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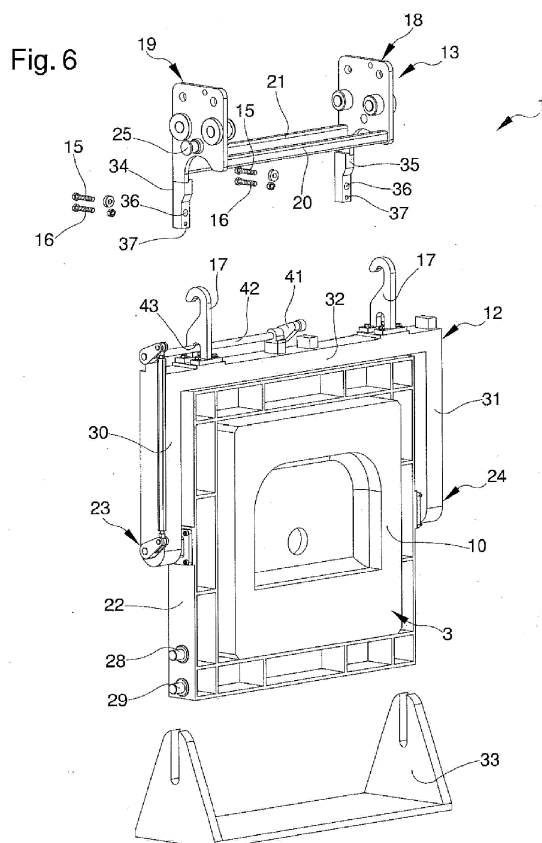
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(54) **Support framework for molds**

(57) The support framework (1) for molds (3) suitable for being used in plants (2) for the pressure slip casting of hygienic-sanitary articles comprises:
- a support element (12) associable with a mold (3) for forming the articles;
- an attachment bracket (13) suitable for being mounted

in the plant (2);
- removable fixing means (15, 34, 35) suitable for solidly joining the bracket (13) to the element (12); and
- hook means (17) fixed to the element (12) and able to removably hook the element (12) to the bracket (13).



Description

[0001] The present invention relates to a support framework for molds intended to be used in plants for the pressure slip casting of hygienic-sanitary articles. Automated plants are known for forming hygienic-sanitary articles.

[0002] These plants make use of pressure slip casting technology, which envisages to enter ceramic material under pressure, in the form of slurry, in the forming cavity defined by suitable molds.

[0003] According to the shape of the cavity, and therefore according to the molds used, these plants allow to realize different articles from time to time, such as sinks, shower trays, toilet boxes, toilet bowls, bidets and the like.

[0004] In detail, a plant is known having a plurality of identical molds mounted in succession and in a suspended manner, by means of suitable support frameworks, to a horizontal elongated structure.

[0005] In detail, the molds are movable along the structure, thanks to the fact that the frameworks are mounted sliding on guides which extend in the longitudinal development of the structure itself.

[0006] Each mold conforms two opposite shaped faces and all molds have the same orientation so that, following their pack compaction, in each pair of adjacent molds, the face of a mold facing to a direction cooperates with the face of the other mold turned in the opposite direction, to define said cavity.

[0007] In detail, the plant also provides thrust means able to keep the molds pressed with force against each other, when they are arranged in the aforementioned pack configuration.

[0008] Once slip casting has been completed, the molds are moved away from each other to allow the removal of hygienic-sanitary articles.

[0009] As mentioned above, by changing the molds used in the plant, the article being formed is changed.

[0010] Therefore, at the end of a cycle for forming sinks, e.g., and before the beginning of a cycle for forming shower trays, it is necessary to replace the molds.

[0011] For example, the molds for sinks must be removed from the above structure and those for shower trays are mounted in their place.

[0012] Each framework comprises both a half-frame, to which the respective mold is coupled, and a pair of carriages, constrained to slide along said guides, fixed on top of the half-frame by means of a plurality of screws arranged vertically.

[0013] In practice, the carriages hold in suspension the half-frames and, therefore, the molds.

[0014] During the replacement, the half-frame and the respective mold must be separated from the carriages that remain connected to the guides.

[0015] Given that the frames and molds are hung from the carriages by means of the screws, and considering that they are very heavy, their replacement requires the use of a forklift driven by an operator.

[0016] In practice, given that the half-frame - mold group is hung solely by means of screws arranged vertically, it can not be removed or mounted from/on the plant simply by loosening/tightening the screws, because such a group would fall to the ground and damage irreparably.

[0017] Therefore, during the removal of the screws, it is necessary to support the group through a kind of harness made with straps applied by skilled personnel on purpose, which are to be used together with the forklift.

[0018] This system is extremely slow and also expensive, because it requires the use of labor made up of several people who are employed for some time.

[0019] Furthermore, it has been verified in practice that, since the application and removal of screws occur while the half-frame - mold group is suspended precariously, the relative motions between the screws during the screwing and unscrewing of the group damage the threads of screws and holes obtained on the frame which act as a nut screw.

[0020] The main aim of the present invention is to provide a support framework for molds intended to be used in plants for the pressure slip casting of hygienic-sanitary articles which allows to replace the respective mold faster than in the prior art.

[0021] Within this aim, an object of the invention is to provide a support framework that allows the replacement of the plant's molds without the risk of damage.

[0022] A further object of the invention is to provide a support framework which allows the replacement of the mold with the use of labor reduced to a minimum. Another object of the present invention is to provide a support framework for molds intended to be used in plants for the pressure slip casting of hygienic-sanitary articles which can overcome the mentioned drawbacks of the prior art in the ambit of a simple, rational, easy and effective to use as well as low cost solution.

[0023] The above mentioned objects are achieved by the present support framework for molds, intended to be used in plants for the pressure slip casting of hygienic-sanitary articles, made according to claim 1.

