ROLLING HATCH COVERS

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This invention relates generally to hatch covers and more particularly to improved rolling hatch covers for use on marine vessels and the like.

Heretofore, hatch covers commonly employed, particularly on hatches for lower or intermediate decks of marine vessels, have included strongbacks and hatch boards; steel pontoons; or mechanically hinged covers. The first two of these are slow and difficult to handle and must in fact be moved and stowed elsewhere, whereas mechanically hinged covers are expensive and must have intermediate hinges if the available head room will not accommodate a single piece cover. These disadvantages are overcome by the improved covers described herein.

One object of the present invention is to provide an improved hatch cover and rigging arrangement which is easily and rapidly operated with a minimum employment of power.

Another object of the present invention is to provide opposed-roll split hatch covers which may be conveniently stowed during the loading or unloading of lading through the hatch.

A further object of the present invention is to provide an improved combination of rolling hatch covers and operating rigging permitting the handling of a plurality of hatches by means of a single power winch and permitting simultaneous, selective or incremental actuation of one or more hatches.

Still another object of the present invention is to provide a hatch cover and operative rigging combination employing cushioning devices to minimize operational noise and shock.

Other objects and advantages of the invention will be apparent to those skilled in this art upon a consideration of the following description and the accompanying drawings of a preferred embodiment of the invention.

The present invention generally comprises a hatch cover split into at least a pair of opposed-roll leaves and an operative rigging permitting selective actuation of one or a plurality of similar hatch covers mounted, for example, on the platform decks of a marine vessel. The hatch covers of the present invention, when stowed, float substantially flush with the deck adjacent to the hatch and, when open, roll flat upon or underneath the adjacent deck. The leaves also may be stowed substantially vertically when open, as illustrated later in this description. The hatch leaves are rolled by the operative rigging with a minimum of power consumption developed by a single tension source.

The present invention will be more readily understood upon consideration of a specific embodiment illustrated in the accompanying drawings wherein:

FIG. 1 is a top plan view of one leaf of a split hatch cover embodying the present invention with the inboard edge toward the bottom of the drawing:

FIG. 2 is an end view of the hatch cover leaf of FIG. 1 taken along line 2--2 of FIG. 1;

FIG. 3 is a schematic cross-sectional view of a marine vessel illustrating the combination of hatch covers and rigging of the present invention installed on several intermediate decks of the vessel; and

FIG. 4 is an enlarged sectional view taken along line 4--4 of FIG. 1 illustrating a form of cushioning means employed in the present invention.

With reference to the embodiment of FIG. 1, each hatch cover 1 comprises two similar leaves 2 which close a hatch opening 3 in the deck 4 of a vessel or similar structure 5. For simplicity of illustration a single leaf of the hatch cover is illustrated in FIGS. 1 and 2. However, it should be understood that each hatch is enclosed by two similar leaves as illustrated in FIG. 3. The described cover is longitudinally split and includes two leaves. The leaves also may be provided with access hatches to form an unitary structure including a cover plate 6 supported by a frame 7 of structural members. The inboard edge of each leaf carries at least one inboard roller 8 at each inboard corner of the leaf. The outboard edge of each leaf carries an outboard roller 9 at each corner. Intermediate rollers also may be provided where structurally desirable, for example, for particularly wide leaves.

As appears in FIG. 2, the inboard rollers 8 rotate about a horizontal axis transverse to the direction of hatch leaf roll. Each roller 8 rotates on a trunnion 10 depending from the inboard corners of the leaf. The outboard rollers 9 rotate on the supporting frame 7 about a parallel axis. Both sets of rollers 8, 9 are guided by a separate track 11 secured to the transverse hatch girders 12. The inboard end of each track is inclined downwardly to the bottom flange of the hatch girder as at 13 to accommodate the inboard roller 8 and its depending leg 10. The hatch cover thus fits substantially flush with the deck 4 in the stowed position illustrated in FIG. 2. The outboard end of each track 11 includes incline 14 by which the outboard rollers 9 are guided upwardly onto the deck when the hatch leaves open as more clearly appears in FIG. 3. Guide means also are provided on the adjacent deck itself for guiding the outboard rollers. The legs 10 upon which the inboard rollers 8 each are mounted permits the hatch leaf to clear the deck as it moves to the open position. When fully open, each described leaf lies parallel to the deck as indicated by hatch leaves 2c, 2d in FIG. 3. In this open position the outboard rollers 9 rest upon deck 4 and the inboard rollers 8 rest upon the outboard end of track 11 adjacent to incline 14. The inboard rollers may be resiliently supported as hereinafter described.

