

PATENT SPECIFICATION

(11)

1593870

1593870

- (21) Application No. 51283/77 (22) Filed 9 Dec. 1977 (19)
(31) Convention Application Nos. 7637111 (32) Filed 9 Dec. 1976
7736151 30 Nov. 1977 in
(33) France (FR)
(44) Complete Specification published 22 July 1981
(51) INT. CL.³ E05F 15/02
(52) Index at acceptance
E2M 11D1 12BX 16



(54) IMPROVEMENTS IN OR RELATING TO A DEVICE FOR OPERATING HATCH COVERS OR THE LIKE COMPOSED OF PANELS

(71) We, MACGREGOR INTERNATIONAL S.A., a Swiss Body Corporate of St Jakobs strasse 9, 4002 Basel, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to covers for hatches on ships or access openings in other types of vehicles, buildings or stationary structures, as well as the various applications and uses thereof and the systems assemblies, outfits and installations provided with such covers.

In a manner known per se, a hatch cover can be divided into several cover panels or sections adapted to be moved between a hatch-closed or covered position where the said cover panels rest on a coaming surrounding the hatch opening, and a stowage or hatch-open position where the said cover panels are stowed in proximity to one another in substantially parallel positions.

Various presently known hatch-covers have operating devices which are essentially constituted by hydraulic or pneumatic actuators or fluid-operated cylinders and/or chains which suffer from disadvantages.

Among such disadvantages mention can be made of the fact that some devices, such as those provided with chains, are mounted externally to the hatch cover on the two mutually opposite side-walls of the hatch coaming, resulting in the necessity of providing along the coaming side-walls a longitudinal band of permanently free or cleared space, due to the fact that such chain devices are movable along the coaming side-walls. Moreover, such chain devices are relatively complex.

In other devices, e.g. those using actuators, the outer surfaces of the mutually opposite hatch-coaming side-walls are left free, but such devices are partially arranged above the

hatch cover panels or sections, and this, in the case of hydraulic devices, may be disadvantageous to the goods in the ship's hold which are located at the level of the periphery of the hatch, due to the fact that the leakage of oil or the like which may occur in such hydraulic devices may damage the goods.

The invention seeks to obviate or reduce both types of disadvantages.

According to the present invention there is provided a cover for a hatch or like access opening surrounded by a coaming or the like which cover comprises at least three cover panels hinged in sequence and foldable together in a hatch open position, the cover having first operating means for partially folding the first two cover panels and second operating means including at least one articulated lever for folding the third cover panel relative to the second cover panel, the arrangement being such that, when the cover is fitted to such a hatch the articulated lever is located outside the coaming and beyond the end or transverse wall thereof, between the said end wall and the first operating means of the first two cover panels.

The various operating means referred to above may be constituted by hydraulic or pneumatic actuators or fluid-actuated cylinders located outside the hatch opening.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:—

Figure 1 is a diagrammatic elevational view of a hatch cover in its closed position, with the various operating means in their position of rest;

Figure 2 is a diagrammatic elevational view illustrating the first hatch-cover opening stage, with the two first cover panels partially folded;

Figure 3 is a diagrammatic elevational view illustrating the second hatch-cover opening stage, with the first two cover panels

completely folded;

Figure 4 is a diagrammatic elevational view illustrating the last hatch-cover opening stage, with the two last panels in their folded position;

Figure 5 is an elevational, partially broken away view illustrating the first and second operating means for folding the first two cover panels, wherein the said first operating means have operated whereas the second operating means are at rest,

Figure 6 is an elevational view illustrating the operation of the second operating means to move the two first cover panels to their completely folded position;

Figure 7 is a partial elevational view showing the third operating means of the two last cover panels in their position of rest;

Figure 8 is an elevational view showing the third operating means after they have acted upon the two last cover panels,

Figure 9 is a view in the direction of arrow IX of Figure 8,

Figure 10 is an elevational view illustrating a second embodiment of the third operating means of the two last panels or sections of the hatch cover, which means offer the advantage of allowing the first two cover panels to be also completely folded, i.e. the second operating means to be dispensed with, and

Figures 11 to 14 are diagrammatic elevational views which illustrate, respectively, the various steps necessary for folding the cover panels according to a modification of the embodiment illustrated in Figure 10.

