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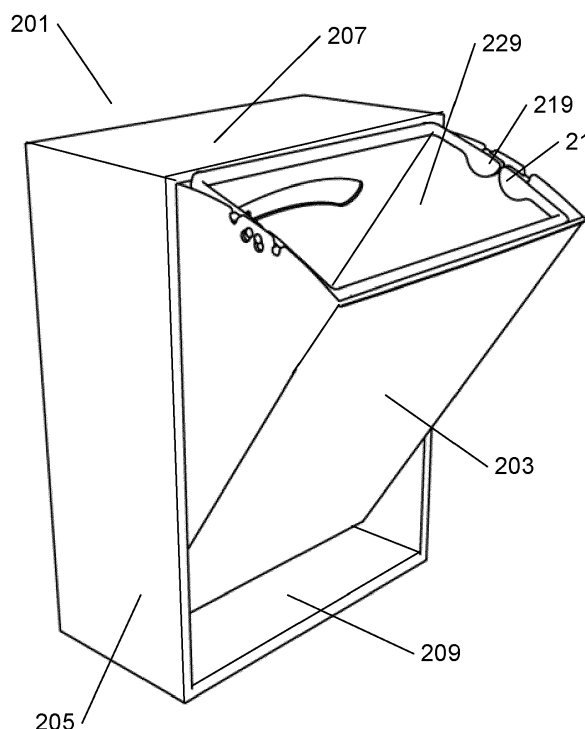
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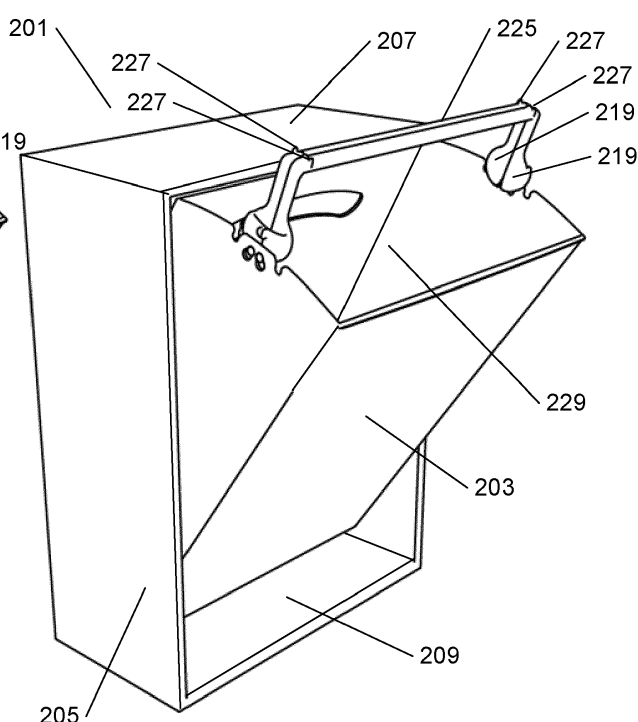
(54) **A WASTE SORTING SYSTEM**

(57) The present invention relates to a waste sorting system (1, 101, 201) for sorting of garbage, wherein the waste sorting system comprises an outer casing and a container enclosing a cavity (29, 229) for collecting a garbage to be sorted wherein an axis (17) is provided where

the entirety of the container is configured to be rotably connected and where the container is configured to be detachable from the outer casing by lifting the container via a handle (25, 125, 225).



**Fig. 6A**



**Fig. 6B**

## Description

### Technical Field

[0001] The present invention relates to a waste sorting system for sorting of garbage, wherein the waste sorting system comprises an outer casing and a container enclosing a cavity for collecting a garbage to be sorted wherein an axis is provided where the entirety of the container is configured to be rotably connected and where the container is configured to be detachable from the outer casing by lifting the container via a handle.

### Background art

[0002] Depending on where one live, waste bins and recycling bins can e.g. be found in the courtyard or the basement. E.g. the municipality of Copenhagen provides waste bins and collects waste from the citizen's property. The city like many others provide recycling stations and local collection points, where the residents of Copenhagen can recycle their waste. A collection point could be smaller, only accepts certain types of recyclable waste, and be accessible by foot only. There may be many different types of recyclable waste, such as bio waste, bulky waste, cardboard, electronic waste, garden waste, glass, hazardous waste, metal, paper, plastic, or residual waste.

[0003] As the cities and countries around the world are more aware of the environmental consequences, and focuses more on sorting of garbage into multiple of the above recyclable waste categories, and as recycling station may be a short walk away from where the citizen is living, this will also require the citizen to have a small sorting system in the kitchen or the like, where one can temporarily store the sorted waste until the sorting system is emptied at the recycling station. An example of a smaller waste container is shown in FR 2659945 A1, which shows a system comprising a container enclosing a cavity for collecting garbage to be sorted, where the container has an upper opening for accessing the cavity.

### Summary

[0004] The present invention solves this need for a small sorting system, which can be present in the kitchen or the like for temporarily storing of the sorted waste by providing a flexible container for garbage sorting made of e.g. recycled plastic and in a minimalistic Danish design.

[0005] The description herein of any aspect or embodiment of the invention using terms such as "comprising", "having", "including", or "containing" with reference to an element or elements is intended to provide support for a similar aspect or embodiment of the invention that "consists of", "consists essentially of", or "substantially comprises" that particular element or elements, unless otherwise stated or clearly contradicted by context, e.g.

a composition described herein as comprising a particular element should be understood as also describing a composition consisting of that element, unless otherwise stated or clearly contradicted by context. It will be further understood that the terms "comprises", "comprising", "includes" and/or "including", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0006] Unless otherwise defined, all terms used herein (including technical and scientific terms) have the same meaning as commonly understood by those skilled in the art to which this invention pertains. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined in the present specification.

[0007] As used herein, the singular forms "a", "an," and "the" are intended to include the plural forms, including "at least one," unless the content clearly indicates otherwise. "At least one" is not to be construed as limiting "a" or "an."

[0008] All headings and sub-headings are used herein for convenience only and should not be construed as limiting the invention in any way.

[0009] The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0010] Disclosed herein in a first aspect is a waste sorting system for sorting of garbage, wherein the waste sorting system comprises: an outer casing comprising at least a back side, two opposing sides, and a top side, wherein the outer casing has a first longitudinal centre plane extending parallel to the two opposing sides, and wherein each of the two opposing sides comprises at least one protrusion, wherein the at least one protrusion are at least directed inwards towards the first longitudinal centre plane; and a container enclosing a cavity for collecting a garbage to be sorted, wherein the container comprises an upper opening for accessing the cavity, wherein a front side of the container provide a front side of the outer casing enclosed by at least the two opposing sides and the top side of the outer casing, and wherein the container comprises at least two parts forming a first handle located at the upper opening of the cavity; wherein the protrusions provide an axis and the entirety of the container is configured to be rotably connected to the axis so as to place the waste sorting system into an open or closed state; wherein the open state is configured to

provide access to the upper opening of the cavity; and wherein the container is configured to be detachable from the outer casing by lifting the container via the first handle when the waste sorting system is in the open state.

**[0011]** The present intervention is designed to increase and ease the sorting of garbage by e.g. hanging the container on a door or on a wall and thereby reduce the challenge of lack of space for sorting garbage. The technical solution is partly the tilting function making it easy to dispose the garbage in the hanging container and the handles which also work as storing the disposal bag. Furthermore, the inner container can be tilted to open and removed altogether to enable easier removal and moving of contained garbage.

**[0012]** Hence, in one or more embodiments, the outer casing comprises means for hanging the outer casing on a vertical surface, such as a door, a closet door, or a wall.

**[0013]** The intervention is made up of two primary parts, which are not attached physically to each other. An outer casing and a container.

**[0014]** The outer casing serves the purpose of being attached to a wall or door and holds the inner container in place, by the sliding function in each side, i.e. the rotation around the proportions.

**[0015]** The protrusion on the outer casing serves two functions. One the protrusion holds the container in place, hereby avoiding it from falling out of the outer casing through the front side. Two, it makes an axis on which the container can be rotated, hereby opening the waste sorting system. The placement/location of the protrusions are important if both this functions shall be obtained from the protrusions. If the protrusions are located in the bottom of the outer casing, they will not serve to retain the container inside the outer casing, but only serve for a rotation. If they are placed two high/further up towards the top of the outer casing and/or if they are placed centrally on the opposing sides the container would require modification in order to rotate around this axis, or the outer casing needs to be constructed with more depth compared to the container to allow the container to rotate. Hence, the placement of the protrusions will determine the size of the cavity in the container.

**[0016]** In one or more embodiments, the axis is located near the front side of the container, such that a longitudinal centre line of the axis is at a distance  $d_{a1}$  from the front side of the container, wherein the distance  $d_{a1}$  is measured perpendicular to and from the front side of the container to the longitudinal centre line of the axis, and the distance  $d_{a1}$  is between 1% and 15% of the distance  $d_{a2}$ , such as between 1% and 10%, such as between 5% and 10%, wherein the distance  $d_{a2}$  is measured perpendicular to and from the front side of the container to the back side of the casing.

