ELECTRONIC ENCLOSURE INCLUDING A FLAME ARRESTER HAVING A MECHANICAL CHECK VALVE

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ABSTRACT

An electronic enclosure includes a housing having a plurality of walls that define an interior portion. A flame arrester is mounted to one of the plurality of walls of the housing. The flame arrester includes a mechanical check valve. The mechanical check valve is configured and disposed to allow a fluid to exit the interior portion of the housing and prevent fluid from entering the interior portion of the housing.
ELECTRONIC ENCLOSURE INCLUDING A FLAME ARRESTOR HAVING A MECHANICAL CHECK VALVE

BACKGROUND OF THE INVENTION

[0001] Exemplary embodiments pertain to the art of electronic enclosures and, more particularly, to an electronic enclosure having a flame arrester including a mechanical check valve.

[0002] Certain electronic enclosures, particularly those employed in environments containing flammable gases or liquids, are required by various standards setting institutes to include an explosion proof designation. The explosion proof designation denotes that the enclosure is designed to prevent internal combustions from occurring and igniting external flammable substances. In some cases, the enclosure includes a flame arrester that prevents a flame front initiating within the enclosure from exiting to the surroundings.

[0003] Flame arrestors function by forcing a flame front through channels too narrow to permit continuation of a flame. The particular form of the channels can vary. For example, flame arrestors may include regular channels, such as those defined by a wire mesh or openings formed in a sheet metal plate, or irregular channels such as those provided with a randomly packed material. The particular size of the channels can vary depending upon the flammability of any associated fuel.

BRIEF DESCRIPTION OF THE INVENTION

[0004] Disclosed is an electronic enclosure that includes a housing having a plurality of walls that define an interior portion. A flame arrester is mounted at one of the plurality of walls of the housing. The flame arrester includes a mechanical check valve. The mechanical check valve is configured and disposed to allow a fluid to exit the interior portion of the housing and prevent fluid from entering the interior portion of the housing.

[0005] Also disclosed is a motor drive system including a fan housing unit having a housing member provides with an interior zone. A motor drive unit is connected to the fan housing unit. The motor drive unit includes a housing having an interior portion. The housing includes at least one flame arrester having a mechanical check valve moveable between a first position that fluidly isolates the interior portion and a second position that allows passage of fluid from the interior portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

[0007] FIG. 1 is a lower left perspective view of a motor drive system in accordance with an exemplary embodiment;

[0008] FIG. 2 is a partially cut away view of the motor drive system of FIG. 1 illustrating flame arrestors including mechanical check valves exploded from a motor drive unit;

[0009] FIG. 3 depicts the mechanical check valves of FIG. 2 in a closed configuration;

[0010] FIG. 4 depicts the mechanical check valves of FIG. 2 in an open configuration;

[0011] FIG. 5 depicts mechanical check valves in accordance with another aspect of the exemplary embodiment in a closed configuration; and

[0012] FIG. 6 depicts the mechanical check valves of FIG. 5 in an open configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0013] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0014] A motor drive system 1 includes an electronic enclosure or motor drive unit 2 in accordance with an exemplary embodiment illustrated generally at 2 in FIG. 1. Motor drive unit 2 is mounted to a fan housing unit 3 having a motor housing unit 4. Motor drive unit 2 includes a housing 8 having a front wall 10, a second wall 11, a third wall 12, a fourth wall 13 and a bottom wall 15 that collectively define an interior portion 17 that houses a motor drive control 20. Motor drive control 20 is configured and disposed to control a fan motor 25 (FIG. 3) arranged within motor housing unit 4. Fan motor 25 drives a fan 30 that is disposed within an interior zone 33 of fan housing unit 3. In the exemplary embodiment shown, fan 30 takes the form of an axial fan. In further accordance with the exemplary embodiment, motor drive unit 2 is provided with a plurality of flame arrestors 40-43. Flame arrestors 40-43 allow a flame front to pass from motor drive unit 2 into interior zone 33. In addition, flame arrestors 40-43 can also prevent moisture from entering motor drive unit 2 from interior zone 33 of fan housing unit 3.

[0015] Reference will now be made to FIGS. 2-4 in describing flame arrestors 40-43. As each flame arrester 40-43 is similarly formed, a detailed description will follow with reference to flame arrester 40 with an understanding that the remaining flame arrestors include corresponding structure. Flame arrester 40 includes a blocking tube 60 having a first end 62 that extends to a second end 63 through an intermediate portion 65. First end 62 includes a flange 70 that is designed to cooperate with bottom wall 15 to position blocking tube 60 within interior zone 33. Second end 63 includes an angled surface 74 that minimizes any ingress of moisture from interior zone 33 to blocking tube 60. In order to prevent any moisture that may enter blocking tube 60 from entering motor drive unit 2, flame arrester 40 includes a mechanical check valve 80 positioned within blocking tube 60.

[0016] In accordance with one aspect of the exemplary embodiment, mechanical check valve 80 takes the form of a duckbill valve 84 that is inserted into blocking tube 60. Duckbill valve 84 includes a first end section 87 that extends to a second end section 88. First end section 87 defines an inlet section 90 and includes a flange section 92. Flange section 92 is configured to locate duckbill valve 84 within blocking tube 60. That is, flange section 92 mates with flange 70 to position duckbill valve 84 within blocking tube 60. Second end section 88 of duckbill valve 84 defines an outlet section 96 that includes a valve member 100. In accordance with the exemplary embodiment, valve member 100 is formed from a resilient material that is designed to deflect when subjected to a predetermined pressure. More specifically, duckbill valve 84 is normally in a closed configuration, such as shown in FIG. 3. In the closed configuration, any moisture that may exist within motor housing unit 4 is prevented from entering motor drive unit 2. However, in the event that a pressure build up occurs within motor drive unit 2 from, for example, a combustion event, valve member 100 deflects to the open configuration as shown in FIG. 4. In the open configuration, duckbill valve 87 allows any pressure build up within motor
drive unit 2 to pass into interior zone 33. At the same time, duckbill valve 84 allows any flame front to pass into interior zone 33.

