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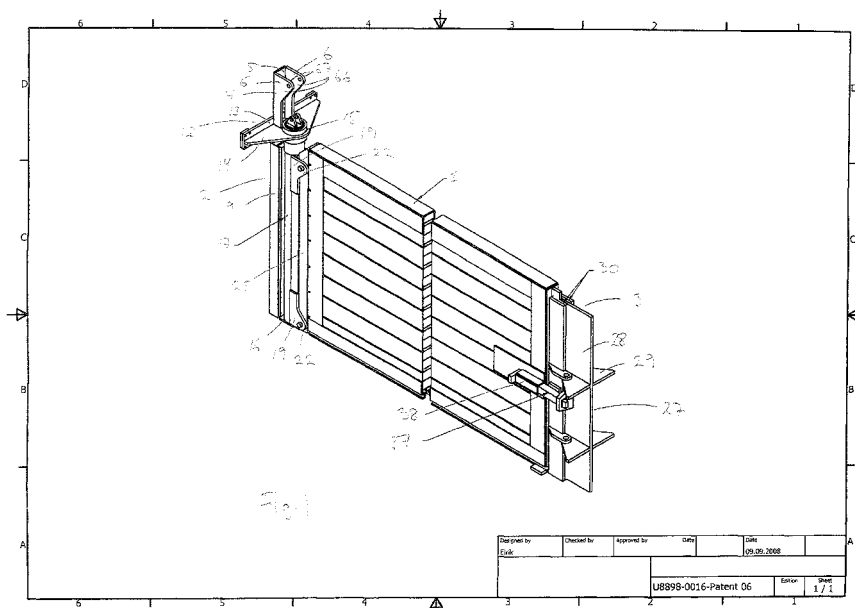
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(54) **Bulkhead arrangement with pivotal section**

(57) It is disclosed a division arrangement for water-proof division of a room. The arrangement comprises a gate plate (1), a first securing arrangement (2) for fastening the gate plate (1) against a first wall or similar structure, and a second securing arrangement (3) for securing the gate plate (1) against a second wall or similar structure. The first securing arrangement comprises means for rotating the gate plate (1). The second securing arrangement (3) comprises means for locking the gate plate in a closed position. The first sealing arrangement (2) comprises a flexible or elastic water-proofing

element (11) and a non-elastic water-proofing element (18) forming a rotatable, water-proof connection between the adjacent wall and a gate cylinder (17), and a flexible or elastic sealing element (41) forming a water-proof, flexible connection between the gate cylinder (17) and the gate plate (1). The second water-proofing arrangement (3) comprises a flange (36) located on the second end wall (35) of the gate plate and a securing flange (28) protruding from the adjacent wall and plate elements (30) suitable to be pressed against the flange (36) and the securing flange (28) to form a water-proof connection between the gate (1) and the second wall.



Description

[0001] The present invention concerns gates for water-tight securing or segregation of a chamber. It concerns particularly gates suitable for water-tight segregation of chambers where there intermittently is movement in the walls to which the gate is secured. This type of gates may inter alia be used in ships with car-decks or cargo decks for segregation of the decks in several apartments.

[0002] After the shipwreck of Estonia in the Baltic Sea in the fall of 1994, new rules for securing the car-deck of ships were established. The cause of the shipwreck was that all of the locks at the bow port had failed during the load of the waves leading to water entering the car-deck. Water in movement gave the ship a catastrophic tilt in a very short time. This was not the first time a ship had capsized on account of this type of problems, but after the Estonia shipwreck new demands for securing of car decks on ferries were established.

[0003] New ferries are built with car-decks where there is built in safety devices against penetration of water, but in older ferries such safety devices must be built into the already existing construction. The securing is ensured by providing water-tight gates in pre-defined positions on the deck based on calculations of inter alia the ship's behavior in high seas and the entrance of water in a damaged condition. Since the hull of a ship will move somewhat when the ship is moving, the gates should work as a water-tight safety device also when the hull is moving/ twisting.

[0004] It is known to calculate with this movement/ twisting by providing an especially solid gate which will not collapse at a certain load in the side walls. A disadvantage of such a solution may be that the securing of the gate to the ship's hull will have to accommodate very high loads, something that may be of importance for the integrity of hull of the ship.

[0005] It is known from the applicant to use water-tight gates that, when they are in use as deflecting elements on a car-deck or cargo deck, take into account the movement of the walls while securing a water-tight coupling between the gate and the floor and walls of the deck so that water may not penetrate from one separated room or section to the next, and that hull and gate are not subjected to excessive forces when there are movements in the ship's construction. The gate is constructed with gate elements for a flexible handling in the same way as commonly known garage gates that through the aid of a mechanical device and a rail system are pulled up into the roof of the garage when the garage is opened and is pulled down again into the garage opening for closing the garage. The water-proof gate for segregating car or cargo decks is stored either in the ceiling or the side walls of the deck in a suitable rail system. For dividing the deck into smaller water-secure zones or sections, one or more gates are pulled by the aid of a corresponding rail system and either manual or automatic mechanisms across the cargo room and are secured in a water-impermeable way

to the walls.

[0006] It is emphasized that with "room" we mean a connection with car or cargo deck, a space of inter alia a deck that is limited a floor and at least three sides. A "room" includes thus open as well as closed rooms.

[0007] In one of the applicant's previously known gate devices an elongated flat element is secured vertically and perpendicularly to the side wall. On the end side of the gate there is deposited one or more elongated gaskets with a groove in between corresponding with the flat element on the wall. By pushing the gaskets adjacent the flat element the side edge will be in a water-proof conjunction to the wall. The flat element and corresponding gaskets protrude sufficiently and overlap each other sufficiently to accommodate displacements of the gate and wall relative to each other.

[0008] From EP patent 0348055 A1 there is known a gate arrangement for water-tight segregation of a room wherein the gate arrangement comprises at least one gate plate running across the entire deck with a first securing arrangement for securing the gate plate against a first wall and a second securing arrangement for securing the gate plate against a second wall. The first and the second securing arrangements comprise means for pivoting the gate plate. The gate plates are locked together when they coincide with each other.

[0009] From NO patent 306384 B1 there is known a water-tight segregation wall system for ships wherein the gates are hinged to the ceiling and that close the room by pivoting the gates 90 degrees down towards the deck.

[0010] However, the previously known solutions are rather complex constructions. This also has as a consequence that the already known solutions require a relatively complex system for guiding and securing the gates. A complicated system will frequently require a larger degree of maintenance than simpler systems. It has also proven to be suitable with machine operation of the gates since these may be relatively heavy to handle. It requires in other words relatively large investments to use previously known gates on a car-deck or a cargo-deck.

[0011] Consequently it is wanted to provide a simpler solution for water-tight segregation of rooms in ships subject to water penetration e.g. as car decks in a ship or a ferry. It is wanted to provide a gate arrangement that may be handled either manually or automatically and that rapidly may form a water-tight connection with adjacent floor and wall or walls. Furthermore it is wanted that such a gate arrangement is to maintain a water-tight connection with adjacent walls and floor when the walls are moving relatively to the arrangement without taking up unwanted forces in the water-tight connection.

[0012] This is achieved with a gate arrangement according to the appended claims.

[0013] One aspect of the present invention is that the securing arrangement has one resilient and one non-resilient tightening element. Furthermore, in one aspect of the invention there is arranged on the gate plate a flange passing into attachment with a securing flange being

mounted on the adjacent wall for locking the gate plate.

[0014] In one aspect the present invention thus presents a water-tight gate arrangement being simple to mount and having an alternative locking action/arrangement of the gate to the adjacent wall.

[0015] The gate arrangement will now be more closely explained with reference to the appended figures wherein:

Fig. 1 shows a perspective view of a gate plate with securing devices according to the invention.

Fig. 2 shows a side view of the gate plate and the securing devices according to the invention.

Fig. 3 shows a detailed view of a first securing device according to the invention.

Fig. 4 shows a detailed bird's eye view of a second securing device according to the invention.

Fig. 5 shows a top-view of the gate plate and securing devices according to the invention.