**[0017]** In one or more embodiments, the outer casing further comprises a bottom side and wherein the longitudinal centre line of the axis is at a distance  $d_{b1}$  from the bottom side of the casing, wherein the distance  $d_{b1}$  is measured perpendicular to and from the bottom side

of the casing to the longitudinal centre line of the axis, and the distance  $d_{b1}$  is between 90% and 110% of the distance  $d_{b2}$ , such as between 90% and 105%, such as between 95% and 105%, wherein the distance  $d_{b2}$  is measured perpendicular to and from the back side of the casing to the longitudinal centre line of the axis.

**[0018]** In one or more embodiments, a bottom third part of the container is shaped to provide an angle between 20° and 50°, such as between 25° and 45°, such as between 30° and 40°, wherein the angle is measured between the front side of the container when the waste sorting system is placed into the open state and the front side of the container when the waste sorting system is placed into the closed state or wherein the angle is measured between a second longitudinal centre plane of the outer casing and the front side of the container when the waste sorting system is placed into the open state, wherein the second longitudinal centre plane of the outer casing is perpendicular to the first longitudinal centre plane of the outer casing.

**[0019]** In one or more embodiments, the container is defined by a top part of the container and a bottom part of the container, wherein the top part of the container is the part located above the longitudinal centre line of the axis and wherein the bottom part of the container is located below the longitudinal centre line of the axis, and wherein the bottom part of the container is substantially trapezium shaped with only one lateral side so as to be configured to stop and hold the container by contact between the back side of the outer casing and the lateral side of the bottom part of the container, when the waste sorting system is in the open state of.

**[0020]** By optimal placement of the protrusion and by "cutting" away a small portion of the bottom container, the size of the cavity can be optimized to the largest size possible inside the outer casing.

**[0021]** In one or more embodiments, the container comprises a guiding slid, which is configured as an indentation in each side of the container facing the protrusions, wherein the guiding slid extends from the bottom of the container to a position on the container where the protrusions provide an axis and the container is connected to the protrusions via the guiding slid. The guiding slid is the "cut" away portion, hence by "cutting" away a small portion is not meant that a small portion of the container is removed, but that an indentation is provided in the sides of the container, hereby slightly limiting the size of the cavity in the container. The guiding slid serves two purposes. One, it makes it easy to detach the container from the outer casing by lifting the container and makes it easy to reinsert the container by fitting the protrusions on the outer casing into a bottom part of the guiding slid in the bottom of the container and then gently lower the container down until the protrusions have reached the top of the guiding slid, and the waste sorting system can then be closed. Two, it helps to prevent the container from being removed from the outer casing without first opening the waste sorting system and then lifting up the container,

i.e. it helps prevent the container from falling out of the outer casing.

**[0022]** In one or more embodiments, the container is configured so as to automatically return the waste sorting system to the closed state. The size and shape of the container provides the function so as when the waste sorting system is in the open state, unless it is locked in this state, it will automatically return to the closed state due to the weight distribution of the container around the rotation axis. When more garbage to be sorted is added to the cavity of the container this function is further enhanced, as the weight of the garbage to be sorted further forces the waste sorting system towards the closed state, i.e. the tipping point/rotation axis in the container means that the waste sorting system will always be in the closed state. The more garbage to be sorted that is added into the container, the heavier it gets, hence this closing function is further reinforced.

**[0023]** The container comprises two parts which can make a handle, an inside handle. The handle may have two functionalities; it helps to hold a plastic bag in place and act as a handle when moving the container, i.e. when the container is detached from the outer casing by lifting the container via the handle.

**[0024]** In one or more embodiments, the at least two parts forming the first handle provides means for holding a bag, such as a waste bag, string bag, paper bag, bin bag, or plastic bag, placed within the cavity of the container.

**[0025]** The two parts forming the handle may further serve as means for locking the waste sorting system into an open state.

**[0026]** Hence, in one or more embodiments, the at least two parts forming the first handle provides means for locking the waste sorting system into the open state.

**[0027]** The container is configured to be detachable from the outer casing by lifting the container via the first handle when the waste sorting system is in the open state. This enables the user to easily move the contents of the container elsewhere, e.g. for emptying it in a larger outside facility, such as a recycling station, or to move it to a waste disposal elsewhere.

**[0028]** The built-in handle also gives easy access to carry one or two containers by one hand, and the container is attached in such a way, that it can be opened, either by grabbing the small notch or the like at the top or pressing on the bottom, hence, in one or more embodiments, the front side of the container is defined by a top part of the front side and a bottom part of the front side, wherein the top part of the front side is the part located above the longitudinal centre line of the axis and wherein the bottom part of the front side is located below the longitudinal centre line of the axis, and wherein the waste sorting system is configured to be opened by applying a force to the bottom part of the front side or by pulling the top part of the front side by means, such as a notch in the top part of the front side, a cut out in the top part of the front side, an indentation in the top part of the

front side, a second handle attached to the top part of the front side, or combinations hereof.

**[0029]** The tilting/rotation function of the waste sorting system enables the user of an easy opening with the back of the hand by pressing it against the bottom, this avoids e.g. grease on the container from greasy hands/fingers.

**[0030]** The handle formed by the two parts located at the upper opening of the cavity of the container has the options of holding a bag in place and to act as handles for lifting or carrying the container.

**[0031]** The nature of the waste sorting system gives the option of having multiple waste sorting systems hanging next to each other, e.g. on a kitchen wall. This will enable the user to have different containers for different materials to be sorted/recycled.

**[0032]** If the waste sorting system is hangable on either a wall or a door, it makes it easier to access compared to a waste sorting system which is located under e.g. a kitchen sink and inside drawers or cupboards.

**[0033]** The present invention may be almost 100% airtight, which will retain odors from the garbage sorted.

**[0034]** The present invention may be made in a design and a color which the consumers will be proud to have on the wall, the present invention may be 100% sustainable and made from recycled plastic and can be recycled itself.

**[0035]** In one or more embodiments, the outer casing and/or the container is made of plastic. The plastic, makes it easy to clean and very durable, as well as recyclable in itself.

**[0036]** In one or more embodiments, the protrusions are connected to form a rod or single rod structure. The protrusions does not have to be only protrusions, but can be connected to form a rod like structure. However, this will also mean that the configuration of the container to be rotably connected to the axis would be larger, hereby reducing the size of the cavity, hence also reducing the amount of garbage to be sorted in the waste sorting system before the waste sorting system is full and needs to be emptied.

#### Brief description of the drawings

**[0037]**

Figure 1A - shows a front view of an embodiment of the present invention in a closed state.

Figure 1B - shows a similar embodiment as figure 1A but with dimensions added.

Figure 2 - shows the A-A cut through as marked in the embodiment of figure 1.

Figure 3 - shows the B-B cut through as marked in the embodiment of figure 1.

Figure 4 - shows a turned front/side birds-eye view of the embodiment of figure 1A/1B.

Figure 5A - shows a side view of the embodiment of figure 4

Figure 5B - shows a side view of an embodiment of the present invention similar to the embodiment of figure 5A, but with dimensions added.

Figure 6A - shows a turned front/side birds-eye view of another embodiment of the present invention.

Figure 6B - shows a turned front/side birds-eye view of the embodiment of figure 6A where the two parts forming the first handle now locks the waste sorting system into the open state.

Figure 7 - shows an opposing side where the distances  $d_{a1}$ ,  $d_{a2}$ ,  $d_{b1}$ , and  $d_{b2}$  are shown.

Figure 8-10 - shows multiple views of the embodiments of figure 1-7 drawn to scale.

#### Detailed description of the drawings

[0038] Various examples are described hereinafter with reference to the figures. It should also be noted that the figures are only intended to facilitate the description of the examples. They are not intended as an exhaustive description of the claimed invention or as a limitation on the scope of the claimed invention. In addition, an illustrated example needs not have all the aspects or advantages shown. An aspect or an advantage described in conjunction with a particular example is not necessarily limited to that example and can be practiced in any other examples even if not so illustrated, or if not so explicitly described.

[0039] When describing the embodiments, the combinations and permutations of all possible embodiments have not been explicitly described. Nevertheless, the mere fact that certain measures are recited in mutually different dependent claims or described in different embodiments does not indicate that a combination of these measures cannot be used to advantage. The present invention envisage all possible combinations and permutations of the described embodiments.

[0040] Figure 1A shows a front view of an embodiment of the present invention. The figure is showing a front view of a waste sorting system 1 in the closed state, where the front side of the container 3 is visible and enclosed by the two opposing sides 5, the top side 7 and the bottom side 9. The figure is further marked with a cut through A-A and B-B. Figure 1B shows a front view of an embodiment of the present invention similar to the embodiment of figure 1A, but with possible dimensions added to the figure.

