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(54) **AN IMPROVED FIXING DEVICE FOR WALL-HUNG TOILETS**

VERBESSERTE BEFESTIGUNGSVORRICHTUNG FÜR WANDHÄNGENDE TOILETTEN
DISPOSITIF DE FIXATION AMÉLIORÉ POUR TOILETTES SUSPENDUES À UNE PAROI

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Description

Technical Field of the Invention

[0001] The present invention relates to a fixing device according to the preamble of claim 1, for anchoring a wall-hung toilet and similar sanitary furniture item to a wall, which provides a practical, fast and durable connection.

Background Art

[0002] Suspended sanitary fixtures have been used for many years. These sanitary facilities are supported, generally hidden in the sanitary facility, on holding elements which are fastened in a cantilever manner on a supporting wall so that the sanitary facility does not stand on the floor.

[0003] It is known to use improved fixing devices for fixing sanitary furniture items to a wall. In the attachment of a sanitary furniture item, such as a water closet and the like, to a wall, a fixing mount is used with an affixing stud fastened on the wall, and the fixing mount is fastened on the wall, at the desired position, by means of an adjustment member therein.

[0004] It is becoming increasingly widespread to use wall-hung toilets, which is advantageous for the user in terms of hygiene due to the lack of contact with the ground. It is also preferred by the users for easy cleaning. Since the wall-hung toilets/water closets do not have contact with the ground, it is expected that the fixing devices thereof are more durable.

[0005] For the installation of the wall-hung toilets, appropriate cavities must be formed on the toilets/water closets in order to attach the closet to a worm gear protruding from the wall. This may cause an extra cost in terms of production. Many wall-hung toilets have an integral hole so as to match with the worm gear. These holes both increase the cost in terms of production and make the assembly difficult after possible minor deviations. In addition, possible fixing mismatches result in gaps, thereby causing sagging and breakage in the product mounted.

[0006] Document DE2252970A1 shows a fixing device comprising two wedge elements sliding on each other by turning a screw being connected to one of the wedge elements. Another fixing device is disclosed in DE9103333U1.

Objects of the Invention

[0007] An object of the present invention is to provide a fixing device that enables solving the problems described above and existing in the prior art.

[0008] Another object of the present invention is to provide a fixing device that provides a robust and durable connection, which avoids any possible wobbling and oscillation.

[0009] Another object of the present invention is to pro-

vide a fixing device wherein the water closet can be connected to the wall through the closet cover assembly holes without requiring the fixing holes that must be drilled on the sides of the sanitary furniture items, while it is facilitated to remove the rear inner side of the closet - in a fully empty state - in the production of the water closets, reducing the cost and increasing the production efficiency.

[0010] Another object of the present invention is to provide a fixing device in which possible dimensional differences are prevented and possible compatibility problems in terms of assembly are avoided.

[0011] Still another object of the present invention is to provide a fixing device in which the need for assembly holes is eliminated that is very difficult to drill in the wall-hung toilets made of ceramic material.

Summary of the Invention

[0012] The present invention relates a fixing device according to claim 1, for fixing a sanitary furniture item, said fixing device comprising a clamping body for attaching against an inner wall of the sanitary furniture item; an adjustment member and an adjustment housing for inserting the adjustment member into the clamping body for adjustment purposes; a lower body arranged to be coupled with an affixing stud mounted on a wall; and a fixing member arranged to pass through an assembly hole of the sanitary furniture item and to be fixed in a through-hole in the clamping body. Said fixing device comprises an upper contact surface on the lower body that is inclined with respect to a longitudinal axis of the fixing device. Moreover, said clamping body is positioned to slide on the inclined upper contact surface; and the lower body comprises an inclined adjustment surface on which an adjustment member lower end is slidably moved by rotating said adjustment member in the adjustment housing. The present invention also proposes a sanitary furniture item comprising said fixing device.

Brief Description of the Drawings

[0013] The fixing device of the present invention is illustrated in the accompanying drawings for better understanding thereof, which drawings are attached for better explaining the present invention and are not limiting the invention, in which:

Fig. 1 is a front perspective view of a fixing device presented according to the present invention.

Fig. 2 is a rear perspective view of the fixing device presented according to the present invention.

Fig. 3 is an exploded view of the fixing device presented according to the present invention.

Fig. 4 is a rear exploded view of the fixing device

presented in Fig. 3.

Fig. 5 is an exploded, longitudinally cross-sectioned view of the fixing device presented according to the present invention.

Fig. 6 is a perspective view of the fixing device presented according to the present invention before being connected with a sanitary furniture item.

Fig. 7 is a cross-sectional view of the fixing device presented according to the present invention.

Fig. 8 is a cross-sectioned view of the fixing device presented according to the present invention, mounted to the sanitary furniture item.

Detailed Description of the Invention

[0014] The invention will herein be explained in detail with reference to the accompanying drawings and the list of the part numbers used in the figures is as follows:

- 10. Fixing device
 - 11. Fixing member
 - 12. Retaining member
 - 13. Adjustment member
 - 14. Adjustment member lower end
 - 15. Through hole
- 20. Clamping body
 - 22. Abutment protrusion
 - 23. Engagement channel
 - 24. Adjustment housing
- 30. Lower body
 - 31. Upper contact surface
 - 32. Engagement protrusion
 - 33. Adjustment surface
 - 34. Stud hole
- 50. Affixing stud
 - 51. Washer
 - 52. Nut
- 100. Sanitary furniture item
 - 101. Assembly hole
 - 102. Inner wall
 - 103. Top surface
- $\alpha 1$ First angle
- $\alpha 2$ Second angle
- X Longitudinal axis of fixing device

[0015] The fixing device (10) presented within the scope of the present invention is arranged to be used in sanitary furniture items (100). The fixing device (10) is specially arranged to use for connecting wall-hung toilets -especially for hung sanitary fittings- to a wall and a built-in reservoir.