Fig. 6 shows a section of a side view of the first securing device according to the invention.

Fig. 7 is a perspective view of a connecting element.

Fig. 8 shows a detailed view in cross section of the contact area of the gate towards the floor under the gate plate.

Figs. 9-13 show a first example of an arrangement for hoisting, lowering and pivoting the gate plate.

Figs. 14-16 show a second example of an arrangement for hoisting, lowering and pivoting the gate plate.

Fig. 17 shows a section of the gate displaying a locked position.

[0016] Fig. 1 shows a perspective view of a gate plate 1 and securing arrangement according to the invention. The gate arrangement shown in fig. 1 comprises a first 2 and a second 3 securing arrangement for water-tight or impermeable connection against adjacent side walls, a proofing arrangement for water-tight or impermeable connection against the ground or floor and a gate plate that may be moved between an open and a closed condition and that may be locked both in an open and closed condition.

[0017] It shall be pointed out with a water-tight connection it is meant here not a completely water-tight connection, but a connection that substantially prevents water and/or other fluid from penetrating. The purpose of said water-tight connection is to stop the movement of the

mass of water, it will, however, be acceptable that some water and/or other fluid penetrates, e.g. from 0 to 100 liters per minute.

[0018] The first securing arrangement is also shown in cross section in a bird's eye-view in fig. 3. The securing arrangement comprises an upper securing element 4, a bearing element 12 and two adjustment elements 9, all being designed to be secured to an adjacent wall. The elements 4, 12 and 9 are secured to the wall e.g. through welding, bolt connections or other suitable securing arrangement.

[0019] In the depicted example the upper securing element 4 comprises a middle part 5 that may abut against a wall or some other securing surface, and two side plates 6 protruding mainly perpendicularly from the wall (not shown) so that the cross section of the securing element 4 seen from above forms a U-like shape. In the front edge of the side plates 6 in the securing element 4 there are two protrusions 66 wherein there are arranged bolt holes. A hydraulic cylinder (not shown) for hoisting and lowering the gate plate may be secured in these bolt holes. In the depicted example the securing element 4 runs from the bearing element 12 and a distance upwards. However, the securing element needs not to be in contact with the bearing element 12. It is also possible to arrange a smaller securing element 4 a distance above the bearing element 12 as long as the distance between, and arrangement of the securing element 4 and the bearing element 12 is suitable for the mounting of a hoisting and lowering device for hoisting and lowering of the gate.

[0020] Two elongated adjustment elements 9 are secured to the wall. These elements 9 are also depicted in fig. 3. Since the gate arrangement according to the invention is to be suitable for mounting to a vessel wall, the surfaces that the gate arrangement is to be mounted to are also depicted in fig. 3. Since the gate arrangement according to the invention is to be suitable for mounting to a vessel wall, the surfaces that the gate arrangement is to be mounted to need not necessarily be straight vertical surfaces. The adjustment elements thus have a shape adjusted to the surface curvature of the surrounding walls. In the figures the adjustment elements 9 are shown as rectangular elements, but based on what is mentioned supra it is obvious that the adjustment elements may have any suitable form just to fit the gate arrangement to a mounting under different conditions and to different constructions.

[0021] The adjustment elements 9 are mounted on each side of a connecting element 7, see fig. 3. The connecting element 7 is constructed with a middle plate 8 and two side elements 46 in such a way that there is obtained an element with a U-like cross section. Between the adjustment elements 9 and the middle plate 8 and between the side elements 46 and the middle plate 8 there will be formed two elongated open rooms 10. A first room 10a faces in towards the wall between the adjustment elements 9, while the other room 10b faces outwards from the wall in the direction of the gate plate.

[0022] The adjustment elements 9 and the connecting element 7 have a height corresponding to the critical height for the water-proof division and the decks. The height of these elements will normally lie within the interval of the wave height that is considered to be maximum height in the area where the ship is to sail, e.g. 2,5 or 4 meters of height. However, it is obvious that any height may be selected for the elements based on the relevant requirements for the ship or vessel wherein the gate arrangement is to be mounted.

[0023] In the second open room 10b there I arranged a flexible or elastic water-proofing element 11, see fig. 3. The water-proofing element 11 is preferably constructed from a flexible or elastic material that may be compacted and that will re-form its original shape is the compacting forces disappear. An especially suitable material for such a water-proofing element 11 is neoprene or similar flexible materials e.g. rubber, synthetic foam materials, polymeric sponge materials, etc. For the water-proofing element it may be advantageous to use sponge neoprene equipped with a Teflon film or other low-friction material on one or more of the external surfaces of the element. The Teflon film may e.g. have a thickness in the interval from 0,5 mm to 5 mm, and preferably about e.g. 2 mm thickness. The low friction material will reduce the wear on the water-proofing element caused by movement of the gate. This will become clearer based on the following disclosure of the invention.

[0024] Below the securing element 4 there is positioned a bearing element 12. The bearing element 12 comprises a flat wall element 13 and a bearing plate 14 placed perpendicularly to the wall element 13. In the bearing plate 14 there are apertures for allowing a cylinder element 15 to be passed through the bearing plate. The cylinder element 15 is mounted in a non-rotational manner to the bearing plate 14, e.g. trough welding. The wall element 13 is suited to be secured to the wall behind the gate arrangement, e.g. through welding, bolt connections or the like. An advantageous way to secure the wall element to the wall is by using an intermediate plate element 68 equipped with bolt holes 69 and welded to the adjacent hind-wall or other adjacent surface and by mounting the wall element 13 to the plate elements 68 through a bolt connection. The wall element 13 and the bearing plate 14 may typically be secured to each other through welding. The wall element 13 will protrude to the sides relative to the longitudinal axis of inter alia the adjustment elements 9 and may thus function as a stabilizing element for the gate arrangement.

[0025] In the lower part of the connecting element 7 there is arranged a securing device or plate 16 suitable to be fastened to the floor (not shown) below the gate arrangement. The securing device or the plate 16 is equipped with a bearing or a peg 48, see fig. 7, for the placement of a section of the axle to a gate cylinder 17 so that the gate cylinder 17 is pivotally mounted on the securing device 16. On or in the surface of the gate cylinder 17, in the longitudinal direction of the cylinder, there is

arranged a water-proofing element 18. The water-proofing element 18 is preferably made of a non-elastic or rigid material such as steel. As the water-proofing element there may typically be used a round iron. The water-proofing element 18 will be brought to impinge on the water-proofing element 11 when the gate plate 1 is pivoted to a closed position, i.e. when the gate is placed across the room which it segregates. In this manner the cylinder 17 will not be worn against the water-proofing element when the gate plate is rotated, by the cylinder 17 being able to be mounted at a distance from the flexible water-proofing element 11.

[0026] Even if the rigid water-proofing element 18 in fig. 13 is shown to lie against a flat surface on the flexible water-proofing element 11, it is obvious for a person skilled in the art that the water-proofing element 18 is arranged so that it will be pressed against the water-proofing element 11 so that this element 11 will be compressed and embrace the water-proofing element 18.

[0027] On the gate cylinder there are also mounted two securing brackets 19. The securing brackets 19 are observed on figs. 1 and 2 and a securing bracket 19 is seen in cross section in fig. 3. The securing brackets 19 comprise a middle plate 20 (see fig. 3) and two side plates 21 arranged in such a way that the bracket 19 has an H-like cross section. The securing brackets 19 thus form a first and a second open room, where the gate cylinder 17 is located in the first room and a flexible or elastic water-proofing element 41 is located in the second room facing the gate plate. The flexible water-proofing arrangement 41 may be of the same type as the water-proofing element 11 disclosed supra.

[0028] The side plates 19 are constructed with one or more arms 22. The arms 22 are equipped with bolt holes 23. The securing brackets are mounted to the upper and lower area of the gate cylinder 17, respectively. The gate plate 1 is secured to the arms 19 through the aid of bolts 26 arranged into corresponding openings 23,24 in the side plates 21 on the securing bracket 19 and in two lengthwise running flanges 25 mounted on the first end wall 45 of the gate 1 in a regular manner. The flanges 25 and the end wall 45 will thus form a U-profile. When the gate plate is secured to the securing brackets 19, the flanges 25 will impinge against the flexible water-proofing element 41, thereby forming a water-proofing connection between the gate cylinder 17 and the gate plate 1. The connection I maintained across the height of the gate, i.e. in the required safety height for the gate, normally the highest presumed wave height for the vessel where one or more port arrangements are to be installed.

