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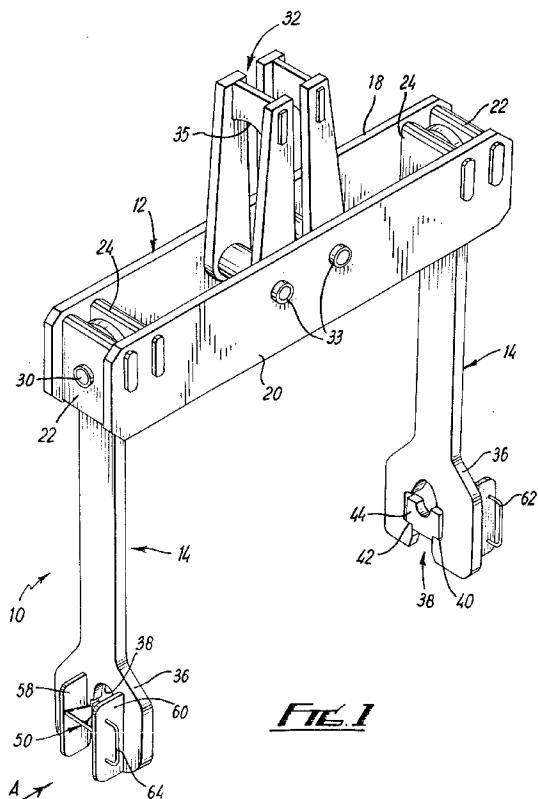
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(54) **A lifting device.**

(57) A lifting device (10) for engaging trunnions (94) or the like of objects to be lifted. The device comprises a beam (12) having at least two substantially rigid depending members (14), each depending member having at least one open slot (38) at its lower end so as to drop downwardly over a respective trunnion (94), and a respective removable member (44) for bridging across a respective said slot (38) under the trunnion (94), the removable member (44) being engageable with the slot (38) so as to support the trunnion (94) when the beam (12) is lifted. The relative rigidity of the device (10) enables a single operator to connect and disconnect the depending members (14) to an object to be lifted.



The invention relates to a lifting device for engaging trunnions or the like of objects to be lifted and more particularly, but not exclusively, to a lifting device for transport flasks for containing nuclear material.

A conventional lifting device usually comprises a beam having side arms depending from each of its ends, and shackles are usually employed to join the side arms to the beam. A shackled joint is extremely flexible and, consequently, the positional adjustment of one side arm is not easily transferred through the beam structure to effect a corresponding adjustment of the other side arm.

According to the present invention, there is provided a lifting device for engaging trunnions or the like of objects to be lifted, the device comprising a beam having at least two substantially rigid depending members, each depending member having at least one open slot at its lower end so as to drop downwardly over a respective trunnion, and a respective removable member for bridging across a respective said slot under the trunnion, the removable member being engageable with the slot so as to support the trunnion when the beam is lifted.

Preferably, each depending member is supported by a pin joint from the beam, and pivotal movement of the depending member is substantially restricted by the beam.

Desirably, the slot extends longitudinally with respect to the respective depending member.

Preferably, the slot near the lower end thereof defines opposing shoulders for engaging the bridging member.

Conveniently, the bridging member is pivotally connected to a pivot mechanism at the respective depending member, the pivot mechanism being operable to move the bridging member to extreme positions to and from the slot.

Advantageously, the extreme positions of the bridging member are maintained by the weight of the bridging member acting on the pivot mechanism.

Desirably, a latching means engageable with the pivot mechanism additionally maintains the bridging member engaged in the slot during lifting of the device.

The invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 shows a perspective view of a lifting device;

Figure 2 shows, to an enlarged scale, a perspective exploded view of part of the lifting device of Figure 1;

Figure 3 shows, to an enlarged scale, a view in the direction of arrow A of Figure 1;

Figure 4 shows, to a reduced scale, a representation on the line IV-IV of Figure 3, and

Figure 5 shows a modification of the representa-

tion of Figure 4.

