

Jan. 28, 1964

H. KUMMERMAN
RETRACTABLE TOGGLE CLAMP

3,119,636

Filed July 25, 1961

4 Sheets-Sheet 1

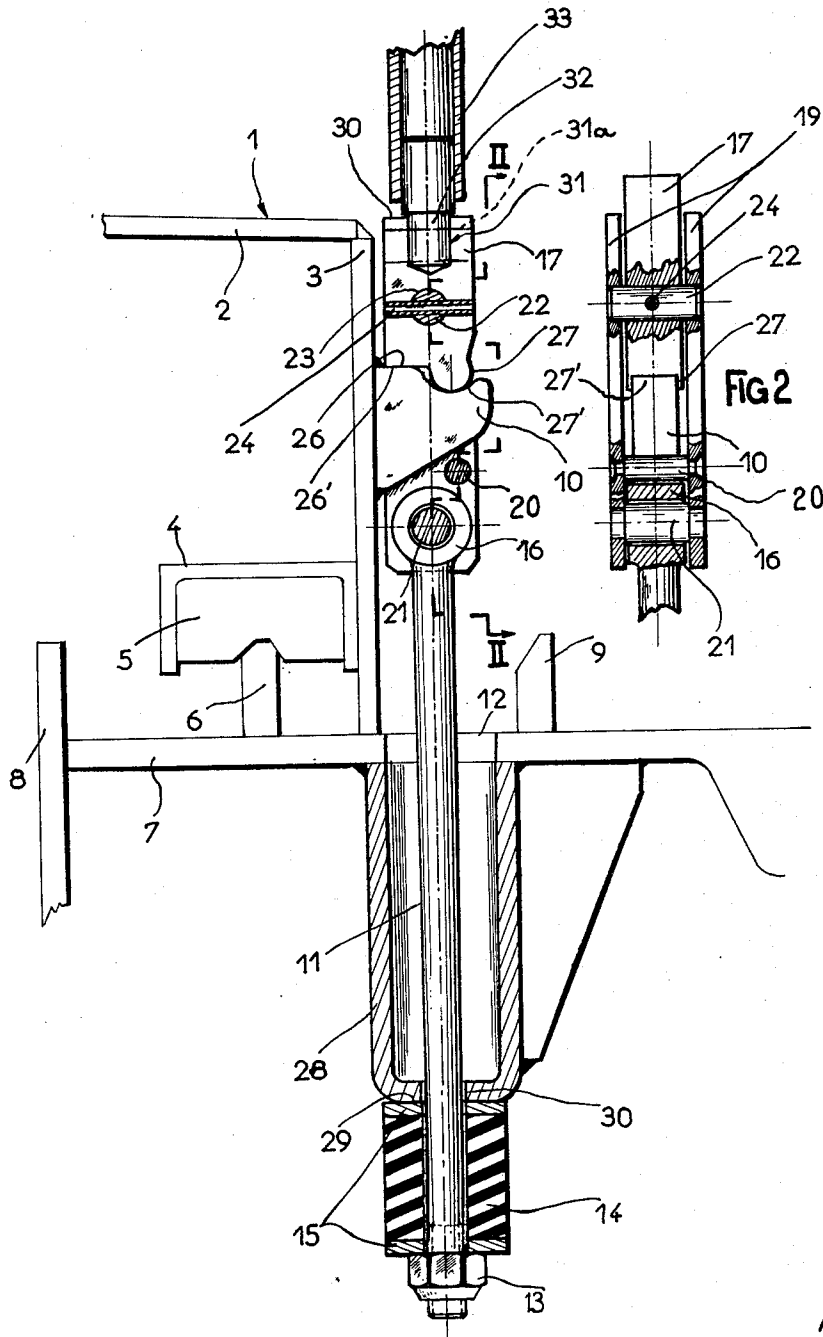


FIG 1

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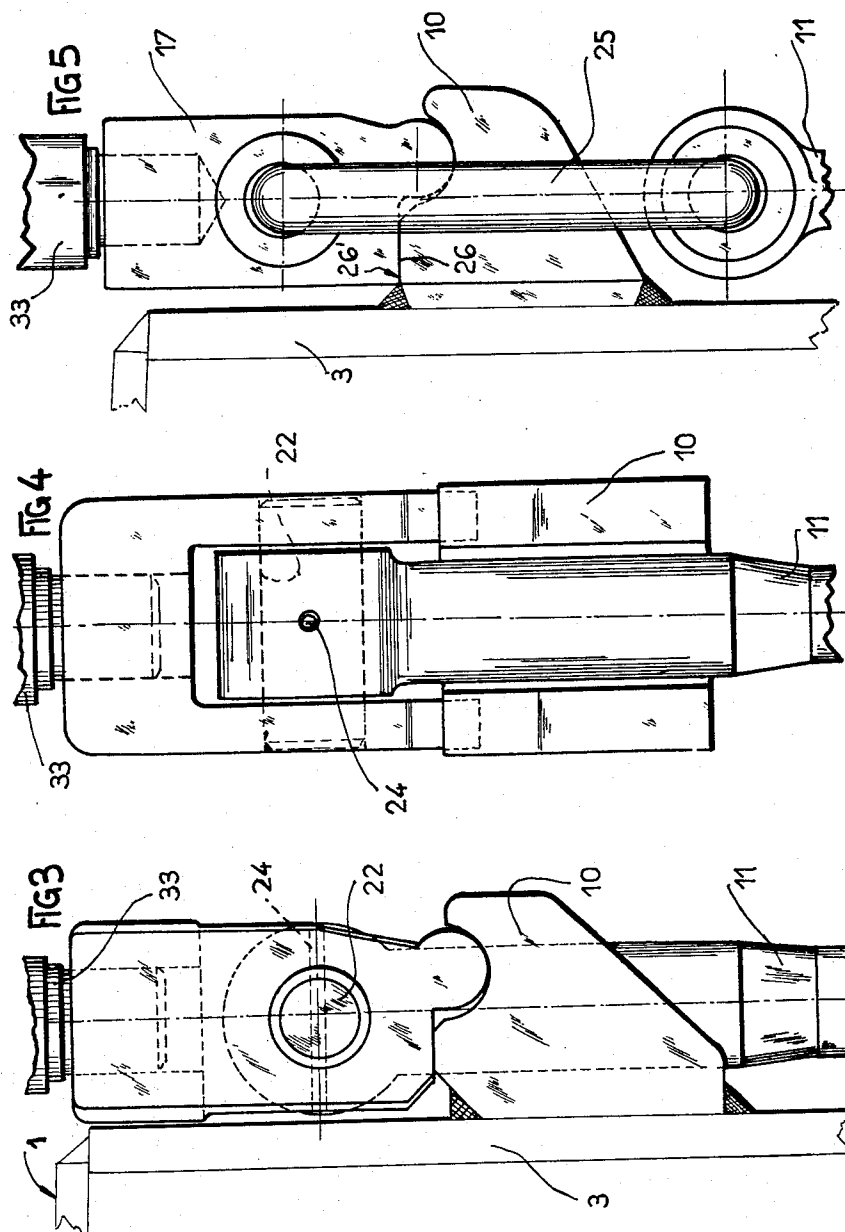