Figures 1 to 4 diagrammatically illustrate the various operations which the operating means must perform to ensure the opening of a hatch cover 1 composed of four cover panels or sections 1a, 2a, 3a and 4a hingedly connected to one another so as to be foldable in the manner of an accordion beyond one of the end or transverse walls of a coaming 5 upon which rests the hatch cover 1 in its closed position.

In these Figures are diagrammatically represented the various operating means allowing the hatch cover to be handled, namely:

first operating means 6 for partially folding the cover panels 1a, 2a as shown in Figure 2,

second operating means 7 for completely folding the cover panels 1a, 2a as illustrated in Figure 3,

and third operating means 8 for folding the cover panels 3a and 4a as illustrated in Figure 4.

The said operating means are essentially constituted by pneumatic or hydraulic actuators or fluid-operated cylinders, which will be described in more detail hereunder.

The first and second operating means for handling the panels 1a and 2a will be described with reference to Figures 5 and 6.

The first operating means 6 are constituted

by a pair of actuators 10 (only one of which is shown) mounted beyond the end or transverse wall 11 of the hatch coaming. More precisely the first operating means 6 are located in a compartment 12 the sidewalls of which extend in prolongation of those of the coaming 5 and which is closed by an upper plate 13 provided with holes to allow for mechanical connections between the first operating means 6 and the cover panel 1a actuated thereby. Each actuator 10 has the end of its cylinder 14 opposite to the piston rod 15 about a substantially horizontal pin 16 secured to the wall of the compartment 12 through the medium of a vertical plate (not shown) located within the said compartment. The free end of the piston rod 15 of each actuator 10 is pivoted about a substantially horizontal pin 17 supported by the cover panel 1a through the medium of, for example, a clevis, yoke or the like (not shown). The panel 1a is itself pivoted about a substantially horizontal pin 18 supported for example by two clevises or the like (not shown) secured to the upper plate 13 of the compartment 12 extending in prolongation of the hatch.

The pivot pins 16 and 18 are substantially parallel with the coaming end-wall 11 and the pivot pins of the cover panels, so as to be foldable in a direction parallel with the side walls of the coaming 5.

The second operating means 7, which will now be described with reference to Figures 5 and 6, also comprise a pair of actuators 20 (only one of which is shown) mounted at either side, respectively, of the mutually opposite side-walls of the coaming 5 and in parallel relationship thereto. Each actuator 20 has the end of its cylinder 21 opposite to its piston rod 22 pivoted about a substantially horizontal pin 41 parallel with the pivot pins 16, 17 and 18 and supported for example by a clevis or the like 42 secured to the side wall of the coaming 5. The end of the piston rod 22 of each actuator 20 is hingedly connected to one end of a substantially rectilinear link 23 through the medium of a pivot pin 24. A second link 25 is hingedly connected to the first link 23 by means of a pivot pin 26 arranged in substantially parallel relationship and in proximity to the pivot pin 24, so that the actuator 20 actuates both links 23 and 25 simultaneously.

Before proceeding to described the connection of the free ends of the links 23 and 24 it is important to point out, referring again to Figures 5 and 6, that the rolling track or runway for the hatch cover 1 along each coaming rail or bar 27 mounted at either side of the lateral surfaces of the coaming 5 is extended the transverse wall of the coaming 5 by an ascending ramp or upgrade 28 whose upper surface serves as a rolling track or runway 29. In parallel relationship to each

ramp 28 is externally secured a member 30 extending the whole length of the ramp 28 and so spaced therefrom that the plane defined by each actuator 20 and the corresponding links 23 and 25 passes through the said space between each member 30 and each ramp 28.