[0041] Figure 2 shows the A-A cut through as marked

in the embodiment of figure 1A/1B. A substantially trapezium shaped is here visible of the bottom part of the container 11. It can be seen that three sides have an angle of around 90 degrees, also called parallel sides, and only one side, also called the lateral side 13, which is the side closest to the back side 15, is not a parallel side. A trapezium of this shape is also known as a right trapezium, i.e. a trapezium that has two adjacent right angles. The "cut out" 23 configured to be connected to the axis 17, hereby obtaining that the entire container can rotate around the axis 17. The embodiment further shows the two parts 19 forming the first handle, wherein a mechanism for transforming the two parts 19 into the first handle, are marked for a zoom in view, where it can be seen that the first handle can be locked in position.

[0042] Figure 3 shows the B-B cut through as marked in the embodiment of figure 1A/1B. When cutting here, the protrusions 21 are visible as well as the "cut out" 23 configured to be connected to these protrusions 21 or the axis formed by these.

[0043] Figure 4 shows a turned front/side birds-eye view of the embodiment of figure 1A/1B in which the waste sorting system 1, 101 is in an open state and where the two parts 19 forms the first handle 25. When the waste sorting system is in the open state, the cavity 29 is visible.

[0044] Figure 5A shows a side view of the embodiment of figure 4, where one of the opposing sides are seen through. This makes the contact between the back side 15 of the outer casing and the lateral side 13 of the bottom part of the container when the waste sorting system 1 is in the open state visible. Figure 5B shows a side view of an embodiment of the present invention similar to the embodiment of figure 5A, but with possible dimensions added to the figure.

[0045] Figure 6A shows a turned front/side birds-eye view of another embodiment of the present invention. In this embodiment the waste sorting system 201 is shown in its open state. Here the two parts 219 forming the first handle 225 are shown with small protrusions which serves as means for locking 227 the waste sorting system into the open state. The embodiment further shows the front side of the container 203 enclosed by the two opposing sides 205, the top side 207 and the bottom side 209. In addition the cavity 229 for collecting a garbage to be sorted is also visible. Figure 6B shows a turned front/side birds-eye view of the embodiment of figure 6A where the two parts 2019 forming the first handle now locks the waste sorting system 201 into the open state.

[0046] Figure 7 shows an opposing side where the distances  $d_{a1}$ ,  $d_{a2}$ ,  $d_{b1}$ , and  $d_{b2}$  are shown in comparison to the axis 17.

[0047] Figure 8, 9, and 10 shows similar views and multiple views of the above described embodiments, where the drawings are drawn to scale, as can be seen in the info boks.

## References

### [0048]

**1, 101, 201** - Waste sorting system  
**3, 103, 203** - Front side of container  
**5, 105, 205** - Opposing side  
**7, 107, 207** - Top side  
**9, 109, 209** - Bottom side  
**11, 111** - Bottom part of container  
**13, 113** - Lateral side  
**15, 115** - Back side  
**17** - Axis  
**19, 119, 219** - Two parts  
**21** - Protrusion  
**23, 123** - Cut-out or guiding slid  
**25, 125, 225** - First handle  
**227** - Means for locking  
**29, 229** - Cavity

## Claims

1. A waste sorting system (1, 101, 201) for sorting of garbage, wherein the waste sorting system (1, 101, 201) comprises:
 

an outer casing comprising at least a back side (15, 115), two opposing sides (5, 105, 205), and a top side (7, 107, 207), wherein the outer casing has a first longitudinal centre plane extending parallel to the two opposing sides (5, 105, 205), and wherein each of the two opposing sides (5, 105, 205) comprises at least one protrusion (21), wherein the at least one protrusion (21) are at least directed inwards towards the first longitudinal centre plane; and  
 a container enclosing a cavity (29, 229) for collecting a garbage to be sorted, wherein the container comprises an upper opening for accessing the cavity, wherein a front side (3, 103, 203) of the container provide a front side of the outer casing enclosed by at least the two opposing sides (5, 105, 205) and the top side (7, 107, 207) of the outer casing, and wherein the container comprises at least two parts forming a first handle (25, 125, 225) located at the upper opening of the cavity;

wherein the protrusions (21) provide an axis (17) and the entirety of the container is configured to be rotatably connected to the axis (17) so as to place the waste sorting system (1, 101, 201) into an open or closed state;

wherein the open state is configured to provide access to the upper opening of the cavity; and  
 wherein the container is configured to be detachable from the outer casing by lifting the container via the

first handle (25, 125, 225) when the waste sorting system (1, 101, 201) is in the open state.

2. The waste sorting system (1, 101, 201) according to claim 1, wherein the axis (17) is located near the front side (3, 103, 203) of the container, such that a longitudinal centre line of the axis is at a distance  $d_{a1}$  from the front side (3, 103, 203) of the container, wherein the distance  $d_{a1}$  is measured perpendicular to and from the front side (3, 103, 203) of the container to the longitudinal centre line of the axis, and the distance  $d_{a1}$  is between 1% and 15% of the distance  $d_{a2}$ , such as between 1% and 10%, such as between 5% and 10%, wherein the distance  $d_{a2}$  is measured perpendicular to and from the front side (3, 103, 203) of the container to the back side (15, 115) of the casing.
3. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the outer casing further comprises a bottom side (9, 109, 209) and wherein the longitudinal centre line of the axis is at a distance  $d_{b1}$  from the bottom side (9, 109, 209) of the casing, wherein the distance  $d_{b1}$  is measured perpendicular to and from the bottom side (9, 109, 209) of the casing to the longitudinal centre line of the axis, and the distance  $d_{b1}$  is between 90% and 110% of the distance  $d_{b2}$ , such as between 90% and 105%, such as between 95% and 105%, wherein the distance  $d_{b2}$  is measured perpendicular to and from the back side (15, 115) of the casing to the longitudinal centre line of the axis.
4. The waste sorting system (1, 101, 201) according to any preceding claims, wherein a bottom third part of the container is shaped to provide an angle between  $20^\circ$  and  $50^\circ$ , such as between  $25^\circ$  and  $45^\circ$ , such as between  $30^\circ$  and  $40^\circ$ , wherein the angle is measured between the front side (3, 103, 203) of the container when the waste sorting system (1, 101, 201) is placed into the open state and the front side (3, 103, 203) of the container when the waste sorting system (1, 101, 201) is placed into the closed state or wherein the angle is measured between a second longitudinal centre plane of the outer casing and the front side (3, 103, 203) of the container when the waste sorting system (1, 101, 201) is placed into the open state, wherein the second longitudinal centre plane of the outer casing is perpendicular to the first longitudinal centre plane of the outer casing.
5. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the container is defined by a top part of the container and a bottom part (11, 111) of the container, wherein the top part of the container is the part located above the longitudinal centre line of the axis and wherein the bottom part (11, 111) of the container is located below the lon-

longitudinal centre line of the axis, and wherein the bottom part (11, 111) of the container is substantially trapezium shaped with only one lateral side (13, 113) so as to be configured to stop and hold the container by contact between the back side (15, 115) of the outer casing and the lateral side (13, 113) of the bottom part (11, 111) of the container, when the waste sorting system (1, 101, 201) is in the open state of.

6. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the outer casing comprises means for hanging the outer casing on a vertical surface, such as a door, a closet door, or a wall. 10
7. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the at least two parts (19, 119, 219) forming the first handle (25, 125, 225) provides means for holding a bag, such as a waste bag, string bag, paper bag, bin bag, or plastic bag, placed within the cavity (29, 229) of the container. 15  
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8. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the at least two parts (19, 119, 219) forming the first handle (25, 125, 225) provides means for locking (227) the waste sorting system (1, 101, 201) into the open state. 25
9. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the front side (3, 103, 203) of the container is defined by a top part of the front side and a bottom part of the front side, wherein the top part of the front side is the part located above the longitudinal centre line of the axis and wherein the bottom part of the front side is located below the longitudinal centre line of the axis, and wherein the waste sorting system (1, 101, 201) is configured to be opened by applying a force to the bottom part of the front side or by pulling the top part of the front side by means, such as a notch in the top part of the front side, a cut out in the top part of the front side, an indentation in the top part of the front side, a second handle attached to the top part of the front side, or combinations hereof. 30  
35  
40
10. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the outer casing and/or the container is made of plastic. 45
11. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the container comprises a guiding slid (23, 123), which is configured as an indentation in each side of the container facing the protrusions (21), wherein the guiding slid (23, 123) extends from the bottom of the container to a position on the container where the protrusions (21) provide an axis and the container is connected to the protrusions (21) via the guiding slid (23, 123). 50  
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12. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the container is configured so as to automatically return the waste sorting system (1, 101, 201) to the closed state.

13. The waste sorting system (1, 101, 201) according to any preceding claims, wherein the protrusions (21) are connected to form a rod or single rod structure.

