of the mixing device, so as to mix the liquids in the tank. The dismountable mixing device comprises a pump unit, a suction hose, and a return hose. The pump unit has an inlet port and an outlet port. The suction hose has one end connected to the inlet port of the pump unit, and a sucking end inserted into the tank through a first opening. The return hose has one end connected to the outlet port of the pump unit, and a returning end inserted into the tank through a second opening. The pump unit is driven by the rotational tool to suck the liquids from the tank via the suction hose, and return the liquids back to the tank via the return hose.

[0013] According to a third aspect of the present invention there is provided a liquid mixing method for initial mixing of at least two liquids inside a tank of a mobile machinery equipment. The mixing method comprises: connecting a suction hose to an inlet port of a pump unit, and inserting the suction hose through a first opening on the tank; connecting a return hose to an outlet port of the pump unit, and inserting the return hose through a second opening on the tank; driving the pump unit to suck the liquids from the tank via the suction hose, and to return the liquids back to the tank via the return hose; and removing the suction hose and the return hose from the tank after the initial mixing.

[0014] In one preferred embodiment, the step of driving the pump unit includes: driving a shaft driven pump of the pump unit by using a rotational tool that has a rotational speed of at least 2000rpm; and driving the pump for at least one minute, to allow the mixing of the liquids to be fully and sufficiently.

[0015] Optionally, the liquid mixing method further includes: controlling the flow velocity in the return hose to be higher than the flow velocity in the suction hose, so that the column of liquids returned to the returning end of the return hose agitates the liquid in the tank sufficiently with a higher liquid flow velocity.

[0016] Preferably, the step of inserting the suction hose includes inserting a sucking end of the suction hose near the bottom of the tank, and the step of inserting the return hose includes inserting a returning end of the return hose below and near the top level of the liquids in the tank, this is to allow for a thorough circulation/rotation of the liquids in the tank.

[0017] Additionally, the liquid mixing method further includes: mounting the pump unit to the tank for the initial mixing; and dismounting the pump unit after the initial mixing. The suction hose and return hose are also removed from the tank after the initial mixing, and thus the pump unit and hoses are ready to be used on other tanks of other equipments.

Brief description of drawings

[0018] A specific implementation of the present invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a dismountable mixing device according to a specific implementation of the present invention;

FIG. 2 is a partially exploded perspective view of the mixing device of FIG. 1;

FIG. 3 is a perspective view of a liquid mixing system that includes the mixing device of FIG. 1 according to a specific implementation of the present invention;

FIG. 4 is a perspective view of the liquid mixing system in FIG. 3 where the rotational tool is a drill according to a specific implementation of the present invention;

FIG. 5 is a process of liquid mixing method according to a specific implementation of the present invention.

Detailed description of preferred embodiment of the invention

[0019] FIG. 1 is a perspective view of a dismountable mixing device 100 according to a specific implementation of the present invention. FIG. 2 is a partially exploded perspective view of the mixing device 100 of FIG. 1. Referring to FIGs. 1 and 2, the dismountable mixing device 100 comprises a pump unit 10, a suction hose assembly 12 and a return hose assembly 14 connected to the pump unit 10. The pump unit 10 has an inlet port 26 connected to the suction hose assembly 12, and an outlet port 28 connected to the return hose assembly 14. The suction hose assembly 12 includes a suction hose 22, and the return hose assembly 14 includes a return hose 24, in operation, both hoses are inserted into a tank of a fire suppression system for a mining machine. When the hoses are inserted into the tank and the mixing device 100 starts working, liquids inside the tank are sucked from a sucking end 23 of the suction hose 22, and returned to a returning end 25 of the return hose 24. By having the liquids circulated in the hoses and the tank for a certain period of time, it can be sufficiently mixed. As the tank usually has quite small openings to limit the negative impact that adding openings may have on the structural strength of the tank when the tank is pressurised after the mixing is completed. Therefore, the suction and return hoses 22 and 24 have diameters to be fitted in such openings, and advantageously, the mixing performance will not be influenced by the limited diameters of the hoses 22 and 24.