[0029] To allow a certain movement of the gate relative to the first securing arrangement 1, the upper bolt opening 23a may advantageously be oblong to a certain extent in horizontal direction so that the upper bolt connection gets a certain freedom of movement in the horizontal direction when a bolt is arranged in the opening.

[0030] The gate plate 1 is consequently secured to the gate cylinder 17 in such a way that the gate may move

somewhat horizontally in a plane parallel to the longitudinal axis of the gate cylinder. The gate cylinder 17 is pivotally connected to the connecting element 7. In this way the gate may be swung about the first securing arrangement 2.

[0031] On the opposite wall (not shown) there is mounted a second securing arrangement 3. A second fastening element 27 comprises an extended securing flange 28 and a number of cross flanges 29 located mainly perpendicularly to the fastening flange 28. The fastening flange 28 and the cross flanges 29 are fastened to the adjacent wall, e.g. through welding. The cross flanges 29 are equipped with one or more openings or holes for the mounting of bolts or other cylindrical elements. It will be obvious for a person skilled in the art that the securing flange also may be equipped with holes or openings for the securing of elements.

[0032] Elongated plate elements 30 equipped with flexible water-proofing elements 31 are located on each side of the securing flange 28, see fig. 4. The elongated plate elements 30 are furthermore equipped with arms 32 and holes 33. The plate elements 30 are pivotally secured to the cross flanges 29 by the aid of bolts 34 being arranged through the holes 33 in the arms 32 on the plate elements 30 and through holes in the cross flanges 29. The plate elements may thus rotate from a position where the surfaces with the water-proofing elements 31 stand more or less parallel with or at least along the vessel wall, to a position where the surfaces stand mainly perpendicular to or at least extends from the vessel wall and mainly along the cross flange 29 and the flange 36.

[0033] On the second end wall 35 of the gate plate 1 there is mounted an extending flange 36 located perpendicularly to the end wall along the entire length of the wall. When the gate plate 1 is being closed, the flange 36 will be located more or less as an extension of the securing flange 28. The plate elements 30 may then be rotated from an open position along the vessel wall to a closed position where the water-proofing elements 31 impinge against the flange 36 on the other end wall 35 and the securing flange 28.

[0034] It shall be emphasized that when the words "perpendicular", "parallel with", "along" and similar expressions are used, this is only to indicate a position that mainly is perpendicular, mainly or completely is parallel with or partly or completely extends along. Since the gate and all other pivotable elements are to be handled manually or mechanically, and be moved repeatedly, it will be obvious for a person skilled in the art that the gate arrangement also will function according to its purpose if the securing elements protrude somewhat askew to the wall if the flange is located tightly against securing flange, but not quite as an extension thereof etc. and that this may be relevant when the gate is handled repeatedly.

[0035] On the side wall of the gate there are arranged one or more cross-bars 37, see fig. 1, fig. 2 or fig. 4. These have been pushed back in corresponding sheaths 38 mounted on the side walls 39 of the gate plate close

to the second end wall 35 of the gate plate 1. The cross-bars are of a standard type with square cross section, an entrance surface and tapering towards the other short side, i.e. the side surface of the cross-bar facing towards the side wall of gate is inclined away from the side wall and towards the axis of the cross-bar towards the end of the cross-bar that is pushed into contact with a corresponding plate element 30. When the cross-bars are pushed over the plate element, the inclined surface will press the plate element in towards the flange 36 on the end wall 35 of the gate thereby securing a water-proof contact between the gate and the second securing arrangement.

[0036] Fig. 5 shows a top view of the gate and the securing devices according to the invention. When the gate is closed the cross-bars 37 will press against the plate elements 30 and isolations 31, so that these are pressed against the flange 36 protruding from the second end wall 35 on the gate plate 1 and the securing flange 28 mounted on the adjacent wall (not shown). As mentioned supra the water-proofings are made of a compressible, water-proofing material. The water-proofing material may optionally be covered by a layer with a low friction such as a layer of Teflon, nylon or other suitable materials. If the walls of the vessel are moving towards or away from the gate arranged between the walls, the gate elements may slide against the flange 36 and the securing flange 28 while maintaining a water-proofing connection.

[0037] Fig. 6 shows a section in side view of the first securing device according to the invention. The upper bolt opening 23a is oval or oblong, e.g. in the form of a slot track, so that the bolt 26 may move in the opening relative to the movement between the vessel wall and the gate. In the shown example the lower bolt opening 23b has a shape that mainly corresponds to the circumference of the bolt 26 being placed in the opening.

[0038] Figure 7 shows the connecting element 7 and the adjusting element 9. These are disclosed in greater detail supra. Lowest at the connecting element at the front of the element there is arranged a securing device or plate 16 being solidly secured to the floor or deck below the gate (not shown). On the plate 16 there is arranged a bearing or peg 48. The gate cylinder 17 (not shown in fig. 7, see fig. 3) of the gate is placed on the bearing or peg 48 thus forming the lower fastening for the gate. Since the gate cylinder is arranged on the bearing 48, this lower corner of the gate may not move towards or away from the walls between which the gate is arranged.

[0039] Otherwise it is to be remarked that this lower corner is the only area of the water-proofing region between the gate and the surrounding walls and floor that do not form a flexible water-proofing connection between the gate and the walls/floor. Since as good as all of the water-proofing area is flexible, there is formed a unique adjustment-friendly gate that simultaneously ensures a water-proof connection. This will make the gate very robust towards movements in the hull of the vessel wherein

it is mounted.

[0040] Fig 8 shows a detailed cross-section of the gate in the contact region against the floor or deck below the gate. The bottom side 49 of the gate 1 faces towards the floor and forms a securing surface for the water-proofing arrangement against the floor (not shown). A profile 50 is secured to the bottom side 49. The profile 50 is preferably equipped with a surface 51 suitable for securing to the bottom side 49 on the gate plate 1. Furthermore, the profile comprises two side profiles 52, 52. In the depicted example each side profile is constructed with an angled side flange 54 and a peg 55 on the inside of the side flange 54. The side flange 54 is shaped like an L against the ground, where the second part of the L faces outwards from the center line in the profile 50. Between the side profile 54 and the peg 55 there is arranged an angled iron 56 following the angle of the L in the side profile. Between the two pegs 55 of the two side profiles 54 there is formed an open room being suitable for providing a flexible water-proofing element 57. Further there is fastened a counter element 58 to the floor. The counter element 58 will press against the water-proofing element 57 so that there at any time will exist a water-proofing connection between the floor and the gate. The counter element 58 may e.g. be a round iron being welded or otherwise secured to the floor. It is evident that any elongated element either being built into the floor construction or secured to the floor may function as such a counter element as long as it is dimensioned to fit against the water-proofing element 57 and will be able to take the required load.

[0041] Even if the depicted flexible water-proofing elements in the figures are shown as they abut with an even surface against the adjacent elements, it is obvious for a person skilled in the art that flexible water-proofing elements will be compacted when the adjacent non-flexible water-proofing elements press against them so that the flexible water-proofing elements will be pressed together and embed the adjacent elements.

[0042] The profile 50 may be an aluminum profile and then preferable an extruded aluminum profile. This is particularly suitable since an extruded profile may provide the necessary angles and pegs for in a simple way to secure the wanted water-proofing elements to the bottom side of the gate. However, it is obvious for a person skilled in the art that any other way to provide the water-proofing element on the under-side of the gate will reside within the purview of the invention. It may e.g. be envisaged to secure simple side plates, flanges, brackets etc. through e.g. welding or bolts against the underside, whereby there is formed an open room suitable for including a water-proofing element.

