



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.10.2001 Bulletin 2001/40

(51) Int Cl.7: **B66C 1/66**

(21) Application number: **00307212.1**

(22) Date of filing: **23.08.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
 Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **27.03.2000 US 192370 P**
31.07.2000 US

(71) Applicant: **INGERSOLL-RAND COMPANY**
Woodcliff Lake, NJ 07675 (US)

(72) Inventors:
 • **Byrne, Nicholas**
Manchester M27 4AR (GB)
 • **Poulson, Arthur John**
Lancashire BB2 7AT (GB)
 • **Roberts, Tony**
Wigan WN2 1DA (GB)

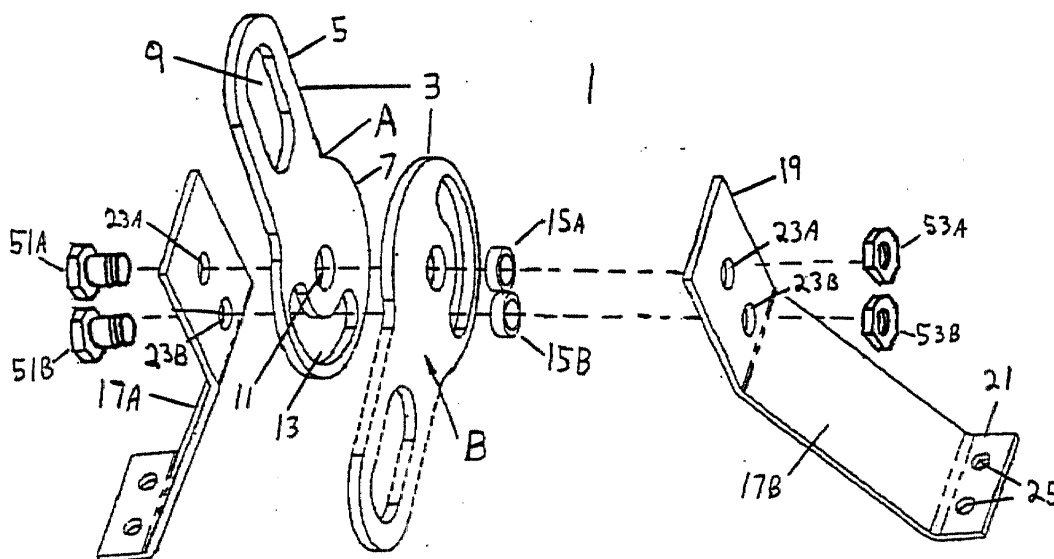
(74) Representative: **Feakins, Graham Allan et al**
RAWORTH, MOSS & COOK
RAWORTH HOUSE
36 Sydenham Road
Croydon, Surrey CRO 2EF (GB)

(54) **Method and apparatus for use in lifting an object**

(57) A pivoting lifting eye (1) to enhance machine security includes a lifting eye member (3) having an upper portion (5) and a lower portion (7), the upper portion including an eye hole (9) configured to receive a lifting hook and the lower portion including a pivot hole (11) and a slot (13) having two ends. A pivot member (51A)

is positioned in the pivot hole while a pivot stop (51B) is positioned within the slot. When the lifting eye member is pivoted about the pivoting member the slot moves about the pivot stop and the pivoting of the lifting eye member about the pivot member is limited by the pivot stop contacting one of the two ends of said slot.

Fig. 1



Description

[0001] The present invention is directed generally to machine security and more particularly to lifting eyes for use in lifting heavy machinery.

[0002] The transportation of heavy equipment such as air compressors and industrial power generators often requires an easily accessible lifting eye to facilitate the loading and unloading of the equipment onto a transportation vehicle, such as a flat bed trailer. Typically, the lifting eye is a rigid element which is either welded or bolted to the piece of equipment. Unfortunately, the easy access to the typical lifting eye also facilitates the theft of equipment.

[0003] The desire to reduce theft and generally improve the security of equipment has generated great interest in providing lifting systems which do not facilitate theft. One known system uses lockable trap doors to cover the lifting eye. The trap doors provide some measure of protection but remain vulnerable to attack in the same manner as conventional locked doors. Furthermore, the locked doors hinder the authorised use of the lifting eye. Other conventional systems provide a removable lifting eye. Removing the lifting eye inhibits theft of equipment but also introduces safety problems. If the removable lifting eye is not secured properly when reattached, the equipment may be dropped and damaged.

