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Mink

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[54] **GAS CYLINDER STRUCTURE AND VALVE-PROTECTING ELEMENT THEREFOR**

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[52] **U.S. Cl.** ..... **220/85 P,** 220/3

[51] **Int. Cl.** **B65d 25/00,** F25j

[58] **Field of Search** ..... 220/85 P, 55 AN, 220/3; 222/182; 137/377, 382; D9/260; D23/2, 21

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Attorney—Christopher C. Dunham et al.

[57] **ABSTRACT**

A compressed-gas cylinder having an integral neck for attachment of a valve or the like, with a rigid, hollow, open-ended valve-protecting element rotatably mounted on the neck. The protecting element includes a sleeve surrounding the neck and held in place by a retaining ring snap-fitted into an annular recess on the neck outwardly of the sleeve. An enlarged, generally outwardly flaring portion of the protecting element is formed integrally with and projects outwardly from the sleeve for laterally enclosing and protecting a valve mounted on the neck. Openings are provided in the wall of this enlarged portion to afford access to the valve and to enable use of the protecting element as a handle for the cylinder.

4 Claims, 8 Drawing Figures

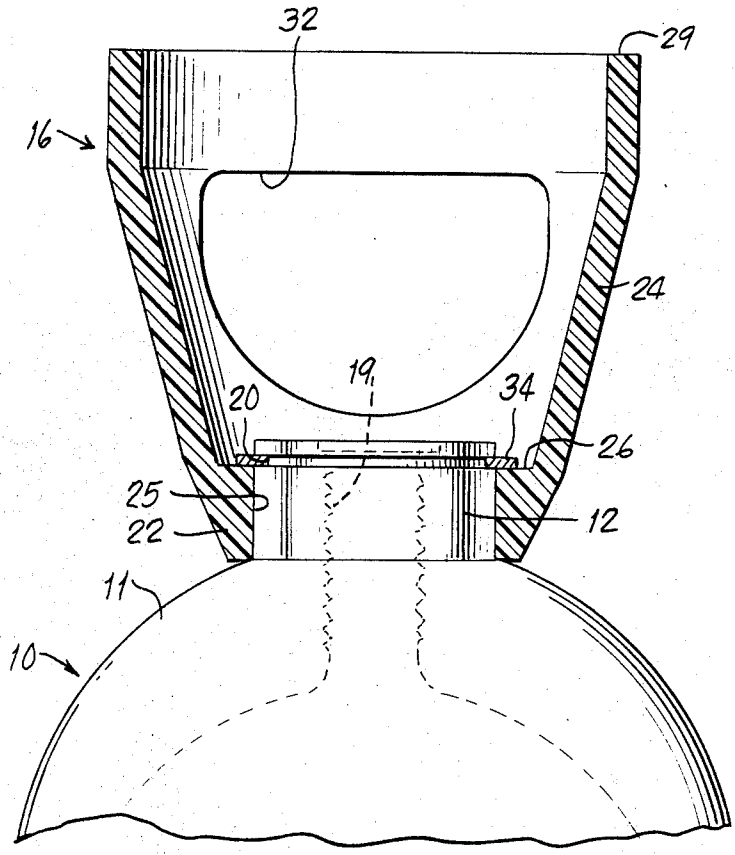


Fig. 1.

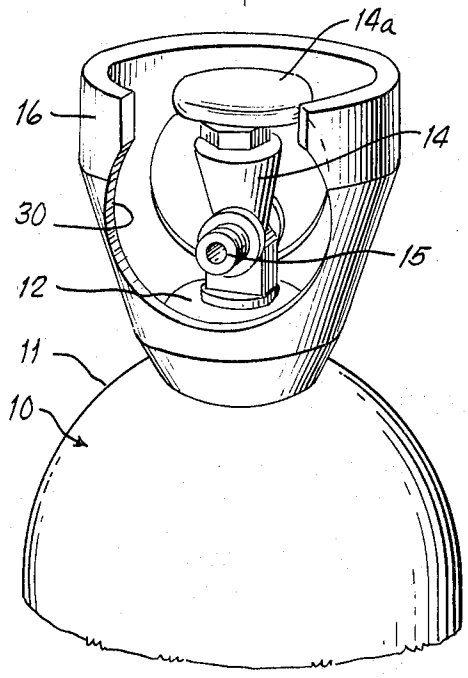


Fig. 3.

