ATTACHMENT UNIT FOR INSTALLING IMAGING APPARATUS IN VEHICLE

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Filed: Sep. 21, 2006

The invention provides an attachment unit for installing a video camera in various vehicles. This attachment unit prevents a mount from rotating together with an arm. The attachment unit includes a mount secured to a hook member for a sun visor, an arm attached to the mount, and an attachment table attached to a tip end of the arm. Herein, the arm is rotatable about a first vertical axis with respect to the mount. An attachment hole is formed in a base end of the mount, and includes a square main hole and irregularities each formed around the main hole. The attachment hole is formed into a shape such that fitting parts of various hook members are fitted thereinto.
FIG. 17

PRIOR ART
ATTACHMENT UNIT FOR INSTALLING IMAGING APPARATUS IN VEHICLE

BACKGROUND OF THE INVENTION

[0001] (1) Field of the Invention

The present invention relates to an attachment unit for installing an imaging apparatus such as a video camera in a vehicle such as a squad car.

[0002] (2) Description of the Related Art

In recent years, a video camera is installed in a vehicle such as a squad car, and a police officer records an image in order to enforce a crackdown on a person who violates traffic regulations. As illustrated in FIGS. 17 and 18, for example, an attachment unit 102 is used for installing a video camera 101 in a vehicle. The attachment unit 102 includes a mount 103, an arm 104 attached to the mount 103, and an attachment table 105 attached to a tip end of the arm 104. The arm 104 is rotatable about a vertical axis 106 with respect to the mount 103. Herein, the video camera 101 is attached to the attachment table 105. A circular attachment hole 107 is formed in a base end of the mount 103.

[0003] As illustrated in FIG. 19, a pair of sun visors 109 for shielding sunlight are provided side by side at a front side of a ceiling 108 of the vehicle. Each sun visor 109 can be pivoted about a shaft 110 provided at its outward end. An engagement piece 111 is provided at an inward end of a sun visor 109, and can be engaged with/detached from a hook member 113 fastened to the ceiling 108 with a screw 112.

[0004] As illustrated in FIG. 18, the hook member 113 includes a pedestal part 114, a hooking part 115 formed under the pedestal part 114, and a fitting part 116 protruding upward from the pedestal part 114. As illustrated in FIG. 17, the ceiling 108 is provided with a ceiling frame 118 having a screw hole (not illustrated) formed therein.

[0005] The fitting part 116 of the hook member 113 is fitted into the attachment hole 107 in the mount 103 from below. The screw 112 is inserted into the hook member 113 and, then, is screwed into the screw hole of the ceiling frame 118. Thus, as illustrated in FIG. 17, both the hook member 113 and the mount 103 are fastened to the ceiling frame 118 with the screw 112, that is, are secured to the ceiling 108.

[0006] As illustrated in FIG. 17, the video camera 101 is directed forward, so that an image of a forward scene can be captured in the vehicle. Further, when the arm 104 is allowed to rotate by 180° about the vertical axis 106 with respect to the secured mount 103, the video camera 101 is directed rearward, so that an image of a rearward scene can be captured in the vehicle.

[0007] JP10-288811A discloses a unit used for attaching a camera to a tripod.

[0008] However, the attachment unit 102 illustrated in FIG. 18 has the following problem. That is, the attachment hole 107 in the mount 103 is formed into a circular shape. Consequently, if the arm 104 is allowed to rotate about the vertical axis 106 so as to change the direction of the video camera 101, the mount 103 disadvantageously rotates together with the arm 104.

[0009] In order to prevent the mount 103 from rotating, the attachment hole 107 in the mount 103 is not formed into a circular shape, but is formed into a shape identical to that of the fitting part 116 of the hook member 113, in other words, an irregular shape.

[0012] However, the shape of the fitting part 116 of the hook member 113 differs for each type of a vehicle. More specifically, an attachment hole 107 in a mount 103, formed in accordance with a shape of the fitting part 116 of a hook member 113 for a certain type of a vehicle, cannot be used for a fitting part 116 of a hook member 113 for another type of a vehicle. Consequently, there arises a problem that the fitting part 116 of the hook member 113 cannot be fitted into the attachment hole 107 in the mount 103, so that the mount 103 cannot be secured to the ceiling 108.

SUMMARY OF THE INVENTION

[0013] An object of the present invention is to provide an attachment unit for installing an imaging apparatus in a vehicle. This attachment unit can prevent a mount from rotating together with an arm, and can be used for various types of vehicles.

[0014] In order to accomplish this objective, according to a first aspect of the present invention, an attachment unit is used for installing an imaging apparatus in a vehicle by means of a hook member for a sun visor fastened to a ceiling of the vehicle with a screw. The hook member includes a pedestal part, a hooking part formed under the pedestal part and a fitting part protruding upward from the pedestal part. The fitting part includes a fastening portion having a screw hole for attachment formed therein and rotation locking pieces each formed on an outer periphery of the fastening portion. The attachment unit comprises a mount secured to the hook member, an arm attached to the mount, and an attachment table attached to a tip end of the arm. The arm rotates about a vertical axis with respect to the mount. The imaging apparatus is attached to the attachment table. The mount includes an attachment hole formed in a base end thereof. The attachment hole includes a main hole into which at least the fastening portion of the hook member is fitted, and abutment portions each formed on an outer periphery of the main hole in correspondence with rotation locking pieces of various hook members such that at least one of the rotation locking pieces of the various members abuts against the abutment portions. The outer periphery of the main hole prevents the rotation locking pieces from being disengaged from the abutment portions.

[0015] With this configuration, the fitting part of the hook member is fitted into the attachment hole in the mount from below. Then, a screw is inserted into the fastening portion of the fitting part, so that the hook member is fastened to the ceiling with the screw. Thus, both the hook member and the mount are secured to the ceiling.

[0016] When the arm is allowed to rotate about the vertical axis with respect to the mount, a direction of the imaging apparatus can be changed. Herein, the attachment hole is not formed into a circular shape, and includes the main hole into which at least the fastening portion of the hook member is fitted, and the abutment portions each formed on the outer periphery of the main hole in correspondence with rotation locking pieces of various hook members such that at least one of the rotation locking pieces of the various hook members abuts against the abutment portions. Further, the outer periphery of the main hole prevents the rotation
locking pieces from being disengaged from the abutment portions. Therefore, both the mount and the hook member are secured to the ceiling; thus, the mount can be prevented from rotating together with the arm.