[0016] The present invention relates a fixing device (10) for fixing a sanitary furniture item (100), said fixing device (10) comprising a clamping body (20) for attaching

against an inner wall (102) of the sanitary furniture item (100); an adjustment member (13) and an adjustment housing (24) for inserting the adjustment member (13) into the clamping body (20) for adjustment purposes; a lower body (30) arranged to be coupled with an affixing stud (50) mounted on a wall; and a fixing member (11) arranged to pass through an assembly hole (101) of the sanitary furniture item (100) and to be fixed in a through-hole (15) in the clamping body (20). Said fixing device (10) comprises an upper contact surface (31) on the lower body (30) that is inclined with respect to a longitudinal axis of fixing device (X). Moreover, said clamping body (20) is positioned to slide/move on the inclined upper contact surface (31); and the lower body (30) comprises an inclined adjustment surface (33) on which an adjustment member lower end (14) is slidably moved by rotating said adjustment member (13) in the adjustment housing (24). The adjustment member lower end (14) is a portion partially above the bottom of the adjustment member (13). The present invention also proposes a sanitary furniture item (100) comprising said fixing device (10).

[0017] As illustrated in Fig. 8, the lower body (30) comprises an adjustment surface (33) inclined with a first angle ($\alpha 1$) of 30° to 60° (preferably 45°) relative to the longitudinal axis of the fixing device (X) and integral with the lower body (30). Similarly, the lower body (30) also comprises the upper contact surface (31) inclined with a second angle ($\alpha 2$) of 15° to 30° relative to the longitudinal axis of the fixing device (X) and forming an upper part of the lower body (30). In this way, by moving the adjustment member, the user moves the clamping body (20) and the sanitary furniture item (100) to which it is connected, especially with respect to the fixed lower body (30), and pulls them towards the wall, thereby providing a robust and non-wobbling connection.

[0018] As illustrated in Figs. 2 and 3, there is an engagement protrusion (32) on the upper contact surface (31) of the lower body (30) that extends along its longitudinal axis as a protrusion. The engagement protrusion (32) extends in a linear axis, and have a certain height and thickness. There is also an engagement channel (23) at the bottom of said clamping body (20), which is shaped and sized according to the engagement protrusion (32) and allows the clamping body (20) to move only linearly in an inclined manner. As shown in Fig. 4, the engagement channel (23) in the form of a U cross-section groove surrounds said engagement protrusion (32). The upper surface of the engagement protrusion (32) that is to be contacted with the engagement channel (23) has a larger cross-section. Similarly, the upper surface of the engagement channel (23) also has a larger cross-section and provides a more robust engagement. In addition, it limits the movement of the clamping body (20) in an upward and downward direction.

[0019] Again, as illustrated in Fig. 8, the clamping body (20) has a plurality of abutment protrusions (22) arranged at the same height and at certain intervals of the clamping body (20). The abutment protrusions (22) in the form of

rounded protrusions abut on the inner wall (102) of the sanitary furniture item (100) to which it will be attached. Thus, the imposed pressure load is properly distributed. The inner wall (102) is preferably inside the uppermost end, when in use.

[0020] The fixing device (10) mainly comprises two main parts, the first one of which is the lower body (30), which is to be securely held by the affixing stud (50) in the form of a worm gear that is connected to the wall, and the other one is the clamping body (20) that is partially moved on the adjustment surface (33) on the lower body (30). When the user desires to use the fixing device (10), (s)he first places the adjustment member (13) into the appropriate adjustment member housing (24) in the clamping body (20). Then, the female engagement channel (23) and the male engagement protrusion (32) slides over each other so that the lower body (30) and the clamping body (20) are connected to each other. In this way, an optimum linear movement is obtained. As best seen in Fig. 6, suitable fixing members (11) are passed through the assembly holes (101) on the sanitary furniture item (100) and are fixed to the sanitary furniture item (100) by being passed through a through-hole (15) in the clamping body (20).

[0021] A cylindrical and partially threaded retaining member (12) can be used to be fitted into the through-hole (15) on the clamping body (20) in order to install the sanitary furniture item (100) in an easier manner. As illustrated in Fig. 6, the retaining member (12) is connected to the clamping body (20) and is adjusted to correspond to the appropriate assembly holes.

[0022] On the lower body (30), there is a stud hole (34) through which said affixing stud (50) is to be passed, and a nut (52) to fix said affixing stud (50). Then, the affixing stud (50) is first passed through the lower body (30), followed by a sub-assembly of a nut (52) and preferably a washer (51). Thereafter, said retaining member (12) is removed from the through-hole (15) where it is located, and the fixing member (11) is inserted into this hole in order to complete the fixing process. In the through-hole (15), there are teeth housings so as to be engaged by the teeth of the fixing member (11). When the fixing member (11) is in use, it has a wide hole that extends along its middle portion so as to allow access to the adjustment member (13).