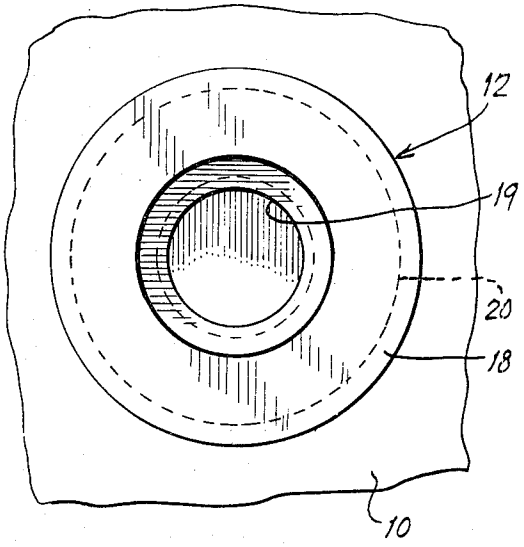


Fig. 2.

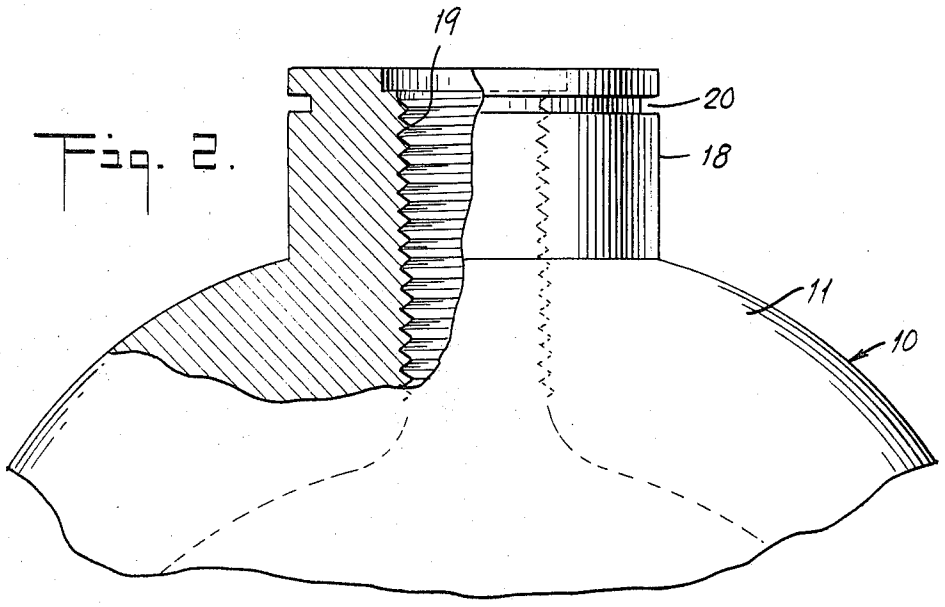
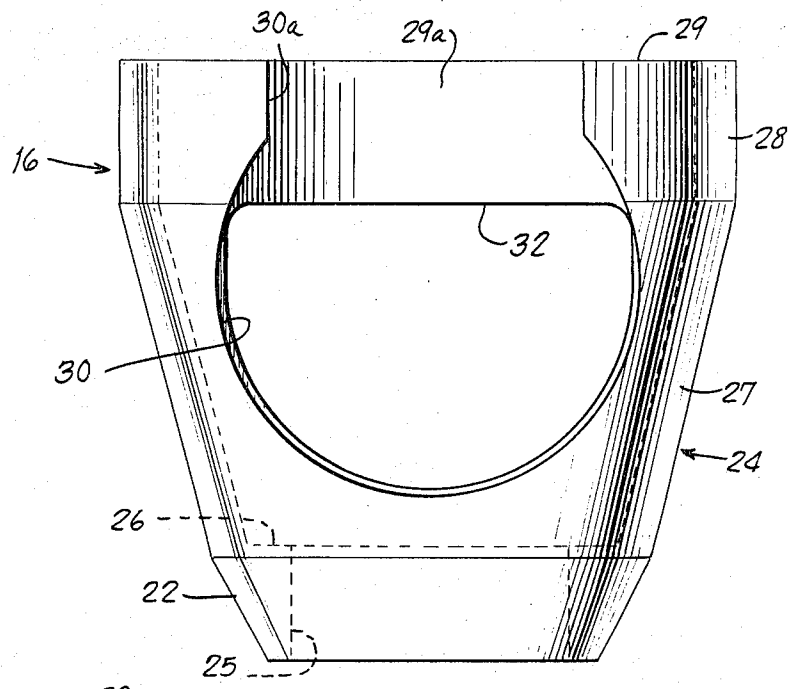


Fig. 4.