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4 Sheets-Sheet 2



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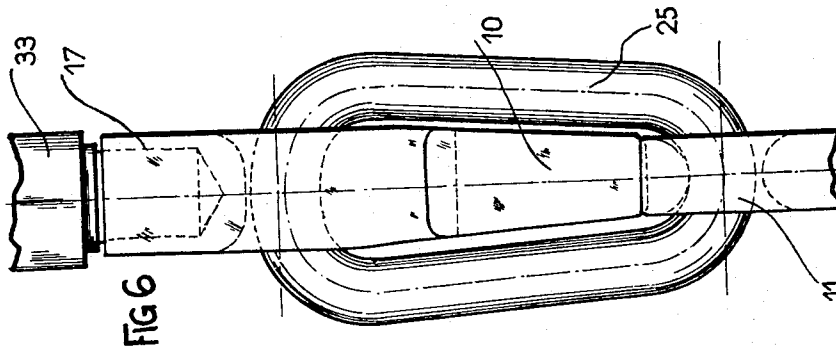
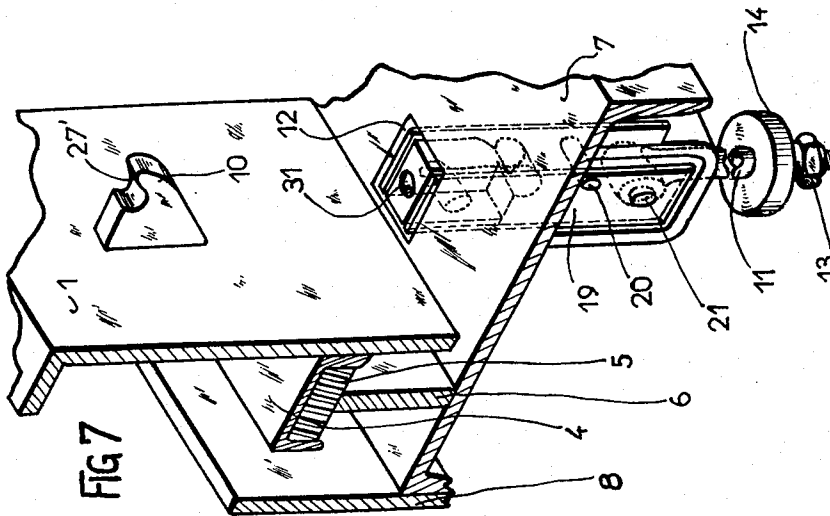
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4 Sheets-Sheet 3



