July 4, 1961 K. W. TANTLINGER 2,991,108

HATCH COVER HOLDDOWN DOG

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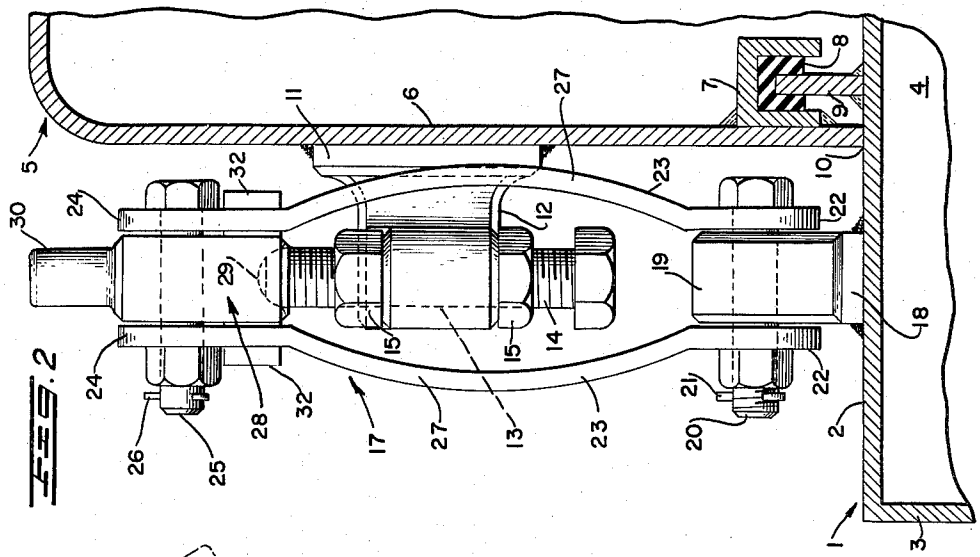

