(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 508 307 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.06.2022 Bulletin 2022/24

(21) Application number: **18150389.7**

(22) Date of filing: **05.01.2018**

(51) International Patent Classification (IPC):
B24C 9/00 *(2006.01)* ***B24C 3/06*** *(2006.01)*
B08B 15/02 *(2006.01)* ***B05B 16/80*** *(2018.01)*

(52) Cooperative Patent Classification (CPC):
B24C 9/00; B08B 15/02; B24C 3/06; B24C 3/065; B24C 9/003; B08B 3/026; B08B 5/02; B08B 9/023

(54) **A FRAMELESS CONTAINMENT SYSTEM WITH MAGNETIC LOCKING MEANS**

RAHMENLOSES RÜCKHALTESYSTEM MIT MAGNETISCHEN VERRIEGELUNGSMITTELN

SYSTÈME DE CONFINEMENT SANS CADRE AVEC MOYENS DE VERROUILLAGE MAGNÉTIQUE

(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

(43) Date of publication of application:
10.07.2019 Bulletin 2019/28

(73) Proprietor: **Pinovo AS**
5225 Nesttun (NO)

(72) Inventor: **Njaa, Torleiv**
5223 Nesttun (NO)

(74) Representative: **Plougmann Vingtoft a/s**
Strandvejen 70
2900 Hellerup (DK)

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a frameless containment system with magnetic locking means.

BACKGROUND OF THE INVENTION

[0002] When performing maintenance work, such as abrasive blasting operations, it is often desirable to be able to reduce dissemination of particles, such as debris, dust or blasting media. To protect surrounding equipment, installations and nearby personnel, it is thus often necessary to build a containment system or enclosure around an area that needs to be maintained.

[0003] Enclosures of this type are often constructed from a large rigid frame covered by a membrane material.

[0004] As an alternative to the use of rigid frames, flexible enclosure have shown better versatility.

[0005] For example, WO 2016/198419 discloses a frameless containement system for providing a substantially dust-tight working space surrounding a work area. However, ensuring substantially dust-tight connection along the edges of the working area protected by the enclosure have shown to be not straight forward. Abrasive blasting operations and other operations involving flying particles may also pose a serious liability to the operator performing the operation. Thus, tightness of the enclosure around the edges of the working area is rather crucial to avoid undesired distribution of particles in the vicinity of the working area. Unfortunately, the joining of the edges of these enclosures around the edges of the working area is very often not sufficient requiring more permanent additional sealing means to provide substantially dust-tight connection. However, more permanent additional sealing means reduce the versatility and the removal of the enclosure when blasting operations are terminated.

[0006] Furthermore, permanent additional sealing means, such as glue, has also the disadvantage that they may contaminate the working area leading eventually to a less efficient treatment of the working area.

[0007] Hence, there is a need for a system ensuring dust-tight connection between the enclosure and the edges of the working area defined by the enclosure.

[0008] Hence, an improved containment system would be advantageous, and in particular a containment system that ensure dust-tight connection between the edges of the working area and the areas surrounding the enclosure.

OBJECT OF THE INVENTION

[0009] An object of the present invention is to provide a dust tight containment system ensuring dust-tight connection between the edge of the containment system and the edge of the working area.

[0010] In particular, it may be seen as an object of the present invention to provide a frameless containment system that solves the above-mentioned problems of the prior art with a removable sealing mean.

[0011] An object of the present invention may be seen as to provide an alternative to the prior art.

SUMMARY OF THE INVENTION

[0012] Thus, the above described object and several other objects are intended to be obtained in a first aspect of the invention by providing a frameless containment system according to claim for providing a substantially dust-tight working space surrounding a work area, such as a work area on a ferritic or magnetic surface, the frameless containment system comprising: a flexible enclosure comprising one or more flexible sheets adapted to be placed around the work area, the one or more flexible sheets comprising an outlet for releasing gas and particles and tides, one or more gas inlet devices; wherein the flexible enclosure, when placed around the work area, defines a dust-tight working space through magnetic means, located, at least partially, within the edge of the flexible enclosure. When assembled, said flexible enclosure comprises one or more wedge shaped elements between said magnetic means and said working area, wherein said one or more wedge shaped elements comprise said outlet for releasing gas and particles and said one or more gas inlet devices.

[0013] The flexible enclosure is adapted to be placed, positioned or assembled around the work area.

[0014] The outlet for releasing gas and particles may release gas vapors and material originated from the actions, such as surface treatments, performed underneath the flexible enclosure.

[0015] The outlet for releasing gas and particles may be connected to a suction hose so as to allow removal of gas and particles by suction.

[0016] The flexible enclosure may be composed by one or more flexible sheets having a plurality of edges adapted to be assembled providing a main body section. The plurality of edges of the flexible sheets may be adapted for being assembled around structures extending in and out of the working space. The magnetic means may be located, at least partially, within the edge of the flexible enclosure defined by the boundaries or plurality of edges of the one or more flexible sheets.

[0017] In some embodiments, the one or more flexible sheets are made from a transparent polymer-based material. It is thus possible to see through the flexible enclosure during operation of the blasting nozzle or the like positioned inside the enclosure. More specifically the material may be a polyethylene composition comprising flame-retardants and/or antistatic agents. Antistatic or electrically dissipative properties may prevent dust from attaching to the inside of the flexible enclosure, hence, preserving visibility.

[0018] In some further embodiments, the one or more

flexible sheets are made of different materials.

[0019] In some embodiments, the one or more gas inlet devices are adapted to introduce compressed fluids, such as gas or liquids, into the flexible enclosure, thereby keeping the frameless containment erected. The containment is thus kept erected without the need of a frame.

[0020] In some further embodiments, the one or more gas inlet devices are adapted to introduce compressed fluids, such as gas or liquids, and particles, thereby allowing for introduction of materials suitable for surface treatment within the work area.

[0021] The one or more gas inlet devices may thus be used for both keeping the frameless containment system erected and for introducing materials to perform surface treatment.

[0022] In some embodiments, the one or more gas inlet devices comprise a second gas inlet device which is adapted to keep the frameless containment system erected.

[0023] In some embodiments, the work area is a surface to be subjected to a surface treatment such as abrasive blasting or painting.

[0024] In some further embodiments, the outlet for releasing gas and particles is configured for connecting a vacuum device for drawing gas and particles out of the flexible enclosure.

[0025] Thus, the outlet may be configured for connecting to a suction hose.

[0026] In some embodiments, the frameless containment system further comprising a vacuum device connected to the outlet for releasing gas and particles, the vacuum device suitable for drawing gas and particles out of the flexible enclosure.

[0027] In some further embodiments, the magnetic means comprise permanent magnets arranged in a chain structure.