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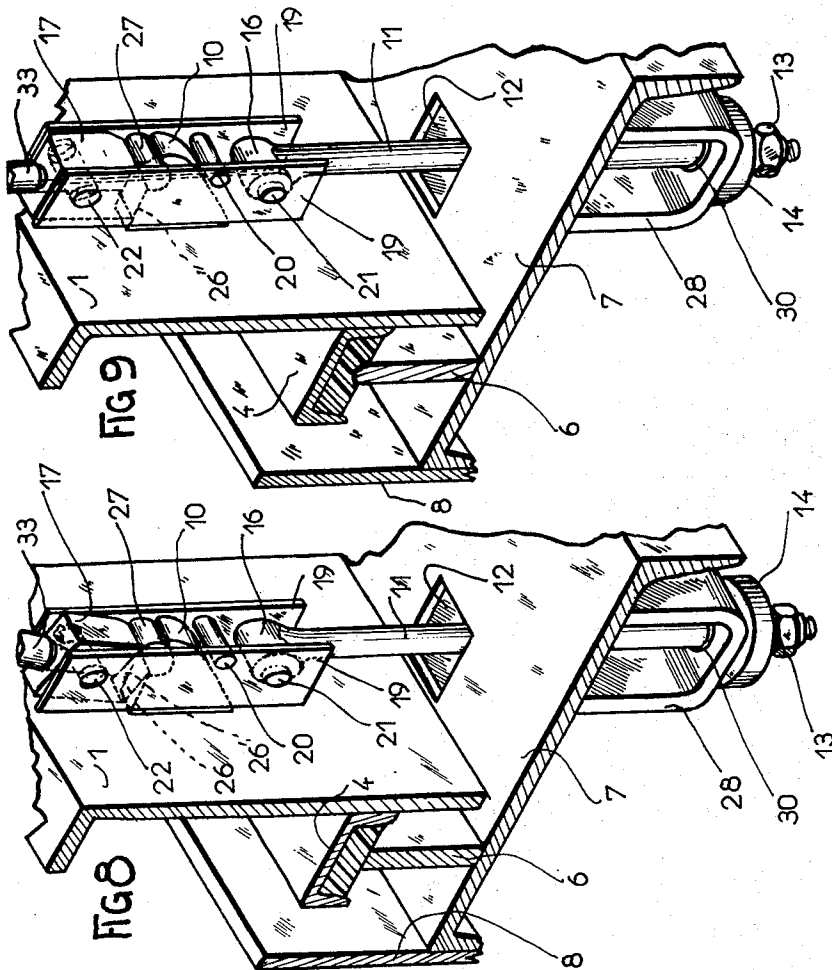
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4 Sheets-Sheet 4



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1

3,119,636

RETRACTABLE TOGGLE CLAMP

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Filed July 25, 1961, Ser. No. 126,535

Claims priority, application France Nov. 4, 1960

5 Claims. (Cl. 292—256.5)

This invention relates essentially to a quick-operated locking device for pressing, clamping or assembling two parts together.

Quick-action locking devices of this general type are known which comprise notably a tenon or like support rigid with one of said parts, a tie-rod or like element extending through an aperture or the like formed in the other part, an eccentric cam or like member acting as a clamping pad adapted to bear on said tenon and pivoted on the rod end adjacent to said tenon, an adjustable abutment or stop member carried by said rod adjacent to its opposite end, on the other side of the other of said parts, a resilient element mounted on said rod and interposed between said abutment and said other part, and a detachable control handle for actuating said cam member and pressing same on said tenon. Although this type of locking or clamping device has a great variety of practical applications, it is described herein with specific reference to a toggle clamp adapted to lock hatches or like covers on a ship and to form and/or preserve a fluid-tight joint between the hatch and the relevant contact edge of the hatchway coaming.

