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**HINGE ARRANGEMENT ON A REFUSE CONTAINER**

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## HINGE ARRANGEMENT ON A REFUSE CONTAINER

The invention relates to a refuse bin made of plastic in the approximate shape of an upright cylinder with a lid attached pivotably to one container edge by means of a hinge device.

Refuse bins of this type already exist in numerous embodiments. In the various embodiments, the connection between the lid and the container is usually ensured in that more or less long supporting arms extend back from said container edge, which can be termed the rear container edge in view of the use of the refuse bin, which are pivotably connected with each other by means of rods or rivets. These rods or rivets have to be manufactured separately, thereby increasing the production costs and assembly work. It is particularly disadvantageous if one has to use connecting elements made from materials different from the commonly used plastic of the container and the lid because in this also increases the cost of disposal at the end of the container's service life. It is impossible to separate container and lid without destroying the connecting element, comprising at least one rivet, and often the container and/or the lid are also damaged when separated. A special tool is required to remove the rivet. Lids can be easily damaged or destroyed as a result of the relatively rough handling to which refuse bins in use are exposed to, and in this case, the entire container has to be temporarily withdrawn from use, or even replaced by a new one because it is impossible to replace the lid by simple means, particularly there and then on the spot.

One possible reason for wanting to be able to exchange container lids quickly and easily can lie in the fact that many waste disposal companies use different types of lids in addition to normal lids, i.e. ones with odour filters for collecting compost, or different coloured lids for different types of rubbish such as e.g. glass, paper, compost, so-called residual waste etc. In this case the waste disposal companies need to define the number of different types required right from the moment of ordering the containers from the manufacturer. Subsequent adaptation of the use of a container is only possible with the difficulties already mentioned.

The invention is therefore based on the task of providing a rubbish bin whose lid can be quickly and easily assembled without any destruction and without the use of a tool.

This task is solved according to the invention in that the hinge devices have at least one cylindrical barrel mounted on the lid with an axle-parallel slit in the barrel wall, and at least one axle mounted on the container lying inside the barrel and rotatingly accommodating the barrel, said axle consisting of at least two sections which - in the



case of an essentially cylindrical starting form - have axle-parallel flattened surfaces or recesses that are offset with respect to each other in the peripheral direction.

The elasticity of the plastic material used allows the slit barrels of the lid to be pressed onto the axle in the radial direction. The flattened surfaces of the axle resp. the axle sections allow the barrels to be pressed onto the axle without the latter having to be excessively opened on both sides of the slit. The offset arrangement of the two axle sections prevents the barrel from being detached from the axle in any of the possible angled positions of the lid without notable resistance.

The barrels are preferably also divided into two barrel sections that correspond to the axle sections, which can undergo separate deformation when the lid is pressed on or removed.

In one preferred embodiment the slits in the barrels, resp. the barrel sections, are located on the underside of the barrels in relation to the closed position of the lid. Hence the barrels can be pressed onto the axle sections when the lid is essentially in the closed position. The flattened surfaces of two associated axle sections preferably extend slopingly downwards from the top apex zone of the axle sections to the opposite sides of the axle sections

The two barrel sections are preferably arranged on two arms projecting from the rear edge of the lid, and two corresponding axle sections are arranged on two radial arms projecting from the upper edge of the container.

The outer end portions of the two radial arms can be connected by a handlerod which extends beyond the radial arms on both sides parallel to the container edge and ends in stems which project parallel to the radial arms in an extension of the two side edges of the container parallel to each other. By means of the handlerod or rail formed in this way the overall hinge construction is stabilized and the handlerod can also be used as a handle when rolling the container, which generally has rollers underneath the hinged side or the rear of the container.