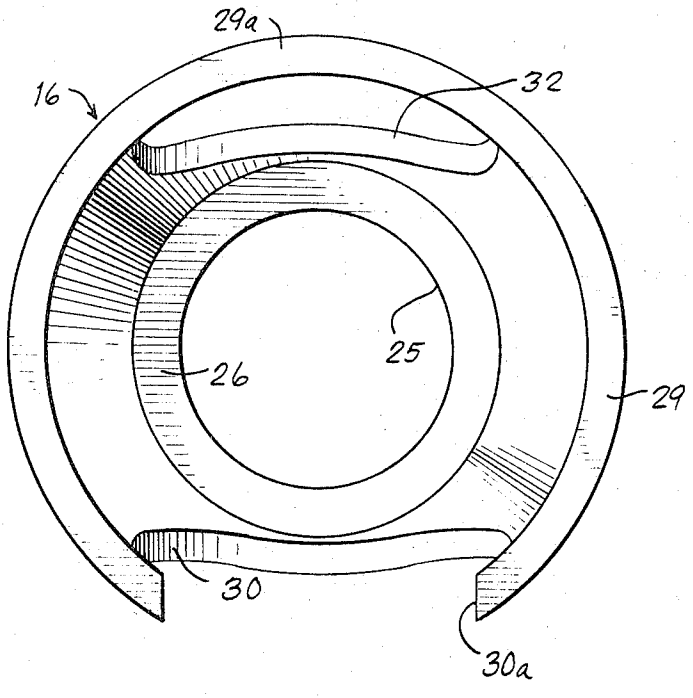
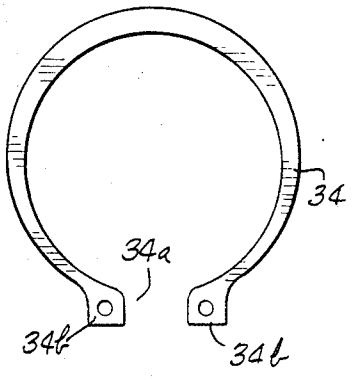


Fig. 5.

Fig. 7.



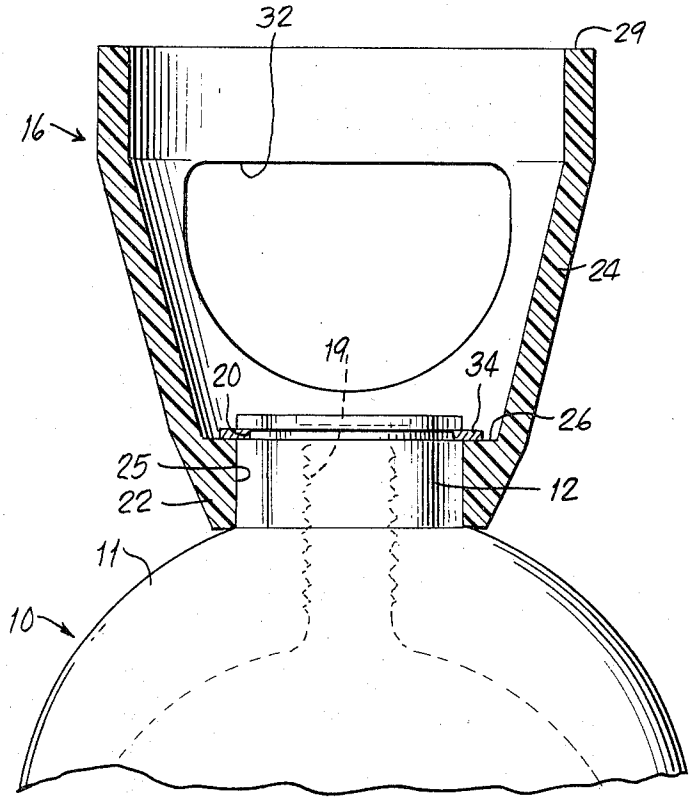

32
29
16
24
19
20
34
26
25
12
22
11
10

Fig. 6.