[0043] Furthermore, there is in the depicted example provided angled brackets against the side profiles 52, 53. These serve the purpose of reducing the wear of the profile 50 if the gate is in contact with the floor when the gate plate is moved over the floor. Furthermore, it is advantageous that these angled brackets are made in tempered

steel thereby to form a galvanic division between a steel deck below the gate arrangement and a gate plate of aluminum for thereby minimizing electrogalvanic corrosion. However, it is quite optional whether or not such angled brackets are used on the gate, since these are of lesser importance for the construction of the gate according to the invention. For providing a water-proofing element 57 against a counter element 58, the gate must be somewhat elevated before it is swung from an open to a closed position.

[0044] Figs. 9-13 show a first example of an arrangement for hoisting and lowering and pivoting the gate. A hydraulic cylinder 70 is in one end fastened to the securing element 4 by the aid of a blot connection. The cylinder 70 is in its other end fastened to the gate cylinder 17. In the upper area of the gate cylinder 17 there is a bolt hole 71. There is furthermore provided a corresponding bolt hole 72 through the cylinder 70. The cylinder 70 is thus fastened to the gate cylinder 17 by a bolt 73 with a blot head 74 protruding from the gate cylinder 17.

[0045] In the example shown in figs. 9-13 the cylinder element 15 is equipped with an opening 75. Externally on the cylinder element 15 there is provided a plate cylinder 76 where a guide plate 77, see fig. 10 or 12, constructed as a arced triangle is mounted on the internal surface so that an apex of the triangle facing downwards and a side edge of the triangle is mainly horizontal and located close to the upper edge 78 of the plate cylinder 76. The plate cylinder 76 is provided over the cylinder element 15 in such a way that the guiding plate 77 lies in the opening 75 in the cylinder element. The guiding plate 77 has a form corresponding to the opening 75 in the cylinder element with a narrower breadth so that there may be formed a track between the opening 75 and the track plate 77. When the track plate abuts a first edge of the opening 75, there will be formed an inclined track between the track plate and the second edge of the opening. If the track plate 77 then is moved over towards the other edge of the opening 75, there will be formed an inclined track along the first edge of the opening.

[0046] When the gate cylinder 17 is hoisted by the aid of the hydraulic cylinder 70, the bolt head 74 protruding from the gate cylinder 17 will follow the inclined track between the track plate 77 and the first or second edge and lead the gate plate outwards and upwards as the bolt is pushed up through the inclined track.

[0047] In each upper and outer end of the opening 75 where the bolt head will be lead when the gate plate resides in its most open position mainly parallel to the adjacent wall, there is located a first and a second rounding. When the bolt head is placed in the rounding, the plate cylinder 76 may rotate somewhat so that the upper mainly horizontal edge of the track plate will lie under the bolt head. The gate plate 1 will thereby be locked in an elevated and open position.

[0048] When it is wanted to close the gate, the plate cylinder is rotated so that an inclined track again is formed for guiding the bolt head. The hydraulic cylinder 70 then

lowers the gate gradually while the bolt head is passed downwards in the inclined track to a lower position where the gate plate will impinge a counter element 58 on the floor. The edges of the opening 75 are constructed as a form of a triangle wherein the bolt head 74, when the gate is closed, lie in a lower rounding where it is mainly prevented from a sideways movement, i.e. when the gate cylinder is prevented from rotating.

[0049] Figs. 14-16 show a second example of an arrangement for hoisting and lowering and rotating the gate. A hydraulic cylinder 80 is mounted to the gate plate (not shown) for elevating and lowering the gate. On the gate cylinder 17 there is arranged a toothed gear wheel 81 cooperating with a toothed plate 82. The toothed plate may again be moved back and forward by a hydraulic transmission and will through horizontal movement rotate the toothed wheel 81 on the gate cylinder 17 and thereby open and close the gate.

[0050] Fig 17 shows a section of the gate which shows the cross-bar 37. The cross-bar lies in the sheath 38. The one end part of the cross-bar is tapering towards the end of the cross-bar i.e. one part of the surface of the cross-bar facing the gate plate 1 is inclined away from the gate. When this end part is pushed into an opening 60 in a bracket 61 arranged on the securing flange 28 in the second securing arrangement it will gradually push more and more against plate elements 30 or a counter-piece 62 arranged on the plate elements 30 in the region where the cross-bar moves over the plate element. In its other end part of the cross-bar there is arranged a driving plate 63. The user of the gate applies a force on the driving plate 63 to push the cross-bar into the bracket for locking the gate in a closed position. It shall however be remarked that the cross-bars also may be driven by a machinery, hydraulic or otherwise, for thus simplifying the handling of the gate.

[0051] The gate may be constructed from a number of profiles assembled to a mainly rigid gate construction. The profiles may be of aluminum since this provides a gate with a sufficient rigidity and low weight. It is then possible to make the profiles of extruded aluminum profiles that simply may be assembled. It shall however be remarked that the gate also may be made from other materials such as iron, wood, titanium, fiber-enforced polymers or a combination thereof. It is e.g. possible to make the gate of wooden element reinforced with metal bars. All such variations of the gate construction will fall under the scope of the present invention.

[0052] The gate arrangement having been disclosed here is particularly suited as a movable barrier for isolating water for roll-on-roll-off vessels and car ferries. The gate forms together with the structure of the vessel, when it is open, an opening for rolling traffic, and together with the structure of the vessel, when it is closed, a barrier against water in motion. The gate may in its open condition be swung 180° to a wanted stored position. Simultaneously with the swinging motion the gate is elevated for passing uneven parts of the plane of the deck, struc-

ture or machine elements, and/or edges in the deck across or along the travelling direction of the vessel. In its barrier position the gate plate is locked between a pivoting column and a locking column, here called a first and a second securing element.

[0053] The gate plate may advantageously be produced in specially developed aluminum profiles for low weight. In its barrier position there is, on account of the adjusted gasket arrangements, created a substantially water-proof or tightening connection between the pivoting column, the gate plate and the locking column. The gasket arrangements are also adjusted to the existing requirements for keeling the gate in a closed and water-proof position when the gate is subjected to water pressure from alternatively its front or rear side or sideways loads from the structure of the vessel.

[0054] The gate plate is advantageously constructed from special aluminum profiles that simultaneously satisfy the requirements for strength and make a manual passage to the wanted position possible. The gate plate has furthermore integrated gasket elements for the lower parts of the gate plate.

[0055] The gate according to the invention is thus formed by a construction for movement with a gasket arrangement at the pivoting column and at the locking column. This ensures a water-proof function also when the structure of the ship is in movement. The different gate elements are movable in such a way that the strength of the gate is maintained also when the structure of the vessel is moving.

[0056] When the gate is pivoted, i.e. when the gate plate changes position, the gate plate will have both horizontal and vertical movements. The gate is adjusted different requirements in different countries in relation to the degree of automatization while the gate still satisfies international classification rules. The gate is furthermore especially advantageous by its being constructed for additions of electronic and hydraulic components and thus also provides the possibility of complying with possible international requirements of the registration of open/closed/locked signals to the officers of the vessel.