[0024] Other characteristics and advantages of the present invention will become more evident from the description of a preferred, but not exclusive, embodiment of a support framework, illustrated by way of an indicative, but not limitative, example in the accompanying drawings wherein:

Figure 1 is an axonometric view of a plant in which a plurality of frameworks is mounted according to the invention;

Figure 2 is the enlarged detail K of the previous figure;

Figure 3 is an axonometric view of a part of the plant of Figure 1;

Figures 4 and 5 are axonometric views showing the framework according to the invention from opposite sides;

Figure 6 is an axonometric, partially broken, view of the framework according to the invention; and Figures 7 and 8 are axonometric views of the framework according to the invention in two different configurations of use.

[0025] With reference to these figures, by reference numeral 1 is globally indicated the support framework of the invention.

[0026] Before describing the proposed framework 1, the structure and operation of a plant 2 for the pressure slip casting of hygienic-sanitary articles to which the invention is intended are briefly described.

[0027] This example of plant 2 is shown in Figures 1, 2 and 3.

[0028] Such plant 2, as far as the structural aspects and operation are concerned, can be made according to the description of the international patent application no. PCT/IB2012/002578 incorporated herein by reference in its entirety.

[0029] The plant 2 is intended for forming sinks, shower trays, toilet boxes, toilet bowls, bidets or other hygienic-sanitary articles, according to the type of mold 3 used, similarly to the prior art discussed above.

[0030] The plant 2 comprises a horizontal base platform 4, resting on the ground, from which stand three uprights 5, 6, 7, of which a median one, aligned along the platform 4.

[0031] The uprights 5, 6, 7 support an upper structure 8 parallel to the platform.

[0032] A plurality of molds 3 are provided, which are hung in a sliding manner from the upper structure 8 by means of the framework 1 of the invention, in a raised position with respect to the platform 4.

[0033] Thanks to the framework 1, the molds 3 are movable along the upper structure 8 between a working configuration, in which they are compacted in a pack (shown in Figures 1 and 2) and a discharge configuration, in which they are moved away.

[0034] In the present description, unless otherwise specified, when using terms or adjectives relating to orientation, such as 'top', 'bottom', 'above', 'below', 'vertical' or 'horizontal' about the invention, one wishes to refer to the framework 1 and to the mold 3 in use, i.e. when they are hanging in the plant 2, defining together a suspended form assembly 1, 3, 12, 22, 3.

[0035] Each mold 3 has a generally planar extension, is substantially quadrangular, and conforms two opposite shaped faces 9, 10.

[0036] Except during the removal phase of the formed article, the molds 3 are all mounted to the structure 8 on ideal plans transversal to the length of the same and all have the same orientation, i.e. the faces 9, 10 equal to one another all point in the same direction (these directions being parallel to the length of the plant 2).

[0037] In this way, following their pack compaction, in each pair of adjacent molds 3, the face 9, 10 of a mold 3 facing to a direction cooperates with the face 9, 10 of

the other mold 3 facing to the opposite direction to define the cavity where the article is formed by pressure slip casting.

[0038] The plant 2 also comprises thrust means 11 able to crush and keep pressed with force the molds 3 one against the other, arranging them in said working configuration.

[0039] Once slip casting has been completed, the molds 3 are arranged in the discharge configuration.

[0040] To obtain the discharge, the molds are rotated by ninety degrees around a horizontal axis, in the manner explained below.

[0041] As shown in Figures 4 - 8, the framework 1 of the invention comprises firstly a support element 12, associable with a respective mold 3, and an attachment bracket 13 intended to be mounted in the plant 2, and preferably able to mate sliding with one or more guides 14 of the plant 2 (see also figures 2 and 3).

[0042] In practice, the bracket 13 holds in suspension the rest of the framework 1 and the respective mold 3.

[0043] In the example of plant 2 shown in the figures, there are two parallel guides 14 which are included in the above upper structure 8.

[0044] Preferably, the bracket 13 comprises two sliding carriages 18, 19 joined by one or more cross members 20, 21 which are transversal to the sliding direction. The carriages 18 and 19 are responsible for the sliding of the relative mold 3, along said structure 8 and allow the molds 3, with which the plant 2 is equipped, to be alternately arranged in the working or in the discharge configuration. The carriages 18, 19 may comprise idle rollers able to run along said guides 14. Moreover, the proposed framework 1 comprises removable fixing means 15, 34, 35 able to integrally join the bracket 13 to the support element 12; these fixing means 15, 34, 35 may comprise screw means, as in the prior art, but devised very differently, as it will be explained later.

[0045] The invention also provides hook means 17 fixed to the element 12 and able to hook in a removable manner to the bracket 13.

[0046] In detail, the hook means 17 are able to support in suspension the element - mold group 12, 3, for reasons which will be explained during operation of the framework 1.

[0047] Preferably, the hook means comprise at least a hook 17, fixed on the top of the mentioned element 12, to define with it a hanger means 12, 17 for hanging the mold 3 to the bracket 13.

[0048] In the embodiment illustrated in the attached drawings, the element 12 comprises an upper elongated section 32, above which two crook-shaped parallel hooks 17 are fixed and able to fasten to the bracket 13.

[0049] In detail, the bracket 13 can comprise two knobs 25, 26 for the attachment of the hooks 17.

[0050] The knobs 25, 26 can be composed of opposite axial-symmetric members, perpendicular to the sliding directions of the carriages 18, 19 and e.g. fixed to the latter under the rollers, projecting cantilevered along op-

posite directions.

[0051] In this case, the support element 12 may be longer than the bracket 13, and the hooks 17 must be spaced away from one another substantially as are the knobs 25, 26 (see in particular Figures 4 and 5).

[0052] At the end of the discharge of the formed article 39, the support element 12 is associable in a rotating manner with the relative mold 3, preferably by interposition of a frame 22 able to integrally couple to the mold 3 itself.

[0053] The hook means 17, the support element 12, the frame 22 and the mold 3, and in practice all the elements of the framework 1 that are hung from the bracket 13 by means of the hook means 17, together define a form assembly 3, 12, 22.

[0054] More in detail, the frame 22 has an annular shape, may be quadrangular (see e.g. Figure 6) and may accommodate the mold 3 in an inner housing, since it is positioned substantially on the same plane of the mold 3.

[0055] In practice, the frame 22 may contain the mold 3, by engaging it at its perimeter edges.