The free end of each link 23 is pivoted about a fixed, substantially horizontal pin 31 parallel with the horizontal pivot pin 24 of each cylinder 21 and supported by the member 30. The other end of each link 25 is hingedly connected to a triangular member 32. More precisely, each end of the links 25 is pivoted about a substantially horizontal pin 33 in proximity to one of the vertices of the triangular member 32. At another vertex of the triangular member 32 is provided a horizontal guiding pin 34 parallel with the pivot pin 33 and both pins 33 and 34 are engaged in a slot 35 substantially parallel with the rolling track 29 of the associated ramp 28 and machined in the member 30. At the third vertex of the triangular member 32 is also provided a pin 36 parallel with the pins 33 and 34 and the function of which will be explained later. Obviously all three pins 33, 34 and 36 are perpendicular to the triangular member 32 and project from a same side thereof. Each triangular member 32 on either side of the lateral surfaces of the coaming 5 can slide in the associated slot 35 and is mounted in each space separating the members 30 and the ramps 28, respectively.

The cover panels 2a and 3a are hingedly connected to one another by means of a substantially horizontal pivot pin 37 parallel with the pivot pin 18 of the cover panel 1a. As also noted in Figures 5 and 6 the cover panel 2a is laterally extended by two arms 38 supporting at their end a wheel or roller 39 intended to roll on the associated coaming bar or rail 27 and ramp 29. Each arm 38 is provided towards its end with a groove 40 intended to receive the pin 36 of the associated triangular member 32. As will be seen later, this connection allows the cover panel 2a to be folded completely against the cover panel 1a, with the triangular member 32 then moving in the associated slot 35.

The third operating means allowing the cover panels 3a and 4a to be raised will now be described with reference to Figures 7 to 9. The third operating means 8 comprise two actuators 50 (only one of which is shown) mounted within the compartment 12 and at either side of the assembly constituted by the two actuators 10 of the first operating means which also are housed within the compartment 12. Each cylinder 51 of the actuators 50 is pivoted substantially at its middle about a substantially horizontal pin 52 parallel with the pivot pins 16 and 14 of the cylinders 14 and 21 of the actuators 10 and 20 of the first and second operating means 6, 7, respec-

tively. The pivot pin 52 is supported by a side wall of the compartment 12 and by an internal plate 53 mounted within the said compartment and parallel with the said side wall. The end of each piston rod 54 projects outside the compartment 12 through a hole 55 provided in the upper plate 13 of the said compartment and is pivoted about a pin 56 supported by a clevis or the like 57. About the pivot pin 56 and on either side of the clevis 57 are pivoted the ends of two curved links 58 connected with one another at their central portion. The other ends of the links are pivoted about a substantially horizontal pin 59 parallel with the pivot pin 56 and with those hingedly interconnecting the various cover panels. The pivot pin 59 is supported by a fixed clevis or the like 60 secured to the upper plate 13 of the compartment 12. On the lower surface or under-part of the cover panel 3a are provided, for each actuator 50, two claw or hook elements 61 arranged in parallel relationship to the longitudinal axis of the cover panel 3a, i.e. the longitudinal opening and closing axis of the hatch cover 1, so as to engage the pivot pin 56, which extends beyond the links 58, when the panel 3a is completely lifted, as will be seen later when describing the operation of the operating means.

A second embodiment of the third operating means 8, will now be described with reference to Figure 10. These means are constituted by a pair of actuators 70 (only one of which is represented) mounted within the compartment 12 and having their cylinders 71 pivoted at one end about a substantially horizontal pivot pin 72 supported for example by two clevises or the like secured to the two side walls of the compartment 12, respectively. Each piston rod 74 is pivoted at the end of a bent intermediate member 73 about a substantially horizontal pin parallel with the pivot pin 72. The intermediate member 73 is pivoted substantially at the level of its bend about a fixed pivot pin 75. The other end of the intermediate member 73 is adapted to bear against a member 76 projecting sideways from the cover panel 3a, so as to come into contact with the latter during the operation of the actuators 70 and raise the cover panels 3a and 4a.

The operation of the device for handling the hatch cover 1 according to the invention will now be described with reference to the various Figures.

Starting from the position where the hatch cover 1 is closed, i.e. the cover panels 1a, 2a, 3a, 4a rest upon the hatch coaming 5, the cover panels 1a, 2a will first be partially raised by means of the first operating means 6 (position shown in Figure 2). Referring to figure 5, the first operating means 6 will be actuated, i.e. hydraulic pressure will be applied to both actuators 10. The rest posi-



tion of the actuators is shown in broken lines in Figure 5. The pressure applied to the actuators 10 will cause the piston rods 15 to extend and push by their ends the cover panel 1a through the medium of the pivot pin 17 secured to the said cover panel, and the latter will rotate about its pivot pin 18 supported by the upper plate 13 of the compartment 12.

