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(54) **A contamination cover apparatus for the hydraulic hoses of a work machine**

(57) A contamination cover apparatus (10) for a machine mounting bracket (5), comprising a cover (12) moveable between an open position and a closed position; an actuator (14) for actuating the cover from the closed position to the open position; and a link assembly

(16) coupling the actuator (14) to the cover (12) to transform an axial movement of the actuator (14) to a translation of the cover (12). The invention concerns the mitigation of damage due to contamination of fluid connectors of a work tool.

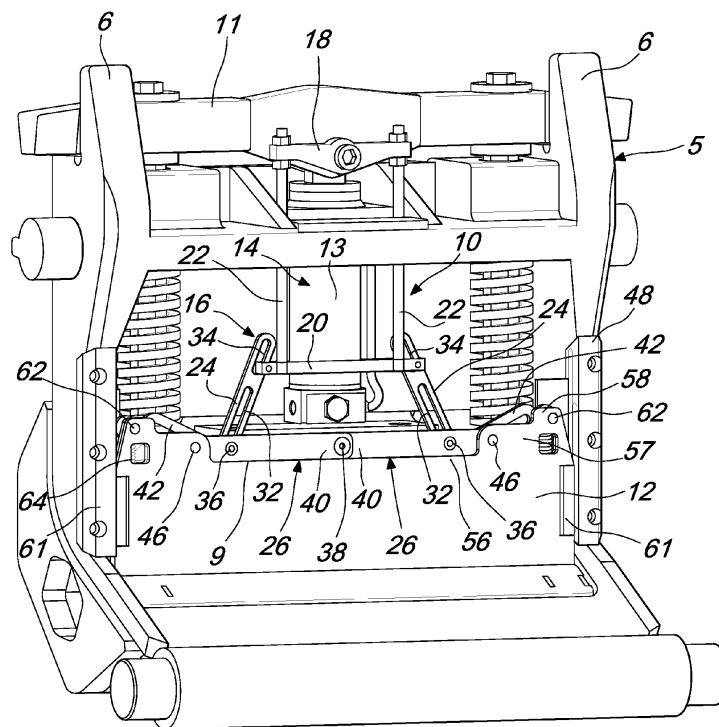


Fig. 1

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Description

Technical Field

[0001] This disclosure relates to a device and a method for preventing contamination of fluid connector components that couple a worktool to a machine, particularly to covers to prevent contamination.

Background

[0002] Worktools, such as shears, grabs, or buckets may be coupled with host machines, such as excavators, to perform work operations like cutting, grabbing or excavating. The worktools may be coupled to a boom or stick mechanism of the host machine via a fixed connection or a quick release connection.

[0003] A quick release connection may allow for a relatively easy exchange of the worktool whereby the operator connects or changes a worktool without leaving the cab. The machine mounting bracket is arranged to slide into the worktool mounting bracket, when the worktool is positioned on the ground. After aligning the mounting bracket of the worktool and the mounting bracket of the machine, a locking device may be moved into a locked position to lock the worktool to the machine.

[0004] The worktool or machine unused during a specific operation may be subject to external elements such as moisture and dust or other contaminants which may settle on the fluidconnectors of the hydraulic lines. Such contamination may damage the fluidconnectors of the worktool or the machine during a coupling procedure or may result in impeding the coupling of the machine mounting bracket and the worktool mounting bracket.

[0005] WO199927194 discloses a device for protecting connection elements on construction equipment from grime, dust and water. The connection elements may serve to connect lines for liquid and gaseous mediums or for electric cables. A covering arrangement may protect the connection elements. The covering arrangement may comprise a tubular and movable envelope provided with openings which cover or expose the connection elements through rotation of the envelope around the connection elements. The envelope may be provided on the worktool bracket or the machine bracket and may be rotated by actuation of a lever connected thereto.

[0006] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system.

Brief Summary of the Invention

[0007] In a first aspect, the present disclosure describes a contamination cover apparatus for a machine mounting bracket, comprising a cover moveable between an open position and a closed position; an actuator for actuating the cover from the closed position to the open position; and a link assembly coupling the actuator

to the cover to transform an axial movement of the actuator to a translation of the cover.

[0008] In a second aspect, the present disclosure describes a method of actuating a contamination cover apparatus for a machine mounting bracket, comprising the steps of arranging a cover to be moveable between an open position and a closed position; and activating an actuator to actuate the cover from the closed position to the open position, wherein the actuator is coupled to the cover through a link assembly to transform an axial movement of the actuator to the translation of the cover.

[0009] Other features and advantages of the present disclosure will be apparent from the following description of various embodiments, when read together with the accompanying drawings.

Brief Description of the Drawings

[0010] The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is a perspective view of a contamination cover apparatus at a closed position in an uncoupled mounting frame according to the present disclosure; Fig. 2 is a perspective view of a contamination cover apparatus at an open position in an uncoupled mounting frame according to the present disclosure; Fig. 3 is a front view of a contamination cover apparatus at an open position in an uncoupled mounting frame according to the present disclosure; Fig. 4 is a side view of a guide of the contamination cover apparatus at an open position according to the present disclosure; Fig. 5 is a side view of a guide of the contamination cover apparatus at a closed position according to the present disclosure; Fig. 6 is a perspective view of a contamination cover apparatus at a closed position in a mounting frame coupled to a worktool without fluidconnectors according to the present disclosure; Fig. 7 is a perspective view of a contamination cover apparatus at an open position in a mounting frame coupled to a worktool with fluidconnectors according to the present disclosure; and Fig. 8 is a perspective view of a cover of the contamination cover apparatus according to the present disclosure.

Detailed Description

[0011] This disclosure generally relates to a contamination cover apparatus **10** for preventing contamination of fluidconnectors. The fluidconnectors may be disposed in a mounting frame.

[0012] Fig. 1 and Fig. 2 illustrate a contamination cover

apparatus 10. The contamination cover apparatus 10 may be disposed in a mounting frame 5, such as a machine mounting bracket. The contamination cover apparatus 10 may comprise a cover 12, an actuator 14 and a link assembly 16. Fig. 2 illustrates a portion of the cover 12 cut-out to show hidden portions of the link assembly 16.

[0013] The cover 12 may be moveable between an open position and a closed position. In the closed position the cover 12 may extend over the fluidconnectors for shielding from contaminants, such as dust, dirt or small rocks. At the open position of the cover 12 the fluidconnectors 50 may be uncovered and may be available for connection to corresponding fluidconnectors that may be disposed in a worktool.

[0014] The cover 12 may be made of a resilient material. The cover 12 may be able to withstand being subjected to a deformation.

[0015] The cover 12 may have a first edge 8 that passes over the fluidconnectors 50 as the cover 12 moves between the open or closed positions. The cover 12 may have a second edge 9 opposite to the first edge 8. The first edge 8 and the second edge 9 may be provided so that as the cover 12 transits between the open or closed positions the edges 8, 9 are not obstructed. The transition path of cover 12 may be suitably provided so that during transition between the open and closed positions the edges 8, 9 are not obstructed.

[0016] The actuator 14 may actuate the cover 12 from the closed position to the open position. The actuator 14 may be arranged to be axially movable along a longitudinal axis thereof. The axial movement of the actuator 14 may effect a translation of the cover 12 from the closed position to the open position.

[0017] The actuator 14 may be disposed in a mounting frame 5. The actuator 14 may be disposed to axially move relative to the mounting frame 5. In an embodiment, the actuator 14 may be a hydraulic cylinder for coupling and decoupling a worktool to the mounting frame 5.

[0018] The actuator 14 may move between a retracted position or an extended position. With respect to Fig. 1, at the fully retracted position of the actuator 14 the cover 12 may be in the closed position. With respect to Fig. 2, at the fully extended position of the actuator 14 the cover 12 may be in the open position.