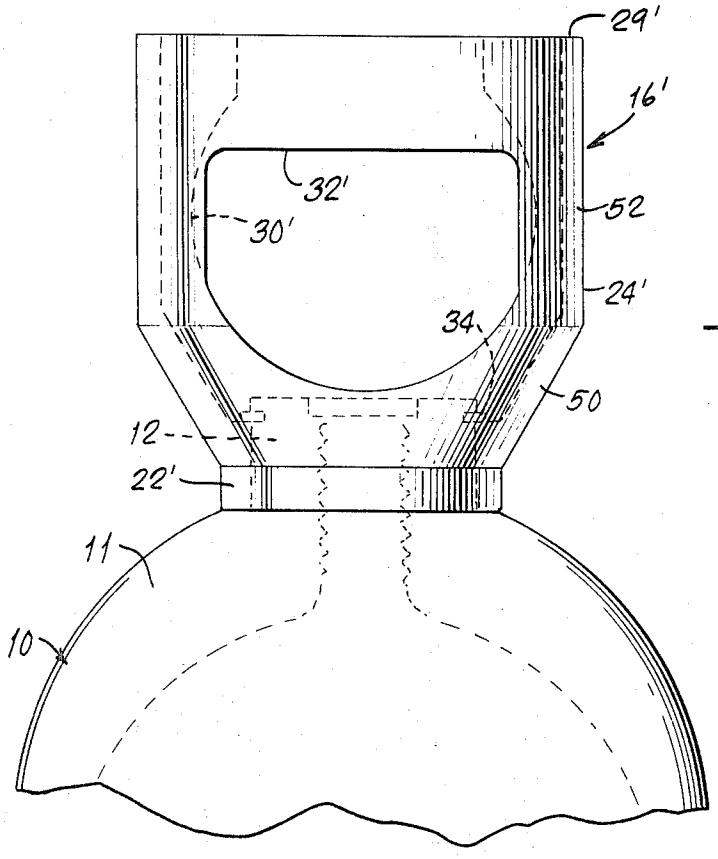

29'
16'
32'
30'
52
24'
34
50
12
22'
11
10

Fig. 8.

GAS CYLINDER STRUCTURE AND VALVE-PROTECTING ELEMENT THEREFOR

BACKGROUND OF THE INVENTION

This invention relates to compressed-gas cylinders, and in particular to new and improved structures mountable thereon to protect valves or the like attached to such cylinders and to provide handles for the cylinders.

Metal-walled cylinders are widely employed for containing gas under pressure, and such cylinders are commonly provided with a neck at one end, on which is mounted a valve or other instrumentality, e.g., to effect controlled release of the contained gas. Merely by way of example, cylinders of this type are used to hold gaseous carbon dioxide for carbonation of beverages, or industrial or welding gases.

Owing to their smooth, elongate shape, cylinders of the type described are somewhat inconvenient to handle. Moreover, the exposed, projecting valve on such a cylinder is vulnerable to misadjustment or damage, either by impacts with objects or hard surfaces incident to handling of the cylinder, or by blows from moving objects when the cylinder is stationary.

Accordingly, it has heretofore been proposed to provide a protecting structure mounted on the neck of the cylinder adjacent the valve, to shield the valve from impacts and blows to which the valve would otherwise be subject, for example, if the cylinder is dropped or tipped over. One widely-used valve-protecting structure is a cap threadedly mounted on the cylinder neck and more or less completely enclosing the valve. Since the cap must be removed before a hose or other attachment can be connected to the valve, it does not protect the valve during use of the cylinder; moreover, the necessity of removing the cap results in a high rate of loss of such caps, with attendant undesired expense for replacement, as the cap is likely to be mislaid after removal.

It has alternatively been proposed to provide a protecting structure, e.g., threadedly mounted on the cylinder neck, and having one or more openings both to enable access to the shielded valve and to adapt the protecting structure for use as a handle in carrying the cylinder. The valve customarily has a fitting that projects on one side thereof for connection of a hose or pressure line, regulator, or other attachment, and also commonly has a hand wheel positioned at its outer extremity; the lateral access opening of the protecting structure is intended to enable connection of the hose, pressure line or other attachment to the fitting, while the hand wheel is accessible through an enlarged end opening of the protecting structure.