Referring to Figures 1 and 2, a lifting device 10 is shown comprising a bridge beam 12 having two identical depending members in the form of side arms 14 in opposing relationship. The beam 12 comprises two elongated parallel plates 18,20, the plates 18,20 being held spaced apart at their ends by respective spacer plates 22,24 which locate in close fitting relationship about a respective side arm 14. Each side arm 14 is supported by a respective pin 30 held at each end in the spacer plates 22,24, the width of the side arms 14 being such that pivotal movement of the side arms 14 on the pins 30 is substantially restricted by the plates 18,20. A lifting structure 32, secured between the plates 18,20 by pins 33 is shaped at 35 to accommodate a conventional crane hook or the like (not shown).

Each side arm 14 has a lower portion 36 defining an open longitudinal slot 38. The lower end of the slot 38 is shaped so as to define opposing shoulders 40, 42, the upper end of the slot 38 being shaped so as to locate a respective trunnion or the like (not shown) of an object to be lifted. A respective removable bridging member 44 (only one is shown) is locatable on the shoulders 40,42 so as to bridge the slot 38, the bridging member 44 being shaped so as to accommodate and support the underside of the trunnion when the beam 12 is lifted. Each bridging member 44 is movable by a respective pivot mechanism 50 to and from the shoulders 40,42.

Referring now to Figure 3, the bridging member 44 is shown located within the slot 38 and rests on the shoulders 40,42. Two side plates 58,60 extend perpendicularly from the lower portion 36, one on either side of the slot 38, each side plate 58,60 being fitted with an outwardly extending handle 62,64 respectively.

The bridging member 44 is movable from a 'closed' position, where it locates on the shoulders 40,42 (as shown), to an 'open' position remote from the shoulders 40,42, and vice versa by means of the pivot mechanism 50. The pivot mechanism 50 has two pegs 66,68 attached one each side of the bridging member 44 and which connect the bridging member 44 to pivot arms 70,72 respectively. Each pivot arm 70,72 has a second peg 74,76 respectively connected to respective pivot stubs 78,80 which in turn are connected at their opposite ends to the side plates 58,60.

A pivot handle 82 is connected between and protrudes beyond the pivot arms 70,72 at 81,83. The pivot mechanism 50 is balanced so that the extreme positions of the bridging member 44 in the 'open' and 'closed' positions are maintained by the weight of the bridging member 44 acting on the pivot mechanism 50.

In the 'closed' position as shown in Figure 5, the bridging member 44 is additionally retained on the shoulders 40,42 by a latching device 71 engageable

with the pivot handle 82. The latching device 71 comprises two spaced apart latching arms 84,86, each of which has a concave portion 85 which engages at 81,83 respectively with the protruding ends of the pivot handle 82 and a lower relieved end 87 with a corner chamfer 89. The ends 87 are arranged such that they engage the pivot handle 82 when it is raised from the "open" position, and deflect the latching arms 84, 86 backwardly from where they return under gravity to latch the pivot handle 82 as shown in Figure 5.

The latching arms 84,86 are connected to each other by a latching handle 88, and are connected to the side plates 58,60 by respective pegs 90,92.

Figure 4 shows the lower portion 36 of the side arm 14 resting on a lifting trunnion 94 with the bridging member 44 in the 'open' position remote from the shoulder 42 and the pivot handle 82 in its lowermost position. Raising the pivot handle 82 in the direction of the arrow X causes the pivot arm 70 to pivot about the peg 74 thereby moving the bridging member 44 to the 'closed' position where it rests on the shoulders 42,44 (as shown in Figure 5).

In Figure 5, the pivot handle 82 is in its uppermost position and is engaged by the concave portion 85 of the latching arm 84 to prevent the bridging member 44 from being inadvertently removed from the closed position during raising and lowering of the beam 12 (not shown). In order to move the bridging member 44 to the 'open' position, the latching handle 88 is pushed upwardly in the direction of the arrow Y so as to cause the latching arm 84 to pivot about the peg 90. The concave latching portion 85 disengages from the pivot handle 82 and the pivot handle 82 is pulled downwardly in the direction of the arrow Z thereby moving the bridging member 44 to the 'open' position.