FIG. 2

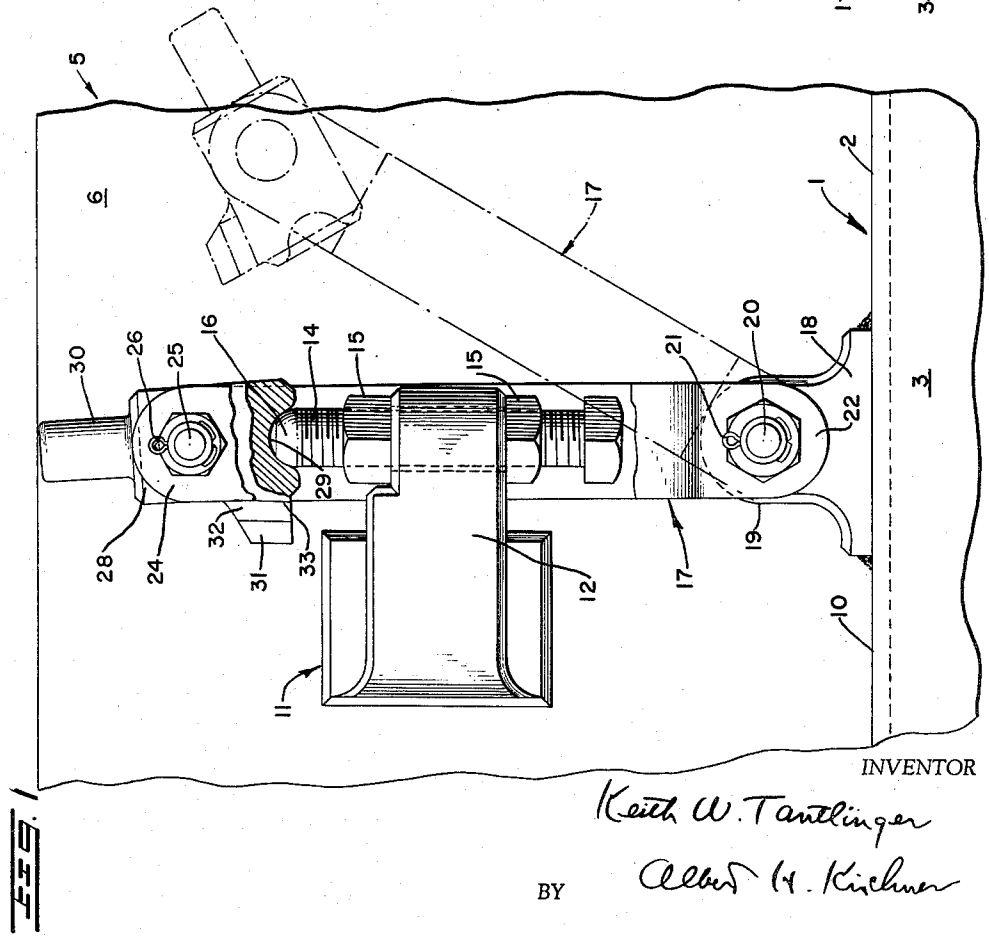

FIG. 1

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Fig. 4

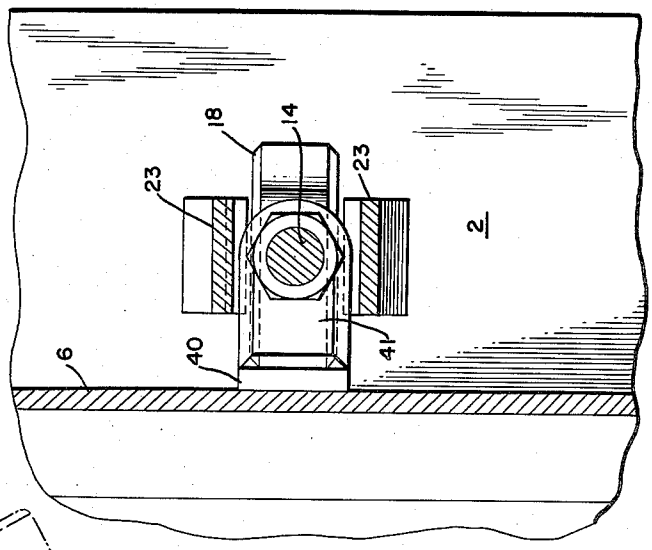
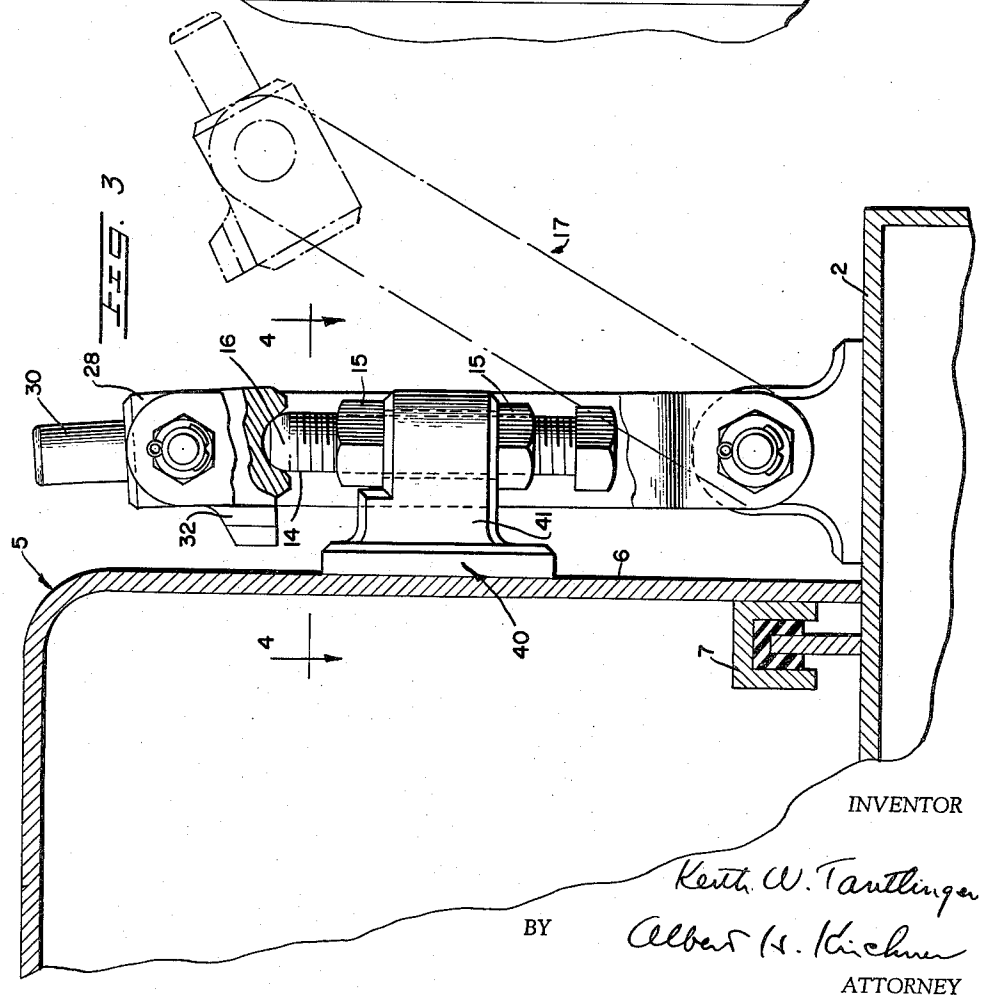


Fig. 3



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HATCH COVER HOLDDOWN DOG

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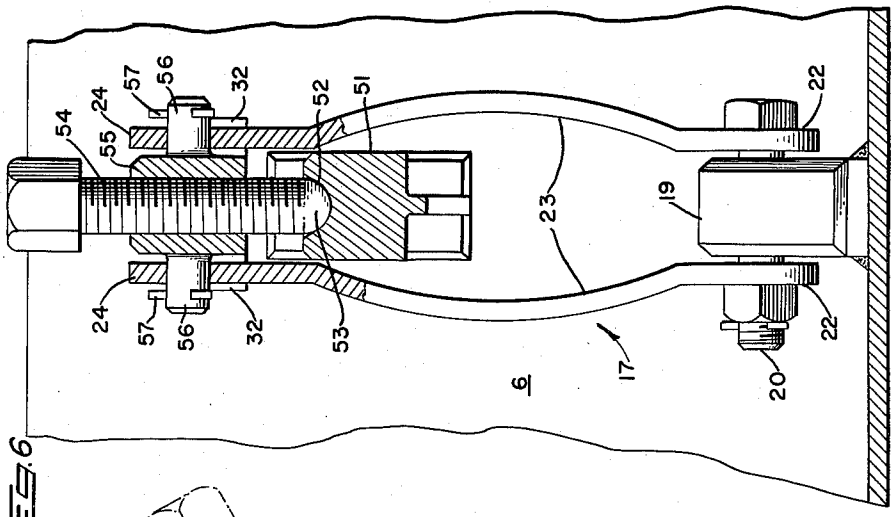

