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(54) **TRANSPORT CONTAINER HAVING A CLAMPING DISC**

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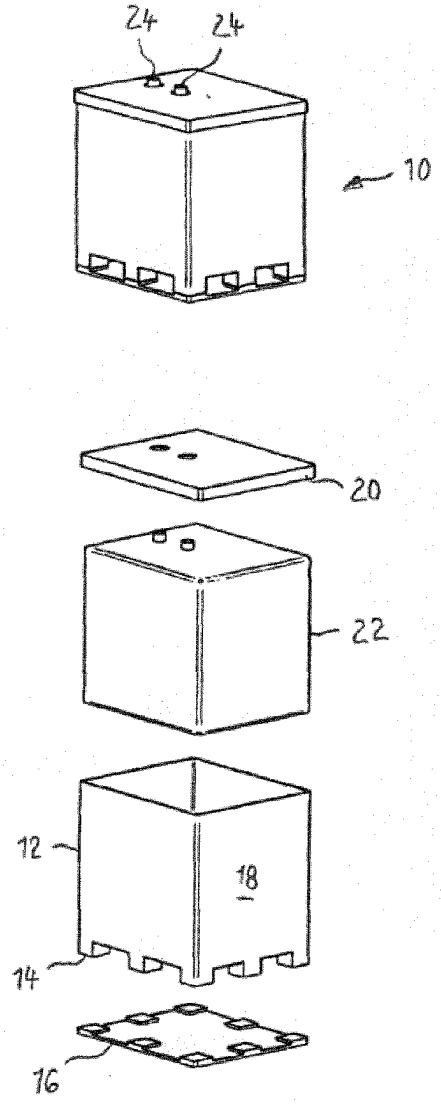
(57) **ABSTRACT**

A container for the transport and storage of liquids comprises at least one upwardly open socket at the top of an inner container. A clamping disk has an internal thread that can be screwed onto an external thread of the socket, thereby clamping a container top at the edge of its opening. A screw lock interacts with the external thread of the socket and the internal thread of the clamping disk and prevents unintentional loosening of the clamping disk and the socket.