In operation of the lifting device 10, the beam 12 is lifted by means of a hook suspended from an overhead crane (not shown) attached to the lifting structure 32. Both of the bridging members 44 are in the 'open' position. The lifting device 10 is manoeuvred by the overhead crane into a position such that the slots 38 of the side arms 14 are approximately aligned over the lifting trunnions 94 of an object such as a flask to be lifted. As the lifting device 10 is lowered by the overhead crane, a single operator can adjust the position of one of the side arms 14 by means of the handles 62,64 so that the slot 38 can drop down over its respective lifting trunnion 94. This positional adjustment is transferred through the structure of the lifting device 10 due to its relative rigidity, so that the slot 38 of the other side arm 14 also drops down over its respective lifting trunnion 94 as the device 10 is lowered until the closed upper ends of the slots 38 rest on their respective lifting trunnions 94. The operator moves the first bridging member 44 into its 'closed' position by operating the pivot handle 82 as described above in relation to Figures 4 and 5.

The operator then moves to the other side arm 14 and repeats the aforementioned procedure for the second bridging member 44 and its respective pivot handle 82.

5 The device 10 may then be lifted and moved to a desired location by the overhead crane, the flask trunnions 94 being engaged and supported by the bridging members 44 and the weight of the flask being transferred through the bridging members 44 to the shoulders 40,42 of the slots 38 as the lifting device 10 rises.

10 Once the flask has reached its desired location, the device 10 is lowered by the overhead crane so that once again the closed ends of the slots 38 rest on their respective lifting trunnions 94. The operator then moves to one of the side arm 14, operates the latching handle 88 to disengage the pivot handle 82 from the latching arms 84,86 and operates the pivot handle 82 to move the bridging member 44 to the 'open' position. The operator next moves to the other side arm 14 and repeats the aforementioned procedure in order to move the respective bridging member 44 to the 'open' position. The device 10 is lifted once again by the overhead crane and may be positioned over another flask which requires to be moved.

15 20 25 It will be appreciated that in contrast to the prior art lifting devices using flexible shackled joints, the relative rigidity of the lifting device of the invention enables a single operator to connect and disconnect the side arms of the device to an object to be lifted.

30 35 Although the invention has been described in relation to a lifting device having two depending members and two slots to engage a trunnion, the device may have more than two depending members and/or more than two slots to engage a corresponding number of trunnions.

40 Claims

1. A lifting device for engaging trunnions or the like of objects to be lifted, the device comprising a beam having at least two depending members, characterised in that the said depending members are substantially rigid, each depending member having at least one open slot at its lower end so as to drop downwardly over a respective trunnion, and a respective removable member for bridging across a respective said slot under the trunnion, the removable member being engageable with the slot so as to support the trunnion when the beam is lifted.
2. A device as claimed in Claim 1 characterised in that each depending member is supported by a pin joint from the beam, and pivotal movement of the depending member is substantially restricted

by the beam.

3. A device as claimed in Claim 1 or Claim 2 characterised in that the slot extends longitudinally with respect to the respective depending member. 5
4. A device as claimed in any one of the preceding Claims characterised in that the slot near the lower end thereof defines opposing shoulders for engaging the bridging member. 10
5. A device as claimed in any one of the preceding Claims characterised in that the bridging member is pivotally connected to a pivot mechanism at the respective depending member, the pivot mechanism being operable to move the bridging member to extreme positions to and from the slot. 15
6. A device as claimed in Claim 5 characterised in that the extreme positions of the bridging member are maintained by the weight of the bridging member acting on the pivot mechanism. 20
7. A device as claimed in Claim 5 or Claim 6 characterised in that a latching means engageable with the pivot mechanism additionally maintains the bridging member engaged in the slot during lifting of the device. 25

