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(54) **Container with flexible latch**

(57) A container (10) has a body (12) and a lid (14) rotatably affixed to the body (12) so as to be selectively rotated between an open position and a closed position. A latch (30) has a first end adapted to be rotatably affixed to the lid (14). A second end is adapted to engage the body (12). The first end is connected to the second end by an arched member (40), the arched member (40) is capable of flexure when a force is applied at a concave surface of the arched member (40). A system (100) for unlatching the latched container comprises a lifting arm (120) having a proximal end (122) adapted to be affixed to a truck, and a distal end (128), a manipulating assembly (140) affixed to the arm (120) at the distal end (128). The manipulating assembly (140) includes a first and a second grabber members (142a, 142b), each adapted to move between a first position and a second position, the second position for engaging the container (10) disposed therebetween. A moving member (147) moves between a first position and a second position, the moving member unlatching the container (10) by moving from the first position to the second position when the lifting arm (120) moves the container (10).

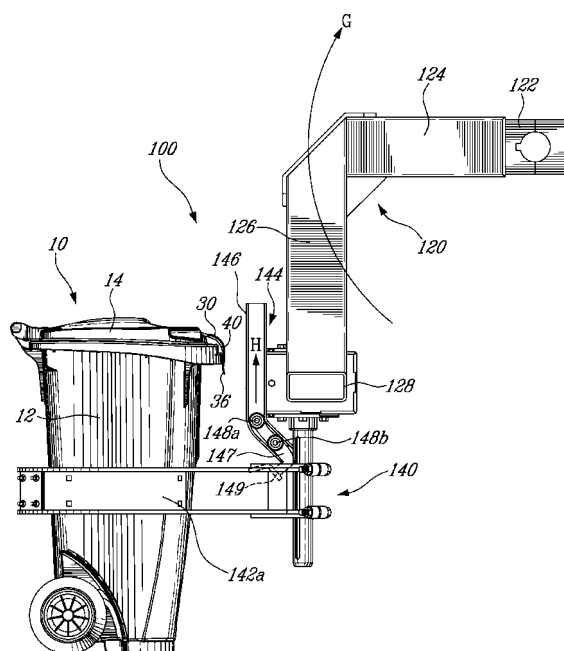


FIG. 12

Description

FIELD OF THE INVENTION

[0001] The present invention is directed to a latch for closing a container lid to a container, and a system and a method for opening a latched container.

BACKGROUND OF THE INVENTION

[0002] Containers such as garbage containers for homes are known in the art. The containers have a container body. In some embodiments, wheels may be provided at a lower corner of the container body. A lid is rotatably affixed to the container to rotate between a first open position and a second closed position.

[0003] To prevent animals from gaining access to trash containers or prevent inadvertent spilling of the contents, it becomes necessary to lock the lid in the closed position. As is known in the art, latches are provided. These latches are usually metal pieces. In products such as those manufactured by Rehrig or Norseman for example, a metal piece formed as a rod is pivotally mounted to the lid. The rod forms a general U-shape in which a first end of the rod is mounted to the lid and the second opposed end of the wire is also mounted to an opposed position on the lid so that the U-shaped rod is pivotally mounted to the lid. The base of the U may be formed as a handle. The sections between the handle and the respective rod ends form, at least in part, an engaging portion for engaging a lip of the container body. In this way, as the latch is pivoted about its ends from a first open position to a second closed position, engaging portions of the latch engage a portion of the container body locking the lid against the container body. To release the lid, the handle is pulled to rotate the latch from the second position releasing the lid from the container body allowing the lid to be rotated into an open position.

[0004] It is also known in the art that trash removal has become automated. Waste disposal trucks now use robotic lifting arms to capture lift and empty the trash container into the truck. However, a latch sufficiently strong to prevent animals such as a raccoon or bear from opening the lid will also prevent the lid from opening when the robotic arm attempts to empty the container. As a result, the driver of the truck must manually release each latch prior to use of the robotic arm; resulting in a waste of time and energy.

SUMMARY OF THE INVENTION

[0005] More specifically, there is provided a container comprising a body and a lid rotatably affixed to the body so as to be selectively rotated between a first open position and a second closed position. A latch has a first end adapted to be rotatably affixed to the lid. A second end is adapted to engage the body. The first end is connected to the second end by an arched member, the

arched member capable of flexure when a force is applied at a concave surface of the arched member.

[0006] There is further provided a lifting arm for emptying a container into a truck, comprising an arm having a proximal end, adapted to be affixed to a truck, and a distal end, a manipulating assembly affixed to the arm at the distal end, the manipulating assembly including a grabber member for engaging the container when disposed within the grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container held by the grabber member by moving from the first position to the second position.

[0007] There is further provided a method for unlatching a latched container, comprising providing a lifting arm for lifting the latched container; moving the latched container from a first position to a second position with the lifting arm; an unlatching the container by moving the container from the first position to the second position.

[0008] There is further provided a system for unlatching a latched container, comprising a container having a body; a lid rotatably affixed to the body and movable between a first position and a second position; and a latch pivotally mounted on the lid for selectively locking the lid in a closed position, the latch having a first member adapted to be pivotally mounted to the lid, a second member adapted to selectively engage a projection on the body; and an arched member connecting the first member to the second member; and a lifting arm comprising an arm having a proximal end adapted to be affixed to a truck and a distal end; a manipulating assembly affixed to the arm at the distal end, the manipulating assembly including a grabber member for engaging the container when disposed within the grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container by moving from the first position to the second position.

[0009] Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the appended drawings:

[0011] Figure 1 is a perspective view of a container constructed in accordance with the invention;

[0012] Figure 2 is a perspective view of a latch constructed in accordance with the invention;

[0013] Figure 3 is a side elevation view of a latch constructed in accordance with the invention;

[0014] Figure 4 is a front elevation view of a latch constructed in accordance with the invention;

[0015] Figure 5 is a rear elevation view of a latch constructed in accordance with the invention;

[0016] Figure 6 is a top plan view of a latch constructed

in accordance with the invention;

[0017] Figure 7 is a bottom plan view of a latch constructed in accordance with the invention;

[0018] Figure 8 is a perspective view of the container showing the latch in an open position;

[0019] Figure 9 is a side elevation view of the container showing the latch in the closed position in accordance with the invention;

[0020] Figure 10 is a side elevation view of the container showing the latch in an intermediate position in accordance with the invention;

[0021] Figure 11 is a top plan view of a system according to an embodiment of an aspect of the invention, prior to activation;

[0022] Figure 12 is a side plan view of a system according to an embodiment of an aspect of the invention, in a first position in which the container is grasped;

[0023] Figure 13 is a top plan view of a system according to an embodiment of an aspect of the invention, showing the container grasped; and

[0024] Figure 14 is a side elevation view of a system according to an embodiment of an aspect of the invention, with the container disposed between the first and second position.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0025] Reference is generally made to Figures 1, 8, and 10 in which a container, generally indicated as 10, constructed in accordance with the invention is provided. Container 10 includes a container body 12 having a projection in the form of an upper rim 22 extending about a top, and the opening formed at the top of body 12. Support members 16 extend from the rim 22. A handle 18 is supported by support members 16 spaced away from housing 12.

[0026] Wheels 26 are affixed to housing 12 as in a manner known in the art so that container 10 is mobile.

