DANMARK

Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: B65D41/47 (2006.01)

(45) Oversættelsen bekendtgjort den: 2014-03-17

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: 2013-12-18

(86) Europæisk ansøgning nr.: 08762420.1

(86) Europæisk indleveringsdag: 2008-06-19

(87) Den europæiske ansøgnings publiceringsdag: 2010-03-10

(86) International ansøgning nr.: GB2008002103

(87) Internationalt publikationsnr.: WO2008155552

(30) Prioritet: 2007-06-19 GB 0711838

(84) Designerede stater: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(73) Patenthaver: Portola Packaging Limited, 3 Carriage Drive, White Rose Way, Doncaster, South Yorkshire DN4 5NT, Storbritannien

(72) Opfinder: MAVIN, Gerry, 26 Home Farm Close, Ashington Northumberland NE63 8QX, Storbritannien

(72) STEPHENSON, Timothy, 3 Spitfire Way, Auckley, Doncaster South Yorkshire DN9 3PL, Storbritannien


(54) Benævnelse: Lukkesystem og dets fremgangsmåde til at danne

(56) Fremdragne publikationer:

   EP-A- 0 698 559
   US-A- 3 731 849
Description

[0001] The present invention relates to a closure system comprising a neck and a cap engageable with the neck. The closure system includes tamper evident means comprising a locking member attached to the neck such that, having applied the cap to the neck, the cap is prevented from being removed from the neck prior to breaking of the tamper evident means.

[0002] Paperboard cartons have long been known to benefit from the addition of a plastics pouring device or spout commonly referred to as a "fitment". Such devices commonly comprise a neck and many are initially closed by an integrally moulded disc within the neck structure. The disc is joined to the neck by means of a frangible tear-line and is provided with a grip mechanism in the form of a pull-ring or pull-tab. A user, on initial opening of the paperboard carton, grasps the grip mechanism and tears the moulded disc away from the neck structure along the frangible tear-line. These devices are generally additionally provided with a cap which surrounds the outside features of the neck and provides the facility to re-close the carton once it has been opened.

[0003] Such devices thus provide reasonable tamper evidence as well as sealing properties appropriate to aseptic or extended life applications. The disadvantage that such devices have is their well known potential for splashing the packaged product as a result of the sudden release of the disc on opening.

[0004] In another variation of the fitment system no disc is provided within the neck structure and, instead, the interaction between the cap and neck is designed to provide both a primary seal and the tamper evident capability. Whilst this variation overcomes the problem associated with the frequent splashing of the packaged product on opening, it has provided poor compatibility with standard long life (aseptic) cleaning systems. This is because, in order to provide a satisfactory primary seal, it has been thought necessary for the surfaces of the cap to engage closely with the surfaces of the neck with the result that it has then been difficult to flush the surfaces of the assembled fitment with an aseptic cleaning solution. If a fitment cannot be processed in this way, then it cannot be used to contain products intended to have an extended shelf life and the usefulness of the fitment is therefore limited.

[0005] Furthermore, depending on the nature of the tamper evidence, if the tamper evident feature is intended to be retained on either the cap or the neck (as opposed to simply being discarded), there is a risk that the tamper evident feature may become detached during normal use. This is regarded as a major issue since if the tamper evident feature were to fall into the receptacle into which the packaged contents were being dispensed and this went unnoticed by the user there then exists the possibility of the tamper evident feature contaminating the dispensed product or, worse still, the user swallowing the tamper evident feature if, as is often the case, the product is intended for human consumption. Because of this risk the tamper evident features of fitments of this type have become increasingly complex and costly to manufacture.

[0006] In contrast to this trend the present invention provides a closure system of reduced complexity and which is cheaper to manufacture in which a locking member is attached to the neck, the locking member being orientated in a first position with respect to the neck to facilitate moulding of the neck and orientated in a second position with respect to the neck to prevent removal of at least a portion of the cap from the neck. Furthermore, the locking member is moved from the first position to the second position upon application of the cap to the neck. Document EP 0 698 559 discloses a closure system in which corresponding locking elements are attached to the closure.

[0007] Whilst it is recognised that the use, on a cap, of a radially inwardly projecting locking bead to engage below a radially outwardly projecting abutment surface provided on a neck is well known to prevent the lifting up of the cap, such an arrangement requires the creation of an undercut on the neck in order to produce the abutment surface. This is both complex and expensive to produce. In particular, such a neck, it if is to be moulded, requires a mould tool having parts that open in at least two transverse directions.

[0008] Similarly, although it is known to provide tamper evident means which include folded features, these are typically provided on the cap and form an inverting band which folds upwardly and inwardly from a lower edge of the cap skirt. By contrast, in the closure system of the present invention the locking member is attached to the neck at a point part way up the neck wall and, in use, is inverted downwards, away from the dispensing orifice. This arrangement also serves to limit the potential for levering up the underside of the cap in order to defeat the tamper evident feature.

[0009] According to a first aspect of the present invention there is provided a closure system comprising a cap, a neck and tamper evident means, the system allowing the application of the cap to the neck whereupon the tamper evident means prevents the cap from being removed from the neck while the tamper evident means remains intact.

[0010] Advantageously the neck is provided with flexible locking members, the members being adapted to engage with the tamper evident means on the cap and thus to resist subsequent removal of an annular band after application of the cap to the neck.