[0017] In addition, the abutment portions are formed on the outer periphery of the main hole of the attachment hole in correspondence with the rotation locking pieces of the various hook members such that at least one of the rotation locking pieces of the various hook members abuts against the abutment portions. Further, the outer periphery of the main hole prevents the rotation locking pieces from being disengaged from the abutment portions. Therefore, the attachment unit can be used for all types of vehicles. Thus, an imaging apparatus can be installed in all types of vehicles by means of one type of attachment unit.

[0018] According to a second aspect of the present invention, an attachment unit is used for installing an imaging apparatus in a vehicle by means of a hook member for a sun visor fastened to a ceiling of the vehicle with a screw. The hook member includes a pedestal part, a hooking part formed under the pedestal part and a fitting part protruding upward from the pedestal part. The fitting part includes a fastening portion having a screw hole for attachment formed therein and rotation locking pieces each formed on an outer periphery of the fastening portion. The attachment unit comprises a mount secured to the hook member, an arm attached to the mount, and an attachment table attached to a tip end of the arm. The arm rotates about a vertical axis with respect to the mount. The imaging apparatus is attached to the attachment table. The mount includes an attachment hole formed in a base end thereof. The mount includes a main body, and mount replacement parts each engaged with/disengaged from the mount main body and each having an attachment hole formed therein. The mount replacement parts are provided in correspondence with fitting parts of various hook members. The attachment holes of the mount replacement parts are formed in accordance with shapes of the fitting parts of the hook members.

[0019] With this configuration, the fitting part of the hook member is fitted into the attachment hole in the mount from below. Then, a screw is inserted into the fastening portion of the fitting part, so that the hook member is fastened to the ceiling with the screw. Thus, both the hook member and the mount are secured to the ceiling.

[0020] When the arm is allowed to rotate about the vertical axis with respect to the mount, a direction of the imaging apparatus can be changed. Herein, the rotation locking pieces of the hook member are fitted into the attachment hole in the mount; therefore, both the mount and the hook member are secured to the ceiling. Thus, the mount can be prevented from rotating together with the arm.

[0021] In addition, one mount replacement part is detached from the mount main body and, then, another mount replacement part is attached to the mount main body; thus, a shape of an attachment hole can be changed in accordance with a type of a vehicle. Accordingly, the attachment unit can be used for all types of vehicles. Herein, one type of mount main body taking a part of a mount can be used.

[0022] According to the first aspect of the present invention, as described above, even when the arm is allowed to rotate about the vertical axis, the mount can be prevented from rotating together with the arm. In addition, the attachment hole includes the main hole into which at least the fastening portion of the hook member is fitted, and the abutment portions formed on the outer periphery of the main hole in correspondence with rotation locking pieces of various hook members such that at least one of the rotation locking pieces of the various hook members abuts against the abutment portions. Further, the outer periphery of the main hole prevents the rotation locking pieces from being disengaged from the abutment portions. Therefore, the attachment unit can be used for all types of vehicles. Thus, an imaging apparatus can be installed in all types of vehicles by means of one type of attachment unit. This leads to cost reduction and the like.

[0023] According to the second aspect of the present invention, even when the arm is allowed to rotate about the vertical axis, the mount can be prevented from rotating together with the arm. In addition, by replacement of a mount replacement part, a shape of an attachment hole can be changed in accordance with a type of a vehicle. Accordingly, the attachment unit can be used for all types of vehicles. Herein, one type of mount main body taking a part of a mount can be used. This leads to cost reduction and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. 1 is a side view illustrating a squad car having a video camera installed therein by means of an attachment unit according to a first embodiment of the present invention;

[0025] FIG. 2 is a perspective view illustrating the attachment unit according to the first embodiment;

[0026] FIG. 3A is a bottom view illustrating a hook member for a squad car of type A in the first embodiment;

[0027] FIG. 3B is a side view illustrating the hook member for the squad car of type A in the first embodiment;

[0028] FIG. 3C is a plan view illustrating a ceiling frame for the squad car of type A in the first embodiment;

[0029] FIG. 4A is a bottom view illustrating a hook member for a squad car of type B in the first embodiment;

[0030] FIG. 4B is a side view illustrating the hook member for the squad car of type B in the first embodiment;

[0031] FIG. 4C is a plan view illustrating a ceiling frame for the squad car of type B in the first embodiment;

[0032] FIG. 5A is a bottom view illustrating a hook member for a squad car of type C in the first embodiment;

[0033] FIG. 5B is a side view illustrating the hook member for the squad car of type C in the first embodiment;

[0034] FIG. 5C is a plan view illustrating a ceiling frame for the squad car of type C in the first embodiment;

[0035] FIG. 6A is a bottom view illustrating a hook member for a squad car of type D in the first embodiment;

[0036] FIG. 6B is a side view illustrating the hook member for the squad car of type D in the first embodiment;

[0037] FIG. 6C is a plan view illustrating a ceiling frame for the squad car of type D in the first embodiment;
FIG. 7A is a bottom view illustrating a hook member for a squad car of type E in the first embodiment;

FIG. 7B is a side view illustrating the hook member for the squad car of type E in the first embodiment;

FIG. 7C is a plan view illustrating a ceiling frame for the squad car of type E in the first embodiment;

FIG. 8A is a bottom view illustrating a hook member for a squad car of type F in the first embodiment;

FIG. 8B is a side view illustrating the hook member for the squad car of type F in the first embodiment;

FIG. 8C is a plan view illustrating a ceiling frame for the squad car of type F in the first embodiment;

FIG. 9A is a perspective view illustrating a mount of the attachment unit according to the first embodiment;

FIG. 9B is a side view illustrating the mount of the attachment unit according to the first embodiment;

FIG. 9C is a plan view illustrating the mount of the attachment unit according to the first embodiment;

FIG. 10A is a plan view illustrating a state that a fitting part of the hook member for the squad car of type A is fitted into an attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 10B is a plan view illustrating a state that a fitting part of the hook member for the squad car of type B is fitted into the attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 10C is a plan view illustrating a state that a fitting part of the hook member for the squad car of type C is fitted into the attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 10D is a plan view illustrating a state that a fitting part of the hook member for the squad car of type D is fitted into the attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 10E is a plan view illustrating a state that a fitting part of the hook member for the squad car of type E is fitted into the attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 10F is a plan view illustrating a state that a fitting part of the hook member for the squad car of type F is fitted into the attachment hole in the mount of the attachment unit according to the first embodiment;

FIG. 11 is a plan view illustrating the attachment unit according to the first embodiment;

FIG. 12A is a plan view illustrating a mount main body of an attachment unit according to a second embodiment of the present invention;

FIG. 12B is a plan view illustrating mount replacement parts of the attachment unit for the squad cars of types A to F in the second embodiment;

FIG. 13 is a sectional view taken along a line X-X in FIG. 12A;

FIG. 14 is a plan view illustrating a state that the mount replacement part for the squad car of type A is attached to the mount main body in the second embodiment;

FIG. 15 is a perspective view illustrating a mount of an attachment unit according to a third embodiment of the present invention;

FIG. 16 is a perspective view illustrating a mount of an attachment unit according to a fourth embodiment of the present invention;

FIG. 17 is a side view illustrating a squad car having a video camera installed therein by means of a conventional attachment unit;

FIG. 18 is a perspective view illustrating the conventional attachment unit; and

FIG. 19 illustrates sun visors in the squad car.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, description will be given of embodiments of the present invention with reference to the drawings.