[0028] For example, the permanent magnets may be block-shaped permanent magnets arranged in a chain structure.

[0029] In some embodiments, the magnetic means comprises electromagnets.

[0030] The chain structure may comprise nonmagnetic materials.

[0031] In some embodiments, the magnetic means are attached to the edge of the flexible enclosure.

[0032] The magnetic means maybe within the edge of the flexible enclosure or attached to or within the plurality of edges of the flexible sheets.

[0033] In some embodiments, the magnetic means are located within sleeves at the edge of the flexible enclosure.

[0034] The sleeves may comprise metallic materials, such as metallic braids.

[0035] The sleeves may also comprise plastic, rubber or other materials.

[0036] In some embodiments, the magnetic means has a magnetic strength between 0.3 N/mm to 30 N/mm, such as between 1 N/mm and 5 N/mm.

[0037] The force measured when pulling the magnets from the surface, depends on the strength of the magnet and the distance from the magnet to the ferritic surface or to another magnet. The strength of the magnet depends on the quality of material and the size and shape of the magnet. The distance is defined by the thickness of the braid, such as a metallic braid, the sheeting thickness and the thickness of the surface treatment, such as the paint, or other surface substances, such as the one produced by corrosion. The resultant pull force is defined in N/mm, wherein the length measurement relates to the length of the magnetic means, such as a magnetic chain.

[0038] In practical use, the wanted pull force is typically between 0.3 N/mm to 2 N/mm. As distance between the magnets and the ferritic surface or another magnet, can typically differ from 0.1 mm to 15 mm depending on the thickness of the paint, braid and sheeting, the magnet force of the magnets measured when pulling the magnets from a plane steel surface, 5 mm thick, can differ between 0.3 N/mm to 30 N/mm, when measured on a row of magnets from 50 to 100 mm long.

[0039] Magnets come in different temperature classes, and for work on hot surfaces a suitable temperature class should be chosen.

[0040] The magnets are assembled with alternated polarity.

[0041] The magnetic means has a magnetic strength between 1 N/mm and 5 N/mm when measured on a 5 mm thick steel plate with a roughness of 0-100 μm, wherein the length measurement relates to the length of the magnetic means, such as a magnetic chain.

[0042] The specific magnetic strength between 0.3 N/mm to 30 N/mm, such as between 1 N/mm and 5 N/mm, is necessary so as to allow for keeping the flexible enclosure attached to the work area during operation and at the same time allowing for removal after use.

[0043] In that, it is an optimized range in relation to the needs of the flexible enclosure, i.e. tight during operation but removable upon pulling action from the user. Thus, the magnetic means may comprise a row of permanent block shaped magnets placed inside a metallic braided sleeve. The ends of the sleeves may be closed with tape. The magnetic means are thus flexible and can be bent and can be attached and removed easily. This in turn allows for efficient fastening of the frameless containment system to magnetic/ferrous structures with complex structures.

[0044] In some further embodiments, the frameless containment system further comprises an inlet opening, such as a blasting hole, suitable for introducing compressed gas and particles.

[0045] The particles may be blasting media or paint, thus blasting may be achieved through a separate line via the inlet opening.

[0046] The one or more wedge shaped elements may comprise magnetic materials. The one or more wedge may thus be part of the magnetic locking system and provide a robust structure for the location of the outlet for

releasing gas and particles and the one or more gas inlet devices.

[0047] The edges of the one or more flexible sheets may be adapted to be joined onsite during assembly of the flexible enclosure around the work area. Additionally, some of the edges, such as the edges of the parts of the flexible sheets defining the lower funnel-shaped section, may be pre-joined prior to delivery of the flexible enclosure.

[0048] The edges may also be adapted for being assembled around structures extending in and out of the working space, for example via magnetic means, such as one or more magnets or components comprising magnetic materials, located within the edges, to provide a substantially dust-tight connection.

[0049] In some embodiments, magnetic means may comprise additional magnetic means, such as one or more magnets located, at least partially, along the edges of the openings of the flexible enclosure so as to provide substantially dust-tight connection between the pipe and the flexible sheets.

[0050] The first, and other aspects of the present invention may each be combined with any of the other aspects and embodiments. These and other aspects and embodiments of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE FIGURES

[0051] The frameless containment system according to the invention will now be described in more detail with regard to the accompanying figures. The figures show one way of implementing the present invention and is not to be construed as being limiting to other possible embodiments falling within the scope of the attached claim set.

Figure 1A is a drawing of the frameless containment system comprising magnetic means according to an embodiment of the invention.

Figure 1B is a drawing of a frameless containment system comprising the magnetic means.

Figure 2 is a drawing of a frameless containment system comprising the magnetic means applied to a working area having a complex geometry.

Figures 3A and 3B are the front view and the perspective view of two flexible sheets assembled around a pipe structure.

Figures 4A and 4B are the perspective view and the front view of a frameless containment system assembled so as to surround a closed pipe structure.

Figure 5 is the perspective view of two flexible sheets assembled around a complex structure.

Figure 6 is a magnetic chain comprising a row of permanent block shaped magnets providing flexibility to the magnetic means according to some embodiments of the invention.

[0052] Figures 1B, 2, 3A, 3B, 4A, 4B and 5 show embodiments which are not in accordance with claim 1.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0053] Figure 1A is a drawing of the frameless containment system 1 comprising a magnetic chain 8 contained within the sleeves at the edge of the flexible enclosure 9. The presence of the flexible magnetic chain allow for a dust tight environment around the working area, in this example characterized by the presence of structure 4.

[0054] The frameless containment system 1 further comprises an inlet opening 2 suitable for introducing compressed gas and particles or fluids via a blasting hose 3.

[0055] The frameless containment system 1 is characterized by the presence of a wedge shaped element 7 ensuring magnetic bond between the magnetic chain 8 and the underneath edge of the working area. The wedge shaped element 7 comprises the outlet 5 for releasing gas and particles configured for connecting a vacuum device for drawing gas, thus suitable for connecting to a suction hose.

[0056] The wedge shaped element 7 also comprises the gas inlet device 6 adapted to introduce compressed fluids, such as gas or liquids, into the flexible enclosure.

[0057] Figure 1B is a drawing of a frameless containment system 19 comprising a magnetic chain 20 contained within the sleeves at the edge of the flexible enclosure 21. The presence of the flexible magnetic chain allow for a dust tight environment around the working area, in this example characterized by the presence of structure 22.

[0058] The frameless containment system 19 further comprises an inlet opening 23 suitable for introducing compressed gas and particles or liquids via a blasting hose 24.

[0059] The frameless containment system 19 is characterized by the presence of a suction hose 25 entering the frameless containment system 19 at the edge between the magnetic chain 20 and the working area surface. The inlet 26 for introducing the gas inlet device is separated from the suction hose 25 and located in a different position on the frameless containment system 19.