[0017] Reference will now follow to FIGS. 5 and 6, wherein like reference numbers represent corresponding parts in the respective views, in describing a mechanical check valve 120 in accordance with another aspect of the exemplary embodiment. Mechanical check valve 120 takes the form of a spring valve 122 including a first end section 129 that extends to a second end section 130. First end section 129 defines an inlet section 134 and includes a flange section 136. In a manner similar to that described above, flange section 136 locates spring valve 122 in blocking tube 60. Second end section 130 defines an outlet section 140 having a valve member 144.

[0018] In a manner also similar to that described above, spring valve 122 is normally in a closed configuration, such as shown in FIG. 5. In the closed configuration, any moisture that may exist within interior zone 33 is prevented from entering motor drive unit 2. However, in the event that a pressure build up occurs within motor drive unit 2 resulting from, for example, a combustion event, valve member 144 opens, as shown in FIG. 6, to allow pressure to escape into motor housing unit 4. The pressure at which valve member 144 will open is determined by a spring 150 that extends between first and second end sections 129 and 130. Spring 150 biases valve member 144 into the closed configuration. However, if pressure build up within motor drive unit 2 is sufficient to overcome the biased force of spring 150, valve member 144 will shift to expose outlet section 140 to inlet section 134 to release the pressure into fan housing unit 4. At the same time, mechanical valve 120 allows any flame front that may develop in motor drive unit 2 to pass into interior zone 33.

[0019] At this point it should be understood that the exemplary embodiments provide an electronic enclosure including a device for preventing moisture from passing from an interior zone into the housing while allowing for pressure relief and flame diversion. More specifically, a motor fan installation may require a motor drive unit capable of explosive containment with pressure relief and flame direction control when located in an explosive environment. Moreover, the same installation may also require that the fan be subjected to a high moisture environment. The explosion proof housing includes a flame arrestor(s) that provides pressure relief and flame control. However, conventional flame arresters allow moisture to pass into the motor drive unit housing. The present exemplary embodiments not only provide the pressure relief and flame control but also provide a barrier to moisture. In this manner, the electronic enclosure can be more readily employed in moist environments such as condensers, evaporators and the like.

[0020] While the invention has been described with reference to an exemplary embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims.

What is claimed is:
1. An electronic enclosure comprising:
   a housing including a plurality of walls that define an interior portion; and
   a flame arrestor mounted at one of the plurality of walls of the housing, the flame arrestor including a mechanical check valve, the mechanical check valve being configured and disposed to allow a fluid to exit the interior portion of the housing and prevent fluid from entering the interior portion of the housing.
2. The electronic enclosure of claim 1, wherein the mechanical check valve includes a valve member that is moveable between a first position that fluidly isolates the interior portion of the housing and a second position that fluidly opens the interior portion of the housing.
3. The electronic enclosure of claim 1, wherein the mechanical check valve comprises a duckbill valve.
4. The electronic enclosure of claim 3, wherein the duckbill valve includes a resilient valve member.
5. The electronic enclosure of claim 1, wherein the mechanical check valve comprises a spring valve.
6. The electronic enclosure according to claim 1, wherein the flame arrestor includes a blocking tube including a first end exposed in the interior portion of the housing and a second end positioned outside the housing, the second end including an angled surface.
7. The electronic enclosure according to claim 6, wherein the mechanical check valve is positioned within the blocking tube.
8. The electronic enclosure of claim 6, further comprising:
   another housing having an interior zone, the interior portion of the housing being connected to the interior zone of the another housing through the blocking tube.
9. The electronic enclosure of claim 8, further comprising:
   a motor drive control arranged within the interior portion of the housing.
10. The electronic enclosure of claim 9, further comprising:
    a fan motor arranged within the interior zone of the another housing.
11. A motor drive system comprising:
    a fan housing unit including a motor housing unit having an interior zone; and
    a motor drive unit connected to the fan housing unit, the motor drive unit including a housing having an interior portion, the housing including a flame arrestor having a mechanical check valve moveable between a first position that fluidly isolates the interior portion and a second position that allows passage of fluid from the interior portion.
12. The motor drive system of claim 11, wherein the mechanical check valve includes a valve member that is moveable between the first position and the second position.
13. The motor drive system of claim 11, wherein the mechanical check valve comprises a duckbill valve.
14. The motor drive system of claim 13, wherein the duckbill valve includes a resilient valve member.
15. The motor drive system of claim 11, wherein the mechanical check valve comprises a spring valve.
16. The motor drive system of claim 11, wherein the fan housing unit comprises an electric motor arranged within the motor housing unit.
17. The motor drive system of claim 11, further comprising:
    a motor drive control arranged within the interior portion of the motor drive unit.
18. The motor drive system of claim 11, wherein the flame arrestor includes a blocking tube having a first end that is
exposed in the interior portion and a second end exposed in the interior zone, the second end including an angled surface.

19. The motor drive system of claim 18, wherein the mechanical check valve is positioned within the blocking tube.

20. The motor drive system of claim 19, wherein the mechanical check valve includes a flange section that locates the mechanical check valve within the blocking tube.

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