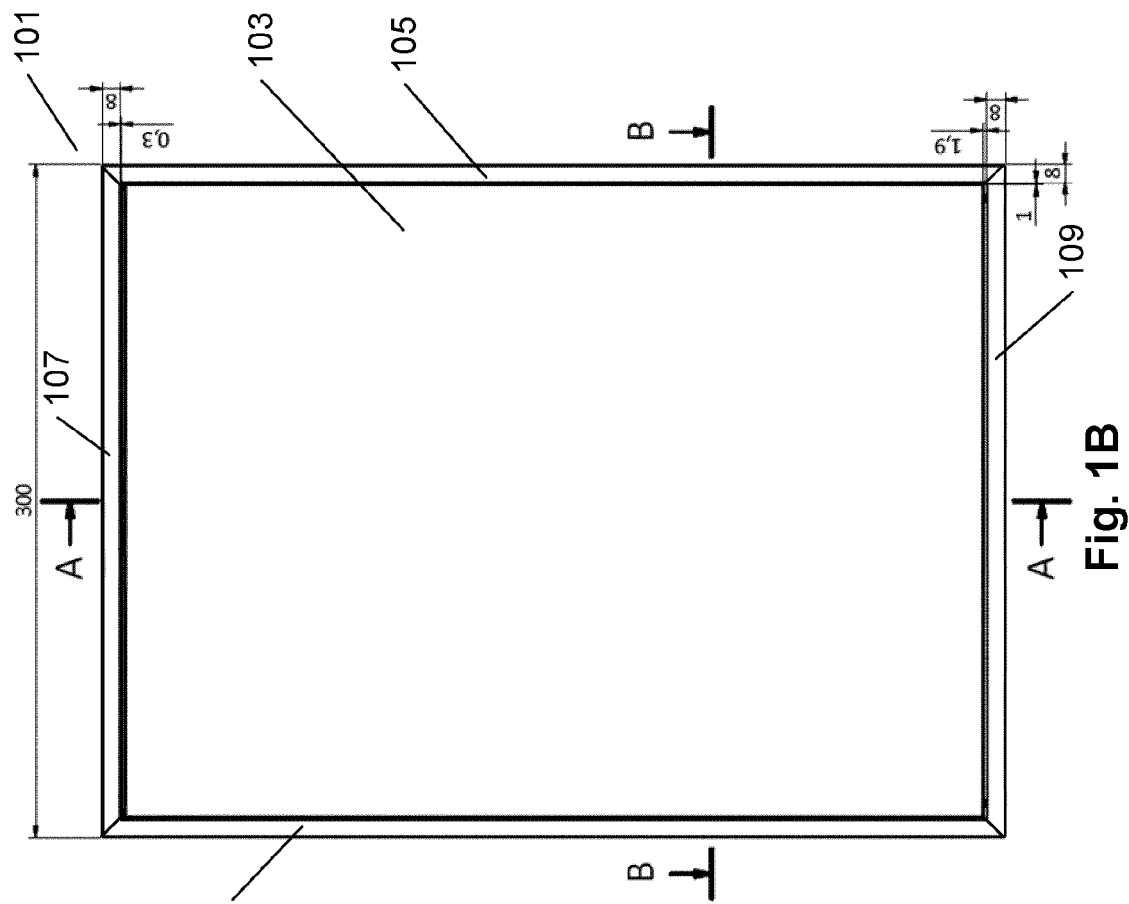


Fig. 1A

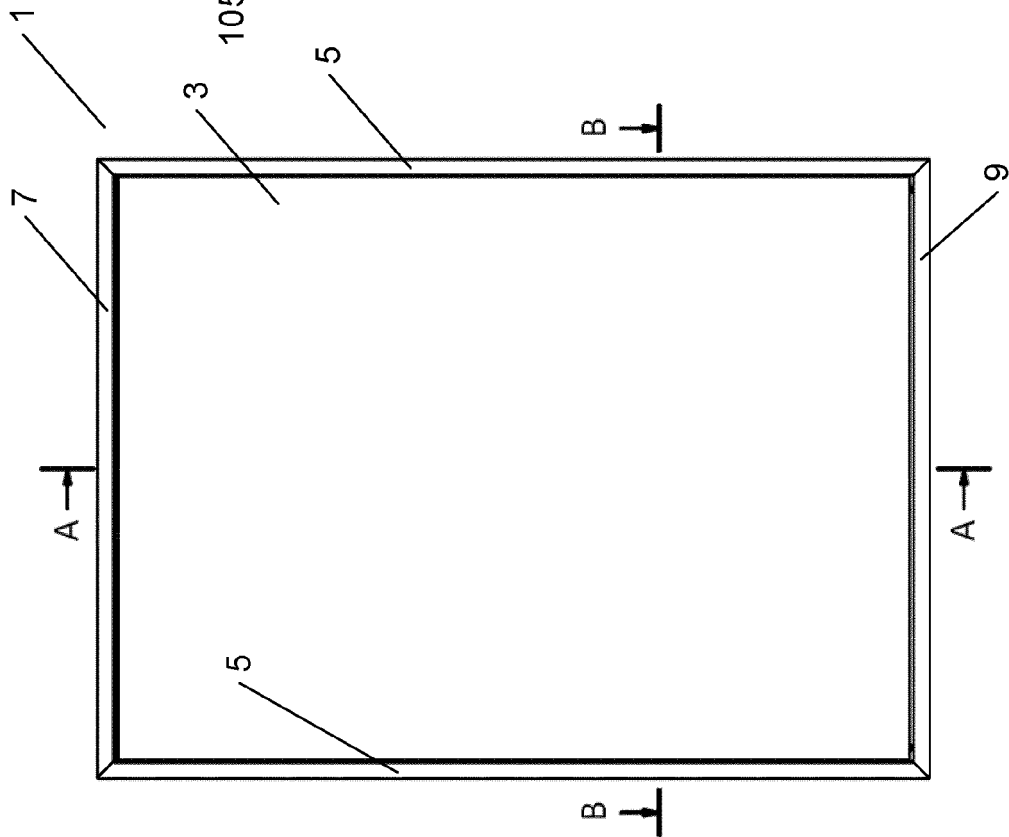


Fig. 1B



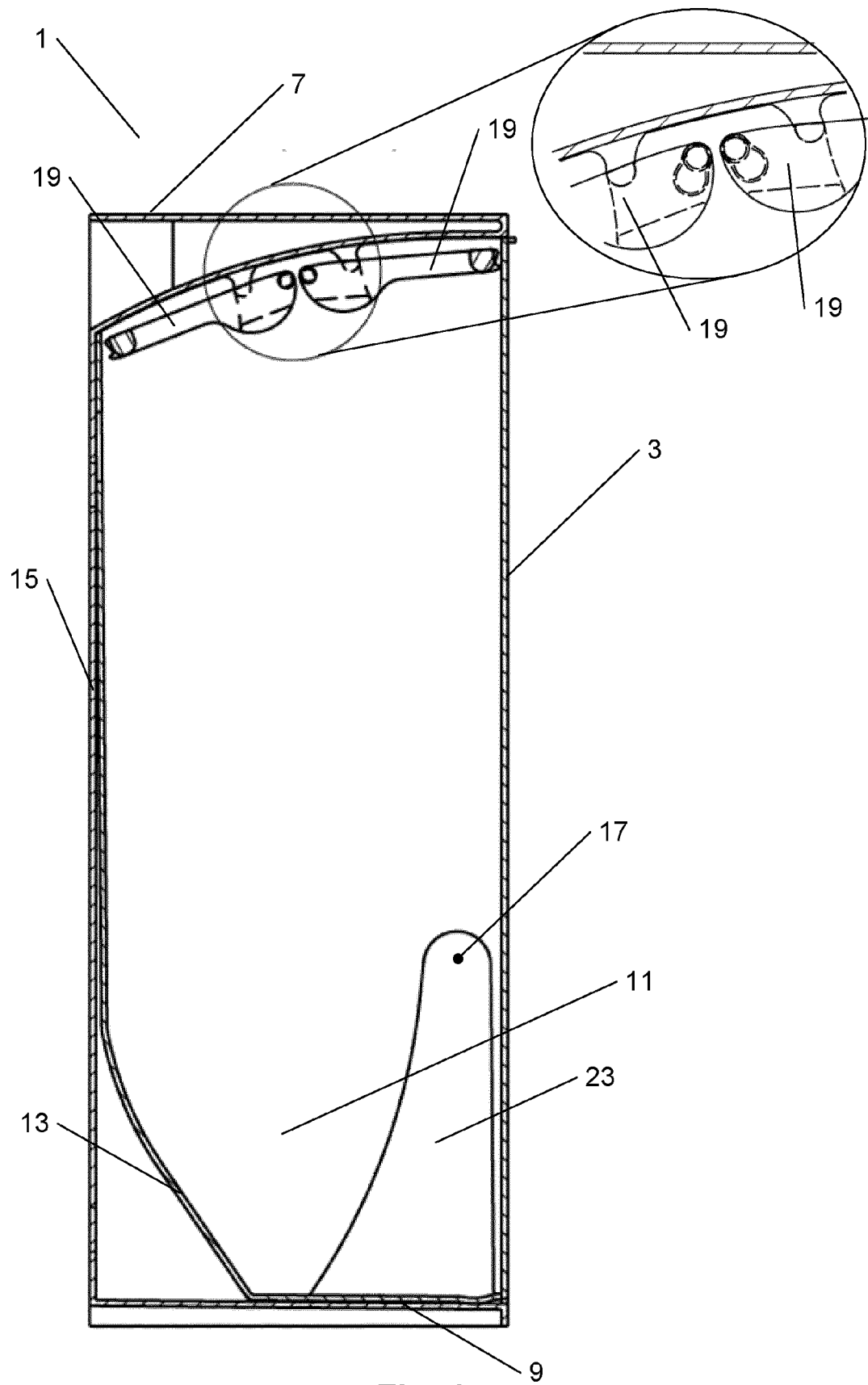


