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AUXILIARY TERMINAL SEAL

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5 Claims. (Cl. 339-94)

This invention relates to teminal seals for hermetically sealed electric motor units, more particularly to auxiliary terminal seals for refrigeration motor-compressor units.

Under conditions of use, the electrical terminals for the motor-compressor units of refrigeration machinery develop leaks. Loss of refrigerant gas and also lubrication oil may result unless any leak is promptly and effectively repaired. In order to enable repairs to be made quickly in the field by any repairman, skilled or unskilled, it has been the practice in the refrigeration repair industry to install an auxiliary terminal seal on the original terminal.

The majority of auxiliary terminal seals that have been developed employ one or more elastic washers or gaskets which are compressed to form a seal by tightening one of the seal members directly thereon. A disadvantage of such seals is that the gasket loses its elasticity after a period of time, and thus its effectiveness as a seal. Another disadvantage is that the seal members can be over-tightened when installed to such a degree that the elastic gasket is substantially destroyed.

Still another, but consequential disadvantage of many present auxiliary terminal seals is that they increase the outward projection of the terminal from the refrigerator casing so that the cover originally installed over the terminal seal cannot be remounted. This cover is necessary to retain heat about the thermally operated overload protector as well as to provide shock protection, and failure to remount it results in malfunctioning of the protector and introduction of an unnecessary shock hazard.

An object of my invention, therefore, is to provide an improved auxiliary terminal seal for hermetically sealed electric motor units which is dependably effective, giving good mechanical operation as well as very long service life.

Another object of my invention is to provide an improved auxiliary terminal seal which cannot be over-tightened to shorten the life or even destroy the effectiveness of any sealing gasket.

Another object of my invention is to provide an improved auxiliary terminal seal which may be quickly and easily installed and which does not increase the projecting length of the original terminal so as to prevent the remounting of any shock protection cover over the terminal.

Still another object of my invention is to provide an improved auxiliary terminal seal which is adaptable to various types of hermetically sealed units.

Other objects and advantages will be apparent from the following specification and claims, and from the accompanying drawing which illustrates embodiments of the invention.

In the drawing:

Fig. 1 shows an auxiliary terminal seal for a refrigeration motor-compressor unit in accordance with my invention.

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Fig. 2 is an exploded view of the auxiliary terminal seal.

Fig. 3 shows an alternate crown construction.

Referring to the drawing in detail, a portion of the casing for a hermetically sealed refrigeration motor-compressor unit is shown at 10. The casing has opening 12 therein through which threaded terminal 14 projects. The terminal is centrally located in the opening by a plurality of insulating bushings 16. The terminal originally was sealed by rubber packing 17 which was compressed by the bushings. The interior (left) end of the terminal is insulated from the casing by washer 18.

Dielectric body 20 of plastic or synthetic material is the first element of my auxiliary terminal seal which would be installed on the original terminal. Usually several bushings 16 will be mounted on the terminal to the right of face 22 on casing 10 and all but the last bushing outwardly of the casing are first removed. This is easily done with a screw driver by the repairman.

The body has hole 24 along its central axis, the hole having first counterbores 26 and 28 at opposite ends thereof. The counterbores are of different diameter with one being approximately $\frac{5}{16}$ of an inch in diameter and the other being approximately $\frac{3}{8}$ of an inch in diameter. This is because it is of general practice in the refrigeration industry to make insulating bushings 16, or whatever type of insulating element is used, $\frac{5}{16}$ or $\frac{3}{8}$ of an inch in diameter. By making the counterbores of different diameter, body 20 is universally adaptable for use with either size bushing. Of course, the body could be made with the diameter of both counterbores being the larger dimension. As shown, counterbore 26 is the smallest in size.

The body has second counterbores 30 and 32 outwardly of the first counterbores and adjacent to body faces 34 and 36, respectively. These counterbores also are of different diameter with the smaller second counterbore being adjacent the smaller first counterbore. Counterbore 30 is adapted to receive O-ring gasket 38 for sealing between the casing and the body and counterbore 32 is adapted to receive O-ring gasket 40 for sealing between the body and crown 42. The depth of each counterbore is very closely controlled so as to limit the amount the gaskets can be compressed when the auxiliary terminal seal is tightened. Thus, the repairman can compress the gasket only sufficiently far to give good sealing characteristics, and he may not compress them so far as to damage or destroy them. The O-ring gaskets employed use the internal gas pressure to produce effective sealing and function as effective seals long after the elastic material of the gasket has lost its ability to produce a sealing pressure through distortion.

The advantage in making counterbores 30 and 32 of different diameter is that frequently casing face 22 is an uneven surface or has been damaged. At least for a $\frac{5}{16}$ inch bushing installation, the repairman has the choice of two sealing circles since he may install body 20 with gasket 38 against the casing face, or he may reverse the body so that larger diameter gasket 40 is against the casing face. Thus he can choose the sealing surface which should give the better sealing characteristics.

Immediately after body 20, with gasket 38 in place, is installed on the terminal, nut 44 is threaded on the terminal and firmly tightened against the body. One of the purposes of this nut is to prevent rotation of body 20 during installation of the remaining terminal seal parts, thus preventing damage to O-ring gasket 38 from a burr on casing face 22. Another purpose of the body retaining nut is to prevent rotation of the terminal and the damaging of any internal electrical lead connected to the left end of the terminal. Should any damage occur, then obviously the whole motor-compressor unit

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must be removed for repair or replacement and an auxiliary terminal seal would be useless.