One of the essential features of this invention is the - offset - cross-sectional form of the axle sections and their interaction with the barrel sections. The form of the cross-section should be selected so that the outer contours of the two axle sections together essentially form a full circle, so that at least one of the barrel sections is guided on the associated axle section when the lid is opened and closed. It is not essential to have a precise geometric circle; a close approximation to a circular shape is sufficient since the

requirements in respect of precision for the pivoting movement of a refuse bin lid are not too high. The position of the flattened surface or recess can, for example, be selected like a mirror image, so that one half of the proposed cylindrical shape remains, whilst a flattened surface or recess follows in a mirror-image arrangement. The purpose of this recess or flattened surface is to lessen the thickness of the two axle sections compared with the original diameter of the cylindrical axle sections. This facilitates or indeed actually makes it possible to press on the slit barrels.

Since the profile of the axle sections is therefore composed of one circumferential half of an approximately circular shape and of one flattened half, a zone is formed at the transition from the circumferential half corresponding to the cylindrical starting form to the flattened or recessed circumferential half, which can be designated as the apex line zone and is more or less tapered and hence offers relatively little resistance to penetration into the slit barrel. If the flattened surfaces are essentially positioned in a mirror-image arrangement with respect to each other then these apex line zones understandably lie essentially in one line. This means that the barrel sections can also lie in one line. They undergo different deformations, however, when pressed onto the axle sections.

In advantageous embodiments the flattened surface or recess is selected so that it slopes away on the same side from the aforementioned apex line zone in the opposite direction in a level or differently shaped surface at an incline in the opposite direction. This gives the two axle sections a cross-section that on one side has the aforementioned apex line zone which, as explained, facilitates the pressing on of the barrel sections, but is so wide on the other side that this cannot be done without some effort, and hence an unintentional detachment of the lid is not likely in the opposite angled position of the lid.

The phrasing used in this connection in relation to the possible mirror-image flattening or recessing of the two axle sections should not lead to the conclusion that the shape of the flattened surfaces or recesses must be identical at all costs. Contrary to this, they can certainly differ from each other in detail whilst it is essential on the other hand that both profiles have an apex line zone that essentially lies along a common generating line of the axle sections.

Details about the shape of the axle sections will become clear from the description of the examples of the embodiments.

In the case of particularly high stresses where there is a risk of an unintentional separation of container and lid, it may be necessary to provide an additional means of securing the lid to the container.

In an embodiment of this type, the axles consist of two coaxial axle stumps separated by a gap. On the initially cylindrical surface one of the axle stumps has an axle-parallel bevelled surface which allows a barrel provided with a slit to be pressed on, as was the case in the first embodiment described. On the barrel there is also a closed ring which interacts with the other of the two axle stumps, which has a flattened surface running at a slope to the radial plane of the axle stump. When the lid is pressed onto the axle of the container, the closed ring provided on the barrel is deformed by the sloping flattened surface of the axle stump until the ring engages fully around this axle stump. During disassembly the lid with the barrels is moved into a position whereby it is pivoted by 180°.

Preferred examples of embodiments according to the invention will be described below with reference to the drawings, in which:

- Fig. 1                    is a diagrammatic side view of a refuse bin according to the invention,
- Fig. 2                    is a diagrammatic top plan view;
- Fig. 3                    is a partial cross-section of the hinge zone of a refuse bin according to the invention;
- Fig. 4                    is a top plan view of Fig. 3;
- Fig. 5 and 6            illustrate how the lid is assembled on the container in vertical partial cross-sections;
- Fig. 7 to 9             are also vertical partial cross-sections and show how the barrel sections and the axle sections interact in the various angled positions of the lid in relation to the container;
- Fig. 10A, B and C    show diagrammatic cross-sectional representations of a few examples of possible cross-sections of the axle sections;

Fig. 11A, B and C show a partially cut side view of how a lid barrel is mounted on an axle of the container in three consecutive steps in a second embodiment of the invention;

Fig. 12A, B and C are cross-sections to Fig. 1 along the intersecting planes A-A, B-B, C-C and D-D, in relation to the assembly procedure of Fig. 11A, B and C.