Fig. 2

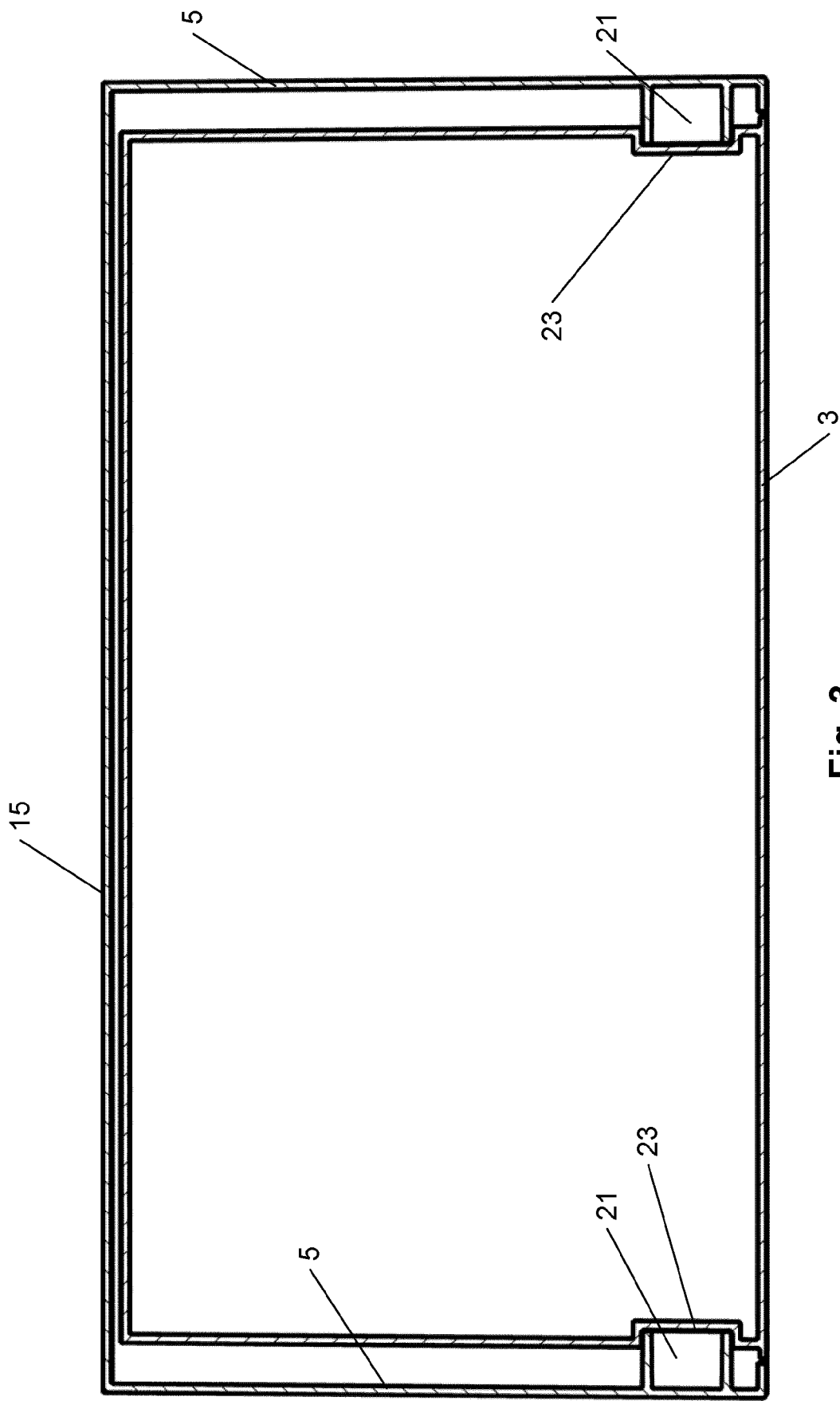


Fig. 3

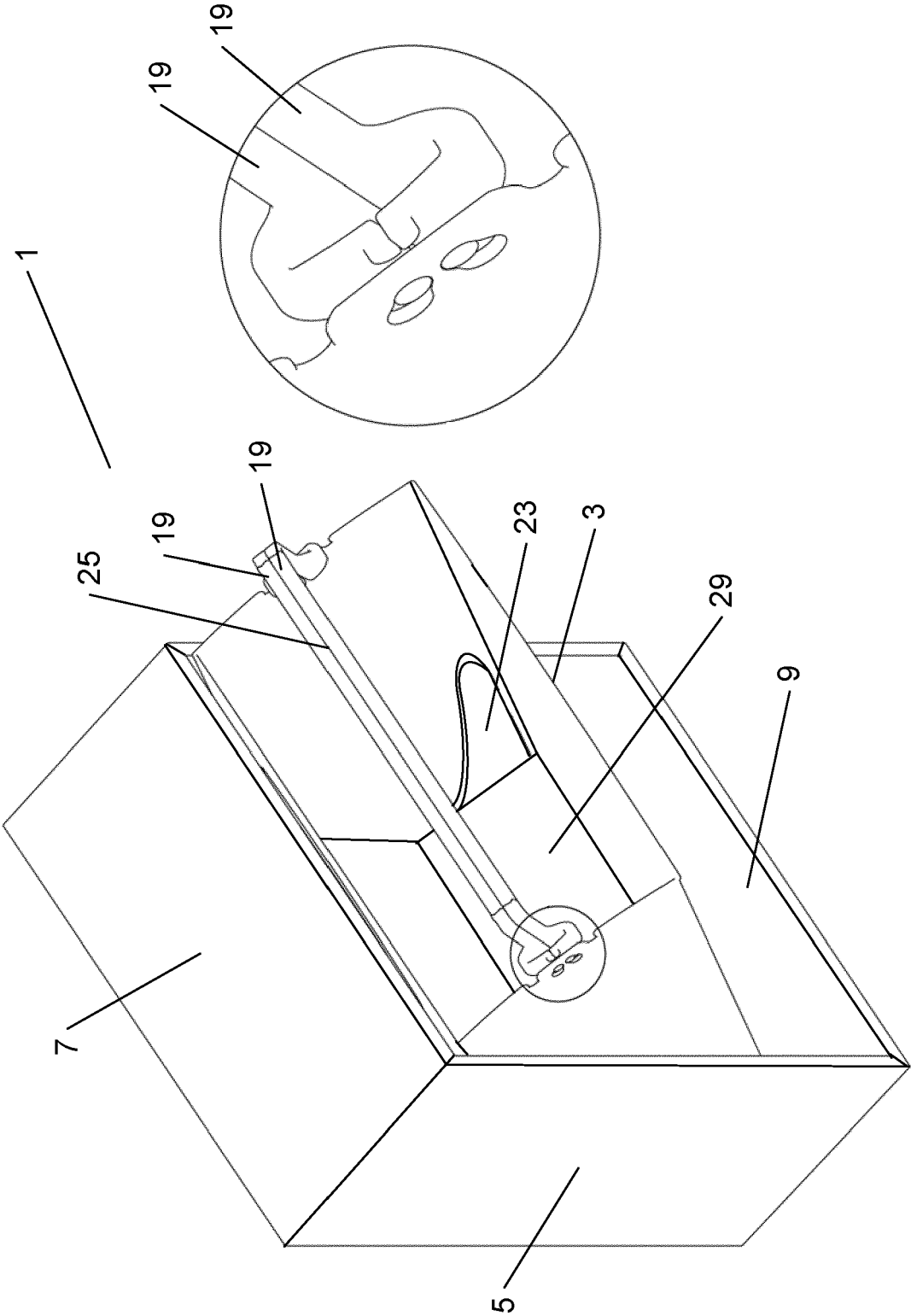


Fig. 4