Once the first operating means 6 have thus acted, the second operating means 7 will be brought into action to completely fold the cover panels 1a, 2a so as to move the latter to a position substantially parallel to one another and substantially perpendicular to the plane of the hatch (position illustrated in Figure 3). Referring to Figure 5, the second operating means are shown in their position of rest. The rods 22 of the actuators 20 are retracted and the links 23 and 25 form an acute angle to one another, whereas the triangular member 32 is located at the end of the slot 35 remote from the cover panel 1a. At that moment the cover panels 3a and 4a have rolled on the coaming rails 27 and the rollers 39 between the cover panels 2a and 3a are located on the ramps 28, so that the cover panel 3a is slightly raised. When pressure is applied to the power cylinders 20, the rods 22 act upon the links 23 and 25 thus causing the triangular member 32 to move in the slot 35 through the medium of its two pins 33 and 34 under the action of the link 25. During this movement, each pin 36 of the triangular members moves into the respective grooves 40 of the arms 38 connected with the cover panel 2a and thus drives the said cover panel as the triangular members are displaced along the respective slots 35. During this displacement the links 23 and 25 tend to become aligned with one another. Figure 6 shows the position of the cover panels 1a and 2a after the actuation of the second operating means 7. As can be observed the links 23 and 25 are aligned with one another, the triangular members 32 have reached the other end of the associated slots 35 and the rollers 39 between the cover panels 2a and 3a have reached their highest position on the ramps 29. During this operation the cover panels 3a and 4a are still aligned with one another even though they have been displaced along the ramps 29 and the coaming rails 27, respectively.

The operation of the third operating means 8 allowing the cover panels 3a and 4a to be folded will now be described with reference to Figures 7 to 9. In Figure 7 these panels are shown in their position of rest and ready to be actuated. After the cover panels 1a and 2a have been folded the cover panel 3a has taken a position substantially beyond the actuators 50, thus allowing the latter to engage the cover panel 3a. More precisely, pressure is applied to the actuators 50 so that

the external surface of each base element of the clevises 57 comes into contact with the lower surface of the cover panel 3a. Once this contact has taken place and while pressure is still applied to the actuators 50, the piston rods 54 raise the cover panel 3a while the clevises 57 are in sliding contact with the said cover panel. Since the pivot pins 57 of the clevises 58 hingedly support the ends of the links 58 whose other end is pivoted about the fixed pins 59, the links 58 are compelled to move along an arc of a circle in a vertical direction, thus causing the cover panel 3a to be raised and the clevis 57 acting as a sliding shoe or pad to be moved onto the end surface of the cover panel 3a adjacent to the end surface of the cover panel 2a. As can be observed in Figure 8 which shows the cover panels 3a and 4a completely folded, the hook elements 61 secured to the cover panel 3a have engaged the pivot pin 56 of the clevises 57, thus allowing the cover panels to be reliably held in position.

Of course the action of the third operating means 8 upon the cover panel 3a compels the end cover-panel 4a to fold against the cover panel 3a. Once the position shown in Figure 4 is reached, the pressure can be removed from the first and second operating means 6, 7 and kept applied only to the third operating means 8 which can alone hold the cover panels in their folded position outside the periphery of the hatch and substantially above the compartment 12.

The operation of the second embodiment of the third operating means 8 will now be described with reference to Figure 10. The folding of the cover panels 1a and 2a is performed in the same manner as previously. In order to fold the cover panels 3a and 4a pressure is applied to the actuators 70 to cause the intermediate 73 to pivot about the fixed pivot pin 75 and allow the ends of the intermediate member 73 opposite to their ends hingedly connected to the piston rods 74 to come into contact with the elements 76 projecting from either side of the cover panel 3a. Once this contact is made, the action of the actuator 70 causes the cover panel 3a, and also the cover panel 4a, to fold up. It should be noted that the elements 76 must have a predetermined length since the ends of the intermediate members 73 are in slight contact with the said elements. Compared with the foregoing embodiment of the third operating means 8, the role played by the intermediate elements 73 is similar to that of the clevises 57.