[0011] Advantageously the locking members are moulded in a flexible format able to adapt to release on removal from a standard and mostly conventional single axis mould movement providing great opportunity for economical manufacturing benefit to such a system over conventional systems.

[0012] Advantageously the locking member will be adapted to fold downwards post moulding as a result of application of a suitable downward force of the cap or
external force.

[0013] Advantageously, upon application of the cap to the neck, the locking wall members hinge with respect to the closure annular band, this providing downward and inward folding movement which forms adaptable engagement with the annular band on the closure.

[0014] Advantageously the flexible locking members may be formed as a plurality of flexible tabs. The plurality of flexible tabs may be circumferentially spaced with each tab being separated from an adjacent tab on either side by a pair of slits.

[0015] Advantageously these tabs are shaped with a radial form which once inverted downwards and inwardly will form against a truncated wall of the cylindrically shaped neck to enhance the structural strength and maintain maximum contact with the annular contact band provided to the closure.

[0016] Advantageously the locking member extends from the neck in a direction which is inclined vertically outwardly at an angle of between 0° and 15° to the vertical axis of the closure system thus providing an adaptable fit to accommodate variations in size of the two components and enhancing the tamper evident security and ability to retain the tear band feature after opening.

[0017] Advantageously the locking member may comprise a plurality of circumferentially spaced locking elements, the locking elements having a first circumferential dimension adjacent the annular band and a second circumferential dimension adjacent the neck, the first circumferential dimension being greater than the second circumferential dimension. Preferably, the locking elements are separated by a plurality of apertures, the apertures being arranged in groups on circumferentially opposite sides of the locking member.

[0018] Alternatively, the locking member may comprise one or more pleats or folds. In another arrangement the locking member may comprise a plurality of circumferentially spaced locking elements separated by areas of weakness or reduced thickness.

[0019] Advantageously the cap may be provided with engagement means for repeated and releasable engagement with complimentary engagement means provided on the neck. Preferably the pair of complimentary engagement means may comprise a pair of helical thread configurations. Under such circumstances, the configuration provided on the neck is preferably a male thread configuration.

[0020] Advantageously the pair of thread configurations is adapted so as to permit the application of the cap to the neck by means of an axially applied force whereupon the threads on the cap slide over those provided on the neck and then interengage. Preferably the threads on the cap are orientated with respect to those on the neck in such a way that upon axial application of the cap to the neck the respective thread configurations are placed in optimal thread engagement.

[0021] Advantageously the cap may be provided with an annular plug for receipt within a bore of the neck.

[0022] Advantageously the closure system comprises a fitment for attachment to a carton or other container.

[0023] Alternatively, the closure system containing the locking members may be integrally moulded with a container, the neck forming a neck of the container.

[0024] Advantageously there is provided an inwardly formed diameter connected to the inside walls of the neck creating an opening able to interact with a suitable formed seal diameter projecting from the underside of the closure to form a gaseous and liquid tight seal.

[0025] Advantageously this inward formed diameter will maintain the point of seal at a distance of between 0.1mm and 5mm clear of the side wall to allow access of cleaning solutions and light able to cleanse the accessible area for the purpose of hygienic and aseptic type packing.

[0026] Advantageously said inward formed diameter will provide strength to the structure to permit further light weighting of the design facilitated primarily by the novel flexible locking members.

[0027] Advantageously said inward formed diameter shall be formed with a slightly downward angle of face to allow ease of application of closure seal and return of product after dispensing.

[0028] There is provided a closure system comprising a cap, a neck and tamper evident means moulded in a flexible structure, the structure allowing the application of the cap to the neck whereupon the tamper evident means prevents the cap from being removed from the neck while the tamper evident means remains intact.

[0029] Advantageously a locking member is joined to the neck at a flexible connection and contacting cap at the extent of member whereupon the member co-operates with the neck and the cap to form said tamper evident means.

[0030] Advantageously said tamper security comprises an annular band adapted to pass over the neck upon application of the cap to the neck and a locking member engaged to the annular band, the locking member being adapted to co-operate with the neck to resist the subsequent removal of the annular band from the neck.

[0031] Advantageously the closure system is installed with a series of fragile bridges between the section of annular ring and threaded portion to provide means of tamper evidence.

[0032] Advantageously the closure system is installed with silt bridges post assembly of the cap to the neck structure.

[0033] Advantageously the locking member is hinged and preferentially, though not essentially, radially formed to allow the neck form to lock fully over to within close proximity of the neck form to more effectively support the closure system allowing for post assembly sitting of bridge form.

[0034] Advantageously the flexible locking member(s) is joined to the neck by a web or point of weakness this forming a hinge permitting the locking member to invert to a downward and slightly outward location thus provid-
ing the necessary surface to cooperate with the annular ring of the closure and create effective tamper proof engagement.

[0035] Advantageously the neck is provided with a locking wall, the annular ring of closure being adapted to engage with the locking wall to resist subsequent removal of the annular band upon application of the cap to the neck.

[0036] Advantageously the act of applying the cap to the neck causes the locking member to fold inwardly of the annular band.

[0037] Advantageously upon application of the cap to the neck the locking member hinges with respect to the annular band, folding inwardly and into engagement with a locking wall provided on the closure.