[0019] The actuator 14 may comprise a cylinder 13 and a piston rod 15. The cylinder 13 may be fixedly mounted in the mounting frame 5. In an embodiment, the actuator 14 may be connected to a wedge 11. The wedge 11 may be connected to the piston rod 15 of the actuator 14. The wedge 11 may be pivotably connected to the piston rod 15.

[0020] In an embodiment, piston rod 15 may be connected to the wedge 11 at the intersection of the longitudinal axis of the actuator 14 and the longitudinal axis of the wedge 11. The longitudinal axis of the actuator 14 may intersect the central portion of the wedge 11.

[0021] In the fully retracted position of the actuator 14,

wedge 11 may abut against the mounting frame 5. The mounting frame 5 may comprise abutment arms 6 to prevent wedge 11 from sliding from mounting frame 5. Wedge 11 may be coupled to the mounting frame 5 through support arms 7 which may be parallel to actuator 14. Support arms 7 may be slidably retained in the mounting frame 5 at passages extending through the mounting frame 5 so that the support arms 7 may slidably move through the passages as the actuator 14 axially moves between the retracted and extended positions.

[0022] The link assembly 16 may couple the actuator 14 to the cover 12. The coupling may enable the axial movement of the actuator 14 to be conveyed to the cover 12. The cover 12 may be moved from the closed position to the open position in response to the axial movement of the actuator 14.

[0023] The link assembly 16 may comprise a balance arm 18. The balance arm 18 may be provided with any suitable shape or form.

[0024] In an embodiment, the balance arm 18 may be coupled to the piston rod 15.

[0025] In an embodiment, the wedge 11 may couple the balance arm 18 to the piston rod 15. The balance arm 18 may be pivotably coupled to the wedge 11. The balance arm 18 may be coupled to the central portion of the wedge 11. The wedge 11 may be tilted relative to the balance arm 18 without effecting a corresponding tilting movement of the balance arm 18. The position of the balance arm 18 at the centre of wedge 11 may enable the link assembly 16 to avoid a malfunction in the unlikely event that the wedge 11 has an end which is obstructed during uncoupling of the mounting frame 5 from the worktool.

[0026] In an embodiment, the balance arm 18 may be coupled to the wedge 11 at the intersection of the longitudinal axis of the actuator 14 and the longitudinal axis of the wedge 11.

[0027] The link assembly 16 may further comprise a flange 20 and a pulling rod 22. The pulling rod 22 may connect the flange 20 to the balance arm 18. The flange 20 may be held parallel to the balance arm 18. The pulling rod 22 may be aligned to the longitudinal axis of the actuator 14.

[0028] In an embodiment, the link assembly 16 may comprise two pulling rods 22 connecting the flange 20 to the balance arm 18. At an end, each pulling rod 22 may be connected to the flange 20 through a screw linkage. At the opposite end, each pulling rod 22 may be integrally connected to the balance arm 18. The pulling rods 22 may be disposed adjacent the respective ends of the flange 20 and the balance arm 18.

[0029] The pulling rods 22 may be mutually parallel and parallel to the longitudinal axis of the actuator 14. The flange 20 may be rigidly held parallel to the balance arm 18 by the pair of pulling rods 22. The wedge 11 may be tilted relative to the balance arm 18 without effecting a corresponding tilting movement of the balance arm 18 and without effecting a corresponding tilting movement

of the flange 20.

[0030] The flange 20 may have a recess to fit about the cylinder 13 of the actuator 14.

[0031] The link assembly 16 may further comprise a strut system to connect the flange 20 to the cover 12. In an embodiment, the strut system may comprise a single connecting strut 24 and a single linking strut 26 for connecting the flange 20 to the cover 12. In an embodiment, the strut system may comprise a plurality of connecting struts 24 and a plurality of linking struts 26. In an embodiment, the strut system may comprise a pair of connecting struts 24 and a pair of linking struts 26.

[0032] The connecting struts 24 and linking struts 26 may be in any suitable form or shape. In an embodiment, the connecting struts 24 and linking struts 26 may be flat and elongated.

[0033] With reference to Fig. 3 and Fig. 4, the connecting struts 24 may be connected to the flange 20. Fig. 3 illustrates a portion of the cover 12 cut-out to show hidden portions of the connecting struts 24 and the linking struts 26.

[0034] An end of each connecting strut 24 may be connected at an end of the flange 20 adjacent to the connection points of the flange 20 and the pulling rods 22. Each end of the flange 20 may have a flange slit 28 to receive the corresponding connecting strut 24. The connecting struts 24 may freely rotate within the respective flange slits 28 at the opposite ends of the flange 20.

[0035] The connecting struts 24 may be retained in the respective slits 28 by respective flange pins 30. The flange pin 30 may engage in a respective second connecting slot 34 of each connecting strut 24. The second connecting slot 34 may be a through slot. In an embodiment, the second connecting slot 34 may be a groove in the connecting strut 24.

[0036] The second connecting slot 34 may enable the stroke of actuator 14 to be aligned with the transition of the cover 12 from the closed position to the open position.

[0037] In an embodiment, each flange pin 30 may be pivotably engaged in the respective second connecting slot 34 of each connecting strut 24 such that connecting struts 24 may pivot about the flange pins 30 relative to the flange 20.

[0038] In an embodiment, each second connecting slot 34 may extend along the longitudinal axis of the respective connecting struts 24. Each flange pin 30 may be slidably engaged in the respective second connecting slot 34 of each connecting strut 24. Each flange pin 30 may be slidable along the respective second connecting slot 34 such that the connecting struts 24 may correspondingly move relative to the flange 20.

[0039] In an embodiment, each flange pin 30 may be pivotably and slidably engaged in the respective second connecting slot 34 of each connecting strut 24. Each flange pin 30 may be slidable along the respective second connecting slot 34 such that connecting struts 24 may pivot about the flange pins 30 relative to the flange 20 and may correspondingly move relative to the flange 20.

[0040] Each connecting strut 24 may have a first connecting slot 32. Each first connecting slot 32 may extend along the longitudinal axis of the respective connecting struts 24. The first connecting slot 32 may be a through slot. In an embodiment, the first connecting slot 32 may be a groove in the connecting strut 24.

[0041] The first connecting slot 32 may be spaced from the second connecting slot 34. In an embodiment, the first connecting slot 32 may be longer than the second connecting slot 34.

[0042] The first connecting slot 32 in the connecting struts 24 may allow the strut system to fold together as the actuator 14 retracts to bring wedge 11 in an abutment position with mounting frame 5. The stroke of the actuator 14 may not be obstructed by the pulling rods 22 and the connecting struts 24.

[0043] The ends of the connecting struts 24 opposite the ends connected to the flange 20 may be connected to the linking struts 26. Each linking strut 26 may comprise a linking boss 36 to securely engage in the first connecting slot 32 of each linking strut 26.

[0044] The linking boss 36 may be fixedly positioned on the linking strut 26. In an embodiment, the linking boss 36 may be positioned adjacent to the centre of the linking strut 26.

[0045] In an embodiment, each linking boss 36 may be pivotably engaged in the respective first connecting slot 32 such that the linking struts 26 may pivot about the linking boss 36 relative to the connecting struts 24.

[0046] In an embodiment, each linking boss 36 may be slidably engaged in the respective first connecting slot 32. The linking boss 36 may be slidable along the respective first connecting slot 32 such that the linking struts 26 may correspondingly move relative to the connecting struts 24.

[0047] In an embodiment, each linking boss 36 may be pivotably and slidably engaged in the respective first connecting slot 32. The linking boss 36 may be pivotable and slidable along the respective first connecting slot 32 such that the linking struts 26 may pivot about the linking boss 36 relative to the connecting struts 24 and may correspondingly move relative to the connecting struts 24.