[0027] As will be seen below, rim 22 is provided by way of exemplary, but nonlimiting embodiment. Any projection from body 12 is contemplated by the present invention. Rim 22 may merely be a ridge, a lip, a platform, or a projection capable of being engaged by a latch 30. Support member 16 may also extend from body 12, rather than rim 22.

[0028] A lid 14 sized to cover an opening (not shown) of body 12 is rotatably disposed on body 12. Lid 14 is formed with wings 20 for rotatably engaging handle 18 as known in the art. In this manner, lid 14 may be moved from a first closed position, as seen in the figures, about the pivot provided by handle 18 to an open position (not shown) to allow access to the container body 12. A pivot 24 is formed within lid 14. In a nonlimiting embodiment, pivot 24 is at an edge of lid 14 opposed to an edge from which lid 14 is rotatably affixed to body 12.

[0029] Latch 30 is pivotally disposed about pivot 24 and is adapted to engage a projection such as that formed

by rim 22 to lock lid 14 in the closed position. Accordingly, latch 30 is rotatable between a first open position, as shown in Figure 8, which allows rotation of lid 14 and a closed position, as shown in Figure 9, which locks the lid 14 to body 12 in the closed position.

[0030] Reference is now also made to Figures 2-7 in which latch 30 is shown with greater particularity. Latch 30 includes a first member 32 which is a pivot member. First member 32 is formed with a receiving portion, in an exemplary but nonlimiting embodiment, an opening 34 therein, adapted to receive pivot 24 of lid 14. Latch 30 includes a second member 36 acting as a handle. An arch member 40 connects first member 32 with second member 36. Handle portion 36 is formed with a catch 38. Catch 38 is a projection adapted to engage a projection of housing body 12 such as rim 22.

[0031] Pivot member 32, handle 36, and arch member 40 are formed as a unitary construction; preferably formed of a plastic material. Arch member 40 is flexible such that a force applied at a convex surface 48 of latch 30 will deflect arch member 40 flattening arch member 40 to lengthen latch 30. Arch 40 has sufficient resiliency that it will substantially return to its original shape upon removal of the force at convex surface 48 of arch portion 40.

[0032] To reduce the amount of material required for latch 30, without sacrificing strength, flexibility, and resiliency, various structures are incorporated into latch 30. A plurality of support archs 44 extend along convex surface 48 between arch member 40 and pivot member 32. Additionally, a second set of support members 46 comprised of one or more support archs, in a nonlimiting exemplary embodiment, extend along a concave surface of arched member 40, and may extend from the handle portion of second member 36 to the pivot portion of second member 32. An opening 42 may be provided in second member 36 adjacent catch 38. Catch 38 may be any shape capable of engaging a projection from housing 12, such as rim 22 while also being dimensioned to allow for disengagement by flexure of handle 36 as will be discussed below.

[0033] During use, latch 30 is pivotally mounted to lid 14. Pivot 24 is received within opening 34 of pivot 32 of latch 30. To lock container 10, latch 30 is pivoted from a first open position (Figure 8) in a direction of arrow C to an intermediate position (Figure 10).

[0034] In the intermediate position, it becomes apparent that latch 30 is dimensioned so that catch 38 is positioned along latch 30 so that when no force is applied to latch 30, catch 38 is disposed at a position in which it does not engage rim 22, in this instance the position is above a bottom surface 23 of the projection provided by rim 22. However, as seen in Figure 9, when a force is applied to the convex surface 48 of arched member 40, latch 30 is lengthened so that catch 38 moves below bottom surface 23 of rim 22 to engage rim 22. Latch 30 is resilient such that once the force in the direction of arrow A is removed, latch 30 will substantially return to its orig-

inal position. However, catch 38 engaging rim 22 prevents complete return, and therefore the restorative force of latch 30 keeps latch 30 in the closed position by the force applied by catch 38 against lip 22. It should be noted that a force in the direction of arrow A not only extends the length of latch 30, but also continues to move handle 30 in the direction of arrow C so that it is the action of pressing against latch 30 at arch member 40 which closes and locks the container as shown in Figures. 1 and 9.

[0035] To open the container, it should be noted that handle portion 36 is slightly curved in that portion of second member 36, which extends from catch 38. Handle 36 is curved in a direction opposed to the curve of arch member 40, and in an embodiment, to a lesser extent (more obtuse curve) than the curve of arched member 40. This facilitates applying a force in direction of arrow B to latch 30 at handle portion 36. Applying a force at handle portion 36 pulls catch 38 away from rim 22 releasing latch 30 allowing rotation into the open position shown in Figure 8. It should be known that the surface of catch 38 may be rounded or cammed to allow catch 38 to slide along rim 22 as it is released rather than requiring movement of handle portion 36 sufficient to rotate catch 38 to clear rim 22 or to flatten catch 40.

[0036] Latch 30 must be sufficiently rigid so as to maintain a grip about pivot 24 and sufficiently rigid along its length to maintain catch 38 in position to prevent opening of lid 14. However, latch 30 must be sufficiently flexible to allow flattening of latch 30 without the need for excessive force, i.e. not beyond a manual force easily applied by an ordinary person and to allow handle 36 sufficient movement to allow catch 38 to either be deflected by rim 22 or disengaged by rim 22. Latch 30 also exhibits restorative properties so that once released, latch 30 returns to its original shape. In an embodiment, latch 30 must maintain these properties across a temperature range from -30°C to 30°C. In an embodiment, latch 30 is unitary nylon construct.

[0037] A slit 35 is formed within pivot member 32. Slit 35 mates with a projection (not shown) formed on lid 14. Slit 35 is off centered along the axis of second member 32 which prevents mistaken installation of latch 30. Latch 30 will only fit about pivot 24 of lid 14 when slit 35 is aligned with the projection guaranteeing normal orientation.

[0038] Reference is now made to Figures 11 to 14 wherein a system generally indicated as 100 for a latch and a robotic lifting arm, by way of nonlimiting example, capable of opening a latched container is provided. System 100 includes a container 10 having a latched lid in which a portion of the latch extends below or beyond the lid, such as latch 30 by way of nonlimiting example and a lifting arm constructed as robotic arm 120, by way of nonlimiting example.

[0039] Robotic lifting arm 120 includes a proximal end 122 adapted to be affixed to a truck (not shown) as known in the art. Robotic arm 120 has a first section 124 extending from proximal end 122 and a second section 126

extending from first section 124 at an angle. Lifting arm 120 is capable of a range of motion as known in the art to enable lifting and dumping of a full container.

[0040] A manipulating assembly 140 is affixed to a distal end 128 of robotic lifting arm 120. Manipulating assembly 140 includes a motor block 141 for housing a motor. A grabber assembly, which, by way of nonlimiting example, includes grabber members 142a, 142b extending from opposed sides of the motor block 141 and move between a first, open, position and a second, closed or pinching, position under the control of a motor (not shown) typically housed in the motor block 141. It is understood that through gearing the motor may be housed anywhere along system 100. Grabber members 142a, 142b when in the closed or second position surround and grab the body 12 of the container 10 (see Figures 12 and 13). Another structure which grabs to lift the container may be substituted for the grabber members 142a, 142b. When grasped, in accordance with the invention, the container 10 is captured by the grabber members 142a, 142b such that the latch 30 is substantially in facing relationship with the robot lifting arm 120.

