

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11) Publication number:

0 415 687 A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 90309357.3

(51) Int. Cl.⁵: **B66F 7/08**

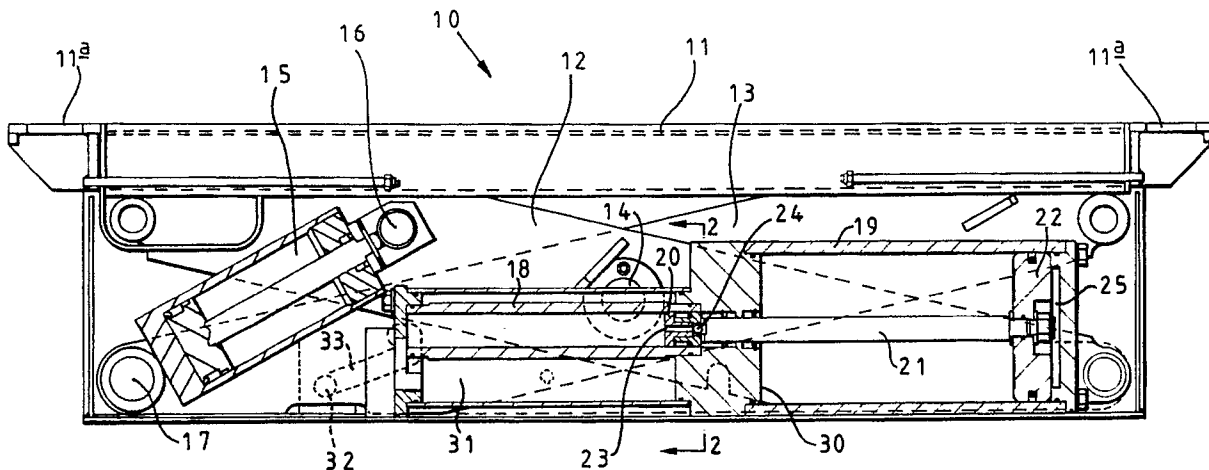
(22) Date of filing: 25.08.90

(30) Priority: 26.08.89 GB 8919468

(43) Date of publication of application:
06.03.91 Bulletin 91/10(84) Designated Contracting States:
AT BE CH DE DK ES FR GR IT LI LU NL SE(71) Applicant: **V.L. CHURCHILL LIMITED**
P.O. Box 3 London Road
Daventry Northants. NN11 4NF(GB)(72) Inventor: **Holland, Ernest**
65 St. Augustine Way
Daventry, Northamptonshire(GB)
Inventor: **Grossart, Peter Simpson Kirkwood**
36 Welton Road, Braunston
Daventry, Northamptonshire(GB)(74) Representative: **Healy, Cecilia Patricia et al**
Walford & Hardman Brown, 5 The Quadrant
Coventry CV1 2EL(GB)(54) **Jacking apparatus.**

(57) A jacking apparatus (10) such as a pit jack incorporates a pneumatic/hydraulic intensifier comprising a double-acting hydraulic piston and cylinder assembly (18) coupled to the piston rod (21) of a double-acting pneumatic piston and cylinder assembly (19). The hydraulic piston (20) incorporates a

through passageway (23) having a one-way ball valve (24). The length of the pneumatic/hydraulic intensifier is reduced by using double-acting piston and cylinder assemblies (18,19) so as to make the jack (10) very compact.

**FIG 1****EP 0 415 687 A1**

JACKING APPARATUS

This invention relates to a jacking apparatus for example for garage use. The jacking apparatus may be a pit jack for use in supporting a vehicle over an inspection pit or may take other forms.

It is known to make a jacking apparatus using an air/hydraulic intensifier in which a large diameter pneumatic piston and cylinder assembly drives a small diameter hydraulic piston and cylinder assembly to produce high pressure hydraulic fluid which operates a lifting ram.