First Embodiment

Description will be given of a first embodiment with reference to FIGS. 1 to 11.

As illustrated in FIG. 1, an attachment unit 1 is used for installing a video camera 3 (one example of an imaging apparatus) in a squad car 2 (one example of a vehicle). The attachment unit 1 is attached to a front end of a ceiling 6 of the squad car 2 by means a hook member 5 of a sun visor (see the sun visor 109 illustrated in FIG. 19). As conventionally, the sun visor can pivot about a shaft provided at its outward end. An engagement piece is provided at an inward end of the sun visor, and can be engaged with/discharged from the hook member 5.

The ceiling 6 is provided with a ceiling frame 10 having a screw hole 9 formed therein. As illustrated in FIG. 2, the hook member 5 includes a pedestal part 11, a hooking part 12 formed under the pedestal part 11, and a fitting part 13 protruding upward from the pedestal part 11, and is fastened to the ceiling frame 10 with a screw 14.

The fitting part 13 of the hook member 5 is formed into a shape differing for each type of a squad car 2. In this embodiment, for example, there are prepared six different shapes as will be described below.

As illustrated in FIGS. 3A and 3B, a fitting part 13 of a hook member 5 for a squad car 2 of type A includes an oval-shaped cylindrical fastening portion 16 having a screw hole 15 for attachment formed therein, and plural rotation locking pieces 17a to 17d each formed on an outer periphery of the fastening portion 16. The rotation locking pieces 17a, 17b and 17c located at a front side, a left side and a right side of the fastening portion 16 have upper ends each protruding higher than an upper end face of the fastening portion 16 in an upward direction. The rotation locking piece 17d located at a rear side of the fastening portion 16 has a protrusion 17e protruding higher than the upper end face of the fastening portion 16 in the upward direction. At least one of the rotation locking pieces 17a to 17d abuts against abutment portions formed on an outer periphery of a main hole 61 in a mount 51 to thereby prevent the mount 51 from rotating. The rotation locking pieces 17a to 17d for the squad
car 2 of type A have the following feature. That is, arrangement of the rotation locking pieces 17a to 17d is bilaterally symmetrical. In each of the left rotation locking piece 17b, the right rotation locking piece 17c and the rear rotation locking piece 17d, a circular protrusion is formed at a tip end of a plate extending outward.

[0069] As illustrated in FIG. 3C, a pair of front and rear holes 18a and 18c and a pair of right and left conecaves 18b and 18d are formed around the screw hole 9 as a center in a ceiling frame 10 for the squad car 2 of type A. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the rotation locking piece 17a and the protrusion 17e are fitted into the hole 18a and the hole 18c, respectively, and the rotation locking piece 17b and the rotation locking piece 17c are fitted into the conecave 18b and the conecave 18d, respectively. Thus, the hook member 5 is secured to the ceiling frame 10.

[0070] (2) As illustrated in FIGS. 4A and 4B, a fitting part 13 of a hook member 5 for a squad car 2 of type B includes a cylindrical fastening portion 21 having a screw hole 15 for attachment formed therein, and plural rotation locking pieces 22a to 22c each formed on an outer periphery of the fastening portion 21. The rotation locking piece 22a and the rotation locking piece 22b, each formed into a “Y” shape, are provided at a front side and a rear side of the fastening portion 21, respectively. The rotation locking piece 22c formed into a pin shape is provided at a rear side of the rear rotation locking piece 22b. The rotation locking portion 22a to 22c for the squad car 2 of type B have the following feature. As described above, the rotation locking piece 22a and 22b each formed into a “Y” shape protrude from the cylindrical fastening portion 21 in a longitudinal direction. The rotation locking piece 22c is formed as a circular protrusion at a tip end of a center of the rotation locking piece 22b.

[0071] As illustrated in FIG. 4C, a hole 23c is formed behind a screw hole 9 in a ceiling frame 10 for the squad car 2 of type B. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the rotation locking piece 22c is fitted into the hole 23c. Thus, the hook member 5 is secured to the ceiling frame 10.

[0072] (3) As illustrated in FIGS. 5A and 5B, a fitting part 13 of a hook member 5 for a squad car 2 of type C includes a fastening portion 26 having a screw hole 15 for attachment formed therein, and plural rotation locking pieces 27a to 27h each formed on an outer periphery of the fastening portion 26. Herein, the rotation locking pieces 27a and 27h are formed in a pair at a front side of the fastening portion 26 in a bilaterally symmetrical manner. The rotation locking pieces 27c and 27d are also formed in a pair at the front side of the fastening portion 26 in a bilaterally symmetrical manner. The rotation locking pieces 27g and 27f are formed in a pair at a rear side of the fastening portion 26 in a bilaterally symmetrical manner. More specifically, the front rotation locking pieces 27a and 27b are formed in parallel in a longitudinal direction at both sides of the fastening portion 26. The rotation locking pieces 27c and 27d are formed at outer rear sides of the rotation locking pieces 27a and 27b, respectively. The rear rotation locking pieces 27g and 27h, each formed as a protrusion, are formed at both sides of the fastening portion 26 with a space identical to that between the front rotation locking pieces 27a and 27b provided therebetween. As illustrated in FIG. 5B, the rotation locking pieces 27a to 27d, 27g and 27h are equal in height to each other. The middle rotation locking pieces 27e and 27f each formed as an almost “C”-shaped protrusion when being seen from its plane, protrude higher than the rotation locking pieces 27a to 27d, 27g and 27h in an upward direction.

[0073] As illustrated in FIG. 5C, a ceiling frame 10 for the squad car 2 of type C is attached to an opening of a main body frame 29 taking a part of a ceiling of the squad car 2 of type C. At a center of the ceiling frame 10 for the squad car 2 of type C in a longitudinal direction, a conecave 28 having a top face bowed inward is formed. The conecave 28 includes a screw hole 9 and a pair of left and right notches 30 and 31 formed at both sides of the screw hole 9 as a center. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the right rotation locking piece 27e is fitted into the notch 30 and the left rotation locking piece 27f is fitted into the notch 31. Further, outer ends of the respective front rotation locking pieces 27a to 27d and outer ends of the respective rear rotation locking pieces 27g and 27h abut against a peripheral edge 29a of the opening of the main body frame 29. Thus, the hook member 5 is secured to the ceiling frame 10.

