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IMAGING SYSTEM FOR BULK TRANSPORT VEHICLES

Abstract

An imaging unit is provided and placed in an access opening of a storage container of a transport vehicle, where the imaging unit includes a mounting assembly including an upper member and a mounting arm extending from the upper member, the upper member configured to rotate the mounting arm about a longitudinal axis and a camera unit rotatably attached to the mounting arm and configured to rotate about a lateral axis that is transverse to the longitudinal axis, where the camera unit is rotated about the longitudinal axis and the lateral axis to a designated position within the storage container and takes at least one image of the inner surfaces of the storage container.

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Background/Summary

BACKGROUND

[0001] The present application relates generally to a system for inspecting the inner surfaces of storage containers of bulk transport vehicles, and more particularly, to an automated, self-contained imaging system that takes images of the inner surfaces of the storage containers of bulk transport vehicles to inspect the cleanliness and structural integrity of the storage containers.

[0002] Bulk transport vehicles, such as railcars and trucks, have storage containers that are used to store and transport solid materials, such as seeds, grains and granular or powdered materials, and liquids, such as chemicals and food stuffs, between different locations. For example, bulk transport vehicles are used to transport bulk solid materials from a manufacturer to a processing plant.

[0003] During transport, the bulk solid materials may move or shift within the storage containers and impact the inner surfaces of the walls of the storage containers. The bulk solid materials may also impact the inner surfaces of the storage containers during loading and unloading of these vehicles. Over time, the repeated impact of the bulk solid materials on the walls may cause wear and/or damage to the walls of the storage containers and compromise the structural integrity of the walls. Also, the impact of the bulk solid materials on the walls may cause a coating, such as a sealant, on the inner surfaces of the walls to chip or flake, where the chips and/or flakes will mix with the bulk solid materials in the storage containers, which decreases the quality and consistency of the bulk solid materials.

[0004] A method for inspecting the inner surfaces of the walls is to have a person physically enter each of the storage containers through an access opening or hatch. Once inside, the person visually inspects the inner surfaces of the walls and documents any dust and/or residual product on the inner surfaces of the walls and the wear and/or damage to the walls. The person may also take pictures or video of the walls using an imaging device, such as camera. Any dust, residual product, wear and/or damage found on the inner surfaces of the walls of the storage containers is then removed and/or repaired.

[0005] An issue with the conventional inspection system is that the coating covering the inner surfaces of the walls in the storage containers is typically a uniform color. The uniform color of the protective coating makes it difficult to detect variances on the walls such as wear and/or damage on the inner surfaces of the walls either visually or with cameras. Another issue with the conventional inspection system is that physically inspecting the interior of each storage container of bulk transport vehicles is that physically entering each storage container by a person requires a significant amount of time. This leads to transportation and processing delays, which increases transportation and processing costs.

[0006] Therefore, it is desirable to provide an automated inspection system for storage containers of bulk transport vehicles that efficiently and accurately inspects the storage containers.

SUMMARY

[0007] The present imaging system is an automated, self-contained imaging system that effectively and efficiently takes images of the inner surfaces of the walls of storage containers of bulk transport vehicles to provide detailed information on the cleanliness and structural integrity of the walls.

[0008] In an embodiment, an imaging unit is provided and placed in an access opening of a storage container of a transport vehicle, where the imaging unit includes a mounting assembly including an upper member and a mounting arm extending from the upper member, the upper member configured to rotate the mounting arm about a longitudinal axis and a camera unit rotatably attached to the mounting arm and configured to rotate about a lateral axis that is transverse to the longitudinal axis, where the camera unit is rotated about the longitudinal axis and the lateral axis to a designated position within the storage container and takes at least one image of the inner surfaces of the storage container.

[0009] In another embodiment, an imaging unit is provided and placed in an access opening of a storage container of a transport vehicle, where the imaging unit includes a mounting assembly including an upper member having a top wall and a base member rotatably attached to the top wall, a mounting arm extending transversely from the base member, the base member configured to rotate the mounting arm about a longitudinal axis, a camera unit rotatably attached to the mounting arm and configured to rotate about a lateral axis that is transverse to the longitudinal axis, the camera unit includes at least one lens and a pair of lidar sensors positioned on opposing sides of the at least one lens and a controller in communication with the base member and the camera unit, the controller being configured to rotate the base member and the camera unit and control the operation of the camera unit, where the camera unit is rotated about the longitudinal axis and the lateral axis to a designated position within the storage container and takes at least one image of the inner surfaces of the storage container.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a side view of a transport vehicle with a wall removed showing an embodiment of the present imaging unit mounted in the access openings of the storage containers of the transport vehicle.