[0023] As illustrated in Fig. 7, the adjustment member (13) is rotated in its housing in the direction of compression by means of a suitable rotation apparatus in order to pull the sanitary furniture item (100) towards the wall and prevent it from wobbling. A suitable Allen key is first passed through the fixing member (11) and then into the adjustment member (13). At this stage, the adjustment member lower end (14) forming an end portion of the adjustment member (13) contacts the inclined adjustment surface (33) in the lower body (30). As the user rotates the adjustment member (13) in the appropriate direction (preferably to the right), the adjustment member lower end (14) moves on the adjustment surface (33),

and the sanitary furniture item (100) is pulled towards the wall and tightened against it with a sliding movement of the clamping body (20). Thus, the sanitary furniture item (100) is securely connected and possible vibrations, any play resulting from a possible gap are prevented.

[0024] Said adjustment member (13) may be a set screw suitable to be tightened by being rotated clockwise with a suitable Allen key. Said fixing member (11) comprises an inner hole allowing access to the adjustment member (13).

[0025] There are preferably two assembly holes (101) on the upper surface (103) of the sanitary furniture item (100) suitable for use in the preferred embodiment of the invention. The number of the assembly holes (101) and the fixing devices (10) can be decreased and increased. Preferably, two fixing devices are used at different ends. Said sanitary furniture item (100) disclosed within the scope of the invention may be a wall-hung toilet.

Claims

1. A fixing device (10) for fixing a sanitary furniture item (100), e.g. a wall-hung toilet, said fixing device (10) comprising:

a clamping body (20) for attaching against an inner wall (102) of the sanitary furniture item (100);
 an adjustment member (13); an adjustment housing (24) of the clamping body (20) for inserting the adjustment member (13) into the clamping body (20) for adjustment purposes;
 a lower body (30) arranged to be coupled with an affixing stud (50) mounted on a wall;
 a fixing member (11) arranged to pass through an assembly hole (101) of the sanitary furniture item (100) and to be fixed in a through-hole (15) in the clamping body (20);
 an upper contact surface (31) on the lower body (30) that is inclined with respect to a longitudinal axis of fixing device (X), wherein said clamping body (20) is positioned to slide on the inclined upper contact surface (31); **characterised in that**
 the lower body (30) comprises an inclined adjustment surface (33) on which an adjustment member lower end (14) of the adjustment member (13) is slidably moved by rotating said adjustment member (13) in the adjustment housing (24).

2. A fixing device (10) according to claim 1, wherein the adjustment surface (33) of the lower body (30) is inclined with an angle (α) of 30° to 60° relative to the longitudinal axis of the fixing device (X) and integral with the lower body (30).

3. A fixing device (10) according to claim 1 or 2, wherein the lower body (30) comprises the upper contact surface (31) and the upper contact surface (31) is inclined with an angle (α_2) of 15° to 30° relative to the longitudinal axis of fixing device (X) and forming an upper part of the lower body (30). 5
4. A fixing device (10) according to any one of the preceding claims, wherein the lower body (30) comprises an engagement protrusion (32) on the upper contact surface (31) that extends along the upper contact surface's (31) longitudinal axis as a protrusion. 10
5. A fixing device (10) according to claim 4, wherein said clamping body (20) comprises an engagement channel (23) which is formed at the bottom of the clamping body (20) wherein the engagement channel (23) is shaped and sized according to the engagement protrusion (32) and which allows the clamping body (20) to move linearly in an inclined manner. 20
6. A fixing device (10) according to claim 5, wherein the upper surface of said engagement protrusion (32) that is to be contacted with the engagement channel (23) has a larger cross-section than the bottom of the engagement protrusion (32). 25
7. A fixing device (10) according to any one of the preceding claims, wherein the clamping body (20) has a plurality of abutment protrusions (22) arranged at the same height and at a certain distance with respect to each other. 30
8. A fixing device (10) according to any one of the preceding claims, wherein the adjustment member (13) is a set screw suitable to be tightened by being rotated clockwise with a suitable allen key. 35
9. A fixing device (10) according to any one of the preceding claims, wherein the through-hole (15) comprises teeth housings so as to be engaged by the teeth of the fixing member (11). 40
10. A fixing device (10) according to any one of the preceding claims, wherein the lower body (30) comprises a stud hole (34) through which said affixing stud (50) is to be passed, and a nut (52) to fix said affixing stud (50). 45
11. A fixing device (10) according to any one of the preceding claims, wherein said fixing member (11) comprises an inner hole allowing, in use, access to the adjustment member (13). 50
12. A sanitary furniture item (100) including fixing device (10) according to any one of the preceding claims, comprising at least two assembly holes (101) on the

upper surface (103) of the sanitary furniture item (100).

13. A sanitary furniture item (100) according to claim 12, comprising two fixing devices (10), each assembly hole being in connection with one respective fixing device.
14. A sanitary furniture item (100) according to claim 12 or 13, being a wall-hung toilet.