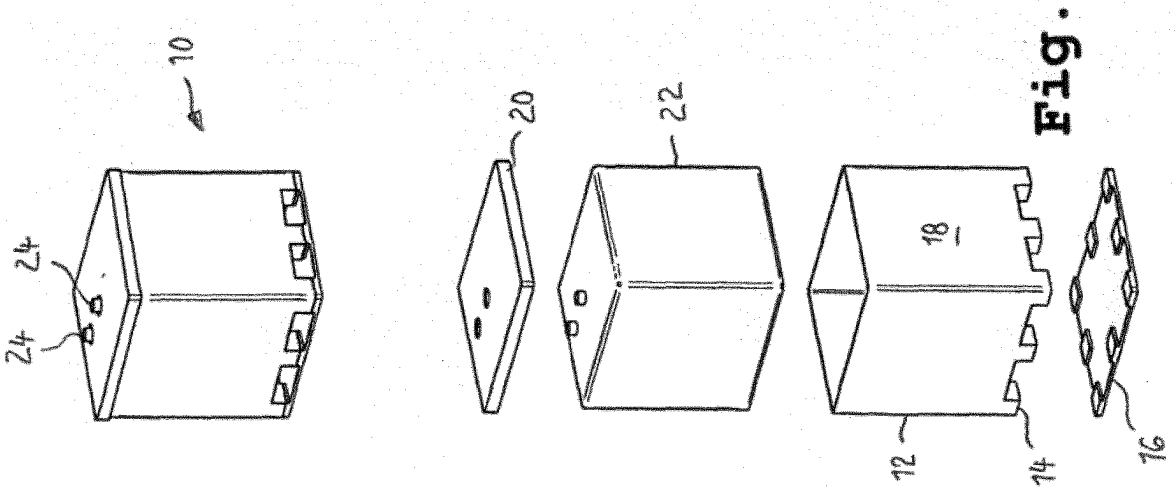


Fig. 1

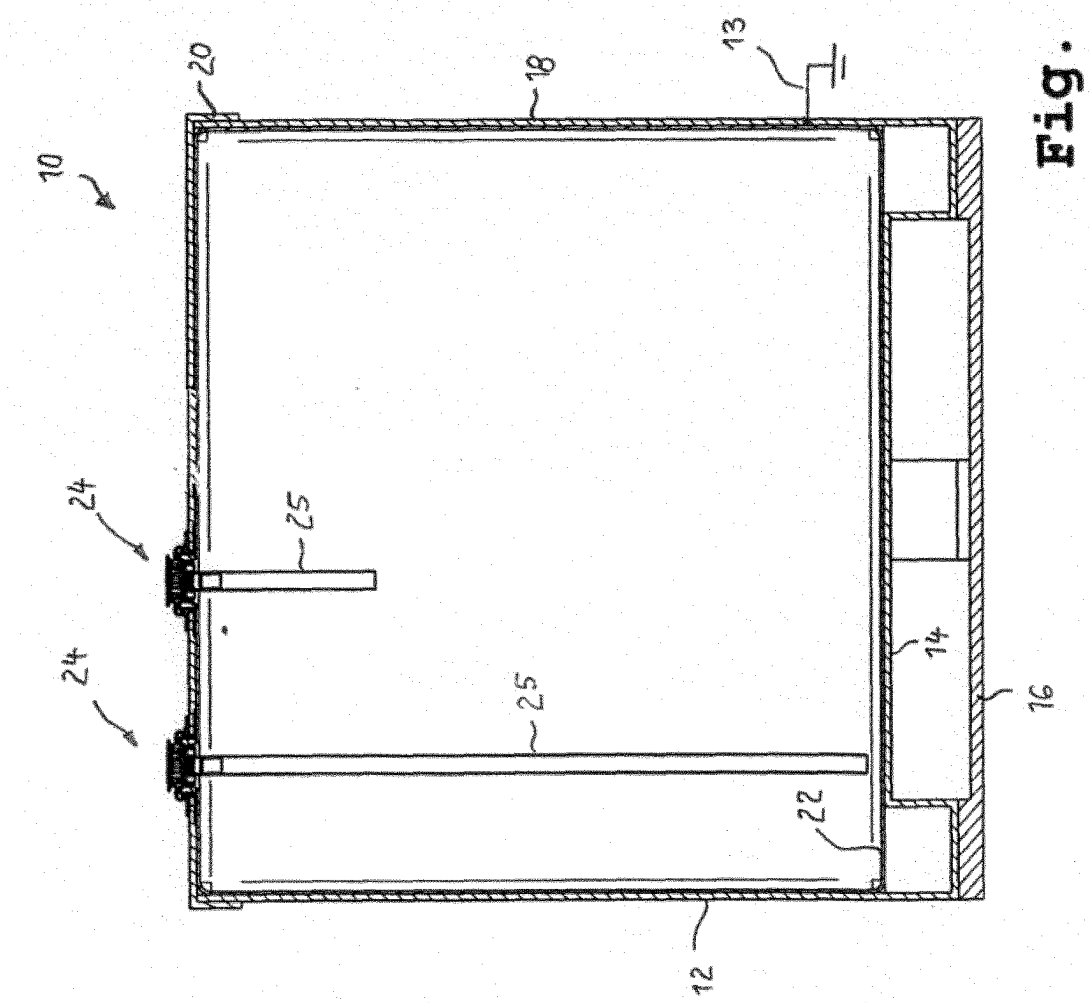


Fig. 2

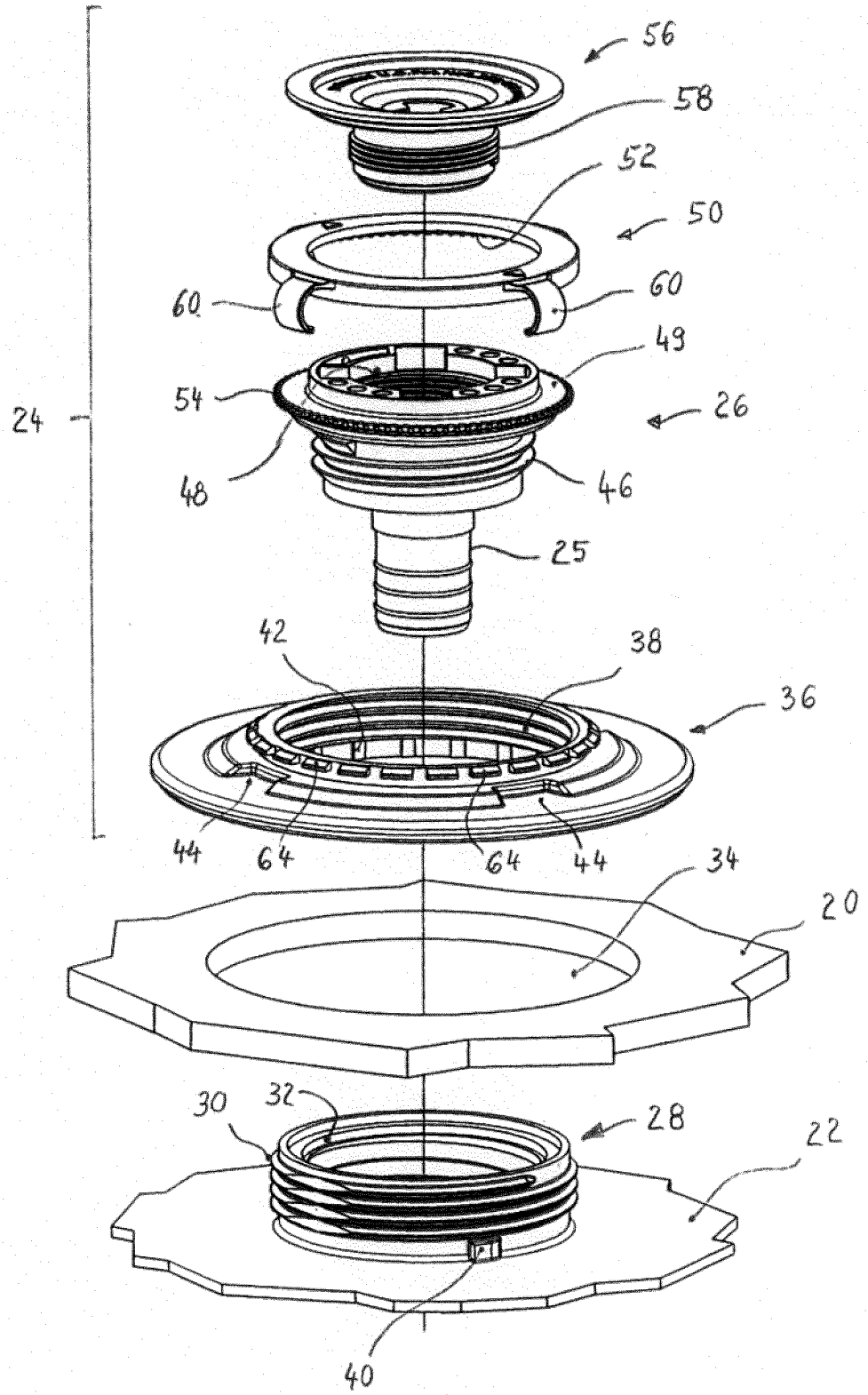

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Fig. 3

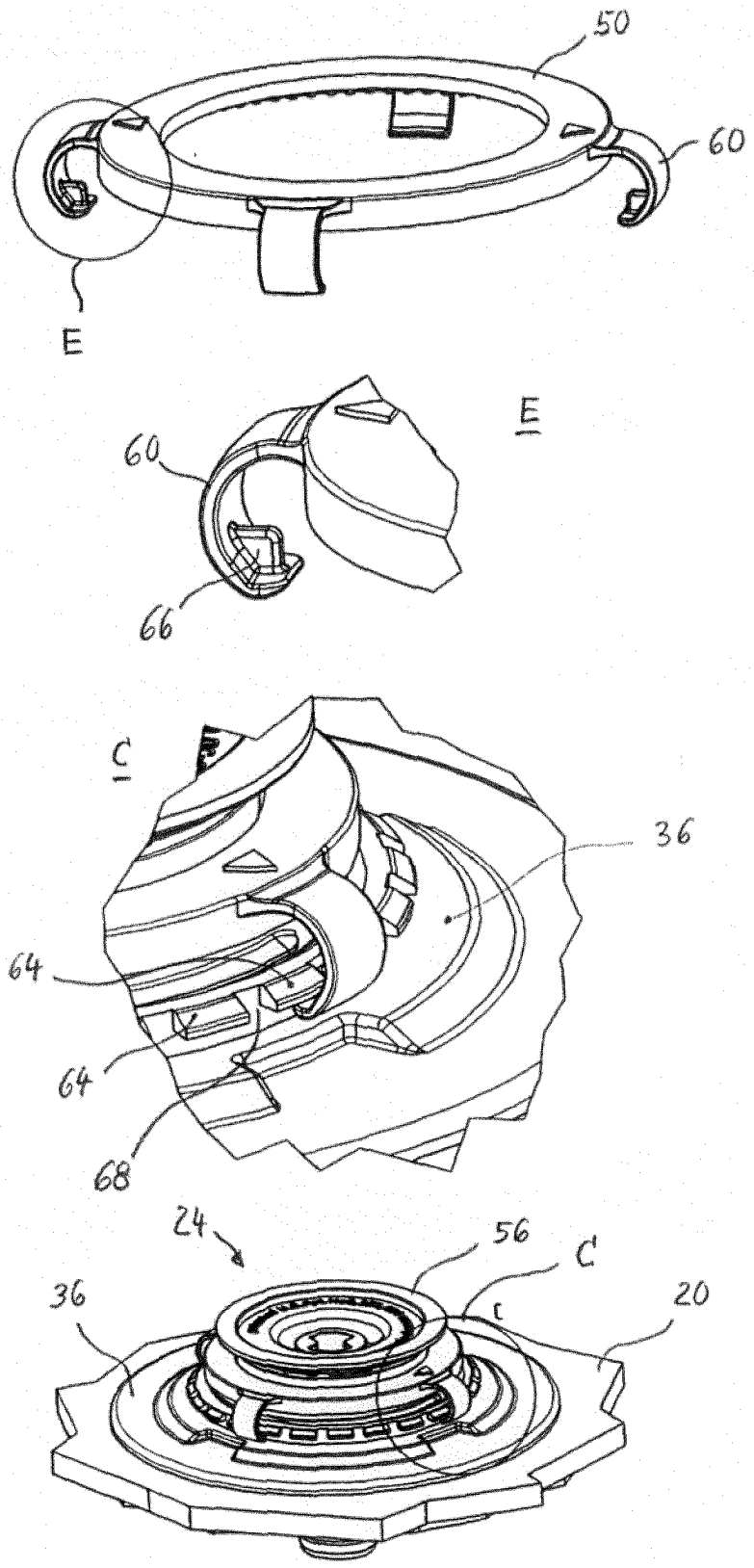

Fig. 4

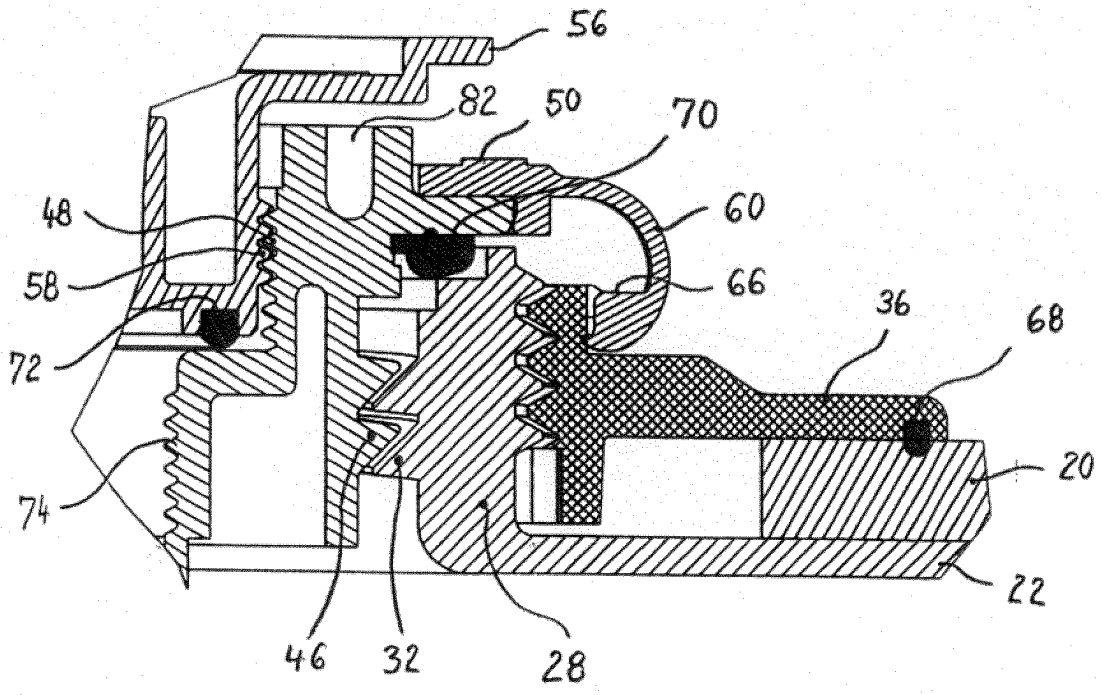

Fig. 5

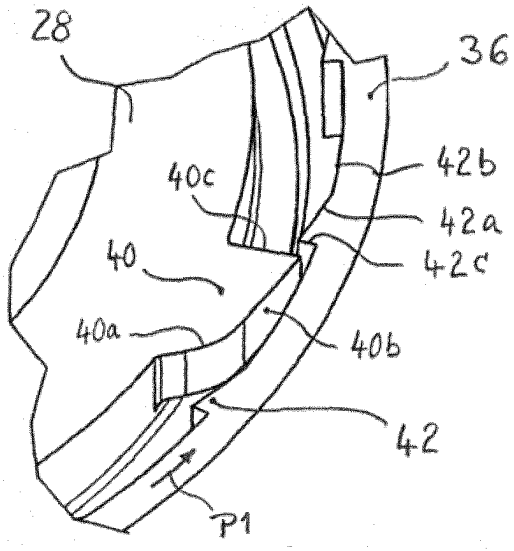

Fig. 6

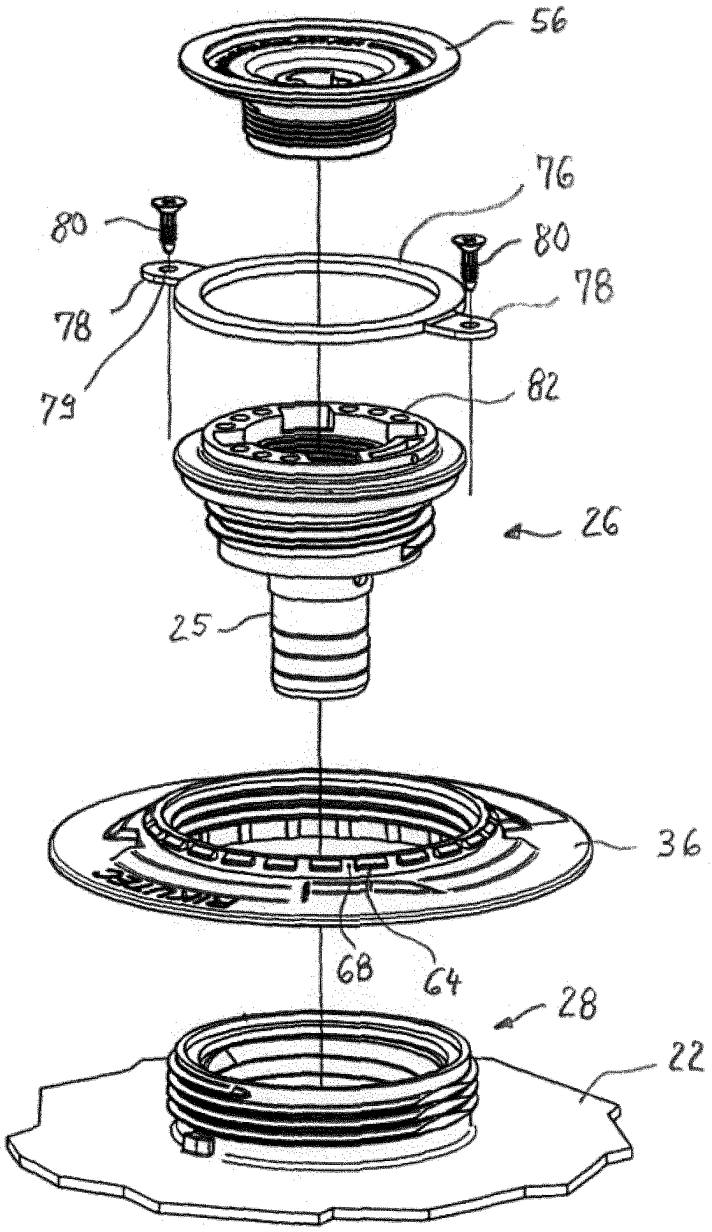

Fig. 7

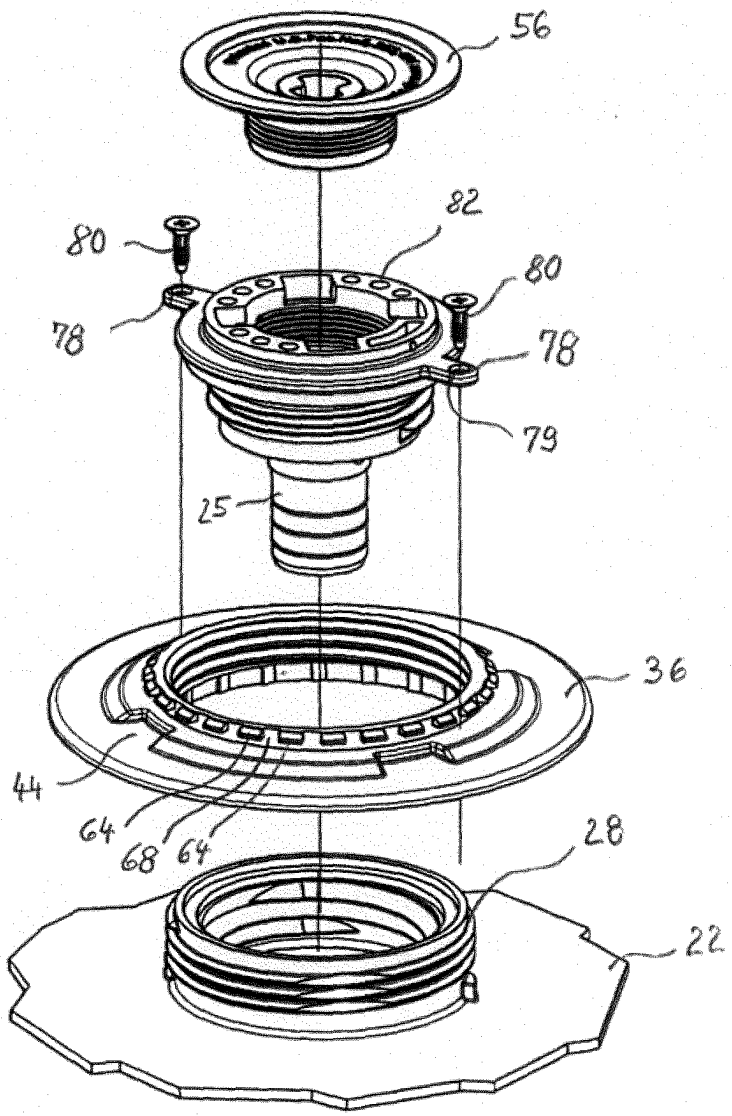

Fig. 8

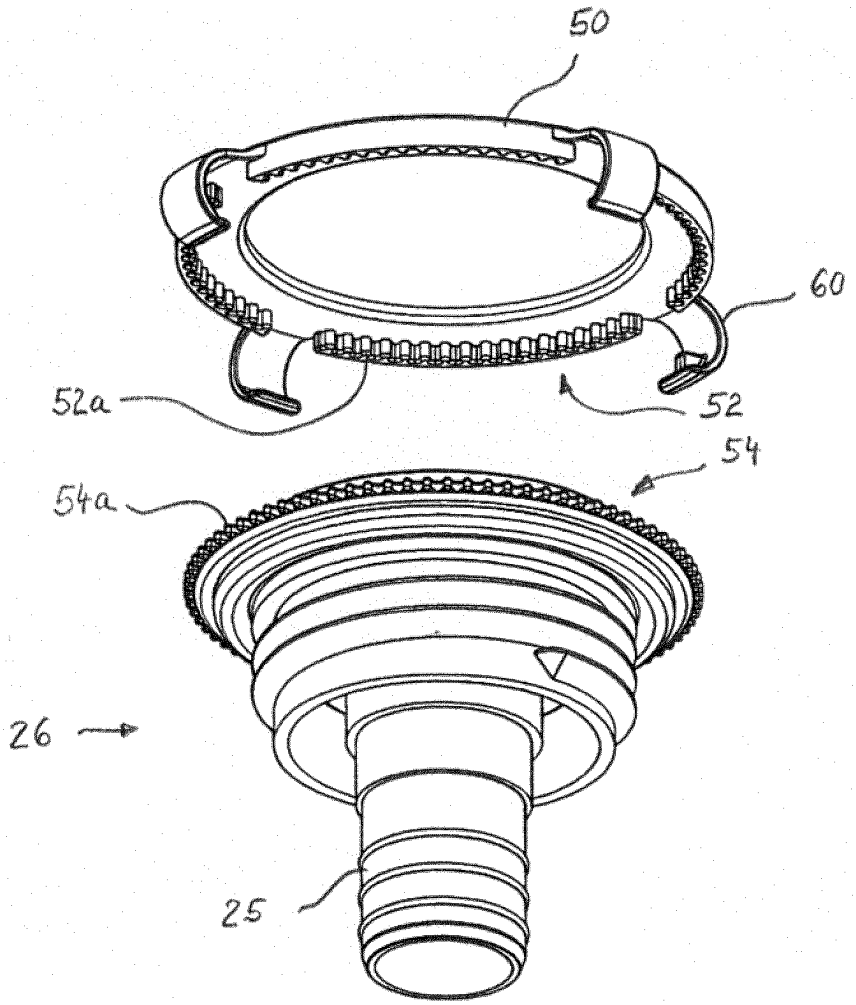

Fig. 9

TRANSPORT CONTAINER HAVING A CLAMPING DISC

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a National Phase of International Application No. PCT/EP2023/056312, filed Mar. 13, 2023, which claims the benefit of German Application 20 2022 101 418.3, filed Mar. 17, 2022, both of which are incorporated herein in their entireties.

TECHNICAL FIELD

