

10

Description

The invention generally relates to a device which permits an equipment enclosure, such as an industrial control housing, to be vented. Such a device may include a vent cover which, while permitting the venting of the enclosure, prevents the introduction of contaminants into the enclosure.

Many enclosures for industrial controls, e.g., pneumatic positioners, require venting. Typically, such venting is accomplished by cutting a hole in one of the exterior surfaces of the enclosure and covering the hole with a fine mesh screen. While this approach does permit venting, it does not prevent windblown dust and rain, splashing water, hose-directed water and other contaminants from entering the enclosure and possibly damaging the contents thereof. Thus, this venting technique and other variations thereof are unsatisfactory since they may result in undesirable damage to the controls contained within the enclosure and costly down-time for a machine or device being regulated by the controls.

Patent specification US-A-2642261 discloses a venting device with a cup-shaped member having a stem extending from within the cup-shaped member with a sealing ring around the stem which co-operates with an aperture through which the stem slidably extends. By pressing on the cup-shaped member the sealing ring can be freed from engagement with the aperture to permit venting. A seal is provided around the edge of the cup-shaped member to prevent leakage of vented fluid around the edge of the cup-shaped member when the sealing ring on the stem is not in engagement with the aperture.

According to the invention there is provided a device for venting an enclosure comprising a vent cover formed by a main portion and a stem member with the main portion cup-shaped and the stem member connected to and directed outwardly from the bottom of the cup-shape, the stem member being received within an aperture in the enclosure and being slidably movable within the aperture between a first position and a second position, wherein the main portion is in a non-contacting relationship with the enclosure when the stem member is in the first position thereby to permit venting of the enclosure and is in a contacting relationship with the enclosure when the stem member is in the second position thereby to prevent venting of the enclosure.

Preferably the vent cover is formed from an elastomeric material, such as BUNA-N rubber, the main portion thereof is cup-shaped main portion and the stem member is directed outwardly from the cup shaped main portion and inwardly into the enclosure. The enclosure is advantageously provided with an outwardly extending sleeve which surrounds at least one vent opening and an aperture which receives the stem member. Under normal operating conditions, venting of the enclosure is accomplished via the vent opening. When the enclosure is exposed to contaminants,

the stem member moves inwardly into the enclosure and the cup-shaped main portion of the vent cover contacts the outwardly extending sleeve and a surface of the enclosure, thus effecting sealing.

The invention is diagrammatically illustrated by way of example with reference to the accompanying drawing, in which:-

Figure 1 is a cross-sectional view of one embodiment of a vent cover of a device for venting an enclosure according to the invention.

Figure 2 is a cross-sectional view of the vent cover of Figure 1, installed in an enclosure to vent same, and illustrates the position of the vent cover with respect to the enclosure when the enclosure is being vented.

Figure 3 is a cross-sectional view of the vent cover of Figure 1, installed in an enclosure to vent same, and illustrates the position of the vent cover with respect to the enclosure when the enclosure is being sealed against the entry of contaminants.

Figure 4 is an end elevation view of a portion of an enclosure to be vented by a device according to the invention and illustrates vent openings provided therein.

Referring to the drawing, in which like reference characters designate like or corresponding parts throughout the several views, a one-piece integrally moulded vent cover 10, comprises a cup-shaped main portion 12 and a stem member 14 mounted substantially centrally within the main portion 12.

The vent cover 10 is integrally moulded from an elastomeric material, such as BUNA-N rubber, and, as such, is very flexible which assists in the sealing process, hereinafter described. The main portion 12 of the vent cover 10 comprises a circular base portion 16 which terminates in a frusto-conical wall portion 18 forming a cup-shape. The circumferential end 20 of the frusto-conical wall portion 18 is flared slightly outwardly for sealing purposes, hereinafter described.

The stem member 14 is circular in cross-section throughout its entire length and comprises a frusto-conical portion 22 adjacent the base portion 16, an enlarged circumferential portion 24, a first diameter portion 26 interposed between the frusto-conical portion 22 and one end of the enlarged circumferential portion 24, and a second diameter portion 28 connected to and directed outwardly from the other end of the enlarged circumferential portion 24. The stem member 14 is integrally moulded to the cup-shaped main portion 12 of the cover 10 and its axis is substantially perpendicular to the base portion 16 of the cover 10 and intercepts the base portion at the approximate centre thereof. The frusto-conical portion 22 of the stem member 14 is positioned so that its base is adjacent the inner surface of the base portion 16 of the cover 10. The opposite end of the frusto-conical portion 22 terminates in the first diameter portion 26. The diameter of the first diameter portion 26 is slightly less than the diameter of the aperture in which the stem

member 14 is to be inserted and the axial length of the first diameter portion 26 is greater than the thickness of the material in which the aperture is located.