In hitherto known locking devices of this character the joint-tightening rods or at least their cam members were supported in their inoperative position by the coaming side plates or platforms and could thus constitute an obstacle to the free movements of the hatches by interfering with members solid with these panels, such as the rollers rolling on the trackways or guide rails formed on or supported by the coamings. With this invention it is possible to retract the movable portion of the locking device behind the face on the abutment side of the other part as mentioned in the preceding paragraph, so that the device can be retracted completely within the coaming plate; this invention is remarkable notably in that the locking device comprises a support or like element solid with that face of said other part which is on the abutment side of said tie-rod, that is, in this case, of the lower face of the coaming plate, said support receiving the pressure from said abutment and being adapted to act as a casing for housing said cam in its inoperative position so that this cam will not project from the other face on the side of the first part, that is, the upper face of the coaming plate.

On the other hand, the known devices of this character did not comprise any means for protecting them against accidental overloads likely to damage them. Such overloads might result, for example, from a difficult actuation of the device due to an excessive tightening as a consequence of a faulty adjustment of the position of the abutment member, or to an abnormal effort occurring when separating two parts to be locked or clamped, such as an excessive lifting effort applied to the hatch-cover.

With the present invention this drawback can be avoided in that, according to another feature characterizing this invention, the device comprises safety means protecting it against overloads, these means consisting preferably of certain easily replaceable elements having a lower mechanical strength than the other component elements of the device, said easily replaceable elements being adapted to break when subjected to a predetermined limit load. This limit load is calculated with a view not to damage the other component elements of the device.

According to a further feature characterizing this invention, the aforesaid weaker elements consists of inter-

2

changeable connecting or assembling member comprising at least a cross-sectional area such as to break up when a predetermined limit load is overstepped.

This invention is also concerned with different forms of embodiment of the locking device broadly set forth hereinabove, and notably with its use as a toggle clamp for tightly locking the hatch-covers of a ship's hold, with a view more particularly to provide and/or maintaining a water-tight joint between said covers and the contact edge of the hatchway.

Other features and advantages of this invention will appear as the following description proceeds with reference to the accompanying drawings illustrating more particularly the application of the locking device to the closing of hatch-cover elements on ships, it being understood that other applications than, and changes in, the precise embodiment of the invention herein disclosed may be contemplated within the scope of what is claimed without departing from the spirit of the invention. In the drawings:

FIGURE 1 is a diagrammatic part-sectional, part-elevational view showing a toggle clamp for tightly locking a hatch-cover which is constructed according to the teachings of this invention and illustrated in its locked and operative position;

FIGURE 2 is a diagrammatic section taken upon the line II—II of FIGURE 1;

FIGURE 3 is another diagrammatic part-sectional, part-elevational view showing an alternate embodiment of a toggle clamp according to this invention;

FIGURE 4 is a diagrammatic fragmentary side elevational view of the device of FIGURE 3;

FIGURE 5 is a diagrammatic elevational view showing another embodiment of the toggle clamp of this invention;

FIGURE 6 is a diagrammatic fragmentary side view of the toggle clamp of FIGURE 5;

FIGURE 7 is a diagrammatic perspective view showing the hatch-cover locking device in its inoperative and retracted position;

FIGURE 8 is a view similar to FIGURE 7 but showing the device in its operative but unlocked position; and

FIGURE 9 is a similar view showing the device in its operative and locked position.