[0056] According to the preferred embodiment of the invention, the support element 12 has a C-shape and supports the frame 22 by means of two rotating couplings 23, 24 with horizontal axis, arranged in opposite position with respect to the frame 22.

[0057] This axis passes centrally with respect to the frame 22 and allows its aforementioned rotation by ninety degrees.

[0058] The rotating couplings 23, 24 are preferably made at the extremities of the element 12, i.e. of the ending parts of the parallel sections 30, 31 which extend transversely, downwards, from an upper section 32, to define said C.

[0059] The upper section 32 is the part of the support element 12 above which are fixed the hooks 17.

[0060] In practice, during use, in particular when the mold 3 is arranged in the plant 2 in the working configuration, the element 3 is coplanar with the frame 22 and the respective mold 3, and its C shape defines a seat in which the frame 22 is housed.

[0061] Before explaining further structural aspects of the invention, especially concerning the preferred configuration of the mentioned fixing means 15, 34, 35, the use of the framework 1 is described below during the replacement of the molds 3.

[0062] During this phase of replacement, of course, the molds 3 are not arranged in the working configuration, but are moved away from each other, similarly to the discharge configuration, so that the operators have easy access to the fixing means 15, 34, 35.

[0063] The molds 3 can be replaced one by one or more at a time.

[0064] In any case, to move them away from the plant 2 or to take close to it, movement means can be used such as the common forklifts or even the so-called self-propelled automated shuttles 27 (like that represented in Figures 1 and 3), e.g. of the laser-guided type or the like.

[0065] For replacement purposes, of course, it is first necessary to remove the molds 3 from the plant 2.

[0066] To do this, the above mentioned fixing means 15, 34, 35 are operated in order to release the support element 12 from bracket 13.

[0067] In detail, if the fixing means 15, 34, 35 comprise screws 15, 16, these are removed.

[0068] This does not involve the form assembly 3, 12, 22 falling to the ground, since the invention advantageously provides the hook means 17 which support it in suspension, like a hanger.

[0069] Therefore, to remove the molds 3 from the plant 2, it is not necessary to use belts or other similar means, because the form assembly 3, 12, 22 is self-supporting.

[0070] Moreover, while the form assembly 3, 12, 22 is hung from the bracket 13, the hook means 17 prevent the displacement thereof between the one and the other, so that the screws 15 of the fixing means can be removed without the risk of damaging the threads.

[0071] At this point, to remove the form assembly 3, 12, 22 from the plant it is sufficient to operate with one of the movement means, which comprise usual lifting members.

[0072] In fact, especially in the case in which the hook means comprise the above mentioned hooks 17, after lifting the form assembly 3, 12, 22 enough to slip off their crook-shaped extremity from the knobs 25, 26, simply move the unit 3, 12, 22 horizontally to obtain the removal of the mold 3 from the plant 2.

[0073] To facilitate this operation, an optional device may be provided wherein the frame 22 comprises, at its perimeter edge, at least two opposite pegs 28, 29.

[0074] In the illustrated example, there are two pairs of pegs 28, 29, arranged protruding in the half of the frame 22 intended to be never accommodated in said parallel sections 30, 31 of the support element 12, even during rotation. These pegs 28, 29 allow the coupling between the unit 3, 12, 22 and a particular support rack 33 (see Figure 6), preferably mounted on said lifting members of the movement means, which comprises parallel and vertical side edges having longitudinal slots to accommodate to measure the pegs 28, 29 and to allow the rack 33 to support the unit 1, 3 by holding it vertically.

[0075] The sequence of operations explained in the previous paragraphs should of course be repeated for each mold 3, while for mounting the new molds 3 in the plant a reversed sequence will be followed, wherein the form assemblies 3, 12, 22 that comprise them are first hung by the hook means 17 and then are integrally locked to respective brackets 13 through the fixing means 15, 34, 35. Note that, if an automated shuttle 27 is used as movement means, to replace the molds 3 it would be enough to have a single operator in charge of fixing and releasing the support element 12 to/from the bracket 13, through the fixing means 15, 34, 35.

[0076] The proposed framework 1 may comprise at least a protrusion 34, 35, but preferably two, fixed to the bracket 13 and extending from it below, in which at least

a transversal through hole 36, 37 is obtained.

[0077] The protrusion 34, 35 is able to be joined to the support element 12 (in particular, to its upper section 32), in correspondence of at least a threaded hole obtained in the support element, by means of at least a screw 15.

[0078] The protrusions 34, 35, the screws 15 and the threaded holes define together the fixing means.

[0079] In practice, as mentioned above, when the support element 12 and the bracket 13 are joined together, their longitudinal extension is parallel and in practice the second surmounts the first.

[0080] In this case, preferably, the two protrusions 34, 35 are parallel (and may also be identical), are placed in different points of the length of the bracket 13 (i.e. in correspondence of its carriages 18, 19) and may be joined by means of the screws 15 to the upper section 32 mentioned in correspondence of at least two threaded holes arranged in different points of the length of the latter.

[0081] In detail, the presence of the two parallel hooks 17 placed in different points of the length of the upper section 32, may be sufficient to prevent the rotation of the unit 3, 12, 22 around an axis parallel to the sliding direction of the carriages 18, 19.

[0082] However, the use of fixing screws 15 prevents the rotation of the hooks 17 around the surface of the knobs 25, 26 during the sliding of the carriages.

[0083] In practice, the fixing means 15, 34, 35 so configured not only allow to make the unit 1, 3 integral to the bracket 13, but ensure the verticality of the molds 3, which is fundamental during pressure slip casting of slurry in the aforementioned forming cavity, to prevent leakage.

[0084] To make such verticality absolutely certain, the following measure can be taken which allows to fine-tune the inclination of unit 1, 3 with respect to a horizontal axis transversal to the direction of sliding.

[0085] The protrusions 34, 35 are elongated and comprise at least a pair of through holes 36, 37 in different points of its length to join them to said support element 12 at a pair of transversal threaded holes, by means of a fixing screw 15 and an adjusting screw 16, to adjust the inclination of unit 1, 3 with respect to the aforementioned transversal horizontal axis.