[0004] Due to shortcomings of existing eye configurations, there remains a need to provide a new lifting eye assembly which inhibits the theft of equipment but does not suffer from the disadvantages described above.

[0005] According to one aspect of the present invention, there is provided a lifting eye for use in lifting an object comprising lifting eye member having an upper portion and a lower portion, said upper portion including an eye hole configured to receive a lifting hook; **characterised in that** said lower portion includes a pivot hole and a slot having two ends, there being a pivot member positioned in said pivot hole, the lifting eye member being capable of pivoting about said pivot member and there being a pivot stop positioned within said slot,

wherein when the lifting eye member is pivoted about said pivot member, said slot moves about said pivot stop and the pivoting of the lifting eye member about said pivot member is limited by the pivot stop contacting one of the two ends of said slot.

[0006] According to a second aspect of the present invention, there is provided a method of lifting an object using a lifting eye; characterised by the steps of rotating a lifting eye member affixed to the object to be lifted from a horizontal position to a vertical lifting position, affixing a lifting mechanism to the eye member; lifting the object; removing the lifting mechanism from the eye member and rotating the lifting eye member from the vertical lifting position to the horizontal position.

[0007] According to a third aspect of the present invention, there is provided a secure lifting eye assembly

comprising a pivoting lifting eye having a lifting eye member having an upper portion and a lower portion, said upper portion including an eye hold configured to receive a lifting hook and said lower portion including a pivot hole and a slot having two ends, a pivot member positioned in said pivot hole, the lifting eye member being capable of pivoting about said pivot member and a pivot stop positioned within said slot; there being a canopy having a slot, the canopy being positioned to cover the lower portion of the lifting eye member; wherein when said pivoting eye is in a vertical lifting position, said upper portion of said lifting eye member extends through the slot in the canopy exposing said eye hole and when said pivoting lifting eye is in a horizontal position, said upper portion of said lifting eye member lies within said canopy obstructing said eye hole.

[0008] According to a fourth aspect there is provided a lifting eye member having an upper portion and a lower portion, said upper portion including an eye hole configured to receive a lifting hook and said lower portion including at least two openings, each opening being configured to receive a holding member; at least one support fixably connected to an object to be lifted, said support including at least two openings, each opening being configured to receive a holding member; and at least two holding members, each holding member passing through an opening in said support and an opening in said lifting eye member.

[0009] For a better understanding of the invention and to show the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is an exploded view of a first embodiment of pivoting lifting eye,

Figure 2 is an exploded view of a second embodiment,

Figure 3 is a pictorial representation of third embodiment,

Figure 4 is a pictorial representation of a lifting eye installed on an object to be lifted.

[0010] Although references are made below to directions such as horizontal, vertical, etc. in describing the drawings, they are made relative to the drawings (as normally viewed) for convenience.

[0011] Figure 1 illustrates a pivoting lifting eye 1 according to a first embodiment including a lifting eye member 3. The lifting eye member 3 is illustrated in both a vertical lifting position A and in a horizontal non-lifting position B. The lifting eye member 3 has an upper portion 5 and a lower portion 7. The upper portion 5 includes an eye hole 9 which is configured to receive a conventional lifting hook. The eye hold 9 may be circular, ellipsoidal, oval or any other shape that permits passage of a hook. The lower portion 7 includes a pivot hole 11 and an arcuate slot 13.

[0012] The pivot hole 11 is sized to receive a pivot

member 51A while the arcuate slot 13 is sized to receive a pivot stop 51B. The pivot member 51A and the pivot stop 51B may be any object that allows the lifting eye member 3 to pivot. For example, the pivot member 51A and the pivot stop 51B may be bolts, rods, bars, dowels or any combination thereof. In order to improve performance, optional bushings 15A, 15B may be used in both pivot the hole 11 and the slot 13. Locking members 57 may be used to secure the pivot member 51A and the pivot stop 51B. The preferred locking member is a nut, however any device suitable for securing the locking member may be used. For example, the locking member may be a cotter pin or a screw cap. In order to improve performance, optional "bushings 15A, 15B may be used in both the pivot hole 11 and the slot 13. The optional bushing 15A is adapted to fit into the pivot hole 11 while the optional bushing 15B is sized to fit into the slot 13.