It is important to note that in this embodiment the second operating means are not absolutely necessary. Indeed, once the first operating means have acted to partially fold the first two cover panels, the structure of the third operating means is such that they can directly be brought into action to fold the two

last cover panels and at the same time completely fold the two first cover panels as a result of the reaction of the third panel against the second panel towards the end of the travel of the rods 74 of the actuator 70. So, the second operating means can be dispensed with and therefore the structure of the device considerably simplified.

The invention thus allows the operating means for the handling of the hatch cover 1 to be advantageously placed outside the periphery of the hatch, without requiring a permanently free or cleared longitudinal space to be provided at either side of the lateral surfaces of the coaming. This, in addition, allows accidents to be avoided.

Such operating devices offer considerable advantages, especially in the case of transportation of goods such as paper, since the absence of any hydraulic device within the periphery of the hatch allows the damaging of the paper by possible oil leakage to be avoided.

Of course such handling devices may be adapted for cover panels other than those of ship's hatches and they can be quite as well used in land installations.

Now referring to Figure 11, there is shown a hatch cover 110 according to the present invention including four panels 111, 112, 113 and 114 placed in parallel on top of a hatch coaming 115. A storage station 120 is located on deck 125 adjacent to right end of the hatch coaming 115. For convenience, those four panels 111, 112, 113 and 114 are respectively referred to as first, second third and fourth panel looking from the storage station 120. The first, second and third panels 111, 112 and 113 are each hingedly connected respectively to the next adjacent panel by means of hinge members 116, 117 and 118 respectively. The first panel 111 is provided with a pivoting arm 101 mounted thereon at the righthand end. The pivoting arm 101 is pivotally connected to a bracket 102 on the deck 125 at the outer end thereof by means of a horizontal pin 123. Actuating means such as a hydraulic cylinder 103, has one end connected to the deck 125 by means of a pivot pin 122 and the other end to the pivoting arm 101 by means of a pivot pin 119 so as to cause the first panel 111 to be pivoted about the pivot pin 123. The fourth panel 114 is provided with a roller along a rail (not shown) on top of the hatch coaming 115. The second and third panel 112, 113 are also provided respectively with similar rollers (not shown).

In the hatch cover 110 according to the present invention, a positioning bar 104 of predetermined length is mounted on the third panel 113 in end surface 128 adjacent to the second panel 112. The positioning bar 104 is provided on each side of the third panel 113 and extends perpendicularly to the

end surface 128. As shown in Figure 12, when the first and second panel 111, 112 are erected onto upright A-shaped configuration slightly before vertical storage position by action of the actuating means 103, third panel 113 is dragged rightward along the rail on top of the hatch coaming 115 and approaches the storage station 120. At this time, righthand end of the positioning bar 104 will be in abut with a stopper post 105 which is mounted on the deck 125 at predetermined location. The second panel 112 erected together with the first panel 111 to form a character A as shown in Figure 2 tends to rotated counterclockwise A about the hinge member 116 by gravity, but will be stopped at a position, where an angle α formed between the first and second panel 111, 112, reaches a predetermined value, by action of inertia of subsequent panels 113 and 114 and friction between rollers provided on those panels and the rail on the hatch coaming. The length of the positioning bar 104 and location of the stopper post 105 are selected such that the positioning bar 104 will be in abut with the stopper post 105 before the angle α reaches the above-mentioned predetermined value. That is to say, the positioning bar will abut with the stopper post 105 while the second panel 112 has still some room to pivot counterclockwise A about the hinge 116. This timing means that the second panel 112 will be assisted in its folding operation over the first panel 111 by action of the third panel 113 which is actuated by swinging levers 106 to be described hereinafter.

The hatch cover 110 according to the present invention is further provided on each side with a swinging lever 106 of predetermined length pivotally mounted on deck. The swinging lever 106 has one end pivotally connected to a suitable support member mounted on the hatch coaming 115 or on the deck 125 by means of a pivot pin 124. Another actuating means, such as a hydraulic cylinder 107, having one end connected to the deck 125 by a pivot pin 121 and the other end to the swinging lever 106 at the intermediate portion thereof by means of a pivot pin 109, is provided for causing the swinging lever 106 to be pivoted about the pivot pin 124.