[0041] An unlatching member 144 includes a guide member 146, which is a pathway or chute extending from the grabber members 142a, 142b towards the second arm section 126 for example. A moving member 147 is disposed within the guide member 146 and is capable of moving within the guide member 146, under the control of gravity, from a first position away from the latch 30 to a second position towards and/or beyond the latch 30. The moving member 147 may include wheels, 148a, 148b as shown, to facilitate movement within the guide member 146 of the moving member 147. It should be noted that wheels are used as an exemplary, nonlimiting embodiment and may be omitted by utilizing low friction elements such as Teflon™ or lubricant such as oil, grease or silicon spray, or any combination thereof so long as the moving member 147 is capable of substantially consistent movement at a speed sufficient to dislodge the latch 30 as the moving member 147 moves from the first position to the second position as will be described below. A finger member 149 extends from the moving member 147 outside of the path formed by the guide member 146 and is sufficiently sized so that to engage a latch, such as the latch 30 as the moving member 147 moves from the first position to the second position.

[0042] Operation of the system 100 is illustrated by Figures 12 and 14 for example, which have substantially the same frame of reference, and show the arm 120 as it moves through an arc generally defined by arrow G between a start position to at least a dumping position. Gravity, acting on the moving member 147 causes the moving member 147 to move substantially in the direction of arrow H as the lifting arm 120 moves. It follows that the finger member 149 moves in the direction of arrow H and engages the latch 30. In this nonlimiting example, the finger member 149 engages the handle portion 36 to flex the handle portion 36 and disengage the latch 30 as

described above. It should be well understood that the system may work with any lid and latch in which contacting a lower extremity of the latch by moving member 147 causes disengagement of the latch.

[0043] By providing a system in which the standard motion for emptying a container into a truck unlatches a latched container, a latch sufficiently strong to resist animal break in may be utilized without the need for the operator of the truck to manually open each container prior to dumping. By providing a lifting arm which utilizes gravity to move an unlatching mechanism from a first position to a second position; the second position being at least an unlatching position, a simple mechanical structure is provided to consistently unlatch latched containers. By providing a plastic latch rotatably affixed to the lid of the container and capable of flexure to engage the body of the container and a disengaging the handle, a simple structure capable of being mass produced at low cost is provided for removably latching the container in a manner that prevents animal break in.

[0044] Thus the present invention provides a container comprising a body; a lid rotatably affixed to the body and moveable between a first position and a second position; and a latch pivotally mounted on the lid for selectively locking the lid in the closed position, the latch having a first member adapted to be pivotally mounted to the lid; a second member adapted to selectively engage a projection on the housing; and an arched member connecting the first member to the second member, the arched member adapted to allow the second member to engage the projection when a force is applied to a convex surface of the arched member.

[0045] The present invention further provides a latch for selectively locking the lid to the container body comprising a first member adapted to be pivotally mounted to the lid; a second member adapted to selectively engage a projection on the container body; and an arched member connecting the first member to the second member, the arched member adapted to allow the second member to engage the housing when a force is applied to a convex surface of the arched member. According to an embodiment of the present invention, the latch further comprises a catch extending from the second member, the catch being disposed along the second member at a position such that when no force is applied to the convex surface, the catch does not engage the container body and when a sufficient force is applied to the convex surface, the catch engages the container body. The latch may further comprise a receiving portion for receiving a pivot therein. The latch may further comprise a catch extending from the second member, the catch having a camming surface thereon. The first member may pivot about an axis, and the latch may further comprise a slit formed in the first member along the axis off center of the first member. The second member may include a handle formed with an arch, the arch extending in a direction opposite to a direction in which the arch member extends.

[0046] The present invention further provides a lifting arm for emptying the container into a truck, comprising an arm having a proximal end, adapted to be affixed to a truck, and a distal end; a manipulating assembly affixed to the arm at the distal end, the manipulating assembly including a grabber member for engaging the container when disposed within the grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container held by the grabber member by moving from the first position to the second position.

[0047] The present invention further provides a method for unlatching the latched container, comprising providing a lifting arm for lifting the latched container; moving the latched container from a first position to a second position with the lifting arm; and unlatching the container by moving the container from the first position to the second position. According to an embodiment of the method, the container is closed in the first position and opened in the second position. The method may further comprise providing a moving member along the lifting arm, the moving member moving from a third position to a fourth position as a function of moving the container from the first position to the second position; and engaging a latch on the latched container with the moving member as the moving member moves from the third position to the fourth position. The latch may include a first member adapted to be pivotally mounted to a lid, a second member adapted to selectively engage a projection on the body of the container, an arch member connecting the first member to the second member, and a handle extending in a direction opposite to the direction in which the arch member extends; the method further comprising the step of deflecting the handle by movement of the moving member.

[0048] The present invention further provides a system for unlatching a latched container having a body; a lid rotatably affixed to the body and movable between a first position and a second position, comprising a latch pivotally mounted on the lid for selectively locking the lid in a closed position, the latch having a first member adapted to be pivotally mounted to the lid, a second member adapted to selectively engage a projection on the body; and an arched member connecting the first member to the second member, and a lifting arm comprising an arm having a proximal end adapted to be affixed to a truck and a distal end; a manipulating assembly affixed to the arm at the distal end, the manipulating assembly including a grabber member for engaging the container when disposed within the grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container by moving from the first position to the second position. The lifting arm may move between a third position and at least a fourth position; the moving member moving from the first position to the second position as the lifting arm moves from the third position to the at least fourth position. The second member of the latch may include a han-

dle, the handle formed with an arch, the arch extending in a direction opposite to a direction in which the arch member extends. The system may further comprise a projection extending from the body, the latch including a catch extending from the second member of the latch, the catch being disposed along the second member of the latch at a position such that when no force is applied to a convex surface of the latch the catch is disposed so as not to engage the projection when adjacent the body, and when a sufficient force is applied to the convex surface of the latch, the catch is disposed to engage the projection. The latch may comprise a handle extending in a direction opposite to the direction in which the arch member extends; and further the moving member engaging the latch as the moving member moves from the first position to the second position.

[0049] It is to be understood that while certain forms of the present invention have been illustrated and described herein, the present invention is not to be limited to the specific forms or arrangement of parts described and shown.

[0050] Although the present invention has been described hereinabove by way of embodiments thereof, it may be modified, without departing from the nature and teachings of the subject invention as defined in the appended claims.