[0074] (4) As illustrated in FIGS. 6A and 6B, a fitting part 13 of a hook member 5 for a squad car 2 of type D includes a cylindrical fastening portion 34 having a screw hole 15 for attachment formed therein, and plural rotation locking pieces 35a to 35f each formed on an outer periphery of the fastening member 34. The rotation locking pieces 35a to 35f are arranged in an “X” shape with the fastening member 34 located at a center, and are bent into an “L” shape toward a center line in a longitudinal direction such that tip ends of the rotation locking pieces 35e and 35f oppose each other and tip ends of the rotation locking pieces 35c and 35d oppose each other.

[0075] As illustrated in FIG. 6C, on a ceiling frame 10 for the squad car 2 of type D, a pair of front and rear convexes 36 and 37, each formed into a rectangular shape, are formed with the screw hole 9 located at a center. Each of the convexes 36 and 37 protrudes downward. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the front convex 36 is fitted into a space between the tip ends of the front rotation locking pieces 35a and 35b and the rear convex 37 is fitted into a space between the tip ends of the rear rotation locking pieces 35c and 35d. Thus, the hook member 5 is secured to the ceiling frame 10.

[0076] (5) As illustrated in FIGS. 7A and 7B, a fitting part 13 of a hook member 5 for a squad car 2 of type E includes a cylindrical fastening portion 40 having a screw hole 15 for attachment formed therein, and plural rotation locking pieces 41a to 41d each formed on an outer periphery of the fastening portion 40. The rotation locking pieces 41a to 41d are arranged in a cross shape with the fastening portion 40 located at a center. Each of the rotation locking pieces 41a, 41b, and 41d is provided with a protrusion protruding higher than the fastening portion 40 in an upward direction at an outer end thereof, and a similar protrusion is provided inward the rotation locking piece 41b relative to the protrusion provided at the outer end of the rotation locking piece 41b.
As illustrated in FIG. 7C, a ceiling frame 10 for the squad car 2 of type E is provided with a front hole 42a, a rear hole 42b and a left hole 42d with the screw hole 9 located at a center. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the outer end protrusion of the front rotation locking piece 41a is fitted into the front hole 42a, the outer end protrusion of the rear rotation locking piece 41b is fitted into the rear hole 42b, and the outer end protrusion of the right rotation locking piece 41d is fitted into the left hole 42d. Thus, the hook member 5 is secured to the ceiling frame 10.

As illustrated in FIGS. 8A and 8B, a fitting part 13 of a hook member 5 for a squad car 2 of type F includes a cylindrical fastening portion 45 having a screw hole 15 for attachment formed therein, four outer peripheral protruding pieces each formed on an outer periphery of the fastening portion 45 at an angle of 90°, and a pair of rotation locking pieces 46a and 46b formed at front and rear sides of the outer peripheral protruding pieces. The front rotation locking piece 46a is formed by a long piece arranged in a lateral direction, and short pieces formed at portions close to both outer ends of the long piece. The rear rotation locking piece 46b is formed into a "T" shape by a long piece arranged in the lateral direction and a piece arranged at the center of the long piece in a longitudinal direction. The piece is almost one-half of the long piece in length. Each of the rotation locking pieces 46a and 46b has an upper end protruding higher than the fastening portion 45 in an upward direction.

As illustrated in FIG. 8C, in a ceiling frame 10 for the squad car 2 of type F, rectangular holes 47a and 47b are formed at front and rear sides of the screw hole 9 as a center. When the hook member 5 is fastened to the ceiling frame 10 with a screw 14, the rotation locking piece 46a is fitted into the hole 47a and the rotation locking piece 46b is fitted into the hole 47b.

Thus, the hook member 5 is secured to the ceiling frame 10.

Next, description will be given of a configuration of the attachment unit 1.

As illustrated in FIGS. 1 and 2, the attachment unit 1 includes the mount 51 secured to the hook member 5, an arm 52 attached to the mount 51, and an attachment table 53 attached to a tip end of the arm 52.

The mount 51 includes a base end plate 51a having an attachment hole 61 formed therein, and an arm attaching plate 51b. The base end plate 51a and the arm attaching plate 51b are connected to each other with a step interposed therebetween.

The arm 52 includes a pair of divided arm pieces 52a and 52b. The arm pieces 52a and 52b are fastened to each other with a tightening tool 54 of a thumb screw type. The arm 52 is attached to the arm attaching plate 51b of the mount 51 through a rotational shaft 55, and is rotatable about a first vertical axis 56, passing through the rotational shaft 55, with respect to the mount 51. Herein, the rotational shaft 55 is provided inside the base end of the arm 52. As illustrated in FIG. 9A, the first vertical axis 56 is shifted leftward relative to a center line 57 of the mount 51 in a longitudinal direction.

As illustrated in FIG. 2, the attachment table 53 is attached to the tip end of the arm 52 through a ball shaft 58 and, therefore, is rotatable about a second vertical axis 59, passing through the ball shaft 58, with respect to the arm 52. Herein, the ball shaft 58 includes a shaft part and a sphere part, and is provided inside the tip end of the arm 52. The video camera 3 is fastened to the attachment table 53 with a screw or the like.

When the tightening tool 54 is loosened manually, the attachment table 53 can be allowed to rotate with respect to the arm 52 and the arm 52 can be allowed to rotate with respect to the mount 51. On the other hand, when the tightening tool 54 is tightened, the rotational shaft 55 and the ball shaft 58 are securely nipped by the arm pieces 52a and 52b each taking a part of the arm 52, so that the rotation of each of the attachment table 53 and the arm 52 is prevented.

The attachment hole 61 in the mount 51 is formed into a shape into which each of the fitting portions 13 of the hook members 5 for the squad cars 2 of types A to F illustrated in FIGS. 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A and 8B is fitted. More specifically, as illustrated in FIG. 9C, the attachment hole 61 includes a square-shaped main hole 61a, plural conaves 61b to 61i each formed around the main hole 61a, and plural convexes 61j and 61k. The concave 61b is formed at a front center end of the main body 61a in a lateral direction. The concaves 61c and 61f are formed at both sides of the front end of the main hole 61a. The concaves 61g, 61h and 61i are formed at a rear end of the main hole 61a. The concaves 61j and 61k are formed at both sides of a middle of the main hole 61a in a longitudinal direction. The convexes 61j and 61k are formed at the rear ends of the main hole 61a.