Patentansprüche

1. Eine Befestigungsvorrichtung (10) zur Befestigung eines Sanitärmöbels (100), z. B. einer wandhängenden Toilette, wobei die Befestigungsvorrichtung (10) folgendes umfasst:

einen Klemmkörper (20) zum Anbringen an einer Innenwand (102) des Sanitärmöbels (100); ein Einstellelement (13); ein Einstellgehäuse (24) des Klemmkörpers zum Einsetzen des Einstellelements (13) in den Klemmkörper (20) zu Einstellzwecken;
einen unteren Körper (30), der so angeordnet ist, dass er mit einem an einer Wand montierten Befestigungsstift (50) verbunden werden kann; ein Befestigungselement (11), das so angeordnet ist, dass es durch ein Montageloch (101) des Sanitärmöbels (100) geführt und in einem Durchgangsloch (15) im Klemmkörper (20) befestigt werden kann;
eine obere Kontaktfläche (31) am unteren Körper (30), die in Bezug auf eine Längsachse der Befestigungsvorrichtung (X) geneigt ist, wobei der Klemmkörper (20) so positioniert ist, dass er auf der geneigten oberen Kontaktfläche (31) gleitet, **dadurch gekennzeichnet, dass** der untere Körper (30) eine geneigte Einstellfläche (33) umfasst, auf der ein unteres Ende (14) des Einstellelements (13) durch Drehen des Einstellelements (13) in dem Einstellgehäuse (24) gleitend bewegt wird.

2. Befestigungsvorrichtung (10) nach Anspruch 1, wobei die Einstellfläche (33) des unteren Körpers (30) mit einem Winkel (α_1) von 30° bis 60° relativ zur Längsachse der Befestigungsvorrichtung (X) geneigt und mit dem unteren Körper (30) integriert ist. 50
3. Befestigungsvorrichtung (10) nach Anspruch 1 oder 2, wobei der untere Körper (30) die obere Kontaktfläche (31) aufweist, die mit einem Winkel (α_2) von 15° bis 30° relativ zur Längsachse der Befestigungsvorrichtung (X) geneigt ist und einen oberen Teil des unteren Körpers (30) bildet. 55

4. Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei der untere Körper (30) einen Eingriffsvorsprung (32) an der oberen Kontaktfläche (31) aufweist, der sich entlang der Längsachse der oberen Kontaktfläche (31) als Vorsprung erstreckt.
5. Eine Befestigungsvorrichtung (10) nach Anspruch 4, wobei der Klemmkörper (20) einen Eingriffskanal (23) umfasst, der am Boden des Klemmkörpers (20) ausgebildet ist, wobei der Eingriffskanal (23) entsprechend dem Eingriffsvorsprung (32) geformt und bemessen ist und dem Klemmkörper (20) eine lineare Bewegung in einer geneigten Weise ermöglicht.
6. Eine Befestigungsvorrichtung (10) nach Anspruch 5, wobei die obere Fläche des Eingriffsvorsprungs (32), die mit dem Eingriffskanal (23) in Kontakt gebracht werden soll, einen größeren Querschnitt aufweist als der Boden des Eingriffsvorsprungs (32).
7. Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei der Klemmkörper (20) eine Vielzahl von Anschlagvorsprüngen (22) aufweist, die auf gleicher Höhe und in einem bestimmten Abstand zueinander angeordnet sind.
8. Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das Einstellelement (13) eine Stellschraube ist, die durch Drehen im Uhrzeigersinn mit einem geeigneten Inbusschlüssel festgezogen werden kann.
9. Eine Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das Durchgangsloch (15) Zahnaufnahmen aufweist, um mit den Zähnen des Befestigungselements (11) in Eingriff zu kommen.
10. Eine Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei der untere Körper (30) ein Bolzenloch (34), durch das der Befestigungsbolzen (50) zu führen ist, und eine Mutter (52) zur Befestigung des Befestigungsbolzens (50) aufweist.
11. Eine Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, wobei das Befestigungselement (11) ein inneres Loch aufweist, das im Gebrauch den Zugang zum Einstellelement (13) ermöglicht.
12. Sanitärmöbel (100) mit Befestigungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, mit mindestens zwei Montagelöchern (101) auf der Oberseite (103) des Sanitärmöbels (100).
13. Sanitäres Möbelstück (100) nach Anspruch 12, um-

fassend zwei Befestigungsvorrichtungen (10), wobei jedes Montageloch mit einer jeweiligen Befestigungsvorrichtung in Verbindung steht.

- 5 14. Sanitäres Möbelstück (100) nach Anspruch 12 oder 13, das eine wandhängende Toilette ist.

Revendications

1. - Dispositif de fixation (10) pour fixer un meuble sanitaire (100), par exemple des toilettes à suspension murale, ledit dispositif de fixation (10) comprenant :
 - un corps de serrage (20) à attacher contre une paroi intérieure (102) du meuble sanitaire (100) ;
 - un élément de réglage (13) ;
 - un boîtier de réglage (24) du corps de serrage (20) pour introduire l'élément de réglage (13) dans le corps de serrage (20) à des fins de réglage ;
 - un corps inférieur (30) agencé pour être accouplé à un goujon de fixation (50) monté sur un mur ;
 - un élément de fixation (11) agencé pour passer à travers un trou d'assemblage (101) du meuble sanitaire (100) et pour être fixé dans un trou traversant (15) du corps de serrage (20) ;
 - une surface de contact supérieure (31) sur le corps inférieur (30) qui est inclinée par rapport à un axe longitudinal du dispositif de fixation (X), ledit corps de serrage (20) étant positionné pour glisser sur la surface de contact supérieure (31) inclinée,
 - caractérisé par le fait que** le corps inférieur (30) comprend une surface de réglage (33) inclinée sur laquelle une extrémité inférieure d'élément de réglage (14) de l'élément de réglage (13) est déplacée de manière coulissante par rotation dudit élément de réglage (13) dans le boîtier de réglage (24).
2. - Dispositif de fixation (10) selon la revendication 1, dans lequel la surface de réglage (33) du corps inférieur (30) est inclinée à un angle (α_1) de 30° à 60° par rapport à l'axe longitudinal du dispositif de fixation (X) et solidaire du corps inférieur (30).
3. - Dispositif de fixation (10) selon la revendication 1 ou 2, dans lequel le corps inférieur (30) comprend la surface de contact supérieure (31) et la surface de contact supérieure (31) est inclinée à un angle (α_2) de 15° à 30° par rapport à l'axe longitudinal du dispositif de fixation (X) et forme une partie supérieure du corps inférieur (30).
4. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel le