Claims

1. A container comprising:
 - a body;
 - a lid rotatably affixed to the body and moveable between a first position and a second position; and
 - a latch pivotally mounted on the lid for selectively locking the lid in the closed position, the latch having a first member adapted to be pivotally mounted to the lid; a second member adapted to selectively engage a projection on the housing; and an arched member connecting the first member to the second member, the arched member adapted to allow the second member to engage the projection when a force is applied to a convex surface of the arched member.
2. The container of claim 1, further comprising a projection extending from said body, the latch including a catch extending from the second member, the catch being disposed along the second member at a position such that when no force is applied to the convex surface the catch is disposed so as not to engage the projection when adjacent the body, and when a sufficient force is applied to the convex surface, the catch is disposed to engage the projection.
3. The container of any one of claims 1 and 2, further comprising a pivot formed in the lid, the first member having a receiving portion for receiving the pivot therein.
4. The container of any one of claims 1 to 3, further comprising a catch extending from said second member, the catch being formed with a camming surface.
5. The container of any one of claims 1 to 4, wherein the first member pivots about an axis, and further comprising a slit formed in the first member along said axis off center of said first member.
6. The container of any one of claims 1 to 5, wherein said second member includes a handle, the handle formed with an arch, the arch extending in a direction opposite to a direction in which the arch member extends.
7. A latch for selectively locking a lid to a container body comprising a first member adapted to be pivotally mounted to a lid; a second member adapted to selectively engage a projection on a container body; and an arched member connecting the first member to the second member, the arched member adapted to allow the second member to engage the housing when a force is applied to a convex surface of the arched member.
8. A lifting arm for emptying a container into a truck, comprising:
 - an arm having a proximal end, adapted to be affixed to a truck, and a distal end;
 - a manipulating assembly affixed to said arm at said distal end, the manipulating assembly including a grabber member for engaging the container when disposed within said grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container held by the grabber member by moving from the first position to the second position.
9. The lifting arm of claim 8, where the manipulating assembly includes a guide member, the moving member being disposed within the guide member and moving between the first position and second position within the guide member.
10. The lifting arm of any one of claims 8 and 9, wherein said moving member includes a finger member, the finger member engaging a latch of the container when the moving member moves from the first position to the second position.
11. The lifting arm of any one of claims 8 to 10, wherein

the lifting arm moves between a third position and at least a fourth position; the moving member moving from the first position to the second position as the lifting arm moves from the third position to the at least fourth position.

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12. A method for unlatching a latched container, comprising:

providing a lifting arm for lifting the latched container; 10
moving the latched container from a first position to a second position with the lifting arm;
and
unlatching the container by moving the container from the first position to the second position. 15

13. A system for unlatching a latched container, comprising:

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a container having a body; a lid rotatably affixed to the body and movable between a first position and a second position; and a latch pivotably mounted on the lid for selectively locking the lid in a closed position, the latch having a first member adapted to be pivotably mounted to the lid, 25
a second member adapted to selectively engage a projection on the body; and an arched member connecting the first member to the second member; and 30
a lifting arm comprising an arm having a proximal end adapted to be affixed to a truck and a distal end; a manipulating assembly affixed to said arm at said distal end, the manipulating assembly including a grabber member for engaging the container when disposed within said grabber member; a moving member capable of moving between a first position and a second position, the moving member unlatching the container by moving from the first position to the second position. 40

14. The system of claim 13, wherein the manipulating assembly includes a guide member, the moving member being disposed within the guide member and moving between the first position and the second position within the guide member. 45

15. The system of any one of claims 13 and 14, wherein said moving member includes a finger member, the finger member engaging the latch of the container when the moving member moves from the first position to the second position. 50

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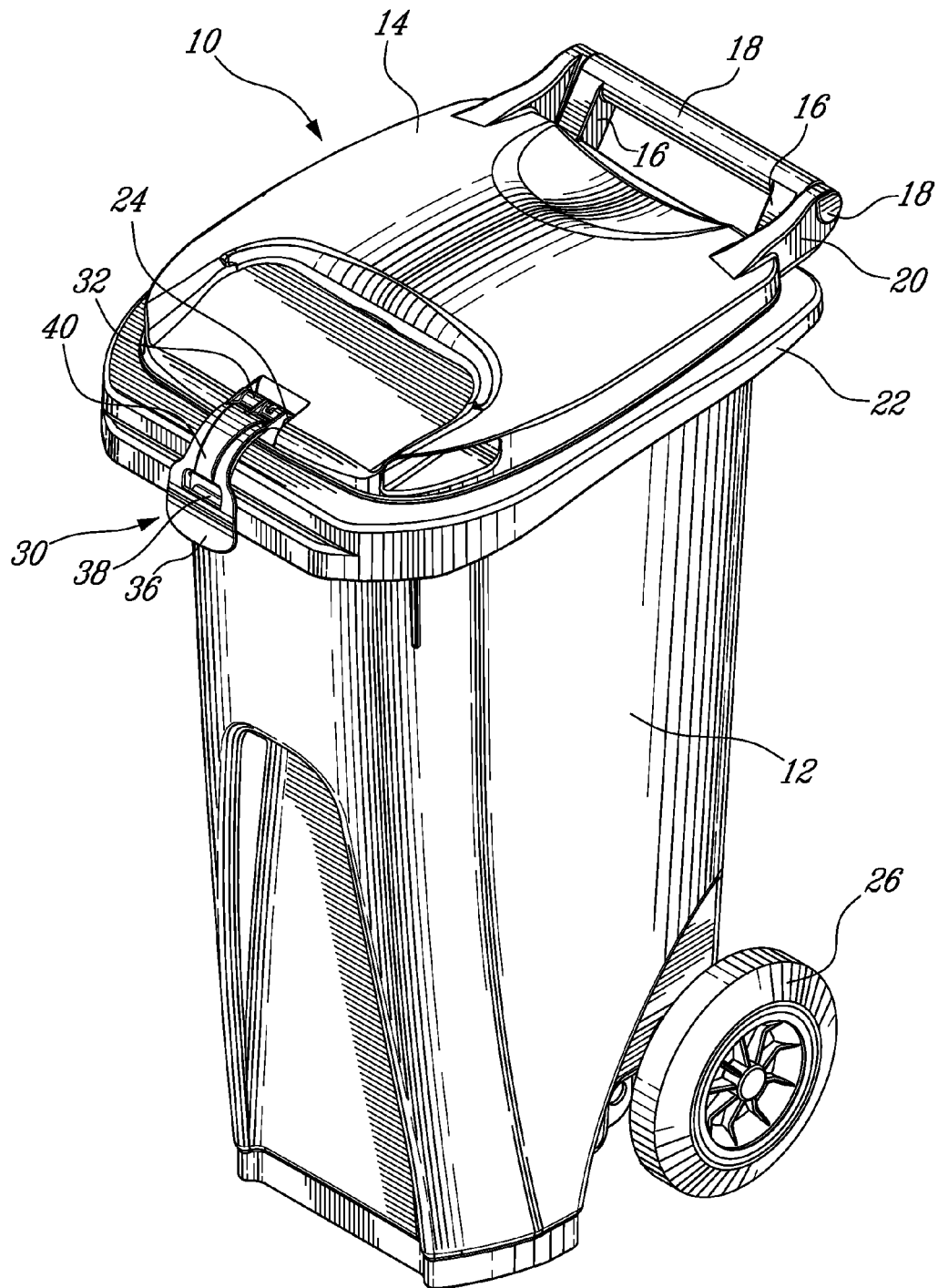