Fig. 1 shows a refuse bin according to the invention with a lid 10, which closes the actual container 12 on its open topside. The container, whose form in this context has been termed essentially cylindrical, runs together slightly conically on closer inspection, so that the collected waste does not become stuck when the container is emptied. Furthermore, the approximate shape of an upright cylinder also includes containers with a cross-section that comes close to a square or a rectangle with rounded edges. Various shapes of this kind already exist and are not essential in relation to this context. The lid usually lies in the closed position on a collar that projects on all side around the top edge of the container.

On the side lying to the right in Fig. 1 the lid 10 has a handle 14 by means of which the user can grip and open the lid. On the opposite side to the left in Fig. 1, there is a hinge 16 that is connected via projections 18,20 with the lid 10 on the one hand, and the container 12 on the other hand. For the purpose of differentiating these projections the term "arm 18" will be used for the lid and "radial arm 20" for the container. In line with the position when the container is used, the container side shown on the right in Fig. 1 can be termed the front side, and the side on the left can be termed the back side. On the bottom edge of the back side there are rollers 22 which allow the container to be moved to the refuse collection lorry and back to its original place.

Fig. 2 is a schematic top plan view of Fig. 1.

Fig. 3 is a partially cut side view of the back edge portion of the lid 10 of the container and of the hinge 16 of the lid. Fig. 4 is a corresponding partial top plan view. The hinge of the lid is located at a certain distance from the back edge of the lid 10, so that the hinge elements are contrived on elongated projections which, as already mentioned, are differentiated by the use of the term arm 24 for the lid and radial arm 26 for the container. As will be seen by looking at Fig. 3 and 4, the arm 24 consists of two lateral vertical side walls 28 and 30 and a horizontal stem 32 connecting them into a double-T profile. At the outer end of the arm 24 a barrel 34 is contrived in one piece with the arm,

which is an element of said hinge 16 and whose middle axis forms the hinge axis. The barrel 34 has a slit 36 running along the entire length of the barrel, which, when the lid is closed as shown in Fig. 3, is located on the underside of the barrel.

As can be seen in particular from Fig. 3 in conjunction with Fig. 4, the barrel 34 consists in detail of two coaxial barrel sections 38,40. Inside the barrel lies an axle 42, which is also divided into two coaxial axle sections 44 and 46 (Fig. 3) to coincide with the barrel sections.

The cross-section of the axle sections 44,46 is basically circular, so that barrel 34 can rotate around the axle resp. the axle sections 44,46. The circular cross-section of the axle sections is flattened, however, and more precisely, as indicated in Fig. 3, is flattened in different ways for the two axle sections 44 and 46. Whilst the one axle section according to Fig. 3 has a flattened surface 48 that slopes downwards to the right from the top apex zone in Fig. 3, the other axle section 46 has a flattened surface 50 that slopes away to the left like a mirror-image. Furthermore, both axle sections 44,46 are provided from the underside in Fig. 3 with a wedge-shaped cut-out (not shown), so that in particular the surface which forms the flattened surface 48 resp. 50 is only embodied by a stem (not shown).

Moreover it can also be seen from Fig. 3 and 4 that the two axle sections 44 and 46 are held between two parallel, vertical side walls 52 and 54, which proceed as one piece from the container not shown in Fig. 3 and 4, and form said radial arms 26.

From Fig. 4 in conjunction with Fig. 2 it can be seen that sections 56,58,60 of a handlerod proceed from the outsides of the side walls 52,54 whose outer sections 56 and 60 are connected at their free ends with the container by means of connecting stems 62,64. which in the example shown, lie in an extension of the straight, parallel, side edges of the top container edge. In this way the handlerod forms, together with the connecting rods and the side walls 52,54 of the radial arms 26, a stable unit that is rigidly connected with the container which, when emptying or otherwise handling the container, provides a means of gripping the container, tilting it backwards, i.e. to the left in Fig. 1 and moving it on the rollers 22.