In the stowed position of FIG. 2, the outboard rollers 9 remain clear of the track 11 and the adjoining incline while the inboard rollers 8 rest upon the lower flange of girder 12. The outboard edge of each leaf is supported upon the deck 4 by means of cover plate 6 which extends slightly beyond the hatch opening 3. It will be apparent from a consideration of FIG. 2 that as the leaf opens the outboard rollers move up incline 14 prior to the movement of the inboard rollers up incline 13 so that the top of the leaf remains horizontal during the opening motion. The fore and aft edges of each leaf also extend slightly beyond the hatch opening. This feature together with the overlap provided along the outboard edge prevents the hatch cover from dropping through the hatch opening even if the rollers should happen to be sheared off in operation.

Each of the inboard rollers throughout the entire opening and closing motion is confined within the enclosure defined by the track 11 and the top flange of the transverse hatch girder 12. These rollers initially are inserted into this enclosure by cutting away a piece of the top flange of each girder, inserting rollers 8, and patching the piece back in place after insertion.

The split hatch covers are operated by the improved rigging illustrated in FIG. 3. The described rigging enables one or more hatch covers to be operated by a single power winch source, such as cargo winch 15, either separately or simultaneously by fair-leading the operating cable 16 through the several deck levels. This feature eliminates the need for multiple winches for operating the hatch
covers. The rigging also is arranged so that a non-uniform motion is imparted to the hatch leaves to cut the power requirements of the operating cable. This feature enables one hatch leaf to be rolled into motion from its stowed position prior to any movement which seems to the other leaf of a particular hatch cover. The inertia of the leaf and the extremely high coefficient of friction of steel upon steel thus are overcome for one leaf at a time. The advantage of this arrangement will be apparent since the coefficient of friction for steel sliding upon steel starting from a state of rest is at least nine times greater than the rolling frictional resistance for a hatch leaf upon its four rollers. Once the initial motion of one leaf has occurred, the full power of the tension source is led to the second leaf, whereupon it is dragged from its stowed position onto its rollers. The motion thereafter is alternately from one leaf to the other until the end of the opening motion is reached.

For example, to open the pair of hatch leaves 2a, 2b illustrated in FIG. 3, the operating cable 16 is fair-leded through the top deck as at 17, trained around guide means 18a pivoted on the vessel, and hooked to a bridle 19 as the juncture of bridle portions 19a, 19b each of fixed length. The bridle 19 hooks at one end into hook pocket 20a on the inboard edge of leaf 2a, trains over guide means 18b also pivoted on the vessel, and is hooked at its other end to the inboard edge of leaf 2b as at 20b. The initial slack position of cable 16a is shown in detail lines in FIG. 3. The first tension applied to operating cable 16b developed by the winch 15, tends to straighten the combination of whip 16a and the portion 19a of bridle 19. The balance of the bridle goes slack. As the whip 16a is tensioned, its hooked end follows the short radius 18a indicated in FIG. 3, associated with the portion 19a of the bridle until the whip 16a and bridle 19a are aligned. Since radius 18a is substantially less than r19, bridle portion 19b, hooked also to the same end of whip 16a, thus becomes slack by a small amount. Further movement of whip 16a then is imparted directly through bridle 19a to leaf 2a. This initially moves leaf 2a only from its stowed position up onto its rollers.

The near leaf 2a rolls open a short distance, moving with it the center of radius r19, until bridle portion 19b becomes tight. Continued tension of the whip 16a moves leaf 2b up its track inclines as the whip tension transfers from bridle portion 19a to 19b and portion 19a becomes slack. Upon movement of the far leaf 2b a short distance the whip tension transfers to bridle portion 19a while 19b goes slack. Thus, the leaves are moved alternately until both reach the end of their respective opening motions as illustrated for leaves 2a and 2b. The amount of intermittent leaf travel and the order of opening for the hatch leaves is selectively determinable by varying the relative lengths of bridle portions 19a, 19b.

To close the hatch the rigging is reversed as for leaves 2c, 2f. The whip 16a is attached to the bridle 19 at a point closer to the hook pocket 20b of hatch leaf 2f and by the described alternate movement, hatch leaves 2c and 2f are returned to their stowed position as illustrated for covers 2g and 2h of FIG. 3.