[0060] Figure 2 is a drawing of a frameless containment system 13 comprising magnetic means 14 fastening the frameless containment system 13 around a working area having a complex structure 18.

[0061] The frameless containment system 13 comprises an inlet opening suitable for introducing compressed gas and particles via a blasting hose 10.

[0062] The frameless containment system 13 comprises also a funnel-shaped section 15. By a funnel-shaped section of the flexible enclosure is meant that the sides of the flexible enclosure are inclined and gradually incline toward each other when seen in the direction towards the outlet opening. The sides of the flexible enclosure thus provides a funnel or V-shaped hollow terminating in the outlet opening 12. The gas inlet device 11 adapted to introduce compressed fluids, such as gas or liquids into the flexible enclosure enters the frameless containment system 13 also via the funnel-shaped section 15.

[0063] Figures 3A and 3B are the front view and the perspective view of two flexible sheets 27 and 30 assembled around a pipe structure 31.

[0064] This embodiment shows how two flexible sheets can be used to create a flexible enclosure defining a dust-tight working space around a pipe structure 31.

[0065] In this configuration, the magnetic chains 28 and 29 are attached to each other, thus this allow for the formation of a frameless containment system also around non-magnetic pipe structures, avoiding the need of other sealing means such as straps or tape.

[0066] In this configuration only one flexible enclosure, i.e. 27 has opening for suction hose 33, blasting hose 32 and gas inlet device 34.

[0067] Figures 4A and 4B are the perspective view and the front view of a frameless containment system 35 assembled so as to surround a closed pipe structure 36.

[0068] In this embodiment, the flexible enclosure 37 is assembled so as to define a dust tight working area around the closed pipe structure 36. In order to do so, the magnets of the magnetic chain 38 are partially attached to each other and partially attached to the closed pipe structure 36. This configuration allows also for defining a dust tight working area around pipes that are not metallic as the magnets are, at least partially, attached to each other.

[0069] Figure 5 is the perspective view of two flexible sheets 39 and 40 assembled around a complex structure 41. The magnets of the magnetic chains 42 and 43 are partially attached to each other and partially attached to the surface of the working area. The suction hose and the gas inlet device are present but not shown for the sake of simplicity.

[0070] This configuration can also be used in combination with the funnel-shaped section as shown in figure 2 or with separate openings within the sheets for the suction hose and the gas inlet device.

[0071] Figure 6 is a magnetic chain 17 comprising a row of permanent block shaped magnets 16 connected together and showing high degree of flexibility.

Claims

1. A frameless containment system (1) for providing a substantially dust-tight working space surrounding a work area, said frameless containment system (1) comprising:

   - a flexible enclosure (9) comprising one or more flexible sheets adapted to be placed around said work area, said one or more flexible sheets comprising an outlet (5) for releasing gas and particles;
   - one or more gas inlet devices (6);

   wherein said flexible enclosure (9) when placed around said work area, defines a dust-tight working space through magnetic means (8), located, at least partially, within the edge of said flexible enclosure;

   characterized in that,

   when assembled, said flexible enclosure (9) comprises one or more wedge shaped elements (7) between said magnetic means (8) and said working area and wherein said one or more wedge shaped elements (7) comprise said outlet (5) for releasing gas and particles and said one or more gas inlet devices (6).

2. A frameless containment system (1) according to claim 1, wherein said one or more gas inlet devices (6) is adapted to introduce compressed fluids, such as gas or liquids, into said flexible enclosure, thereby keeping the frameless containment erected.

3. A frameless containment system (1) according to any of the preceding claims, wherein said one or more gas inlet devices (6) is adapted to introduce compressed fluids, such as gas or liquids, and particles, thereby allowing for introduction of materials suitable for surface treatment within said work area.

4. A frameless containment system (1) according to any of the preceding claims, wherein said outlet (5) for releasing gas and particles is configured for connecting a vacuum device for drawing gas and particles out of said flexible enclosure.

5. A frameless containment system (1) according to any of the preceding claims, further comprising a vacuum device connected to said outlet for releasing gas and particles, said vacuum device suitable for drawing gas and particles out of said flexible enclosure.

6. A frameless containment system (1) according to any of the preceding claims, wherein said magnetic means (8) comprise permanent magnets or electromagnets arranged in a chain structure.

7. A frameless containment system (1) according to any of the preceding claims, wherein said magnetic means (8) are attached to said edge of said flexible enclosure.

8. A frameless containment system (1) according to any of the preceding claims, wherein said magnetic means (8) are located within sleeves at said edge of said flexible enclosure.

9. A frameless containment system (1) according to claim 8, wherein said sleeves comprise metallic materials, such as metallic braids.

10. A frameless containment system (1) according to any of the preceding claims 8 and 9, wherein said sleeves comprise plastic, rubber or any other materials.

11. A frameless containment system (1) according to any of the preceding claims, wherein said magnetic means (8) has a magnetic strength between 0.3 N/mm to 30 N/mm, such as between 1 N/mm and 5 N/mm

12. A frameless containment system (1) according to any of the preceding claims, further comprising an inlet opening (2), such as a blasting hole, suitable for introducing compressed gas and particles.

13. A frameless containment system (1) according to claim 1, wherein said one or more wedge shaped elements (7) comprise magnetic materials.

Patentansprüche

1. Rahmenloses Rückhaltesystem (1) zum Bereitstellen eines im Wesentlichen staubdichten Arbeitsraums, der einen Arbeitsbereich umgibt, wobei das rahmenlose Rückhaltesystem (1) umfasst:

   - eine flexible Umhausung (9), die eine oder mehrere flexible Folien umfasst, die dazu geeignet sind, um den Arbeitsbereich herum angeordnet zu werden, wobei die eine oder die mehreren flexiblen Folien einen Auslass (5) für die Freisetzung von Gas und Partikeln umfassen;
   - eine oder mehrere Gaseinlassvorrichtungen (6);

   wobei die flexible Umhausung (9), wenn sie um den Arbeitsbereich herum angeordnet ist, einen staubdichten Arbeitsraum durch magnetische Mittel (8) definiert, die zumindest teilweise innerhalb der Kante der flexiblen Umhausung angeordnet sind;
   dadurch gekennzeichnet,
   dass im zusammengebauten Zustand die flexible Umhausung (9) ein oder mehrere keilförmige Elemente (7) zwischen dem magnetischen Mittel (8) und dem Arbeitsbereich umfasst und wobei das eine oder die mehreren keilförmigen Elemente (7) den Auslass (5) zum Freisetzen von Gas und Partikeln und die eine oder die mehreren Gaseinlassvorrichtungen (6) umfassen.