The enlarged circumferential portion 24 of the stem member 14 comprises a frusto-conical portion 30 and a conically bevelled surface 32 positioned in an abutting relationship. The diameter of the base of the frusto-conical portion 30, i.e., at its junction with the conically bevelled surface 32 is greater than the diameter of the aperture in which the stem member 14 is to be inserted, and the surface of the frusto-conical portion 30 acts as a "lead-in" surface during the insertion process. In this manner, the surface of the frusto-conical portion 30 permits the insertion of the stem member 14 into an aperture and the base of the frusto-conical portion 30 impedes the easy removal of the stem member from same.

The base of the frusto-conical portion 30 terminates in the conically bevelled surface 32 which, in turn, terminates in the first diameter portion 26 of the stem member 14. The opposite end of the frusto-conical portion 30 terminates in the second diameter portion 28 of the stem member 14. The diameter of the second diameter portion 28 is less than or equal to the diameter of the first diameter portion 26 and its axial length is sufficient to permit it to act as a "pilot tip" for the stem member 14 during the insertion process.

Figure 2 illustrates the vent cover 10 installed in an enclosure 40, such as an enclosure for a pneumatic positioner, and shows the position of the vent cover with respect to the enclosure when the enclosure is being vented. The enclosure 40 is provided with a circular recess 42 having a diameter greater than the maximum diameter of the vent cover 10 and having a depth greater than the height of the cup-shaped main portion 12 of the cover 10. An aperture 44 having a diameter slightly greater than the diameter of the first diameter portion 26 but less than the diameter of the enlarged circumferential portion 24 of the stem member 14 is positioned substantially centrally in the base 46 of the recess 42. An outwardly extending sleeve 48 is connected to the base 46 in the recess 42 and surrounds the aperture 44 provided therein. The inner diameter of the sleeve 48 is greater than the outer diameter of the stem member 14, and the outer diameter of the sleeve 48 is less than the diameter of the base portion 16 of the vent cover 10, thereby permitting the stem member 14 to be received within the sleeve 48 and allowing the cup-shaped main portion 12 of the cover 10 to be in a surrounding relationship with respect to the sleeve 48. The axial length of the sleeve 48 is slightly less than the depth of the cup-shaped main portion 12 of the vent cover 10, thereby permitting the end 50 of the sleeve 48 to come into contact with the inner surface of the base portion 16 of the cover 10 and allowing the circumferential end 20 of the

frusto-conical wall portion 18 to come into contact with the base 46 of the recess 42 as shown in Figure 3. One or more vent openings 52, as shown in Figure 4, are provided in the base 46 of the recess 42 and are positioned so as to be within the inner diameter of the sleeve 48 and in a surrounding relationship to the aperture 44.

In operation, the vent cover 10 is typically in a non-sealing relationship (Figure 2) with respect to the enclosure 40, i.e., the inner surface of the base portion 16 of the cover is not contacting the end 50 of the sleeve 48 and the circumferential end 20 of the frusto-conical wall portion 18 is not contacting the base 46 of the recess 42. In this orientation, venting of the enclosure 40 via the vent openings 52 can occur. If, however, the vent cover 10 is exposed to an external force, such as water spray, etc., the vent cover 10 moves inwardly into a contacting, sealing relationship with the enclosure 40 (Figure 3) preventing the introduction of any contaminants therein. When the vent cover 10 is exposed to such an external force, the stem member 14 moves inwardly through the aperture 44 into the enclosure 40 until the inner surface of the base portion 16 of the cover 10 contacts the end 50 of the sleeve 48. In this orientation, the end 20 of the frusto-conical wall portion 18 of the cover 10 sealingly contacts the base 46 of the recess 42. Thus, the vent cover 10 provides two sealing surfaces, i.e., the inner surface of the base portion 16 of the cover 10 against the end of the sleeve 48 and the end 20 of the frusto-conical wall portion 18 of the cover 10 against the base 46 of the recess 42. These two sealing surfaces can ensure that no contaminants enter the enclosure 40 via the vent openings 52. When the external force is subsequently removed from the vent cover 10, the stem member 14 moves outwardly through the aperture 44, breaking the foregoing two sealing surfaces and permitting the venting of the enclosure 40 via the vent openings 52.

Claims

1. A device for venting an enclosure (40) comprising a vent cover (10) formed by a main portion (12) and a stem member (14) with the main portion (12) cup-shaped and the stem member (14) connected to and directed outwardly from the bottom of the cup-shape (16, 18), the stem member (14) being received within an aperture (44) in the enclosure (40) and being slidably movable within the aperture (44) between a first position and a second position, wherein the main portion (12) is in a non-contacting relationship with the enclosure (40) when the stem member (14) is in the first position thereby to permit venting of the enclosure (40) and is in a contacting relationship with the enclosure (40) when the stem member (14) is in the second position thereby to prevent venting of the enclosure (40).

