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Translation

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The invention relates to a barrel, having a bung, and made from thermoplastic material, with a carrying and transport ring arranged surrounding the barrel wall in the vicinity of the upper end, and with at least one bung hole socket arranged in the edge region of the upper end, the socket being sunk in a bunghole housing in such a manner that the end surface of the bunghole socket is flush with the external surface of the upper end, or lies slightly therebelow.

Plastic barrels of this type are generally known, having at least one gripping ring arranged on the upper peripheral region of the barrel casing for a barrel gripper, and, optionally, additional rolling rings on the periphery of the barrel. Plastic barrels with bungs can be manufactured according to different methods. According to one possibility, the barrel is formed by blow-moulding in a single piece with the barrel ends and the carrying and transport rings, the said rings being squeezed on whilst still in the blow mould, using displaceable mould slides (e.g. DE-PS 29 14 938). In another method, the cylindrical body of the barrel and the ends, with carrying and transport rings or rolling rings, are separately pre-manufactured as individual parts and are then bonded or stuck together (e.g. US-PS 3 394 747). It is also already known for only the carrying and transport rings to be pre-manufactured as separate individual parts, and then to be welded or stuck on to the blow-moulded body of the barrel. In a further known plastic barrel with a bung, the upper end is screwed on to the barrel casing, with the carrying and transport ring as a detachable individual part (e.g. US-PS 4 094 432). The plastic barrel can also be formed as a wide-mouth packing barrel with a detachable bung hole cover and a clamping ring.

However, all the known plastic barrels with an upper carrying and transport ring have the same disadvantage in common, namely that because the bung hole socket or the bung hole housing is sunk into the upper end of the barrel, there are problems in emptying residual contents out of such barrels. Even if the barrel is tilted into an angled inverted

position and manually tipped back and forth, an unsatisfactory emptying of the residual contents is all that can be achieved, even if the barrel is held in such a manner that the bung hole remains at the lowest possible point.

The object of this invention is to provide a constructional form of a plastic barrel with a bung, or of the upper end (cover) thereof, allowing as much emptying of residual contents as possible in a static angled position (without tipping back and forth).

This object is achieved in accordance with the invention in a plastic barrel of the type originally mentioned, in that the upper end has a planar part, shaped substantially as a portion of a circle, or has a sloping part which is symmetrically formed on both sides of the bunghole socket and, when seen in the standard position of the barrel, is recessed so as to extend, slightly sloping, at an angle inwards into the body of the barrel as far as the edge thereof, the lowest point of the sloping part being on the side of the barrel casing in the vicinity of the bunghole socket and opening there into the lower-lying plane of the floor of the bunghole socket housing, or into the bunghole socket. Upon residual emptying or inverted positioning of the barrel in a slightly angled but stationary tilted position, at an angle of, for example, 10° to 12° , the residual liquid runs over the inner surface of the sloping part to the barrel casing as far as the bunghole housing and then through the bung hole nozzle out of the barrel; this is because the upper end is not uniformly flat, but has the sloping part essential to the invention in the vicinity of the bunghole.

In a preferred embodiment of the invention, provision is made for the sloping part to form a slight inclination edge with the remainder of the upper end of the barrel, the average distance of the edge from the central point of the barrel being substantially the same as, or less than, a quarter of the barrel diameter, the sinking of the bunghole housing beginning at, or close to, the inclination edge on the side facing the middle of the barrel, but having a larger inclination angle in relation to the upper end than the sloping part of the circular portion at the upper end in the region of the bunghole socket. The essential feature is that as large a region as possible of the original planar upper end region remains, as a sloping part at the upper end with too large a surface area would reduce the supporting

surface for stacking the barrels, and thus would adversely affect the stacking properties of the barrel.