Referring more particularly to the form of embodiment of the invention which is illustrated in FIGURE 1, it will be seen that the hatch-cover or panel element designated broadly by the reference numeral 1 comprises essentially a top plate 2 and side walls 3. A packing channel 4 consisting of an inverted U section secured on the inner side of the wall 3 has fitted therein a resilient sealing gasket 5 of rubber or other similar material. A sealing bar 6, adapted to form a fluid-tight joint with its upper edge engaging the gasket 5, is welded along its lower edge on the coaming plate or platform 7 secured on the outer side of the coaming 8. This coaming plate 7 carries a guide rail 9 located externally of the side wall 3 of the hatch-cover 1 and adapted to receive in rolling engagement the rollers mounted on this panel. A tenon or like projecting support 10 is secured on the outer face of the side wall 3. This tenon 10 may have either a solid configuration as shown in FIGURES 1, 2, 5 and 6, or a forked configuration as shown in FIGURES 3 and 4. A tie-rod 11 extends through an opening 12 formed in the platform 7 and comprises a screw-threaded lower portion engaged by a self-locking or like nut 13 acting as an adjustable abutment. A resilient member 14 consisting either of a rubber block or of a metal spring is mounted freely on the rod 11 between two metal washers 15 or the like above the nut 13. This rod 11 is formed at its upper end with an integral pivot eye 16. An eccentric or like cam member 17 is connected through a single or double hinge to the eye 16 of rod 11. Thus, according to the

form of embodiment illustrated in FIGURES 1 and 2, this cam member 17 is connected to the rod 11 through the medium of a strap or yoke 18 consisting in the manner known per se of two paired shackles 19 assembled for example by means of a rivet or like member 29 (see FIGURE 2). This strap 18 is mounted on the eye 16 of rod 11 by means of a pivot pin 21. The cam member 17 is pivoted at the other end of the strap 18 by means of another pivot pin 22 extending through a hole 23 formed in this cam member and fastened thereto for example by means of a cross pin 24 or the like. According to another form of embodiment illustrated in FIGURES 5 and 6 the cam member 17 may be pivoted on the rod 11 by means of a link or like element 25 passing through the pivot hole 23 of cam 17 and the eye 16 of rod 11.

Finally, according to another modified embodiment of this invention, as illustrated in FIGURES 3 and 4 of the drawings, the tenon 10 and cam member 17 may have a forked configuration and the eye 16 of rod 11, located between the two sides of cam member 17, is pivoted directly on this member by means of the pivot pin 22.

In the locked position the cam member 17 engages the tenon 10 through the medium of two separate, spaced bearing faces, that is, one portion of a flat face 26 adapted to engage a corresponding flat portion 25' of the tenon, and one portion of a projecting surface 27 having a rounded convex contour adapted to engage a corresponding recess or notch 27' formed in the tenon 10 and consisting of a recessed surface portion having a concave contour.

In the locked position the homologous bearing surfaces 26, 26' and 27, 27' in mutual contact are located on either side of the longitudinal axis of rod 11.

In known devices of this general type the upper washer 15, in the locked position, engages the underface of the coaming plate or platform 7. In the device of this invention, a support 28 is secured on the lower face of the coaming plate 7 in alignment with the opening 12. This support 28 may have for example the shape of a U with a flat bottom 19 through which an axial hole 30 also aligned with the opening 12 is formed and receives the rod 11, as shown. In the locked position, this flat bottom is engaged by the upper washer 15. The shape and dimension of the opening 12, the depth of the space provided between the two sides of the U-shaped support 28 and the relative spacing of these two sides are such that in the inoperative position the cam member 17 may pass through the opening 12 so as to nest completely within the support 28 with its upper face 30 just flush with the upper face of the coaming platform 7 (see FIGURE 7). In this retracted position the cam member 17 cannot interfere with the movements of the rollers (not shown) of the hatch-cover on the guide rails 9.

The cam member 17, on its lever arm opposite to the lever arm engaging the tenon 10, and preferably on its upper face 30, has an orifice 31 formed therein, in which the end or tip 32 of the detachable control lever 33 may be fitted. For the sake of convenience and if this is permitted by the space available for the angular movements of the control handle, this orifice 31 may be formed as shown at 31a, at right angles to the axis of cam 17.

To avoid any possibility of damaging the toggle clamp in case of accidental overload occurring in one of its component elements, safety means are provided, preferably in certain connecting or assembling members. The connecting members selected for this purpose comprise at least a cross-sectional area adapted to yield and break when a predetermined limit load is applied thereto, without detrimentally affecting the other component elements. According to the preferred form of embodiment illustrated the breakable connecting elements consist on the one hand of the pivot pin 22 adapted to be readily replaced when broken, this pin breaking for example when an abnormal lifting stress is applied to the hatchway cover 1, and on the other hand of the fitting end or tip 32 of the control lever 33 which is so designed as to

break in case of an abnormal resistance occurring in its operation due, for example to an excessive tightening of the nut 13, so as to provide an efficient protection for all the other component elements of the toggle device.

The operation of the locking device of this invention is described hereafter from the initial unlocked and retracted position of the device which is shown in FIGURE 7.