[0013] The lifting member 3 is supported and attached to the machine to be lifted by at least one support 17A. In the preferred embodiment, two supports 17A, 17B are used. Each support 17A, 17B has an upper portion 19 and a lower portion 21. The upper portion 19 has upper and lower openings 23A, 23B. The upper opening 23A is sized to receive the pivot member. In the preferred embodiment, the pivot member 51A passes through the upper opening 23A in support 17A, through the bushing 15A in the pivot hole 11 in the lifting member 3 and through upper opening 23A in support 17B. The pivot member 51A is secured with locking member 53A. The pivot stop 51B passes through the lower opening 23B in support of 17A, through the bushing 15B in the slot 13 in the lifting member 3 and through the lower opening 23B in support 17B. The pivot stop 51B is secured with locking member 53B. The lower portion 21 includes mounting holes 25 through which bolts or the like may be used to mount the supports 17A, 17B to the object to be lifted. Alternatively, the lower portion 25 may be welded or adhesively mounted to the object to be lifted.

[0014] In the non-lifting configuration, the lifting eye member 3 is in a horizontal position B. When it is desired to lift an object, the lifting member eye 3 is pivoted approximately 90 degrees to the vertical position A. A hook can then be inserted in to the eye hole 9, and the object lifted. The pivot stop 51B prevents the lifting member eye 3 from over-rotating, thereby adding stability to the lifting eye 1. Additionally, the pivot stop 51B improves safety by providing a second support in case of the failure of the pivot member. In the preferred embodiment, the lower portion 7 has a larger mass than the upper portion 5. This offset mass configuration results in the lifting member 3 remaining in a vertical lifting position A unless a force is applied to rotate to the horizontal position B. When not required for lifting an object, the lifting member 3 is preferably secured in horizontal position B.

[0015] Figure 2 illustrates a second embodiment that can be used when there is a lower threat of theft. In the second embodiment, the pivoting lifting member 3 is re-

placed by a fixed, non-rotating lifting member 27. The fixed lifting member 27 has an upper portion 28 and a lower portion 30. The upper portion 28 includes an eye hole 9 and upper and lower openings sized to receive holding members 55. The holding members secure the fixed lifting member 27 to supports 17A, 17B. The holding members 55 may be any object that can be used to secure the fixed lifting eye member 27 to the supports 17A, 17B. For example, the holding members may be bolts, rods, bars, dowels or any combination thereof. Locking members 57 may be used to secure the holding members 55. The preferred locking member is a nut, however any device suitable for securing the locking member may be used. For example, the locking member may be a cotter pin or a screw cap.

[0016] The rotating lifting eye 1 may include an alternative second lifting eye member 29 as shown in Figure 3. The second lifting eye member 29 is similar to the first lifting eye member 3 in most respects except 'that the second lifting eye 29 includes a second arcuate slot 31 and a second pivot stop (not shown) The use of a second slot 31 and a second pivot stop further improves safety and reliability in case of failure of the pivot member or the first pivot stop. During rotation of the lifting eye member 29, the two slots 13, 31 slide simultaneously about the two pivot stops.

[0017] The lifting eye 1 may be mounted to an object 39, as shown in Figure 4. The secure lifting eye assembly 33 of Figure 4 includes a canopy 35 for covering the lifting eye 1. Preferably, the canopy 35 is rotatably affixed to the object 39 by hinges 37. Alternatively, the canopy may be affixed to the object by any conventional means allowing quick access to the underlying lifting eye 1. The canopy 35 may include an optional handle 41. Also illustrated is a lock 43 which may be used to secure the canopy 35 to the object 39. As shown in Figure 4, the lock 43 is built into the object 39. The arrangement is shown for illustration purposes only and is not intended to be limiting. Any suitable locking configuration may be used. For example, a locking mechanism integrated into the canopy 35 or a conventional exterior padlock system may be used. In a preferred embodiment, the canopy 35 may include a slot 45. The slot 45 is configured so that the upper portion 5 of the lifting eye member 3 protrudes through the slot 45, fully exposing the eye hole 9 when the lifting eye member 3 is in the vertical lifting position A. When the lifting eye member 3 is in the non-lifting horizontal position B, the upper portion 5 of the lifting eye member 3 is secure under the canopy 35. The eye hole 9 is covered by the canopy 35, preventing its use and thereby reducing the likelihood of theft.

Claims

1. A lifting eye (1) for use in lifting an object comprising a lifting eye member (3) having an upper portion (5)

and lower portion (7), said upper portion including an eye hole (9) configured to receive a lifting hook; **characterised in that** said lower portion (7) includes a pivot hole (11) and a slot (13) having two ends, there being a pivot member (51A) positioned in said pivot hole, the lifting eye member (3) being capable of pivoting about said pivot member (51A), and there being a pivot stop (51B) positioned within said slot (13), wherein when the lifting eye member (3) is pivoted about said pivot member (51A), said slot (13) moves about said pivot stop (51B) and the pivoting of the lifting eye member about said pivot member is limited by the pivot stop contacting one of the two ends of said slot.

