

Explosion Proof Housing for Camera with Self Cleaning Viewing Window

FIELD OF THE INVENTION

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The present invention is for an explosion proof housing for a camera, said housing having a system to clean the viewing window for the camera.

BACKGROUND OF THE INVENTION

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The invention is to be used in oilfields and oil rigs for oil exploration. In such hazardous areas, end users or operators are emphasizing on safety and security as the top priority. Such cameras are installed in remote and high areas where the view of the oil rig or area under surveillance is panoramic and offers either
15 180 degree or 360 degree views. Ease and low cost maintenance, and automated or minimal human intervention for daily surveillance operations are always the crucial requirements for such on-site cameras. Any feature which offers points for improvement, to be more cost efficient and minimize human error would always be desired by users.

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The proposed invention is an explosive proof housing with a self cleaning system for a camera operating continuously 24 hours 7 days a week in hazardous worksites in tough environmental conditions. In order for the camera to capture images of the surrounding properly, the camera has to be protected
25 by an explosion proof housing which has a window (if the camera were to capture a 180 degree view of the surroundings) or two windows (if the camera were to capture a 360 degree view of the surroundings). It is imperative that the view of the camera must be kept clean from dirt, pollutants and rain. This would require the explosion proof housing to have a viewing window (or two or
30 more viewing windows, depending on the cameras used and the degree of coverage by the said camera of the surrounding) and such viewing windows have capability for self cleaning. The combined effect of accumulation of dirt, pollutants and rain would cause the viewing windows to be dirtied with some dirt stuck onto the windows. What is required is an integrated viewing window
35 cleaning system which enables continuous use of a single or dual or more units of panoramic view camera at the same time, for 90 degree, 180 degree up to

360 degree viewing and monitoring of the hazardous area, for total surveillance and ease of maintenance.

5 It is crucial to have 180 degree or 360 degree panoramic view in the surveillance of operations in the hazardous area, to obtain complete view of the intended surveillance area without any blind spot, and to further minimize human intervention in controlling the viewing angle of the camera, in order to minimize human error.

10 This objective therefore is to further improve surveillance operations in the hazardous area. In most cases, explosion proof housing for cameras are located outdoor, of which the viewing window gets dirty easily in the rough and dusty environment of hazardous area. An integrated cleaning system installed on such cameras would enable the cleaning of the viewing window remotely without
15 physical access to the camera housing. This is vital for operations in hazardous areas, since access to the camera is often restricted and often due to difficulty in accessing building structures where such cameras are installed. A clean and clear viewing window shall provide unobstructed view for the operation of the camera, thus further enhancing the surveillance operation.

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U S Patent No. 6 527 000 B1 (Alan Randmae et al) proposes a non-contact wiper and washer assembly for surveillance camera domes. However, the surveillance camera and dome is not for use in hazardous areas nor explosion proof.

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US Patent No. 7,316,176 B2 (Jerry Lee Dunn et al) discusses a remote monitor system having an explosion proof enclosure with a video camera which enables an operator in refineries, chemical manufacturing facilities, storage facilities and so on to observe and read marking indicia on a plugging cylinder control bar.
30 However, this prior art document did not discuss the possibility of the camera being unable to read the marking indicia and the need to clean the camera.

The inventors have proposed an improved explosion proof housing for camera with a viewing window which has a self-cleaning system. In hazardous areas,
35 the presence of sparks from electrical components and sparks arising from friction due to moving parts has to be avoided, to prevent the chance of an explosion. Such an improved explosion proof housing with self-cleaning facilities

for the housing would ensure continuous surveillance of operations by the surveillance camera without the need to clean the camera windows which have been exposed to the elements including dirt, dust and rain.

5 SUMMARY OF THE INVENTION

A first object of the invention for an explosion proof housing for one or more cameras installed and used in hazardous areas with each of the said camera has a viewing window in the housing to capture images from the surrounding the camera is directed, wherein said housing has a window
10 cleaning system which washes and cleans the viewing window of the housing, whenever the viewing window is dirty.

Preferably, the explosion proof housing has one or more cameras installed
15 and used in hazardous areas, with each camera having a viewing window to record images of a 90 degrees panoramic view of the surrounding the camera is directed.

Preferably, the explosion proof housing has one or more cameras installed
20 and used in hazardous areas, wherein each camera has a viewing window to record images of a 180 degrees panoramic view of the surrounding the camera is directed.

Preferably, the window cleaning system has a built in motorized wiper and
25 washer system.

Preferably, the built-in motorized wiper and washer system is operated by a motor.

30 Preferably, the wiper and washer system is operated by a magnet.

Preferably, the window cleaning system has a washer pump to supply water to the washer system.

35 Preferably, the window cleaning system has a nozzle spray head for spraying washer fluid on the window of the housing.

Preferably, the window cleaning system has a plurality of gears for the wipers to activate and drive the wipers.