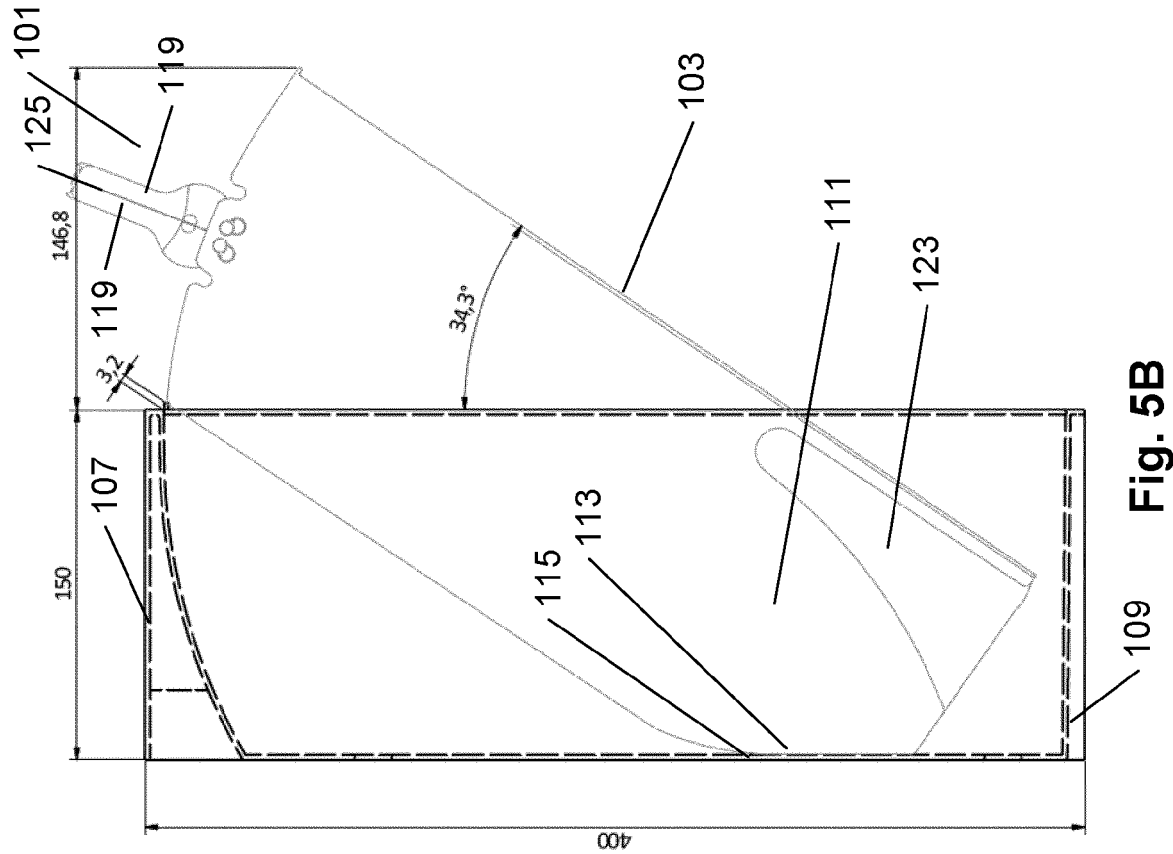


Fig. 5B

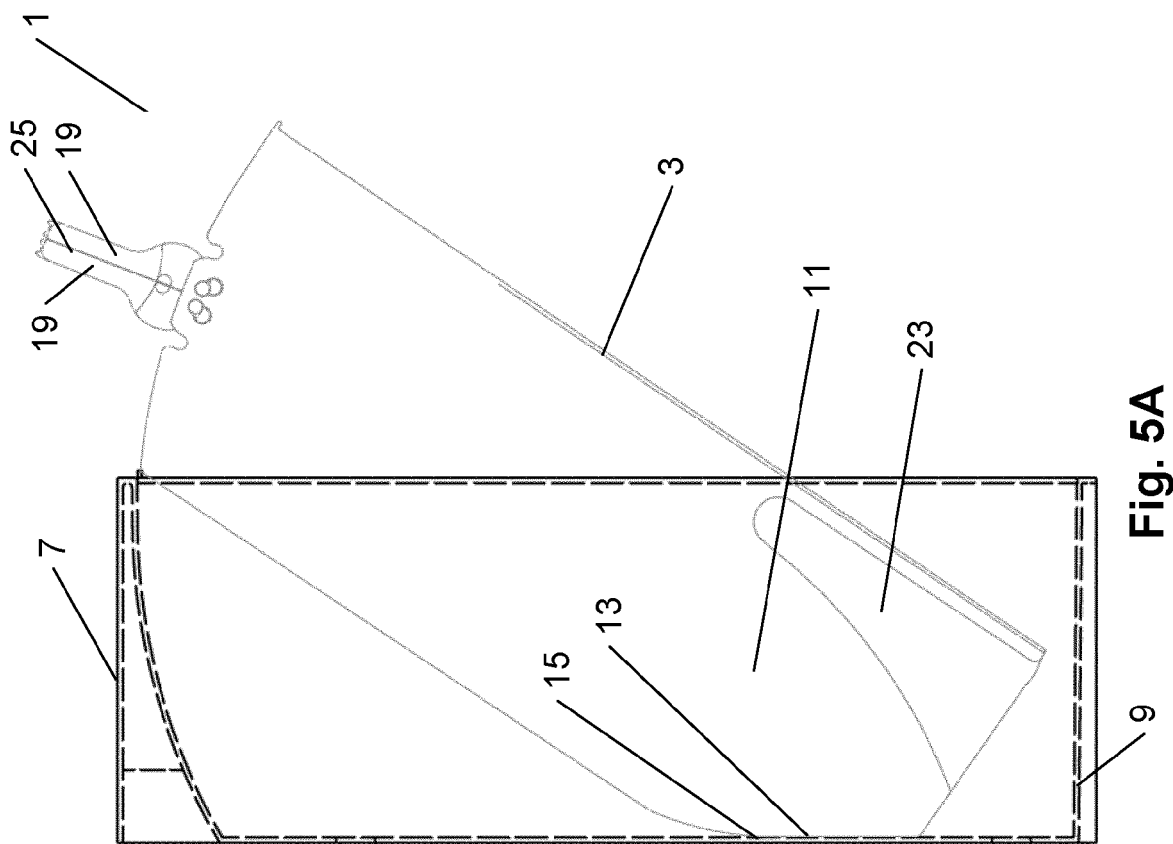


Fig. 5A

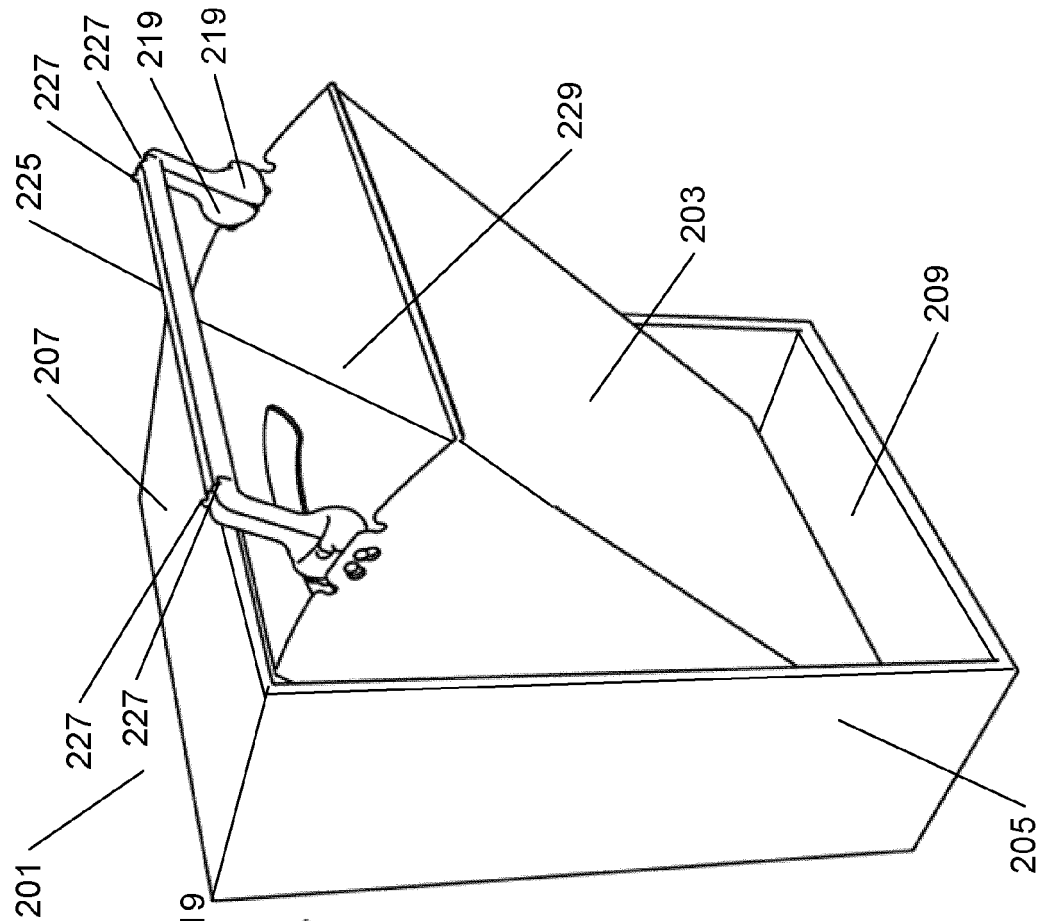


Fig. 6A