This form of the invention for a barrel with a bung, with a bung hole cover forming a lower seal for the bung hole socket, allows for the sinking/angling of the bunghole housing on the side facing the centre of the barrel to be between 30° and 45° , and preferably approximately 40° , and the sloping part of the circular portion at the upper end to have an inclination angle of between 10° and 17° , preferably approximately 13° . In this barrel with a bung, having a widened bung opening, emptying of residual contents takes place by simply tilting and holding the barrel at a tilting angle of approximately 18° to 20° in the angled inverted position of the barrel. In another form of the invention, for a barrel with a bung and a bung cover forming an upper seal at the edge of the bung hole socket, provision is made for the sloping part of the circular portion at the upper end to be flatter or to have a slight inclination angle of between 4° and 10° , preferably approximately 6° , and a recess or a passage is provided in the bunghole socket with the upper seal, on the side facing the barrel casing, for the discharge of residual liquid. In this barrel, emptying of residual contents therefore takes place by tipping and holding the barrel at a lesser tipping angle of approximately 10° to 12° in a slightly tilted inverted position of the barrel.

Because of the constructional form of its upper end or a corresponding barrel cover, the barrel in accordance with the invention is suitable for independent emptying without any liquid remaining and without manual tipping back and forth, provided that it is ensured, for example using a simple corresponding holding device, that the barrel remains in its intended angled position; the bung hole is to be orientated at the lowest position.

The invention will subsequently be explained and described in greater detail by means of the embodiments shown in the drawings.

Fig. 1 is a partial view of a barrel of the invention in the region of the bung hole;

- Fig. 2 is the barrel from fig. 1 in a tilted position for emptying of residual contents;
- Fig. 3 is a second, different embodiment of a plastic barrel in accordance with the invention;
- Fig. 4 is a plan view of the barrel of the invention in accordance with fig. 3;
- Fig. 5 is a view from the interior to the upper end of the barrel in the position for emptying residual contents;
- Fig. 6 is a further embodiment of a plastic barrel having a bung hole socket with an upper seal;
- Fig. 6a is a partial view of the lower bung hole nozzle from fig. 6;
- Fig. 7 is a fourth embodiment of a plastic barrel having a bung hole socket with an upper seal; and
- Fig 7a are a partial view and a partial section respectively of the
Fig. 7b lower bung hole socket from fig. 7.

Fig. 1 shows a stackable barrel, having a bung, and made of thermoplastic material for extensive emptying of residual contents, manufactured integrally with a squeezed-on gripping ring using a blow-moulding process. The barrel has a cylindrical casing 22 with a barrel gripping ring 30, arranged in the upper peripheral region for the use of a barrel gripper, and also has a flat upper end 12. The upper edge of the barrel-gripping ring 30 projects from the surface of the upper end of the barrel, by approximately three times the thickness of the barrel wall. A bung hole 14 is provided in the upper end 12 of the barrel in the vicinity of the barrel casing 22. The bung hole 14 is surrounded by a bung hole socket 16 which is sunk in a bung hole housing 18 in such a manner that the end surface of the bung hole socket 16 is approximately flush with the outer surface of the barrel upper end 12 or is sunk so as to be slightly deeper. The bung hole socket is sealed below the thread on the angled narrowed portion of the diameter.

A planar part shaped as a portion of a circle, or a substantially planar or flat sloping part 10 of the upper end 12, is recessed symmetrically to the bung hole socket 16, or to the outer edge of the barrel, so as to extend, slightly sloping, at an angle inwards into the body of the barrel, the lowest point of the sloping part 10 being on the side of the barrel casing 22 and opening there into the lower-lying plane of the floor 20 of the bung hole socket, at the same level as the said plane.

The reference numeral 24 designates an inclination edge extending (in this case) in a straight line between the upper end 12 of the barrel and the sloping part 10. The sinking of the bung socket housing 18 is moved slightly beyond the inclination edge 24 in the direction of the middle of the barrel. The bung socket housing wall is sunk at an angle 38 of between 30° and 45° , preferably approximately 40° , in relation to the upper end 12 of the barrel, whilst the sloping part 10 beginning at the inclination edge 24 is tilted by an angle 36 of between 10° and 17° , preferably approximately 13° , in relation to the upper end 12 of the barrel. At its lowest point the sloping part 10 borders the barrel casing 22 on the interior, at the height of the base region of the carrying and transport ring 30, or the region of connection thereof to the barrel casing 22.