[0048] The linking strut 26 may have a first end 40 and a second end 42. The first end 40 may be coupled to the mounting frame 5 and the second end 42 may be coupled to the cover 12. In an embodiment, the linking boss 36 may be positioned nearer the second end 42 of the linking strut 26.

[0049] Linking struts 26 may be connected to the mounting frame 5 at the first end 40 through a pivot 38. In an embodiment, the pivot 38 may be engaged such that the linking struts 26 may rotate about the pivot 38 relative to the mounting frame 5.

[0050] In an embodiment, a pair of linking struts 26 may be connected to the mounting frame 5 at the respective first ends 40 through a pivot 38. The linking struts 26 may rotate about the pivot 38 relative to the mounting frame 5. The linking struts 26 may rotate about the pivot

38 relative to the each other.

[0051] The second end 42 may be slanted relative to the longitudinal axis of the linking strut 26. The second end 42 may be slanted away from the first and second edges 8, 9 of the cover 12. The second end 42 may be slanted towards the balance arm 18. The second end 42 may comprise a linking slot 44. The linking slot 44 may be a through slot. In an embodiment, the linking slot 44 may be a groove in the linking strut 26.

[0052] The cover 12 may comprise a cover boss 46 to securely engage in the linking slot 44 of the linking strut 26. The cover boss 46 may be fixedly positioned on the cover 12. In an embodiment, the cover boss 46 may be positioned adjacent the second edge 9. In an embodiment, the cover 12 may comprise a pair of cover bosses 46 to securely engage in the linking slot 44 of each linking strut 26.

[0053] In an embodiment, the cover boss 46 may be pivotably engaged in the respective linking slot 44 such that the linking struts 26 may pivot about the cover boss 46 relative to the cover 12.

[0054] In an embodiment, the cover boss 46 may be slidably engaged in the respective linking slot 44. The cover boss 46 may be slidable along the respective linking slot 44 such that the linking struts 26 may correspondingly move relative to the cover 12.

[0055] In an embodiment, the cover boss 46 may be pivotably and slidably engaged in the respective linking slot 44. The cover boss 46 may be pivotable and slidable along the respective linking slot 44 such that the linking struts 26 may pivot about the cover boss 46 relative to the cover 12 and may correspondingly move relative to the cover 12.

[0056] The linking slot 44 may increase the transition path of the cover 12.

[0057] The linking struts 26 may be interposed between the connecting struts 24 and the cover 12. The linking struts 26, the connecting struts 24 and the cover 12 may be positioned so that the relative movement of a component is not obstructed by one of the other components.

[0058] The cover 12 may be suitably mounted in the contamination cover apparatus 10 to be moveable between an open position and a closed position. With reference to Fig. 4 and Fig 5, the contamination cover apparatus 10 may further comprise a guide 48. The cover 12 may be engaged to a guide 48. The guide 48 may be mounted to the mounting frame 5.

[0059] The guide 48 may be coupled to the cover 12 for guiding the cover 12 along a transition path. The guide 48 may be mounted to the mounting frame 5. The guide 48 may be mounted to the mounting frame 5 adjacent the cover 12 to guide the transition path of the cover 12.

[0060] In an embodiment, guide 48 may support the cover 12. The cover 12 may be floatingly supported by the guide 48 in the contamination cover apparatus 10. The guide 48 may support the cover 12 at the open position, along the transition path and the closed position.

[0061] The guide 48 may be positioned relative to cover 12 to effect unobstructed opening and closing of the cover 12. The guide 48 may be positioned lateral to the cover 12 adjacent to edges 8, 9. In an embodiment, the guide 48 may be positioned lateral to the cover 12 so that the transition path of cover 12 is parallel to the axial movement of the actuator 14.

[0062] The guide 48 may comprise a guide slot 51. The cover 12 may be supported by the guide 48 in the guide slot 51. The engagement of the cover 12 in the guide slot 51 may allow the guide 48 to direct the transition path of the cover 12.

[0063] The cover 12 may have a cover stud 52 extending from the cover 12 into the guide slot 51. The cover stud 52 may be slidably held in the guide slot 51. In an embodiment, the cover stud 52 may be a slot pin. The cover stud 52 may be rigidly fixed in the cover 12.

[0064] With reference to Fig 8, the cover 12 may have a cover bracket 61. The cover bracket 61 may be fixedly mounted to the cover 12. In an embodiment, the cover bracket 61 may be integral with the cover 12.

[0065] In an embodiment, the cover stud 52 may extend from the cover bracket 61 into the guide slot 51. The cover stud 52 may be rigidly fixed in the cover bracket 61.

[0066] With reference to Fig. 5, in an embodiment, the guide slot 51 may have a slanted section 53. The slanted section 53 may diverge from the longitudinal axis of the guide slot 51 toward the mounting frame 5. The slanted section 53 may push the cover 12 towards the fluidconnectors on the mounting frame 5. The cover 12 may be pushed towards the fluidconnectors as cover 12 transits to the closed position. The transition path of the cover 12 may be defined such that the cover 12 may be pushed against a surface that is located around the fluidconnectors 50. The surface of cover 12, between edges 8, 9 may be pushed against the surface around the fluidconnectors 50.

[0067] In an embodiment, the surface around the fluidconnectors 50 may be lined by a rubber seal element. This rubber seal element may be slightly compressed by cover 12 and so protect the fluidconnectors 50 against contaminants. The rubber seal element may act as a wiper seal to further assist to keep contaminants away from the fluidconnectors 50.

[0068] The rubber seal element may be mounted inside the fluidconnector housing by means of a steel lockplate. The rubber seal element may be ring-shaped and may be vulcanized at the inner diameter of the lockplate. The lockplate may be removed to replace a damaged rubber seal element.

[0069] The rubber seal element may be functional in both coupled and uncoupled states of the mounting frame 5. In the coupled stated, the rubber element may be pushed against the worktool to isolate the connecting portions of the fluidconnectors and corresponding fluid connectors from the external environment. At the uncoupled state the cover 12 may be pushed against the rubber seal element to further isolate fluidconnectors 50 from

the external environment.

[0070] With reference to Fig. 4 and Fig. 5, in an embodiment, the guide 48 may comprise an additional guide slot 54 parallel to the guide slot 51. The position of guide slot 54 may be offset to the position of guide slot 51. The guide slot 54 may be positioned closer to the balance arm 18 with respect to the position of the guide slot 51. The guide slot 54 may have an additional slanted section 53. The slanted sections 53 may push the cover 12 towards the fluidconnectors on the mounting frame 5.

[0071] The cover 12 may have an additional cover stud 55 extending from cover 12. The cover stud 55 may be rigidly fixed in the cover 12. In an embodiment, with reference to Fig 8, the cover stud 55 may extend from the cover bracket 61. The cover stud 55 may be rigidly fixed in the cover bracket 61.

[0072] The additional cover stud 55 may extend into the guide slot 54. The cover stud 55 may be slidably held in the guide slot 54. In an embodiment, the cover stud 55 may be a slot pin.

[0073] The position of cover stud 52 may be offset to the position of the cover stud 55. The cover stud 52 may be positioned closer to the second edge 9 with respect to the position of the cover stud 55. The cover stud 55 may be positioned adjacent to the side of the cover 12 facing the fluidconnectors 50 and the cover stud 52 may be positioned adjacent the opposite side.

[0074] With reference to Fig. 4, the cover 12 may be in the open position. The cover studs 52, 55 may be positioned in the respective guide slots 51, 54 at an end opposite the respective slanted sections 53. The first edge 8 of the cover 12 may be positioned within the guide slots 51, 54.

[0075] With reference to Fig. 5, the cover 12 may be in the closed position. The cover studs 52, 55 may be positioned in the respective guide slots 51, 54 at the respective slanted sections 53. The second edge 9 of the cover 12 may be positioned within the guide slots 51, 54.