[0086] In fact, according to the degree of screwing of the adjusting screws 16 the inclination of the plane wherein the support element 12 lies may be adjusted with respect to that wherein the protrusions 34, 35 lie.

[0087] As mentioned above, the framework 1 of the invention is designed to perform the rotation by ninety degrees of the mold 3, to allow the removal by gravity of the article from the mold 3.

[0088] In detail, as shown in Figures 7 and 8, the mold 3 can rotate between a position in which it is arranged vertically, in order to achieve the forming of the article or to replace it, and a position in which it is horizontal and allows the aforementioned removal.

[0089] The formed article 39, during removal, is supported by suitable means, e.g. comprising an anthropo-

morphic robot 38 arranged on a slide above said upper structure 8.

[0090] The robot 38 then provides to place the formed article 39 on a conveyance means 40 that leads it to other processing plants.

[0091] To achieve this rotation a drive mechanism 41, 42 may be provided connected to one of said rotating couplings 23, 24 between the support element 12 and the frame 22, and comprising an operating lever 41 directly connected to a rod 42 as a crank handle.

[0092] The lever 41 and the rod 42 may be placed above the already mentioned upper section 32.

[0093] Advantageously, at least one of the hooks 17 of the invention may comprise a passage 43 wherein the rod 42 is fitted and is free to rotate.

[0094] Even more in detail, the drive mechanism 41, 42 may comprise a lever crank equal to that disclosed in PCT/IB2012/002578.

[0095] Within a longitudinal seat obtained in the upper structure 8, a self-propelled operating device may be contained sliding able to engage the mentioned lever 41 so as to operate the mechanism 41, 42 and perform the rotation.

[0096] In the event the rollers of the carriages 18, 19 being idle, this device can also engage the bracket 13 to allow the sliding of the molds 3 along the plant 3.

[0097] In practice it has been found how the described invention achieves the intended objects and in particular the fact is underlined that it provides a support framework 1 for molds 3 intended to be used in plants 2 for the pressure slip casting of hygienic-sanitary articles which allows a faster, more secure and less expensive replacement of mold 3.

Claims

1. Support framework (1) for molds (3) suitable for being used in plants (2) for the pressure slip casting of hygienic-sanitary articles, comprising:

- a support element (12) associable with a mold (3) for forming said articles;
- an attachment bracket (13) suitable for being mounted in said plant (2); and
- removable fixing means (15, 34, 35) suitable for solidly joining said bracket (13) to said element (12);

characterized in that it comprises hook means (17) fixed to said element (12) and able to removably hook said element (12) to said bracket (13).

2. Framework (1) according to claim 1, **characterized in that** said hook means comprises at least a hook (17) fixed on said element (12).

3. Framework (1) according to one or more of the pre-

ceding claims, **characterized in that** said element (12) is rotatively associable to said mold (3).

4. Framework (1) according to one or more of the preceding claims, **characterized in that** it comprises a frame (22) suitable for coupling to said mold (3). 5
5. Framework (1) according to claims 3 and 4, **characterized in that** said element (12) supports said frame (22) through at least a rotating coupling (23, 24). 10
6. Framework (1) according to one or more of the preceding claims, **characterized in that** it comprises at least a protrusion (34, 35) fixed to said bracket (13), having at least a through hole (36) and suitable for being joined to said element (12) at one or more through hole thereof by means of at least a screw (15), so as to define said fixing means (15, 34, 35). 15
7. Framework (1) according to one or more of the preceding claims, **characterized in that** said bracket (13) comprises at least a sliding carriage (18, 19). 20
8. Framework (1) according to one or more of the claims from 2 to 7, **characterized in that** said bracket (13) comprises at least a knob (25, 26) for hooking the hook (17). 25
9. Framework (1) according to claims 2 and 8, **characterized in that** said bracket (13) comprises two knobs and **in that** said element (12) comprises at least an elongated section (32), above which at least two hooks (17) are fixed for hooking to said knobs (25, 26). 30
10. Framework (1) according to claims 6 and 9, **characterized in that** said fixing means (15, 34, 35) include at least two protrusions (34, 35) joined to said section (32) at one or more of threaded holes thereof arranged in different points of its length. 35 40
11. Framework (1) according to one or more of the claims from 6 to 10, **characterized in that** said protrusion (34, 35) comprises at least a pair of through holes (36, 37) in different points of its length to join them to said element (12) at a pair of through holes, by means of a fixing screw (15), and an adjusting screw (16). 45
12. Framework (1) according to one or more of the claims from 4 to 11, **characterized in that** said frame (22) comprises, at its perimeter edge, at least two opposite pegs (28, 29). 50
13. Framework (1) according to one or more of the claims from 5 to 12, **characterized in that** it comprises a drive mechanism (41, 42) connected to said rotating coupling (23) and comprising at least an operating

lever (41) directly connected to a rod (42) as a crank handle, and **in that** said hook (17) comprises a passage (43) in which said rod (42) is fitted and is free to rotate.

14. Form assembly (1, 3) for being used in plants (2) for the pressure slip casting of hygienic-sanitary articles, comprising at least a framework (1) according to one or more of the preceding claims, and a mold (3) carried by said framework (1) comprising two opposite shaped faces (9, 10), each of which, upon the application adjacent to a shaped face (9, 10) of another mold (3), is able to define with the latter a cavity for forming of one of said hygienic-sanitary articles by means of said pressure slip casting.