[0020] In practice, the operator/worker first fills the tank of the fire suppression system, e.g. of a mining machine,

with water to a correct level, and then adds a required amount of concentrated fire agent, the concentrated fire agent having a higher density than water. In order for the fire suppression system to work properly, the concentrated fire agent and water need to be fully mixed to become a homogeneous solution in suspension, and for which the homogeneity is maintained over its lifetime. The dismountable mixing device 100 is thus fit onto the tank for mixing. After the liquids inside the tank are fully mixed, the mixing device 100 is removed, and the fire suppression system is pressurized.

[0021] In one embodiment, the hoses can be transparent. By way of example, the return hose 24 is a transparent hose such that when the mixing device 100 is mixing the liquids inside the tank 30, the transparent return hose 24 enables the operator to monitor the status of the mixed liquids, so as to decide if it is fully mixed.

[0022] Referring to FIG. 2, according to the specific implementation, the pump unit 10 of the mixing device 100 includes a pump 20 having a shaft 21 that can be driven by a portable rotational tool (not shown). When the mixing device 100 is detachably mounted onto the tank of a mobile machinery equipment, e.g., a mining machine, the pump 20 can be driven to rotate by the rotational tool with a predetermined rotational speed to allow a liquid to be able to flow through the pump 20, so that the liquids run from the sucking end 23 of the suction hose 22 to the returning end 25 of the return hose 24, and it runs for a minimum period of time to ensure that the mixing is complete and that the liquids become a homogeneous solution. After the mixing runs for the minimum period of time, the pump unit 10 can be removed from the tank. The suction hose assembly 12 and the return hose assembly 14 are also detached from the tank.

[0023] FIG. 3 is a liquid mixing system 300 that includes the mixing device 100 of FIG. 1 according to a specific implementation of the present invention. FIG. 4 is a perspective view of the liquid mixing system 300 in FIG. 3 where the rotational tool 36 is a drill 40 according to a specific implementation of the present invention. Referring to FIGs. 3 and 4 the liquid mixing system 300 includes the tank 30, the dismountable mixing device 100 and the rotational tool 36. As mentioned above, the rotational tool 36 drives the pump unit 10 of the mixing device 100, so as to mix the liquids in the tank 30. The tank 30 holds a mixture of at least two liquids, and on the top surface of the tank 30, there are at least two openings, a first opening 31 and a second opening 32. One of the openings 31 and 32 can be the pressure relief bung opening, and the other one is a top center hole on the tank 30. The suction hose 22 is inserted into the tank 30 via the first opening 31 and the return hose 24 is inserted into the tank 30 via the second opening 32.

[0024] As can be seen in the embodiment of FIG. 3, the sucking end 23 of the suction hose 22 is located near to the bottom of the tank 30, and the returning end 25 of the return hose 24 is located below and near the top level of the liquids inside the tank 30, to allow circulation/rotation

of the whole volume of liquids in the tank 30. In such an embodiment, the sucking end 23 of the suction hose 22 may have cut outs at the tip to reduce the risk of the tip being sucked to the bottom of the tank 30.

[0025] Referring to FIGs. 3 and 4 again in one embodiment, a diameter of the return hose 24 is configured to be smaller than a diameter of the suction hose 22, so that the liquid flow velocity on the returning end 25 of the return hose 24 is controlled to be higher than that on the sucking end 23 of the suction hose 22. By way of example, the diameter of the return hose 24 can be 10mm smaller than the diameter of the suction hose 22.

[0026] In yet another embodiment of this invention, a flow control element (not shown) is configured on the outlet port 28 of the pump 20 or in the return hose 24, so as to control the liquid flow velocity on the returning end 25 to be higher than that on the sucking end 23. By way of example, an orifice, or other type of flow restrictor or flow restricting valve can be located on the outlet port 28 of the pump 20. Advantageously, with a higher liquid flow velocity on the returning end 25 than the sucking end 23, the volume of liquid returned to the returning end 25 will agitate the liquid in the tank 30 sufficiently with a higher liquid flow velocity.