Fig. 5 and 6 illustrate the way the lid 10 is assembled on the container. The lid 10 is first brought into a position as shown in Fig. 5, which is the position essentially adopted when the lid is closed. The barrel 34 with the two barrel sections lies above the two axle sections 44 and 46. The slit 36 of the barrel sections is located above the top apex of the two axle sections. If the barrel is now pressed downwards onto the axle sections, the

slit 36 is spread apart. At the same time, the flexible stem of the axle sections (not shown), which limits the two flattened surfaces 48, 50, is pressed springingly to the side. In this manner the barrel sections lock into position so that they engage around the axle sections 44,46 and, together with the latter, form the hinge. No additional elements, in particular none made from other materials such as metals, are required to make the hinge.

When the lid is to be removed and replaced by another lid, it is just as easy to disassemble. For this purpose the lid is simply swung into the essentially horizontal position. In this position, which is shown in Fig. 8, the slit 36 in the barrel 34 is located on the top side above the apex of the axle sections 44 and 46. By exerting pressure on the arm 24 of the lid 10, the slit 36 can be made to widen and the barrel 34 can be pressed downwards in relation to the axle sections 44,46 until the barrel 34 is separated from the axle sections 44,46.

Fig. 7 to 9 show different angled positions of the lid 10 in relation to the container. It can be seen that in all the angled positions of the lid, except that shown in Fig. 8, the slit 36 is positioned in relation to the two axle sections 44,46 in such a way that the slit 36 would essentially have to be opened up to the entire width of the diameter of the axle sections if the intention were to press the barrel down from the axle sections. It is not likely that the barrel will be spread apart to this extent, at least not by the forces that normally occur during operations and during use of the refuse bins.

The slit 36 does not necessarily have to lie in the lower portion of the barrel 34 in relation to the closed position of the lid 10. The slit and the apex zones of the axle sections 44,46 should however be arranged relative to each other so that in particular in the angled position of the lid in which disassembly becomes possible, i.e. the angled position as shown in Fig. 8, the least stresses on the lid are to be expected.

Fig. 10A shows a cross-section of axle sections 44 and 46, which essentially corresponds to the cross-sections shown in Fig. 3 to 9. Fig. 10 first shows, by way of an addition, the two individual axle sections 44 and 46 and then the way they overlap in an axial view.

A special feature of the embodiment of Fig. 10A is that the two axle sections 44 and 46 each have a top apex line zone 66,68 from which the cross-section has flattened surfaces 48,50 that run downwards at an angle in opposite directions. This gives the cross-sections the shape of a wedge or triangle with a relatively slim point in the apex line zones 66,68 and a far bigger width on the underside in Fig. 10A. This means that a

slit barrel 34 can be relatively easily pushed on from the top in Fig. 10A, because the slim apex line zones 66,68 can be pushed into the slit in the barrel, but that it is more or less impossible to detach the barrel sections from the axle sections in the opposite direction. The pushing-on process could be additionally facilitated by largely cutting out the profile of the axle sections from below in Fig. 10A so that the flattened surfaces 48,50 consist essentially only of stems which can, if required, act like springy tongues and are deflected to the left and right in Fig. 10A when the barrels are pushed on. As a general rule, however, the deformation of the barrel sections for assembling and disassembling the lid is sufficient.

In Fig. 10B the axle sections have the cross-section of an essentially elliptical hollow profile. As in the embodiment form of Fig. 10A, viewed in the longitudinal direction of the axle sections, the two ellipses are arranged offset in relation to each other and, more precisely, in such a way that one of the two ellipses essentially follows the circumference of the - possibly - cylindrical starting shape. The embodiment of 10B differs in the way it functions from that of Fig. 10A in that the barrel sections can be detached from the axle sections from two opposite orientations, in Fig. 10B with top and bottom slits.