The conaves 61b to 61i have inner wall faces serving as abutment portions against which the rotation locking pieces of the hook member 5 abut. The rotation locking pieces of the hook member 5 are fitted into the conaves 61b to 61i, and are prevented from being disengaged from the concave abutment portions, respectively; thus, the mount 51 can be prevented from rotating. The convexes 61j and 61k have outer wall faces also serving as abutment portions against which the rotation locking pieces abut. At least two rotation locking pieces nip the convexes 61j and 61k, so that the rotation locking pieces are prevented from being disengaged from the abutment portions. Thus, the mount 51 can be prevented from rotating.

Hereinafter, description will be given of functional effects of the aforementioned configuration.

(1) In a case that the video camera 3 is installed in the squad car 2 of type A by means of the attachment unit 1, the fitting portion 13 of the hook member 5 illustrated in FIGS. 3A and 3B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 16, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

Herein, as illustrated in FIG. 10A, the fastening portion 16 of the fitting portion 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, and the pair of left and right rotation locking pieces 17b and 17c are fitted into the pair of left and right convexes 61e and 61f of the attachment hole 61, respectively.
As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape. Further, as illustrated in FIG. 10A, the rotation locking pieces 17b and 17c of the hook member 5 are fitted into the concaves 61e and 61f of the attachment hole 61, respectively. Therefore, both the mount 51 and the hook member 5 are secured to the ceiling 6; thus, the mount 51 can be prevented from rotating together with the arm 52. More specifically, the rotation locking pieces 17b and 17c abut against the abutment portions of the concaves 61e and 61f, respectively. In addition, the concave 61f is almost equal in size to the rotation locking piece 17c; therefore, the rotation locking piece 17c is fitted into the concave 61f. As a result, the rotation locking piece 17c is prevented from being disengaged from the corresponding abutment portion; thus, the mount 51 can be prevented from rotating. There is a clearance between the concave 61e and the rotation locking piece 17b. This clearance exhibits the following effect. That is, it is assumed herein that an operator forcibly allows the video camera 3 to rotate beyond its limit. Even in such a case, the operator becomes aware of excess of the limit of the video camera 3 before destruction of the hook member 5 by a feeling that the rotation locking piece 17b slightly moves within the concave 61e. Thus, the operator can stop an excessive rotation of the video camera 3.

In a case that the video camera 3 is installed in the squad car 2 of type B by means of the attachment unit 1, the fitting part 13 of the hook member 5 illustrated in FIGS. 4A and 4B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 21, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

Herein, as illustrated in FIG. 10B, the fastening portion 21 of the fitting part 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, the left and right ends of the front rotation locking piece 22a are fitted into the pair of left and right concaves 61c and 61d of the attachment hole 61, and the rear rotation locking piece 22c is fitted into the rear concave 61h of the attachment hole 61.

As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape. Further, as illustrated in FIG. 10B, the rotation locking pieces 22a of the hook member 5 is fitted into the concaves 61c and 61d of the attachment hole 61 and the rotation locking piece 22c of the hook member 5 is fitted into the concave 61h of the attachment hole 61, so that both the mount 51 and the hook member 5 are secured to the ceiling 6. Thus, the mount 51 can be prevented from rotating together with the arm 52. More specifically, the rotation locking pieces 22a and 22c of the hook member 5 abut against the abutment portions of the concaves 61c, 61d and 61h at three points, so that each rotation locking piece is prevented from being disengaged from the abutment portion. Thus, the mount 51 can be prevented from rotating.

In a case that the video camera 3 is installed in the squad car 2 of type B by means of the attachment unit 1, the fitting part 13 of the hook member 5 illustrated in FIGS. 5A and 5B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 26, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

Herein, as illustrated in FIG. 10C, the fastening portion 26 of the fitting part 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, the pair of left and right rotation locking pieces 27c and 27d formed at the front side of the fastening portion 26 are fitted into the rear concaves 61e and 61f of the attachment hole 61, the pair of left and right rotation locking pieces 27g and 27h formed at the rear side of the fastening portion 26 are fitted into the rear concaves 61g and 61f of the attachment hole 61, and the front convexes 61j and 61k of the attachment hole 61 are fitted into a space between the rotation locking pieces 27g and 27h.

As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape. Further, as illustrated in FIG. 10C, the rotation locking pieces 27c, 27d, 27g and 27h of the hook member 5 are fitted into the concaves 61c, 61f, 61g and 61j of the attachment hole 61, respectively, and the convexes 61j and 61k are fitted into the space between the rotation locking pieces 27g and 27h. Further, the tip ends of the rotation locking pieces 27c and 27h abut against the inner wall at the tip end of the main hole 61a, and the middle rotation locking pieces 27e and 27f abut against inner walls at the both sides of the main hole 61a, respectively; therefore, both the mount 51 and the hook member 5 are secured to the ceiling 6. Thus, the mount 51 can be prevented from rotating together with the arm 52.

In a case that the video camera 3 is installed in the squad car 2 of type B by means of the attachment unit 1, the fitting part 13 of the hook member 5 illustrated in FIGS. 6A and 6B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 34, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

Herein, as illustrated in FIG. 10D, the fastening portion 34 of the fitting part 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, and the respective rotation locking pieces 35a to 35d are fitted into the main hole 61a.

As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape.
Further, as illustrated in FIG. 10D, the rotation locking pieces 35a and 35b of the hook member 5 are fitted into the inner wall of the main hole 61a of the attachment hole 61; therefore, both the mount 51 and the hook member 5 are secured to the ceiling 6. Thus, the mount 51 can be prevented from rotating together with the arm 52.

[0102] (5) In a case that the video camera 3 is installed in the squad car 2 of type E by means of the attachment unit 1, the fitting part 13 of the hook member 5 illustrated in FIGS. 7A and 7B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 40, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

[0103] Herein, as illustrated in FIG. 10E, the fastening portion 40 of the fitting part 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, and the rear end of the rear rotation locking piece 41b is fitted into the rear concave 61b of the attachment hole 61.

[0104] As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape. Further, the rotation locking pieces 41a to 41d of the hook member 5 are fitted into the main hole 61a, and the rotation locking pieces 41c and 41d abut against the both side walls of the main hole 61a, respectively. When the mount 51 slides forward with respect to the hook member 5, the rotation locking piece 41b of the hook member 5 is fitted into the concave 61b of the attachment hole 61 as illustrated in FIG. 10E. Hence, both the mount 51 and the hook member 5 are secured to the ceiling 6; thus, the mount 51 can be prevented from rotating together with the arm 52.