[0027] Referring to FIG. 3, according to the specific implementation, the pump unit 10 can be fastened to the first opening 31 by a fastening means after the suction and return hoses 22 and 24 are inserted into the tank 30. In the embodiment of FIG. 3, the pump unit 10 includes a swivel nut 32 to be tightened to the first opening 31 of the tank 30. However, the swivel nut shall not be a limitation to the present invention, and in other embodiments, various types of fastening means can be applied to this invention. Since it is well known by the skilled person in the art, the fastening means will not be elaborated in this application.

[0028] Referring to FIG. 4, the portable rotational tool 36 can be a handheld drill 40 used to drive the pump 20 of the pump unit 10 when the mixing device 100 is mounted on the tank 30. More specifically, the pump 20 is a shaft driven pump, and the drill 40 is applied to rotate the pump shaft 21 with a predetermined rotational speed to allow the liquid to flow through the pump 20. In one preferred embodiment, the pump flow rate of over 20L/min is required to suck the viscous concentrate into the pump. If the flow is not high enough, the pump will only re-circulate water and leave the concentrate unmixed in the bottom of the tank. In another preferred embodiment, the handheld drill 40 drives the shaft driven pump 20 with a rotational speed of 2000rpm, or drives the pump 20 with a pump flow of 40L/min. In this embodiment, liquids filling a tank with a volume of 110L will be fully mixed by having the pump driven to rotate for one minute. In other embodiments of the present invention, if the tank has a lower volume, e.g., 25L, 45L, 80L etc., smaller rotational speed and shorter rotation time for mixing may be required.

[0029] FIG. 5 is a process of liquid mixing method 500 for mixing liquids in a tank 30 of a fire suppression system

according to a specific implementation of the present invention. The liquid mixing method 500 includes the following steps:

Step 51: connecting a suction hose 22 to an inlet port 26 of a pump unit 10, and inserting the suction hose 22 through a first opening 31 on the tank 30. The inlet port 26 of the pump unit 10 is then connected to a suction hose assembly 12 that includes the suction hose 22. The suction hose 22 has one end connected to the inlet port 26 of the pump unit 10, and a sucking end 23 inserted into the tank 30 through the first opening 31, to be near the bottom of the tank 30.

Step 52: connecting a return hose 24 to an outlet port 28 of the pump unit 10, and inserting the return hose 24 through a second opening 32 on the tank 30. The outlet port 28 of the pump unit 10 connects to a return hose assembly 14 that includes the return hose 24. The return hose 24 has one end connected to the outlet port 28 of the pump unit 10, and a returning end 25 inserted into the tank 30 through the second opening 32, to be below and near the top level of the liquids in the tank 30.

[0030] The pump unit 10 includes a pump 20 having a shaft 21 that can be driven by a portable rotational tool 36 to perform the initial mixing.

[0031] Step 53: driving the pump unit 10 to suck the liquids from the tank 30 via the suction hose 22, and returning the liquids back to the tank 30 via the return hose 24. When the pump 20 is driven to rotate by the rotational tool 36 with a predetermined rotational speed to allow a liquid to be able to flow through the pump 20, the liquids run from the sucking end 23 of the suction hose 22 to the returning end 25 of the return hose 24. In the present embodiment, the mixing needs to run for a minimum period of time to ensure the mixing is complete and the liquids becomes a homogeneous solution.

[0032] In one embodiment, the hoses can be transparent. For example, the return hose 24 is a transparent hose, so that the operator can observe the fluid in the return hose 24, to decide whether the liquids are adequately mixed, e.g., if the returning fluid is in a uniform milky color.