corps inférieur (30) comprend une saillie d'engagement (32) sur la surface de contact supérieure (31) qui s'étend le long de l'axe longitudinal de la surface de contact supérieure (31) sous la forme d'une saillie.

5. - Dispositif de fixation (10) selon la revendication 4, dans lequel ledit corps de serrage (20) comprend un canal d'engagement (23) qui est formé à la partie inférieure du corps de serrage (20), le canal d'engagement (23) étant formé et dimensionné en fonction de la saillie d'engagement (32) et qui permet au corps de serrage (20) de se déplacer linéairement de manière inclinée. 5
6. - Dispositif de fixation (10) selon la revendication 5, dans lequel la surface supérieure de ladite saillie d'engagement (32) qui est destinée à être en contact avec le canal d'engagement (23) a une section transversale plus grande que la partie inférieure de la saillie d'engagement (32). 10
7. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel le corps de serrage (20) a une pluralité de saillies de butée (22) disposées à la même hauteur et à une certaine distance les unes par rapport aux autres. 15
8. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel l'élément de réglage (13) est une vis de calage apte à être serrée par rotation dans le sens horaire à l'aide d'une clé Allen appropriée. 20
9. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel le trou traversant (15) comprend des logements de dents de façon à être engagé par les dents de l'élément de fixation (11). 25
10. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel le corps inférieur (30) comprend un trou de goujon (34) à travers lequel ledit goujon de fixation (50) est destiné à passer, et un écrou (52) pour fixer ledit goujon de fixation (50). 30
11. - Dispositif de fixation (10) selon l'une quelconque des revendications précédentes, dans lequel ledit élément de fixation (11) comprend un trou intérieur permettant, en utilisation, l'accès à l'élément de réglage (13). 35
12. - Meuble sanitaire (100) comprenant un dispositif de fixation (10) selon l'une quelconque des revendications précédentes, comprenant au moins deux trous d'assemblage (101) sur la surface supérieure (103) du meuble sanitaire (100). 40

13. - Meuble sanitaire (100) selon la revendication 12, comprenant deux dispositifs de fixation (10), chaque trou d'assemblage étant en liaison avec un dispositif de fixation respectif.

14. - Meuble sanitaire (100) selon la revendication 12 ou 13, étant des toilettes à suspension murale. 45