2. Rahmenloses Rückhaltesystem (1) nach Anspruch 1, wobei die eine oder die mehreren Gaseinlassvorrichtungen (6) so ausgelegt sind, dass sie komprimierte Fluide, wie Gas oder Flüssigkeiten, in die flexible Umhausung einleiten und dadurch rahmenlose Rückhalte aufrecht erhalten.

3. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei die eine oder die mehreren Gaseinlassvorrichtungen (6) so ausgelegt sind, dass sie komprimierte Fluide, wie Gas oder Flüssigkeiten, und Partikel einführen können, wodurch das Einführen von für die Oberflächenbehandlung geeigneten Materialien in den Arbeitsbereich ermöglicht wird.

4. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei der Auslass (5) zum Freisetzen von Gas und Partikeln für den Anschluss einer Vakuumvorrichtung zum Absaugen von Gas und Partikeln aus der flexiblen Umhausung konfiguriert ist.

5. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, das ferner eine mit dem Auslass verbundene Vakuumvorrichtung zum Freisetzen von Gas und Partikeln umfasst, wobei die Vakuumvorrichtung geeignet ist, Gas und Partikel aus der flexiblen Umhausung abzusaugen.

6. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei die magnetischen Mittel (8) Permanentmagnete oder Elektromagnete umfassen, die in einer Kettenstruktur angeordnet sind.

7. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei die magnetischen Mittel (8) an der Kante der flexiblen Umhausung angebracht sind.

8. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei die magnetischen Mittel (8) innerhalb von Hülsen an der Kante der flexiblen Umhausung angeordnet sind.

9. Rahmenloses Rückhaltesystem (1) nach Anspruch 8, wobei die Hülsen metallische Materialien, wie z. B. Metallgeflechte, umfassen.

10. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche 8 und 9, wobei die Hülsen Kunststoff, Gummi oder ein anderes Material umfassen.

11. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, wobei das magnetische Mittel (8) eine Magnetstärke zwischen 0,3 N/mm und 30 N/mm, wie z. B. zwischen 1 N/mm und 5 N/mm aufweist.

12. Rahmenloses Rückhaltesystem (1) nach einem der vorstehenden Ansprüche, das ferner eine Einlassöffnung (2), wie z. B. ein Sprengloch, umfasst, die zum Einleiten von Druckgas und Partikeln geeignet ist.

13. Rahmenloses Rückhaltesystem (1) nach Anspruch 1, wobei das eine oder die mehreren keilförmigen Elemente (7) magnetische Materialien umfassen.

Revendications

1. Système de confinement sans cadre (1) pour fournir un espace de travail sensiblement étanche à la poussière entourant une zone de travail, ledit système de confinement sans cadre (1) comprenant :

- une enceinte souple (9) comprenant une ou plusieurs feuilles souples adaptées pour être placées autour de ladite zone de travail, lesdites une ou plusieurs feuilles souples comprenant une sortie (5) pour libérer du gaz et des particules ;
- un ou plusieurs dispositifs d'entrée de gaz (6) ;

dans lequel ladite enceinte souple (9), lorsqu'elle est placée autour de ladite zone de travail, définit un espace de travail étanche à la poussière par l'intermédiaire de moyens magnétiques (8), situés, au moins partiellement, à l'intérieur du bord de ladite enceinte souple ;
caractérisé en ce que,
lorsqu'elle est assemblée, ladite enceinte souple (9) comprend un ou plusieurs éléments en forme de coin (7) entre lesdits moyens magnétiques (8) et ladite zone de travail et dans lequel lesdits un ou plusieurs éléments en forme de coin (7) comprennent ladite sortie (5) pour libérer du gaz et des particules et lesdits un ou plusieurs dispositifs d'entrée de gaz (6).

2. Système de confinement sans cadre (1) selon la revendication 1, dans lequel lesdits un ou plusieurs dispositifs d'entrée de gaz (6) sont adaptés pour introduire des fluides comprimés, tels que du gaz ou des liquides, dans ladite enceinte souple, maintenant ainsi le confinement sans cadre érigé.

3. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits un ou plusieurs dispositifs d'entrée de gaz (6) sont adaptés pour introduire des fluides comprimés, tels que du gaz ou des liquides, et des particules, permettant ainsi l'introduction de matériaux appropriés pour un traitement de surface dans ladite zone de travail.

4. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel ladite sortie (5) pour libérer le gaz et les particules est configurée pour connecter un dispositif d'aspiration pour aspirer le gaz et les particules hors de ladite enceinte souple.

5. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, comprenant en outre un dispositif d'aspiration connecté à ladite sortie pour libérer le gaz et les particules, ledit dispositif d'aspiration étant adapté pour aspirer le gaz et les particules hors de ladite enceinte souple.

6. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens magnétiques (8) comprennent des aimants permanents ou des électroaimants agencés dans une structure en chaîne.

7. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens magnétiques (8) sont fixés audit bord de ladite enceinte souple.

8. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens magnétiques (8) sont situés dans des manchons au niveau dudit bord de ladite enceinte souple.

9. Système de confinement sans cadre (1) selon la revendication 8, dans lequel lesdits manchons comprennent des matériaux métalliques, tels que des tresses métalliques.

10. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes 8 et 9, dans lequel lesdits manchons comprennent du plastique, du caoutchouc ou tout autre matériau.

11. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens magnétiques (8) ont une force magnétique comprise entre 0,3 N/mm et 30 N/mm, par exemple entre 1 N/mm et 5 N/mm.

12. Système de confinement sans cadre (1) selon l'une quelconque des revendications précédentes, comprenant en outre une ouverture d'entrée (2), telle qu'un trou de soufflage, adaptée pour introduire du gaz comprimé et des particules.

13. Système de confinement sans cadre (1) selon la revendication 1, dans lequel lesdits un ou plusieurs éléments en forme de coin (7) comprennent des matériaux magnétiques.