[0033] In one embodiment, the step 53 further includes driving the shaft driven pump 20 of the pump unit 10 by using the rotational tool 36 that has a rotational speed of at least 2000rpm; and driving the pump 20 for at least one minute. In a preferred embodiment, the rotational tool 36 is a handheld drill 40 with a rotational speed of 2000rpm, or that the pump 20 is driven with a pump flow of 40L/min. By having the drill 40 driving the pump 20 for one minute, the liquids filled in the tank with a volume of 110L can be fully mixed. If the tank has a lower volume, e.g., 25L, 45L, 80L etc., smaller rotational speed and shorter rotation time for mixing may be required.

[0034] In one embodiment of the present invention, the mixing method further controls the flow velocity in the return hose 24 to be higher than the flow velocity in the suction hose 22, so that the volume of liquid returned to the returning end 25 will agitate the liquid in the tank 30 sufficiently with a higher liquid flow velocity.

[0035] Step 54: removing the suction hose 22 and the return hose 24 from the tank 30 after the initial mixing. In one embodiment, the liquid mixing method further includes mounting the pump unit 10 to the tank for initial mixing. When the initial mixing is performed and the liquids is fully mixed, the pump unit 10 is dismounted from the tank 30, and the suction hose assembly 12 and the return hose assembly 14 are removed from the system as well.

[0036] By using the mixing method 500 for mixing liquids in a tank 30 of a fire suppression system on e.g., a mining machine, initial mixing can be performed sufficiently without being affected by the small openings on the tank. For tanks having different capacity sizes, different suction hoses and return hoses can be chosen to meet the dimensional requirements of the tanks, as long as the sucking end of the suction hose can be inserted to be near the bottom of the tank, and the returning end of the return hose can be inserted to be below and near the top level of the liquids in the tank.

[0037] While the foregoing description and drawings represent embodiments of the present invention, it will be understood that various additions, modifications and substitutions may be made therein without departing from the spirit and scope of the principles of the present invention as defined in the accompanying claims. One skilled in the art will appreciate that the invention may be used with many modifications of form, structure, arrangement, proportions, materials, elements, and components and otherwise, used in the practice of the invention, which are particularly adapted to specific environments and operative requirements without departing from the principles of the present invention. The presently disclosed embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims and their legal equivalents, and not limited to the foregoing description.

Claims

1. A dismountable mixing device (100) for mixing at least two liquids inside a tank (30) of a mobile machinery equipment, the mixing device (100) comprising:

a pump unit (10), having an inlet port (26) and an outlet port (28);
a suction hose (22), having one end connected to the inlet port (26) of the pump unit (10), and having a sucking end (23) inserted into the tank