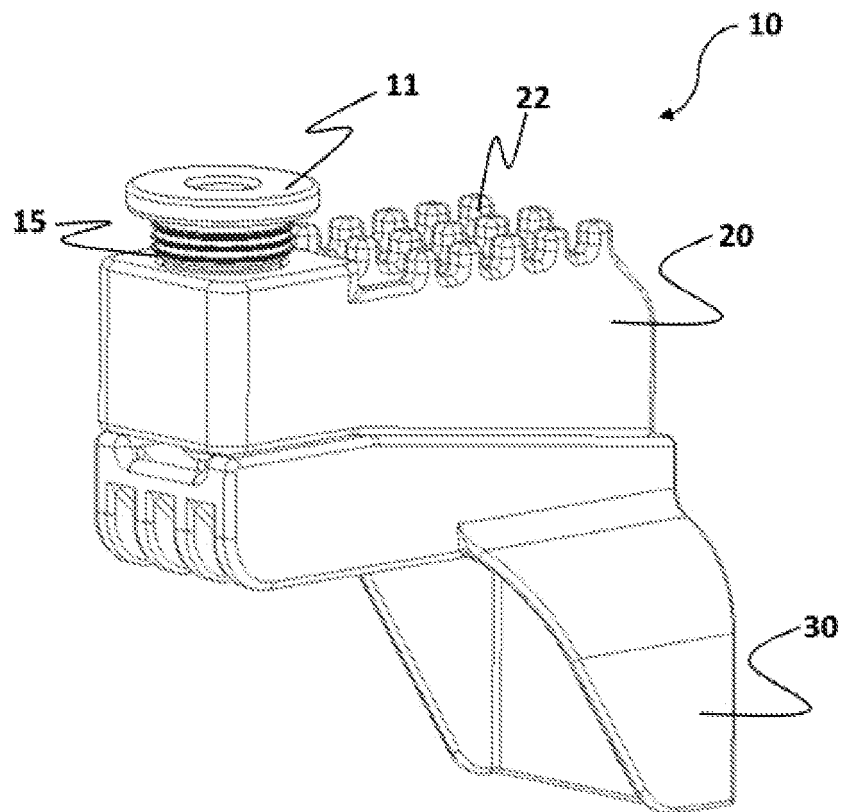


FIGURE 1

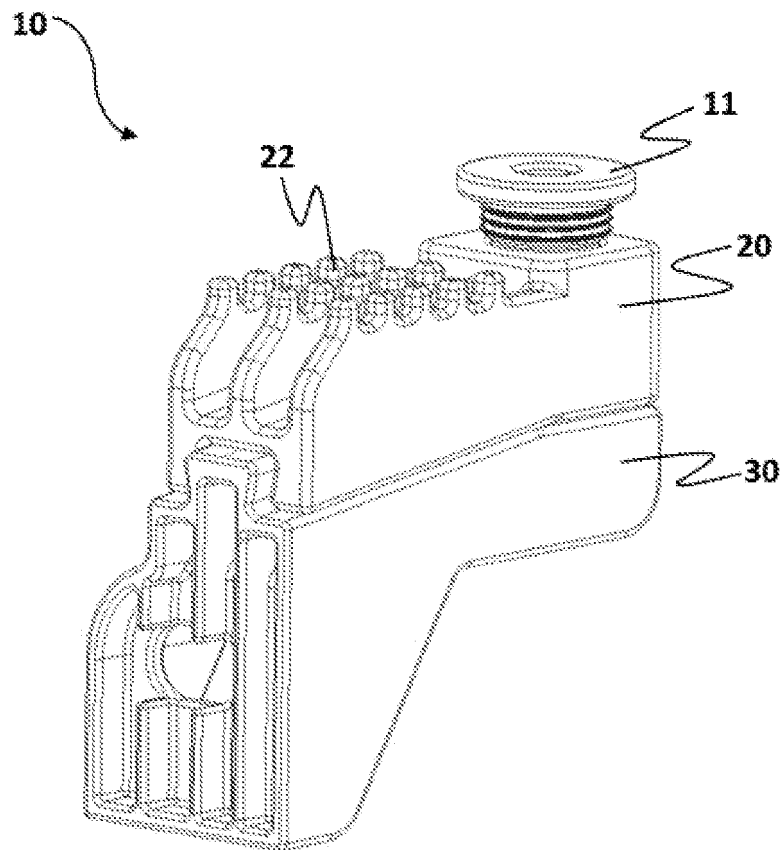


FIGURE 2

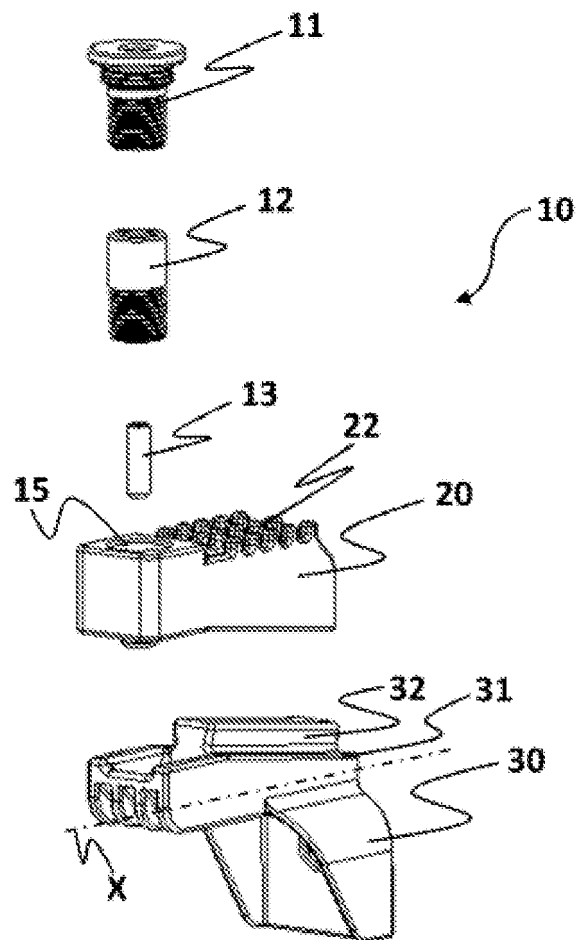


FIGURE 3