The illustrative rigging in FIG. 3 includes guide means 18a, 18b pivoted from the vessel sides at a spaced distance above the corresponding hatch cover leaves. This positioning in combination with the bridle 19 produces the described alternate movement of the leaves. Various guide positions and bridle lengths will be apparent to those skilled in this art for accomplishing a variety of hatch leaf movements, for example, for opening the far leaf 2b first rather than the near leaf 2a for raising the outboard leaf edges upwardly rather than rolling them upon the deck surfaces by training the whip over an idler sheave 21 as shown in dashed lines in FIG. 3. Many sequences and intermittent opening or closing motions may be selected for particular installations. Each leaf also may be opened singly by omitting to hook the bridle 19 to the opposed leaf. Moreover, a plurality of hatch leaves are operable by a single power source merely by dropping the whip 16a through fair-leads 17 in the various deck levels.

An improved cushioning device is combined in the present invention with the foregoing hatch and rigging. The device is illustrated in FIG. 4 and comprises at least one spring-loaded bell crank 21 permanently pivoted on the vessel along the outboard edge of each hatch 3. The bell crank 21 is actuated by a lever 22 and by a compression spring 22 bearing against the deck 4 of the vessel, for example, and one leg 2ta of the bell crank. The other leg 21b of the bell crank contacts the frame 7 of a hatch leaf 2. In the closed position illustrated in full lines in FIG. 4, the spring 22 supports the major part of the weight of the outboard half of the hatch leaf. This relieves the cover plate 6 of a large share of the load it otherwise would support at the lip overlapping the outboard edge of the hatch opening. In addition, the cushioning device through its supporting action reduces the dead weight tendency to produce high sliding frictional resistance upon initial leaf movement.

Upon opening of the hatch leaves the cushioning devices assist each leaf to ride up incline 14 and at an open position, illustrated in hidden lines in FIG. 4, the spring means is fully extended and the bell crank restrained from further movement by the spring contact between leg 21a and the longitudinal strength member of the hatch opening. Subsequently, as the hatch is returned to its stowed position, the longitudinal strength member of the leaf frame 7 catches leg 21b of the bell crank. As the outboard rollers 9 begin to roll down incline 14 the bell crank is pivoted and a portion of the leaf weight absorbed by the compression of spring 22. It will be apparent that the cushioning device performs a dual function of assisting the opening of a hatch by decreasing the line tension required to initially move the particular hatch leaf and of assisting the quiet closing of the hatch leaves by a braking action provided as the hatch rolls down the last several inches of its travel on incline 14. Horizontal travel of the leaves toward each other upon closing is stopped by resilient restraining means 23 disposed at the end of each track 11. This feature also insures the quiet operation of the hatch cover.

It will be apparent to those skilled in this art that various modifications of the general structure described may be made. The foregoing description of a specific embodiment of the invention has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom.

We claim:

1. An improved rolling hatch cover system including at least two nonarticulated opposed-roll hatch cover leaves alternately in increments closing each hatch; rigging means for moving said hatch leaves in opposite directions with respect to each other to effectively open and close said hatch, said means moving the outboard edge of at least one of said leaves upwardly relative to the inboard edge of said leaf for substantially vertical stowage of said leaf.

2. An improved rolling hatch cover system including at least two nonarticulated opposed roll hatch cover leaves normally closing each hatch; support rollers rotatable upon said leaves about parallel axes disposed transversely with respect to the path of leaf travel; guide means restraining movement of said rollers; and rigging means for moving said leaves alternately in increments in opposite directions with respect to each other to effectively open and close said hatch comprising a power operated tension whip; a bridle detachably secured at each of its ends to a different one of a pair of said opposed-roll hatch leaves; a first guide means supporting the bight of said bridle a spaced distance above said hatch leaves; and a second guide means supporting said tension whip a spaced distance above said hatch leaves, said tension
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5 whip being detachably secured at a fixed point to one of the falls of said bridle depending from said first guide means.

3. In a hatch cover system having at least two non-articulated opposed-roll hatch cover leaves normally closing said hatch and rigging means for opening and closing each of said leaves; the improvement including rigging means secured to each of said leaves for alternately moving first one leaf and then the other in short increments along their paths of travel.

4. In a hatch cover system according to claim 3 said rigging means for opening and closing said leaves comprising a power operated tension whip; a bridle detachably secured at each of its ends to a different one of a pair of said opposed-roll hatch leaves; a first guide means supporting the bight of said bridle a spaced distance above said hatch leaves; and a second guide means supporting said tension whip a spaced distance above said hatch leaves; said tension whip being detachably secured at a fixed point to at least one of the falls of said bridle depending from said first guide means.

5. An improved rolling hatch cover system including at least two opposed-roll hatch cover leaves closing each hatch; rigging means for moving said leaves in opposite directions with respect to each other to effectively open and close said hatch; and a separate spring-loaded crank pivoted adjacent said hatch to resiliently engage each hatch leaf prior to the end of its closing motion and thereby brake the motion of said leaf.

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