Fig. 10C shows an embodiment whose design essentially coincides with that of Fig. 10A. In the cylindrical portion which serves to guide the barrel sections the cross-section only approximately comes close to a circular form over several stages. Overall it is a hollow profile that is open at the bottom in Fig. 10C, of a relatively thin wall thickness, which can easily be pressed together when the barrel sections are pushed on from the top in Fig. 10C, but prevents the barrel sections from being pulled off in the opposite direction.

In the embodiments shown in Fig. 11 and 12, there are two axially aligned axle stumps 70 and 72 separated from each other by a gap (not shown) instead of the two axle sections 44 and 46 of the first embodiment. The two axle stumps 70 and 72 are attached to the radial arms 74 and 76, which correspond to the radial arms 20 of the first embodiment. The two axle stumps 70 and 72 extend in a coaxial arrangement from the radial arms 74,76. Fig. 11 does not show how these radial arms 74,76 are attached to the container, but the method essentially coincides with that of the first embodiment. The top portion of Fig. 11A shows a section of the lid on which a barrel 78 is mounted by means of arms (not shown) as in the first embodiment. This barrel 78 has a cross-section that changes several times along its length, as shown in Fig. 12A with reference to the intersecting planes A, B, C and D in Fig. 11A.

The section of the barrel 78 lying on the left in Fig. 11A, to which the section A-A in Fig. 12A corresponds, is essentially structured like the barrel sections 38 and 40 of the first embodiment. This section of the barrel 78, which is designated by 80, has an axle-parallel slit 82. The corresponding axle section 84 has on its circumference at least one axle-parallel flattened element 86, as in the first embodiment. Fig. 12A shows the axle section 84 essentially in the form of an upside down V along the intersecting plane A-A. Hence flattened elements similar to the flattened element 86 are provided on both sides, and the interior inside the two arms of the V is hollow so that a certain deformation is possible when the barrel section 80 is pressed on.

Adjacent to axle section 84 is an axle section 88 with a bigger diameter, which acts as a sealing flange for axle section 84. Because of the bigger diameter of axle section 88, the corresponding barrel section 90 also has a bigger inside diameter. When axle section 88 engages inside the barrel section 90, as occurs when assembled in the steps shown in Fig. 11B and 11C, the barrel 78 is axially secured on the axle section 84 against displacement to the right in Fig. 11.

To the right of the axle section 88 with the bigger diameter follows a gap 92, followed by the opposite axle stump 72. This axle stump 72 also has a cylindrical starting shape, but its top side in Fig. 11A is provided with a flattened surface 94 that runs slopingly towards the radial plane. In the corresponding portion on the side of the barrel there is a barrel section 96, which is formed as a closed ring. As already mentioned, Fig. 12A shows the four cross-sections in the planes A, B, C and D in Fig. 11A. It can be seen that the barrel section 96, which forms a closed ring, is directly and rigidly attached by its top and middle portions to an adjacent barrel section 98, which creates the transition to the barrel section 90, whilst the bottom portion of the ring-shaped barrel section 96 is separated from the barrel section 98. This makes it possible for the final barrel section 98 to deform to a certain extent in the axial direction. This in turn allows the ring-shaped barrel section 96 to lock into place on the second axle stump 72.

Fig. 11B, 12B, 11C and 12C show how the barrel 78 can be pushed onto the axle with the two axle stumps 70 and 72.

First of all, the barrel section 80, which has the axle-parallel slit 82, is spread open when pushed onto the wedge-shaped axle section 84. This opening of barrel section 80 corresponds to the procedure in the first embodiment.

The barrel section 90 with the bigger diameter lies essentially without deformation on the axle section 88 with the bigger diameter, as shown in Fig. 11B and 11C. The following

barrel section 98, which provides the transition to the ring-shaped barrel section 96, does not require any deformation during assembly, either, because it surrounds axle stump 72 with a gap on all sides, as shown in Fig. 12B and 12C along the intersecting plane C-C.

When, however, the ring-shaped barrel section 96 runs up against the flattened surface 94 of the axle stump 72, a deformation of the interacting elements of the lid and the container is essential.