5 Preferably, the washer fluid used in the washer system is a mixture of water and cleaning chemicals.

10 Preferably, there is a microprocessor to monitor the state of cleanliness of the viewing window and to initialize the cleaning of the viewing window when the viewing window of the housing is dirty and has to be cleaned, starting the wiper and washer system, controlling the amount of washer fluid to the wipers and controlling the speed of the wipers and stopping the cleaning once the viewing window is clear.

15 These and other advantages of the invention will become apparent from a review of the following description, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

20 For a better understanding of the invention, its advantages, and the objects attained by its use, reference should now be made to the accompanying drawings. The accompanying drawings illustrate one or more embodiments of the invention and together with the description herein, serve to explain the workings and principles of the invention.

25 Fig. 1 shows views of a preferred embodiment of a single (180 degree) explosion proof housing for camera with viewing window cleaning facilities.

Fig. 2 shows views of a preferred embodiment of a dual (360 degree) explosion proof housing for camera with viewing window cleaning facilities.

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Fig. 3 shows views of a second embodiment of a single (180 degree) explosion proof housing for camera with viewing window cleaning facilities.

35 Fig. 4 shows views of a second embodiment of a dual (360 degree) explosion proof housing for camera with viewing window cleaning facilities.

DETAILED DESCRIPTION OF THE INVENTION

- The proposed invention is an explosive proof housing for a camera operating continuously 24 hours 7 days a week in hazardous worksites in tough environmental conditions. In order for the camera to capture images of the surrounding properly, the camera has to be protected by an explosion proof housing which has a window (if the camera were to capture a 180 degree view of the surroundings) or two windows (if the camera were to capture a 360 degree view of the surroundings). It is imperative that the view of the camera must be kept clean from dirt, pollutants and rain. This would require the explosion proof housing to have a viewing window (or two or more viewing windows, depending on the cameras used and the degree of coverage by the said camera of the surrounding) which are capable of self cleaning.
- The invention is an integrated viewing window cleaning system which enables continuous use of a single or dual or more units of panoramic view camera at the same time, for 90 degree, 180 degree up to 360 degree viewing and monitoring of the hazardous area, for total surveillance and ease of maintenance.
- Fig. 1 shows views of a preferred embodiment of a single (180 degree) explosion proof housing for camera with viewing window cleaning facilities.

The explosion proof housing 1 contains the panoramic view camera(s) or related surveillance camera(s), the wiper system 2 and the washer system 3. The wiper and washer system can be operated by motor or magnetic device.

Washer pump compartment 4 is designed to contain the washer pump 5.

Connector 6 is the washer fluid inlet that connects to washer fluid supply hose. Connector 7 is the washer fluid outlet that connects to nozzle spray head 8 for spraying washer fluid on the viewing window. Nozzle spray head 8 is attached to the wiper arm 14.

Washer system 3 shall drive the washer pump 5 through steel rod 9.

In the case of a Single Viewing Window Design, the wiper system 2 shall drive the first wiper gear 11 through steel rod 10. Second wiper gear 12 to be driven by

first wiper gear 11, and at the same time activating the movement of the wiper arm 14. First wiper gear 11 and second wiper gear 12 to be contained inside the wiper gears compartment 13.

5 Fig. 2 shows views of a preferred embodiment of a dual (360 degree) explosion proof housing 1 for camera with viewing window cleaning facilities. For a Dual Viewing Window Design, the wiper system 2 shall drive the first wiper gear 11 through steel rod 10. Second wiper gear 12 to be driven by first wiper gear 11. Second wiper gear 12 shall drive the third wiper gear 21 through steel rod 22. Fourth
10 wiper gear 23 to be driven by third wiper gear 21, and at the same time activating the movement of the wiper arm 14. Third wiper gear 21 and fourth wiper gear 23 to be contained inside the wiper gears compartment 13.

Wiper arm 14 is connected to wiper bearing 18.

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Wiper arm 14 can be attached with rubber or fiber material in its inner circle, for the cleaning of the viewing window 15.

Viewing window 15 to be attached to windows flange 16 using adhesive material and
20 the screw ring 17.

Cable gland 19 to be attached to cable entry 20.

25 The cleaning system consists of a washer and wiper system, wherein the wiper is moved by gears, moving over the viewing window. The cleaning fluid is supplied through the washer fluid supply hose and is sprayed out through a nozzle spray head 8. The nozzle spray head 8 is attached to the wiper arm 14.

OTHER EMBODIMENTS

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Fig. 3 shows views of a second embodiment of a single (180 degree) explosion proof housing 1 for camera with viewing window cleaning facilities.

The explosion proof housing 1 contains the panoramic view camera(s) or related surveillance camera(s), the wiper system 2 and the washer system 3. The wiper 2
35 and washer system 3 can be operated by motor or magnetic device.