[0002] The invention relates to a container for the transport and the storage of liquids, with an inner container made of plastic for holding liquid and with an outer container made of plastic with a rigid lower bottom, a rigid shell and a rigid container top.

[0003] Such containers are known as IBCs (Intermediate Bulk Containers) and include a pallet so that they can be easily moved by forklift trucks. The liquid can be filled into and again removed from the inner container via a socket on the inner container and a dip tube. Such containers are often used for flammable, highly toxic, high purity and highly acidic liquids, for example for the semiconductor industry.

BACKGROUND

[0004] From DE 195 35 707 A1 a disposable and reusable container is known, which has an inner container on the upper side of which a filler neck is integrally formed, the end section of which projects outwards from the container top of the outer container. The filler neck is held in an opening in the rigid container top by means of a slotted clamping ring, the opening edge of the container top resting against the upper side of the inner container. The filler neck is closed with a screw cap.

[0005] During use of the container, changes in shape can occur on the inner container. For example, increased filling temperatures and the subsequent cooling phase can cause a vacuum in the inner container, which results in deformation of the inner container. The varying filling level of the inner container can also cause deformation. Such deformation also alters to a certain extent the exact position of the socket opening, which can be critical during filling and emptying because operators often wear protective clothing and protective gloves due to the hazardous contents, making fine motor handling difficult. The precise location of the socket relative to the container top is another problem. As a result of vibration during transport, the connection between the socket and the container top can loosen, causing the socket to move loosely and wobble in the opening, making it difficult to fill and remove liquid.

[0006] A German utility model application having the file number 20 2022 101 418.3 exists for the present patent application. The German Patent and Trademark Office has conducted a prior art search on this utility model application. The search report mentions two documents DE 10 2009 016 451 B3 and U.S. Pat. No. 4,164,304 A, which are assigned to category A (documents defining the technological background).

BRIEF DESCRIPTION

[0007] It is the object of the invention to specify a container for the transport and the storage of liquids, which is simple in construction and improves handling when filling and emptying the inner container.

[0008] This object is solved by the combination of features of claim **1**. Advantageous embodiments are specified in the dependent claims.