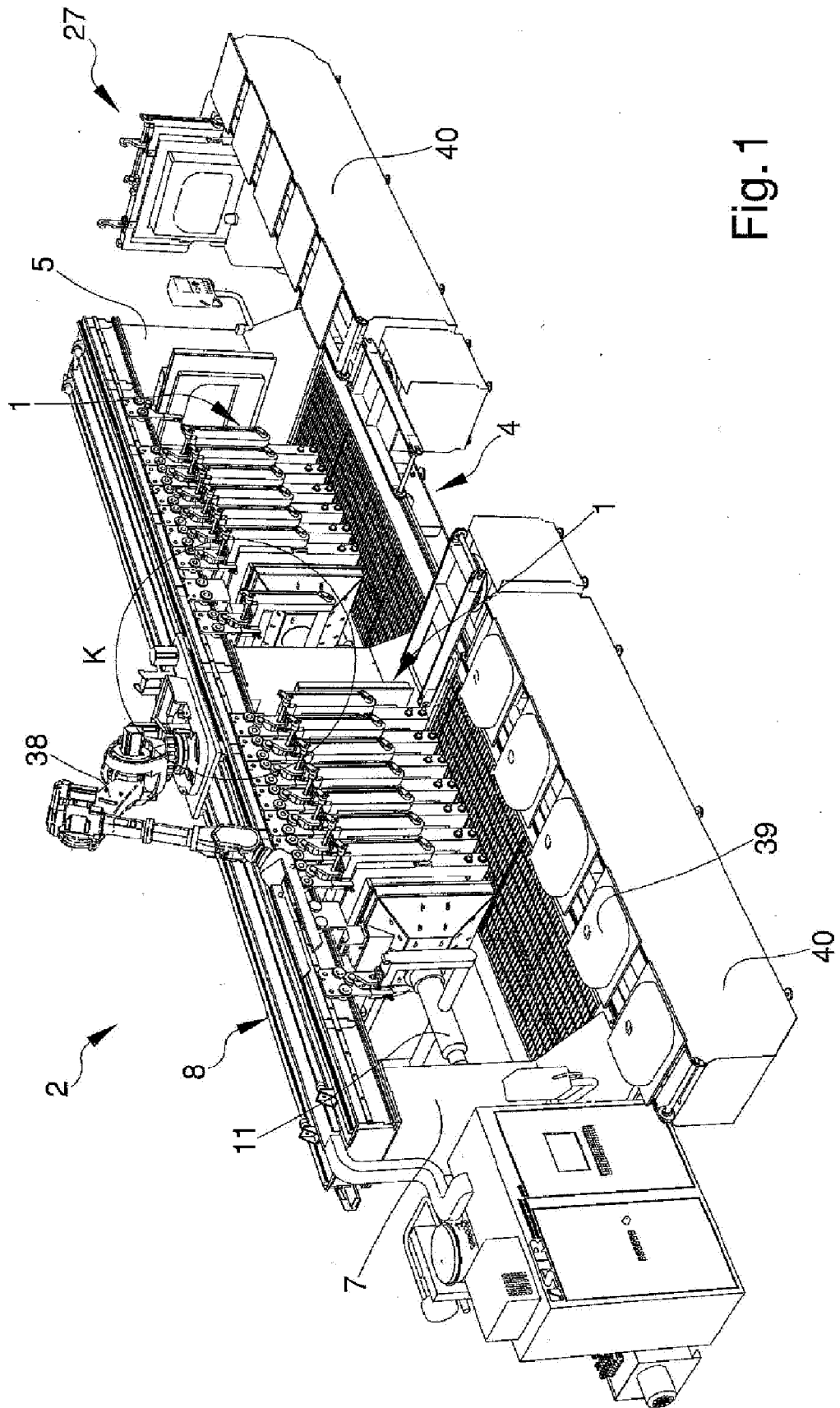


Fig. 1

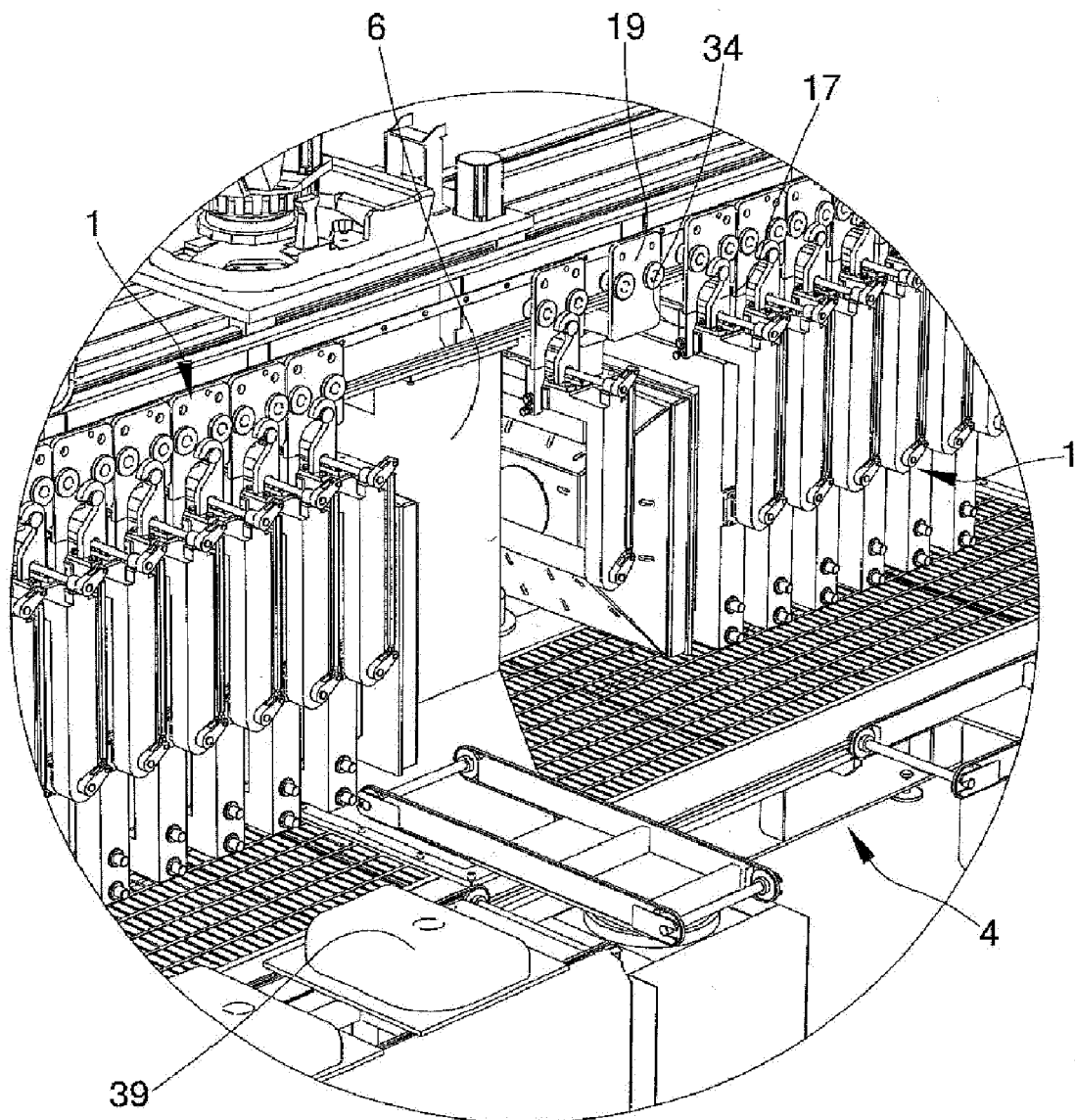