[0105] (6) In a case that the video camera 3 is installed in the squad car 2 of type F by means of the attachment unit 1, the fitting part 13 of the hook member 5 illustrated in FIGS. 8A and 8B is fitted into the attachment hole 61 in the mount 51 from below. Then, the screw 14 is inserted into the screw hole 15 of the fastening portion 45, and is screwed into the screw hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 9B, both the hook member 5 and the mount 51 are fastened to the ceiling frame 10 with the screw 14, that is, are secured to the ceiling 6.

[0106] Herein, as illustrated in FIG. 10F, the fastening portion 45 of the fitting part 13 of the hook member 5 is inserted into the main hole 61a of the attachment hole 61, and the rear end of the ‘‘T’’-shaped rear rotation locking piece 46b is fitted into the rear concave 61b of the attachment hole 61. Further, the tip ends of the shorter pieces formed at the portions close to the both sides of the longer piece of the front rotation locking piece 46a abut against the inner wall of the main hole 61a.

[0107] As illustrated in FIG. 11, when the tightening tool 54 is loosened in order that the arm 52 is allowed to rotate about the first vertical axis 56 with respect to the mount 51, the direction of the video camera 3 can be changed. Herein, the attachment hole 61 is not formed into a circular shape. Further, as illustrated in FIG. 10F, the rotation locking piece 46b of the hook member 5 is fitted into the concave 61b of the attachment hole 61, and the tip ends of the shorter pieces formed at the portions close to the both sides of the longer piece of the rotation locking piece 46a abut against the inner wall of the main hole 61a. Therefore, both the mount 51 and the hook member 5 are secured to the ceiling 6; thus, the mount 51 can be prevented from rotating together with the arm 52.

[0108] As described in the aforementioned (1) to (6) with reference to FIGS. 10A to 10F, the attachment hole 61 in the mount 51 is formed so as to be applied to plural (six) types of the fitting parts 13 of the hook members 5. Therefore, the attachment unit 1 can be used for all of the squad cars 2 of types A to F. Accordingly, the video camera 3 can be installed in all of the squad cars 2 of types A to F by means of the attachment unit 1. This leads to effects of cost reduction and the like.

[0109] In a case that the attachment unit 1 is attached by means of the hook member 5 of the right sun visor, as shown by a solid line in FIG. 11, a room mirror 63 is located at an immediately left position of the video camera 3. A distance between the first vertical axis 56 serving as a center of rotation and the installation position of the video camera 3 is equal to the length of the arm 52. Therefore, if the arm 52 is allowed to rotate about the first vertical axis 56 so as to oppose the room mirror 63, that is, rotate in a clockwise direction, the video camera 3 moves about the first vertical axis 56. Thus, even when the room mirror 63 adjoins to the left side of the video camera 3, the video camera 3 never interferes with the room mirror 63.

[0110] In addition, a connector 3a of the video camera 3 is positioned rearward with respect to the arm attaching plate 51b of the mount 51. Further, the first vertical axis 56 is shifted leftward with respect to the center line 57 of the mounting 51. Accordingly, as shown by an imaginary line in FIG. 11, in a case that the arm 52 is allowed to rotate about the first vertical axis 56 by 180° so as to change the direction of the video camera 3, the connector 3a rotates by 180° at a position rearward the arm attaching plate 51b. Thus, a cable 3b connected to the connector 3a never interferes with the arm attaching plate 51b.

[0111] In the first embodiment, the attachment hole 61 in the mount 51 is formed in accordance with the fitting parts 13 of the hook members 5 for the squad cars 2 of six types A to F; however, the present invention is not limited thereto.

Second Embodiment

[0112] Next, description will be given of a second embodiment with reference to FIGS. 12A to 14.

[0113] A mount 51 includes a mount main body 66, and one of mount replacement parts 67a to 67f each attached to/detached from the mount main body 66 and formed into a square flat plate shape. Further, there are prepared plural (six) mount replacement parts in correspondence with the fitting parts 13 of the hook members 5 for the squad cars 2 of plural (six) types A to F illustrated in FIGS. 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A and 8B.

[0114] As illustrated in FIG. 12B, screw holes 68 are formed at four corners of each of the mount replacement parts 67a to 67f. As illustrated in FIG. 12A, a square opening 69 is formed in the mount main body 66, and each of the
mount replacement parts 67a to 67f is fittable into/remov-
able from the opening 69. At four corners of the opening 69, 
catching pieces 70 are provided for catching one of the 
mount replacement parts 67a to 67f fitted into the opening 69 
from below. A screw hole 71 is formed in each catching 
piece 70. Four countersunk screws 73 are inserted into the 
screw holes 68 of one of the mount replacement parts 67a to 67f, 
and then, are screwed into the screw holes 71 of the 
catching pieces 70, respectively. Thus, as illustrated in FIG. 
14, each of the mount replacement parts 67a to 67f is secured 
to the mount main body 66.

[0115] As illustrated in FIG. 12B, an attachment hole 72a 
is formed in the mount replacement part 67a for the 
squad car 2 of type A. The attachment hole 72a is formed in 
correspondence with the fitting part 13 of the hook member 5 
(see FIGS. 3A and 3B) for the squad car 2 of type A.

[0116] An attachment hole 72b is formed in the mount 
replacement part 67b for the squad car 2 of type B. The 
attachment hole 72b is formed in correspondence with the 
fitting part 13 of the hook member 5 (see FIGS. 4A and 4B) 
for the squad car 2 of type B.

[0117] An attachment hole 72c is formed in the mount 
replacement part 67c for the squad car 2 of type C. The 
attachment hole 72c is formed in correspondence with the 
fitting part 13 of the hook member 5 (see FIGS. 5A and 5B) 
for the squad car 2 of type C.

[0118] An attachment hole 72d is formed in the mount 
replacement part 67d for the squad car 2 of type D. The 
attachment hole 72d is formed in correspondence with the 
fitting part 13 of the hook member 5 (see FIGS. 6A and 6B) 
for the squad car 2 of type D.

[0119] An attachment hole 72e is formed in the mount 
replacement part 67e for the squad car 2 of type E. The 
attachment hole 72e is formed in correspondence with the 
fitting part 13 of the hook member 5 (see FIGS. 7A and 7B) 
for the squad car 2 of type E.

[0120] An attachment hole 72f is formed in the mount 
replacement part 67f for the squad car 2 of type F. The 
attachment hole 72f is formed in correspondence with the 
fitting part 13 of the hook member 5 (see FIGS. 8A and 8B) 
for the squad car 2 of type F.