Washer pump compartment 4 is designed to contain the washer pump 5.

Connector 6 is the washer fluid inlet that connects to washer fluid supply hose. Connector 7 is the washer fluid outlet that connects to nozzle spray head 8 for spraying washer fluid on the viewing window 15. Nozzle spray head 8 is attached to the wiper arm 14.

Washer system 3 shall drive the washer pump 5 through steel rod 9.

In the case of a Single Viewing Window Design, the wiper system 2 shall drive the first wiper gear 11 through steel rod 10. Second wiper gear 12 to be driven by first wiper gear 11, and at the same time activating the movement of the wiper arm 14. First wiper gear 11 and second wiper gear 12 to be contained inside the wiper gears compartment 13.

Fig. 4 shows views of a second embodiment of a dual (360 degree) explosion proof housing 1 for camera with viewing window cleaning facilities. For a Dual Viewing Window Design, the wiper system 2 shall drive the first wiper gear 11 through steel rod 10. Second wiper gear 12 to be driven by first wiper gear 11. Second wiper gear 12 shall drive the third wiper gear 21 through steel rod 22. Fourth wiper gear 23 to be driven by third wiper gear 21, and at the same time activating the movement of the wiper arm 14. Third wiper gear 21 and fourth wiper gear 23 to be contained inside the wiper gears compartment 13.

Wiper arm 14 is connected to wiper bearing 18.

Wiper arm 14 can be attached with rubber or fiber material in its inner circle, for the cleaning of the viewing window 15.

Viewing window 15 to be attached to windows flange 16 using adhesive material and the screw ring 17.

Cable gland 19 to be attached to cable entry 20.

Two embodiments of the explosion proof housing 1 for camera with devices for self cleaning window have been described, each embodiment using either one or two cameras. It is conceivable that each embodiment can use three or four

cameras, in which case, each explosive proof housing 1 can have three or four viewing windows 15.

While two embodiments of the explosion proof housing 1 for camera with self
5 cleaning viewing window 15 have been described, it should be apparent, therefore
that various modifications, rearrangements, substitutions alterations and adaptations
to those embodiments may occur to persons skilled in the art with the attainment of
some or all of the advantages of the present invention. Accordingly, it should be
clearly understood that the present invention is not intended to be limited by the
10 particular features and structures hereinbefore described and depicted in the
accompanying drawings. It is therefore intended to cover all such modifications,
alterations and adaptations without departing from the scope and spirit of the present
invention as defined by the appended claims.

15 **ADVANTAGEOUS EFFECTS OF THE INVENTION**

The invention offers an improved explosion proof housing 1 for camera with
viewing window 15 which has self-cleaning system for a continuous operation
camera used in an open, remote and hazardous environment and in all weather
20 conditions so that clear images can be obtained by the camera all the time.

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CLAIMS

1. An explosion proof housing 1 for one or more cameras installed and used in hazardous areas, each of the said camera having a viewing window 15 in the housing 1 to capture images from the surrounding the camera is directed, said housing 1 having
- a window cleaning system which washes and cleans the viewing window 15 of the housing 1, whenever the viewing window 15 is dirty.
2. An explosion proof housing 1 for one or more cameras installed and used in hazardous areas, with each camera having a viewing window 15 wherein each of the said camera record images of a 90 degrees panoramic view of the surrounding the camera is directed.
3. An explosion proof housing 1 for one or more cameras installed and used in hazardous areas, wherein each of the said camera record images of a 180 degrees panoramic view of the surrounding the camera is directed.
4. The window cleaning system used in an explosion proof housing 1 for a camera as claimed in Claim 1, said device having a built in motorized wiper 2 and washer system 3.
5. The window cleaning system as claimed in any of the preceding claims wherein the wiper 2 and washer system 3 is operated by a motor.
6. The window cleaning system as claimed in any of the preceding claims wherein the wiper 2 and washer system 3 is operated by a magnet.
7. The window cleaning system as claimed in any of the preceding claims having a washer pump 5 to supply water to the washer system 3.
8. The window cleaning system as claimed in any of the preceding claims having a nozzle spray head 8 for spraying washer fluid on the viewing window 15 of the housing 1.

9. The window cleaning system as claimed in any of the preceding claims having a plurality of gears for the wipers to activate and drive the wipers.

5 10. The washer fluid used in the washer system as claimed in any one of the preceding claims wherein the washer fluid is a mixture of water and cleaning chemicals.

10 11. A microprocessor for a window cleaning system to monitor the state of cleanliness of the viewing window 15 and to initialize the cleaning of the viewing window 15 when the viewing window 15 of the housing 1 is dirty and has to be cleaned, starting the wiper 2 and washer system 3, controlling the amount of washer fluid to the wipers and controlling the speed of the wipers and stopping the cleaning once the viewing window 15 is clear.

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