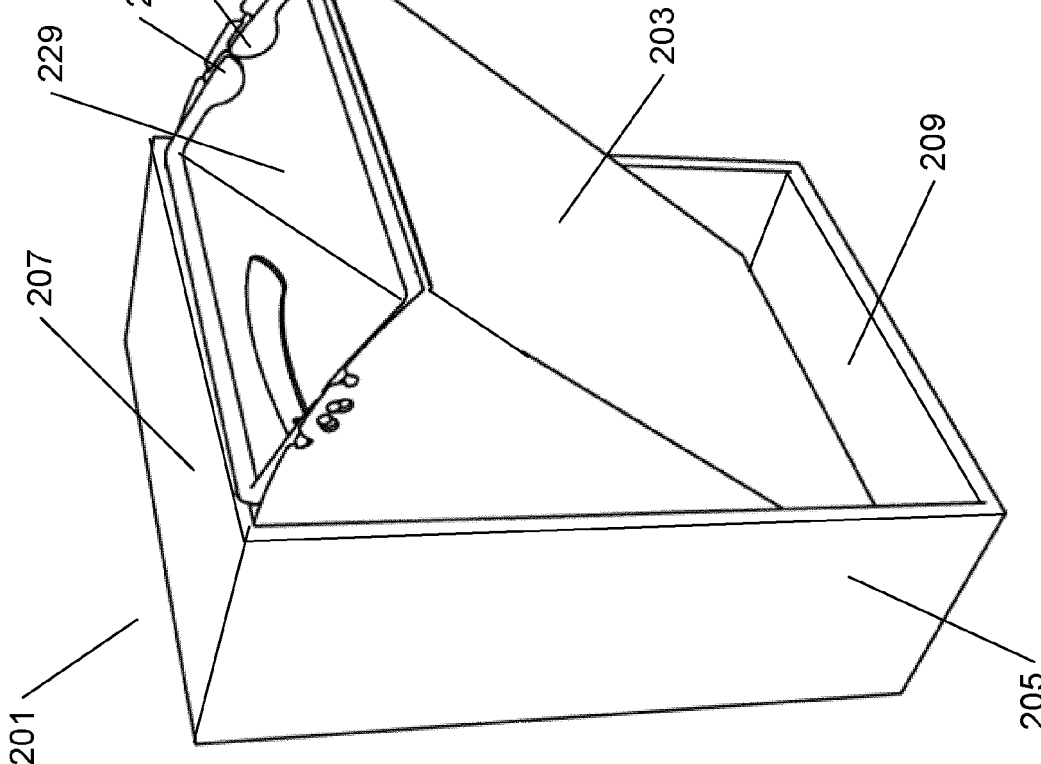


Fig. 6B

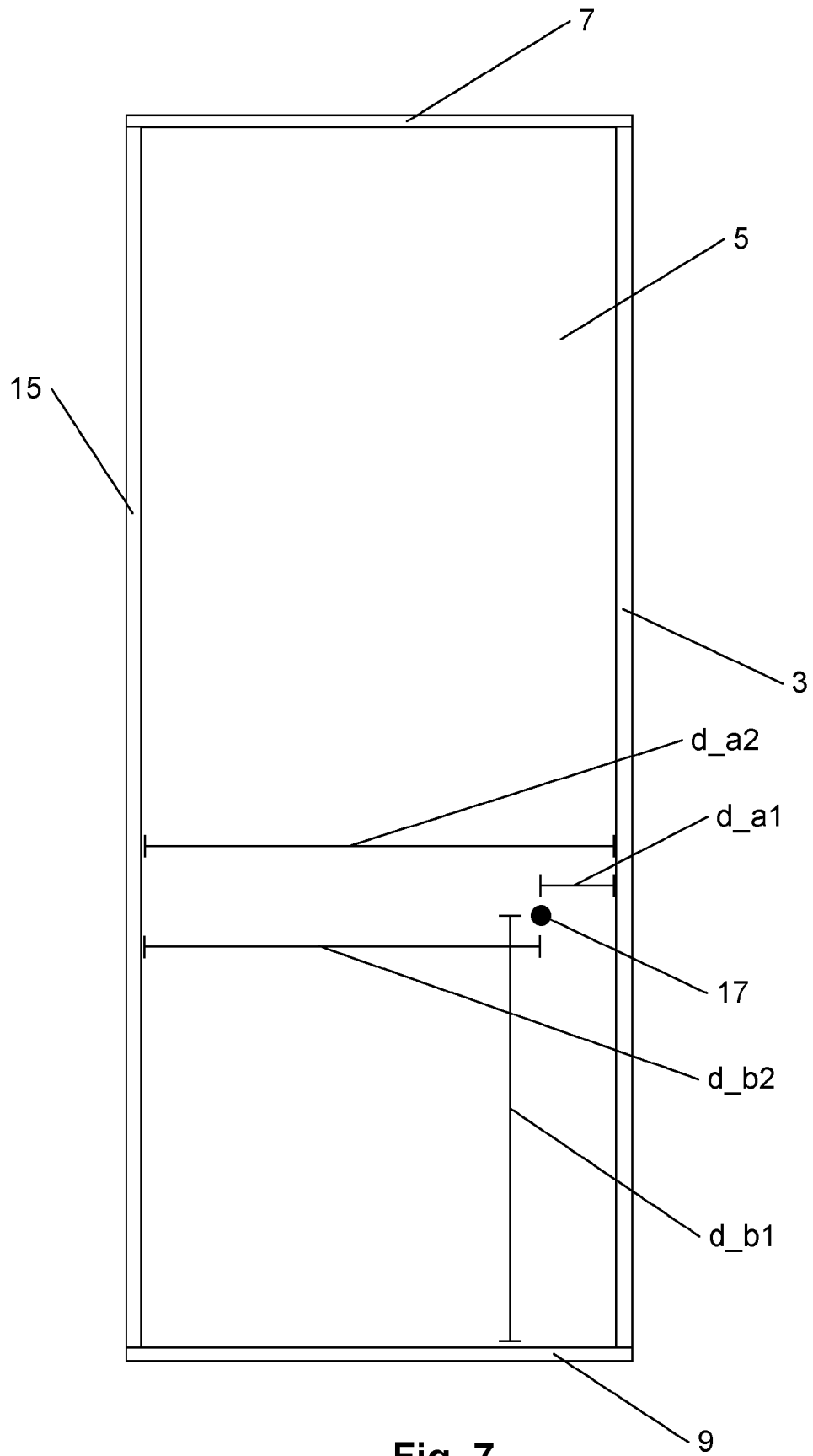
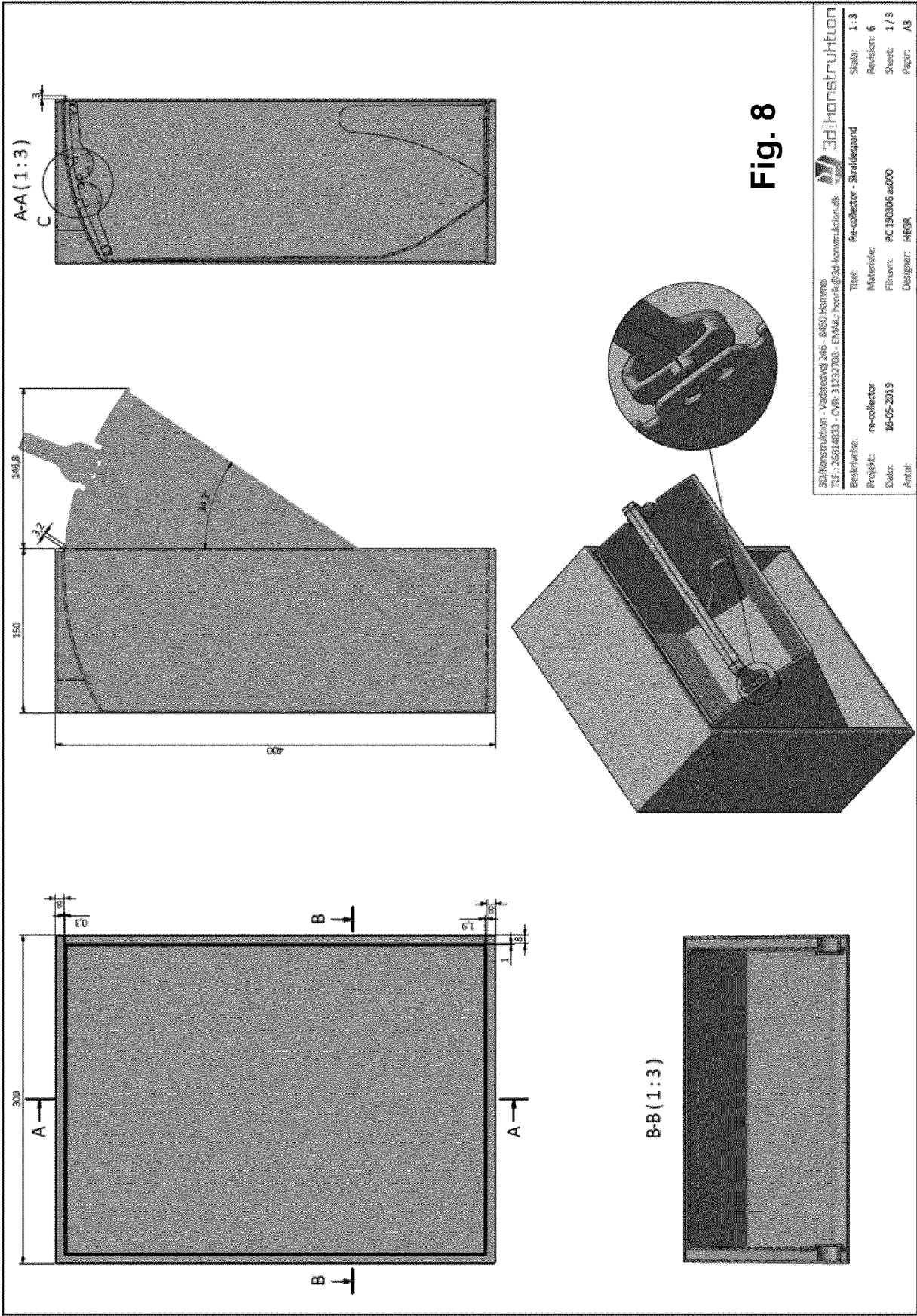