The position for emptying residual contents from the barrel with a bung can be seen from fig. 2. In its inverted position the barrel is tipped by an angle of approximately 18° to 20° , and is retained in this position, preferably by means of a corresponding tipping device. Because of the angular difference between the sloping part and the tipping angle, the liquid contents can run out independently over the sloping part 10 to the barrel casing 22 and from there through the bung housing or the bung hole socket 16 without any of the contents remaining.

Fig. 3 shows a somewhat different embodiment. The sinking of the bung hole housing 18 begins precisely on the inclination edge 24 on the side facing the centre of the barrel; however, it is sunk at a sharper inclination angle in relation to the upper end 12 of the barrel than the sloping part 10 of the circular portion at the upper part of the barrel in the region of the bung hole socket 16. Additionally, a rib-like projection 34 is provided on the floor 20 of the bung socket housing between the barrel casing 22 and the bung hole socket 16, with a corresponding channel-like depression 32

also provided on the inner side. This ensures that the last of the contents can run out of the hollow between the sloping part 10 and the inner barrel casing 22 in the tilted position of the barrel. A further difference is that the upper edge of the gripping ring 30 is formed flush with, or at the same height as, the surface of the upper end of the barrel.

In fig. 4 the relevant part of the upper end 12 of the barrel is shown in plan view. It can be seen that the sloping part 10 forms the slight inclination edge 24 with the rest of the upper end 12 of the barrel, the distance 26 of the said edge from the central point 28 of the barrel being approximately the same as, or less than, a quarter of the barrel diameter. The sinking of the bung hole housing 18 begins at the inclination edge 24. The sloping part 10 opens at the side of the bung hole into the level floor 20 of the bung hole housing 18. The comparatively narrow rib-like projection 34 extends between the inner barrel wall 22 and the bung hole socket 16.

The flow diagram for the drops of residual liquid of the fluid contents is shown in fig. 5. The residual liquid flows from the inner surface of the upper end 12 substantially at right angles over the inclination edge 24 as far as the inner curved barrel casing 22 and along the same as far as the hollow in the vicinity of the bung hole housing floor 20. At this collection point the last of the residual liquid flows through the short, slightly sunken, radially extending channel 32 into the bung hole socket 16 and out of the barrel.

A further change to promote the flow speed of the last of the residual liquid, as indicated in fig. 3 by the lowest diagonal line of the sloping part 10, is that the two halves of the sloping part 10 (in relation to the inverted position) are at a slight angle to one another extending downwards towards the bung hole, i.e. they form an total internal angle of approximately 175° at the bung hole socket (central line through the bung hole 14 and the central point 28 of the barrel).

Fig. 6 shows a further blow-moulded plastic barrel with a different bung hole socket 44. In the case of this bung hole socket 44, the screwed-in bung hole cover (not shown) seals the barrel by means of a corresponding seal against the upper edge or flange edge of the bung hole socket, in

contrast to the barrel in fig. 1, in which the bung hole cover forms a seal in the lower, somewhat recessed bung hole socket 16. Hence in this embodiment a recess 46 can be formed on the side of the inner or lower bung hole socket 44 facing the barrel casing 22, through which recess the accumulating residual liquid can run out of the barrel in its residual emptying position, or angled inverted position. By means of this additional measure of providing a recess 46 in the lower bung hole nozzle edge, as is also partially illustrated in fig. 6a, it is sufficient for the sloping part 40 of the circular portion at the upper end to have a slight inclination angle 42 or a flatter inclination of between 4° and 10° , preferably approximately 6° , and to open at its lowest point into the obliquely conically recessed edge region of the upper end 12 of the barrel, at approximately half the height of the long vertical web of the carrying and transport ring 30, a recess 46 or a passage 50 being provided in the bung hole socket 44 (48) on the side facing the barrel casing 22, for the discharge of residual liquid.