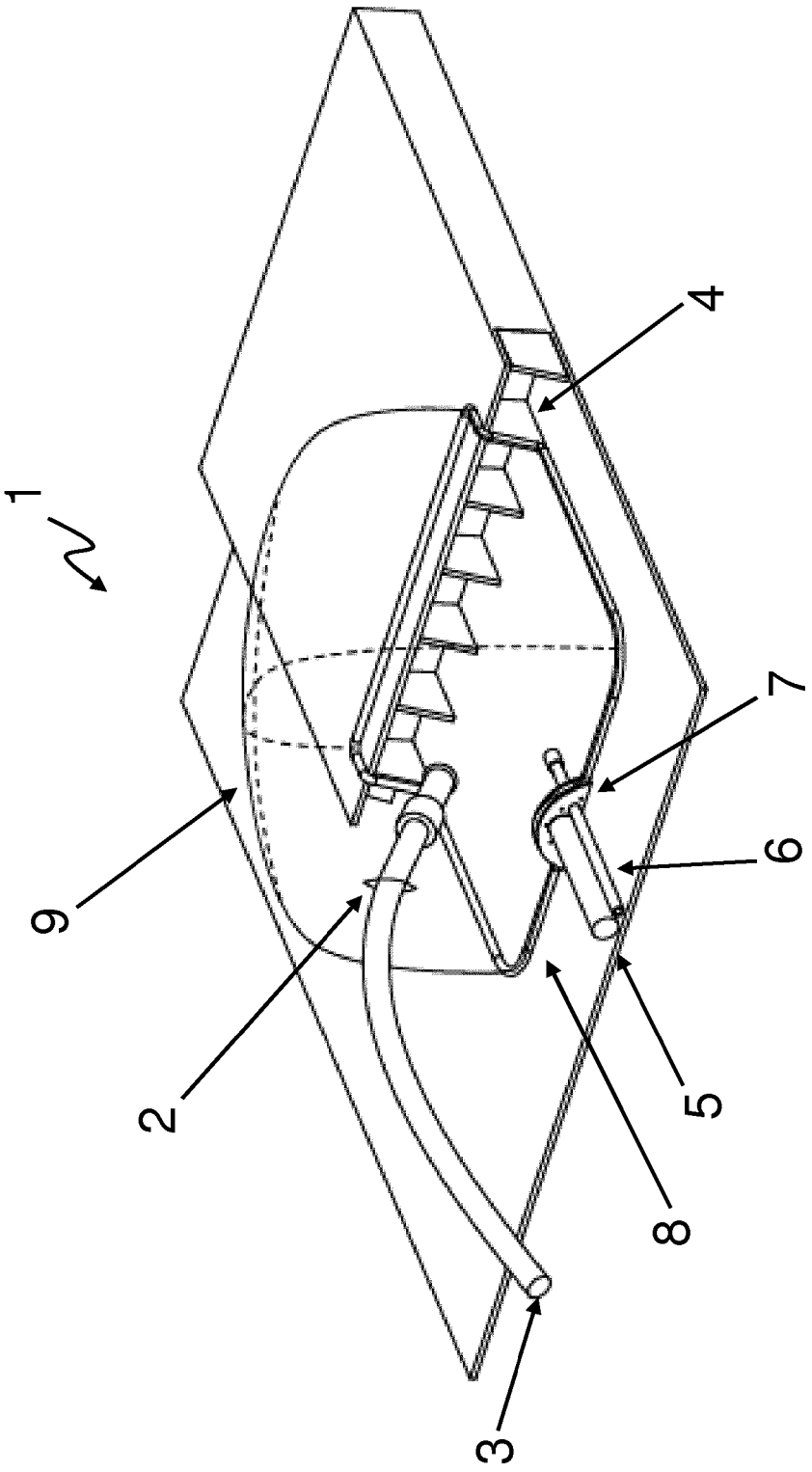


FIG. 1A

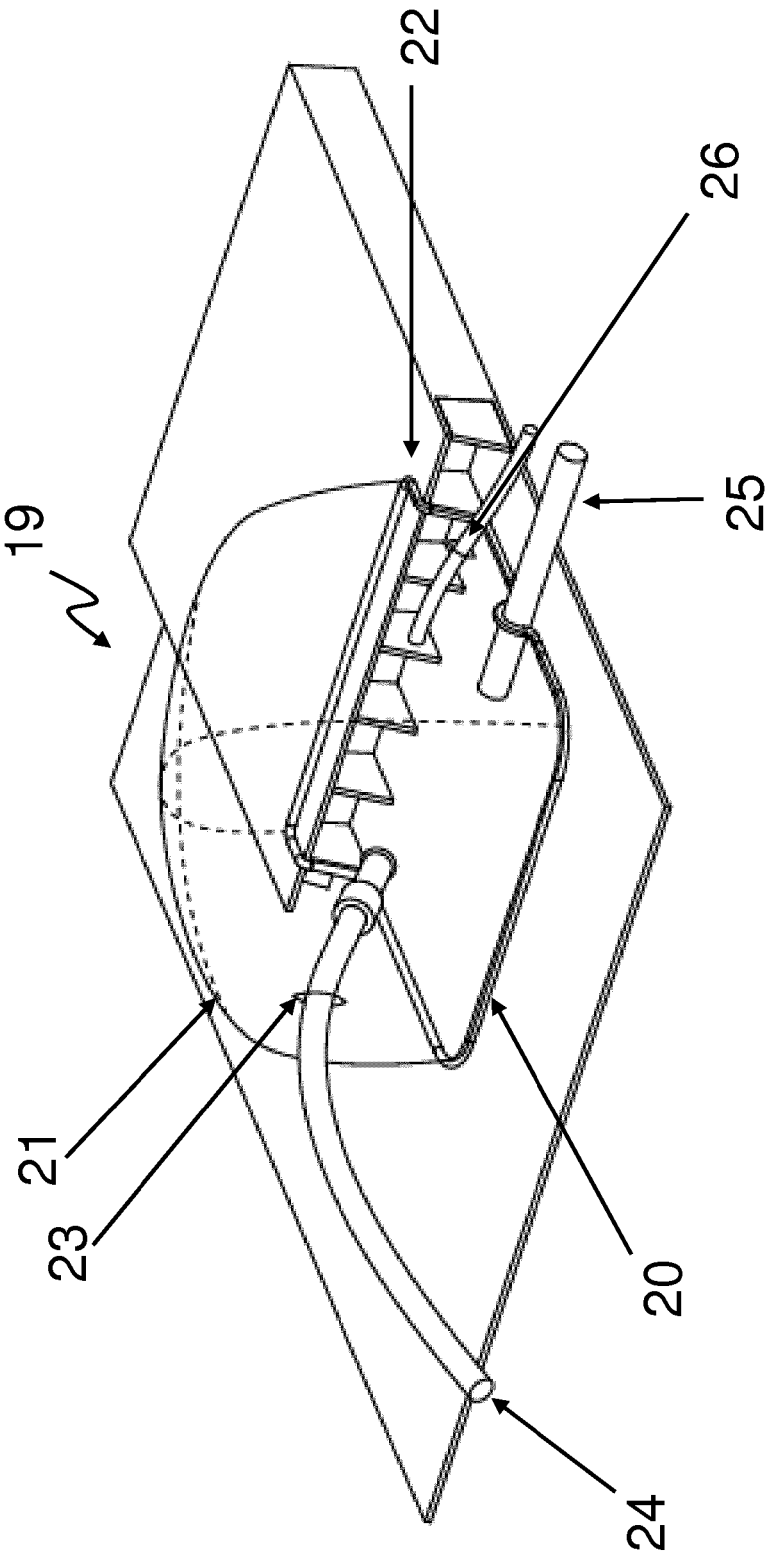


FIG. 1B

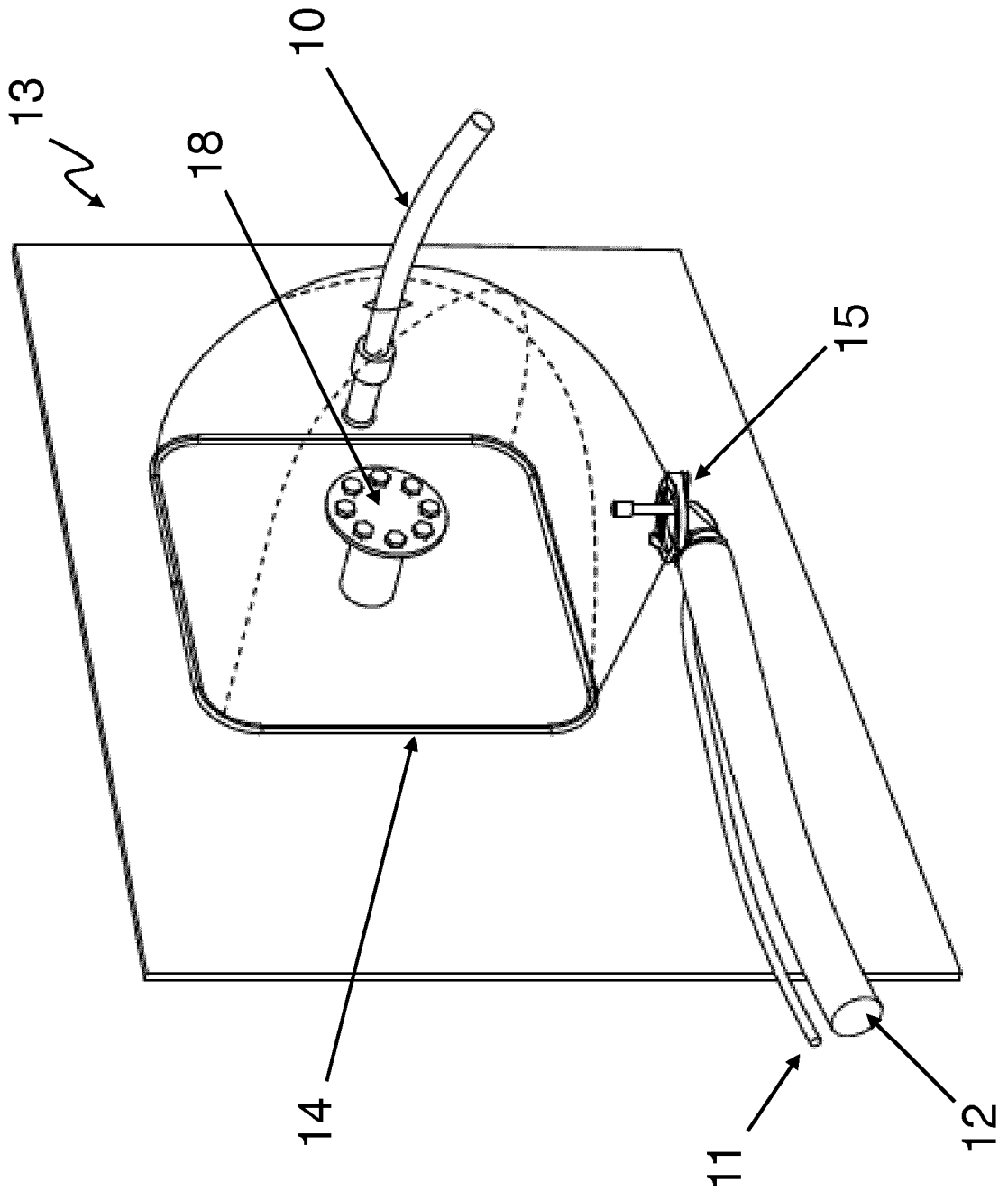