As shown in Figure 12, a stud 108 is mounted on the third panel 113 on each side 120, at a point adjacent to an end opposite to the end where the positioning bar 104 is mounted. When the swinging lever 106 is rotated clockwise B about the pivot pin 124 by action of the actuating means 107, the swinging lever 106 will engage with the stud 108 on the third panel 113, which is dragged along to a position adjacent to the storage station 120 with the positioning bar 104 in abut with the stopper post 105, and will cause

the third panel 113 to be rotated clockwise B about the hinge member 117 as shown in Figure 13 and further to be folded upon the second panel at the storage station 120 as shown in Figure 14. During this time, the swinging lever 106 will push the hinge 117, that is, the lower end of the second panel 112 in Figure 12, toward the first panel 111 thereby enabling the second panel 112 to be completely folded over the first panel 111. Hence the swinging lever 106 will fold not only, the third panel 113 over the second panel 112, but also the second panel 112, but also the second panel 112 over the first panel 111 at the panel 111 at the storage station 120. In the stored condition of all panels as shown in Figure 14 the fourth panel 114 is suspended from the hinge 118 on top of the third panel 113, which is erected upright, with a roller 126 mounted on the fourth panel 114 at its lower end engaged with a ramp 127. When all panels 111, 112, 113 and 114 are folded together at the storage station 120, they are fastened to suitable supporting post member (not shown) by a length of lashing wire (not shown), and the swinging lever 106 is brought back to horizontal position as shown in Figure 11.

When closing the hatch coaming 115, the lashing wire is released at first from the hatch cover 110 which is folded together at the storage station 120 as shown in Figure 14, and then the third panel 113 will rotate counter-clockwise A about the hinge member 117 and simultaneously the roller 126 at the lower end of the fourth panel 114 will roll along the ramp 127, thereby causing the lower ends of the third and fourth panel 113, 114 to be spread apart in a shape of the character A thus bringing both panels 113 and 114 into condition as shown in Figure 13. The positioning bar 104 mounted on the third panel 113 is in abut with the stopper post 105 in the condition as shown in Figure 13 and then rotated counterclockwise A about a point 129 whereas the outer end of the positioning bar 104 is in contact with the stopper post 105 and will pull the hinge member 117 leftward from the position in Figure 13, thereby causing the lower ends of the first and second panel 111 and 112 to be spread apart in a shape of the character A thus enhancing a hatch closing operation and bringing all the panels 111, 112, 113 and 114 in the condition as shown in Figure 12. At this point, the actuating means 103 will be operated to bring all the panels on top of the hatch coaming 115 to close the hatch opening as shown in Figure 11.

WHAT WE CLAIM IS:—

1. A cover for a hatch of like access opening surrounded by a coaming or the like which cover comprises at least three cover panels hinged in sequence and foldable

together in a hatch open position, the cover having first operating means for partially folding the first two cover panels and second operating means including at least one articulated lever for folding the third cover panel relative to the second cover panel, the arrangement being such that, when the cover is fitted to such a hatch the articulated lever is located outside the coaming and beyond the end or transverse wall thereof, between the said end wall and the first operating means of the first two cover panels.

2. A cover according to claim 1, in which the second operating means for folding the third section includes two said levers spaced from one another, substantially parallel to the opening and closing axis of the sections and each pivoted at one end about a fixed pivot pin and hingedly connected at its other end to the actuating rod of a fluid pressure actuator by means of a clevis or yoke element intended to be in sliding contact with the lower surface of the third section.

3. A cover according to claim 2, in which the said two levers are curved in shape.

4. A cover according to any one of the foregoing claims, in which each lever is constituted by two curved, substantially parallel links interconnected at their central portion and pivoted at one end about a stationary pin and at the other end about a pivot pin supported by the clevis and secured to the end of the actuator or power cylinder.

5. A cover according to any one of the foregoing claims, in which the said third cover panel is provided on its lower face with two pairs of substantially parallel hook elements arranged in perpendicular relationship to the pivot axes of the cover panels and intended to receive the clevis pivot pin when the third cover panel is folded.