Although the threaded engagement of the protecting structure with the cylinder neck affords a secure connection between the structure and the cylinder, it is attended with disadvantages, not only because it requires provision of threads on the cylinder neck as well as on the protecting structure, but also because it hinders desired access to the interior of the protecting structure. In particular, this threaded engagement prevents ready positioning of the openings of the protecting structure in alignment with the valve fitting, as is necessary to enable connection or adjustment of a hose or other attachment to the valve fitting within the protective structure. The openings themselves permit only limited access to the structure interior. Therefore, initial

mounting of the protective structure and an associated valve in appropriately aligned positions on a cylinder has been a difficult procedure; and connection or adjustment of attachments to the valve fitting after the protector is in place has presented further difficulties. Alternative proposals for mounting a protective structure on a cylinder neck have been, in general, structurally complex and hence more or less costly and inconvenient.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a gas cylinder structure having a new and improved protecting element for shielding a valve or the like on the neck of a compressed gas cylinder and for serving as a handle for the cylinder, with substantially enhanced freedom and ease of access to the interior of the element as desired to facilitate connection, adjustment and replacement of attachments to the valve fitting, i.e., for release of the contents of the cylinder and/or charging of the cylinder.

Another object is to provide a new and improved protecting element of such type, capable of being readily mounted on a cylinder.

To these and other ends, the present invention broadly contemplates the provision of a hollow, open-ended protecting element mounted on the cylindrical neck of a compressed gas cylinder or the like so as to be freely rotatable relative to the neck but secured against axial movement relative to the neck. In accordance with the invention, the protecting element includes a sleeve having a smooth cylindrical opening for receiving the neck of the cylinder and an outwardly facing annular surface surrounding the outer extremity of that opening, the sleeve being so dimensioned that a portion of the neck projects outwardly beyond the annular surface. The protecting element further includes an enlarged, generally outwardly flaring portion formed integrally with the sleeve and projecting outwardly therefrom for laterally enclosing and shielding a valve or the like mounted on the cylinder neck; this enlarged portion has at least one lateral opening for access and connection of attachments to the valve fitting. The terms "inner" or "inwardly" and "outer" or "outwardly" as used herein refer to directions respectively toward and away from the cylinder.

Further in accordance with the invention, a retaining ring is mounted in a recess formed in the aforementioned outwardly projecting portion of the cylinder neck and projects laterally of the neck for engaging the annular surface of the sleeve to prevent outward movement of the sleeve relative to the neck while permitting rotation of the protecting element relative to the neck. Conveniently, this ring is a resiliently deformable split annulus snap-fitted into the recess, which may be an annular groove formed in the cylindrical neck surface or may be defined by the inwardly facing surface of a laterally projecting annular land or ridge formed on the neck surface; in the latter case, the land or ridge has a diameter larger than that of the major extent of the neck surface (so as to hold the ring in place) but smaller than the inner diameter of the sleeve, i.e., to permit the sleeve to be slipped into place on the neck.

As a still further particular feature of the invention, the enlarged portion of the protecting element has an annular outer lip, a first large lateral opening extending outwardly through the lip for facilitating access to a

valve or the like mounted on the cylinder neck, and a second lateral opening bridged outwardly by the lip for receiving a human hand to enable use of the element as a handle for the cylinder.

In the described structure, the retaining ring provides a secure attachment of the protecting element to the neck of the cylinder as necessary for use of the element as a handle, and for ensuring that the element will effectively protect a valve (mounted on the cylinder neck) against blows and impacts. At the same time, this mounting arrangement permits free rotation of the protecting element around the neck, so that the access opening of the element may readily be aligned with a laterally projecting fitting of a valve mounted on the neck, for connection of a hose, pressure line, regulator, or other device to such fitting. The lip in effect defines a large opening at the outer end of the protecting element, and the access opening (extending through the lip) is effectively continuous with this end opening, further enhancing freedom of access to instrumentalities shielded by the element.