FIG. 2

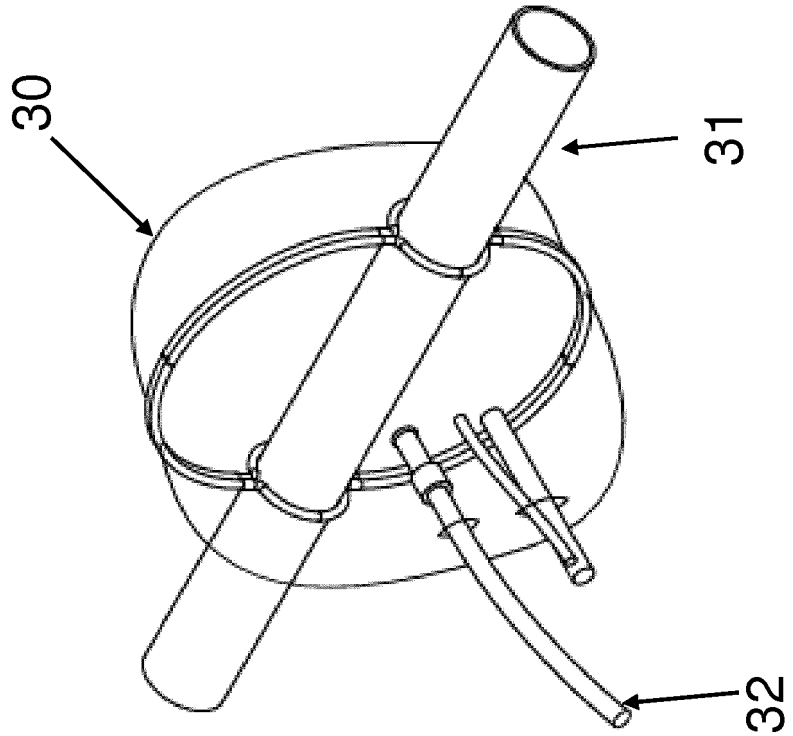


FIG. 3B

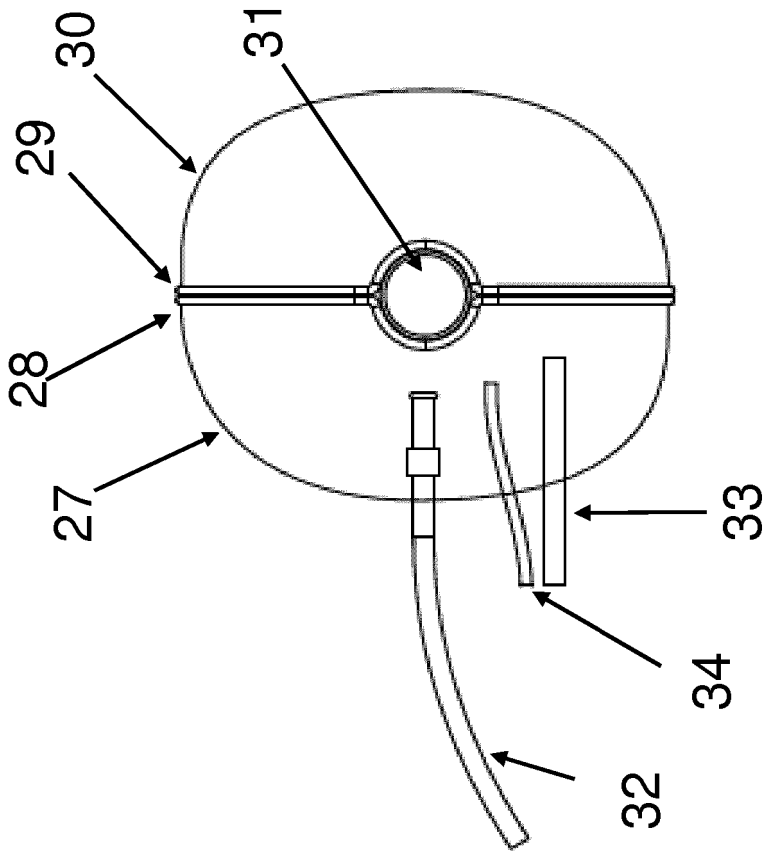


FIG. 3A