[0121] Hereinafter, description will be given of functional 
effects in the aforementioned configuration.

[0122] (1) In a case that the video camera 3 is installed in 
the squad car 2 of type A by means of the attachment unit 1, 
as illustrated in FIG. 13, the mount replacement part 67a for 
the squad car 2 of type A is fitted into the opening 69 and, 
then, is fastened to the mount main body 66 with the 
countersunk screws 73. Thus, as illustrated in FIG. 14, the 
mount replacement part 67a for the squad car 2 of type A is 
caught by the catching pieces 70, and is secured to the mount 
main body 66.

[0123] Thereafter, the fitting part 13 of the hook member 5 
(see FIGS. 3A and 3B) for the squad car 2 of type A is fitted 
into the attachment hole 72a in the mount 51 from below. 
Then, the screw 14 is inserted into the screw hole 15 of the 
fasting portion 16, and is screwed into the screw hole 9 of the 
ceiling frame 10. Thus, as illustrated in FIG. 1, both the 
hook member 5 and the mount 51 are fastened to the ceiling 
frame 10 with the screw 14, that is, are secured to the ceiling 
6.

[0124] (2) In a case that the video camera 3 is installed in 
the squad car 2 of type B by means of the attachment unit 
1, as in a similar manner to that in the aforementioned (1), 
the mount replacement part 67b for the squad car 2 of type 
B (see FIG. 12B) is fitted into the opening 69 and, then, is 
fastened to the mount main body 66 with the countersunk 
screws 73.

[0125] Thereafter, the fitting part 13 of the hook member 
5 (see FIGS. 4A and 4B) for the squad car 2 of type B is 
fitted into the attachment hole 72b in the mount 51 from 
below. Then, the screw 14 is inserted into the screw hole 
15 of the fastening portion 16, and is screwed into the screw 
hole 9 of the ceiling frame 10. Thus, as illustrated in FIG. 1, 
both the hook member 5 and the mount 51 are fastened to 
the ceiling frame 10 with the screw 14, that is, are secured to 
the ceiling 6.

[0126] (3) In a case that the video camera 3 is installed in 
the squad car 2 of type C, as in a similar manner to that 
in the aforementioned (1), the mount replacement part 67c 
for the squad car 2 of type C (see FIG. 12B) is attached to 
the mount main body 66. Thereafter, the fitting part 13 of 
the hook member 5 (see FIGS. 5A and 5B) for the squad car 
2 of type C is fitted into the attachment hole 72c in the mount 
51 from below. Thus, both the hook member 5 and the mount 
51 are fastened to the ceiling frame 10 with the screw 14.

[0127] (4) In a case that the video camera 3 is installed in 
the squad car 2 of type D, as in a similar manner to that 
in the aforementioned (1), the mount replacement part 67d 
for the squad car 2 of type D (see FIG. 12B) is attached to 
the mount main body 66. Thereafter, the fitting part 13 of 
the hook member 5 (see FIGS. 6A and 6B) for the squad car 
2 of type D is fitted into the attachment hole 72d in the mount 
51 from below. Thus, both the hook member 5 and the mount 
51 are fastened to the ceiling frame 10 with the screw 14.

[0128] (5) In a case that the video camera 3 is installed in 
the squad car 2 of type E, as in a similar manner to that in 
in the aforementioned (1), the mount replacement part 67e 
for the squad car 2 of type E (see FIG. 12B) is attached to 
the mount main body 66. Thereafter, the fitting part 13 of 
the hook member 5 (see FIGS. 7A and 7B) for the squad car 
2 of type E is fitted into the attachment hole 72e in the mount 
51 from below. Thus, both the hook member 5 and the mount 
51 are fastened to the ceiling frame 10 with the screw 14.

[0129] (6) In a case that the video camera 3 is installed in 
the squad car 2 of type F, as in a similar manner to that in 
in the aforementioned (1), the mount replacement part 67f 
for the squad car 2 of type F (see FIG. 12B) is attached to 
the mount main body 66. Thereafter, the fitting part 13 of 
the hook member 5 (see FIGS. 8A and 8B) for the squad car 
2 of type F is fitted into the attachment hole 72f in the mount 
51 from below. Thus, both the hook member 5 and the mount 
51 are fastened to the ceiling frame 10 with the screw 14.

[0130] As described in the aforementioned (1) to (6), 
one of the mount replacement parts 67a to 67f is detached from 
the mount main body 66 and, then, another one of the mount 
replacement parts 67a to 67f is attached to the mount main 
body 66. Thus, a shape of an attachment hole can be changed 
in accordance with a type of a squad car. Accordingly, the 
attachment unit 1 can be used for all of the squad cars 2 of 
types A to F. The mount main body 66 taking a part of the 
mount 51 (see FIG. 12A) to be used herein is one type. This 
leads to effects of cost reduction and the like.
In the second embodiment, the six mount replacement parts 67a to 67f having the attachment holes 72a to 72f different in shape from each other are used; however, the present invention is not limited thereto.

In the first and second embodiments, the video camera 3 is installed in the squad car 2. However, the video camera 5 may be installed in a vehicle other than the squad car 2, such as a passenger car or a truck. Further, it is assumed in the first and second embodiments that the vehicle such as the squad car 2 is of a left-hand drive type. Therefore, the attachment unit 1 is attached by means of the hook member 5 for the right sun visor. If the present invention is applied to a vehicle of a right-hand drive type, the attachment unit 1 is attached by means of a hook member 5 for the left sun visor.

Third Embodiment

Fig. 15 is a perspective view illustrating a mount 51 in a third embodiment of the present invention. In the third embodiment, there is no necessity that the attachment hole 61 having a special shape (see Fig. 2) is not formed in a base end plate 51a of the mount 51. In the third embodiment, an oval-shaped attachment hole 61 larger in size than the fitting part 13 of the hook member 5 is formed. Further, at both sides of the base end plate 51a of the mount 51, four screw holes 62 opened at the attachment hole 61 side are formed while being opened in a width direction of the base end plate 51a. However, positions where the screw holes 62 are formed are not limited to the aforementioned positions. The screw holes 62 may be formed from the rear end side of the mount 51 to the attachment hole 61 side. Alternatively, the screw holes 62 may be formed radially from the attachment hole 61. In addition, a count of the screw holes 62 is not limited to four. It is desirable that the count of the screw holes 62 to be formed is large as much as possible. A set screw 64 is screwed into each screw hole 62. The set screw 64 protrudes from the attachment hole 61 to serve as an abutment portion. A length of the set screw 64 protruding from the attachment hole 61 is adjusted, so that the fitting part 13 or any one of the rotation locking pieces 17a to 17d of the hook member 5 is prevented from being disengaged from the abutment portion.