FIG. 6

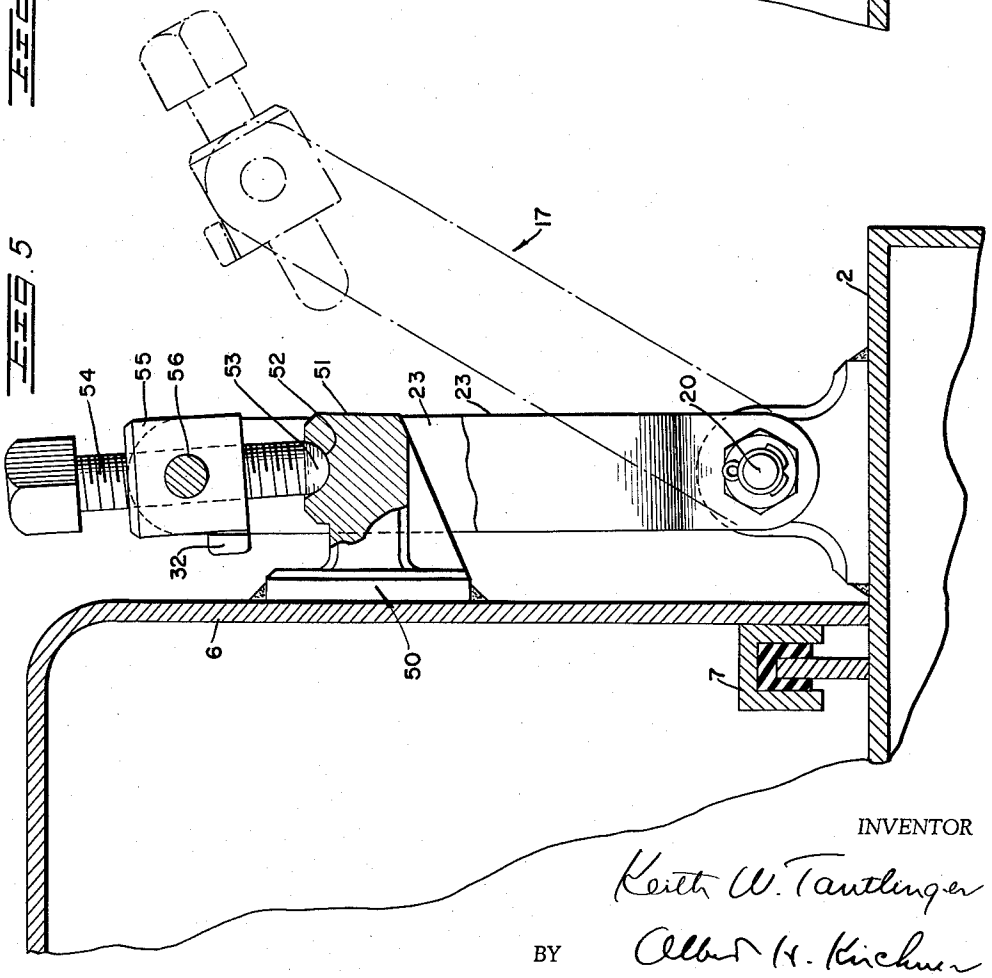

FIG. 5

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HATCH COVER HOLDDOWN DOG

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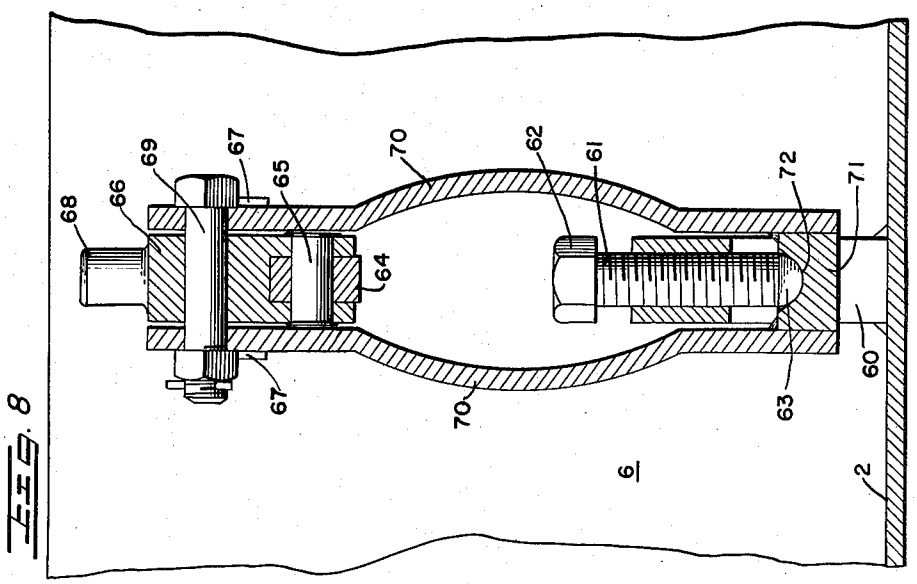