[0011] FIG. **2** is an end view of the transport vehicle of FIG. **1** where the end wall of the transport vehicle is removed.

[0012] FIG. **3** is a right side perspective view of the imaging unit shown in FIGS. **1** and **2**.

[0013] FIG. **4** a right side view of the imaging unit of FIG. **3**.

[0014] FIG. **5** is a front view of the imaging unit of FIG. **3**.

[0015] FIG. **6** is a left side perspective view of the imaging unit of FIG. **3**.

[0016] FIG. **7** a left side view of the imaging unit of FIG. **3**.

[0017] FIG. **8** is a rear view of the imaging unit of FIG. **3**.

[0018] FIG. **9** is an exploded perspective view of the imaging unit of FIG. **3**.

[0019] FIG. **10** is another exploded perspective view of the imaging unit of FIG. **3**.

[0020] FIG. **11** is a perspective view of an embodiment of the camera unit of the imaging unit of FIG. **3**.

[0021] FIG. **12** is a perspective view of the camera unit of FIG. **11** with a wall removed from the camera unit.

[0022] FIG. **13** is an exploded perspective view of an embodiment of a drive assembly mounted inside the base member of FIG. **3**.

[0023] FIG. **14** is an exploded perspective view of the drive assembly of FIG. **13**.

[0024] FIG. **15** is an exploded perspective view of another embodiment of the drive assembly mounted inside the base member of FIG. **3**.

[0025] FIG. **16** is an exploded perspective view of the drive assembly of FIG. **15** mounted inside the camera unit.

DETAILED DESCRIPTION

[0026] FIGS. **1** and **2** show an imaging system including an imaging unit generally indicated by **20**, mounted in at least one of the access openings **22** of storage containers **24** of a bulk transport vehicle **26**, such as a railcar, a truck or other transport vehicle, where the imaging unit **20** moves in multiple directions and takes one or more images of each inner surface of the walls of the storage containers **24**. In an embodiment, the images taken by the imaging unit **20** are high resolution digital images but it is contemplated that other types of images may be taken. The image or images taken by the imaging unit **20** are used to determine the cleanliness of the storage containers **24**, i.e., if any product and/or dust on the inner surfaces of the walls is below a predetermined residual product limit and/or dust limit, and/or to check the structural integrity of the walls of the storage containers **24**, i.e., detect wear and/or damage to the inner surfaces of the walls. In operation, the imaging unit **20** moves in multiple directions within the storage containers to take images of the inner surfaces of the top wall, side walls and/or bottom wall or bottom walls of the storage containers **24** to efficiently inspect the walls without requiring a person to physically enter the storage container or storage containers of a bulk transport vehicle.

[0027] Referring now to FIGS. **3** to **14**, the imaging unit **20** includes a mounting assembly **28** and a camera unit **30** movably attached to the mounting assembly. The mounting assembly **28** includes an support member **32** that is placed on and engages a top wall **34** surrounding an access opening **22** of one or more of the storage containers **24** of a bulk transport vehicle **26** or other vehicle and supports the imaging unit lowered into the access openings. As shown, the support member **32** includes a base member **36** having a housing **38** and a top planar plate **40** with a generally circular shape attached to the housing, where a diameter of the plate **40** is greater than a length and/or a width of the housing **38** so that the plate **40** extends outwardly from the outermost edges of the housing. As described below, the base member **36** is movably attached to the plate **40** and is configured to move or rotate 360 degrees in a clockwise or in a counterclockwise direction relative to the plate **40**. A pair of handles **42** are spaced apart and attached to an upper surface of the plate **40** to enable a person or a lifting machine to grab the handles and move and/or manipulate the position of the imaging unit **20** relative to and in an access opening **22** of one or more of the storage containers **24**. For example, the handles **42** may be used to grasp and mount the imaging unit **20** in an access opening **22** or grasp and remove the imaging unit **20** from an access opening **22** of a storage container **24**. A mounting arm **44** extends transversely to the plate **40** where a first end **46** of the mounting arm **44** is attached to the housing **38** of the base member **36** and an opposing, second end **48** of the mounting arm is attached to the camera unit **30**.