FIG. 1

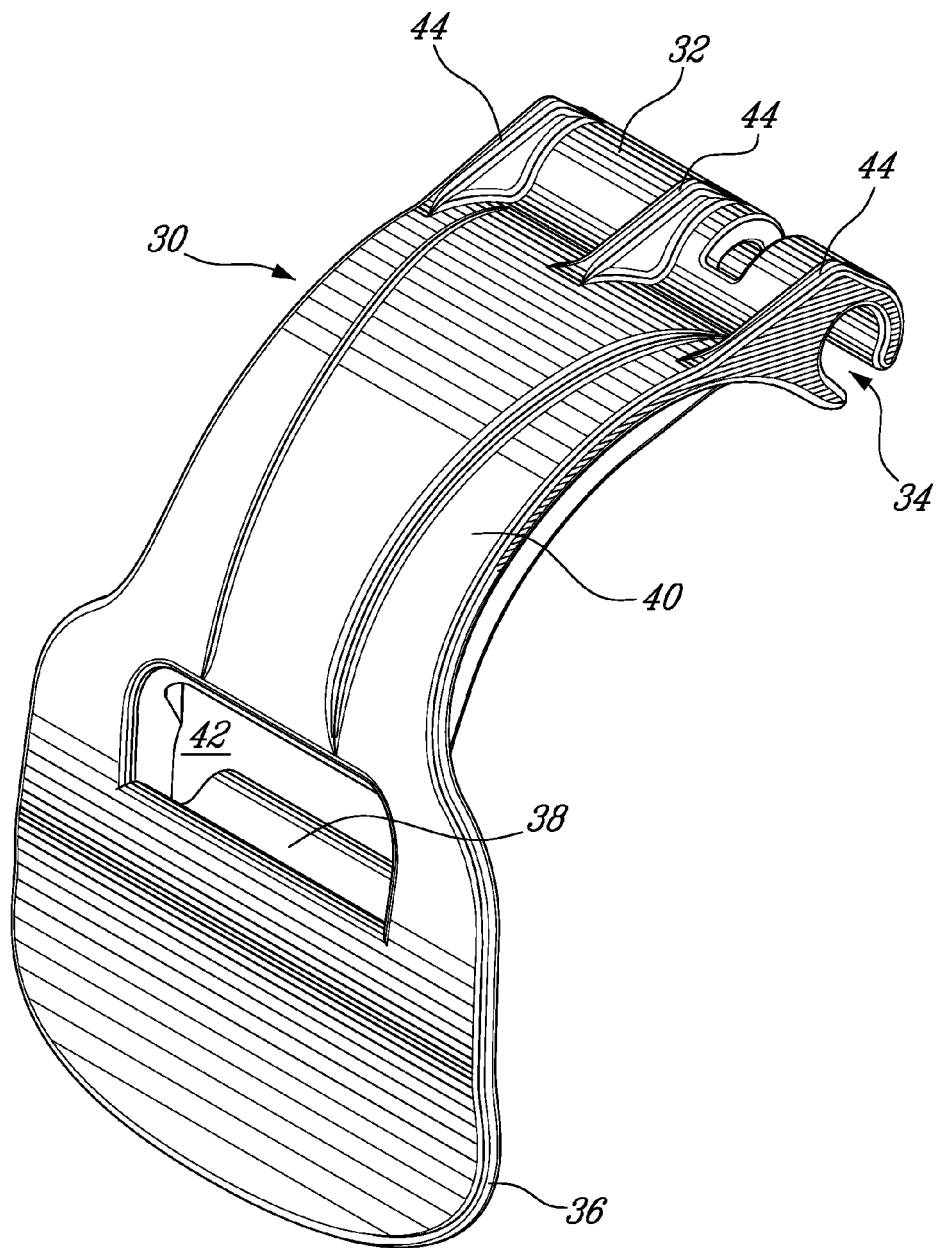


FIG. 2

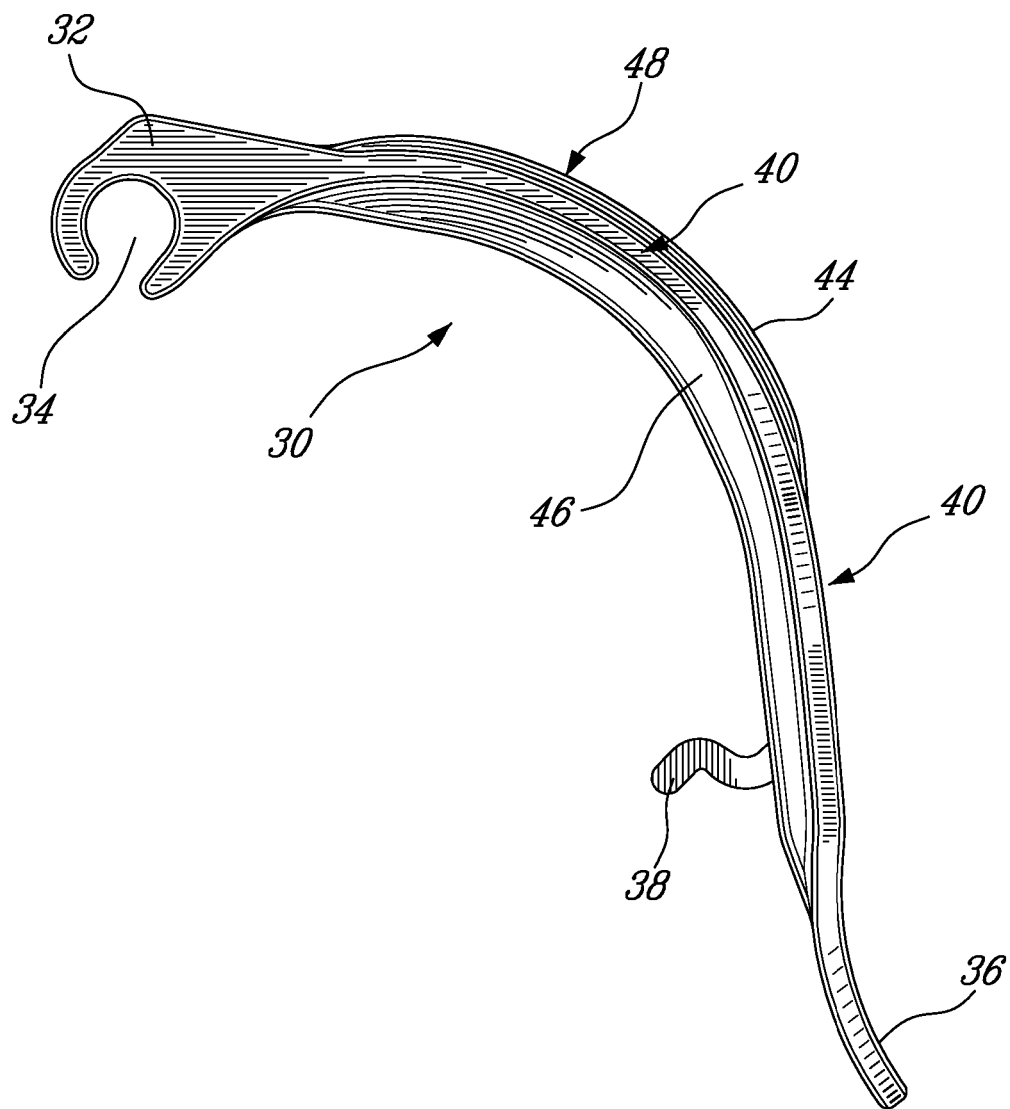