Moreover, the rotatable mounting of the protecting element greatly facilitates initial installation of the element and an associated valve on a cylinder, i.e., because no care need be taken to achieve initial alignment of the access opening with the lateral fitting of the valve, such alignment being immediately achieved whenever desired by simple turning of the mounted protecting element. This mounting also eliminates the need to provide threads on the outer wall of the cylinder neck. The use of a split ring snap fitted in a recess on the cylinder neck affords an especially rapid, convenient and economical way of securing the protecting element to the neck, with a minimum of modification of conventional cylinder neck structure. As an additional advantage, the protecting element of the invention not only serves to shield an enclosed valve and to provide a handle for carrying a cylinder (or for moving the cylinder by rolling) but may also be used as a base to support the cylinder, i.e., if the cylinder is inverted so that the valve fitting and neck are oriented downwardly, as may be desired, e.g., when the cylinder contains a gas in liquified form.

Thus there is provided a valve protecting element and handle for a compressed gas cylinder, affording important advantages of economy and especially enhanced convenience of mounting and subsequent connection of attachments to the shielded valve. Problems such as provision of external threads on the cylinder neck, and subsequent thread wear are avoided. The element need not be removed from the cylinder, but remains in place during use of the cylinder (i.e., even when a hose, regulator or other attachment is mounted on the valve) to continue serving its functions as a handle for the cylinder and a protector for the valve. Since the element is not removed, the problems of loss and cost of replacement associated with conventional valve caps are avoided. Moreover, with this element, it is not necessary to provide a separate neck ring for the cylinder as now conventionally employed. While the element of the invention is described herein, for purposes of illustration, as used with a compressed gas cylinder (and is adapted for use with a wide variety of conventional cylinders), it will be appreciated that the element of the invention is also capable of use for other similar purposes to provide shielding for structures such as valves on cylindrical necks in various kinds of equipment.

Further features and advantages of the invention will be apparent from the detailed description hereinbelow set forth, together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of one end of a gas cylinder structure incorporating a valve-protecting element embodying the present invention in a particular form;

FIG. **2** is a side elevational view of the end portion and neck of a compressed gas cylinder of generally conventional type but adapted to receive the protecting element of the invention;

FIG. **3** is a plan view of the cylinder neck of FIG. **2**;

FIG. **4** is a side elevational view of the protecting element of FIG. **1**;

FIG. **5** is a plan view of the element of FIG. **4**;

FIG. **6** is a side elevational sectional view of the element of FIG. **4** as assembled on the neck of the cylinder of FIG. **2**;

FIG. **7** is a plan view of one form of retaining ring suitable for use in mounting the protecting element of the invention on a cylinder neck; and

FIG. **8** is a view similar to FIG. **6** but showing a modified configuration of the protecting element.

DETAILED DESCRIPTION

Referring first to FIG. **1**, the embodiment of the invention there illustrated is incorporated in structure including a generally conventional metal-walled compressed gas cylinder **10**, e.g., fabricated of an aluminum alloy and having an elongated cylindrical shape with a rounded end wall **11** terminating in a neck **12** on which may be mounted a valve **14** for effecting controlled release of the contained gas through an outlet fitting **15** that projects laterally from the valve, i.e., in a direction transverse to the long axis of the cylinder. A protecting element **16** embodying the invention is mounted on the neck **12** in surrounding relation to the valve **14**.

As more particularly shown in FIGS. **2** and **3**, the cylinder neck **12**, formed integrally with the cylinder and projecting from the end wall **11** in coaxial relation to the cylinder, has a cylindrical outer wall **18** of relatively short axial extent and a central bore **19** communicating with the interior of the cylinder; this bore may be internally threaded for engagement with mating external threads of the valve. For mounting the protecting element of the invention, an annular recess **20** is formed in the neck outer wall **18**, and spaced a short distance inwardly from the outer extremity of the neck. In the cylinder shown, the recess **20** constitutes a machine groove, i.e., a groove cut into the neck wall.

The protecting element **16** of the invention, in a presently preferred embodiment, is shown in FIGS. **4** and **5**. This element is generally rigid (although it may be more or less flexible), and is a unitary, integrally formed structure, e.g., fabricated of metal or of a suitable molded plastic. It includes a sleeve portion **22** for receiving the cylinder neck **12** and an enlarged portion **24** projecting outwardly from the outer end of the sleeve portion **22** for laterally surrounding and shielding the valve **14** mounted on the neck **12** in spaced relation to the valve.