- (30) through a first opening (31); and a return hose (24), having one end connected to the outlet port (28) of the pump unit (10), and having a returning end (25) inserted into the tank (30) through a second opening (32); wherein the pump unit (10) is driven to suck the liquids from the tank (30) via the suction hose (22), and return the liquids back to the tank (30) via the return hose (24).
2. The mixing device (100) as claimed in claim 1, wherein the pump unit (10) is detachably mounted to the tank (30) and comprises a shaft driven pump (20), and wherein a shaft (21) of the shaft driven pump (20) is driven by a rotational tool (36).
 3. The mixing device (100) as claimed in claim 2, wherein the rotational tool (36) comprises a drill (40) that rotates the shaft (21) of the pump (20) with a predetermined rotational speed to allow the liquids to flow through the pump (20).
 4. The mixing device (100) as claimed in claim 3, wherein the liquid flow through the pump (20) is equal to or is greater than 40L/min.
 5. The mixing device (100) as claimed in claim 3, wherein the predetermined rotational speed is equal to or is greater than 2000rpm.
 6. The mixing device (100) as claimed in any preceding claim, wherein the liquids are mixed for a minimum time of one minute.
 7. The mixing device (100) as claimed in any preceding claim, wherein the sucking end (23) of the suction hose (22) is inserted to be near the bottom of the tank (30), and the returning end (25) of the return hose (24) is inserted to be below and near the top level of the liquids in the tank (30).
 8. The mixing device (100) as claimed in any preceding claim, further comprising a flow control element (34) located on the outlet port (28) of the pump (20) or in the return hose (24), the flow control element (34) is configured to control the flow velocity on the returning end (25) of the return hose (24) to be higher than the flow velocity on the sucking end (23) of the suction hose (22).
 9. The mixing device (100) as claimed in any preceding claim, wherein a diameter of the return hose (24) is smaller than a diameter of the suction hose (22).
 10. The mixing device (100) as claimed in any preceding claim, wherein the return hose is a transparent hose.
 11. The mixing device (100) as claimed in any preceding claim, wherein the liquids mixed by the mixing device (100) is used in a fire suppression system of the mobile machinery equipment.
 12. A liquid mixing system used for a mobile machinery equipment, the liquid mixing system comprising:
 - a tank that holds a mixture of at least two liquids; the dismountable mixing device as claimed in claims 1-11; and
 - a rotational tool that drives the pump unit of the mixing device, so as to mix the liquids in the tank.
 13. A liquid mixing method (500) for initial mixing at least two liquids inside a tank (30) of a mobile machinery equipment, the mixing method (500) comprising:
 - connecting a suction hose (22) to an inlet port (26) of a pump unit (10), and inserting the suction hose (22) through a first opening (31) on the tank (30);
 - connecting a return hose (24) to an outlet port (28) of the pump unit (10), and inserting the return hose (24) through a second opening (32) on the tank (30);
 - driving the pump unit (10) to suck the liquids from the tank (30) via the suction hose (22), and to return the liquids back to the tank (30) via the return hose (24); and
 - removing the suction hose (22) and the return hose (24) from the tank (30) after the initial mixing.
 14. The liquid mixing method (500) as claimed in claim 13, wherein the step of driving the pump unit (10) comprises:
 - driving a shaft driven pump (20) of the pump unit (10) by using a rotational tool (36) that has a rotational speed of at least 2000rpm; and
 - driving the pump for at least one minute.
 15. The liquid mixing method (500) as claimed in any one of claims 13-14, further comprising:
 - controlling the flow velocity in the return hose (24) to be higher than the flow velocity in the suction hose (22).
 16. The liquid mixing method (500) as claimed in any one of claims 13-15, wherein the step of inserting the suction hose (22) comprises inserting a sucking end (23) of the suction hose (22) to be near the bottom of the tank (30), and wherein the step of inserting the return hose (24) comprises inserting a returning end (25) of the return hose (24) to be below and near the top level of the liquids in the tank (30).
 17. The liquid mixing method (500) as claimed in any

one of claims 13-16, further comprising:

mounting the pump unit (10) to the tank (30) for
the initial mixing; and
dismounting the pump unit (10) after the initial 5
mixing.