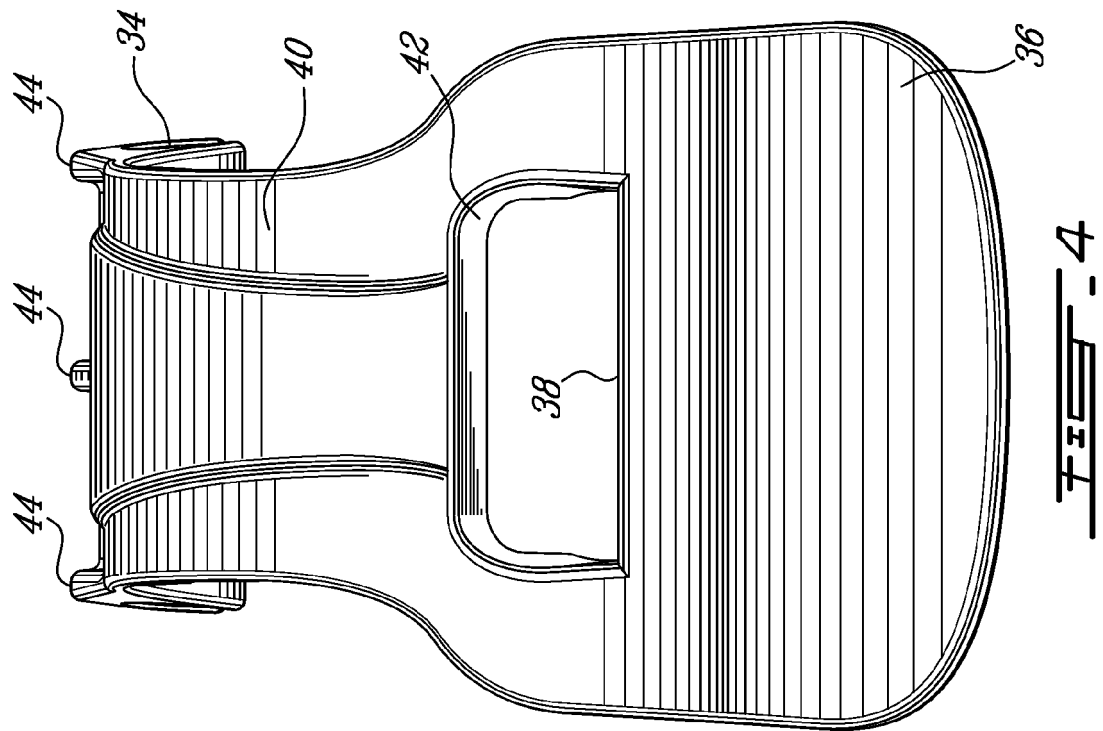
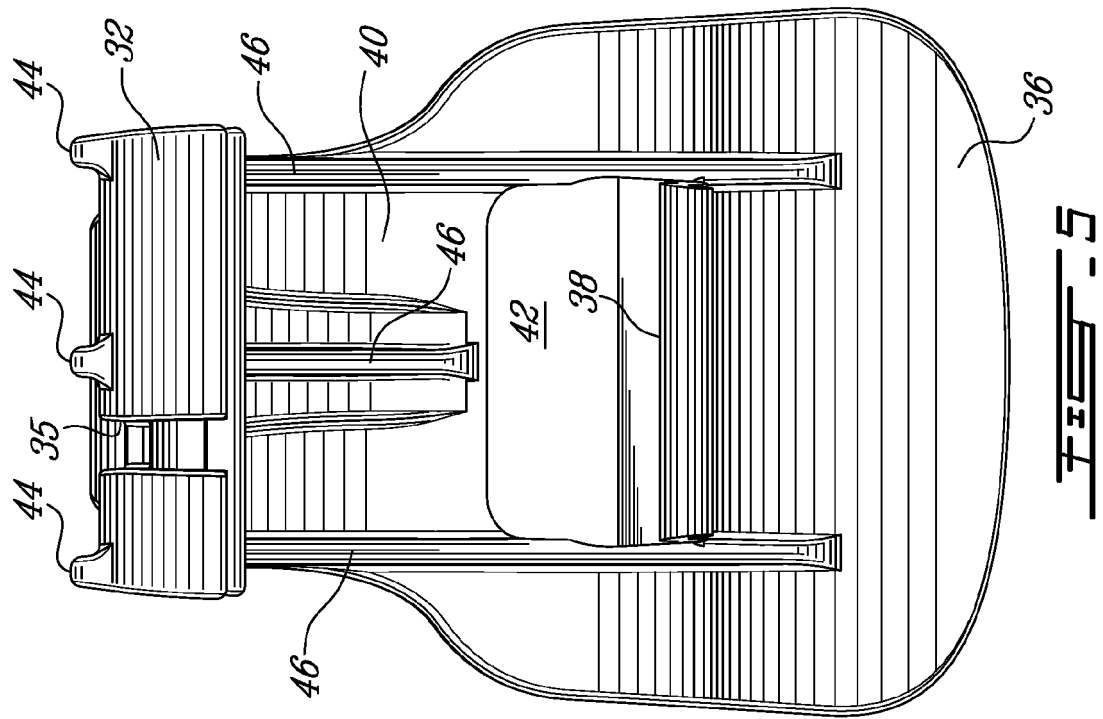
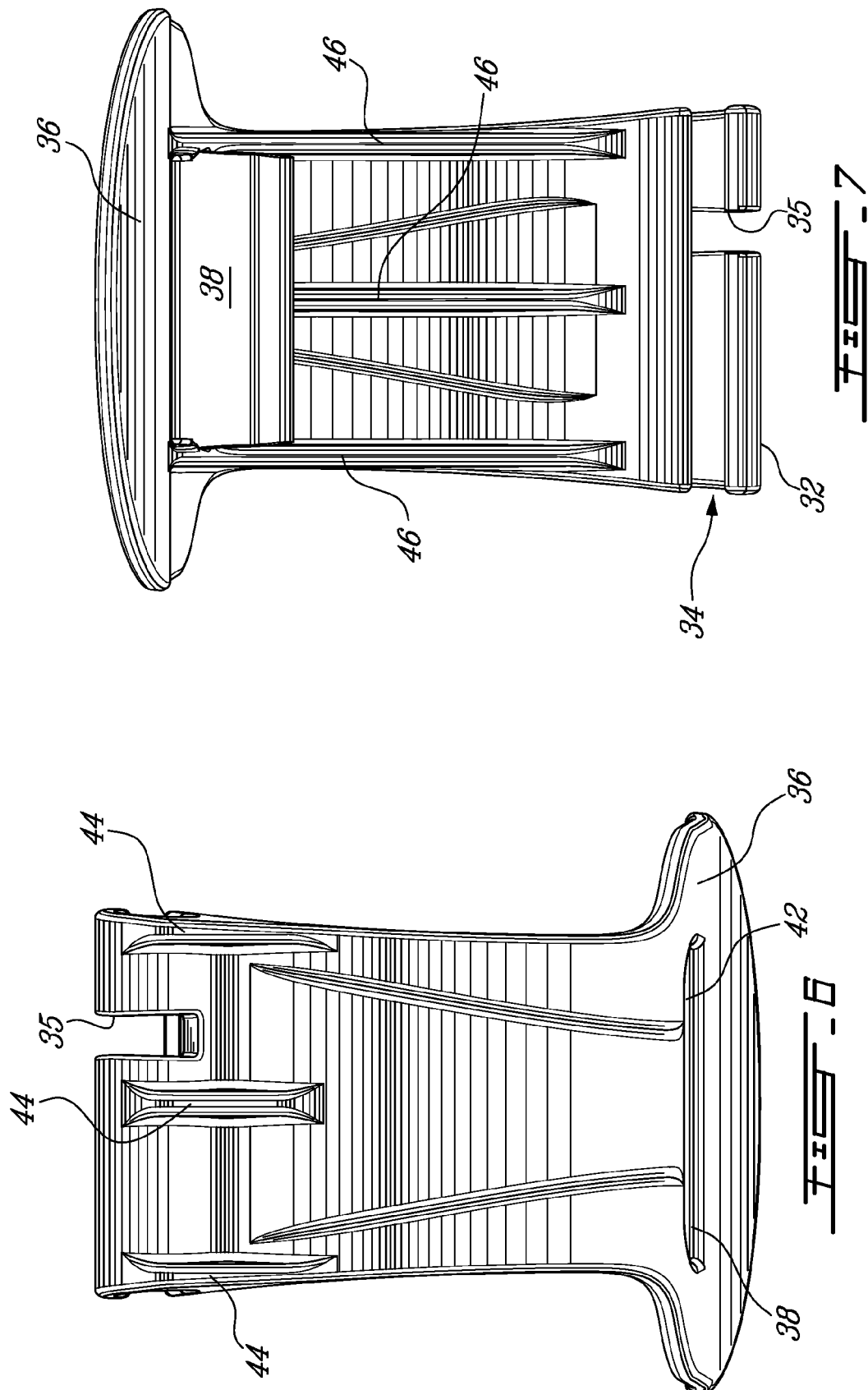