[0028] Referring to FIG. **9**, the mounting arm **44** includes a top wall **50**, opposing sidewalls **52**, a bottom wall **54** and a generally planar base wall **56** where the top wall, the sidewalls and the bottom wall are attached to the base wall by fasteners or welding and extend from the base wall. The base wall **56** includes a first opening **58** that is aligned with a corresponding opening **60** in the base member **36** and a second opening **62** that is aligned with a corresponding opening **64** in the camera unit **30**. A plurality of circuit boards **66** and/or electrical connectors **68** are attached to an inner surface of the base wall **56** and configured to communicate with the camera unit **30** to control the movement of the camera unit relative to the top wall of the base member **36** and to the mounting arm **44**, and control the operation of the camera unit **30**. A cover **70** is removably attached to the top wall **50**, the sidewalls **52** and the bottom wall **54** of the mounting arm **44** by fasteners and enables a person to access the interior of the mounting arm **44**.

[0029] Referring to FIGS. **10** to **12**, an embodiment of the camera unit **30** is shown where the camera unit **30** includes a housing **72** defining an interior space where the housing has a front wall **74**, opposing sidewalls **76**, a rear wall **78** and a top wall **80** and a cover **81** that are connected together by fasteners, welding or other suitable attachment method. The front wall **74** of the camera unit **30** includes a central member **82** and a plurality of recessed areas **84** on each side of the central member where the recessed areas each have a generally rectangular shape. As shown, the central member **82** includes an imaging lens **86** and a light source **88**. The imaging lens **86** is part of a digital camera located within the camera unit **30**, where the digital camera that takes high resolution images of the inner surfaces of the walls of the storage containers **24**. It should be appreciated that the camera unit **30** may have a single lens and camera or a plurality of lenses and cameras. Also, the light source **88** may be any suitable lighting device and emits a light that illuminates the interior space of the storage container **24**. In an embodiment, the light source **88** emits diffused light but it is contemplated that the light source may emit other types of light.

[0030] As shown in FIG. **5**, two lidar sensors **90** are positioned on opposing sides of the central member **82** to determine a distance from the camera unit **30** and more specifically, the imaging lens **86**, to a designated inner surface of the walls of a storage container **24**. The measured distance is used to adjust the focus of the imaging lens or imaging lenses **86** of the camera unit **30** in real time. It should be appreciated that the camera unit **30** may have one or a plurality of the lidar sensors **90**. In operation, each lidar sensor **90** emits pulsed light waves toward a designated surface inside the storage containers **24**, where the pulsed light bounces off a designated surface and the reflected light returns to the lidar sensors. Each lidar sensor **90** uses the time it took for each pulsed light to return to the lidar sensor to calculate the distance that the pulsed light traveled, which is used to adjust the focus of the imaging lens or lenses **86** of camera unit **30** and the level or amount of light emitted by the light source **88** within each storage container **24** to optimize the precision and clarity of the images taken by the camera unit **30**.

[0031] In the illustrated embodiment, a pair of handles **92** are located on opposing sides of the central member **82** where each handle has a generally trapezoidal shape with a central opening **94** and openings **96** on each side of the central opening. The handles **92** enable a person to grasp the camera unit **30** for mounting the camera unit on the mounting arm **44**, grasp the camera unit **30** for removing the camera unit from the mounting arm **44** for maintenance or replacement and/or for manually moving the camera unit **30** to desired position relative to the walls of the storage containers **24**.

[0032] As shown in FIGS. **9** and **12**, the inner surface **98** of at least one of the sidewalls **76** of the camera unit **30** includes a circuit board **100** and/or electronic devices **102** configured to control the movement and operation of the camera unit **30**. Additionally, a camera movement mechanism **104** is attached to an inner surface **106** of the rear wall **78** of the housing **72** and controls the movement of the camera unit **30** relative to the mounting arm **44**.