Fig. 7 shows an embodiment of a barrel cover, with a cylindrical bung hole socket 48, produced by injection moulding. The upper end of the barrel is formed in the same manner as that of the barrel shown in fig. 6, except that the bung hole nozzle 48 is more deeply recessed into the bung hole housing 18 or projects slightly into the interior of the barrel, as this bung hole socket is also sealed at the upper edge by the screwed-on bung hole cover (not shown). In order that the last of the accumulating residual fluid can again run out unimpeded, the bung hole socket 48 has a corresponding passage 50 on its side facing the barrel casing 22. The passage 50 in the bung hole socket is again shown, for further clarification, in fig. 7a in cross-section and in fig. 7b in side view.

This form of the upper end of the barrel, which is produced by injection moulding and is bonded on to a barrel casing and barrel base which has been blow-moulded, for example, can also be achieved in an entirely single-part plastic barrel, in that only the bung hole socket is pre-manufactured as a separate injection-moulded part and is welded into a corresponding position on the bung hole housing floor.

In the embodiments in figs. 6 and 7, in which the bung stopper is produced with an upper seal, the short drainage channel 32 (see fig. 5)

from the edge of the barrel into the bung hole could drain into the bung housing at a higher point, a complete and independent residual emptying still being achieved.

The additional drawings provide a better illustration of the form of the upper end of the barrel of the invention.

Fig. 8 is a further embodiment of an upper end (cover) of a barrel in accordance with the invention;

Fig. 9 is another embodiment according to the invention, in partial perspective view; and

Fig. 10 is a final embodiment of the invention, in overall perspective view.

In the plan view of the upper end of the barrel with a bung, as shown in fig. 8, the inclination edge extends between the barrel upper end and the sloping part in a manner which is not entirely straight; instead the two halves of the sloping part extend at a slight angle to one another at the inclination edge. The two surface halves of the sloping part can also be angled slightly towards one another, with a slope at the bung hole in the inverted position, in order to promote discharge of the residual liquid.

It is notable in this connection that the smaller of the two bungs is a discharge bung and is arranged within the sloping part.

In this or in another embodiment, given a combination of several of the features of the invention, a conventional standard cover can also be produced, and be secured by means of a clamping ring on the upper opening of an open top drum.

In the partial perspective view of fig. 9, the inclination edge of the sloping part is curved into a sickle or arched shape, the two surface halves of the sloping part not being planar; instead they can both also be formed so as to curve outwards.

Finally, fig. 10 shows a perspective overall view of a version of a barrel of the invention, which is particularly suitable for a manufacturing process according to a tandem blow-moulding technique.

Two barrel bodies with bases are simultaneously blow-moulded in one blowing mould, and are then cut apart at the middle, and an upper end with an external handling ring, pre-manufactured by injection moulding, is welded on to each of the barrel bodies.

All combinations of the features shown fall within the context of the invention. Thus the inclination edge 24 between the sloping part 10 and the remainder of the upper end 12 of the barrel can also be shaped as an arc of a circle with a large radius, or can be curved into a sickle shape, provided there is an enlargement or reduction of the sloping part 10 in the external edge regions. The measures of the invention are equally suitable for a single-piece blow-moulded barrel with a bung, having a squeezed-on barrel-gripping ring, or for a barrel which has been welded or stuck together from pre-manufactured individual parts (a barrel upper end with a gripping ring, a barrel base and a cylindrical casing). The barrel can equally be formed as a barrel with a cover (wide-mouth packing drum) with a plastic or sheet steel cover which can be clamped on, the cover in this case having the features of the invention.

In the case of plastic barrels which are stacked for long periods, it can occur that the upper end of the barrel stacked at the bottom can sink slightly inwards to the interior of the barrel as a result of the stacking load. With traditional plastic barrels with an upper end which is cambered outwards, the possibility of residual emptying is thus adversely affected, whilst this phenomenon in the plastic barrel of the invention does not reduce the possibility of emptying residual contents, but instead is beneficial thereto.