FIG. 8

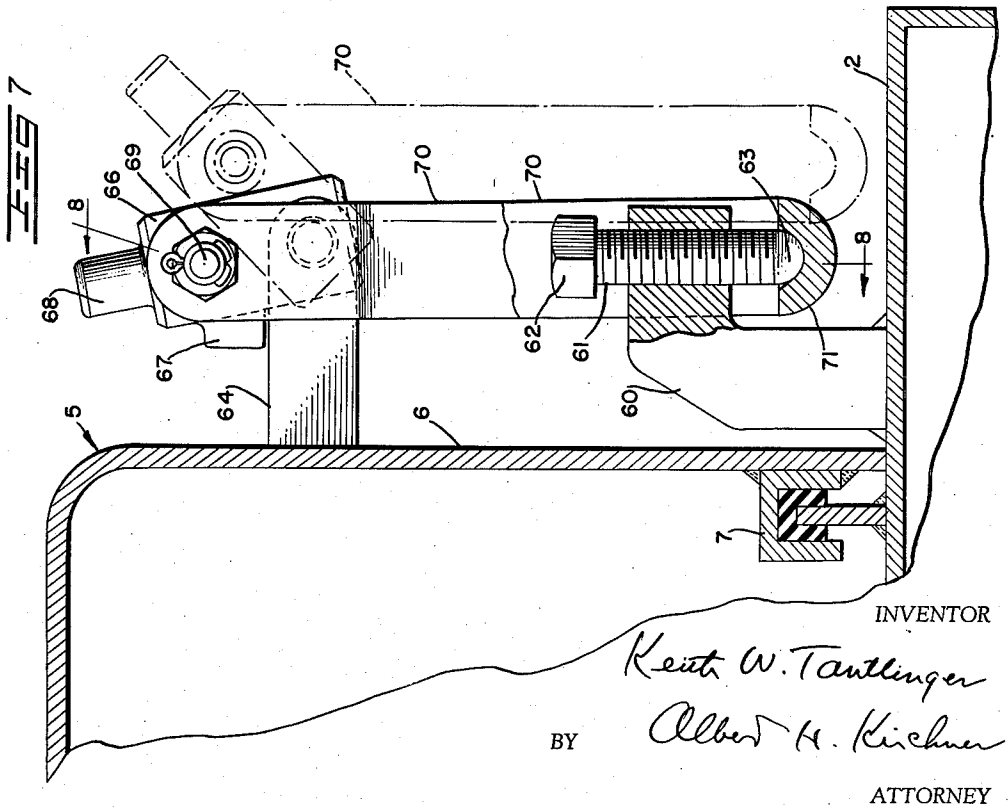

FIG. 7

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United States Patent Office 2,991,108 Patented July 4, 1961

2,991,108

HATCH COVER HOLDDOWN DOG

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Filed July 3, 1957, Ser. No. 669,782
5 Claims. (Cl. 292—256.5)

The present invention relates to latching means for separably securing a hatch cover to the adjacent coaming on the deck of a ship and more particularly to a holddown dog device for permanent installation at spaced intervals around the coaming of a hatchway provided with an effectively or virtually one-piece cover.

Such covers are commonly quite large, being, in the case of some ships to which the present invention has been applied, of the order of 26 by 36 feet in area and weighing some twenty tons, being fabricated of heavy gauge steel plates stiffened by various beam and bracing means. They are provided with eyes or equivalent fixtures for application of hooks or the like on cables by which they are lifted and lowered. The present invention is concerned with providing a simple, strong and easily operated holddown dog for securing such covers in lowered, closing position on the hatchway.

An important object of the invention is to provide a holddown dog of the class indicated having two main parts which are capable of being installed respectively on the coaming and cover by a welding or equivalent operation requiring no great accuracy or nicety of positioning the parts.

A related object is to provide such a dog as can be made of a few simple castings, forgings and standard hardware parts, such as bolts and nuts, and which will constitute a rugged device of such strength and durability as to be virtually indestructible.

Another object is to provide a dog structure which can be multiplied around a hatchway, at spacings of any appropriate length, such for example as at intervals of the order of five feet, and which will all act in tension between the cover and coaming, so as to exert compressive force on the cover, even though all of the dogs are not uniformly adjusted to substantially identical relationship of the parts that are connected respectively to the coaming and the cover.

A further object is to provide a hatch cover holddown dog incorporating resilience or elasticity in the form of a tension member which is adapted in use to apply pressure to the cover to hold it down on the coaming, even though the cover make, as may be preferred, metal to metal rigid, incompressible and unyielding contact with the coaming, thus producing the distinct advantage of yielding pressure in the latch connection without requiring any spacing of the cover from the coaming.

A more specific object comprises forming a holddown dog for hatch cover use with means providing a toggle action type of linkage, or a camming relationship, by which coacting surfaces of the two main parts swing past a dead point to a limiting stop in movement of the parts to connecting position so that accidental movement to detaching position is effectively prevented, while movement in the reverse direction past dead center instantly disengages the coacting surfaces for separation of the parts.