[0033] In the illustrated embodiment, the camera movement mechanism **104** includes a rotation assembly **106** and a gear assembly **108** in communication with the circuit board **100** via electrical wiring or electrical cables. As shown, the rotation assembly **106** includes a first mounting member **110** and a second mounting member **112** that is rotatably attached to the first mounting member. The first mounting member **110** has a cylindrical body **114** and a flange **116** extending transversely from the body. As shown in FIGS. **9** and **12**, the body **114** extends through the opening in the mounting arm **44** so that the flange **116** engages the inner surface of the bottom wall **54** of the mounting arm **44**. The flange **116** includes a plurality of spaced holes **118** configured to receive fasteners to secure the flange **116** and thereby the first mounting member **110** to the mounting arm **44**. The second mounting member **112** has a cylindrical body **120** and a flange **122** extending transversely from the body. The body **120** of the second mounting member **112** is rotatably coupled to the first mounting member **110** so that the second mounting member rotates 360 degrees relative to the first mounting member **110**.

[0034] To rotate the camera unit **30** relative to the mounting arm **44**, the gear assembly **108** including a cylindrical drive gear **122** mounted to the second mounting member **112** using fasteners or other suitable attachment method, where the drive gear **122** includes a ring body **124** with a central opening **126** and a plurality of teeth **128** extending transversely from a peripheral outer surface of the ring body. The drive gear **122** is driven by a worm gear assembly **130** mounted to the inner surface of the rear wall **78** of the housing **72** where the worm gear assembly includes a worm gear member **132**, a first end mount **134** and a second end mount **136**. The worm gear member **132** has a shaft **138** with spiral threads **140** and a first end post **142** rotatably mounted to the first end mount **134** and a second end post **144** rotatably mounted to the second end mount **136**. The first end mount **134** includes a motor, such as an electric motor, that is coupled to the first end post **142** of the worm gear member **132** and in communication with the circuit board **100**. The motor rotates the first end post **142** and in turn, the worm gear member **132** at a predetermined rotational speed, where the rotational speed is controlled via the circuit board **100**. As shown, the spiral threads **140** of the worm gear member **132** engage the teeth **128** on the drive gear **122** so when the worm gear member rotates, the spiral threads **140** cause the drive gear **122** to move in a clockwise or counterclockwise direction. It should be appreciated that the worm gear member **132** may rotate in a clockwise and/or counterclockwise direction to correspondingly move the drive gear **122** in a clockwise and/or counterclockwise direction.

[0035] Referring to FIGS. **3**, **13** and **14**, the base member **36** includes the housing **146** where the housing has a top wall **148** and a plurality of sidewalls **150** attached together by fasteners, welding or other suitable attachment method. The top wall **148** includes a central opening **152** that is in communication with the interior space of the housing **146**. A bottom wall or cover **154** is removably attached to the sidewalls **150** of the housing **146** by fasteners. A drive assembly including a rotation unit **156** is mounted to an inner surface of the top wall **148** and is in the interior space of the housing **146**. The rotation unit **156** includes a first ring member **158** having a first opening **160** where the first ring member is attached to the inner surface of the top wall **148** of the housing **146** by fasteners, and a second ring member **162** having the same size and shape as the first ring member **158** where the second ring member is attached to the first ring member by fasteners. The first ring member **158** and the second ring member **162** define an interior space when the first ring member and the second ring member are attached together. A rotating member **164** is positioned in the interior space between the first ring member **158** and the second ring member **162** and is configured to rotate 360 degrees relative to the first ring member and the second ring member.

[0036] In the illustrated embodiment, the rotating member **164** includes a body **166** having an upper projecting wall **168** and a lower projecting wall **170**. A bearing member **172** having a plurality of bearings is attached to the body **166** of the rotating member between the upper projecting wall **168** and the lower projecting wall **170** as shown in FIG. **14**. Specifically, the bearing member **172** includes two rows of bearings where one of the rows of bearings engages a corresponding groove **174** on the inner surface of the upper projecting wall **168** and the other row of bearings engages a corresponding groove **176** on the inner surface of the lower projecting wall **170**. In operation, the bearing member **172** helps to facilitate movement or rotation of the rotating member **164** relative to the first ring member **158** and the second ring member **162**.