6. A cover according to claim 5, in which, in the folded position of the said third cover panel, the clevises of both levers are respectively located in proximity to the end surface of the third panel adjacent to the second cover panel.

7. A cover according to claim 1, in which the second operating means, for the third cover panel, includes two spaced levers substantially parallel with the opening and closing axis of the panels, each lever being constituted by a bent member pivoted about a fixed pin substantially at the level of the bend, and hingedly connected at one end to the rod of a fluid pressure actuator, the other end of the lever serving as a bearing surface to raise the third cover panel.

8. A cover according to claim 7, in which each aforesaid lever is located at either side of the said third cover panel.

9. A cover according to claim 8, in which the said third cover panel comprises two projecting lateral plates against the lower surface of which bear and slide the free ends



the third panel 113 to be rotated clockwise B about the hinge member 117 as shown in Figure 13 and further to be folded upon the second panel at the storage station 120 as shown in Figure 14. During this time, the swinging lever 106 will push the hinge 117, that is, the lower end of the second panel 112 in Figure 12, toward the first panel 111 thereby enabling the second panel 112 to be completely folded over the first panel 111. Hence the swinging lever 106 will fold not only, the third panel 113 over the second panel 112, but also the second panel 112, but also the second panel 112 over the first panel 111 at the panel 111 at the storage station 120. In the stored condition of all panels as shown in Figure 14 the fourth panel 114 is suspended from the hinge 118 on top of the third panel 113, which is erected upright, with a roller 126 mounted on the fourth panel 114 at its lower end engaged with a ramp 127. When all panels 111, 112, 113 and 114 are folded together at the storage station 120, they are fastened to suitable supporting post member (not shown) by a length of lashing wire (not shown), and the swinging lever 106 is brought back to horizontal position as shown in Figure 11.

When closing the hatch coaming 115, the lashing wire is released at first from the hatch cover 110 which is folded together at the storage station 120 as shown in Figure 14, and then the third panel 113 will rotate counter-clockwise A about the hinge member 117 and simultaneously the roller 126 at the lower end of the fourth panel 114 will roll along the ramp 127, thereby causing the lower ends of the third and fourth panel 113, 114 to be spread apart in a shape of the character A thus bringing both panels 113 and 114 into condition as shown in Figure 13. The positioning bar 104 mounted on the third panel 113 is in abut with the stopper post 105 in the condition as shown in Figure 13 and then rotated counterclockwise A about a point 129 whereas the outer end of the positioning bar 104 is in contact with the stopper post 105 and will pull the hinge member 117 leftward from the position in Figure 13, thereby causing the lower ends of the first and second panel 111 and 112 to be spread apart in a shape of the character A thus enhancing a hatch closing operation and bringing all the panels 111, 112, 113 and 114 in the condition as shown in Figure 12. At this point, the actuating means 103 will be operated to bring all the panels on top of the hatch coaming 115 to close the hatch opening as shown in Figure 11.

60

WHAT WE CLAIM IS:—

1. A cover for a hatch of like access opening surrounded by a coaming or the like which cover comprises at least three cover panels hinged in sequence and foldable

together in a hatch open position, the cover having first operating means for partially folding the first two cover panels and second operating means including at least one articulated lever for folding the third cover panel relative to the second cover panel, the arrangement being such that, when the cover is fitted to such a hatch the articulated lever is located outside the coaming and beyond the end or transverse wall thereof, between the said end wall and the first operating means of the first two cover panels.

2. A cover according to claim 1, in which the second operating means for folding the third section includes two said levers spaced from one another, substantially parallel to the opening and closing axis of the sections and each pivoted at one end about a fixed pivot pin and hingedly connected at its other end to the actuating rod of a fluid pressure actuator by means of a clevis or yoke element intended to be in sliding contact with the lower surface of the third section.

3. A cover according to claim 2, in which the said two levers are curved in shape.

4. A cover according to any one of the foregoing claims, in which each lever is constituted by two curved, substantially parallel links interconnected at their central portion and pivoted at one end about a stationary pin and at the other end about a pivot pin supported by the clevis and secured to the end of the actuator or power cylinder.