Upon attachment of the mount 51, the fitting part 13 of the hook member 5 is inserted into the attachment hole 61. Then, the set screws 64 are allowed to protrude from the attachment hole 61 by means of a wrench 50. Thus, the set screws 64 are engaged with the rotation locking pieces 17a to 17d of the hook member 5. Alternatively, the fitting part 13 is secured by a tip ends of the set screws 64. Then, the hook member 5 is fastened to the ceiling 6 with the screw 14 such that the mount 51 is secured to the ceiling 6.

In the third embodiment, there is no necessity that an attachment hole 61 having a special shape is formed in the base end plate 51a of the mount 51. Therefore, the mount 51 in the third embodiment can be used for various hook members 5. In the second embodiment, the six mount replacement parts 67a to 67f are prepared for the six fitting parts 13 of the hook members 5 illustrated in Figs. 3A, 3B, 4A, 4B, 5A, 6A, 6B, 7A, 7B, 8A and 8B. However, the mount 51 in the third embodiment requires no mount replacement part.

Fourth Embodiment

Fig. 16 is a perspective view illustrating a mount 51 in a fourth embodiment of the present invention. In the fourth embodiment, a square attachment hole 61 larger in size than the fitting part 13 of the hook member 5 is formed. A support edge 65 is formed at an outer peripheral edge of the attachment hole 61. A pair of engagement members 80 and 80 each formed into an almost "U" shape are supported by the support edge 65. The pair of engagement members 80 and 80 can slide in a longitudinal direction of the mount 51. Irregularities 81 are formed at an inner face of each engagement member 80 so as to be engaged with the rotation locking pieces 17a to 17d of the hook member 5. Each of the irregularities 81 serves as an abutment portion. In the present invention, the pair of engagement members 80 and 80 may be arranged so as to slide on the mount 51 in a lateral direction of the attachment hole 61.

In order to secure the engagement member 80 to the mount 51, a countersunk screw 83 is inserted into a long hole (not illustrated) formed in the support edge 65 through a screw hole 82 formed in the engagement member 80, and is tightened with a nut (not illustrated) at a rear face of the mount 51.

Upon attachment of the mount 51, the countersunk screw 83 of the engagement member 80 is loosened, the engagement member 80 is slid such that the irregularities 81 are engaged with the rotation locking pieces 17a to 17d of the hook member 5. Then, the irregularities 81 are prevented from being disengaged from the rotation locking pieces 17a to 17d of the hook member 5.

In the fourth embodiment, there is also no necessity that an attachment hole 61 having a special shape is formed in the base end plate 51a of the mount 51. Therefore, the mount 51 in the fourth embodiment can be used for various hook members 5. Further, the mount 51 in the fourth embodiment requires no mount replacement part unlike the second embodiment.

The attachment unit according to the present invention is useful in a case that a video camera is installed in a squad car. Further, the attachment unit according to the present invention is also useful in a case that a video camera is installed in a passenger car or the like.

What is claimed is:
1. An attachment unit for installing an imaging apparatus in a vehicle by means of a hook member for a sun visor fastened to a ceiling of the vehicle with a screw, the hook member including a pedestal part, a hooking part formed under the pedestal part and a fitting part protruding upward from the pedestal part, the fitting part including a fastening portion having a screw hole for attachment formed therein and rotation locking pieces each formed on an outer periphery of the fastening portion, the attachment unit comprising a mount secured to the hook member, an arm attached to the mount, and an attachment table attached to a tip end of the arm, wherein
the arm rotates about a vertical axis with respect to the mount,
the imaging apparatus is attached to the attachment table,
the mount includes an attachment hole formed in a base end thereof,

the attachment hole includes a main hole into which at least the fastening portion of the hook member is fitted, and abutment portions each formed on an outer periphery of the main hole in correspondence with rotation locking pieces of a variety of hook members such that at least one of the rotation locking pieces of the variety of hook members abuts against the abutment portions, and

the outer periphery of the main hole prevents the rotation locking pieces from being disengaged from the abutment portions.

2. The attachment unit according to claim 1, wherein irregularities are formed as abutment portions on the outer periphery of the main hole.

3. The attachment unit according to claim 2, wherein concaves are formed at a rear side of the main hole such that the mount slides forward with respect to the hook member and the rotation locking pieces of the hook member are engaged with the concaves.

4. The attachment unit according to claim 1, wherein a clearance is created between the rotation locking piece and the abutment portion.

5. The attachment unit according to claim 1, wherein rotation locking pieces of each hook member abut against the abutment portions at three points.

6. The attachment unit according to claim 2, wherein two convexes are formed on one side of the main hole with a space into which the rotation locking pieces of the hook member are fitted, and spaces are provided between outer ends of the convexes and both sides of the main hole respectively such that the rotation locking pieces of the hook members are fitted into the spaces.

7. The attachment unit according to claim 1, wherein an attachment hole having a size larger than that of the fitting part of the hook member is formed in the base end of the mount, a pair of engagement members each sliding in one of a longitudinal direction and a lateral direction of the mount are provided in the attachment hole, abutment portions engaged with the rotation locking pieces of the hook member are formed on an inner circumference of each engagement member.

8. The attachment unit according to claim 1, wherein an attachment hole having a size larger than that of the fitting part of the hook member is formed in the base end of the mount, a pair of engagement members each sliding in one of a longitudinal direction and a lateral direction of the mount are provided in the attachment hole, abutment portions engaged with the rotation locking pieces of the hook member are formed on an inner circumference of each engagement member.

9. An attachment unit for installing an imaging apparatus in a vehicle by means of a hook member for a sun visor fastened to a ceiling of the vehicle with a screw, the hook member including a pedestal part, a hooking part formed under the pedestal part and a fitting part protruding upward from the pedestal part, the fitting part including a fastening portion having a screw hole for attachment formed therein and rotation locking pieces each formed on an outer periphery of the fastening portion,

the attachment unit comprising a mount secured to the hook member, an arm attached to the mount, and an attachment table attached to a tip end of the arm, wherein

the arm rotates about a vertical axis with respect to the mount,

the imaging apparatus is attached to the attachment table,

the mount includes an attachment hole formed in a base end thereof,

the mount includes a mount main body, and mount replacement parts each engaged/disengaged with/from the mount main body and each having an attachment hole formed therein,

the mount replacement parts are provided in correspondence with fitting parts of a variety of hook members, and

the attachment holes of the mount replacement parts are formed in accordance with shapes of the fitting parts of the hook members.

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