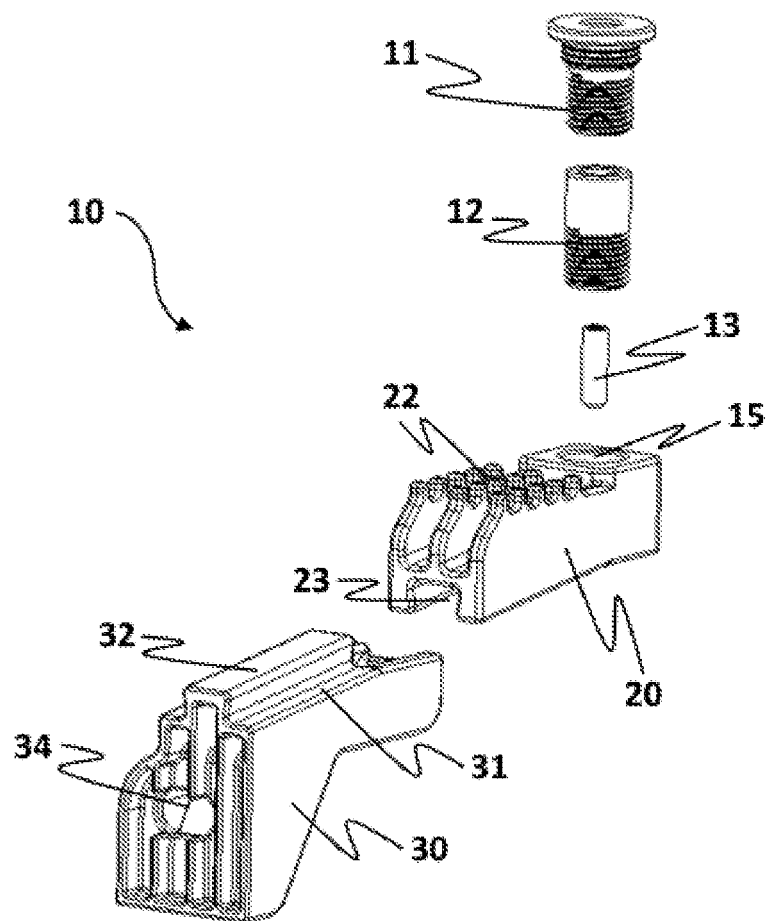


FIGURE 4

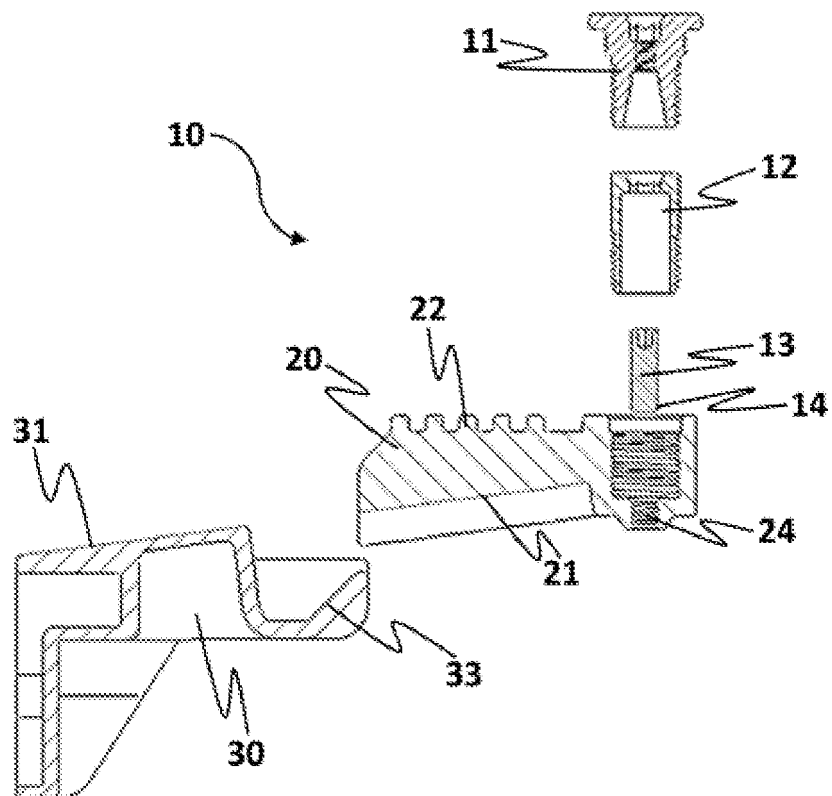


FIGURE 5

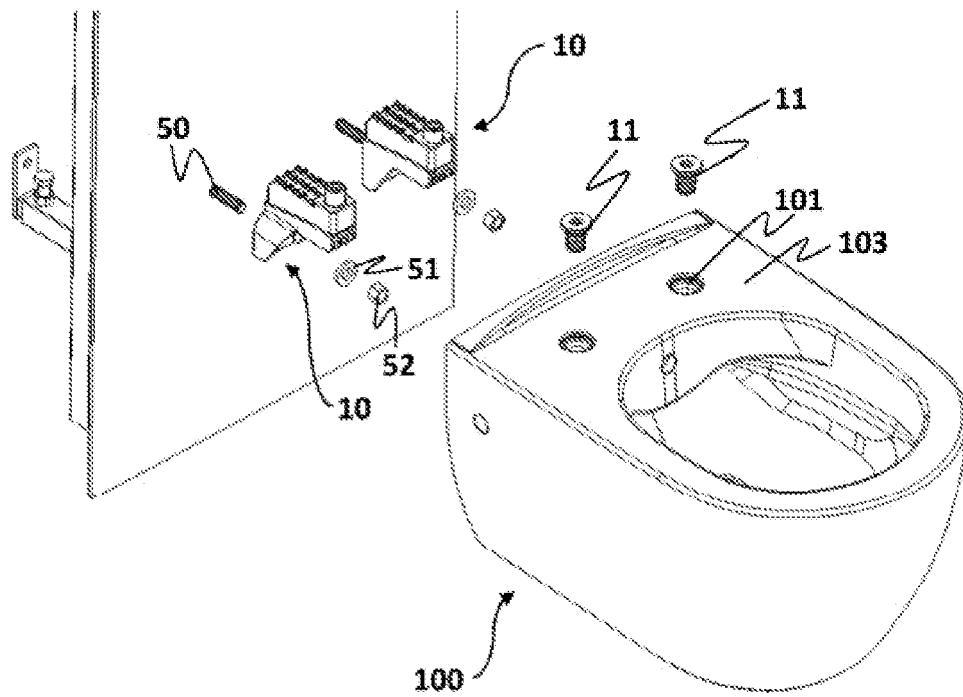


FIGURE 6

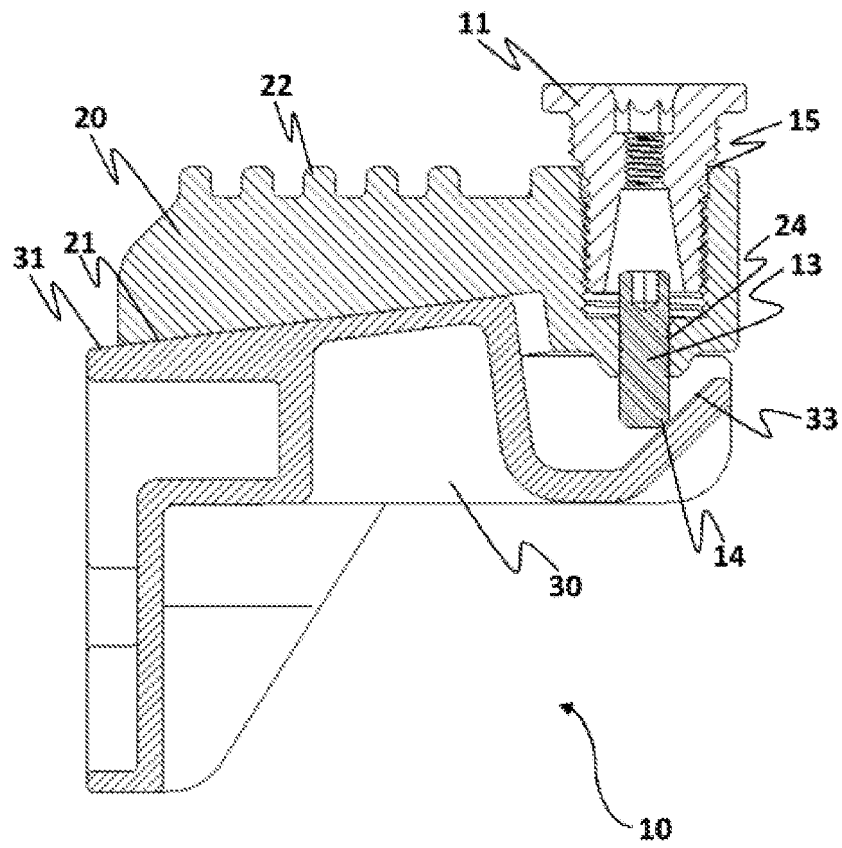