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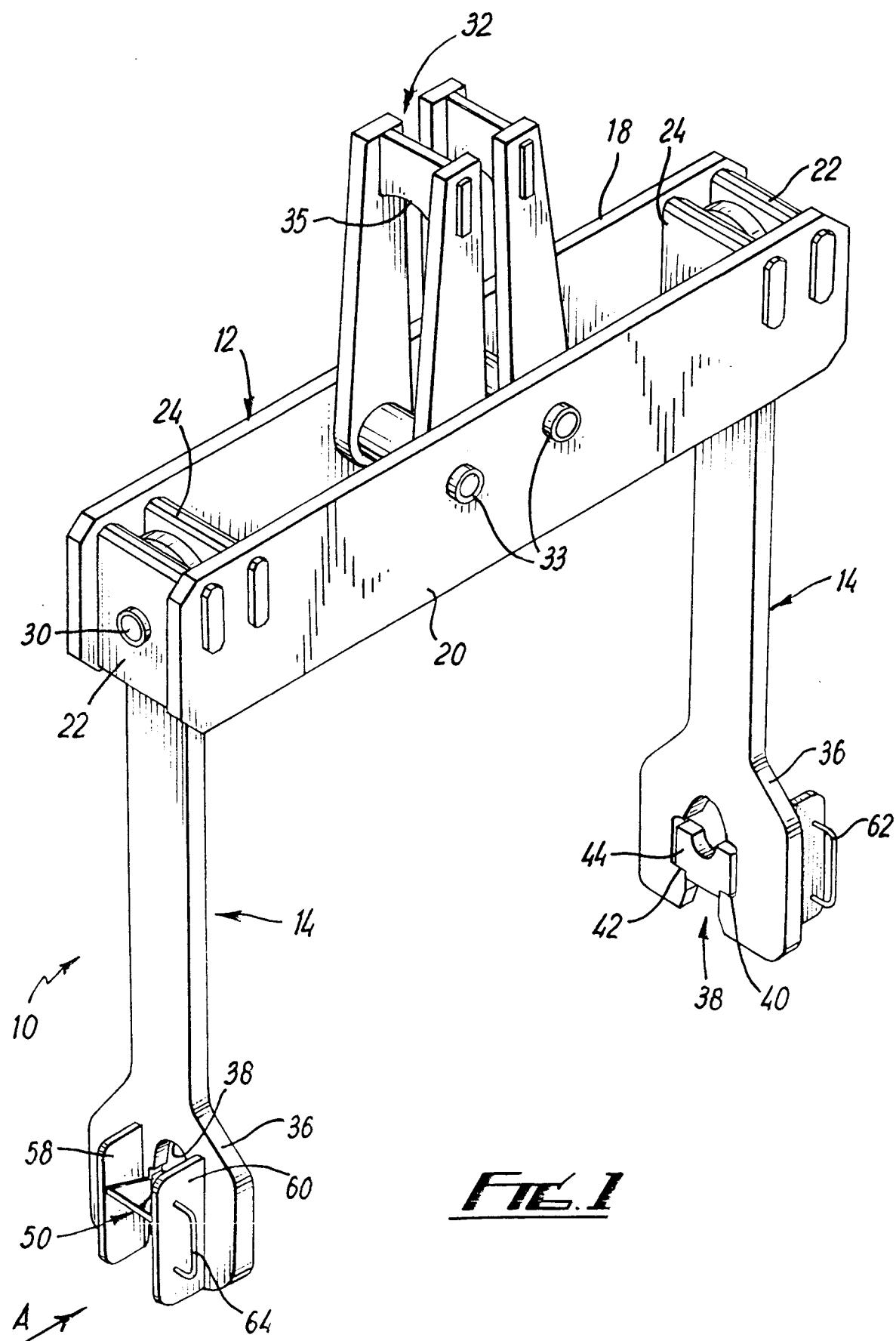
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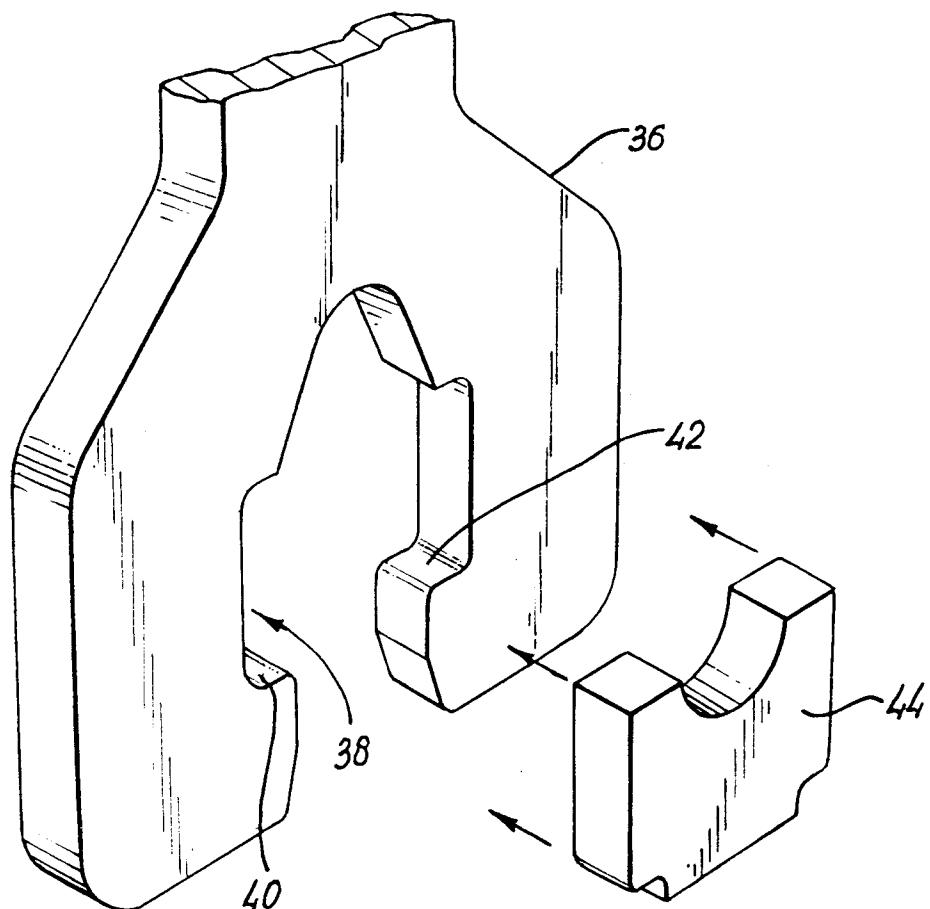