Fig. 2

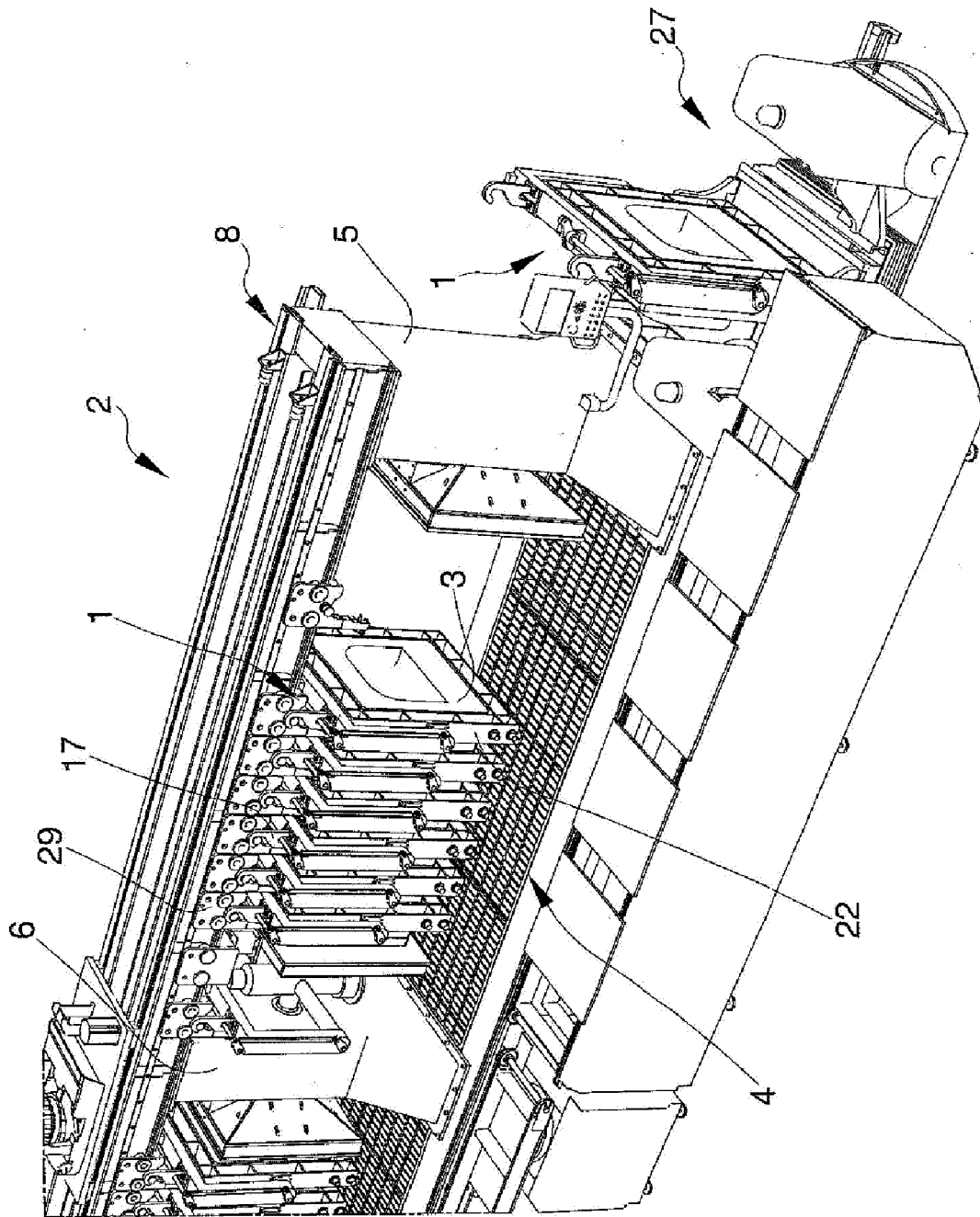


Fig. 3

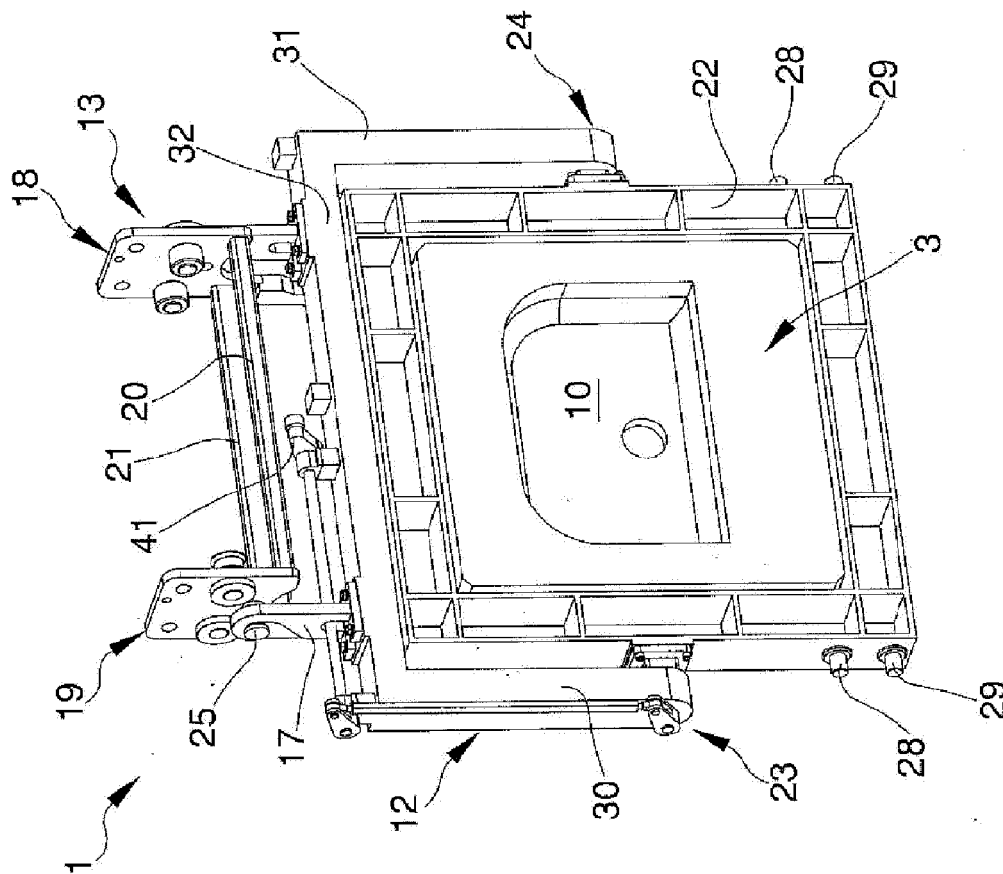