List of reference numbers

[0057]

- | | |
|----|-----------------------------|
| 1 | Gate plate |
| 2 | first securing arrangement |
| 3 | second securing arrangement |
| 4 | cylinder fastening |
| 5 | middle piece |
| 6 | side plate |
| 7 | connecting element |
| 8 | middle plate |
| 9 | adjustment element |
| 10 | room |

(continued)

11	water-proofing element
12	bearing element
13	wall element
14	bearing plate
15	cylinder element
16	securing device or plate
17	gate cylinder
18	water-proofing element
19	securing bracket
20	middle plate
21	side plate
22	arm
23	bolt opening
24	opening
25	flange
26	bolt
27	securing element
28	securing flange
29	cross-flange
30	plate element
31	water-proofing part
32	arm
33	hole
34	bolt
35	second end wall
36	flange
37	cross-bar
38	sheath
39	side wall
41	water-proofing element
45	first end wall
46	side element
47	16 securing arrangement
48	bearing or peg
49	bottom side
50	profile
51	surface
52	side profile
53	side profile
54	side flange
55	peg
56	angle iron
57	water-proofing element
58	counter element
60	opening
61	bracket
62	counter-part
63	driving plate
66	protrusion
67	bolt hole
68	plate element

(continued)

69	bolt hole
70	hydraulic cylinder
71	bolt hole
72	bolt hole
73	bolt
74	bolt head
75	opening
76	plate cylinder
77	track plate
78	upper edge
80	hydraulic cylinder
81	toothed cog
82	toothed plate

Claims

1. Device at hull divisions for water-proof segregation of a room, wherein said division comprises a division plate (1) comprising a first side edge and a second side edge (35) as well as a top edge and a bottom edge (49), a first locking and sealing arrangement (2) for locking the division plate (1) against a first wall or similar structure and a second sealing and locking arrangement (3) for locking the division plate (1) against a second wall or similar structure, wherein the first locking arrangement comprises devices for moving the division plate (1), and wherein the second locking arrangement (3) comprises devices for locking the division plate in a sealed position, said first sealing arrangement (2) comprising a first sealing element (11) and a second sealing element (18) forming a sealing connection between the adjacent wall and a division cylinder (17) and a third sealing element 41 forming a sealing connection between the division cylinder (17) and the division plate (1), wherein the second sealing arrangement (3) comprises a flange (36) located on the second end edge (35) of the division plate (1) and a securing flange (28) protruding from the adjacent wall as well as elements (30) equipped with sealing structures (31) for abutting the flange (36) and the securing flange (28) to form a water-proof connection between the division plate (1) and the second wall.
2. Division device according to claim 1, wherein the first sealing arrangement comprises flexible and/or elastic elements.
3. Division device according to claim 1 or 2, wherein the second sealing arrangement comprises a pivotable hinge.
4. Division device according to any of the claims 1 - 3, wherein the third sealing element comprises flexible

and/or elastic sealing parts.

5. Division device according to any of the claims 1-4, wherein division plate elements (30) abut sealingly against the flange (36) through the action or a number of slides (37). 5
6. Division device according to any of the preceding claims, wherein the bottom edge (49) of the division plate (1) is equipped with a profile (50) where there is arranged a flexible or elastic element (57) which, when the division is closed, abuts against a non-elastic counter piece (58) secured to the deck below the division device. 10 15
7. Division device according to any of the preceding claims, wherein the sealings (11,41,57) are made of a polymer material, optionally covered with a material with low friction. 20
8. Division device according to claim 7, wherein the sealings (11,41,57) are made of sponge neoprene, optionally covered with Teflon or similar low friction material. 25