2. A device according to claim 1, wherein the

member 14 is to be inserted and the axial length of the first diameter portion 26 is greater than the thickness of the material in which the aperture is located.

The enlarged circumferential portion 24 of the stem member 14 comprises a frusto-conical portion 30 and a conically bevelled surface 32 positioned in an abutting relationship. The diameter of the base of the frusto-conical portion 30, i.e., at its junction with the conically bevelled surface 32 is greater than the diameter of the aperture in which the stem member 14 is to be inserted, and the surface of the frusto-conical portion 30 acts as a "lead-in" surface during the insertion process. In this manner, the surface of the frusto-conical portion 30 permits the insertion of the stem member 14 into an aperture and the base of the frusto-conical portion 30 impedes the easy removal of the stem member from same.

The base of the frusto-conical portion 30 terminates in the conically bevelled surface 32 which, in turn, terminates in the first diameter portion 26 of the stem member 14. The opposite end of the frusto-conical portion 30 terminates in the second diameter portion 28 of the stem member 14. The diameter of the second diameter portion 28 is less than or equal to the diameter of the first diameter portion 26 and its axial length is sufficient to permit it to act as a "pilot tip" for the stem member 14 during the insertion process.

Figure 2 illustrates the vent cover 10 installed in an enclosure 40, such as an enclosure for a pneumatic positioner, and shows the position of the vent cover with respect to the enclosure when the enclosure is being vented. The enclosure 40 is provided with a circular recess 42 having a diameter greater than the maximum diameter of the vent cover 10 and having a depth greater than the height of the cup-shaped main portion 12 of the cover 10. An aperture 44 having a diameter slightly greater than the diameter of the first diameter portion 26 but less than the diameter of the enlarged circumferential portion 24 of the stem member 14 is positioned substantially centrally in the base 46 of the recess 42. An outwardly extending sleeve 48 is connected to the base 46 in the recess 42 and surrounds the aperture 44 provided therein. The inner diameter of the sleeve 48 is greater than the outer diameter of the stem member 14, and the outer diameter of the sleeve 48 is less than the diameter of the base portion 16 of the vent cover 10, thereby permitting the stem member 14 to be received within the sleeve 48 and allowing the cup-shaped main portion 12 of the cover 10 to be in a surrounding relationship with respect to the sleeve 48. The axial length of the sleeve 48 is slightly less than the depth of the cup-shaped main portion 12 of the vent cover 10, thereby permitting the end 50 of the sleeve 48 to come into contact with the inner surface of the base portion 16 of the cover 10 and allowing the circumferential end 20 of the

frusto-conical wall portion 18 to come into contact with the base 46 of the recess 42 as shown in Figure 3. One or more vent openings 52, as shown in Figure 4, are provided in the base 46 of the recess 42 and are positioned so as to be within the inner diameter of the sleeve 48 and in a surrounding relationship to the aperture 44.

In operation, the vent cover 10 is typically in a non-sealing relationship (Figure 2) with respect to the enclosure 40, i.e., the inner surface of the base portion 16 of the cover is not contacting the end 50 of the sleeve 48 and the circumferential end 20 of the frusto-conical wall portion 18 is not contacting the base 46 of the recess 42. In this orientation, venting of the enclosure 40 via the vent openings 52 can occur. If, however, the vent cover 10 is exposed to an external force, such as water spray, etc., the vent cover 10 moves inwardly into a contacting, sealing relationship with the enclosure 40 (Figure 3) preventing the introduction of any contaminants therein. When the vent cover 10 is exposed to such an external force, the stem member 14 moves inwardly through the aperture 44 into the enclosure 40 until the inner surface of the base portion 16 of the cover 10 contacts the end 50 of the sleeve 48. In this orientation, the end 20 of the frusto-conical wall portion 18 of the cover 10 sealingly contacts the base 46 of the recess 42. Thus, the vent cover 10 provides two sealing surfaces, i.e., the inner surface of the base portion 16 of the cover 10 against the end of the sleeve 48 and the end 20 of the frusto-conical wall portion 18 of the cover 10 against the base 46 of the recess 42. These two sealing surfaces can ensure that no contaminants enter the enclosure 40 via the vent openings 52. When the external force is subsequently removed from the vent cover 10, the stem member 14 moves outwardly through the aperture 44, breaking the foregoing two sealing surfaces and permitting the venting of the enclosure 40 via the vent openings 52.