Fig. 7



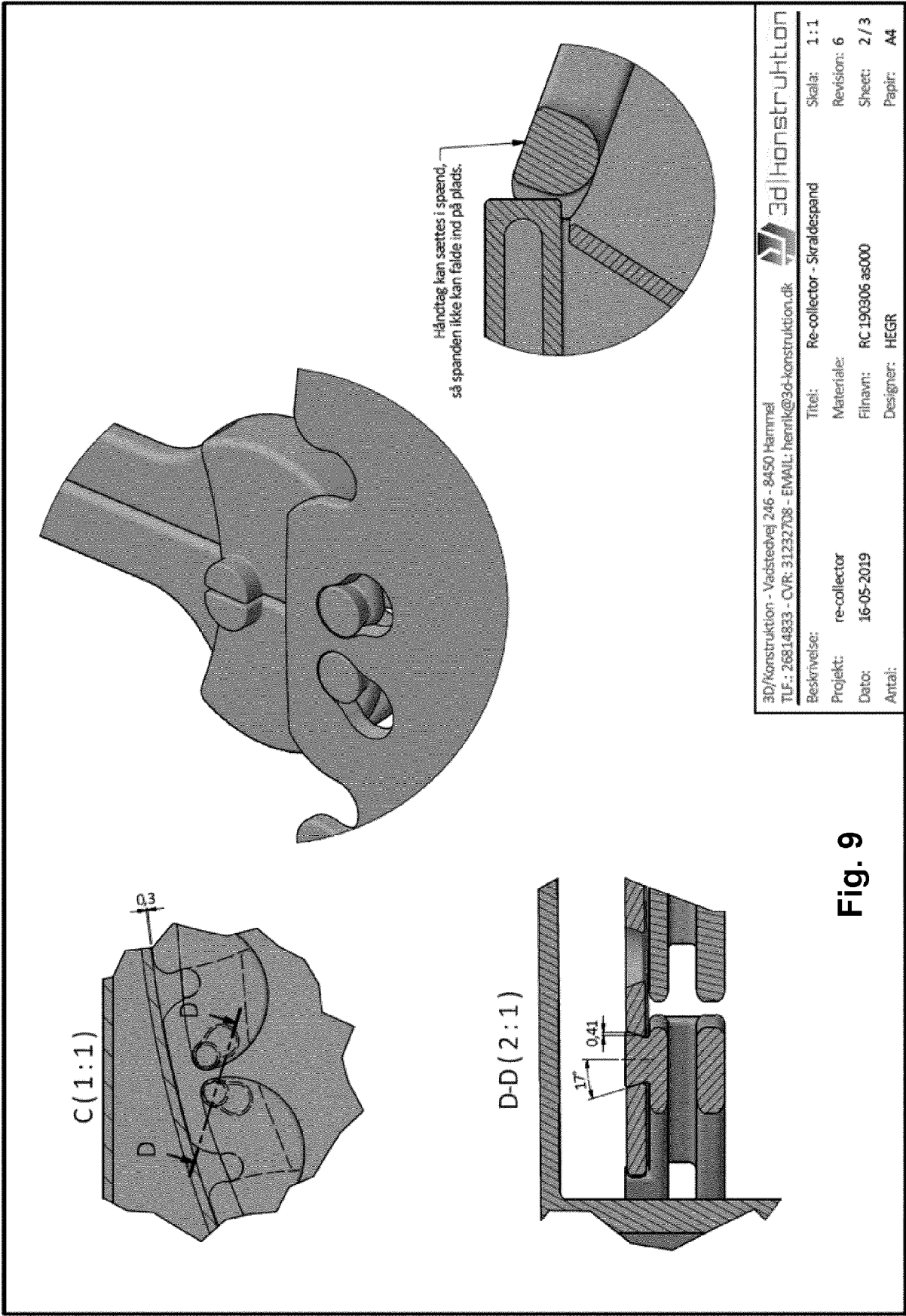
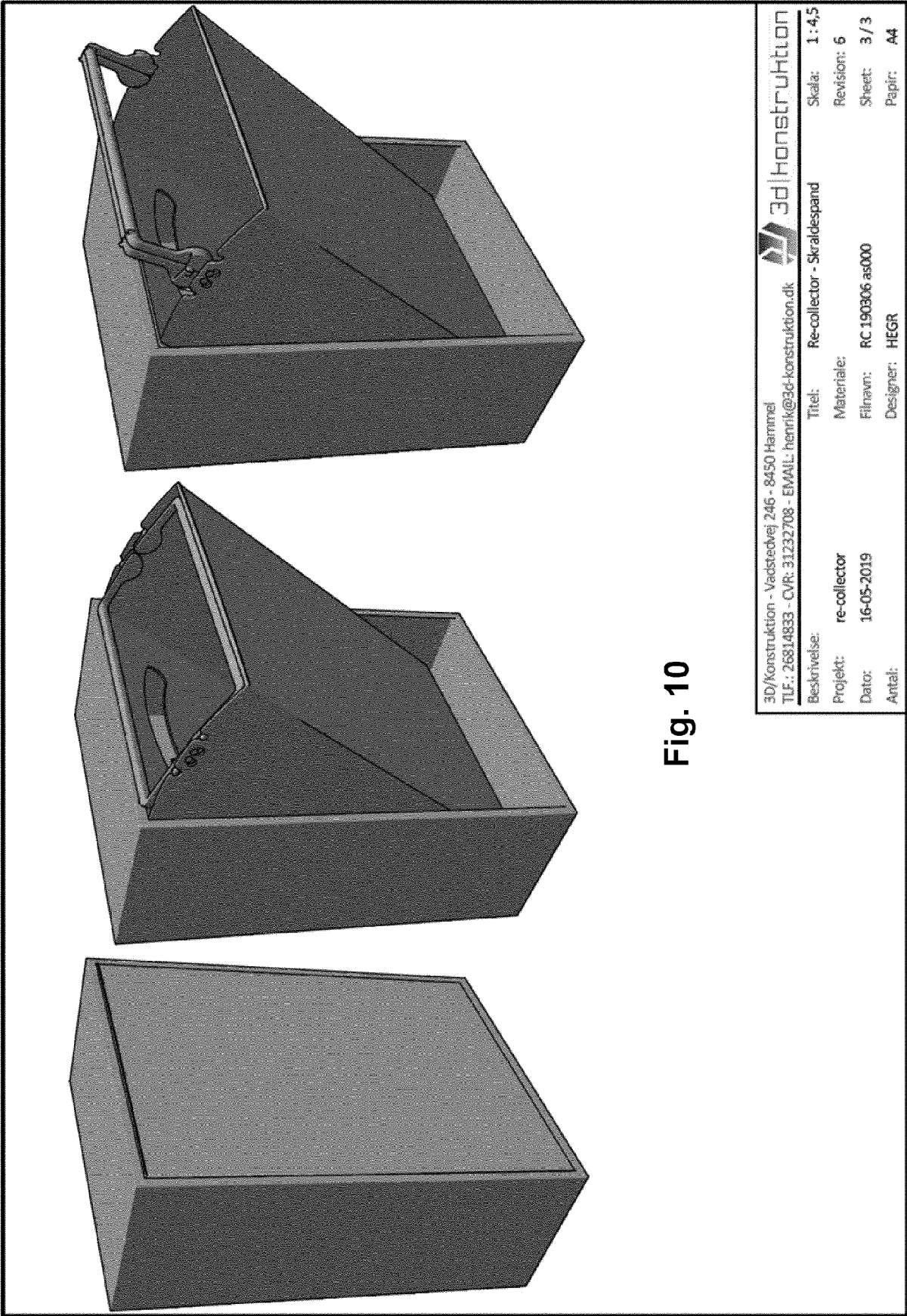


Fig. 9







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