[0009] In the invention, the socket, which is formed integrally with the inner container, has an external thread and an internal thread. A clamping disk with an internal thread can be screwed to the external thread of the socket, thereby clamping the container top at the edge of its opening. In this way, the socket is fixed to the rigid container top and cannot change its position relative to the outer container, even if deformation occurs on the inner container as a result of pressure differences or a variable filling level. Handling during filling and emptying is thus facilitated and the risk of spilling problematic liquids is avoided. Furthermore, the invention comprises a screw lock which interacts with the external thread of the socket and the internal thread of the clamping disk and is suitable for preventing unintentional loosening of the clamping disk and the socket. This measure also increases the safety of the container, because loosening or disconnection of the screw connection due to vibration during transport or when unscrewing the sealing plug is prevented.

[0010] According to an embodiment of the invention, at least the rigid container top consists of electrically conductive plastic. The conductivity is generated, for example, in such a way that electrically conductive carbon black particles or aluminum particles are admixed to the plastic. The electrical conductivity is adjusted in such a way as to dissipate electrical charges which may be generated as a result of frictional electricity during filling and emptying of the inner container. The screwed connection of the container top to the inner container advantageously has a triple function, namely on the one hand the precise stationary fixing of the tube receptacle relative to the outer container, on the other hand protection against unintentional loosening of the container top from the socket and furthermore the avoidance of hazards due to electrical discharges.

[0011] Another embodiment provides that an electrically insulating sealing ring is arranged between the tube receptacle and the socket, and that the tube receptacle, which is made of electrically conductive plastic, comprises an electrically conductive contact element that is electrically conductively connected to the clamping disk. Such a sealing ring, for example made of TPE (thermoplastic elastomer), provides a liquid-tight seal between the inner container and the outside world. With the aid of the electrically conductive contact element, the electrically insulating seal is bridged so that continuous electrical conductivity is ensured between the tube receptacle, the clamping disk and the container top, further reducing the risk of spontaneous electrical discharge.

[0012] A further advantageous embodiment is characterized in that an anti-rotation lock is provided which interacts with the contact element, the tube receptacle and the clamping disk and is suitable for preventing relative rotation of the tube receptacle and the clamping disk. With the aid of this anti-rotation lock, the tube receptacle is fixed to the clamping disk. This clamping disk, in turn, is secured against unintentional loosening by the screw lock mentioned further above. This means that even if a sealing plug is firmly seated in the tube receptacle, for example because it is screwed in very tightly or the threaded connection has become rigid due to deformation, the tube receptacle is not moved when this

sealing plug is unscrewed, thus improving the safety of the entire container. For example, this prevents liquid from sloshing out. The interaction of the screw lock and the anti-rotation lock thus ensures that even if the sealing plug is relatively tight, the tube receptacle and the clamping disk do not come loose from the screwed connection, resulting in increased safety for the entire container.

[0013] According to a preferred embodiment, the inner container with the integral socket is made of HDPE in a blow molding process or a plastic rotational molding process.

[0014] Embodiments of the invention are explained below with reference to the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. **1** shows a transport container for the transport and the storage of liquids in a perspective exploded view.

[0016] FIG. **2** shows a schematic cross-section through the container.

[0017] FIG. **3** shows an exploded view showing parts of the device for filling and/or emptying the inner container, as well as a section of the container top and the socket of the inner container.

[0018] FIG. **4** shows the contact ring with contact arms in various partial views.

[0019] FIG. **5** shows a partial cross-section in the assembled state of the device for filling and/or emptying the inner container.

[0020] FIG. **6** shows a schematic detailed view of detent cams and locking cams.

[0021] FIG. **7** shows another embodiment with contact lugs on the contact ring.

[0022] FIG. **8** shows another example with contact lugs on the tube receptacle, and

[0023] FIG. **9** shows the detent toothing on the contact ring and the tube receptacle.

DETAILED DESCRIPTION

[0024] FIG. **1** shows in a perspective exploded view parts of a transport container **10** according to the invention for the transport and the storage of liquids. In FIG. **2**, a cross-section through the transport container **10** is shown. This transport container **10** comprises an outer container **12** made of electrically conductive plastic, preferably PE, having a rigid lower bottom **14** resting on a pallet **16** that has the dimensions of a Euro pallet. The outer container **12** further comprises a rigid shell **18** and a rigid container top **20** or lid. Housed within the outer container **12** is an inner container **22** made of plastic, preferably high purity HDPE, for holding liquid. At least one device **24** for filling and/or emptying the inner container **22** is connected to the rigid container top **20** and the inner container **22**. A dip tube **25** forming part of this device **24** extends into the interior of the inner container **22**. The inner container **22** is filled and emptied via this dip tube **25**. An electrical ground connection **13** is provided for discharging electrical charges from the outer container **12**.

[0025] FIG. **3** shows in an exploded view further details of said device **24** and its attachment to the container top **20** and the inner container **22**. An upwardly open socket **28** is integrally formed on the inner container **22**. Said socket **28** has an external thread **30** and an internal thread **32**. The inner container **22** is formed by a blow molding or rotational molding process in which the socket **28** is formed with its threads **30**, **32** and at least one detent element **40**. The rigid container top **20** includes an opening **34** surrounding the socket **28** with clearance.

[0026] The device **24** includes a clamping disk **36** having an internal thread **38**, which is adapted to be threadedly engaged with the external thread **30** of the socket **28** during assembly, thereby clamping the container top **20** at the edge of its opening **34**.