List of reference symbols

10	Sloping part
12	Upper end of barrel
14	Bung hole
16	Bung hole socket
18	Bung hole housing
20	Floor of bung hole housing
22	Barrel casing
24	Inclination edge
26	Distance 24/28
28	Central point of barrel
30	Gripping ring
32	Channel in 20
34	Projection from 20
36	Inclination angle 10
38	Inclination angle 18
40	Sloping part
42	Tilting angle (approx. 6°)
44	Bung hole socket
46	Open recess
48	Bung hole socket
50	Passage/recess



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Translation

Claims:

1. A barrel, having a bung, and made of thermoplastic material, with a carrying and transport ring (30) arranged surrounding the barrel wall (22) in the vicinity of the upper end (12), and with at least one bung hole socket (16) arranged in the edge region of the upper end (12), the socket being sunk in a bunghole socket housing (18) in such a manner that the end surface of the bunghole socket (16) is flush with the external surface of the upper end (12), or lies slightly therebelow, **characterised in that** the upper end (12), additionally to or apart from the bunghole socket housing (18), has a planar part, shaped substantially as a portion of a circle, or has a sloping part (10) which is symmetrically formed on both sides of the bunghole socket (16) and, when seen in the standard position of the barrel, is recessed so as to extend, slightly sloping, at an angle inwards into the body of the barrel, the lowest point of the sloping part (10) being on the side of the barrel casing (22) in the vicinity of the bunghole socket (16) and opening there into the lower-lying plane of the floor of the bunghole socket housing (20), or into the bunghole socket (16).
2. A barrel in accordance with claim 1, **characterised in that** the sloping part (10) forms a slight inclination edge (24) with the remainder of the upper end (12) of the barrel, the average distance (26) of the edge from the central point (28) of the barrel being substantially the same as, or less than, a quarter of the barrel diameter.
3. A barrel in accordance with claim 2, **characterised in that** the sinking of the bunghole housing (18) begins at the inclination edge (24) on the side facing the middle of the barrel, but has a larger inclination angle (38) in relation to the upper end (12) than the sloping part (10) of the circular portion at the upper end in the region of the bunghole socket (16).



4. A barrel in accordance with claim 1, 2 or 3, **characterised in that** the sinking/angling of the bunghole housing (18) on the side facing the centre of the barrel is between 30° and 45° , and preferably approximately 40° , and the sloping part (10) of the circular portion at the upper end has an inclination angle (36) of between 10° and 17° , preferably approximately 13° , and at its lowest point borders the barrel casing (22) on the interior, at the height of the base region of the carrying and transport ring (30) or the region of connection thereof with the barrel casing (22).
5. A barrel in accordance with claim 1, 2 or 3, **characterised in that** for barrels with a bunghole socket (44, 48) with an upper seal, the sloping part (40) of the circular portion at the upper end has a slight inclination angle (42) or a flatter inclination of between 4° and 10° , preferably approximately 6° , and at its lowest point opens into the obliquely conically recessed edge region of the upper end (12) of the barrel at approximately half the height of the long vertical web of the carrying and transport ring (30), a recess (46) or a passage (50) being provided in the bunghole socket (44, 48) on the side facing the barrel casing (22), for the discharge of residual liquid.
6. A barrel in accordance with claim 2, 3, 4 or 5, **characterised in that** the inclination edge (24) between the level upper end (12) of the barrel and the sloping part (10, 40) is slightly curved in a sickle-shape, or is formed so as to extend at a slight angle to the bung socket for outflow (16).
7. A barrel in accordance with one of the preceding claims 1 to 6, **characterised in that** the two halves of the sloping part (10, 40) seen in an inverted position, are at a slight angle to one another, extending downwards towards the bunghole socket (16), i.e. they form an internal angle between themselves of approximately 175° .