[0076] The contamination cover apparatus 10 may further comprise a biasing member 60. The biasing member 60 may bias the cover 12 to move from the open position to the closed position.

[0077] The biasing member 60 may be positioned between the mounting frame 5 and the guide 48. The biasing member 60 may be connected at an end to the cover 12. The biasing member 60 may be connected to a finger 62 extending from the cover 12.

[0078] At the opposite end the biasing member 60 may be connected to the mounting frame 5. In an embodiment, at the opposite end the biasing member 60 may be connected to the mounting frame 5. In an embodiment, the biasing member may be a coil spring.

[0079] In an embodiment, the contamination cover apparatus 10 may further comprise a second guide 48 positioned at the opposite side of cover 12 and mounted to the mounting frame 5. The guides 48 may be orientated to be mutually parallel. The cover 12 may include further cover studs 52, 55 to engage in the respective guide slots

51, 54 of the second guide 48.

[0080] In an embodiment, the cover 12 may have an additional cover bracket 61. The additional cover bracket 61 may be fixedly mounted to the opposite side of cover 12. In an embodiment, the additional cover bracket 61 may be integral with the cover 12. The cover 12 may include further cover studs 52, 55 extending from the additional cover bracket 61 to engage in the respective guide slots 51, 54 of the second guide 48.

[0081] The transition path of the cover 12 may be directed by both the guides 48. The cover 12 may be supported by both the guides 48.

[0082] In an embodiment, the contamination cover apparatus 10 may further comprise a second biasing member 60. The second biasing member 60 may be positioned between the mounting frame 5 and the second guide 48.

[0083] The actuator 14 may pull the cover 12 to the open position by overcoming the force of the biasing members 60. As the actuator 14 moves the cover 12 to the open position the biasing members 60 may store energy which may be required to move the cover 12 to the closed position.

[0084] The second edge 9 of cover 12 may have a stepped configuration. The second edge 9 may have a centre portion 56, middle portions 57 that border the centre portion 56 and end portions 58. The centre portion 56 may be level with a side of the connecting struts 24.

[0085] The middle portions 57 may extend from the centre portion 56 along the plane of the cover 12. The cover bosses 46 may be positioned at the respective middle portions 57. The cover bosses 46 may be positioned at the apex of the respective middle portions 57 adjacent to the centre portion 56.

[0086] The end portions 58 may border the middle portions 57 at the ends opposite the centre portions. The end portions 58 may extend from the middle portions 57 along the plane of the cover 12. The fingers 62 may be positioned at the respective end portions 58.

[0087] The cover 12 may further comprise retaining holes 64. The retaining holes 64 may be positioned adjacent the second edge 9 of the cover 12. In an embodiment, the retaining holes 64 may be positioned at respective middle portions 57 of the second edge 9. The retaining holes 64 may be rectilinear with the cover boss 46. The retaining holes 64 may be in a suitable shape or form to receive and engage corresponding dowels on a worktool.

[0088] A method of actuating a contamination cover apparatus 10 for a mounting frame 5 may comprise the steps of arranging a cover 12 to be moveable between an open position and a closed position; and activating an actuator 14 to actuate the cover 12 from the closed position to the open position, wherein the actuator 14 is coupled to the cover 12 through a link assembly 16 to transform an axial movement of the actuator 14 to a translation of the cover 12.

[0089] With reference to Fig. 1, the contamination cov-

er apparatus **10** may be in the closed position and a work-tool may not be coupled. The actuator **14** may pull the wedge **11** to abut against mounting frame **5**. The cover **12** may be positioned over the fluidconnectors **50** for protection from contaminants. Biasing members **60** may generate a force to retain the cover **12** at the closed position.

[0090] The second connecting slots **34** in the connecting struts **24** may align the stroke of the actuator **14** with the sliding of the cover **12**. In the closed position, the tension from the actuator **14** may be off the connecting struts **24** as the actuator **14** may be fully retracted and the wedge **11** may be abutting against the mounting frame **5**.

[0091] To actuate the cover **12** from the closed position to the open position, the actuator **14** may be activated.

[0092] In the contamination cover apparatus **10**, the stroke of the actuator **14** may be greater than the sliding path of the cover **12**. As the actuator **14** extends from the fully retracted position the wedge **11** may be moved away from the mounting frame **5**. At the initial extension stroke of the actuator **14** the cover **12** may not move.

[0093] The linking slots **44** may increase the sliding path cover **12**. During the movement of the cover **12** the cover bosses **46** may slide along the respective linking slots **44**. The linking slots **44** may have a progressive angle relative to the initial movement of the connecting struts **26** such that the movement of the cover **12** may be increased. The cover **12** may move over a larger distance than the stroke distance of the actuator **14**.

[0094] As the actuator **14** extends further, the wedge **11** may move further from the mounting frame **5**. The link assembly **16** which couples the wedge **11** to the cover **12** may pull the cover **12** from the closed position to the open position to expose the fluidconnectors **50**, as illustrated in Fig. 2.

[0095] As the cover **12** moves to the open position energy may be stored in the biasing members **60**. In an embodiment, the biasing members **60** may be contracted.

[0096] The strut system may allow cover **12** to slide over the same distance as the stroke of the actuator **14** but at different speed. This sliding ratio may allow the fluidconnectors **50** to be exposed within the time to initiate the coupling or the uncoupling procedure.

[0097] With reference to Fig. 6, at this position the mounting frame **5** may be coupled to a worktool that is not equipped with corresponding fluidconnectors. The worktool may be a bucket or an older worktool. The actuator **14** may be activated to retract from the extended position and to correspondingly move wedge **11** towards the mounting frame **5**. As the worktool and the mounting frame **5** may be coupled by the wedge **11** the return stroke of the actuator **14** may not be completed.

[0098] The cover **12** may move to the closed position when the actuator **14** may not have completed the return stroke. The connecting struts **24** may not be subject to a force exerted by the actuator **14**. The second connecting

slot **34** in the connecting struts **24** may align the stroke of the actuator **14** to the sliding of the cover **12**.

[0099] The force of the biasing members **60** may be exerted on the linking struts **26** and the connecting struts **24**. The force exerted by biasing members **60** may force the cover **12** to move relative to the linking struts **26** and may force the linking struts **26** to move relative to the connecting struts **24** such that the cover **12** transits to the closed position.

[0100] With reference to Fig. 7, at this position, the mounting frame **5** may be coupled to a worktool that is equipped with corresponding fluidconnectors. The actuator **14** may be activated to retract from the extended position and to correspondingly move wedge **11** towards the mounting frame **5**. As the worktool and the mounting frame **5** may be coupled by the wedge **11** the return stroke of the actuator **14** may not be completed.

[0101] The cover **12** may be retained in the open position with the actuator **14** being partly to move the wedge **11** towards the mounting frame **5**. The cover **12** may be held in the open position by dowels provided in the worktool. The dowels may protrude through the retaining holes **64** in the cover **12**. The dowels may be located on the worktool mounting bracket.

[0102] The force of the biasing members **60** may not be exerted on the link assembly **16** and may be exerted on the dowels. The cover **12** may remain in the open position while the worktool may be coupled to the mounting frame **5**. In order to prevent the actuator **14** from being obstructed by the link assembly **16**, first connecting slots **32** may be provided in the connecting struts **24**. The first connecting slots **32** may allow the link assembly **16** to fold together as the actuator **14** is retracted.

[0103] The skilled person would appreciate that foregoing embodiments may be modified or combined to obtain the contamination cover apparatus **10** of the present disclosure.

Industrial Applicability

[0104] This disclosure describes a contamination cover apparatus **10** for preventing contamination of fluidconnectors when not connected. The fluidconnectors **50** may be disposed in a mounting frame **5**, such as a machine mounting bracket.