An ancillary object is to provide a dog of the character indicated with a simple actuating appurtenance which is readily engageable by an operating lever for movement of the parts between connecting and releasing positions in an action requiring no skill or care on the part of the operator.

Other objects of the invention are to provide hatch cover holddown dogs in a variety of specific embodiments, each particularly suited to a special condition of use,

e.g., space limitations and requirements, but all having in common certain desirable features, such as the application of constant pressure of the cover on the coaming through the medium of elastic means in the fastening device, substantial independence of the need for accuracy in locating the cooperating parts of the devices on the cover and coaming, respectively, or of special care in positioning the cover on the coaming, etc., all of which are common to the generic inventive concept.

Other objects and advantages will be evident, it is believed, from a consideration of certain preferred embodiments of the invention which are illustrated in the accompanying drawings, in which

FIGURE 1 is a side elevational view of one form of the dog, with parts broken away, shown in connecting position in full lines and in released position in broken lines;

FIG. 2 is an end elevational view of the full line showing of FIG. 1, with the coaming and hatch cover depicted in vertical section, and the mechanism in the latching position;

FIG. 3 is a view generally like that of FIG. 1 but taken on a plane at a right angle thereto sectionally through the cover and coaming and showing a modified type of hatch cover bracket;

FIG. 4 is a horizontal sectional view taken on the line 4—4 of FIG. 3;

FIG. 5 is a view like that of FIG. 3 but showing a modified type of cam block;

FIG. 6 is a view generally like that of FIG. 2 but taken on a plane at a right angle thereto sectionally through the coaming and showing, partly in vertical section, the modification of FIG. 5;

FIG. 7 is a view generally like that of FIG. 3 but showing a still further modification; and

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 7.

In these figures the reference numeral 1 designates a conventional type of coaming which is formed with a horizontal surface 2 and a vertical surface 3 enclosing a hatchway 4 of generally rectangular shape and usually of some large area which may be of the order of twenty-plus feet by thirty-plus feet. The hatchway is closed by a cover 5, the details of which are not important to the present invention but which may include a metallic shell, rectangular in plan, terminating perimetrically in a depending skirt 6 whose bottom edge rests on the horizontal surface 2 of the coaming when the cover is in place thereon, as shown in FIG. 2. It may be desirable to improve the seal of the cover on the coaming by some such adjunct as a channel 7, shown in FIG. 2, welded around the inside of the lower margin of the cover and containing a rubber type gasket 8 receiving a low rib 9 which is welded in upstanding relation to the coaming surface 2 just inside the cover. However, for reasons of strength and security, including availability of the cover to support heavy deck freight, the bottom edge of the cover should make metal to metal contact with the coaming, as shown at 10 in FIG. 2, and it is this relationship of the cover and coaming that the preferred embodiment of the present invention, or a series of dogs spaced around the hatchway, each constructed in accordance with the principles of the invention, desirably maintains regardless of unevenness or inaccuracy in the fit of the cover and coaming by which not all juxtaposed portions of the respective surfaces may be in mutual contact.

Accomplishment of this object involves incorporating resilient yieldability in the latching connection, preferably with provision for adjustment of the coacting surfaces of the two main parts or members which are secured to the coaming and cover respectively, so that the extent to which these members go in making initial en-

gagement, prior to relative movement into final, securing relationship, can be varied. These features are incorporated in the preferred embodiment of the invention which is shown in the drawing and which will now be described.

Affixed to one of the two surfaces that are to be connected, preferably to the cover **5**, is a bracket generally designated **11** having a forwardly and laterally projecting horizontal arm **12** terminating in a vertical bore **13** in which is mounted a stout screw in the form of a headed bolt **14**. A pair of nuts **15** are threaded on the bolt and bear against the bracket arm **12** at the ends of the bore **13** to provide for vertical adjustment of the bolt, so as to regulate the height of the rounded top end **16** of the shank of the bolt above the bottom edge of the skirt **6** of the hatch cover. The end **16** thus forms a vertically adjustable abutment or bearing surface for engagement by the cooperating member of the connecting couple which is secured to the coaming and in the preferred, illustrated embodiment of the invention comprises the member generally designated **17**, which will now be described.

The member **17** comprises essentially a swinging or swingable link device pivoted to the coaming for movement into and out of engagement with the bracket element and preferably incorporating yieldable resilience for promoting a cam or toggle action by which the swing can be carried past a dead point so that the parts will be maintained in connected relation securely against undesired or accidental disconnection. Under excessive stress the bowed side plates straighten and develop their total strength.

The preferred arrangement includes a base bracket **18** welded or otherwise securely affixed to the coaming **1**, as for example to the horizontal surface **2** thereof, and presenting an upstanding eye or horizontally bored boss **19** in which is journaled a pivot pin **20**, here shown as a conventional headed bolt provided with a nut and diametrically drilled to receive a cotter pin **21** for preventing loss of the nut.

Straddling the boss **19** and journaled on the pivot pin **20** are the perforated flat parallel lower end portions **22** of a pair of elongated plates **23** which together comprise the link member **17**. The opposite ends of these plates are similarly formed as perforated flat ears, as shown at **24**, and these ears, forming what may be regarded as the normally upper ends of the plates **23**, constitute the bearings for a pivot pin **25** which, like the pin **20**, may consist of a standard type of headed bolt provided with a nut and cotter pin **26**.

