



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.11.2017 Bulletin 2017/46

(51) Int Cl.:
C23C 22/02 (2006.01) **C23C 22/05** (2006.01)
C23C 22/77 (2006.01) **B43M 11/08** (2006.01)
B43K 5/18 (2006.01)

(21) Application number: **17170451.3**

(22) Date of filing: **10.05.2017**

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

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(30) Priority: **10.05.2016 US 201615151114**

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(54) **CONVERSION COATING TREATMENT**

(57) A kit for applying a coating includes a first hand-held container (10a) with a first liquid trivalent chromium salt composition disposed therein. A first applicator (14a) is disposed in fluid communication with the first container and is configured to dispense the first composition. The kit also includes a second handheld container (10b) having a second liquid oxidizing agent composition disposed therein. A second applicator (14b) is disposed in fluid communication with the second container and is configured to dispense the second composition.

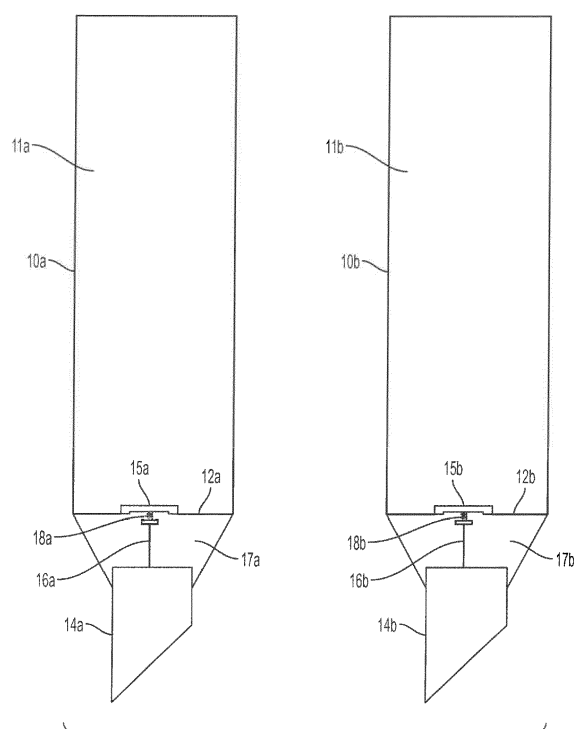


FIG. 1

Description

BACKGROUND

[0001] This disclosure relates to coatings for corrosion protection, and more specifically to conversion coatings for corrosion protection of metal substrates.

[0002] Many metals are subject to corrosion, which can be exacerbated by exposure to corrosion-promoting environmental conditions such as high-chloride environments found in proximity to marine environments. Surface coatings have been used to provide protection against corrosion by imposing a physical barrier between the metal substrate and the surrounding environment. However, conventional polymer surface coatings can suffer from a number of problems such as inadequate or uneven thickness, pinholes and other gaps in coating coverage, and the necessity of extensive surface preparation of the substrate prior to application of the coating in order to provide adequate bonding between the coating and the substrate, in addition to the cost, time and complexity of applying the polymer coating.

[0003] Metal surface treatments such as conversion coatings have been used to protect metals such as aluminum, zinc, cadmium, tin, magnesium, iron, copper, silver, and their alloys such as zinc-nickel, tin-zinc, etc. Conversion coating compositions have been commonly applied to large surface area substrates by immersion or spray application. Such techniques, however, can be cumbersome for touch-up application such as to repair abraded surfaces or at connection interfaces between assembled metal components. Small scale handheld application of conversion coatings has been performed with felt pen-style applicators. Historically, chromate conversion coatings utilizing hexavalent chromium have been effectively used to provide corrosion protection. However, the use of hexavalent chromium is largely in the process of being discontinued due to toxicity concerns. Touch-up conversion coatings based on trivalent chromium have been applied with felt pen-style applicators; however, such trivalent conversion coatings have been found to be less effective at preventing corrosion than conversion coatings based on hexavalent chromium.

BRIEF DESCRIPTION

[0004] According to some aspects of this disclosure, a kit for applying a coating comprises a first handheld container comprises a first liquid composition disposed therein that comprises a trivalent chromium salt. A first applicator is disposed in fluid communication with the first container and is configured to dispense the first composition. The kit also includes a second handheld container comprises a second liquid composition disposed therein comprising an oxidizing agent. A second applicator is disposed in fluid communication with the second container and is configured to dispense the second composition.