A smooth-walled cylindrical central opening **25** is formed in sleeve **22**, extending through the sleeve from the inner extremity to the outer extremity thereof for

receiving cylinder neck **12.** The diameter of opening **25** is selected so that the sleeve will fit closely around the neck, yet with sufficient clearance to permit ready rotation of the element **16** in relation to the neck. At its outer extremity, opening **25** is surrounding by a flat annular surface **26** facing outwardly, e.g., lying in a plane perpendicular to the axis of the opening **25.**

In the form shown in FIGS. **4** and **5,** the major extent of the enlarged portion **24** of element **16** is a wall **27** of outwardly flaring frusto-conical configuration, terminating outwardly in a short cylindrical wall **28** which provides an annular lip **29** for the element; this lip **29** lies in a plane parallel to the plane containing surface **26,** i.e., perpendicular to the axis of opening **25.** The enlarged portion **24** is disposed in coaxial relation to opening **25.**

As thus formed, the element **16** constitutes a hollow, generally outwardly flaring structure having an opening **25** at its inner end of relatively small diameter, sufficient to accommodate the neck **12,** and a much larger opening defined by lip **29** at its outer extremity in coaxial relation to the inner opening. The wall of the element **16** is rigid and preferably of sufficient thickness and strength to support the weight of the cylinder on which the element is mounted, as well as to shield the valve **14** effectively against blows or impacts.

A large lateral opening **30** is formed in one side of the frusto-conical wall **27** and cylindrical wall **28** of the enlarged portion **24.** As shown, this opening is U-shaped or keyhole shaped and extends upwardly through the lip **29,** providing a gap **30***a* in the lip. A second lateral opening **32** through the wall **27** of enlarged portion **24** is shown as positioned in diametrically opposed relation to opening **30;** unlike opening **30,** opening **32** does not extend upwardly through the lip **29,** but is instead bridged by a portion **29***a* of that lip. Additional openings may also be made in the side wall of portion **24** of element **16,** if desired.

The assembly of element **16** with the cylinder **10** is further illustrated in FIG. **6.** As there shown, the cylinder neck **12** is inserted through opening **25** of sleeve **22** until the inner extremity of sleeve **22** abuts a shoulder portion **11***a* of the enlarged cylinder end wall **11** at the base of neck **12.** The axial dimension of the sleeve opening **25** is shorter than that of the neck wall **18,** so that when the sleeve abuts the cylinder shoulder **11***a,* a portion of the cylinder neck **12,** including groove **20,** projects outwardly beyond opening **25,** i.e., beyond the annular outer surface **26** of that opening.

A retaining ring **34** is inserted in the recess or groove **20,** outwardly of surface **26.** As thus mounted, the ring **34** projects laterally from the cylinder neck wall **18,** in overlying relation to the sleeve surface **26,** so as to hold the sleeve (and element **16,** of which the sleeve is a part) against outward axial movement relative to the neck. Conveniently, the retaining ring **34** may be a resiliently deformable split annulus, e.g., a so-called snap ring fabricated of steel or the like, and shown in plan view in FIG. **7.** As there illustrated, the ring **34** is open on one side (at **34***a*) so that its internal diameter can be varied by spreading the free ends **34***b* of the ring. The undeformed inner diameter of the ring is at least less than the outer diameter of the cylinder neck wall **18.** For insertion into the groove **20,** i.e., after the protecting element **16** is positioned as shown in FIG. **6,** the ring **34** is spread to fit over the outermost end of the neck **12** and is then released so that it resiliently snaps into place in the groove or recess **20,** the outer wall of which holds the ring against outward axial movement relative to the neck.

In the described assembly, the element **16** is secured against any substantial axial movement in either direction relative to the cylinder **10** by the snap ring **34** and cylinder shoulder **11***a* respectively disposed for engagement with the outer and inner extremities of sleeve **22** of element **16.** Therefore, the element **16** can be used as a handle to lift the cylinder, and also provides assured effective protection for the enclosed valve **14.** However, the clearance between the cylindrical sleeve opening **25** and the cylindrical neck wall **18,** and also the clearances between ring **34,** sleeve **22** and shoulder **11***a,* are sufficient to permit free rotation of the element **16** about the long axis of the cylinder **10,** as stated above.