Between the upper and lower end ears **24** and **22** each of the plates **23** is outwardly bowed, as shown at **27**, so that the plates can be elongated or stretched, upon flattening of the bowed portions, so as to increase the distance between the two pivot pins. The metal of which the plates are made is sufficiently resilient or elastic to permit such deformation under tension, followed by restoration to the initial bowed shape on release of the stretching force. Standard conventional mild steel is appropriate for the purpose, since the bending stresses are of such low magnitude that the yield strength of ordinary mild steel is not exceeded.

Journaled on the upper pivot pin **25**, between the ears **24** of the plates **23**, is a relatively short block **28** which is formed with a shallow indentation or socket **29** at one end and with an axially projecting stud or stub shank **30** at its other end. The contour of the socket **29** is complemental to that of the rounded top end **16** of the bolt **14**, and the dimensions and proportions of the stud **30** are such as are appropriate for fitting into the socketed end of a long bar (not shown) which is operative as a handle or lever for turning the block **28** about its pivot **25**, as will be explained hereinafter.

The block **28** is generally rectangular in cross section and is about the same thickness as the boss **19** so that it fills the spacing of the upper ears **24** just as the boss **19** fills the spacing of the lower ears **22**. However, formed integral with the body of the block **28**, on its side facing the bracket **11**, is an enlargement, the ends of which are beveled as shown at **31** in FIG. 1 and extend out beyond the side edges of the block, adjacent the end of the block in which the socket **29** is formed, constituting a pair of laterally extending lugs **32**. What may be regarded as the inner face of each of these lugs, i.e., the surface facing the block **28**, is beveled or chamfered slightly, as shown at **33** in FIG. 1, so that the lugs taper downwardly a little, their inner bottom edges being spaced slightly out from the plane of the adjacent surface of the block while their inner top edges are in the plane of that surface.

The operation of the device is as follows:

With the bolt **14** adjusted to fix its upper rounded end **16** at the proper elevation, which adjustment is easily accomplished by trial and error, the link member **17** is swung about the pivot pin **20** up through the broken line position of FIG. 1, with the block **28** directed as there shown, until the socket **29** of the block is engaged with the end **16** of the bolt. The adjustment of the bolt in the bracket arm **12** should be such that this engagement is effected with the longitudinal axes of the plates **23** and the block **28** forming an angle which is somewhat more acute than the angle at which they are shown in broken lines in FIG. 1. This angle should be such that, with a suitable bar handle (not shown) socketed over the stud **30**, the block can be rocked about its pivot pin **25** past the dead point, in which the axes are coincident, to bring the lugs **32** into engagement with the adjacent side edges of the plates **23**, in which position the axes will form an angle of preferably about three to four degrees, as shown in full lines in FIG. 1. The setting of the bolt **14** should be such that during this swinging of the plates **23** and block **28** the plates will be deformed in tension toward a more flat condition of their bowed portions **27**, with the deformation beginning before the axes of the block and plates reach an angle on the approach side of their movement equal to the angle to which they will be limited on the far side of their movement by engagement of the lugs **32** with the plates **23**. Thus it results that in the final position of the parts, shown in full lines in FIG. 1, the plates **23** can be placed under a high degree of tension, holding down the cover **5** on the coaming **1** by a very considerable force. It will be evident also that the parts cannot be moved to separated relation without reverse rocking of the block and reverse swinging of the link member **17** formed by the plates **23** and that this movement involves a considerable increase in the tension in the plates before the axes of the block and plates cross dead center and pass therefrom toward the broken line position of FIG. 1 with consequent release of all the tension stress. The parts are best made in such size and of such material that the tension that must be overcome in disconnecting or separating movement requires the application of a lever handle tool of considerable length to the stud **30**, so that the dog is for all practical purposes incapable of being released by anyone not possessing such a tool.

It will be recognized that during the swinging movements just described the block **28** cams about the surface **16** to stretch the link member **17** until the lugs **32** stop the camming action. Thus the block is a cam, the bearing surface **16** is a fixed follower, the lugs **32** are cam stops, and the plates **23** comprise a member linking the cam to the pivot pin **20** as a fixed center of rotation with freedom of the cam pivot to shift as the link member become elongated or contracted.

It will be noted also that the combination of the link member **17** and the block **28** constitutes a toggle linkage. Thus the block is a lever of the second order which fulcrums about the rounded surface **16** of the bolt **14** when turning force is applied by the handle tool (not shown) to the stud **30**. In this operation the plates **23** connect the lever **28** with the load (the pivot **20**) which the lever

28 tends to lift. The pivot 20 being fixed, it results that the link 17 formed by the plates 23 stretches by flattening of the bowed portions 27 with increasing tension therein, as has been explained.

It will be appreciated that while, in the embodiment of the invention shown in FIGS. 1 and 2 and thus far described, resilient yieldability has been built into the link member 17, this property could be incorporated elsewhere in the device, as in the bracket member 11, in the structure contiguous to the fulcrum or abutment surface 16, in the block 28 or its mounting or the bracket 18, or even, conceivably, in the metal of the cover 5 or coaming 1. Such modifications of the FIGS. 1 and 2 species, some of which will be hereinafter briefly described, are deemed to be within the broad spirit of the invention and the comprehension of the broader of the appended claims.