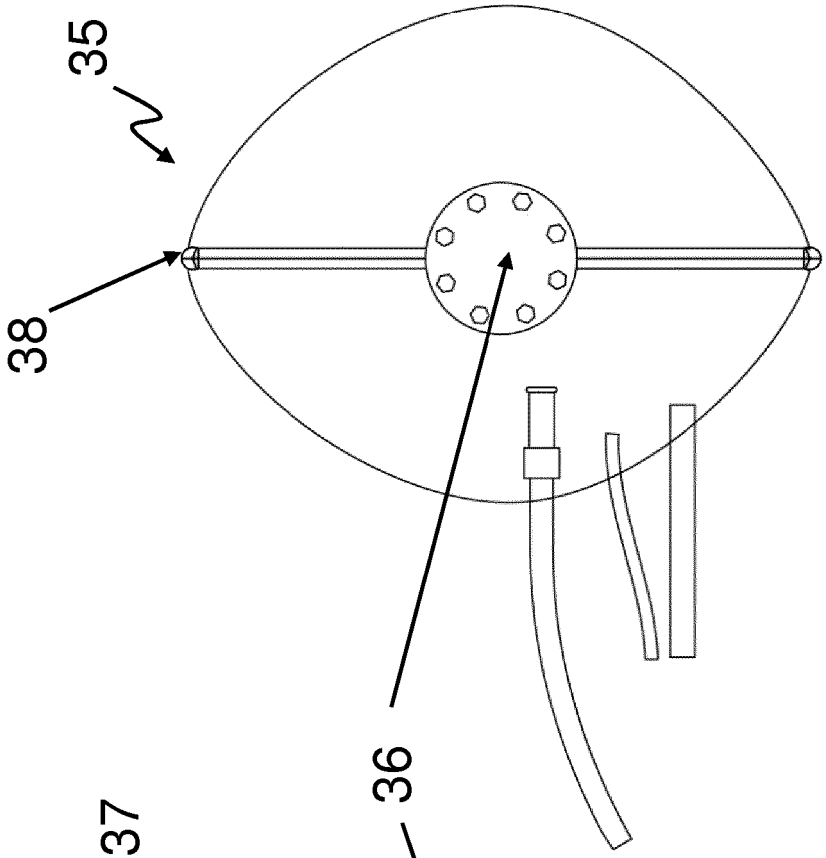


FIG. 4B

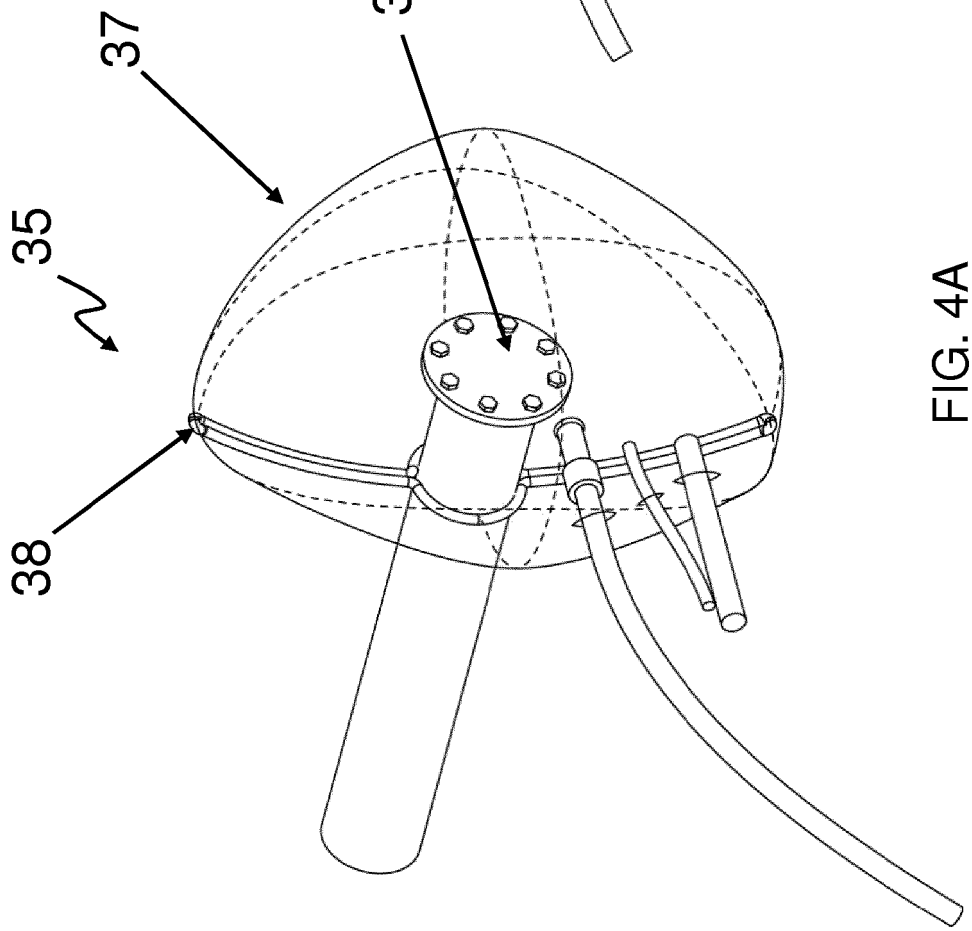
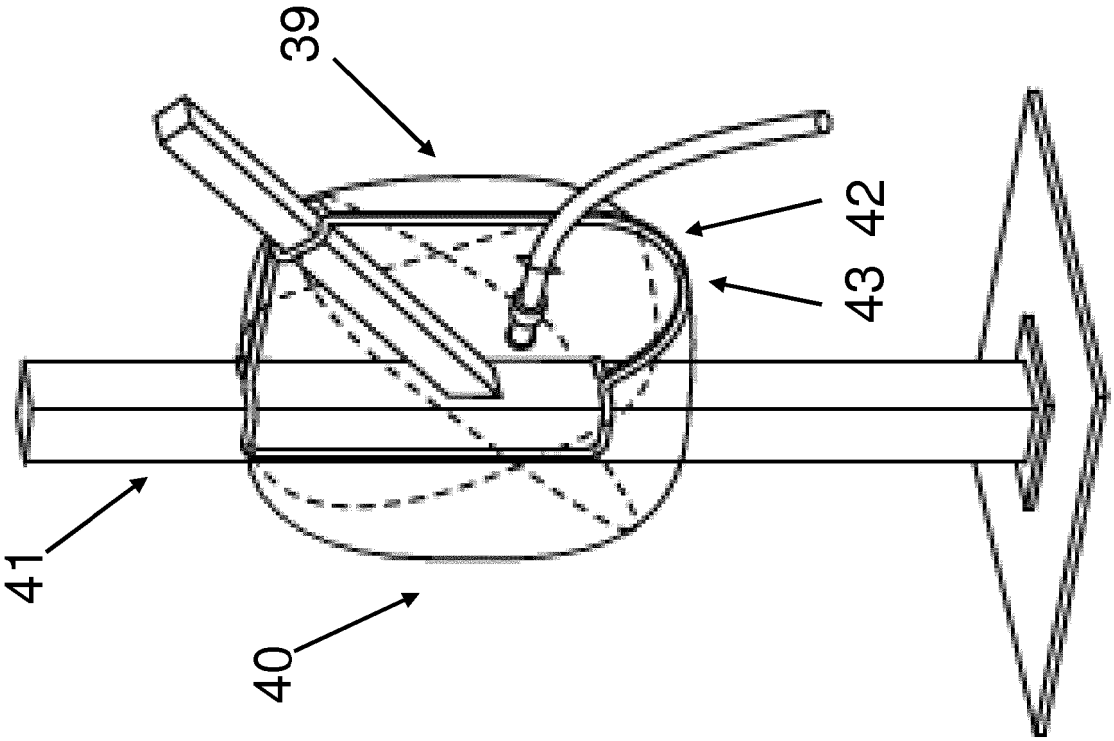