30

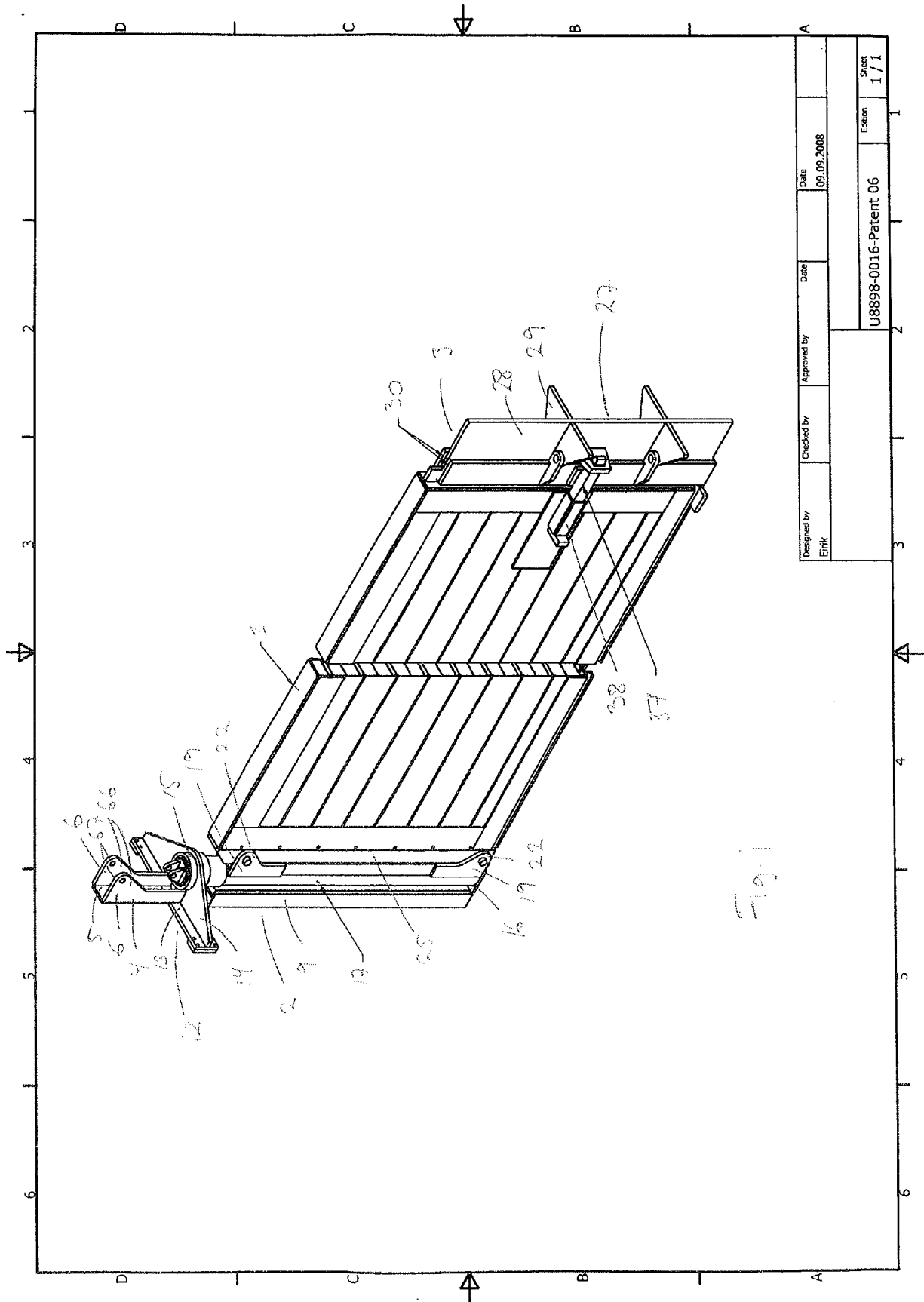
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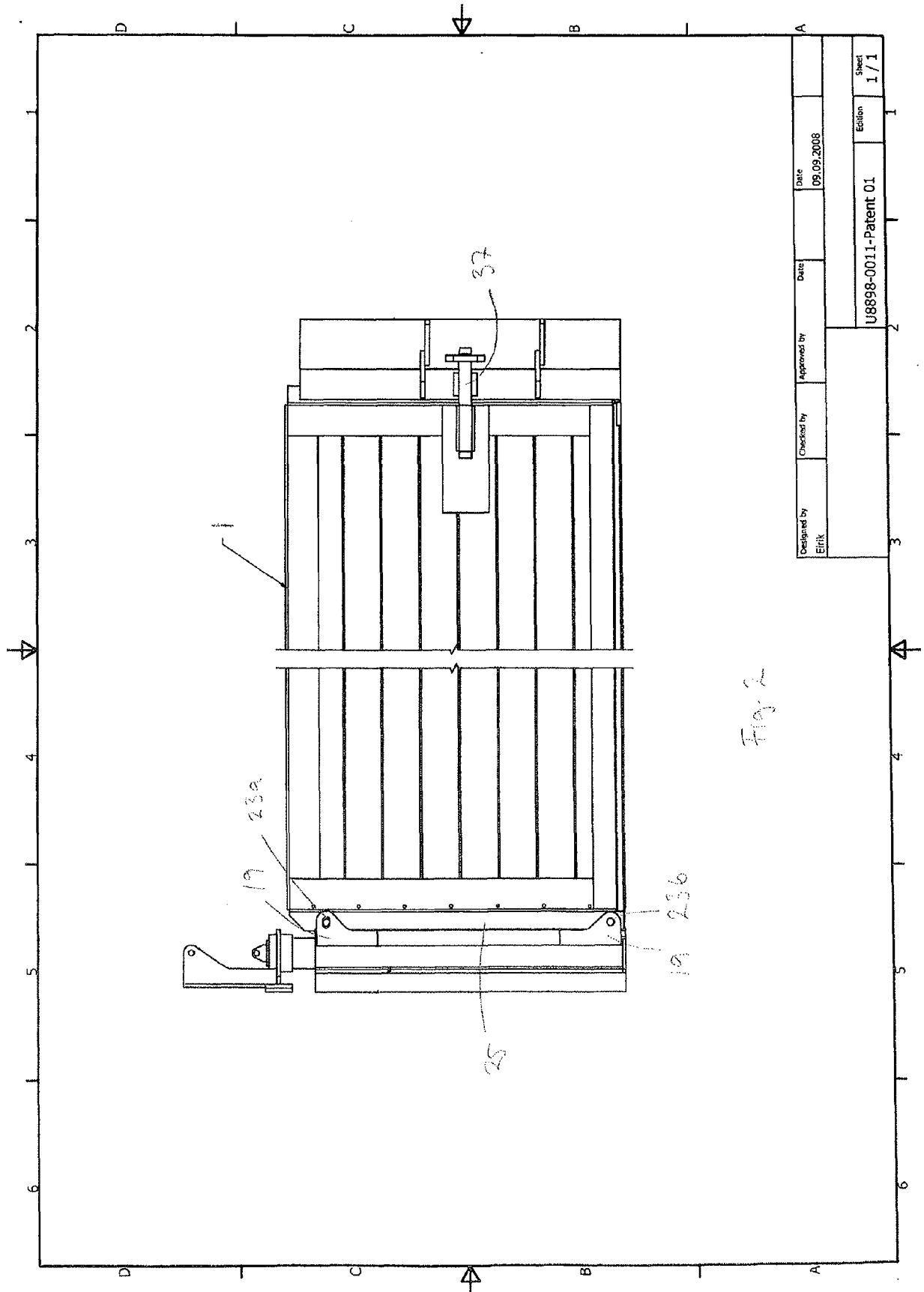
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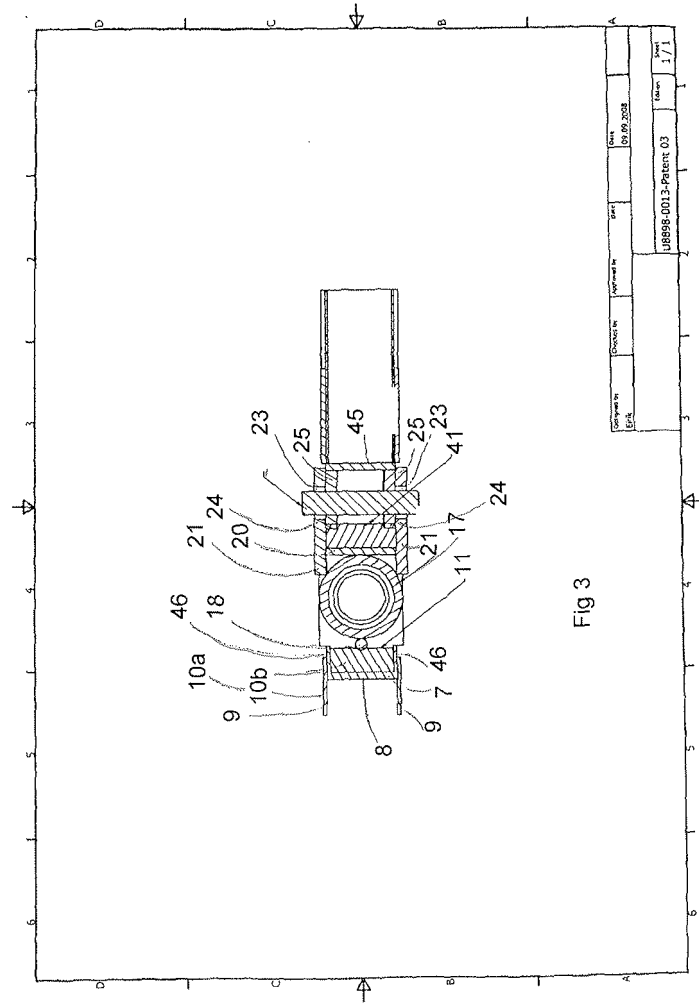