The valve **14** (FIG. **1**) threaded in and projecting outwardly from the bore **19** of the neck **12,** and laterally shielded by the element **16,** is accessible through the large "keyhole" opening **30** in the side of element **16** as well as through the outer end opening of element **16,** this outer end opening being continuous with opening **30** through the gap **30***a* in lip **29.** The valve may (for example) be installed after the protecting element is in place, as there is no need to provide initial alignment of the lateral outlet fitting **15** with the access opening **30** of the element. When desired, the rotatable element **16** is simply turned (about the axis of the cylinder) until the opening **30** is aligned with the valve outlet fitting **15.** A hose, pressure line, regulator or other attachment may then readily be connected to the outlet fitting **15,** through opening **30,** without interference by the protecting element. The dimensions of the element **16,** its end opening, and the keyhole opening **30** continuous therewith, are selected to accommodate with clearance a valve and tools necessary for such connection or adjustment of an attachment to the valve, while the hand wheel **14***a* of the valve is accessible for manual adjustment through the end opening of element **16.**

The other lateral opening **32** of element **16** is shaped to permit insertion of a human hand for use of the bridging lip portion **29***a* as a handle grip, enabling use of the element **16** as a handle in picking up and carrying the cylinder to which it is attached. Furthermore, since the lip **29** of element **16** is disposed in coaxial relation to cylinder **10** and in a plane perpendicular to the axis of cylinder **10,** the element **16** can be used as a base for supporting the cylinder **10** in an inverted standing position, i.e., a position in which the neck **12** is oriented downwardly.

An alternative configuration for the protecting element of the invention is illustrated in FIG. **8** as mounted on the same cylinder **10** described above, i.e. by means of the same snap ring **34.** The protecting element **16'** of FIG. **8** includes a sleeve portion **22'** (which may be essentially identical to the sleeve **22** of the element **16** of FIGS. **1** — **7**) and an enlarged portion **24'**, generally similar in arrangement to the enlarged portion **24** of the above-described element **16** but differing therefrom in specific details of shape. Portion **24'** of element **16'** has a short frusto-conical wall **50** flaring outwardly from the sleeve **22'** to a large diameter cylindrical wall **52** of substantial axial extent; i.e., in the structure of FIG. **8,** the axial extent of the cylindrical wall **52** of enlarged portion **24'** is greater than the axial extent of the frusto-conical wall **50** joining wall **52** to

sleeve 22'. At its outer extremity, wall 52 provides an annular lip 29'; lateral openings 30' and 32' (respectively corresponding to the openings 30 and 32 in the element of FIGS. 1 — 7) are formed in the wall 52.

It is to be understood that the invention is not limited to the features and embodiments hereinabove specifically set forth but may be carried out in other ways without departure from its spirit.

I claim:

1. Gas cylinder structure comprising
   a. a compressed-gas cylinder; and
   b. a cylindrical neck projecting outwardly from a wall of said cylinder for receiving a valve or the like;

wherein the improvement comprises

   c. a hollow, open-ended protecting element including
      i. a sleeve having a smooth cylindrical opening receiving said neck for rotatably mounting said element thereon and an outwardly facing annular surface surrounding the outer extremity of said opening, and
      ii. an enlarged, generally outwardly flaring portion formed integrally with said sleeve and projecting outwardly therefrom for shielding a valve or the like mounted on said neck, said enlarged portion having at least one lateral opening for access to the interior of the element;
   d. said neck having a portion projecting outwardly beyond said annular surface of said sleeve, with an annular recess formed in said outwardly projecting portion of said neck; and
   e. a retaining ring mounted in said recess and projecting laterally thereof for engaging said annular surface of said sleeve to prevent outward movement of said sleeve relative to said neck while permitting rotation of said element relative to said neck.

2. Structure as defined in claim 1, wherein said ring is a resiliently deformable split annulus snap-fitted into said recess.

3. Structure as defined in claim 2, wherein said enlarged portion of said element has an annular outer lip, a first large lateral opening extending outwardly through said lip for facilitating access to a valve or the like on said neck, and a second lateral opening bridged outwardly by said lip for receiving a human hand to enable use of the element as a handle for the cylinder.

4. Structure as defined in claim 3, wherein said neck projects from one end wall of said cylinder in coaxial relation thereto, and wherein said annular lip of said enlarged portion of said element lies in a plane perpendicular to the long axis of said cylinder, for use of said element as a base for supporting said cylinder with the neck thereof oriented downwardly.

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