2. A lifting eye according to claim 1, wherein said pivot member (51A) is a bolt.

3. A lifting eye according to claim 1 or 2, wherein said pivot stop (51B) is a bolt.

4. A lifting eye according to claim 1, 2 or 3, further comprising a bushing (15A) positioned in said pivot hole (11) between said pivot member (51A) and said lifting eye member (3).

5. A lifting eye according to any one of claims 1 to 4, further comprising a bushing (15A) positioned in said slot between said lifting eye member and said pivot stop (15B).

6. A lifting eye according to any one of claims 1 to 5, wherein said slot (13) has an arcuate shape.

7. A lifting eye according to any one of claims 1 to 6, wherein said lifting eye member (29) has a second slot (31) and a second pivot stop.

8. A lifting eye according to any one of claims 1 to 7, further comprising a first support (17A) for connection to the object (39), wherein said pivot member (51A) is secured to said support.

9. A lifting eye according to claim 8, wherein said pivot stop (51B) is connected to said first support.

10. A lifting eye according to claim 8 or 9, further comprising a second support (17B) for connection to the object (39) and positioned on an opposite side of said lifting eye member from said first support.

11. A lifting eye according to claim 10, wherein said pivot member (51A) is connected to said first and second supports.

12. A lifting eye according to any one of the preceding claims, wherein the mass of the lower portion (7) is greater than the mass of the upper portion (5).

13. A lifting eye according to claim 12, wherein the pivot hole (11) is positioned in the lifting eye member so that said lifting eye has an offset mass configuration.

14. A lifting eye according to any one of the preceding claims, wherein the length of the slot (13) limits the amount of rotation of said lifting eye member (3) around said pivot member (51A) to approximately 90 degrees.

15. A method of lifting an object using a lifting eye; **characterised by** the steps of rotating a lifting eye member (3) affixed to the object (39) to be lifted from a horizontal position to a vertical lifting position, affixing a lifting mechanism to the eye member, lifting the object, removing the lifting mechanism from the eye member, and rotating the lifting eye member from the vertical lifting position to the horizontal position.

16. A method according to claim 15, wherein the steps of rotating comprise rotating said lifting eye member (3) about a pivot member (51A) in a pivot hole (11) and a pivot stop (51B) in a slot (13).

17. A secure lifting eye assembly comprising a pivoting lifting eye (1) having a lifting eye member (3) having an upper portion (5) and a lower portion (7), said upper portion including an eye hole (19) configured to receive a lifting hook and said lower portion including a pivot hole (11) and a slot (13) having two ends, a pivot member (51A) positioned in said pivot hole, the lifting eye member being capable of pivoting about said pivot member and a pivot stop (51B) positioned within said slot; there being a canopy (35) having a slot (45), the canopy being positioned to cover the lower position of the lifting eye member; wherein when said lifting eye member extends through the slot in the canopy exposing said eye hole and when said pivoting lifting eye is in a horizontal position, said upper portion of said lifting eye member lies within said canopy obstructing said eye hole.

18. A lifting eye (1) comprising a lifting eye member (3) having an upper portion (5) and a lower portion (7), said upper portion including an eye hole (9) configured to receive a lifting hook and said lower portion including at least two openings (11, 12), each opening being configured to receive a holding member; at least one support (17A) fixably connected to an object (39) to be lifted, said support including at least two openings, each opening being configured to receive a holding member; and at least two holding members, each holding member passing through an opening in said support and an opening in said lifting eye member.

19. A lifting eye according to claim 18, wherein one of said openings in said lifting eye member is a hole and one of said openings in said lifting eye member is an arcuate slot (13).

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20. A lifting eye according to claim 18, wherein all of said openings in said lifting eye member are holes.