On the one hand, the ring-shaped barrel section 96 is bent to the left in Fig. 11B and 11C by the flattened surface 94 of the axle stump 72. The ring only locks back in the starting position of Fig. 11C when the bottom portion of the ring-shaped barrel section 96 passes the flattened surface 94.

The deformation required during the assembly of the lid is not, however, limited to barrel section 96 alone. It is much more the case that the radial arms 74 and 76 are likely to spread outwards as shown by the arrows 100 and 102 in Fig. 11B. When selecting an appropriate plastic for manufacturing the container and the lid and an appropriate design of the radial arms 74,76, the elastic deformability of the two radial arms 74,76 and the barrel 78 can be selected so that the lid and the container can be pressed together relatively easily without any tools, and so that an unintentional separation is excluded when the refuse bin is in use.

To disassemble the lid from the container all that is required is to pivot the lid and, with it, the barrel 78 by 180° in relation to Fig. 11 and 12, and then to exert pressure on the lid. In this manner the lid is separated from the container axles whilst the aforementioned procedures take place in reverse.



## PATENT CLAIMS

1. Refuse bin made of plastic in the approximate shape of an upright cylinder with a lid (10) attached pivotably to one container edge by means of a hinge device (16), **characterized** in that the hinge device (16) comprises at least one cylindrical barrel (34) mounted on the lid (10) with an axle-parallel slit (36) in the barrel wall and at least one axle (42,44,46) mounted on the container (12) lying inside the barrel and rotatingly accommodating the barrel, said axle consisting of at least two sections (44,46) which - in the case of an essentially cylindrical starting form - have axle-parallel flattened surfaces or recesses (48,50).
2. The refuse bin of claim 1, **characterized** in that the slit (36) of the barrel (34) lies in the bottom portion of the barrel in relation to the position of the closed lid (10), and in that the flattened surfaces or recesses (48,50) essentially run slopingly downwards in opposite directions from a top apex line zone of the axle sections (44,46).
3. The refuse bin of claim 1 or 2, **characterized** in that the barrel (34) is divided into barrel sections (38,40) that correspond to the axle sections (44,46).
4. The refuse bin of claim 3, **characterized** in that two barrel sections (38,40) are disposed on an arm (24) projecting from the rear edge of the lid (10) and two corresponding axle sections (44,46) are disposed on a radial arm (26) projecting from the top back edge of the container (12).
5. The refuse bin of claim 4, **characterized** in that there are two spaced arms (24) with two barrel sections (38,40) and two corresponding radial arms (26) with two axle sections (44,46).
6. The refuse bin of claim 5, **characterized** in that the two radial arms (26) are connected along their portions located at a distance from the container by a handlerod (56,58,60), which extends beyond the radial arms (36) from the opposite outer sides of the radial arms parallel to the container edge up to two connecting stems (62,64), which are extended along the side edges of the container.
7. The refuse bin of one of claims 2 to 6, **characterized** in that the axle sections (44,46) have recesses on the side lying opposite the top apex line zone.
8. The refuse bin of one of claims 2 to 6, **characterized** in that the axle sections (44,46) are hollow profiles.

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9. The refuse bin of claim 8, **characterized** in that the axle sections (44,46) formed as hollow profiles are open on the side lying opposite the top apex line zone.

10. The refuse bin of claim 1, **characterized** in that the axles are formed as two coaxial axle stumps (70,72) separated by a gap (92), in that one of the axle stumps (70) has at least one axle-parallel flattened surface (86) on the periphery to accommodate an associated barrel section (80) provided with a slit (82), in that the other axle stump (72) has a flattened surface (94) that runs slopingly towards the free end, in that a barrel section (96) designed as a closed ring is provided in the region of the other axle stump (72) at the end of the barrel, and that the two flattened surfaces (86,94) of the two axle stumps (70,72) are essentially equidirectional in the direction perpendicular to the axis of the axle stumps.

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