[0027] At least one first detent element **40** is formed at the bottom of the external thread **30**. On the side of the clamping disk **36** facing the socket **28**, at least one second detent element **42** is formed in the lower region of the internal thread **38**. A screw lock is formed with the aid of these two detent elements **40**, **42**, wherein the detent elements **40**, **42** latch with one another when screwing in clockwise direction, given a clockwise threading, of the clamping disk **36** with the socket **28**. During this latching operation, a positive fit is formed which prevents the clamping disk **36** from detaching from the socket **28** after the screw connection is established. The clamping disk **36** includes peripheral recesses **44**, in which a tool (not shown) can engage in order to be able to perform the screwing with sufficient torque. Preferably, the first detent element is formed as a protruding detent cam **40** on the lower circumference of the external thread **30** of the socket **28** and the second detent element on the clamping disk **36** is formed as a locking cam **42** on the lower circumference of the internal thread **38**. The formation of the detent cam **40** on the core cylinder of the external thread **30** has the advantage that a reliable latching takes place even in the event of thickness variations of the container top **20**. However, it is also possible to form the first detent element **40** on the end face of the inner container **22**, which then faces a second detent element **42** formed on the end face of the clamping disk **36**.

[0028] A tube receptacle **26** has an external thread **46** in its upper region, which can be screwed to the internal thread **32** of the socket **28**. The tube receptacle **26** supports the dip tube **25**, which is shown greatly shortened. A contact ring **50**, which is made of electrically conductive plastic, rests on an end face **49** of the tube receptacle **26**. On its underside facing the tube receptacle **26**, the contact ring **50** has first detent means **52**, for example a detent toothing. These detent means **52** cooperate with second detent means **54** present on the end face **49**, for example also a detent toothing. A sealing plug **56** having an external thread **58** is used for liquid-tight sealing of the inner container **22**. The external thread **58** is screwed into the internal thread **48** of the tube receptacle **26**. With this screw connection, a stationary locking of the contact ring **50** is effected by the first detent means **52** and the second detent means **54**, so that the rotational position of the contact ring **50** and the tube receptacle **26** is clearly fixed. The pitch of the detent means **52**, **54** defines the angular resolution for the rotational position of the contact ring **50**. For example, the angular resolution is increased by a small tooth pitch of the detent toothing.

[0029] In the example shown in FIG. **3**, the contact ring **50** has contact arms **60** bent radially outward and downward along its circumference, which include third detent means (not shown in FIG. **3**). These third detent means cooperate with fourth detent means **64** along the circumference at the clamping disk **36** and engage therein during screwing. In this manner, relative rotation of the tube receptacle **26** with respect to the clamping disc **36** and thus relative to the socket **28** is prevented.

[0030] FIG. **4** shows further details in several partial illustrations, in particular how the contact ring **50** latches with the clamping disk **36**. In the lower image part, the device **24** is shown in the assembled state. In the middle part, detail C is shown enlarged. The upper image part shows the contact ring **50** with the contact arms **60**, and below that a magnified view E of a contact arm **60**. Each contact arm **60** includes a detent element **66**. This detent element **66** engages in gaps **68** between adjacent detent cams **64** that form the fourth detent means along the circumference of the clamping disk **36**. The contact ring **50** is made of flexible plastic material and is clicked onto the ring comprising the detent cams **64**, with the contact arms **60** engaging under the detent cams **64**.

[0031] When assembling the parts according to FIGS. **3** and **4**, first the clamping disk **36** is screwed with its internal thread **38** to the external thread **30** with the aid of a tool engaging in the recesses **44**, wherein on the one hand, the container top **20** is clamped and, on the other hand, the first detent element **40** slides elastically over the second detent element **42** and locks into place to form a screw lock. Then the tube receptacle **26** is inserted into the socket **28** and its external thread **46** is screwed into the internal thread **32**. The contact ring **50** is then placed on the end face **49** of the tube receptacle **26**, with the first detent means **52** coming into contact with the second detent means **54** of the tube receptacle **26**. The contact arms **60** engage over the ring of detent cams **64** and the detent element **66** engage in gaps **68** between the detent cams **64**, thereby fixing the rotational position of the contact ring **50**. Finally, the external thread **58** of the sealing plug **56** is screwed to the internal thread **48** of the tube receptacle **26**. With the aid of the anti-rotation lock, on the one hand, that is formed by the first detent means **52** on the contact ring **50** and the second detent means **54** on the tube receptacle **26** as well as the third detent means **66** and the fourth detent means **64**, and of the screw lock comprising the first detent element **40** and the second detent element **42**, on the other hand, an unintentional loosening or disconnection of the connection of the clamping disk **36** and the tube receptacle **26** from the socket **28** is not possible when unscrewing the sealing plug **56** in the counterclockwise direction for releasing the sealing plug **56**, for example for filling or emptying the inner container **22**. In this way, on the one hand, the position of the tube receptacle **26** is clearly and precisely fixed and, on the other hand, the rotational position with respect to the tube receptacle **26** cannot change, which improves the handling and the safety of the entire container.

[0032] FIG. **5** shows a partial cross-section in the assembled state of the device **24** for filling and/or emptying the inner container **22**. Identical parts are designated identically. The socket **28** formed on the inner container **22** receives with its internal thread **32** the tube receptacle **26** with the external thread **46**. The clamping disk **36** clamps the container top **20**, with an annular fluid-tight seal **68** providing a sealing (for example, seal **68** is made of a thermoplastic elastomer molded on flat). An electrically insulating sealing ring **70** (for example, also made of thermoplastic elastomer) is arranged between tube receptacle **26** and socket **28**. The tube receptacle **26**, the clamping disk **36** and also the container top **20** are made of electrically conductive plastic for dissipating electrical charges. The inner container **22** made of HDPE is electrically non-conductive. Therefore, the important contact element in the form of the contact ring **50** is required, which establishes the necessary electrically conductive connection between tube receptacle **26** via the clamping disk **36** and the container top **20**. The sealing plug **56** is screwed with its external thread **58** into the internal thread **48** of the tube receptacle **26** and is sealed in a liquid-tight manner via a further annular seal **72**. The tube receptacle **26** has a further internal thread **74**. This internal thread **74** is firmly connected to an external thread of an adapter device (not shown) during filling and/or emptying of the inner container **22**, via which adapter device the liquid to be filled in is removed from a tank or the liquid to be removed is supplied to a further device.