Claims

1. A device for venting an enclosure (40) comprising a vent cover (10) formed by a main portion (12) and a stem member (14) with the main portion (12) cup-shaped and the stem member (14) connected to and directed outwardly from the bottom of the cup-shape (16, 18), the stem member (14) being received within an aperture (44) in the enclosure (40) and being slidably movable within the aperture (44) between a first position and a second position, wherein the main portion (12) is in a non-contacting relationship with the enclosure (40) when the stem member (14) is in the first position thereby to permit venting of the enclosure (40) and is in a contacting relationship with the enclosure (40) when the stem member (14) is in the second position thereby to prevent venting of the enclosure (40).

2. A device according to claim 1, wherein the



12

main portion (12) contacts the enclosure (40) on at least one enclosure surface when the stem member is in the second position.

A device according to claim 1 or claim 2, wherein the stem member (14) is located approximately in the centre of the main portion (12).

4. A device according to any one of claims 1 to 3, wherein the stem member (14) includes an enlarged area (24) thereon, the enlarged area (24) preventing the removal of the stem member (14) from the aperture (44) in the enclosure (40).

5. A device according to any one of claims 1 to 4, wherein the main portion (12) and the stem member (14) are integrally moulded from an elastomeric material.

Patentansprüche

1. Vorrichtung zum Be- und Entlüften einer Hülle (40) mit einer Lüftungsabdeckung (10), welche aus einem Hauptabschnitt (12) und einem Stiftteil (14) gebildet ist, wobei der Hauptabschnitt (12) napfförmig und das Stiftteil (14) mit dem Boden der Napfform (16, 18) verbunden und von dieser nach außen gerichtet ist, das Stiftteil (14) in einer Öffnung (44) der Hülle (40) aufgenommen und gleitend in der Öffnung (44) zwischen einer ersten Stellung und einer zweiten Stellung bewegbar ist, wobei der Hauptabschnitt (12) nicht mit der Hülle (40) in Berührung steht, wenn das Stiftteil (14) in der ersten Stellung ist und dadurch das Be- und Entlüften der Hülle (40) erlaubt, und mit der Hülle (40) in Berührung steht, wenn das Stiftteil (14) in der zweiten Stellung ist, so daß dadurch das Be- und Entlüften der Hülle (40) verhindert wird.

2. Vorrichtung nach Anspruch 1, wobei der Hauptabschnitt (12) mit der Hülle (40) auf zumindest einer Hüllenoberfläche in Berührung tritt, wenn das Stiftteil sich in der zweiten Stellung befindet.

3. Vorrichtung nach Anspruch 1 oder 2, wobei das Stiftteil (14) näherungsweise in der Mitte des Hauptabschnittes (12) angeordnet ist.

4. Vorrichtung nach einem der Ansprüche 1 bis

3, wobei das Stiftteil (14) einen vergrößerten Bereich (24) aufweist, wobei der vergrößerte Bereich (24) das Entfernen des Stiftteiles (14) aus der Öffnung (44) der Hülle (40) verhindert.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, wobei der Hauptabschnitt (12) und das Stiftteil (14) einstückig aus einem elastomeren Material geformt sind.

Revendications

1. Dispositif pour ventiler un boîtier (40) comprenant un couvercle de ventilation (10) formé par une portion principale (12) et une tige (14) avec la portion principale (12) en forme de coupe et la tige (14) reliée au fond de la coupe (16, 18) et dirigée extérieurement à partir de celle-ci, la tige (14) étant reçue à l'intérieur d'une ouverture (44) dans le boîtier (40) et étant mobile par coulissement à l'intérieur de l'ouverture (44) entre une première position et une seconde position, dans lequel la portion principale (12) est en relation de non-contact avec le boîtier (40) lorsque la tige (14) est dans la première position afin de permettre la ventilation du boîtier (40) et est en relation de contact avec le boîtier (40) lorsque la tige (14) est dans la seconde position afin d'empêcher la ventilation du boîtier (40).

2. Dispositif selon la revendication 1, dans lequel la portion principale (12) entre en contact avec le boîtier (40) sur au moins une surface du boîtier lorsque la tige est dans la seconde position.

3. Dispositif selon la revendication 1 ou 2, dans lequel la tige (14) est située approximativement au centre de la portion principale (12).

4. Dispositif selon l'une quelconque des revendications 1 à 3, dans lequel la tige (14) comprend une portion élargie (24) sur celle-ci, la portion élargie (24) empêchant l'extraction de la tige (14) à partir de l'ouverture (44) dans le boîtier (40).

5. Dispositif selon l'une quelconque des revendications 1 à 4, dans lequel la portion principale (12) et la tige (14) sont moulées intégralement à partir d'un matériau élastomère.



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