5. A cover according to any one of the foregoing claims, in which the said third cover panel is provided on its lower face with two pairs of substantially parallel hook elements arranged in perpendicular relationship to the pivot axes of the cover panels and intended to receive the clevis pivot pin when the third cover panel is folded.

6. A cover according to claim 5, in which, in the folded position of the said third cover panel, the clevises of both levers are respectively located in proximity to the end surface of the third panel adjacent to the second cover panel.

7. A cover according to claim 1, in which the second operating means, for the third cover panel, includes two spaced levers substantially parallel with the opening and closing axis of the panels, each lever being constituted by a bent member pivoted about a fixed pin substantially at the level of the bend, and hingedly connected at one end to the rod of a fluid pressure actuator, the other end of the lever serving as a bearing surface to raise the third cover panel.

8. A cover according to claim 7, in which each aforesaid lever is located at either side of the said third cover panel.

9. A cover according to claim 8, in which the said third cover panel comprises two projecting lateral plates against the lower surface of which bear and slide the free ends

70

75

80

85

90

95

100

105

110

115

120

125

130



1,593,870

7

of the said levers when the third cover panel is being folded.

10. A cover according to any one of the foregoing claims; in which there are further operating means for completely folding the first and second cover panels before folding the third cover panel, the said further operating means being located at either side of the lateral surfaces of the hatch coaming and below the coaming rails.

11. A cover according to claim 10, in which the said further operating means comprise a pair of hydraulic or pneumatic actuators fluid-actuated cylinders, the end of each piston rod being hingedly connected to the ends of a first and a second link, the other end of the first link being pivoted about a fixed pin, and the other end of the second link being pivoted about a pin supported by a movable member intended to come into contact, through the medium for example of a groove, with the end surface of the second cover panel, which end surface is hingedly connected to the third cover panel.

12. A cover according to claim 11, in which each aforesaid member is movable along a slot machined in a plate element which is secured in parallel relationship to the lateral surfaces of the coaming in spaced relationship to the said lateral surfaces, and extends at either side of the associated end or transverse wall of the hatch coaming.

13. A device according to claims 11 and 12, in which the coaming rails or bars mounted on the lateral surfaces of the coaming are extended beyond the end wall of the hatch coaming by an inclined plane the upper surface of which serves as a rolling surface.

14. A cover according to claim 13, in which each said movable member is mounted in the space defined by each said element and each said inclined plane.

15. A cover according to any one of claims 10 to 14, in which the aforesaid links extend in prolongation of one another, when the first and second cover panels are completely folded.

16. A cover according to claim 1, in which the lever for folding the third cover panel is driven by an actuator which, when the cover is fitted to a hatch or like access opening is pivotally connected to the fixed structure of the hatch or like access opening to cause the said lever to pivot, the said lever being itself pivotally connected to the said fixed structure.

17. A cover according to claim 16, in which the said lever is pivoted at one end to the fixed structure of the hatch or like access opening about a pivot pin, whereas its free end is intended to co-operate with the third cover panel.

18. A cover according to claims 16 or 17, in which the said third cover panel is

provided with at least one sidewise projecting driving pin upon which the free end of the said lever bears so as to fold the said third cover panel.

19. A cover according to any one of claims 16 to 19, in which the said third cover panel has at least one positioning element such as a bar in prolongation of the said third cover panel from its free end adjacent to the second cover panel.

20. A cover according to claim 19, in which the free end of the said positioning element bears temporarily upon a stop or abutment secured to the said fixed structure to start the folding of the third cover panel.

21. A cover according to claim 20, in which the said positioning element bears upon an associated stop or abutment while the second cover panel is only partially folded.

22. A cover according to claim 21, in which the second cover panel is completely folded by means of the actuator of the aforesaid lever, while the said positioning bar is no longer in contact with the associated stop or abutment.

23. A cover according to any one of claims 16 to 22, in which two positioning elements are mounted on either side of the said cover panel with respect to the hatch closing or opening direction, and associated with two stops or abutments, respectively, and with two actuators, respectively.

24. A cover for a hatch or like access opening, substantially as described herein with reference to and as illustrated in the appended drawings.

For the Applicants,
J. F. WILLIAMS & CO.,
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office by Burgess & Son
(Abingdon) Ltd.—1981. Published at The Patent Office,
25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.