[0005] In some aspects, a method of using the above-described kit comprises applying a coating of the first composition to a substrate, allowing a drying period of time to pass, applying the second composition to the coated substrate, and maintaining a wet layer of the second composition on the coated substrate for at least 0.5 minutes.

[0006] In some aspects, a method of protecting a trivalent chromium conversion-coated substrate from corrosion comprises contacting the substrate with a porous pad disposed on an end of an oblong handheld housing in fluid communication with a chamber disposed within the housing, and dispensing a liquid composition comprising an oxidizing agent disposed in the chamber onto the substrate through the porous pad.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The subject matter which is regarded as the present disclosure is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the present disclosure are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic depiction of a cross-sectional view of an example embodiment of a kit for applying a conversion coating; and

FIG. 2 is a schematic depiction of a cross-sectional view of another example embodiment of a kit for applying a conversion coating.

DETAILED DESCRIPTION

[0008] With reference now to the Figures, FIG. 1 schematically depicts an example embodiment of a kit for applying a conversion coating. As shown in FIG. 1, a first container in the form of housing 10a has a liquid composition comprising a trivalent chromium salt disposed in chamber 11a formed by the housing 10a and barrier 12a. A second container in the form of housing 10b has a liquid composition comprising an oxidizing agent disposed in chamber 11b formed by the housing 10b and barrier 12b. The housings 10a and 10b can be configured in various shapes, sizes, and forms in order to facilitate being held by hand during use. In some embodiments, the housings are configured in an oblong configuration as depicted in FIG. 1. In some embodiments, an oblong housing can have a maximum linear dimension in a cross-sectional plane perpendicular to the longest oblong axis in ranges having a lower endpoint of 5 mm, more specifically 10 mm, and even more specifically 15 mm, and an upper endpoint of 50 mm, more specifically 40 mm, more specifically 30 mm, and even more specifically 25 mm. In some embodiments, an oblong housing can be configured as a cylinder. Such embodiments can also be re-

ferred to as a "coating pen" or "coating pens". In some embodiments, the cylinder can have a diameter in ranges having a lower endpoint of 5 mm, more specifically 10 mm, and even more specifically 15 mm, and an upper endpoint of 50 mm, more specifically of 40 mm, more specifically 30 mm, and even more specifically 25 mm. The above upper and lower endpoints can be independently combined to disclose various different ranges.

[0009] In some embodiments, the trivalent chromium salt composition can be an aqueous solution or a non-aqueous solution comprising trivalent chromium and various anions. Exemplary anions include nitrate, sulfate, phosphate, and/or acetate. Specific exemplary trivalent chromium salts can include $\text{Cr}_2(\text{SO}_4)_3$, $(\text{NH})_4\text{Cr}(\text{SO}_4)_2$, $\text{KCr}(\text{SO}_4)_2$, CrF_3 , $\text{Cr}(\text{NO}_3)_3$, and mixtures comprising any of the foregoing. The concentration of the trivalent chromium salt in the composition, per liter of solution, can range from about 0.01 g to about 22 g, more specifically from about 3 g to about 12 g, and even more specifically from about 4 g to about 8.0 g. Embodiments of compositions and the application thereof to substrates are described in US Patent Nos. 5,304,257, 5,374,347, 6,375,726, 6,511,532, 6,521,029, and 6,511,532. Various additives and other materials can be included in the composition comprising trivalent chromium as disclosed in the patent literature, and the trivalent chromium salt composition can be selected from any of a number of known commercially-available compositions.

[0010] In some embodiments, the oxidizing agent can be a peroxide or a permanganate salt. In some embodiments, the oxidizing agent is hydrogen peroxide (H_2O_2). Examples of peroxides other than hydrogen peroxide include inorganic peroxides (e.g. Li_2O_2 , Na_2O_2 , K_2O_2 , BaO_2), and organic peroxides (e.g., R-OO-R' , R-OO-H , or RCO-OO-R' , where R, and R' are organic groups). The oxidizing agent can be in aqueous or non-aqueous solutions at concentrations in ranges having a lower endpoint of 0.1 wt.%, more specifically 0.5 wt.%, more specifically 1.0 wt.%, more specifically 2.0 wt.%, more specifically 3.0 wt.%, and more specifically 4.0 wt.%, and an upper endpoint of 10.0 wt.%, more specifically 9.0 wt.%, more specifically 8 wt.%, more specifically 7 wt.%, more specifically 6 wt.%, more specifically 4 wt.%, and even more specifically 3.5 wt.%. The above upper and lower endpoints can be independently combined to disclose various different ranges.