[0105] The contamination cover apparatus **10** comprises a cover **12** positioned about the fluidconnectors when not in use. The cover **12** may be moved during a coupling procedure between a worktool and a machine to allow engagement between corresponding fluidconnectors located on the worktool and the machine. The cover **12** may be moved along a transition path defined by the guide slots **51** and **54** in the guide **48**.

[0106] The contamination cover apparatus **10** may increase the sliding movement of the cover **12**.

[0107] After the worktool is picked up by the machine the actuator **14** may be moved into the locked position. The cover **12** may be moved to closed position by the

biasing members **60** if the worktool is not equipped with corresponding fluidconnectors. The cover **12** may be retained in the open position to ensure clearance for the corresponding fluidconnectors to be connected with the fluid connectors in the mounting frame **5**. The contamination cover apparatus **10** may move without manual interference to allow the actuator **14** to lock the worktool while the cover **12** is retained at the open position. An operator may not have to compensate for the stroke of the actuator **14**.

[0108] Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

[0109] Where technical features mentioned in any claim are followed by reference signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

[0110] One skilled in the art will realise the disclosure may be embodied in other specific forms without departing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

Claims

1. A contamination cover apparatus (10) for a machine mounting bracket, comprising:
 - a cover (12) moveable between an open position and a closed position;
 - an actuator (14) for actuating the cover (12) from the closed position to the open position; and
 - a link assembly (16) coupling the actuator (14) to the cover (12) to transform an axial movement of the actuator (14) to a translation of the cover (12).
2. The apparatus (10) of claim 1 further comprising at least one biasing member to urge the cover (12) to the closed position.
3. The apparatus (10) of claim 1 or 2 wherein the link assembly (16) comprises a balance arm (18) coupled to the actuator (14).

4. The apparatus (10) of claim 3 wherein the balance arm (18) is coupled to the actuator (14) through a wedge (11).
5. The apparatus (10) of claim 4 wherein the balance arm (18) is pivotably connected to the wedge (11).
6. The apparatus (10) of any one of the preceding claims wherein link assembly (16) is coupled to the cover (12) through a pivotable engagement.
7. The apparatus (10) of any one of the preceding claims wherein link assembly (16) is coupled to the cover (12) through a slidable engagement.
8. The apparatus (10) of claim 6 or 7 wherein the cover (12) comprises a cover boss pivotably and slidably engaged in a linking slot (44) of a linking strut (26).
9. The apparatus (10) of claim 8 wherein the link assembly (16) further comprises a connecting strut (24) connected to the linking strut (26) through a slidable engagement.
10. The apparatus (10) of claim 8 or 9 wherein the link assembly (16) further comprises a connecting strut (24) connected to the linking strut (26) through a pivotable engagement.
11. The apparatus (10) of claim 9 or 10 wherein the linking strut (26) comprises a linking boss pivotably and slidably engaged in a first connecting slot (32) of the connecting strut (24).
12. The apparatus (10) of claim 9 or 10 wherein the link assembly (16) further comprises a flange (20) having a flange pin (30) pivotably and slidably engaged in a second connecting slot (34) of the connecting strut (24).
13. The apparatus (10) of any one of the preceding claims wherein the cover (12) transition path of the cover (12) is determined by a first guide slot (51) and a second guide slot (54).
14. A machine mounting bracket comprising the apparatus (10) of any one of the preceding claims.
15. A method of actuating a contamination cover apparatus (10) for a machine mounting bracket, comprising the steps of:
 - arranging a cover (12) to be moveable between an open position and a closed position; and
 - activating an actuator (14) to actuate the cover (12) from the closed position to the open position, wherein the actuator (14) is coupled to the cover (12) through a link assembly (16) to trans-

form an axial movement of the actuator (14) to a translation of the cover (12).

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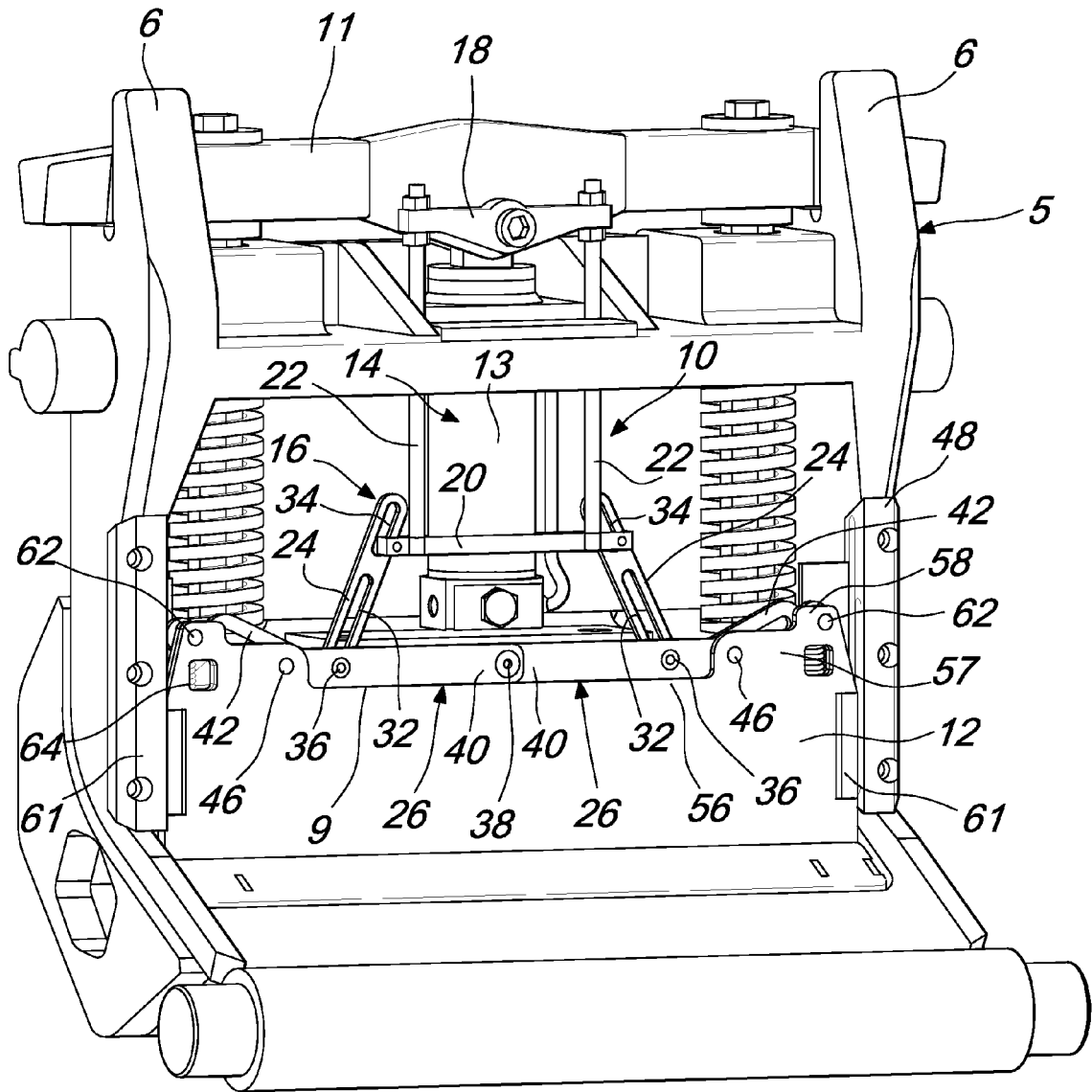