Crown 42 is the last element of my seal to be installed. The crown has threaded bore 46 extending inwardly along its central axis from face 48 for receiving the terminal. The bore is counterbored adjacent face 48 at 50 to receive that portion of nut 44 extending outwardly beyond face 36 on body 20. In order to provide a minimum over-all length of the seal, a portion of the external surface of crown 42 is adapted to receive a connector and locking nut. Threaded surface 52 surrounds threaded bore 46 and extends along a portion of the length of the bore. This surface receives connector 52 and washer 56 which are locked in place by nut 58. Tip 60 on the crown is covered by dielectric cap 62 to prevent any sparkover from the crown to a cover, not shown, provided over the original terminal, and which should be reinstalled. Flats 64 are milled on the crown for wrenching purposes.

Since body retaining nut 44 completely compresses O-ring gasket 38 against casing face 22, crown 42 may be installed with low running torque. Crown face 48 is lubricated for installation purposes so as not to damage O-ring gasket 40 as the crown is tightened. The crown only lightly compresses body 20, being tightened beyond the bottoming point just enough to produce good tension with the threads of terminal 14.

In cases where the over-all length of the auxiliary terminal seal is not critical and the repairman does not wish to change the original connector to a size which will fit threaded surface 52, a crown similar to crown 66 in Fig. 3 may be used. The connector attaching surface on this crown does not surround threaded bore 68, but is provided by threaded tip 70. The tip is the same diameter as the original terminal and will take the connector which originally was on the terminal. Of necessity this construction increases the length of crown 66 as compared to crown 44. Flats are milled on section 72 of the crown for wrenching purposes.

Crown 42 or crown 66 must be of a conducting material and it has been found desirable to use a material, such as brass, which is substantially softer than the terminal material. By using such a material protection is afforded the threads on terminal 14 since, if the repairman should attempt to tighten the crown too much, the crown bore threads will strip. Thus, not only does a brass or similar material crown protect the terminal threads, but it also provides a better electrical connection since the electrical connection between threaded members is much improved by using dissimilar metals. In addition, a brass crown will run cooler during operation by virtue of the good heat dissipation from its surface.

Long life for O-ring gaskets 38 and 40 is assured since the gaskets are not subject to the detrimental effects of electrolysis. This is because body 20 is the insulating element rather than the gaskets. This construction affords a further advantage because the gasket materials having good resistance to the deleterious effects of refrigerant gases generally do not have the best electrical insulating properties. In view of the insulating nature of body 20, complete freedom is given in the selection of a gasket material best suited to a particular installation.

In my terminal seal the crown is firmly supported by dielectric body 20 rather than by either of gaskets 38 and 40. In previous terminal seals in which one or more gaskets support a crown or similar member, crown-to-terminal tension is relaxed after a period of time by virtue of the loss of elasticity of the gaskets. This produces a high resistance connection—the so-called “hot joint.” High crown-to-terminal tension is maintained for a long period of time in my terminal seal since the gaskets in no way affect the tension. This results in a lower resistance connection between the crown and the terminal, lowering the operating temperature and ex-

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tending service life. Further, since body 20 is of a dielectric material, the leakage path from the terminal to casing 10 is reduced, providing a safer operating unit.

It is to be understood that the invention is not limited to the specific embodiments herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. A terminal seal for an electric motor unit which is hermetically sealed in a casing and which has an original terminal extending through an opening in said casing, said terminal seal comprising an annular dielectric body, a retaining nut and a crown of conducting material mounted on said terminal, said body having a counterbore of different diameter on each face with gaskets in each of said counterbores, said crown having an internally threaded bore for connection of said crown to said terminal and an externally threaded surface surrounding said internally threaded bore and extending over at least a portion of the length of said threaded bore, said body, nut and crown coacting whereby said gaskets are partially compressed in said counterbores and the faces of said body abut the respective casing and crown faces.

2. A terminal seal for an electric motor unit which is hermetically sealed in a casing and which has an original terminal extending through an opening in said casing, said terminal seal comprising an annular dielectric body, a retaining nut and a crown mounted on said terminal, said body having a counterbore of different diameter on each face with gasket means in each of said counterbores, said body and crown coacting whereby said gasket means are partially compressed in said counterbores and the faces of said body abut the respective casing and crown faces.

3. A terminal seal for an electric motor unit which is hermetically sealed in a casing and which has an original terminal extending through an opening in said casing, said terminal seal comprising a dielectric body and a crown surrounding said terminal, said body having a counterbore of different diameter on each face with gasket means in each of said counterbores, said crown having an internally threaded bore for connection of said crown to said terminal and an externally threaded surface surrounding said internally threaded bore and extending over at least a portion of the length of said threaded bore, said body and said crown coacting whereby said gasket means are compressed in said counterbores and the faces of said body can abut the respective casing and crown faces.

4. A terminal seal for an electric motor unit which is hermetically sealed in a casing and which has an original terminal extending through an opening in said casing, said terminal seal comprising a dielectric body, a retaining nut and a crown surrounding said terminal, said body having a counterbore on each face with gasket means in each of said counterbores, said crown having an internally threaded bore for connection of said crown to said terminal and an externally threaded surface surrounding said internally threaded bore and extending over at least a portion of the length of said threaded bore, said body and crown coacting whereby said gaskets are compressed in said counterbores and the faces of said body can abut the respective casing and crown faces.

5. A terminal seal for an electric motor unit which is hermetically sealed in a casing and which has an original terminal extending through an opening in said casing, said terminal seal comprising a dielectric body and a crown surrounding said terminal, said body having a counterbore on each face with gasket means in each counterbore between said casing and said body and said crown and said body, said crown having an internally threaded bore for connection of said crown to said terminal and an externally threaded surface surrounding said internally threaded bore and extending over at least a

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portion of the length of said threaded bore, said body and crown coacting whereby said gasket means are compressed in said counterbores and the faces of said body can abut the respective casing and crown faces.

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