Fig. 5

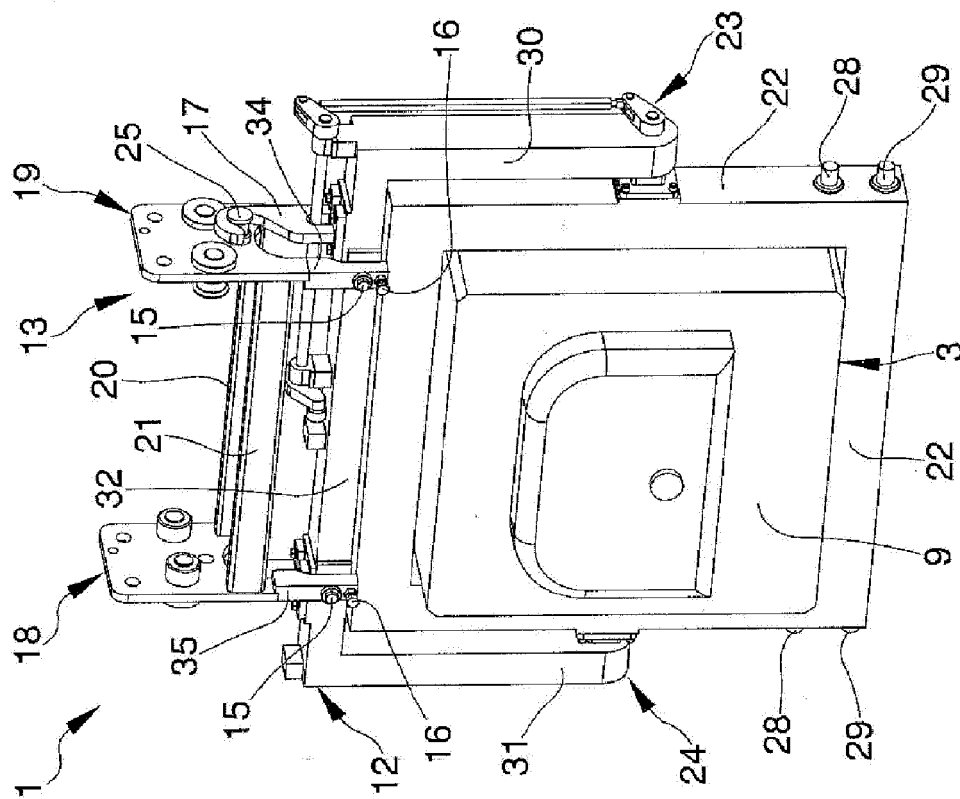
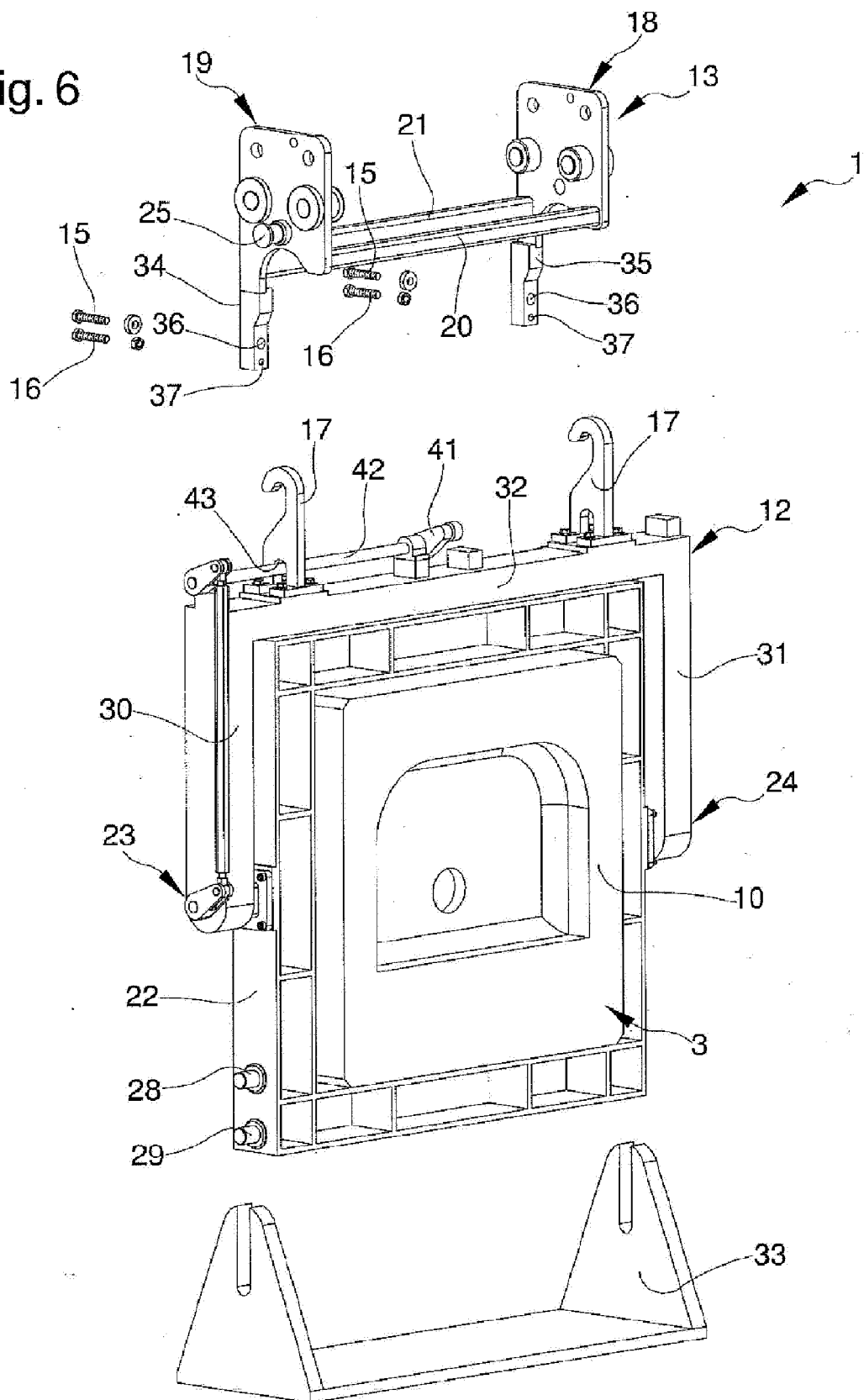