Fig. 1

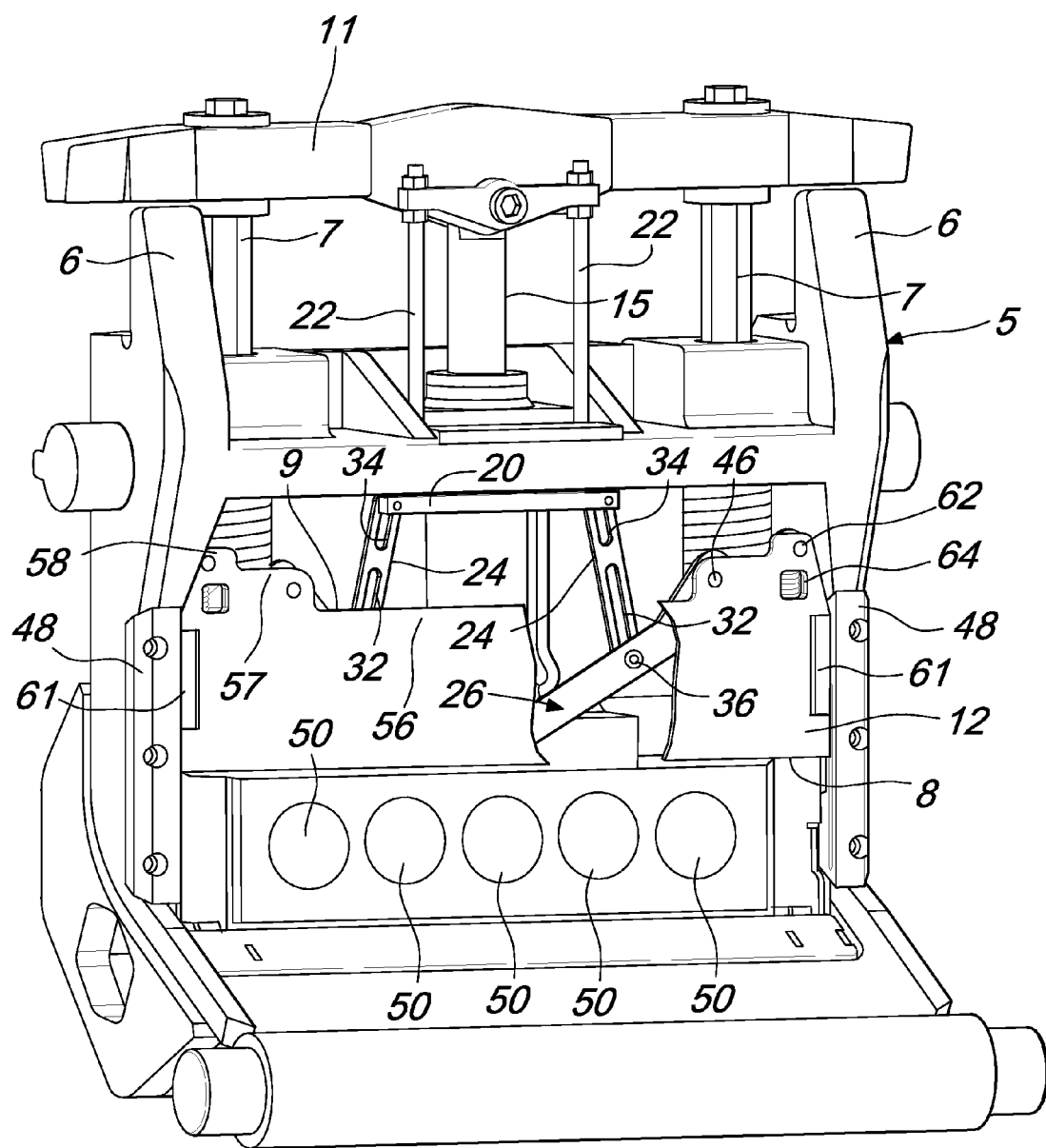


Fig. 2

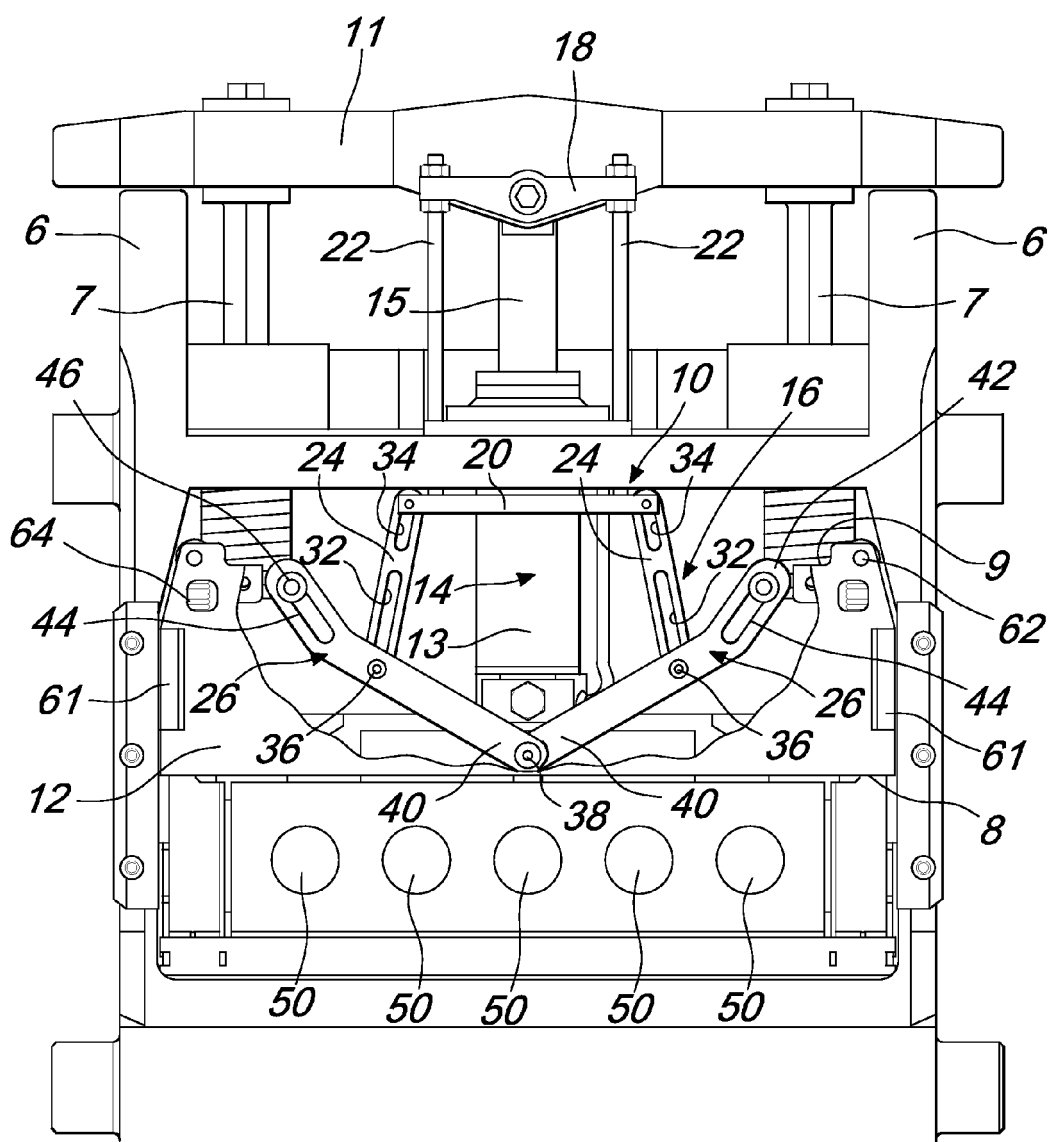