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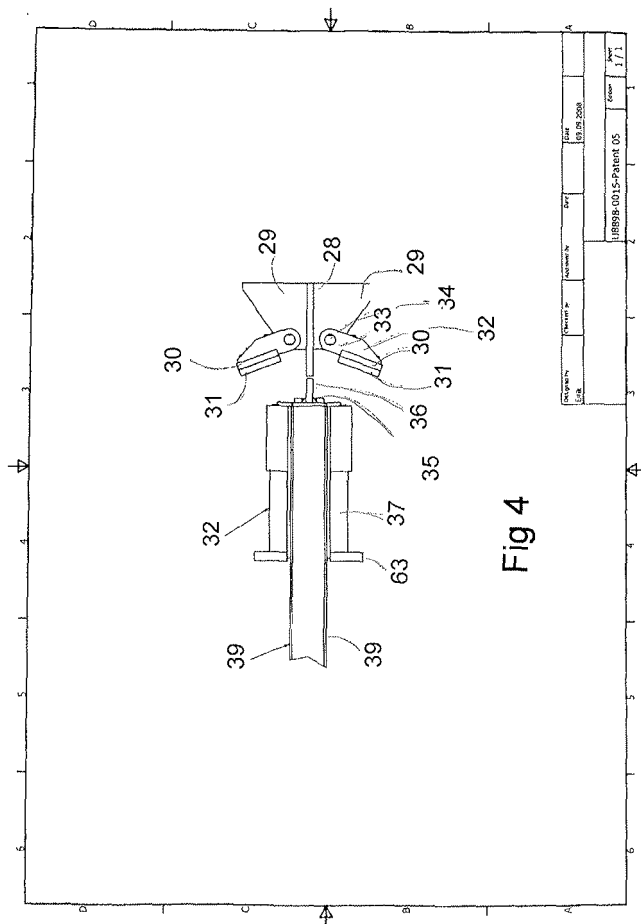
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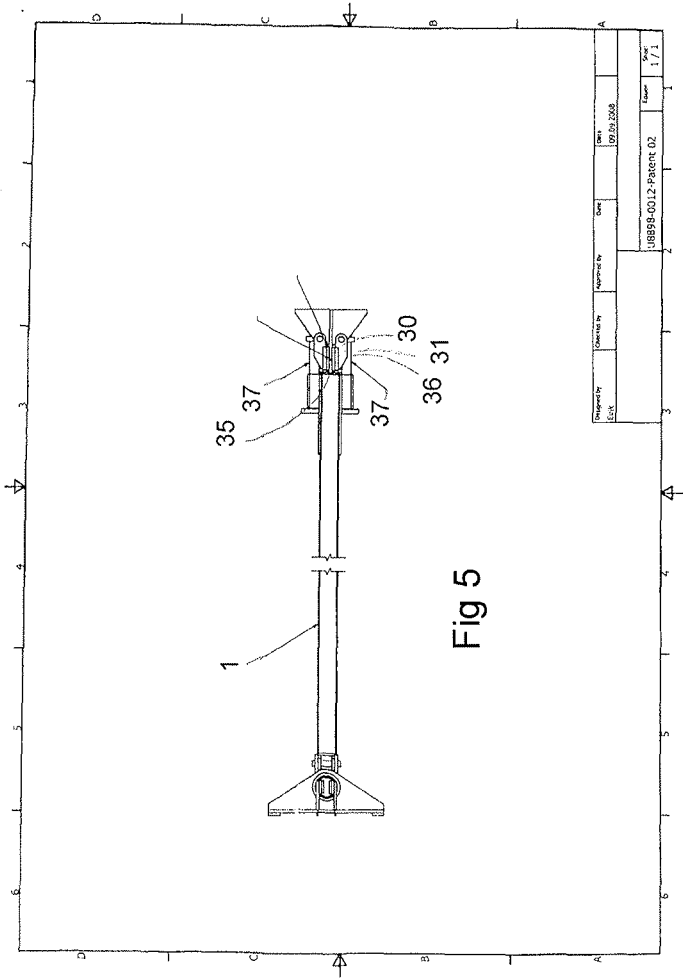
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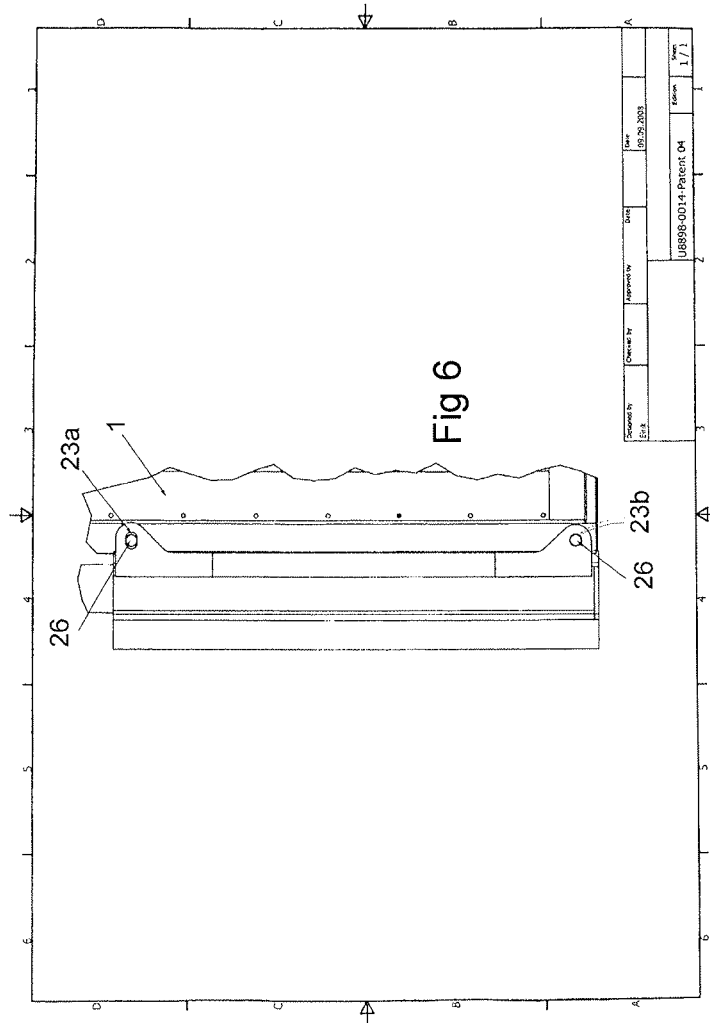