[0011] The compositions in the chambers 11a, 11b can be dispensed by bringing the liquid compositions in the chambers 11a, 11b into contact with the dispensing applicators 14a, 14b, respectively. Each dispensing applicator 14a, 14b can independently be selected as a porous material configured to transport the liquid composition from the respective chamber 11a, 11b to a substrate in contact with the outer surface of the applicator 14a, 14b. The liquid composition can be brought into contact with the applicator 14a, 14b by bringing the dispensing applicator 14a, 14b into contact with a fixed-position surface (which can but does not have to be the substrate to be

coated) and applying hand pressure on the housing 10a, 10b toward the surface to open the poppet valve 15a, 15b. The dispensing applicators 14a, 14b are slideably mounted in the housing 10a, 10b. At rest, the dispensing applicators 14a, 14b are biased away from the main body of the housing 10a, 10b by applicator biasing members (not shown) to an at-rest position as shown in FIG. 1. This biasing force is transmitted through actuator 16a, 16b to apply an expansive force on the spring member 18a, 18b, which in turn acts on the poppet valve 15a, 15b to keep it engaged on the barrier 12a, 12b and closed. Upon the application of hand pressure urging housing 10a, 10b toward the surface, the counteracting force of the surface acting on the dispensing each applicator 14a, 14b compresses the spring member 18a, 18b until the fully compressed spring and actuator engage against the poppet valve 15a, 15b and displace it away from the barrier 12a, 12b to open the poppet valve 15a, 15b. Hand pressure can be maintained to keep the poppet valve open for a period of time sufficient to charge a desired quantity of liquid into chamber 17a, 17b, at which point the hand pressure can be removed or relaxed so that the applicator biasing members again bias the applicators 14a, 14b to the at-rest position with the poppet valve 15a, 15b closed. Liquid in the chamber 17a, 17b can then continue to be delivered and spread on the substrate. Of course, the applicators 14a, 14b are not limited to porous pads. The applicators 14a, 14b could also be independently selected from brushes, rollers, nozzles, etc. When not in use, the applicators 14a, 14b can be covered with an air- and liquid-tight cap.

[0012] Another example embodiment of a kit is schematically depicted in FIG. 2, in which the first and second containers are configured as first and second chambers 11a, 11b formed by housing 10 and barrier 20, with applicators 14a, 14b disposed at opposing ends of the oblong or cylindrical housing 10. The remaining components and features depicted in FIG. 2 and their operation are as in FIG. 1, and do not require further explanation. The embodiment depicted in FIG. 2 provides additional technical benefits of convenience and efficiency, while reducing the potential for cross-contamination between the compositions by delivering the two distinct chemical compositions through applicators disposed on opposite ends of a coating pen.

[0013] In some embodiments, avoidance of contamination from chromium salts on the substrate being coated into the second container comprising the oxidizing agent composition is promoted by contamination-avoiding materials or components. In some embodiments, the applicator 14b can be formed from a material that is resistant to wicking of material from the coated substrate into the chamber 17b from which it could potentially infiltrate to the chamber 11b when the poppet valve 15b is open. Such materials can include surfaces that are resistant to wetting by the coated chromium salt composition. In some embodiments, the poppet valve 15b can include check-valve features (not shown, but known in the valve

art) to prevent migration of fluid from chamber 17b into chamber 11b. In some embodiments, anti-contamination procedures can be followed such as draining or flushing the chamber 17b after application is complete, or using a surface other than the coated substrate for displacing the applicator 14b to charge the chamber 17b so that the poppet valve 15b is closed before the applicator 14b comes into contact with the coated substrate. Combinations of the above materials or procedures can be used as well.