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Fig. 1

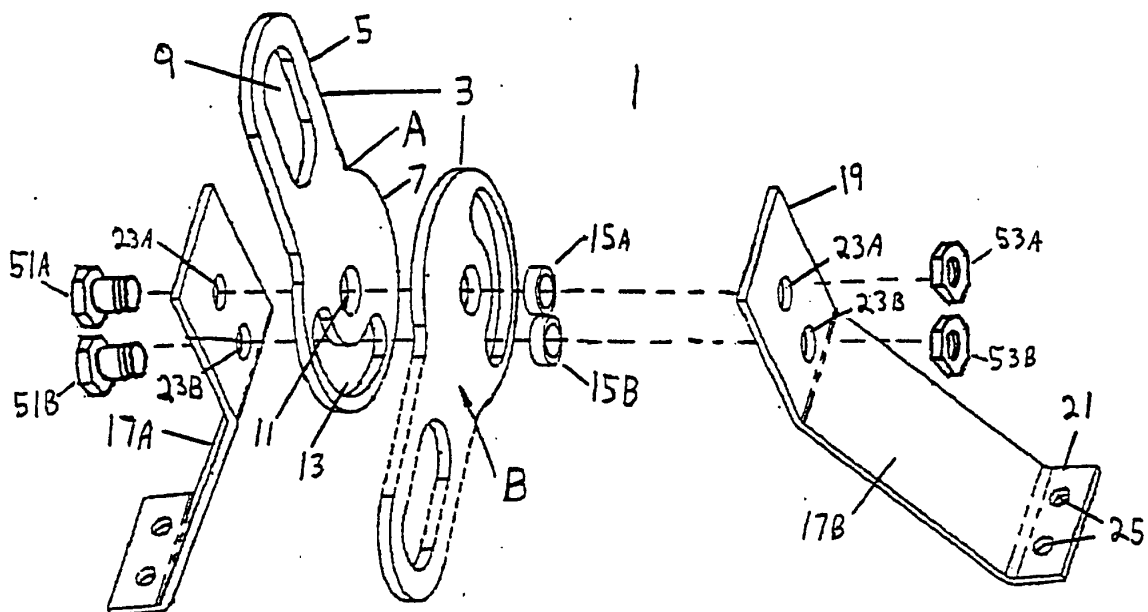


Fig. 2

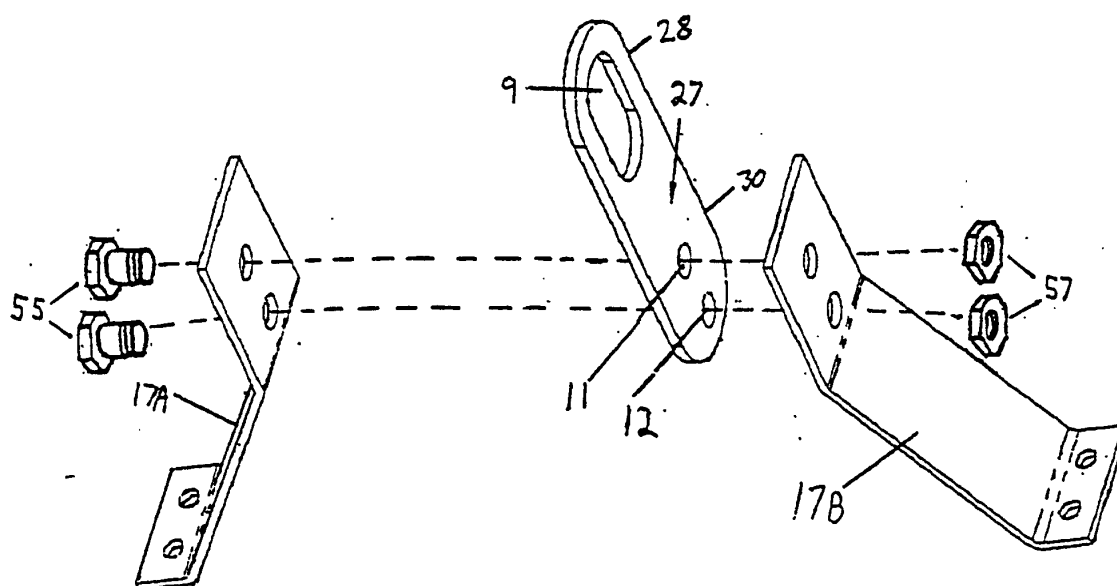


Fig. 3

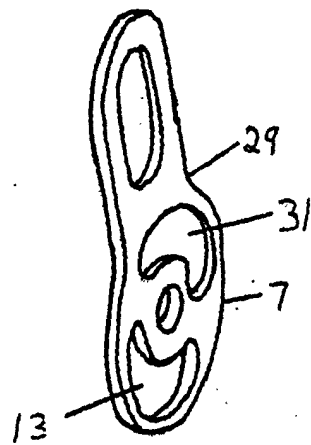


Fig. 4