FIG. 3





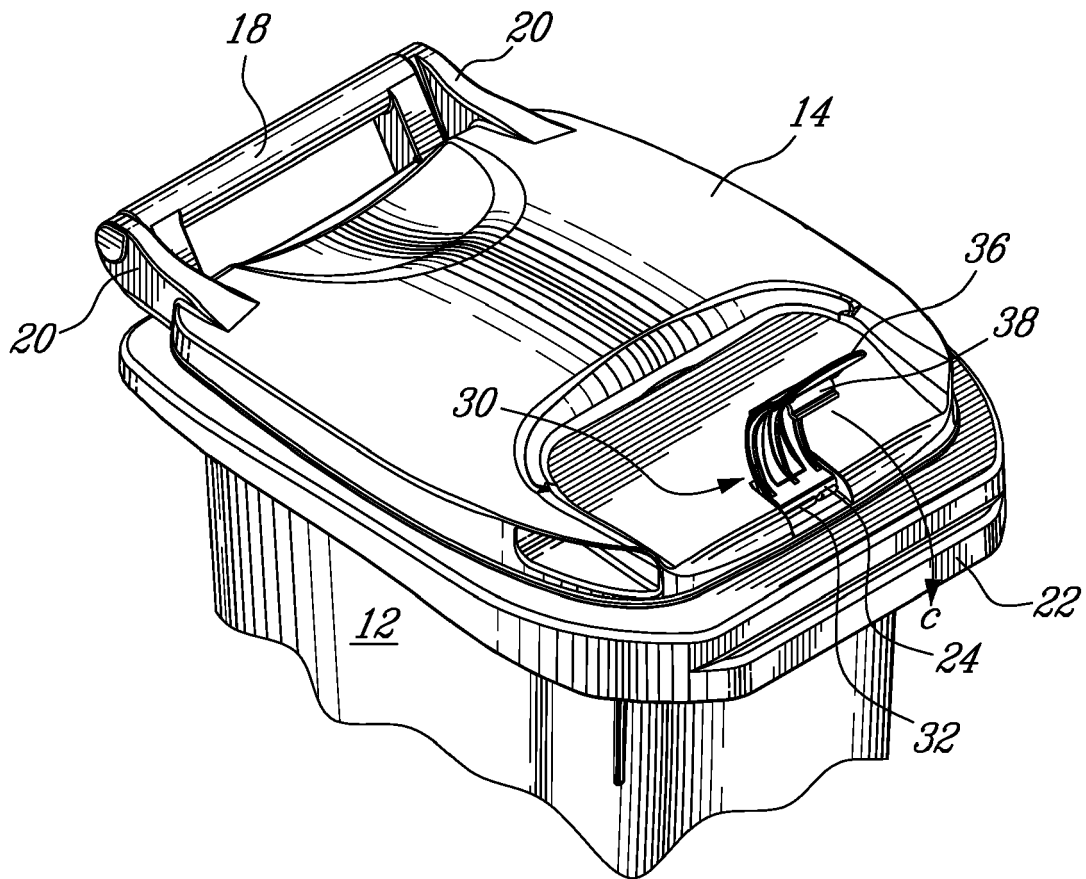


FIG. 8

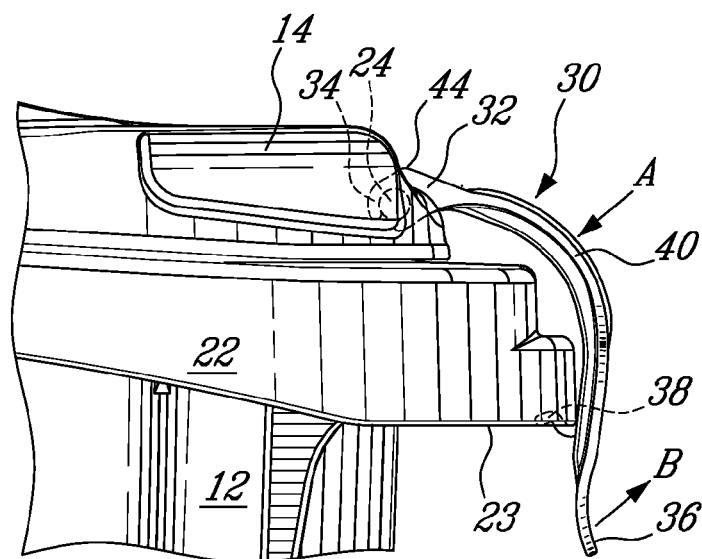


FIG. 9