[0037] The upper projecting wall **168** is attached to the top wall **148** of the housing **146** by fasteners and the lower projecting wall **170** is attached to a gear assembly **178**. The gear assembly **178** includes a drive gear **180** having a plurality of teeth **182** extending transversely from a peripheral surface of the drive gear, and a worm gear member **184**. The worm gear member **184** includes a worm gear **186** having a shaft **188** with spiral threads **190** and a first end **192** and an opposing second end **194**. The first end **192** includes a first gear mount **196** attached to the top wall **148** by fasteners and the second end **194** includes a second gear mount **198** attached to the top wall **148** by fasteners. The first end **192** and the second end **194** of the worm gear member **184** are each rotatably attached to the first gear mount **196** and the second gear mount **198** so that the worm gear member (shaft with spiral threads) rotates relative to the first end mount and the second end mount. A motor, such as an electric motor **200**, is coupled to the second end **194** of the shaft **188** and rotates the worm gear member **184** in a clockwise direction and/or a counterclockwise direction. As shown, the spiral threads **190** of the worm gear member **184** engage the teeth **182** of the drive gear **180** so that rotation of the worm gear member **184** simultaneously rotates the drive gear. Similar to the worm gear member **184**, the drive gear **180** rotates in a clockwise direction and/or a counterclockwise direction.

[0038] A battery pack **202** is attached to the outer surface of the top wall **148** of the housing **146** and provides power to the imaging unit **20**, namely the circuit boards and all electronics of the imaging unit, and specifically provides power to the gear assemblies that rotate the camera unit **30** in multiple directions. The battery pack **202** may be any suitable battery device including a rechargeable battery pack.

[0039] In an embodiment, imaging unit **20** includes a controller (not shown) that controls the movement and operation of the camera unit **30**. The controller **202** may be a computer or any suitable control unit or processor. In the illustrated embodiment, the controller **202** includes a single board computer (SBC) that controls the various circuits and sub-circuits of the imaging unit **20**, such as the camera unit **30**, lens actuators, light source **88**, lidar sensors **90** and servo controller, via a plurality of communication busses such as a Universal Serial Bus (USB), Inter Integrated Circuit/Bus (I2C), Serial/Parallel Interface (SPI), Low Voltage Differential Signaling (LVDS) and direct general purpose inputs/outputs and/or General Purpose Inlets/Outlets (GPIOs).

[0040] In operation, the imaging unit **20** is manually placed, in a specific orientation, in an access hatch or access opening **22** of one of the storage containers **24** of a transport vehicle **26** so that the support member **32** of the mounting assembly **28** is supported by the wall **34** surrounding the access opening **22**. Once the imaging unit **20** is in position, the housing **38** of the imaging unit is suspended inside the storage container **24** and free to rotate 360 degrees in multiple directions. Once mounted, an operator starts the imaging unit **20** via a wireless tablet or remote control panel. The camera unit **30** is rotated about a longitudinal axis and/or about a lateral axis that is substantially transverse to the longitudinal axis, to a desired position. The camera unit **30** then takes a series of digital photographs of an inner surface or multiple inner surfaces of the walls of the storage container **24** following a predetermined pattern based on the geometry of the storage container. In this way, the camera unit **30** produces high resolution digital images of the inner surfaces of the storage container **24** that are of the same resolution and same scale regardless of the distance that the camera unit **30** is from the inner surfaces of the walls of the storage container **24** when photographed from a single point. This is achieved by using multiple imaging lenses **86**, adjustable diffused light from one or more light sources **88** and lidar sensors **90** as described above. Specifically, the lidar sensors **90** are positioned on opposing sides of the imaging lens or imaging lenses **86**. The imaging lens or imaging lenses **86** of the camera unit **30** are then rotated as described above to face one or more of the inner surfaces of the walls of the storage container **24** as shown in FIGS. **1** and **2**. The lidar sensors **90** are then activated and an average distance from each imaging lens **86** to the inner surfaces of the wall or walls of the storage container **24** is determined to adjust the focus of the selected imaging lens or imaging lenses and to also adjust the amount of light emitted by the light source **88** to optimize the clarity of the images taken by the camera unit **30**. In this way, the present imaging unit **20** overcomes conventional camera autofocus processors' that are unable to sufficiently focus on near featureless and indistinguishable surfaces of the storage container because the interior spaces of railcars, trucks, tanks and storage containers are smooth with little to no color variations and varying light levels.