However, because a relatively large quantity of high pressure hydraulic fluid is required for the lifting ram, the hydraulic intensifier has hitherto been too large to produce a convenient and compact jacking device. This is because the quantity of fluid to be pumped is related to the stroke of the hydraulic piston and cylinder assembly and of the pneumatic piston and cylinder assembly which drives it.

It is an object of the present invention to provide a new or improved jacking apparatus which overcomes or reduces this disadvantage.

According to the invention there is provided a jacking apparatus comprising an hydraulic lifting ram adapted to lift a structure, and a pneumatic/hydraulic intensifier adapted to supply high pressure hydraulic fluid to said ram to operate it, the intensifier comprising a large diameter pneumatic piston and cylinder assembly and a small diameter hydraulic piston and cylinder assembly operable by the pneumatic piston, wherein at least one piston and cylinder assembly of the intensifier is double-acting. The expression "double-acting" in this description means that fluid is pumped by the piston and cylinder assembly in both directions of reciprocating travel of the piston.

Preferably, both the hydraulic and pneumatic assemblies are double-acting.

The jacking apparatus may comprise a scissor operating lifting beam.

The pneumatic/hydraulic intensifier may be provided between the arms of the scissor in the lowered condition.

A manually operated directional control valve may be used to supply air to the pneumatic piston and cylinder assembly. Alternatively, an automatic change-over valve may be provided to supply air to the pneumatic piston and cylinder assembly.

A jacking apparatus embodying the invention will now be described in more detail by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a general arrangement of the jack shown in side elevation;

Figure 2 is a sectional view of a valve assembly

on the line 2-2 of Figure 1;

Figure 3 is an enlarged view of part of Figure 1.

Referring to the drawings, a jacking device generally indicated at 10 is intended to raise a beam 11 which in turn supports a load. In a typical example, the jack is intended to support a vehicle over an inspection pit and is provided with roller wheels of generally known type which run on rails provided along the inspection pit opening. These details are not shown in the drawings. The beam 11 has side extensions 11a telescopically arranged so as to extend the effective width of the beam.

The beam 11 is lifted by a scissor linkage comprising a pair of crossing scissor arms 12 and 13 linked by a pivot 14. The arms 12 and 13 can be moved by a generally conventional angled hydraulic ram 15 which is attached at 16 and 17 to the limbs 12 and 13 respectively. It will be appreciated that, as the ram 15 extends, the limbs 12 and 13 pivot about the point 14 and raise the beam 11 in generally known manner.

Hydraulic fluid is supplied to the ram 15 from a small diameter hydraulic piston and cylinder assembly 18. This forms one element of a pneumatic/hydraulic intensifier, the other element being a pneumatic piston and cylinder assembly 19. The hydraulic assembly has a piston 20 which is driven by a rod 21 secured to the piston 22 of the pneumatic assembly.

The pneumatic piston and cylinder assembly is of large diameter compared with that of the hydraulic assembly. This means that the pressure of hydraulic fluid is multiplied by the ratio of the piston areas, compared with the pressure of the air operating the pneumatic piston and cylinder assembly, in generally known manner.

The hydraulic piston 20 has a central passageway 23 which is closed by a ball valve 24. The ball valve controls a passageway through which hydraulic fluid can be pumped to the ram 15. A valve block shown in Figure 2 of the drawings is used to direct hydraulic fluid through pipework (not shown) to the ram 15.

In use, compressed air is introduced by a manually controlled directional valve (not shown) at the right-hand end 25 of the pneumatic piston and cylinder assembly. This causes the piston 22 to travel towards the left, pushing the rod 21 and hence the piston 20. As the piston 20 moves up the hydraulic cylinder, the ball valve 24 opens, forcing compressed hydraulic oil into the space 26 behind the piston 20.

This oil passes through a pressure openable ball valve 27 and passageways 28 to a hydraulic hose 29 connected to the ram 15.