While of course specific dimensions and indeed proportions of the parts also are not to be regarded as part of the inventive concept, it may be helpful to note that in an entirely satisfactory device in which the invention has been reduced to actual practice the link member 17 was made of steel plates twelve and one-quarter inches by three-eighths inch by two inches with a three-quarter inch bow; the bracket 18 and the body of the block 28 were each three inches high and one and one-half inch thick, with the stud 30 one and one-half inch long and one inch in diameter; the length of the bore 13 in the bracket arm 12 was two inches; and bolt 14 was of one inch diameter and each of the bolts 20 and 25 was of three-quarter inch diameter; the height of the enlargement forming the stop lugs 32 was one inch, its length was three inches, and the relief 33 was one-sixteenth inch; and the bracket 11 had a total projection from the hatch cover skirt of three and one-eighth inches and a reach (the distance from the axis of the bore 13 to the far edge of its base affixed to the hatch cover skirt) of four and eleven-sixteenths inches.

FIGS. 3–8 illustrate other species of the generic concept and will now be briefly described.

In FIGS. 3 and 4 the structure, arrangement and operation of the device are the same as in FIGS. 1 and 2 except that the hatch cover bracket 40 differs from the bracket 11 by lacking the right-angular form of that bracket. Thus the bracket 40 is provided with a pad or base portion that is welded to the vertical side wall or skirt 6 of the cover 5 and an arm 41 that projects straight out over the coaming ledge 2 on which the swinging link member 17 is mounted, exactly as in FIGS. 1 and 2 except that the member is mounted for swinging movement toward and away from the hatch cover, as shown in FIG. 3, instead of parallel to it.

In the species of the invention shown in FIGS. 5 and 6 the adjustable element is carried by the cam block or short lever element of the toggle linkage, analogous to the member 28 of FIGS. 1–4. The hatch cover bracket may be of the right-angular type of FIGS. 1 and 2, or the straight type of FIGS. 3 and 4, as shown in FIGS. 5 and 6. Since the adjustment is made on the block, this hatch cover bracket, designated generally 50, is reduced simply to a pad or base which is welded to the cover and has an arm 51 projecting out over the coaming ledge and having a more or less hemi-spherical socket or depression 52 in its upper surface for fulcruming the complementally rounded lower end 53 of a stout headed bolt 54 which is threaded in the block 55. This block, which functions like the block 28 of the other figures, is provided with integral trunnions 56 which are journaled in bearing holes formed in the ears 24 of the two bowed side plates 23 of the link member 17 and may have cotter keys 57 standing through their end portions to hold the block assembled with the link. Lugs 32 are formed on the block 55 and function as stops abutting the side plates for limiting the angle of the block and link member 17 beyond dead center, as has been described in connection with the other two species of the invention.

In the use of the FIGS. 5 and 6 embodiment the bolt 54 is adjusted in the block so that when its bottom end is seated in the socket 52 and the bolt is rocked from the dotted line position of FIG. 5 to the full line position, the toggle will swing past dead center, with deformation of the bowed plates toward straight condition when the lugs 32 strike the sides of the plates, as shown in full lines in FIG. 5, and as will be understood from the explanation of the other figures. Because the bolt 54 functions for the foregoing adjustment and as the stud 30 of the other figures, it is best provided with a hex or other polygonal head for reception of the socketed end of a combination wrench and lever (not shown) by which the bolt may be rotated for adjustment and the block may be rocked, as will be understood.

FIGS. 7 and 8 show an embodiment of the invention in which the principal parts of the structure are reversed relatively to their positions and functions in the other species. That is to say, in this form a bracket bearing an adjustable screw is welded to the coaming and serves as the bearing or fulcrum for the toggle linkage which in this instance is pivoted to a bracket secured to the cover.

Thus, referring to FIGS. 7 and 8, a bracket 60 is welded to the coaming ledge and is threaded for engagement by a stout upright screw 61 which is adjustable by application of a wrench to its head 62 to position its downwardly facing rounded shank end 63 at variable spacings from the coaming ledge surface.

A bracket 64 is welded to the vertical skirt 6 of the hatch cover and in this instance may comprise a simple straight length of stout bar stock. The outer end portion of this bracket is apertured for reception of a heavy pivot pin 65 the ends of which are peened over a cam block 66, shaped generally like the block 28 of FIGS. 1 and 2, i.e., the block is provided at its back with a transversely extending enlargement forming laterally protruding lugs 67 whose front surfaces form a slightly oblique angle with the longitudinal axis of the block. Moreover, the block 66 is surmounted with an operating stud 68 like the stud 30, and the upper portion of the block is bored for reception of a bolt 69 which, like the bolt 25, pivotally mounts on the block the straight, parallel upper end portions of a pair of bowed plates which constitute the elastic or resilient link or lever of the toggle. The lower ends of these plates 70 may be straightened like the upper ends, and they are connected by a stout filler block 71 which is welded to the plates and has its upper surface provided with a socket 72 that is complemental to the shape of the rounded end 63 of the adjusting bolt 61. Thus the plates 70 and filler block 71 form an assembly constituting the elastic link or lever of the toggle linkage which is completed by the block 66 and the pivot 69 which connects the block and elastic link.