[0041] Referring to FIGS. **15** and **16**, another embodiment of a drive system **202** is shown where the drive system may be used to rotate the base member **36** relative to the top plate **40** and thereby the mounting arm **44** about the longitudinal axis and to rotate the camera unit **30** relative to the mounting arm **44** and about the lateral axis as described above.

[0042] In the illustrated embodiment, the drive system **202** includes a rotating member (not shown) similar to the rotating member **164** described above, where the rotating member includes a body having an upper projecting wall and a lower projecting wall. A bearing member (not shown) is attached to the body of the rotating member between the upper projecting wall **203** and the lower projecting wall. In operation, the bearing member helps to facilitate movement or rotation of the rotating member relative to a first ring member **204** and a second ring member **206**.

[0043] The upper projecting wall **203** is attached to the top wall **208** of the housing **210** by fasteners and the lower projecting wall is attached to a drive gear **212** having an annular groove **214** extending about the peripheral surface of the drive gear, and a belt **216** seated in the groove **214**. A belt drive **218** is configured to engage the belt **216** under tension and rotate the belt **216** and simultaneously rotate the drive gear **212**. The belt drive **218** includes a housing **220** with a shaft **222** having a first end **224** extending outwardly from the housing and in engagement with the belt **216**, and a second end **226** coupled to a motor, such as an electric motor **228**. The motor **228** is activated and rotates the shaft **222** where the motor may be any suitable motor.

[0044] While particular embodiments of the present imaging system are shown and described, it will be appreciated by those skilled in the art that changes and modifications may be made thereto without departing from the invention in its broader aspects and as set forth in the following claims.

Claims

1. An imaging unit placed in an access opening of a storage container of a transport vehicle, the imaging unit comprising: a mounting assembly including an upper member and a mounting arm extending from the upper member, the upper member configured to rotate the mounting arm about a longitudinal axis; and a camera unit rotatably attached to the mounting arm and configured to rotate about a lateral axis that is transverse to the longitudinal axis, wherein the camera unit is rotated about the longitudinal axis and the lateral axis to a designated position within the storage container and takes at least one image of the inner surfaces of the storage container.
2. The imaging unit of claim 1, wherein the upper member includes a top wall and a base member rotatably attached to the top wall, the mounting arm being attached to the base member.
3. The imaging unit of claim 1, wherein the mounting arm rotates 360 degrees about the longitudinal axis.
4. The imaging unit of claim 3, wherein the camera unit rotates 360 degrees about the lateral axis.
5. The imaging unit of claim 1, wherein the mounting arm rotates in a clockwise direction and a counterclockwise direction.
6. The imaging unit of claim 1, wherein the camera unit rotates in a clockwise direction and a counterclockwise direction.
7. The imaging unit of claim 1, wherein the camera unit includes at least one lens and two lidar sensors, the lidar sensors being on opposing sides of the lens.
8. The imaging unit of claim 7, wherein the camera unit includes at least one additional lens.
9. The imaging unit of claim 1, wherein the upper member of the mounting assembly includes two handles.
10. An imaging unit placed in an access opening of a storage container of a transport vehicle, the imaging unit comprising: a mounting assembly including an upper member having a top wall and a base member rotatably attached to the top wall; a mounting arm extending transversely from the base member, the base member configured to rotate the mounting arm about a longitudinal axis; and a camera unit rotatably attached to the mounting arm and configured to rotate about a lateral axis that is transverse to the longitudinal axis, the camera unit includes at least one lens and a pair of lidar sensors positioned on opposing sides of the at least one lens; and a controller in communication with the base member and the camera unit, the controller being configured to rotate the base member and the camera unit and control the operation of the camera unit, wherein the camera unit is rotated about the longitudinal axis and the lateral axis to a designated position within the storage container and takes at least one image of the inner surfaces of the storage container.
11. The imaging unit of claim 10, wherein the mounting arm rotates 360 degrees about the longitudinal axis.
12. The imaging unit of claim 11, wherein the camera unit rotates 360 degrees about the lateral axis.
13. The imaging unit of claim 10, wherein the mounting arm rotates in a clockwise direction and a counterclockwise direction.
14. The imaging unit of claim 13, wherein the camera unit rotates in a clockwise direction and a counterclockwise direction.
15. The imaging unit of claim 10, wherein the camera unit includes at least one additional lens.
16. The imaging unit of claim 1, wherein the top wall of the upper member of the mounting assembly includes two handles.