FIG. 2

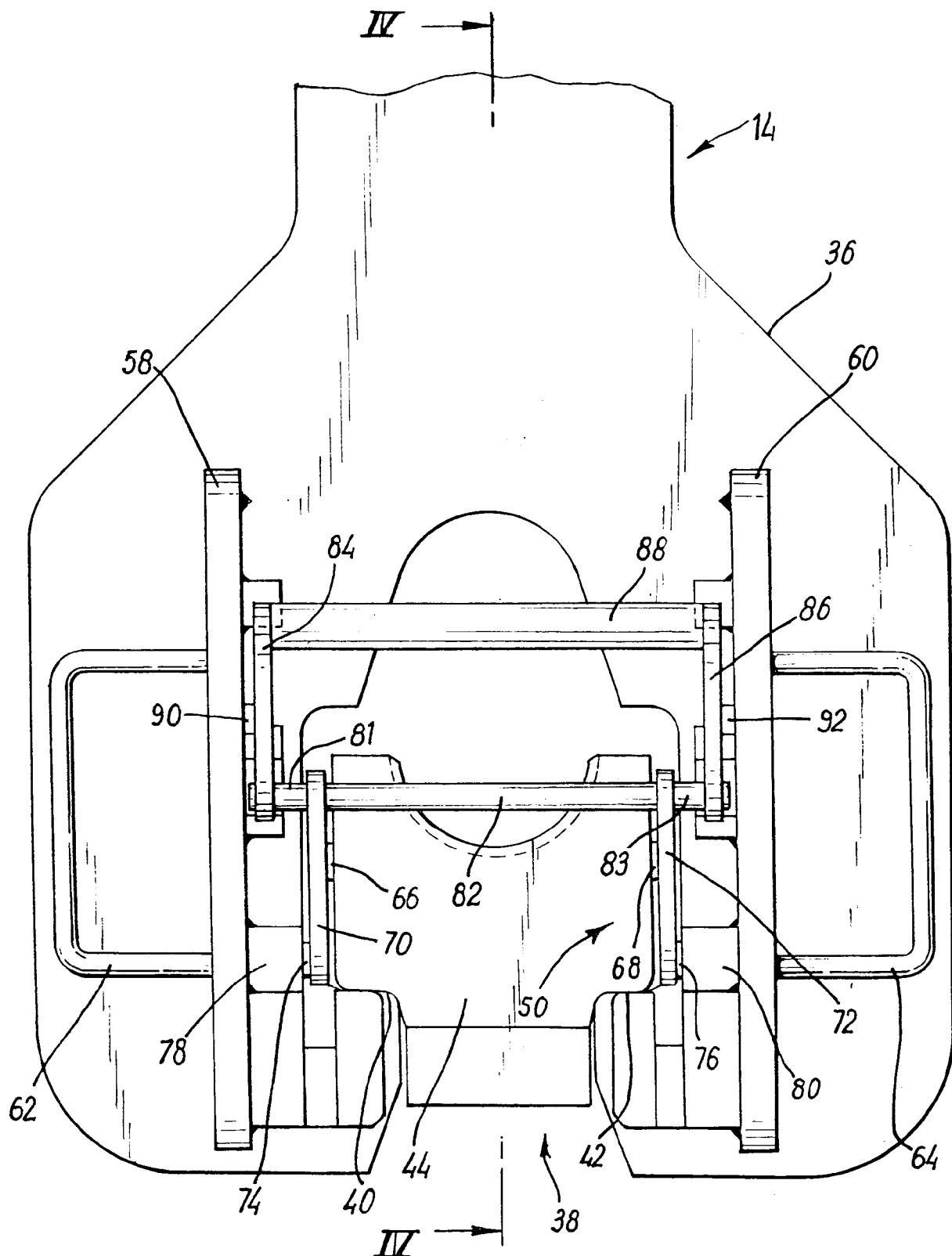