[0014] In some embodiments, the first liquid composition comprising the trivalent chromium salt can be allowed to contact the substrate for a period of time before applying the second composition comprising the oxidizing agent, and in some embodiments the kit can include instructions to that effect. The amount of contact time can vary considerably depending on the ambient temperature and humidity, the specific properties of the applicator and the liquid composition, and the thickness with which it is applied. Any amount of contact time greater than zero can be used. In some embodiments, contact times can range from 1 minute to 5 minutes. In some embodiments, contact times can range from 1 minute to 3 minutes.

[0015] In some embodiments, a wet layer of the second liquid composition comprising the oxidizing agent is maintained on the coated substrate for a minimum period of time. Although this disclosure is not bound by any theory of operation, it is believed that the wet layer promotes chemical interaction of the oxidizing agent with the trivalent chromium salt composition. Examples of minimum wet layer time limits can include 0.5 minutes, more specifically 1 minute, more specifically 1.5 minutes, more specifically 2 minutes, more specifically 3 minutes, more specifically 4 minutes, and even more specifically 5 minutes. Theoretically there is no maximum wet layer time; however, minimization of the opportunity costs of lost efficiency typically results in drying times that do not drastically exceed the specified minimum wet layer time. In some embodiments, a wet layer of the second liquid composition comprising the oxidizing agent is maintained by making a plurality of passes over the substrate with the applicator 14b, and in some embodiments the kit can include instructions to that effect. In some embodiments, the second liquid composition can be configured to maintain a wet layer for a target duration, e.g., through the inclusion of additives such as gel or thickening agents (e.g., fused silica, water soluble polymers) or lower volatility solvents. Moisture can also be retained by film-forming agents in the first composition such as sodium or potassium salts of hexafluorotitanic acid or hexafluorozirconic acid, or the selection of a chromium salt with colligative properties such as high solubility that render it inherently slow-drying.

[0016] While the present disclosure has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the present disclosure is not limited to such disclosed em-

bodiments. Rather, the present disclosure can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the scope of the present invention as defined by the claims. Additionally, while various embodiments of the present disclosure have been described, it is to be understood that aspects of the present disclosure may include only some of the described embodiments. Accordingly, the present disclosure is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

Claims

1. A kit for applying a conversion coating, comprising:
 - a first handheld container (10a) comprising a first liquid composition disposed therein that comprises a trivalent chromium salt;
 - a first applicator (14a) in fluid communication with the first container configured to dispense the first composition;
 - a second handheld container (10b) comprising a second liquid composition disposed therein comprising an oxidizing agent; and
 - a second applicator (14b) in fluid communication with the second container configured to dispense the second composition.
2. The kit of claim 1, comprising a housing (10) that comprises a first chamber (11a) as said first container and a second chamber as said second container (11b).
3. The kit of claim 1, comprising an oblong handheld housing that comprises a first chamber (11a) as said first container and a second chamber (11b) as said second container, the first applicator (14a) comprising a porous pad disposed at a first end of the oblong housing in fluid communication with the first chamber, and the second applicator (14b) comprising a porous pad disposed at a second end of the oblong housing in fluid communication with the second chamber.
4. The kit of claim 1, comprising a first housing (10a) that comprises a first chamber (11a) as said first container, and a second housing (10b), separate from the first housing, that comprises a second chamber (11b) as the second container.
5. The kit of claim 4, comprising a first oblong handheld housing that comprises a first chamber as said first container and the first applicator (14a) comprising a porous pad disposed at an end of the first oblong housing in fluid communication with the first cham-