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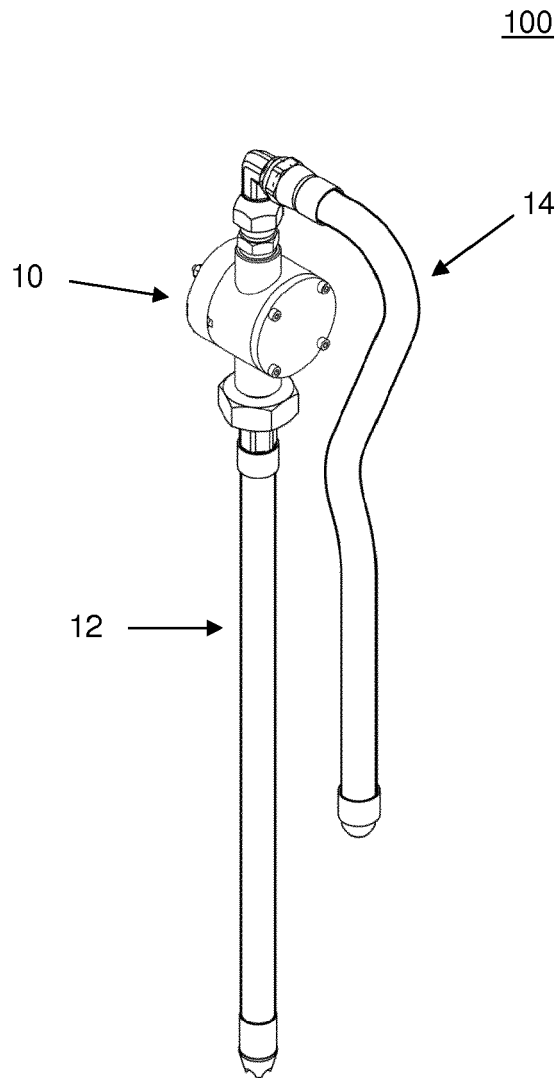