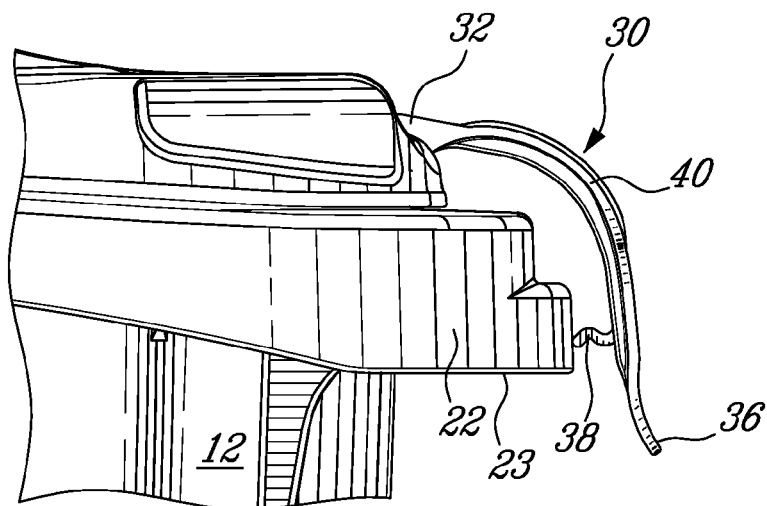
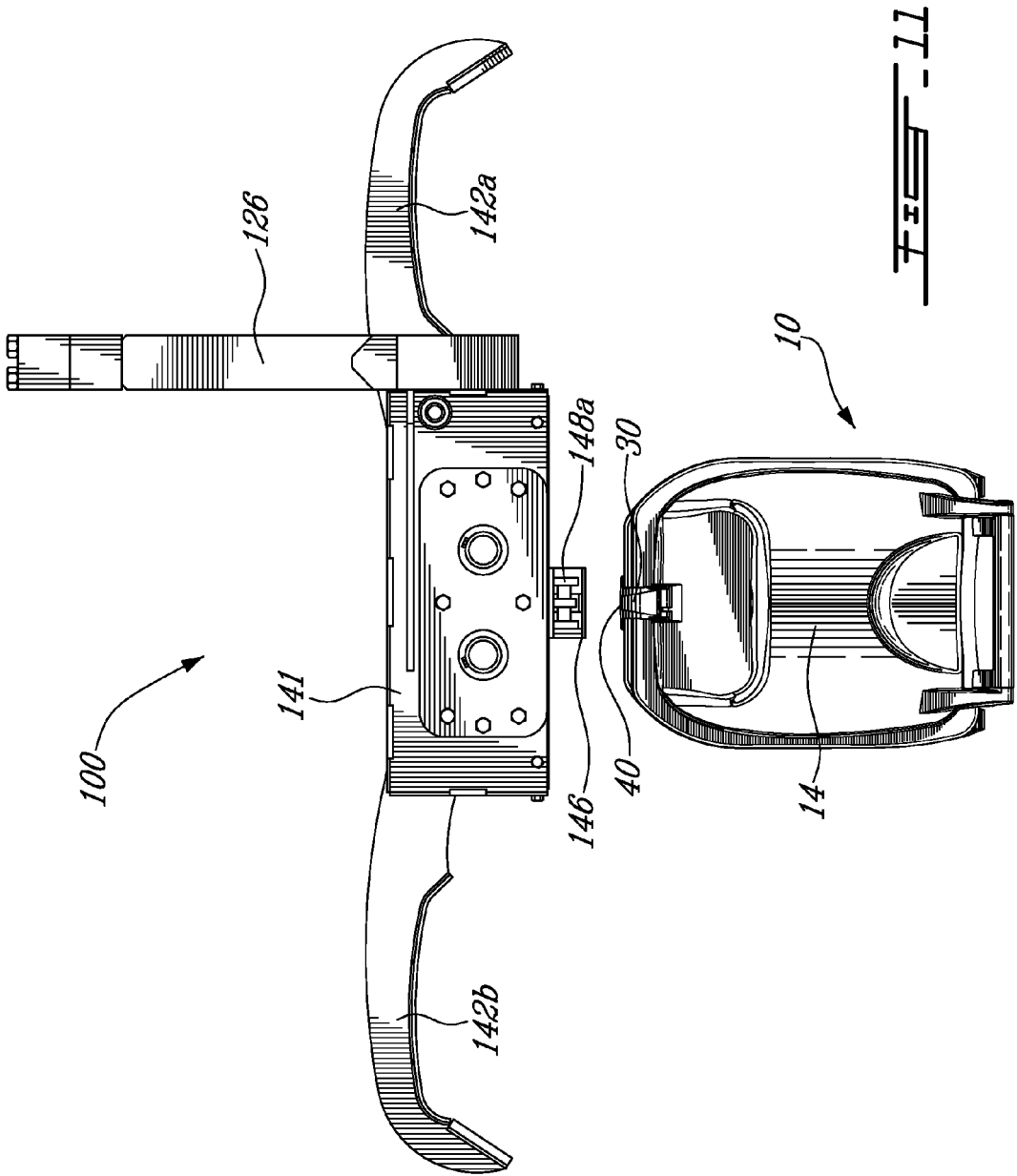


FIG. 10



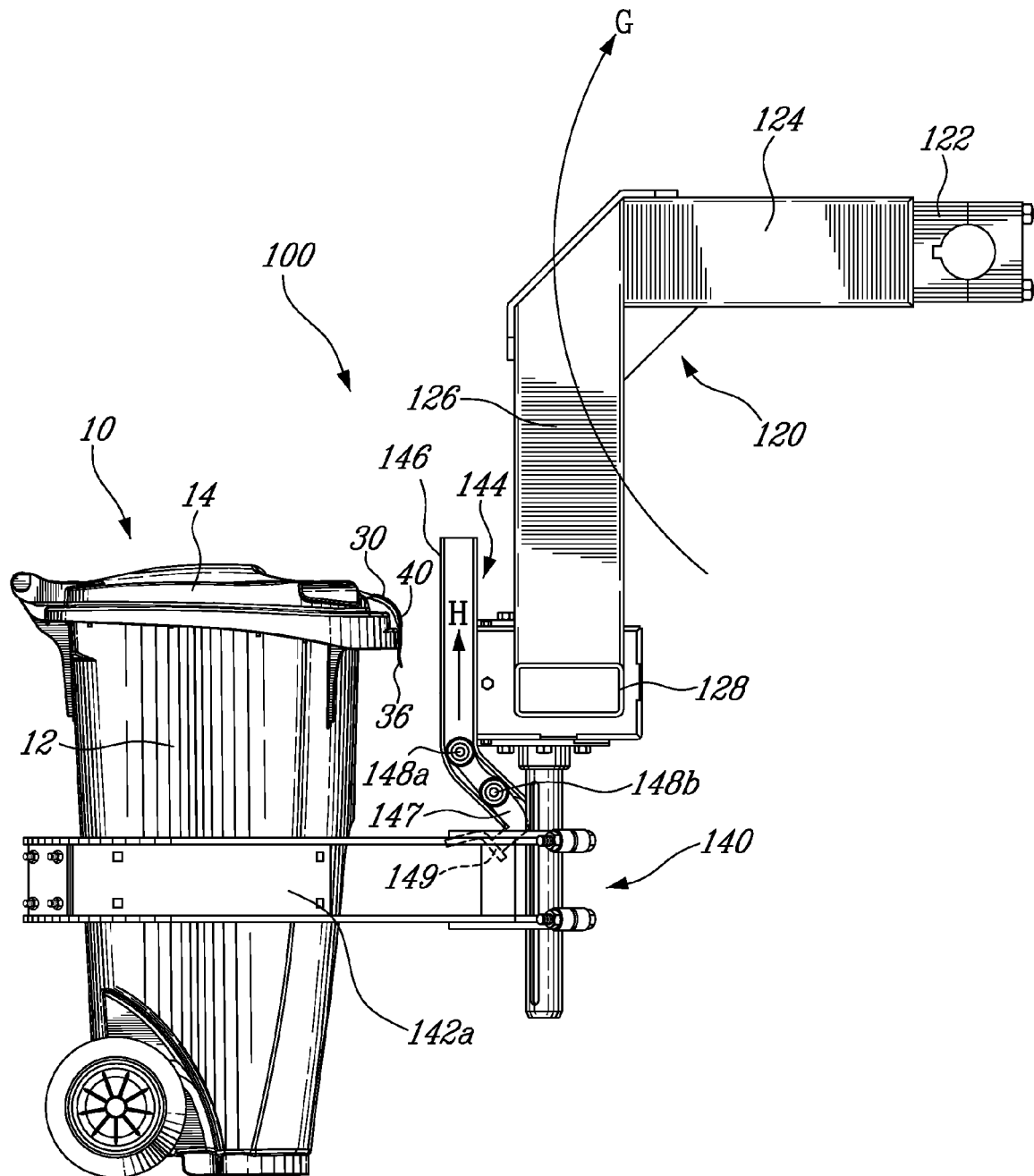


FIG. 12