- ber, and a second oblong housing that comprises a second chamber as said second container and the second applicator (14b) disposed at an end of the second oblong housing comprising a porous pad in fluid communication with the second chamber. 5
6. The kit of any of claims 1-5, wherein the applicators are each independently selected from porous pads, brushes, rollers, or nozzles. 10
7. The kit of any of claims 1-6, wherein the applicator in fluid communication with the second container is configured to make contact with a substrate to apply the second composition to the substrate, and wherein the second container and the applicator in fluid communication with it are configured to prevent fluid communication from the applicator to the second container. 15
8. The kit of any of claims 1-7, wherein the oxidizing agent is selected from a peroxide, a permanganate salt, or combinations comprising the foregoing. 20
9. The kit of claim 8, wherein the oxidizing agent comprises hydrogen peroxide. 25
10. The kit of claim 9, wherein the second composition comprises 0.1 wt.% to 10 wt.% hydrogen peroxide, based on the total weight of the second composition. 30
11. The kit of any of claims 1-10, wherein the second liquid composition is configured to stay wet on a substrate for at least 0.5 minutes. 35
12. The kit of any of claims 1-11, further comprising instructions to apply a plurality of passes of the second composition to a substrate at intervals configured to maintain a wet layer of the second composition on the substrate for at least 0.5 minutes, or instructions to allow a drying period of time after application of the first composition to a substrate before applying the second composition, or both instructions to apply a plurality of passes of the second composition to a substrate at intervals configured to maintain a wet layer of the second composition on the substrate for at least 0.5 minutes and instructions to allow a drying period of time after application of the first composition to a substrate before applying the second composition. 40 45 50
13. A method of using the kit of any of claims 1-12, comprising applying a coating of the first composition to a substrate, allowing a drying period of time to pass, applying the second composition to the coated substrate, and maintaining a wet layer of the second composition on the coated substrate for at least 0.5 minutes. 55
14. A method of protecting a trivalent chromium conversion-coated substrate from corrosion, comprising contacting the substrate with a porous pad disposed on an end of an oblong handheld housing in fluid communication with a chamber disposed within the housing, and dispensing a liquid composition comprising an oxidizing agent disposed in the chamber onto the substrate through the porous pad, and maintaining a wet layer of the liquid composition on the substrate for at least 0.5 minutes.
15. The method of claims 13 or 14, comprising applying a plurality of passes of the second composition or the liquid composition, respectively, to the substrate at intervals to maintain a wet layer on the substrate for at least 0.5 minutes, or optionally for at least 3 minutes or for at least 5 minutes.