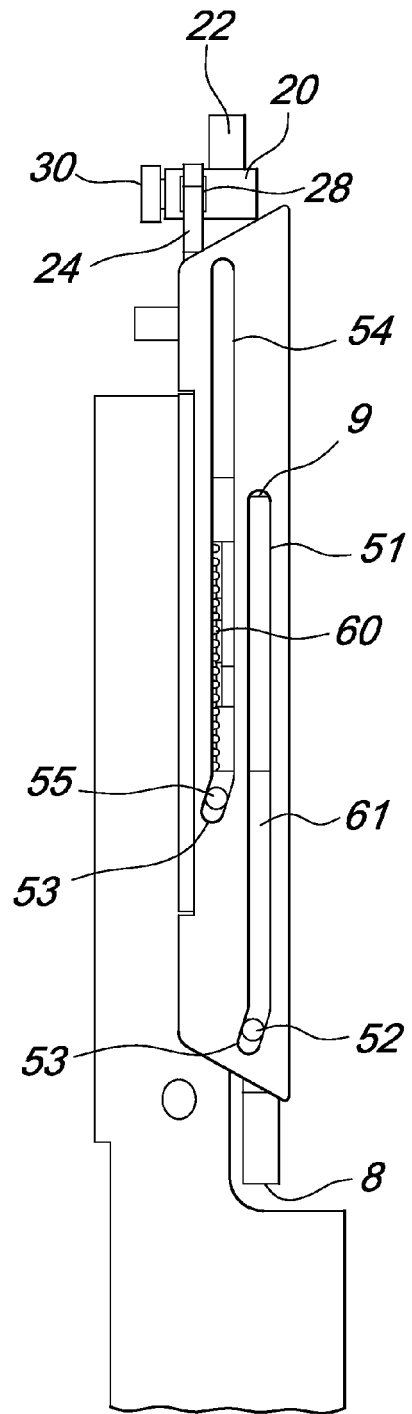
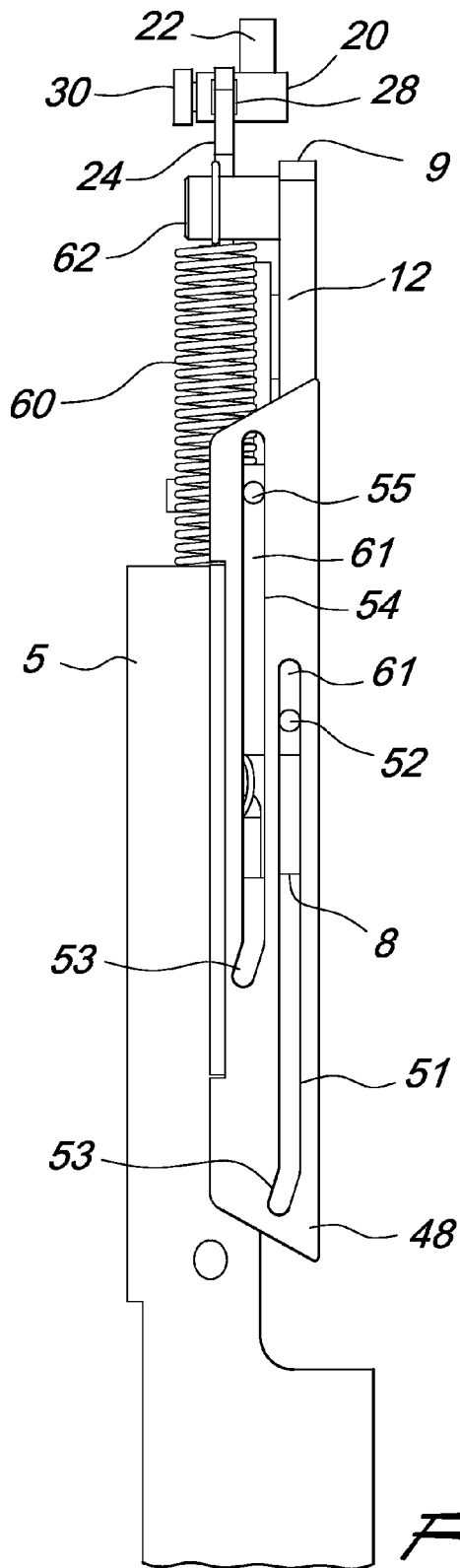