Fig. 4

Fig. 6



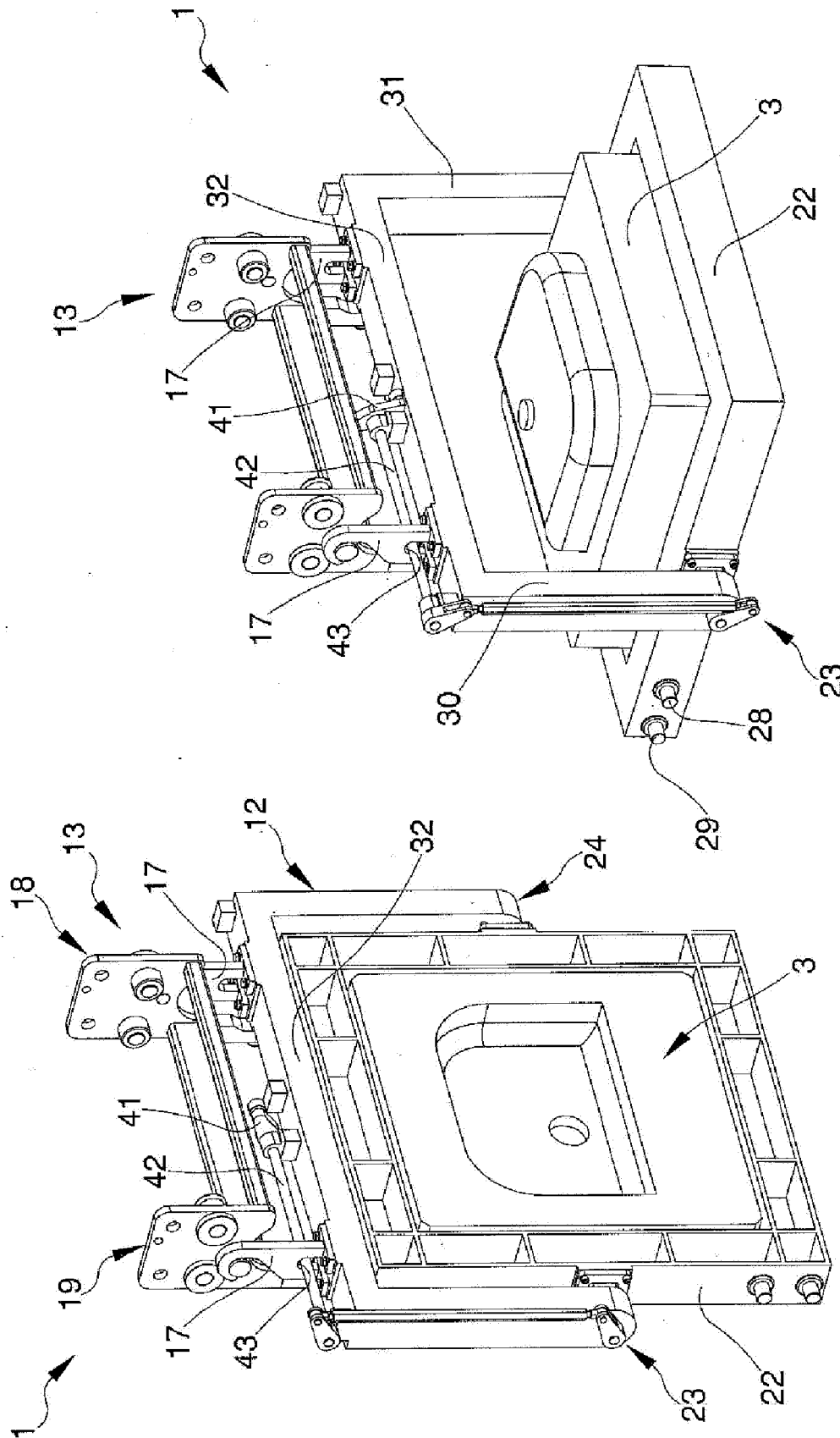


Fig. 8

Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 9733

DOCUMENTS CONSIDERED TO BE RELEVANT			
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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 7 October 2014	Examiner Boone, John
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 14 16 9733

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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