The rod 11 is raised up to the position shown in FIGURE 8, and the projection 27 of cam member 17 is placed into the relevant notch 27' of tenon 10. The upward movement of rod 11 causes the upper washer 15 to contact the lower bearing face 29 of the U-shaped support 28. The tip 32 of control lever 33 is fitted into the hole 31 of cam member 17 and the control handle 33 is raised to a substantially vertical position while compressing the resilient block 14. During this movement, the cam member 17 pivots about its momentary fulcrum consisting of the successive lines of contact of its projection 27 with the notch 27' formed in the tenon 10. When the elements are in their locked and eccentric position as shown in FIGURE 9 the resilient block 14 provides a force directed downwards along the longitudinal axis of rod 11 so as to safely hold the parts in their locked position. The cam member 17 can easily be locked on the tenon 10 by simply raising the handle 33 and without screwing any member whatsoever. By locking the cam member 17 on its support 10 the latter and therefore the hatchway cover or panel element 1 with its sealing gasket 5 are lowered, so that a water-tight joint is formed between the gasket 5 and the sealing bar 6. If this joint is already formed by the pressure resulting from the weight of the hatchway cover 1 alone, it will be maintained by locking of the cam member 17 relative to its support 10.

When it is desired to unlock or release the cover 1 for removing same, the handle 33 is lowered to free the cam member 17 from its support 10, then the tip of handle 33 is removed from the orifice 31 in cam member 17 and the rod 11 is lowered until the cam member 17 has collapsed within the recess formed by the support 28.

Of course, the invention should not be construed as being limited to the forms of embodiment given in the attached drawings and described hereinabove, as many modifications and variations may be brought thereto without departing from the spirit and scope of the invention and appended claims.

What I claim is:

1. A quick operated releasable locking device adapted to tightly secure a first part in abutting relationship against a second part, and comprising at least one outwardly projecting lug rigid with said first part and having at least one bearing edge facing away from said second part and formed with a curved recess and a flat seating portion spaced from said recess and substantially perpendicular to said first part, restraining means consisting of a laterally projecting double-sided flange member secured to said second part and formed with an opening therethrough, a swing dog bolt having a shank extending freely through said opening formed in said flange member, a toggle-clamp lever formed with at least one eccentric cam member pivotally secured at its central portion through an intermediate link member to that end of said dog bolt which is towards said lug, said cam member being formed at one end with an orifice and at its opposite end with at least one convex rounded projection and one flat counter-stop portion spaced from each other and adapted to engage in matching relationship said curved recess and said seating portion of said lug respectively at points lying on opposite sides of the longitudinal axis of said shank in the locked position thereof whereas said pivotal connections of said cam and shank are substantially aligned at right angles to said seating portion, an adjustable abutment mounted on said shank near its opposite free end on the other side of said flange member, a resilient element mounted on said shank and interposed in engageable rela-

5

tionship between said abutment and said flange member, a detachable operating handle for actuating said toggle-clamp lever and causing said cam member thereof to bear on said lug, said handle having a tip portion snugly insertable in said orifice and said toggle-clamp lever having at least one frangible part selected from the group including the pivotal connection of said cam member and said tip portion of said handle and adapted to break at a given stress to prevent overload, a bracket means integral with and projecting from said other side of said flange member about said opening therein and provided with a bearing end face formed with a hole substantially registering with said opening for the passage of said shank therethrough and engageable by said abutment through said resilient element, said bracket consisting of a stirrup-like part forming a hollow recess for accommodating said toggle-clamp lever in its inoperative position, so that the latter is entirely retractable in said recess and does not protrude from said flange member on the side of said first part.

2. A device according to claim 1, wherein said toggle-clamp lever is pivotally connected through said cam member to one end of a pair of substantially parallel elongated flat side plates integral with one another, hingedly secured by their opposite ends to said that end of the shank of said dog bolt, and straddling said shank and cam member.

6

3. A device according to claim 1, wherein said cam member and said lug are each bifurcated in shape, with two parallel corresponding arms, straddling the connecting end of said dog bolt.

4. A device according to claim 1, wherein said toggle-clamp lever is pivotally connected through said cam member to said that end of the shank of said dog bolt by means of a chain link forming a one-piece shackle.

5. A device according to claim 1, wherein said abutment comprises a nut means threaded on said opposite end of the shank of said dog bolt and said resilient element comprises a washer of elastic material.

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