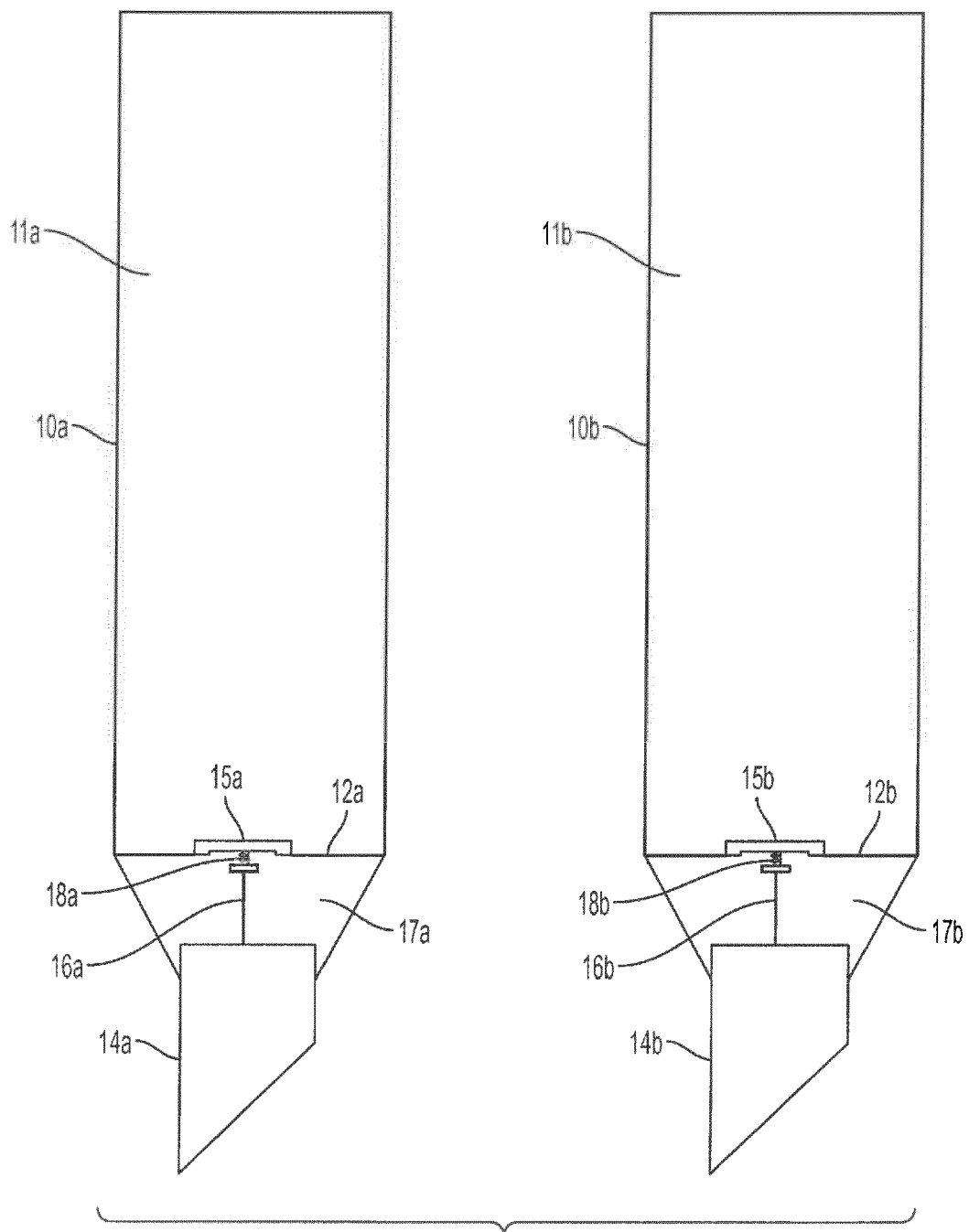


FIG. 1

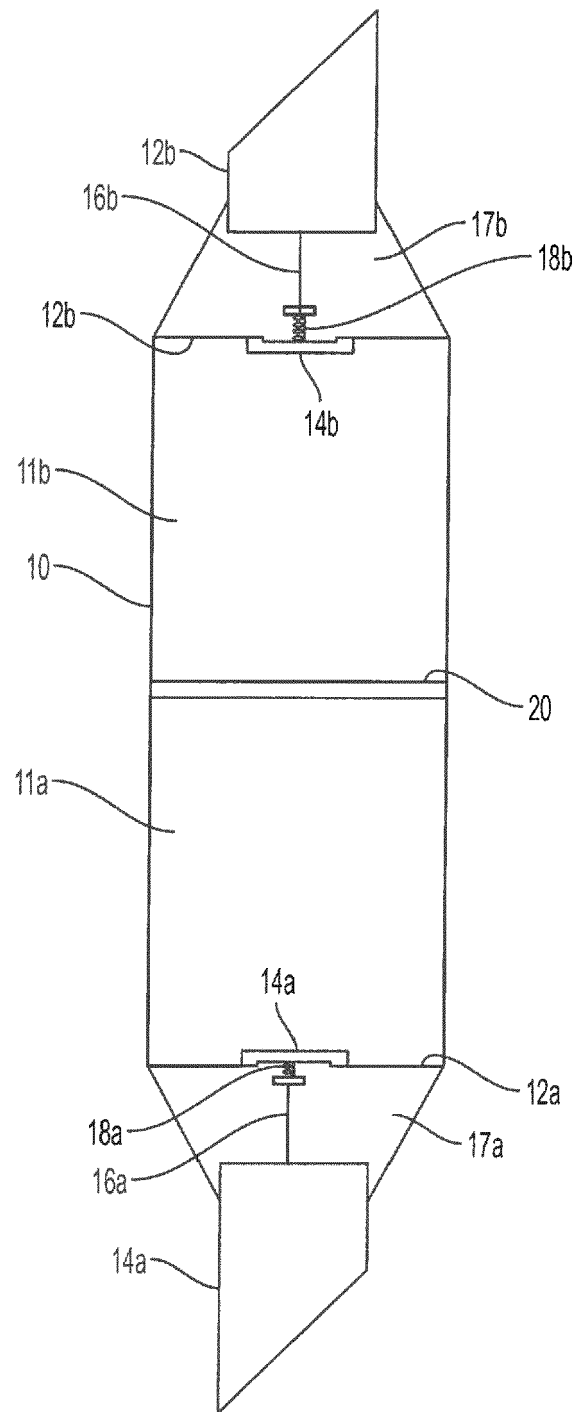


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 0451

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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 September 2017	Examiner Schwake, Andree
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ON EUROPEAN PATENT APPLICATION NO.**

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