[0038] Advantageously the annular band is joined to the cap at a frangible connection, said frangible connection being adapted to break upon the attempted removal of the cap from the neck.

[0039] Advantageously the locking member is formed to a radius able to co-operate with the neck form on final inverting.

[0040] Advantageously locking connections are formed as a plurality of frangible tabs connected to the neck form.

[0041] Advantageously said plurality of flexible locking tabs are circumferentially spaced with each tab being separated from an adjacent tab on either side by a pair of slits, openings or folding pleats.

[0042] Advantageously the flexible locking member extends from the neck to a point able to cooperate with the annular band of closure on inverting of said flexible locking member.

[0043] Advantageously the flexible locking member extends from the neck in a direction which is inclined vertically outwardly at an angle of between 0° and 15° to the axis of the closure system thus providing an adaptable fit to accommodate variations in size between the two components and enhancing the tamper evident security and ability to retain the tear band feature after opening.

[0044] Advantageously the flexible locking elements are separated by a plurality of apertures.

[0045] Advantageously the flexible locking member comprises one or more pleats or folds.

[0046] Advantageously the cap is provided with engagement means for repeated and releasable engagement with complimentary engagement means provided on the neck.

[0047] Advantageously the pair of complimentary engagement means comprise between 1 and 10 helical thread configurations.

[0048] Advantageously the thread configuration provided on the neck is a male thread configuration.

[0049] Advantageously the thread configuration provided on the neck is a female thread configuration.

[0050] Advantageously the thread configurations are adapted so as to permit the application of the cap to the neck by means of a rotationally and axially applied force whereupon the threads on the cap slide over those provided on the neck to create engagement.

[0051] Advantageously the cap is provided with an annular plug for receipt within a bore of the neck.

[0052] Advantageously the frangible bridges connecting the annular ring portion and threaded portion are formed preferentially, though not essentially, by sitting or other method after assembly of closure to neck form.

[0053] Advantageously the closure system comprises a fitment for attachment to a carton or other container.

[0054] According to a further aspect of the present invention there is provided a closure in combination with a neck which when assembled provides access of between 0.5mm and 5mm towards point closure and neck cooperate to provide a seal thus allowing for more effective sanitizing.

[0055] According to a further aspect of the present invention there is provided a neck form providing an inwardly projected surface creating a point of seal 0.5mm-5mm clear of the neck side wall.

[0056] Advantageously the inwardly projected surface is preferentially, though not essentially, angled downwards towards the opening of the neck to permit product return flow and enhance seal and application by creation of mechanical advantages.

[0057] According to a further aspect of the present invention there is provided a method of closing a container in a tamper evident manner comprising the steps of moulding a flexible locking member to the neck of the container by which means form a structure which by applying the cap to the neck prevents the cap from being removed from the neck while the tamper evident ring attached to the closure remains intact.

[0058] Advantageously the tamper evidence mechanism of the closure may be created by siting of the bridge formation after the closure is assembled to the neck thus permitting for weaker bridge form and resultant enhancement to the tamper evidence.

[0059] The present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a closure system embodying the present invention;
Figure 2 is an elevational view of the closure system of Figure 1;
Figure 3 is a cross sectional view of a neck portion of the closure system;
Figure 4 is a detailed cross sectional view of the neck portion of the present invention showing a flexible locking member;
Figure 5 is an elevational view of the neck portion of the closure system;
Figure 6 is a cross sectional view of a cap portion of the closure system;
Figures 7(a), (b) and (c) are cross-sectional views of the closure system showing the movement and
resultant position of the flexible locking member when the cap portion is applied to the neck portion; Figure 8 is a cross sectional view of the closure system once the cap portion has been fully applied; Figure 9 is a cross sectional view of the closure system after the cap portion has been removed and with a tamper evident band retained on the neck portion.

[0060] As shown in Figures 1 and 2, a closure system embodying the present invention may take the form of a fitment 10. The fitment 10 comprises a neck portion 12 and a cap portion 14.

[0061] The neck portion 12 is shown in more detail in Figures 3 to 5 and comprises an apertured flange 16 having substantially smooth and planar upper and lower surfaces 18 and 20, respectively.

[0062] Surrounding the aperture, a cylindrical wall 22 projects upwardly from the upper flange surface 18 to form a smooth lower neck portion. At an end remote from the apertured flange 16, the cylindrical wall 22 merges with an upwardly and radially inwardly projecting wall 24. This upwardly and radially inwardly projecting wall 24 in turn merges with a second cylindrical wall 26 which has both a reduced internal diameter and a reduced external diameter compared to the first cylindrical wall 22. However, the first cylindrical wall 22 is of reduced wall thickness compared to both the upwardly and radially inwardly projecting wall 24 and the second cylindrical wall 26 as well as the apertured flange 16.

[0063] At an end remote from the upwardly and radially inwardly projecting wall 24, the second cylindrical wall 26 merges with a downwardly and radially inwardly directed annular rim 28 which terminates at a cylindrical surface 30 defining a dispensing aperture or bore 32.