FIG. 4A

FIG. 5



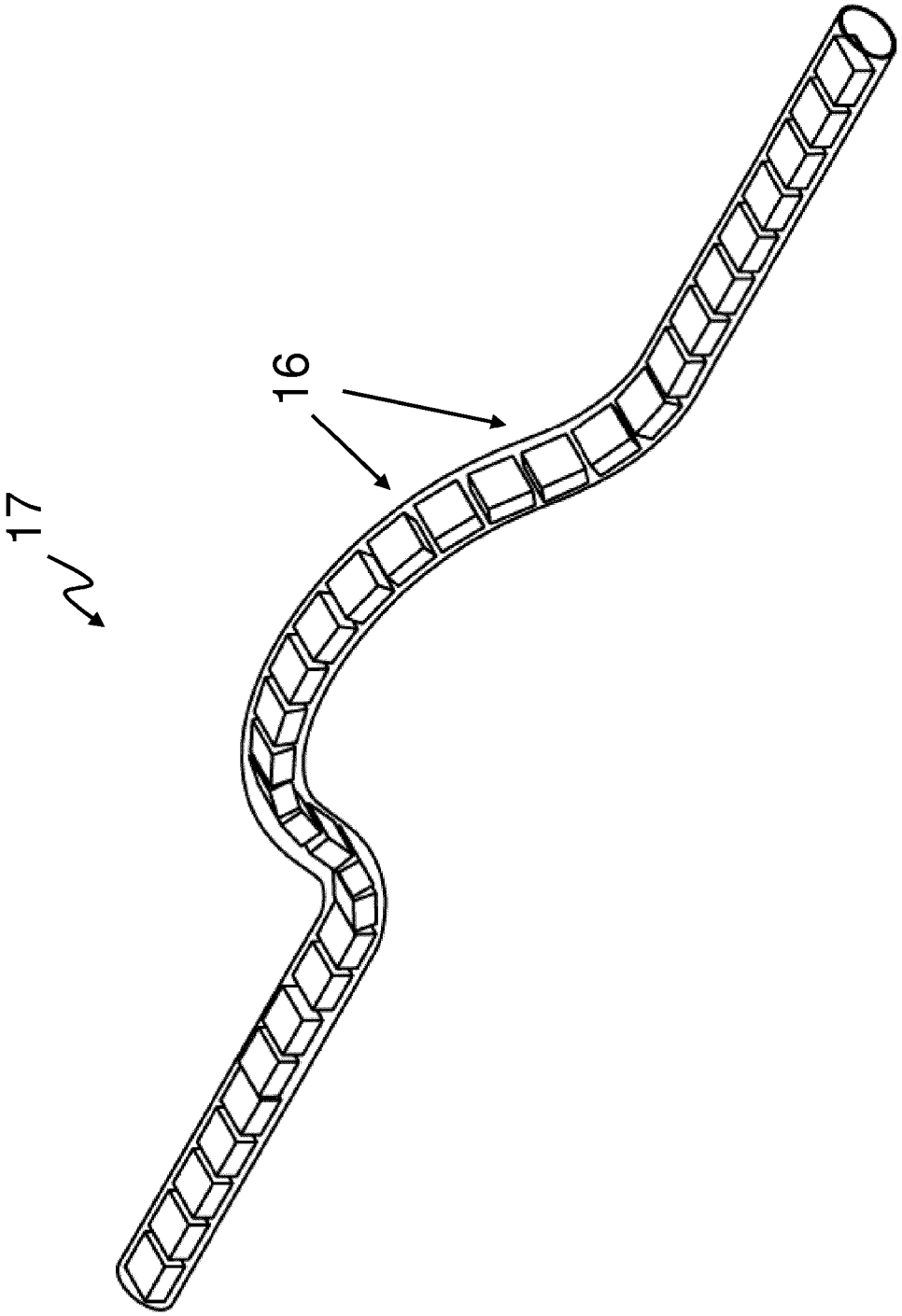


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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