FIG.1

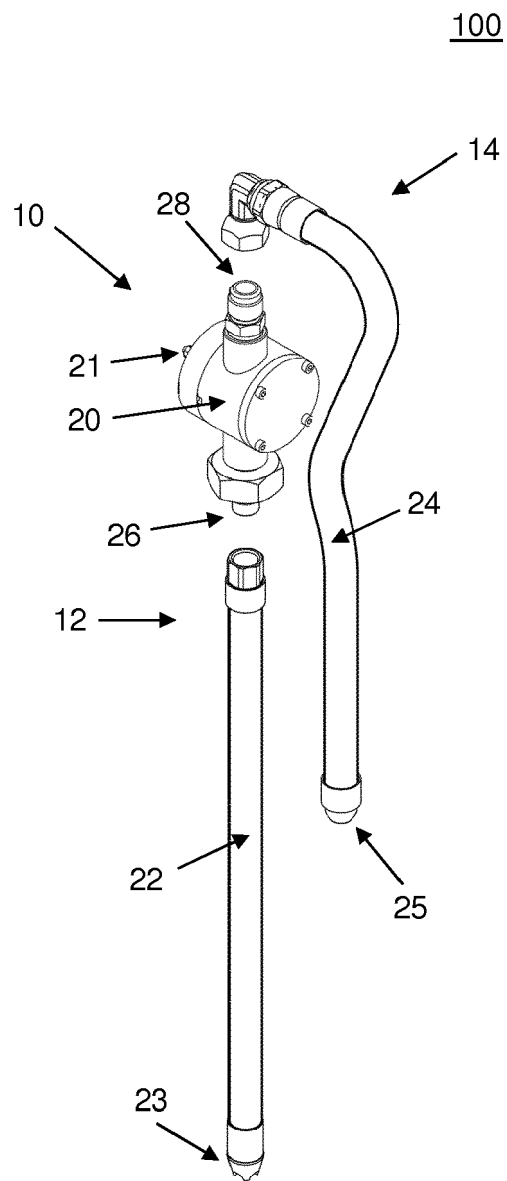


FIG.2

300

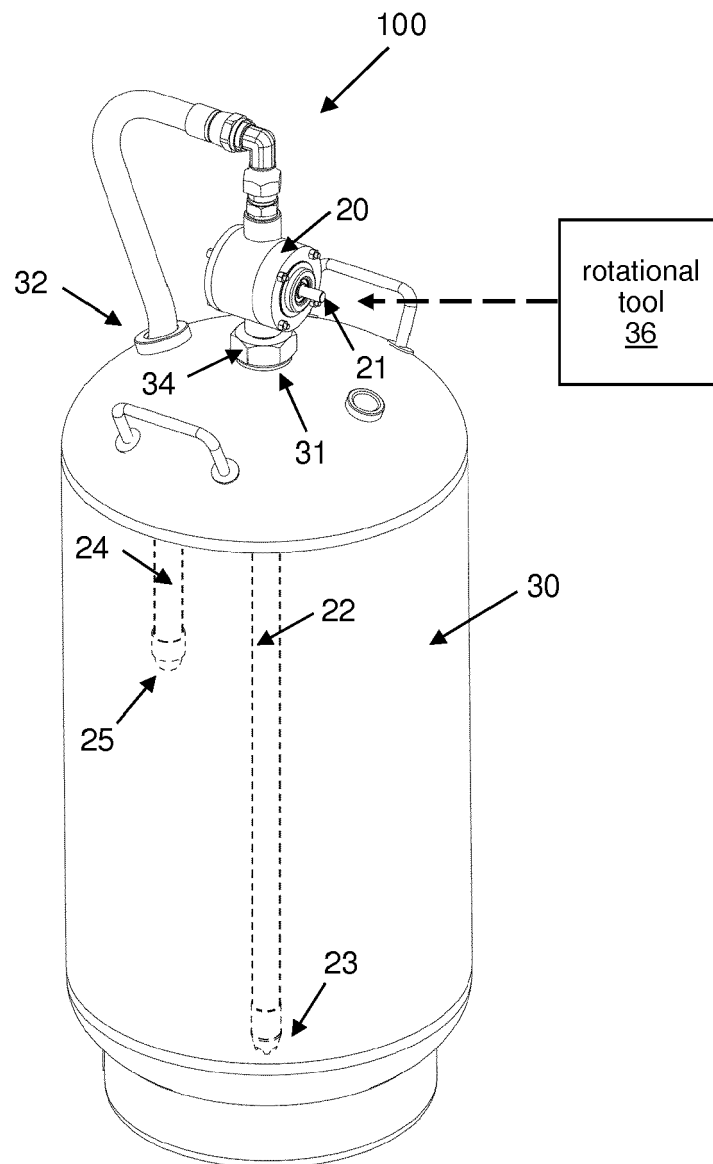


FIG.3

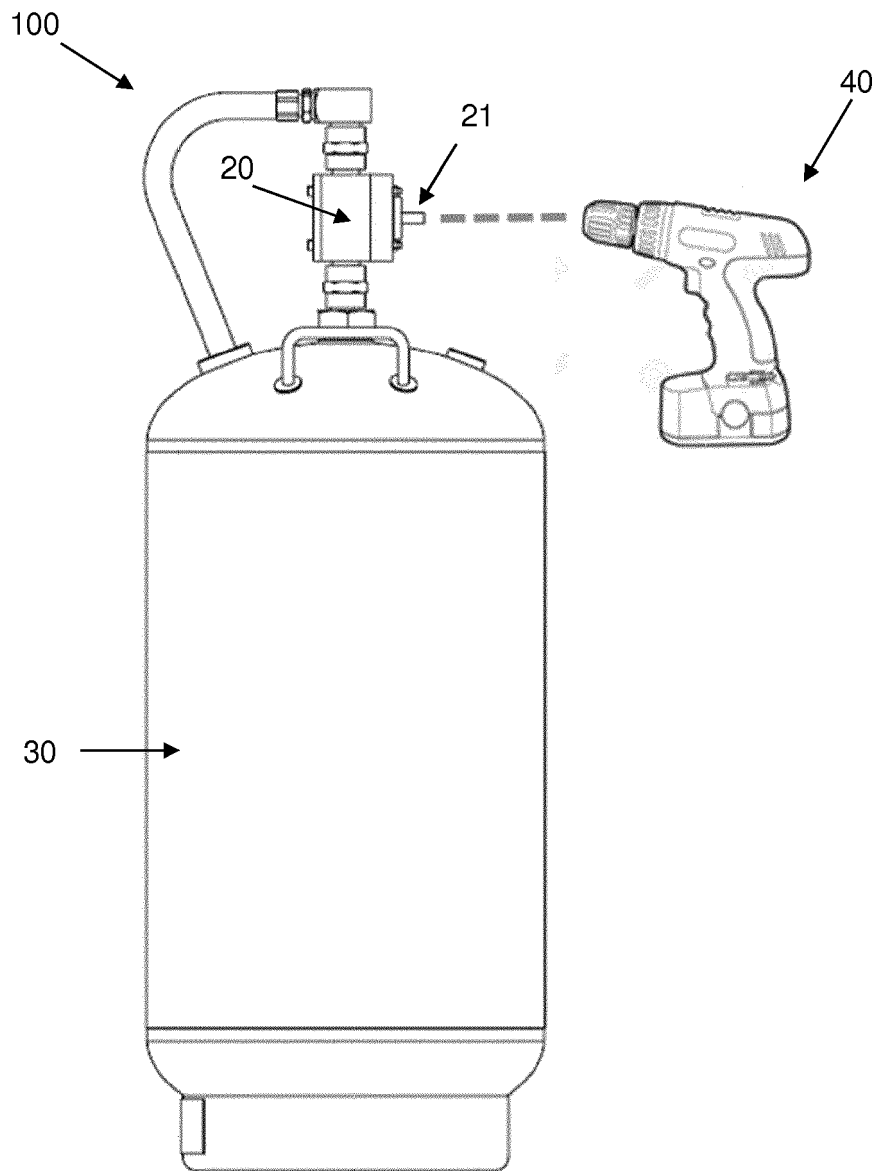


FIG.4

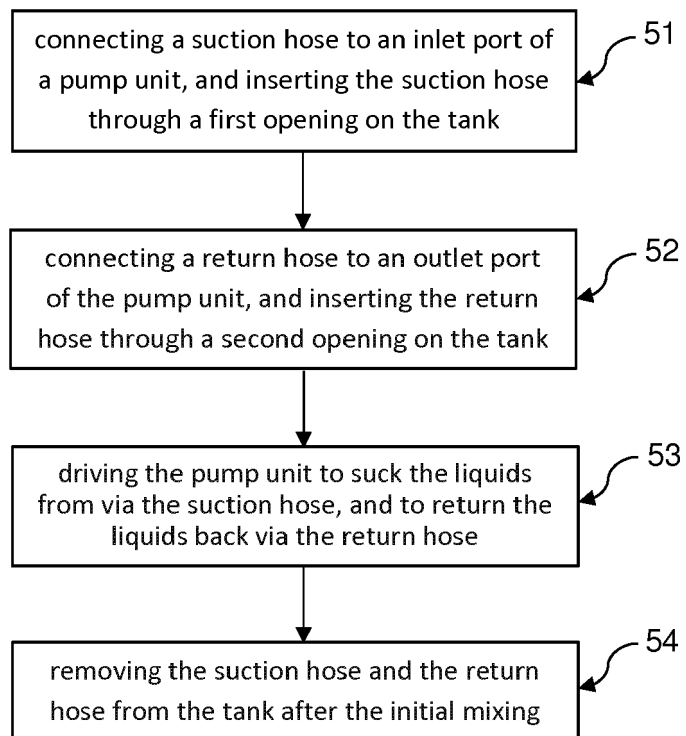
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FIG.5



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 18 2202

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraph [0002] - paragraph [0005] * * paragraph [0007] * * paragraph [0021] - paragraph [0023] * * paragraph [0025] * * paragraph [0028] * * figures *	3,10,11	
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A	* claim 1 * * figure 2 *	8,9,15	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 May 2019	Examiner Real Cabrera, Rafael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 May 2019	Examiner Real Cabrera, Rafael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 18 18 2202

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 18 18 2202

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-9, 12-17

Dismountable mixing device comprising a pump, wherein the pump is driven by a drill.

2. claim: 10

Dismountable mixing device comprising a transparent return hose.

3. claim: 11

Dismountable mixing device being used is a fire suppression system.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 18 2202

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-05-2019

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