[0064] The second cylindrical wall 26, which defines an upper neck portion, is provided on an external surface with engagement means 34 with which to engage complimentary engagement means provided on the cap portion 14. In the example shown, the engagement means 34 take the form of a male, equi-spaced, multi-lead helical thread configuration which includes three threads or leads 36. It will be apparent however, that the engagement means 34 may take a number of different forms and, in particular, need not be limited to three threads or leads but may comprise one or two threads as appropriate. The engagement means 34 may also comprise four, five or more threads if so desired.

[0065] In the illustrated embodiment, each thread 36 extends about 120° around the circumference of the second cylindrical wall 26. Once again however, it will be understood that threads of a lesser or greater extent may also be employed. For example, each thread 36 may extend within a range from 90° to more than 360°. Preferably the helical thread configuration has a fine thread density to limit the vertical float of the cap portion 14 with respect to the neck portion 12. Thus, the thread density preferably lies within a range of between 6 and 12 threads per linear inch. Most preferably of all, the helical thread configuration has a thread density of approximately 8 threads per linear inch.

[0066] By contrast, on an external surface of the first cylindrical wall 22, at or near where it merges with the upwardly and radially inwardly projecting wall 24, the neck portion 12 is provided with a plurality of upwardly and radially outwardly directed locking members 40. The locking members 40 are mutually spaced and arranged circumferentially around the neck portion 12. Each locking member 40 is joined to the first cylindrical wall 22 and/or the upwardly and radially inwardly projecting wall 24 by a thin web 42 which, with the locking member 40, defines, in cross-section, an upwardly and radially outwardly directed lower surface 44 which terminates in an end surface 46. The end surface 46, remote from the first cylindrical wall 22 and the upwardly and radially inwardly projecting wall 24, extends substantially at right angles to the lower surface 44 before joining, again at right angles, with a downwardly and radially inwardly directed upper surface 48. This upper surface 48 in turn merges with a substantially downwardly directed necking surface 50 before merging with an upper surface 52 of the web 42.

[0067] As can be seen more clearly in Figure 5, the locking members 40 are curved such that the lower surface 44 has substantially the same radius of curvature and centre of curvature as the first cylindrical wall 22. Being of substantially constant wall thickness, other than in the region of the web 42 and necking surface 50, the upper surface 48 is similarly curved.

[0068] Although the locking members 40 are shown as being mutually spaced and arranged circumferentially around the neck portion 12, it will be understood that one or more (or, indeed, all) of the locking members 40 may be joined by pleats or folds extending between their respective side surfaces. These pleats or folds may be of reduced wall thickness compared to the locking members 40 to enhance their flexibility or else may be of substantially the same wall thickness and scored or necked along intended fold lines.

[0069] On an internal surface, adjacent the transition between the apertured flange 16 and the first cylindrical wall 22, the neck portion 12 is provided with a radially inwardly projecting bead 38, the purpose of which will be described in more detail below.

[0070] Turning to the cap portion 14 shown in Figure 6, the cap portion comprises a circular top 60 having an undersurface 62. The circular top 60 merges at a radially outer edge with a downwardly and radially outwardly inclined surface 64 which, in turn, merges with a depending annular side wall 66 to form a downwardly extending skirt portion.

[0071] The depending annular side wall 66 is provided, on an inner surface 68, with complimentary engagement means 70 for repeated and releasable engagement with the engagement means 34 provided on the neck portion 12. As before, this engagement means 70 may take many forms but, in the example shown, comprise a male, equi-spaced, multi-lead helical thread configuration having
three threads or leads 72 and a thread density of approximately 8 threads per linear inch. Once again, however, it will be appreciated that the complimentary engagement means 70 need not be limited to three threads or leads but may comprise one or two threads as appropriate. The complimentary engagement means 70 may also comprise four or five or more threads if so desired.

[0072] In the embodiment shown, each thread 72 extends approximately 120° around the inner surface 68 of the depending annular side wall 66. However, it is to be understood that this thread length may be increased or decreased if desired. For example, each thread 72 may extend in a range from 90° to more than 360°. Likewise, the thread density is not intended to be limited to being about 8 threads per linear inch but, nevertheless, preferably lies within the range from about 6 to about 12 threads per linear inch.

[0073] As will be apparent to those skilled in the art, if one of the engagement means 34 or 70 comprises a male helical thread configuration, then the other of the two engagement means may comprise a helical groove configuration. In the case of two male helical thread configurations, it will be apparent that one or both of the thread configurations may be interrupted at intervals along its length.

[0074] The two thread configurations may be shaped so as to slip past one another when a direct, axial downward force is applied to the cap portion 14 to urge the cap portion into engagement with the neck portion 12. In other words, when the cap portion 14 is pushed onto the neck portion 12, the threads 72 on the cap portion 14 snap over the threads 36 on the neck portion 12 before interengaging with them. This may be made possible by appropriate shaping of the threads 36 and 72, for example, by forming the threads with an asymmetric cross-section or by making them less pronounced. Alternatively, if it is desired to rotate the cap portion 14 onto the neck portion 12, the threads 36 and 72 may be of symmetrical, as opposed to asymmetrical, cross-section and may be more pronounced.