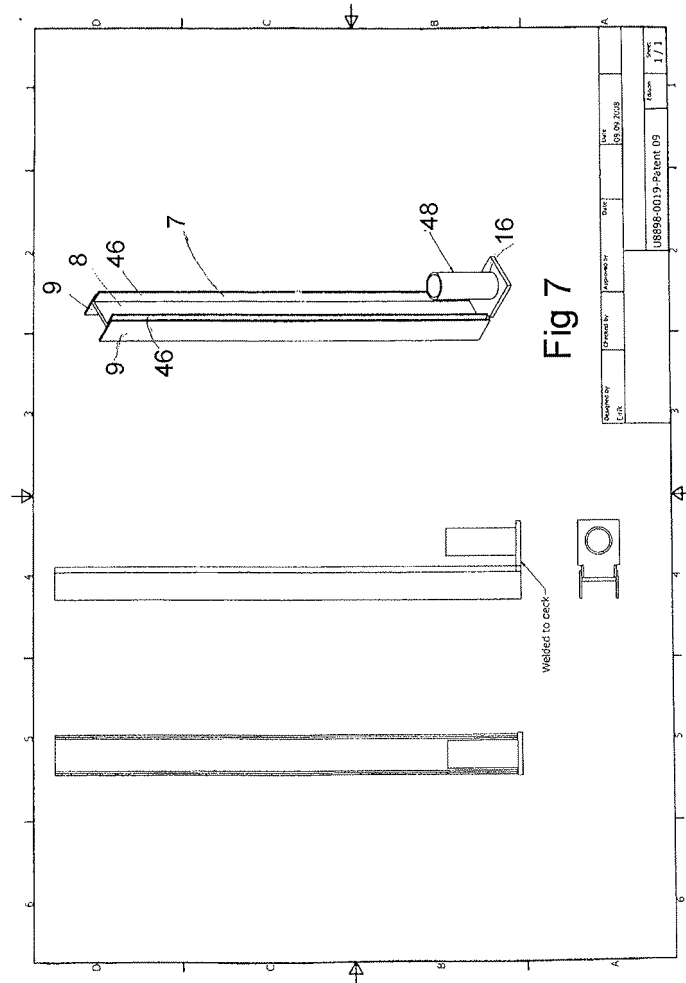


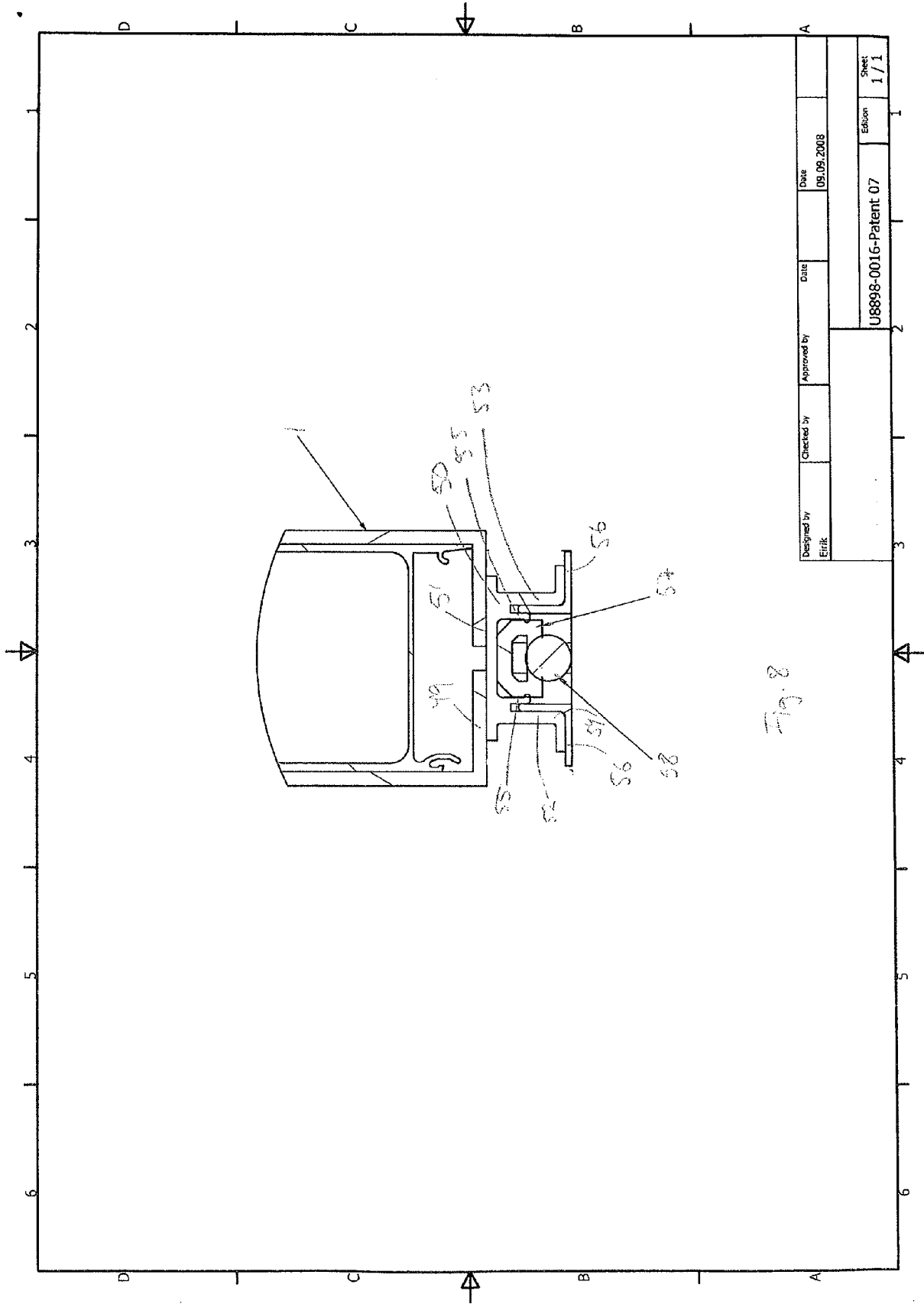




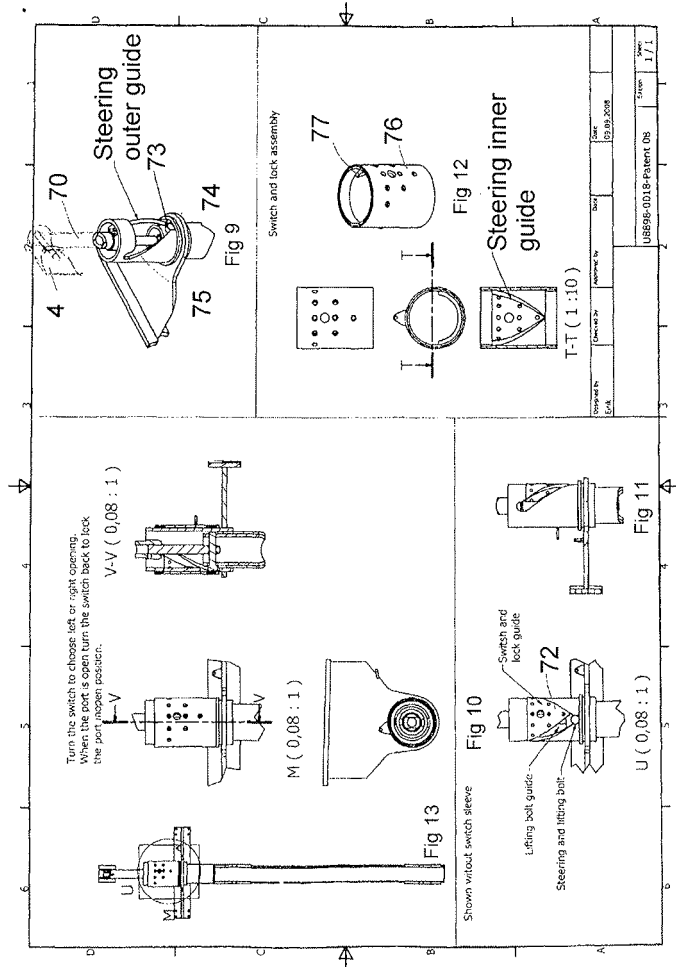








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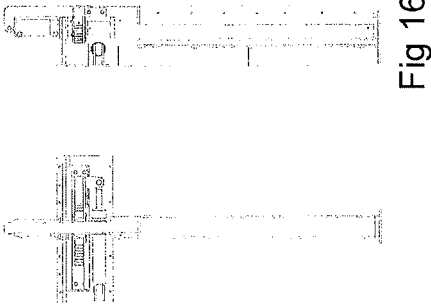


Fig 16



Fig 14

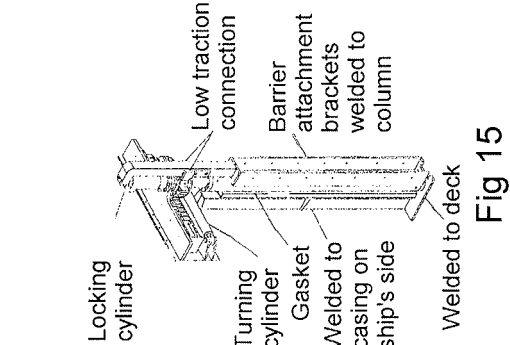
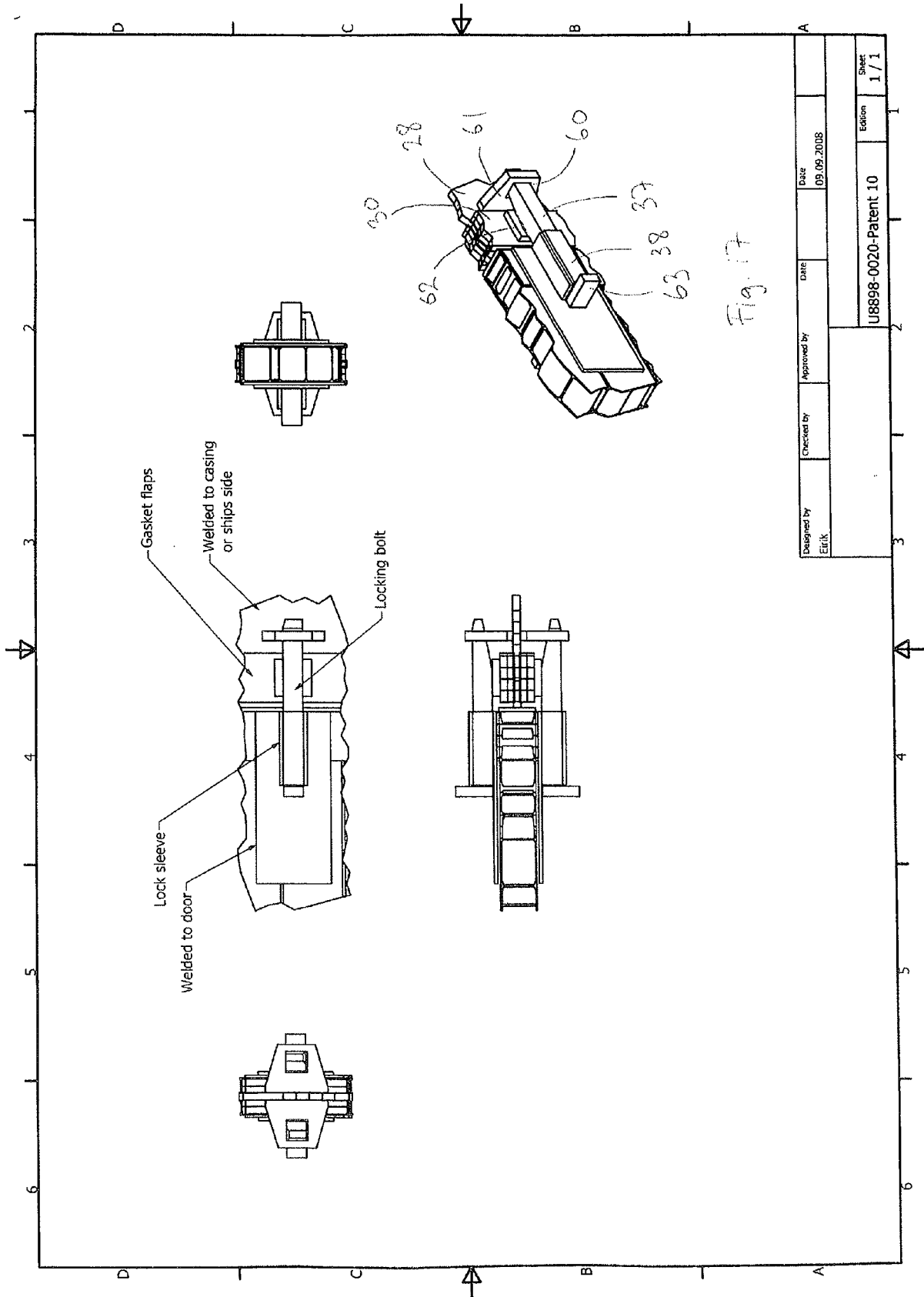


Fig 15



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REFERENCES CITED IN THE DESCRIPTION

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