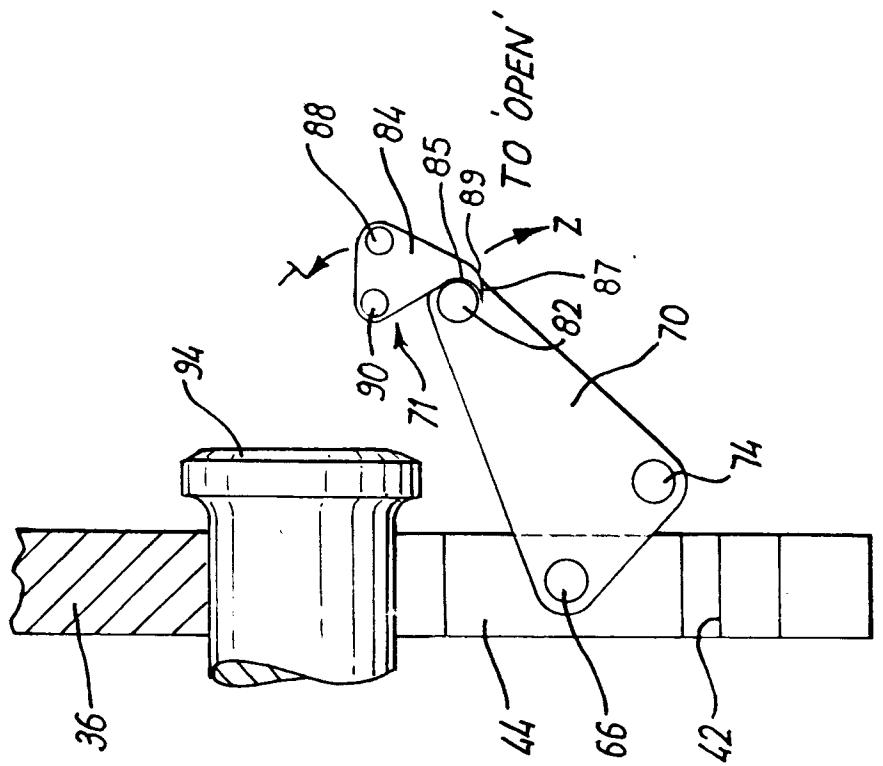
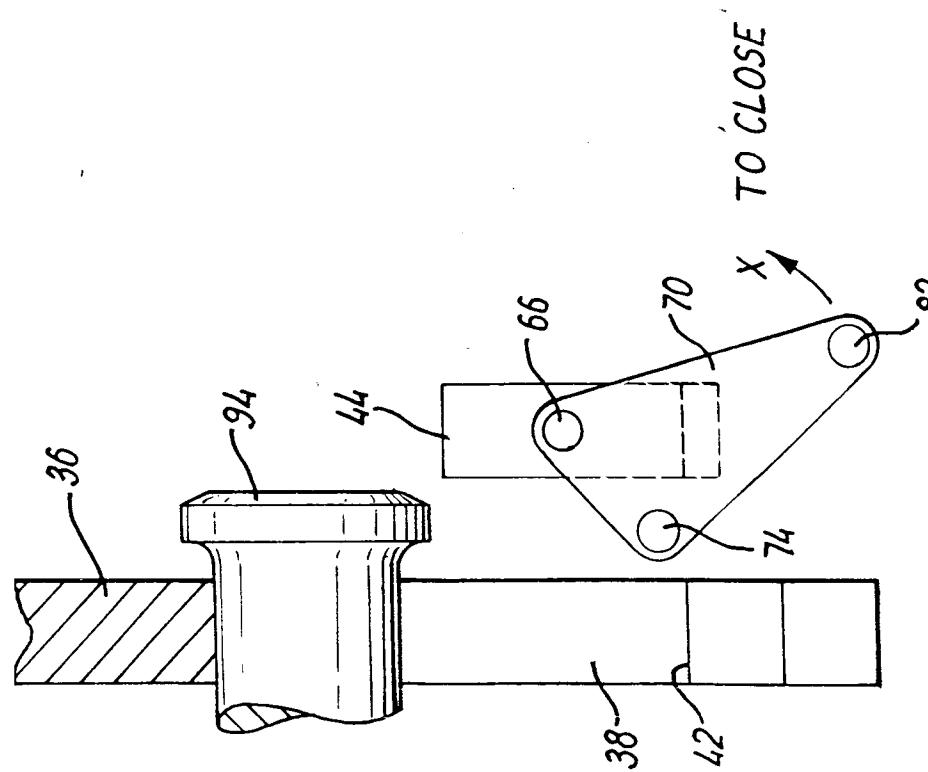