[0075] In addition to the complimentary engagement means 70, the interior of the cap portion 14 is provided with an annular plug 74 which depends from the underside 62 of the circular top 60 and is spaced radially inwardly of the depending annular side wall 66. The annular plug 74 is defined by a respective radially inner and outer walls 76 and 78. The radially outer plug wall 78 merges at an end remote from the circular top 60 with a generally downward and radially inwardly directed surface 80. This generally downward and radially inwardly directed surface 80 intersects the radially inner plug wall 76 and, together, serves to provide the annular plug 74 with a beveled radially outer surface and a tapering cross-section. The tapering cross-section is further accentuated by the fact that, whereas the radially outer plug wall 78 extends in a direction substantially perpendicular to the plane of the underside 62, the radially inner plug wall 76 extends from the underside 62 in a direction which is both downward and radially outward.

[0076] By contrast, on an exterior of the cap portion 14, the depending annular side wall 66 is provided on its outer surface with a plurality of circumferentially spaced, vertically extending ribs 82 which serve as knurls to facilitate the gripping of the cap portion 14 by a user. The vertically extending ribs 82 also facilitate the assembly of the cap portion 14 to the neck portion 12 during the mechanical process for the assembly of the fitment 10. As is common with a number of caps, a small downwardly directed dimple 84 is formed in the centre of the circular top 60 so that any flash left after the cap portion 14 has been moulded does not project above a plane defined by the upper surface of the circular top 60.

[0077] In addition to the foregoing features, the inner surface 68 of the depending annular side wall 66 is provided with a radially inwardly projecting bead 86 at an end remote from the circular top 60. The radially inwardly projecting bead 86 is, in turn, defined by a radially inwardly and downwardly directed surface 88 which merges with the inner surface 68 and, with it, forms an internal shoulder 90. At an end remote from the inner surface 68, the radially inwardly and downwardly directed surface 88 merges with a downwardly and radially outwardly directed surface 92 before this last surface, in turn, merges with an end surface 94 of the depending annular side wall 66, the end surface 94 extending generally at right angles to the inner surface 68.

[0078] Between the radially inwardly projecting bead 86 and the engagement means 70, the depending annular side wall 66 is provided with a plurality of circumferential slits or spaces 96. These slits or spaces 96 are mutually spaced by frangible bridging elements 98 and together serve to define a circumferential line of weakness which divides the downwardly extending skirt portion defined by the depending annular side wall 66 into an upper skirt section and a lower skirt section in which the lower skirt section is capable of functioning as a retained tamper evident band 100. As will be apparent to those skilled in the art, the circumferential slits or spaces 96 may be formed as a secondary slitting operation and may be created mechanically after the cap portion 14 has been moulded. Alternatively, the slitting operation may be performed after the cap portion 14 has been assembled onto the neck portion 12. In another arrangement the circumferential slits or spaces 96 may be formed during the process of moulding the cap portion 14. Although moulding the circumferential slits or spaces 96 provides the advantage that no secondary operations are then required to the cap portion 14 other than assembly to the neck portion 12, one disadvantage is that the strength of the bridging elements 98 can not be easily adjusted without major retooling. Another disadvantage is that without correct maintenance there is a risk that flashing may occur within the circumferential slits or spaces 96 which may, in turn, adversely affect the tamper evident properties of the fitment 10. Both these disadvantages are addressed by a secondary slitting opera-
In addition the cap portion 14 can then be moulded using a single axis mould tool. Such mould tools, in which the mould components open and close along only a single axis, are generally less complex, less costly and may run faster and more efficiently than their multi-axis counterparts. Furthermore, the strength or dimensions of the bridging elements 98 can be easily adjusted by replacing a single blade in the slitting machine. The disadvantage, of course, is that a second machine is required to do the slitting and these can be costly when required to run at high volumes.

[0079] In order to assemble the fitment 10, the cap portion 14 is offered up to the neck portion 12 in the orientation illustrated schematically in Figures 7(a), (b) and (c). The cap portion 14 may be applied to the neck portion 12 by means of a push-on application, whereby the threads 72 on the cap portion 14 snap over those provided on the neck portion 12, or else by means of a rotary application in which the cap portion 14 is threaded onto the neck portion 12 and the two thread configurations interengage in the conventional manner. In any event, prior to the interengagement of the threads 36 and 72, the radially inwardly projecting bead 86 provided on the inner surface 68 of the depending annular side wall 66 passes over the engagement means 34 provided on the neck portion 12. This is, in part, facilitated by the riding of the engagement means 34 up the downwardly and radially outwardly directed surface 92 of the radially inwardly projecting bead 86 as the cap portion 14 is applied to the neck portion 12.

[0080] Having reached the position shown in Figure 7(a) continued movement of the cap portion 14 in the direction of the neck portion 12 causes the end surface 94 of the depending annular side wall 66 to come into engagement with the locking members 40. As shown in Figure 7(b), this engagement occurs at a location radially outwardly of the web 42 and causes the locking members 40 to fold or rotate downwardly about the connection between the web 42 and the first cylindrical side wall 22. This movement continues until such time as the lower surface 44 of the locking member 40 is pressed against the smooth first cylindrical wall 22. It will be remembered that these two surfaces share a substantially common radius and centre of curvature to enable the locking members 40 to hug the first cylindrical wall 22 in a close confronting relationship notwithstanding the fact that the wall is cylindrical in nature.