[0033] FIG. **6** shows a schematic illustration as a cross-section through the socket **28** at the level of the detent cam **40** and the locking cam **42** of the clamping disk **36** in the screwed state (cf. FIG. **3**). The detent cam **40** has a run-up slope **40***a*, a plateau portion **40***b* and a descending edge **40***c*. The locking cam **42** has a run-up slope **42***a*, a plateau portion **42***b* and a detent nose **42***c*. When screwed in the direction of arrow P**1**, the run-up slopes **40***a* and **42***a* slide over each other, with the locking cam **42** yielding elastically relative to the material of the socket **28**. After sliding over the plateau section **40***b*, the detent nose **42***c* engages resiliently at the descending edge **40***c* and locks in the opposite direction. The engagement of the detent nose **42***c* can be felt by an operator, as a result of which the handling is further improved.

[0034] FIG. **7** shows another embodiment in which the contact element is formed as a contact ring **76** with lugs **78**. Screws **80** engage as fasteners in gaps **68** between detent cams **64** through the lugs **78** provided with threads **79**, thus establishing an electrical contact. The screws **80** may be made of electrically conductive plastic. As in the embodiment according to FIG. **3**, the contact ring **76** can comprise a detent toothing and the tube receptacle **26** can also comprise a detent toothing, so that an exact angular position can be set when the contact ring **76** and the tube receptacle **26** are latched with one another.

[0035] FIG. **8** shows another embodiment, wherein lugs **78** are formed along with the tube receptacle **26** at the edge and have electrical conductivity. With their respective tips, the screws **80** can be brought into electrical and mechanical resilient contact with the surface of the electrically conductive clamping disk **36**. To prevent relative rotation of the tube receptacle **26** and the clamping disk **36**, the tip of the respective screw **80** engages in the gap **68** between adjacent detent cams **64**. In FIG. **8**, a plurality of coding holes **82** can be seen. Corresponding coding pins engage in these when the tube receptacle **26** is connected to the adapter device during filling/emptying and prevent incorrect operation.

[0036] FIG. **9** shows details of the detent toothing of the contact ring **50** and the tube receptacle **26** (cf. also FIG. **3**). The first detent means on the contact ring **50**, identified with **52**, comprise a ring of projecting detent teeth **52***a*, and the second detent means on the circumference of the tube receptacle **26**, identified with **54**, comprise a further ring of projecting detent teeth **54***a*. During latching, the opposing detent teeth **52***a*, **54***a* engage in the recesses of adjacent teeth and prevent mutual rotation of the contact ring **50** and the tube receptacle **26**.

1. A container for the transport and the storage of liquids, with an inner container made of plastic for holding liquid,

an outer container made of plastic with a rigid lower bottom, a rigid shell and a rigid container top,

at least one upwardly open socket on the top of the inner container for filling and/or emptying the inner con-

tainer, the socket being formed integrally with the inner container and having an external thread and an internal thread, and the container top including an opening which surrounds the socket with clearance,

a clamping disk with an internal thread, which can be screwed to the external thread of the socket, thereby clamping the container top at the edge of its opening,

a screw lock which cooperates with the external thread of the socket and the internal thread of the clamping disk and is suitable for preventing unintentional loosening of the clamping disk and the socket,

a tube receptacle supporting a dip tube and having an internal thread and an external thread which can be screwed into the internal thread of the socket,

and with a sealing plug with an external thread, which can be screwed into the internal thread of the tube receptacle and closes the latter in a liquid-tight manner.

2. The container according to claim **1**, characterized in that the screw lock comprises:

at least one first detent element on the socket and at least one second detent element on the side of the clamping disk facing the socket,

wherein, when screwing the internal thread of the clamping disk onto the external thread of the socket, the first detent element and the second detent element are latched with one another to prevent loosening of the screw connection.

3. The container according to claim **2**, characterized in that the first detent element is formed integrally with the inner container.

4. The container according to claim **3**, characterized in that the first detent element is formed as a detent cam on the cylindrical shaft at the bottom of the external thread of the socket and the second detent element on the clamping disk is formed as a locking cam on the lower circumference of the internal thread of the clamping disk.

5. The container according to claim **1**, characterized in that at least the rigid container top is made of electrically conductive plastic.

6. The container according to claim **1**, characterized in that an electrically insulating sealing ring is arranged between the tube receptacle and the socket, and in that the tube receptacle, which is made of electrically conductive plastic, comprises an electrically conductive contact element which is electrically conductively connected to the clamping disk.

7. The container according to claim **6**, characterized in that an anti-rotation lock is provided which cooperates with the contact element, the tube receptacle and the clamping disk and is suitable for preventing relative rotation of the tube receptacle and the clamping disk.

8. The container according to claim **7**, characterized in that the contact element is configured as a contact lug which can be fixed on the upper side of the clamping disk by means of an electrically conductive fastening element.

9. The container according to claim **7**, characterized in that the anti-rotation lock comprises:

first detent means on the contact element formed as a contact ring and

second detent means on the tube receptacle,

wherein, when the contact ring is clamped between the sealing plug and the tube receptacle, the first detent means and the second detent means are latched with one another to prevent rotation of the contact ring relative to the tube receptacle.

10. The container according to claim **9**, characterized in that the anti-rotation lock has a locking lug projecting radially from the contact ring, which locking lug can be fixed in the edge region of the clamping disk after the tube receptacle has been screwed to the socket in order to prevent relative rotation of the tube receptacle with respect to the clamping disk.

11. The container according to claim **9**, characterized in that the contact ring comprises radially outwardly directed contact arms on its circumference, the contact arms having third detent means that cooperate with fourth detent means on the clamping disk to prevent relative rotation of the tube receptacle with respect to the clamping disk.

12. The container according to claim **11**, characterized in that the third detent means on the contact arm have detent element that engage in gaps between outer detent cams of the fourth detent means on the clamping disk.

13. The container according to claim **1**, characterized in that the sealing plug is made of electrically conductive plastic.

* * * * *