FIG. 3



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European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 30 1859

DOCUMENTS CONSIDERED TO BE RELEVANT						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)			
X	FR-A-2 243 901 (GAUTIER)	1, 3, 5	B66C1/66			
Y	* page 2, line 8 - page 4, line 12 *	4, 6				
Y	US-A-3 625 558 (JOHNSON)	4, 6				
	* column 1, line 46 - line 75 *					
	* column 2, line 28 - line 51 *					
X	DE-A-2 438 172 (WUPPER)	1-3, 5				
	* page 4, paragraph 7 - page 6, paragraph 5 *					
A	US-A-4 108 485 (JENNINGS)					
A	DE-A-2 338 480 (GESELLSCHAFT FUR KERNFORSCHUNG)					
A	DE-A-3 421 774 (KRAFTWERK UNION)					
A	FR-A-2 455 203 (ECOPOL)					
A	US-A-4 336 460 (BEST)					
A	DE-B-1 252 390 (BETEILIGUNGS- UND PATENTVERWALTUNGSGESELLSCHAFT)					

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)			
			B66C G21F			
<p>The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search THE HAGUE</td> <td>Date of completion of the search 21 JUNE 1993</td> <td>Examiner VAN DEN BERGHE E.</td> </tr> </table>				Place of search THE HAGUE	Date of completion of the search 21 JUNE 1993	Examiner VAN DEN BERGHE E.
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CATEGORY OF CITED DOCUMENTS		<p>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</p>				
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						