[0081] As the locking members 40 hinge downwardly, the radially inwardly projecting bead 86 slides down the upper surface 48 until such time as the components reach the position shown in Figure 7(c). In this position the radially inwardly projecting bead 86 has passed beyond the end surface 46 of the locking member 40 and occupies a position between the locking member 40 and the apertured flange 16. Furthermore, the locking member 40 is received within the shoulder 90 defined by the radially inwardly and downwardly directed surface 88 of the radially inwardly projecting bead 86 and the inner surface 68 of the depending annular side wall 66. At the same time, the natural resilience of the material used to form the locking members 40 tends to urge the locking members 40 to rotate in such a way as to return to their as-moulded, starting position shown in Figure 7(a). Although this movement is prevented by the presence of the cap portion 14, nonetheless this bias causes the upper surface 48 of the locking members 40 in the region close to the end surface 46 to engage even more compellingly with the inner surface 68 of the depending annular side wall 66. This, of course, in turn means that the end surface 46 of the locking members 40 is brought evermore reliably into confronting relationship with the radially inwardly projecting bead 86.

[0082] As the cap portion 14 is applied to the neck portion 12, the annular plug 74 is also received within the bore 32 defined by the cylindrical surface 30 at the radially inner end of the downwardly and radially inwardly directed annular rim 28. In so doing, the generally downward and radially inwardly directed surface 80 slides along the cylindrical surface 30 causing the annular plug 74 to flex slightly radially inwardly. This same movement also causes the downwardly and radially inwardly directed annular rim 28 to flex slightly downwardly. Once fully received within the bore 32, the restoring force inherent in the resilient nature of the design and materials making up the annular rim 28 and the annular plug 74 causes the radially outer plug wall 78 to be urged into sealing engagement with the cylindrical surface 30. Thus, in the assembled condition, the interaction between the annular plug 74 and the cylindrical surface 30 constitutes a primary seal.

[0083] With the closure system in the assembled condition, the fitment 10 may be applied to a cardboard or other carton in the conventional manner. In this regard it will be noted that the opening to the neck portion 12 defined by the radially inwardly projecting bead 38 facilitates the insertion of a spud of a manipulation tool. Since the apertured flange 16 has substantially smooth and planar upper and lower surfaces 18 and 20, the fitment 10 may be bonded either to the outside or to the inside of a carton panel as desired. However, in another arrangement, the neck portion 12 may be provided with one or more additional projections which co-operate with the apertured flange 16 to retain the fitment 10 in a specific orientation with respect to the carton panel to which the fitment is to be attached.

[0084] Once the fitment 10 has been applied to a carton, the fitment provides that carton with a closure that can be repeatedly opened and closed as desired and which offers excellent sealing and re-sealing characteristics. In addition, the fitment 10 also provides a tamper evident capability to alert a consumer should the contents of the carton have been compromised prior to initial opening. This tamper evident capability is provided in the form of a retained tamper evident band 100 which must first be separated from the cap portion 14 before the cap portion can be removed from the neck portion 12. If a consumer finds that the tamper evident band 100 has been
separated from the cap portion 14 before the fitment 10 has first been opened by them then it is possible that the contents of the carton may have been tampered with or may have become adversely affected in some other way. The tamper evident capability of the fitment 10 functions as follows.

[0085] In the assembled condition the cap portion 14 is prevented from being removed from the neck portion 12 in an axial direction by the interengagement of the engagement means 34 and 70 and by the engagement of the end surfaces 46 of the locking members 40 with the radially inwardly projecting bead 86. Furthermore, the close proximity of the end surface 94 of the depending annular side wall 66 with the upper flange surface 18 precludes the insertion of a tool between the two surfaces to prise the cap portion 14 off the neck portion 12. In order to remove the cap portion therefore, a user is required to rotate the cap portion 14 with respect to the neck portion 12. This causes the threads 72 of the engagement means 70 to rise up the threads 36 of the engagement means 34 and bring the radially inwardly and downwardly directed surface 88 of the radially inwardly projecting bead 86 more firmly into engagement with the end surfaces 46 of the locking members 40. Continued upward movement of the cap portion 14 with respect to the neck portion 12 is resisted by the locking members 40 with the result that the upward force exerted by a user in unscrewing the cap portion is applied to the circumferentially spaced bridging elements 98 which serve to connect the upper skirt section of the depending annular side wall 66 to the retained tamper evident band 100. The relative size of the webs 42 compared to the bridging elements 98 ensures that the bridging elements 98 will fracture as a user continues to unscrew the cap portion 14 long before any damage is sustained by the locking members 40.

[0086] As shown in Figure 9, once the bridging elements 98 have been broken, the cap portion 14 may be removed and the contents dispensed from the carton. The cap portion 14 may be reapplied and subsequently removed from the neck portion 12 as often as it is desired. Even though the bridging elements 98 have been fractured, it will be noted that the fact that the locking members 40 remain folded and trapped between the first cylindrical wall 22 and the inner surface 68 ensures that the tamper evident band 100 is retained on the neck portion 12 and cannot be removed without causing physical damage to the fitment 10 and/or the associated packaging.

[0087] In the example shown, the tamper evident band 100 remains in essentially the same position with respect to the neck portion 12 both before and after initial opening. However, it will be appreciated that in order to provide the tamper evident band 100 with a drop down capability which may more easily alert a consumer to potential tampering, all that is required is to elongate the portion of the cylindrical wall 22 between the apertured flange 16 and the end surfaces 46 of the locking members 40 when in their downwardly folded configuration.