The manner in which this embodiment of the invention is used will, it is believed, be evident from the foregoing description taken in conjunction with the full and broken line views in FIG. 7. The screw 61 being properly adjusted in the bracket 60, the block 66 is swung out, around the pivot 65, to substantially the broken line position of FIG. 7 and the socket 72 is engaged under the rounded bearing head 63 of the screw 61. An operating handle (not shown) is then socketed over the stud 68 and the block 66 is rocked about the pivot pin 65, with stretching of the plates 70, past dead center until the lugs 67 engage the back side edges of the plates 70 and stop the movement. Release is accomplished by reverse swinging of the block about the pivot 65, through dead center, accompanied by a slight stretching of the plates 70 with final shortening as the tension terminates and the block 71 becomes freed from the abutment 63.

It will be recognized that in each of the specific em-

bodiments selected to illustrate the invention the hatch cover is held down on the coaming by a constant pressure produced by the bending stress in the elastic or resilient link that forms part of the toggle linkage. The constant value of this stress is an important feature of the invention, as is also the independence of the device relatively to reasonable maladjustments of the cover on the coaming, or of the location of the respective brackets of each couple. One more important feature of the invention in all its forms is the fact that the cam stop provided by the lugs on the block element of the toggle linkage coacts with the bowed plates, i.e., with the cooperating element of the linkage, rather than with some fixed surface such as the cover bracket or the cover. Thus, with the invention incorporating this feature the proper relationship between the coacting parts is comparatively easy to establish and maintain, and the relationship is independent of and unaffected by variations in installation positioning of the brackets. Consequently the brackets may be applied to the coaming and cover without need of great care in exact positioning such as would be necessary if the stops were to react with either of the brackets.

Other features and advantages will, it is believed, be evident from the foregoing brief discussions of certain typical exemplifications of the generic concepts and require no further elaboration. Departures from the specific structural details of the disclosed embodiments are contemplated within the spirit of the invention and are intended to be included within the comprehension of the broader of the appended claims. Thus, to state just a few typical possibilities for altering the structures disclosed without departing from the spirit or principles of the invention:

The bar handle, not shown, which is to be socketed over the studs **30** or **68**, need not be a special tool. Any suitable length of common iron pipe of proper diameter can be used. Indeed, it may be found desirable in some installations to make the stud long enough to provide sufficient leverage, in which case no separate handle member is needed. Again, while the use of two clamping or jam nuts **15** threaded on the bolt **14** involves the advantage of smooth-boring the bracket **12** and thus avoiding difficulties that might result from corrosion of an internal thread, it is quite possible to use with success an internally threaded bracket and a single jam nut threaded on the bolt. And in FIGS. 7 and 8 a single jam nut can be threaded on the bolt **61**, or the bracket bore may be left smooth and a pair of nuts used.

The recitation of these equivalents is made by way of suggestion and as typical or representative and illustrative merely and is by no means exclusive, as will be understood by those skilled in the art to which the invention relates.

I claim:

1. A holddown dog for securing a hatch cover to a coaming comprising an upper bracket member affixed to the cover and a lower bracket member affixed to the coaming, a toggle linkage pivotally connected at one end to one of said members and swingable into and out of engagement with a bearing surface formed on the other of said members, said toggle linkage comprising the combination of a pair of identical elongated resilient members disposed in laterally spaced parallel relation and a block element pivoted between said resilient members at one end thereof, each of said resilient members comprising a plate having aligned straight ears at its opposite ends and an outwardly bowed intermediate section resiliently connecting said ears, the ears at one end of the two resilient members being parallel to each other and the block element being pivoted between said ears and having an upper end formed for engagement by a tool for applying leverage to the element for swinging it about its pivot and having its lower end portion extending downwardly between the ears and below said pivot, and abutment means comprising a lug formed on the block element and extending laterally therefrom below the block element pivot axis and parallel thereto for engagement with the adjacent ear of one of said resilient members to stop swinging movement of said pivoted linkage at a terminal position beyond dead center of the toggle components thereof.

2. A holddown dog as claimed in claim 1 in which the upper bracket member is of right angular shape in plan, having one end welded to the side of the hatch cover and having a vertical screw threaded into its other end forming said bearing surface and rendering the same adjustable, and in which the lower bracket member has a pivot pin normal to the adjacent side of the hatch cover mounting the toggle linkage for swinging in a vertical plane parallel to said side.

3. A holddown dog as claimed in claim 1 in which the upper bracket member is a substantially straight arm having one end welded to the side of the hatch cover and having a vertical screw threaded into its other end forming said bearing surface and rendering the same adjustable, and in which the lower bracket member has a pivot pin parallel to the adjacent side of the hatch cover mounting the toggle linkage for swinging in a vertical plane normal to said side.

4. A holddown dog as claimed in claim 1 in which the upper end of the block element comprises a screw engaged in a substantially vertical threaded socket formed in the block element for adjustably engaging the bearing surface formed on the upper bracket member and in which the upper end of said screw comprises the upper end of the block element formed for engagement by the tool.

5. A holddown dog as claimed in claim 1 in which the bearing surface is formed on the lower bracket member and comprises the lower end of a screw engaged in a threaded socket in said lower bracket member spaced above the coaming and received in a socket element connecting the ears at the end of the resilient members opposite the end thereof to which the block element is pivoted.

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