FIGURE 7

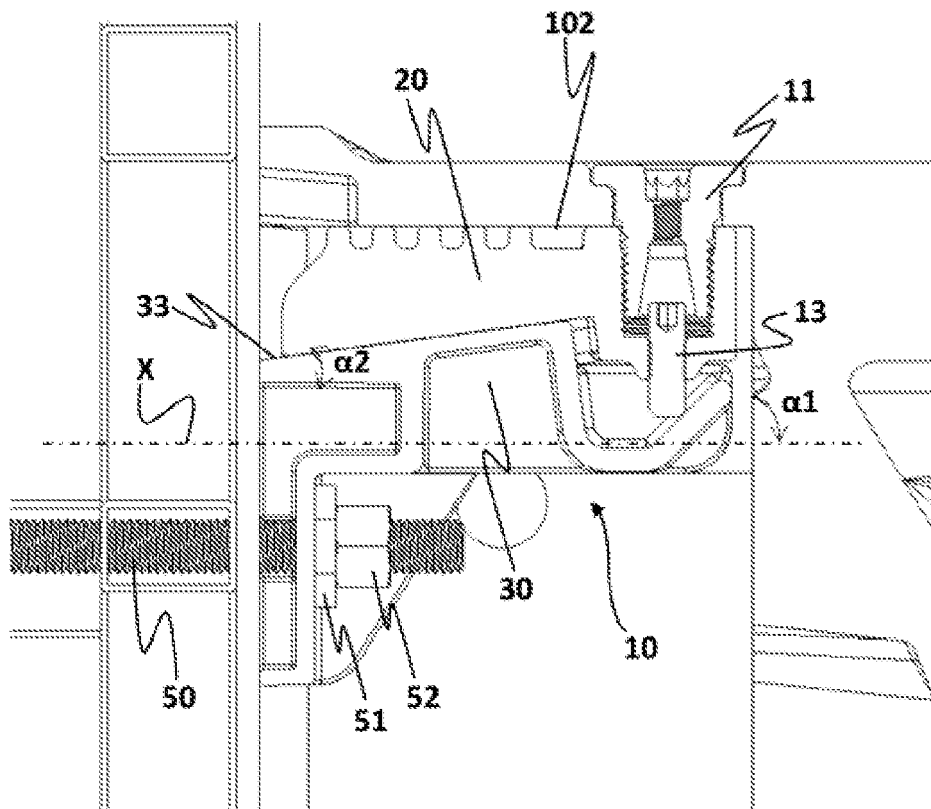


FIGURE 8

REFERENCES CITED IN THE DESCRIPTION

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