[0088] The design of the neck portion 12 illustrated in Figures 3 to 5 provides considerable manufacturing advantages and cost savings. Although it would be possible to mould a plastics fitment in which the neck portion had the same configuration as that illustrated in Figure 7(c) but in which the locking members were formed as radial protrusions from the first cylindrical wall (rather than as hinged elements that fold down into this position), such a fitment would be considerably more expensive to produce. In particular, in such an arrangement the end surfaces of the locking members would represent an undercut which could only sensibly be formed using a mould tool having components that opened and closed along two transverse axes. By contrast, the neck portion 12 illustrated in Figures 3 to 5 can be formed using a mould tool having components that open and close along only a single axis. This represents a significant saving in tooling costs and a simplification of the manufacturing process.

[0089] Although the necking surface 50 is shown in Figure 4 as being substantially downwardly directed, in fact the surface may extend from the upper surface 48 to the upper surface of the web 42 at an angle of between 0.5° and 10° to a longitudinal axis of the neck portion indicated by reference numeral 54 while still enabling the mould tool responsible for producing the neck portion 12 to open and close in a direction parallel to the longitudinal axis 54 and without requiring mould tool components to open and close in a direction transverse to that axis.

[0090] Another advantage of using locking members 40 which, in their initial position, are directed upwards and radially outwardly from the cylindrical wall 22 but which may be folded or hinged so as to engage or otherwise hug the cylindrical wall is that it allows the first cylindrical wall 22 to be formed with a reduced wall thickness compared to other parts of the neck portion 12. This has a direct saving on the amount of plastics material necessary to mould the fitment 10 and translates into an important reduction in the cost of manufacture. Although it might be thought that reducing the wall thickness of the first cylindrical wall 22 might compromise the operation of the fitment 10, the fact that, in the assembled condition, the locking members 40 are pressed up against the first cylindrical wall 22 means that, in use, the effective thickness of the lower neck portion at the point where it engages with the radially inwardly projecting bead 86 is comparable to other regions of the neck portion 12 and more than capable of fulfilling its function.

[0091] Another advantage of using locking members 40 that can flex from an initial, as-moulded, position to an operable, in-use, position is that they may serve to eliminate any vertical float of the cap portion 14 with respect to the neck portion 12. This is because the cap portion 14 may be fully retained by the interengagement between the end surfaces 46 of the locking members 40 and the radially inwardly projecting bead 86. The natural resilience of the locking members 40 which tends to urge them to return to their as-moulded position and so causes
the upper surface 48 adjacent the end surface 46 to be 
urged into evermore pressing engagement with the inner 
surface 68 of the depending annular sidewall 66 also 
helps to prevent the cap portion 14 from becoming loose 
during transit between the point of manufacture and the 
point of final application of the fitment 10 to a carton. 
[0092] Another advantage of the described closure as-
sembly is that the primary seal between the annular plug 
74 and the cylindrical surface 30 is located a small but 
non-zero distance 102 from the inner surface of the sec-
ond cylindrical wall 26. Typically, this distance 102 may 
be between 0.1mm and 5mm. In a preferred embodiment 
this distance 102 is between 1.8mm and 2.1mm. This 
spacings between the position of the primary seal and the 
inner surface of the second cylindrical wall 26 has the 
advantage of allowing the ingress of cleaning solutions 
of the type used during rinsing processes. This config-
uration also has the advantage of allowing light to pe-
trate to all surfaces of the neck portion 12 for the purpose 
of hygiene treatment and so allows the fitment 10 to be 
used in aseptic packaging applications. 
[0093] In addition, the natural hoop strength of the 
downwardly and radially inwardly directed annular rim 28 
serves to strengthen the neck structure and prevents the 
second cylindrical wall 26 from collapsing radially in-
wards. This added strength may be utilised to permit fur-
ther decreases in wall thickness thereby enabling further 
savings in manufacturing costs in terms of the quantity 
of plastics material needed to mould the closure system. 
[0094] The fact that the annular rim 28 is directed 
downwardly and radially inwardly provides the advan-
tage that any product left on the rim after dispensing will 
tend to drain back through the dispensing orifice defined 
by the bore 32 rather than draining down the outside of 
the neck portion 12 and onto the treads 36. 
[0095] Although the present invention has been de-
scribed in relation to a fitment for attachment to a carton, 
it will be appreciated by those skilled in the art that the 
invention is not so limited and that the closure assembly 
may be formed integrally with a container if so desired.
Krav

1. Lukkesystem omfattende en hals (12):
en hætte (10) som kan gå i indgreb med halsen (12), og et låseelement (40) fastgjort til halsen (12), låseelementet (40) er orienteret i en første position i forhold til halsen (12) for at gøre det lettere at støbe halsen (12) og låseelementet (40), og orienteret i en anden position i forhold til halsen (12) for at forhindre fjernelse af mindst en del af hætten (10) fra halsen (12), låseelementet (40) bevægtes fra nævnte første position til nævnte anden position ved påføring af hætten (10) på halsen (12).