Fig. 3



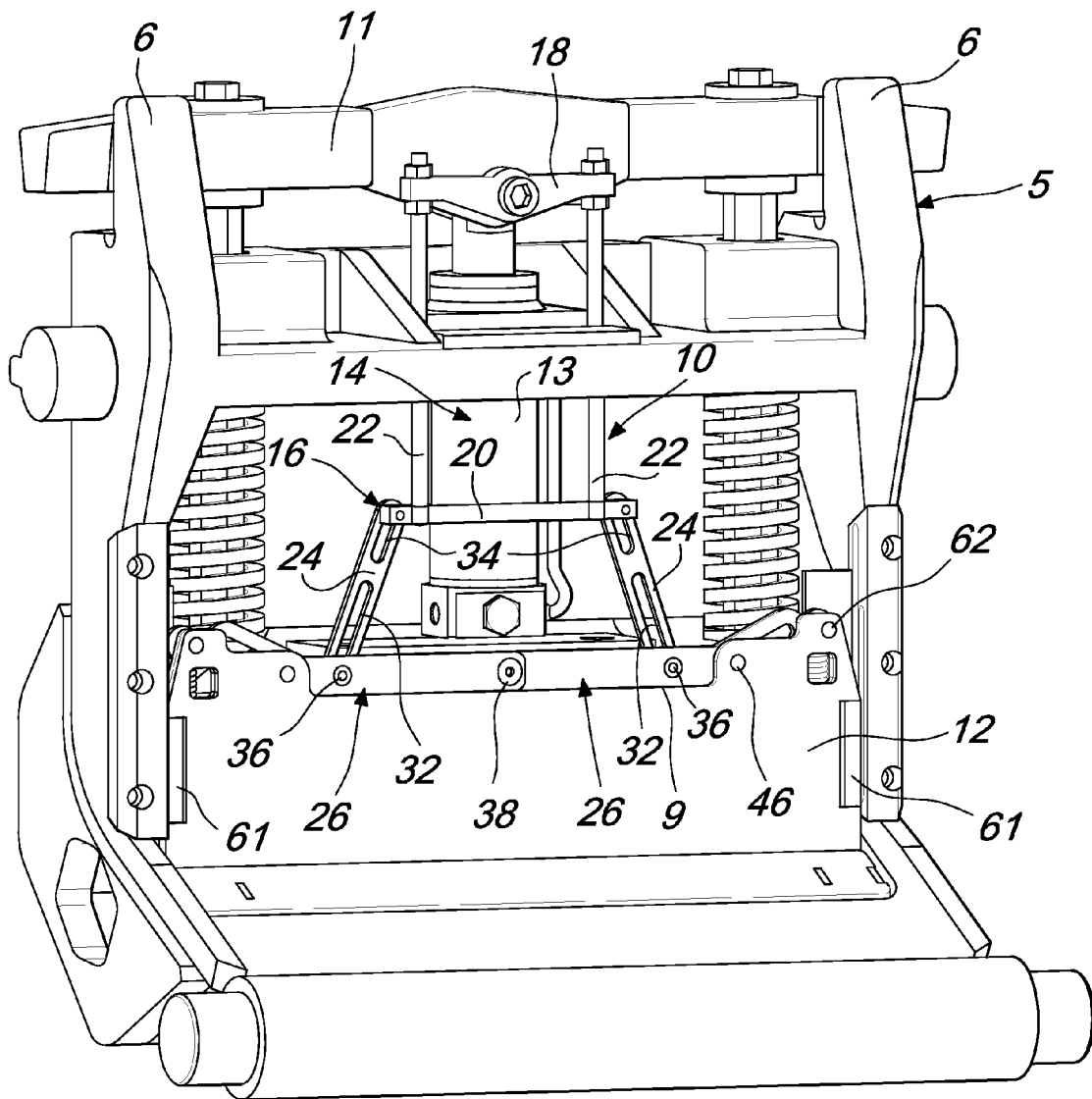


Fig. 6

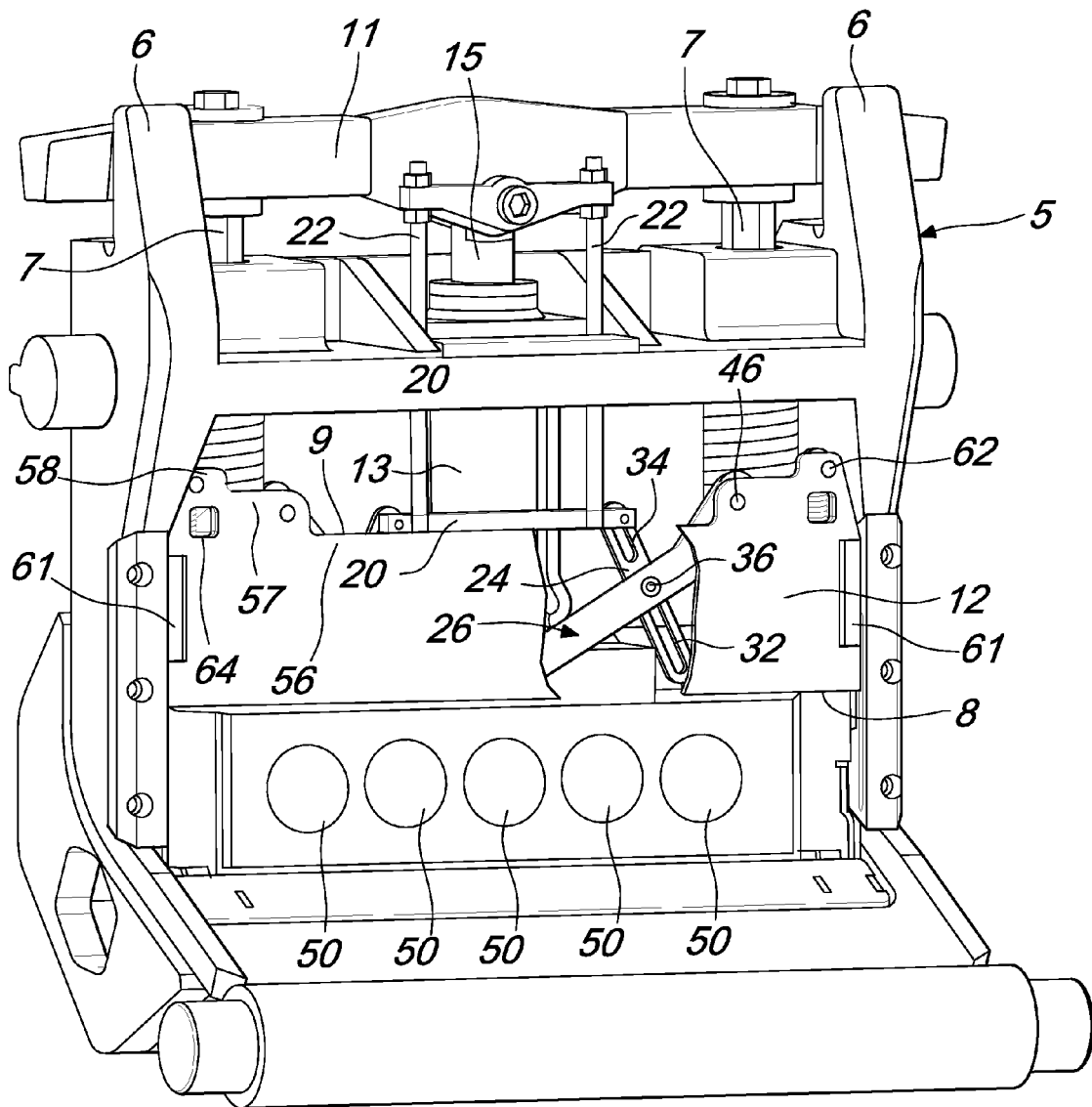


Fig. 7

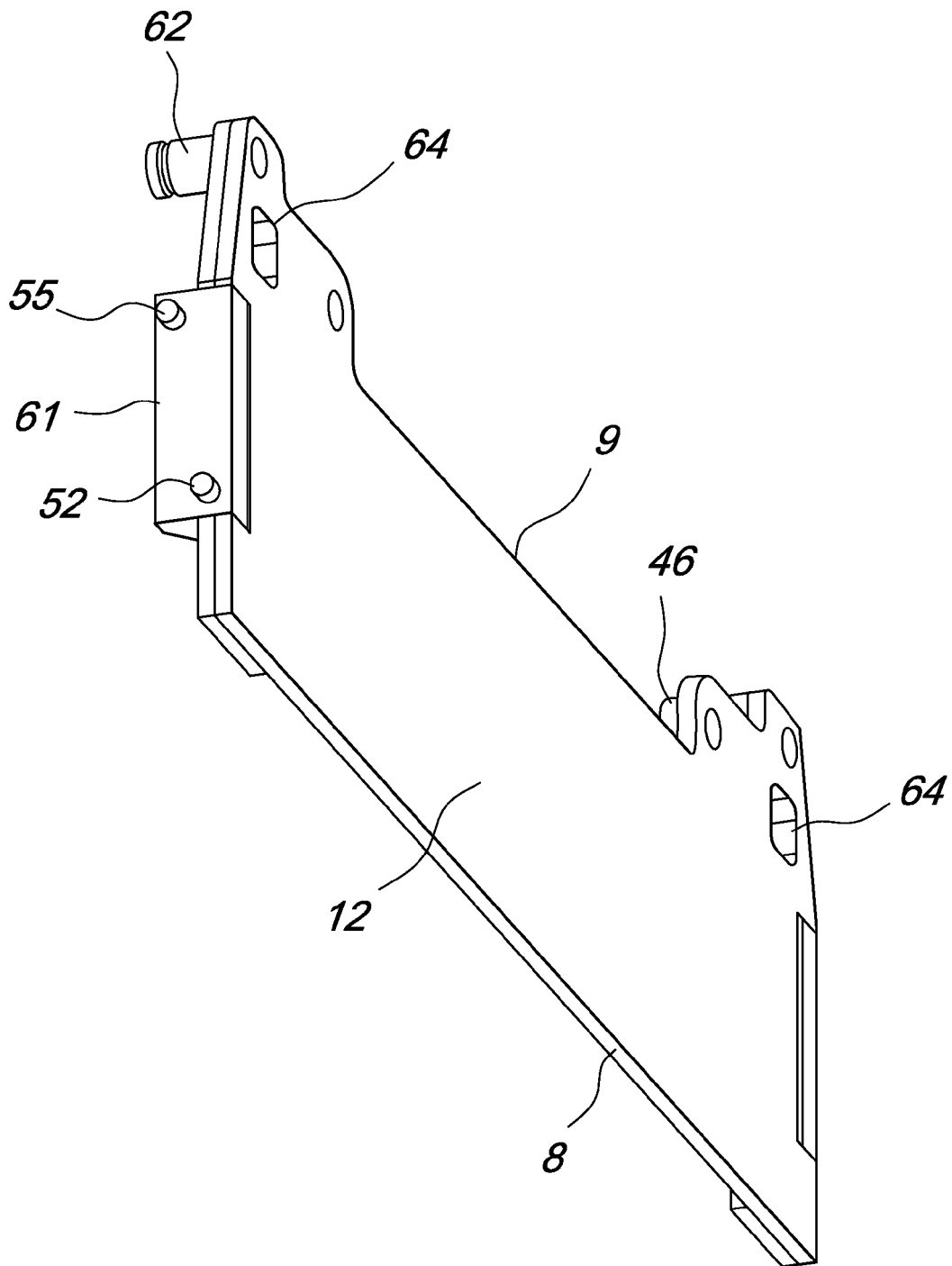


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 4220

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Place of search Munich		Date of completion of the search 30 May 2011	Examiner Papadimitriou, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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