2. Lukkesystem ifølge krav 1, hvori halsen (12) og låseelementet (40) er støbt som ét stykke.

3. Lukkesystem ifølge krav 1 eller krav 2, hvori låseelementet (40) svinger omkring et fastgørelsespunkt (42) til halsen (12) ved bevægelse fra nævnte første position til nævnte anden position.

4. Lukkesystem ifølge ethvert af de foregående krav, hvori låseelementet (40) er forbundet med halsen (12) ved hjælp af en fleksibel forbindelse (42).

5. Lukkesystem ifølge ethvert af de foregående krav, hvori halsen (12) definerer en langsgående akse (54) og låseelementet (40, hælder i forhold til nævnte akse (54) ), når det er i første position, og låseelementet (40) er orienteret hovedsagelig parallelmet med nævnte akse (54), når det er i anden position.

6. Lukkesystem ifølge ethvert af de foregående krav, hvori halsen (12) definerer en langsgående akse (54), og låseelementet (40) omfatter en låseeoverflade (46) fjernet fra placeringen, hvor låseelementet (40) er fastgjort til halsen (12), låseeoverfladen (46) ligger i et plan hovedsagelig retvinklet på nævnte langsgående akse (54), når låseelementet (40) er i nævnte anden position.
7. Lukkesystem ifølge ethvert af de foregående krav, hvori halsen (12) omfatter en væg (22), som låseelementet (40) er fastgjort til, låseelementet (40) strækker sig på tværs af væggen (22), når i nævnte første position, og strækker sig hovedsagelig parallelt med væggen (22), når i nævnte anden position.

8. Lukkesystem ifølge ethvert af de foregående krav, hvori hætten (10) omfatter en indadrettet projektion indrettet til at indgribe med låseelementet (40), når låseelementet (40) er i nævnte anden position.

9. Lukkesystem ifølge krav 8, hvor halsen (12) er cylindrisk og den indadrettede projektion (86) omfatter en ringformet eller delvis ringformet låsevulst (86).

10. Lukkesystem ifølge krav 8 eller krav 9, hvor hætten (10) omfatter en skørtsektion og et til skørtsektionen forbundet bånd (100) til vise manipulation, båndet er brudbart forbundet til skørtsektionen, den indadrettede projektion (86) er tilvejebragt på båndet (100) til at vise manipulation.

11. Lukkesystem ifølge krav 10, hvor låseelementet (40) i nævnte anden position fastholder båndet (100) til at vise manipulation i forhold til halsen (12), således at et forsøg på at fjerne hætten (10) fra halsen (12) resulterer i en brydning af den brudbare forbindelse (98) mellem skørtsektionen og båndet (100) til at vise manipulation.

12. Lukkesystem ifølge ethvert af de foregående krav, hvori halsen (12) er forsynet med indgrebsmidler (34) til gentagen og løsbart indgreb med komplementære indgrebsmidler (70) tilvejebragt på hætten (10).

13. Lukkesystem ifølge ethvert af de foregående krav, hvori låseelementet (40) omfatter et stort antal af indbyrdes adskille låseelementer (40) arrangeret om halsens (12) perimeter, hvert låseelement (40) er fastgjort til halsen (12) og er bevægelig mellem henholdsvis en første position, hvor låseelementet (40) er orienteret i forhold til halsen (12) for at gøre det lettere at støbe halsen (12) og låseelementet (40), og henholdsvis en anden position, hvor låseelementet (40) er orienteret i forhold til halsen (12) for at forhindre fjernelse af mindst en del af hætten (10) fra halsen (12).
14. Lukkesystem ifølge krav 13, hvori det store antal låseselementer (40) er forbundne ved hjælp af en materialeribbe (42).

15. Lukkesystem ifølge krav 14, hvori materialeribben (42) har en reduceret tykkelse sammenlignet med låseselementerne (40).

16. Lukkesystem ifølge krav 14 eller krav 15, hvori materialeribben (42) omfatter en eller flere folder.

17. Lukkesystem ifølge ethvert af de foregående krav, hvori halsen (12) omfatter en cylindrisk væg (22) og definerer en cirkulære udboring (32) i indadrettet radial afstand fra den cylindriske væg (22), den cirkulære udboring (32) indgriber forseglende med en ringformet prop (74) tilvejebragt på hætten (10) ved påføring af hætten (10) på halsen (12).

18. Lukkesystem ifølge ethvert af de foregående krav, hvori lukkesystemet omfatter et tilbehør til fastgørelse til en kartonbeholder eller anden beholder.

19. Lukkesystem ifølge ethvert af kravene 1 til 18, hvori lukkesystemet er støbt ud i et med en beholder, halsen (12) danner beholderens hals (12).

20. Fremgangsmåde til at danne halsen (12) på et lukkesystem ifølge ethvert af de foregående krav omfattende trinene at tilvejebringe et stort antal støbedele, der er i stand til at arbejde sammen for at definere en formkavitet egnet til formningen af halsen (12); at lukke formdelene til nævnte formkavitet ved at bevæge nævnte formdele langs, eller parallelt med, en enkelt akse; at introducere plastikmateriale ind i nævnte formkavitet; at adskille nævnte formdele ved at bevæge nævnte formdele langs eller parallelt med nævnte samme enkelte akse (54); og udstøde den formede hals (12).