When the hydraulic ram 20 reaches the end of its travel towards the left-hand side of the drawings, the compressed air feed to the part 25 of the pneumatic cylinder is cut off. Reverse manual operation of the directional control valve then introduces compressed air to the space 30 at the left-hand side of the piston 22, tending to force the piston 22 back to its start position.

In so doing, the rod 21 is pulled towards the right-hand side and the ball valve 24 in the piston 20 closes, preventing compressed hydraulic fluid from returning to the cylinder 18. Hydraulic fluid is supplied from a reservoir 31 forming a jacket around the cylinder 18 through a demand valve (not shown) to replenish the oil in the cylinder.

Hydraulic oil at the right-hand side of the piston 20 is forced into the space 26, since it cannot return through the closed valve 24, and is also pumped through the valve 27 and passageways 28 to the supply hose 29 and hence to the ram 15.

It will be appreciated that the directional control valve can be repeatedly operated to supply air firstly to the right-hand and then to the left-hand end of the pneumatic cylinder and this will cause stepwise operation of the ram 15 until the limit of its travel is reached. Conveniently, a mechanical lock is then provided to support the beam 11 in its fully lifted condition so as to prevent sudden dropping of the beam in the event of hydraulic failure. This is provided by a peg 32 running in a cranked slot 33 of the scissor linkage.

Lowering of the beam may be achieved by a manually operated exhaust valve which releases hydraulic pressure in the ram 15 and returns the hydraulic fluid to the reservoir 31.

For automatic operation, the pneumatic cylinder could have an associated change-over valve to direct compressed air to the appropriate end of the cylinder to continue lifting. The change-over valve can be controlled by suitable mechanical switches detecting limit positions of the pneumatic piston for example. The manual control valve is then only required to switch on and off the air supply.

In Figure 2 of the drawings, an additional valve 34 can be seen. This is a pressure relief valve of generally known type operable on excess pressure being built up in the region 26. The valve operates to return hydraulic oil to the reservoir 31 in the event of a pressure overload.

As can be seen from the drawings, the intensifier comprising the assemblies 18 and 19 can be housed compactly within the scissor linkage in its lowered condition, as shown. This enables the jacking device to be made very compact while permitting adequate lifting of the beam 11.

Claims

1. A jacking apparatus comprising an hydraulic lifting ram adapted to lift a structure, and a pneumatic/hydraulic intensifier adapted to supply high pressure hydraulic fluid to said ram to operate it, the intensifier comprising a large diameter pneumatic piston and cylinder assembly and a small diameter hydraulic piston and cylinder assembly operable by the pneumatic piston, characterised in that at least one piston and cylinder assembly of the intensifier is double-acting.
2. A jacking apparatus according to Claim 1 further characterised in that the hydraulic piston and cylinder assembly is double acting.
3. A jacking apparatus according to Claim 1 or Claim 2 further characterised in that the pneumatic piston and cylinder assembly is double acting.
4. A jacking apparatus according to any preceding claim and comprising a scissor operating lifting beam.
5. A jacking apparatus according to claim 4 further characterised in that the pneumatic/hydraulic intensifier is provided between the arms of the scissor in the lowered condition.
6. A jacking apparatus according to any one of Claims 3-5 further characterised in that a manually operated directional control valve is used to supply air to the pneumatic piston and cylinder assembly.
7. A jacking apparatus according to any one of Claims 3-5 further characterised in that an automatic changeover valve is provided to supply air to the pneumatic piston and cylinder assembly.
8. A jacking beam according to any claim directly or indirectly appendant to Claim 2 further characterised in that the hydraulic assembly comprises a cylinder having a single outlet port and a piston having a through passageway controlled by a one-way valve whereby, in one direction of travel of the piston, the valve is closed and fluid is delivered conventionally to the outlet port and, in the other direction of travel of the piston, fluid is forced through said one-way valve to the outlet port.
9. A jacking apparatus according to any claim directly or indirectly appendant to Claim 4 further characterised in that the arms of the scissor have a positional detent adapted to engage to retain the scissor in an uppermost raised condition.

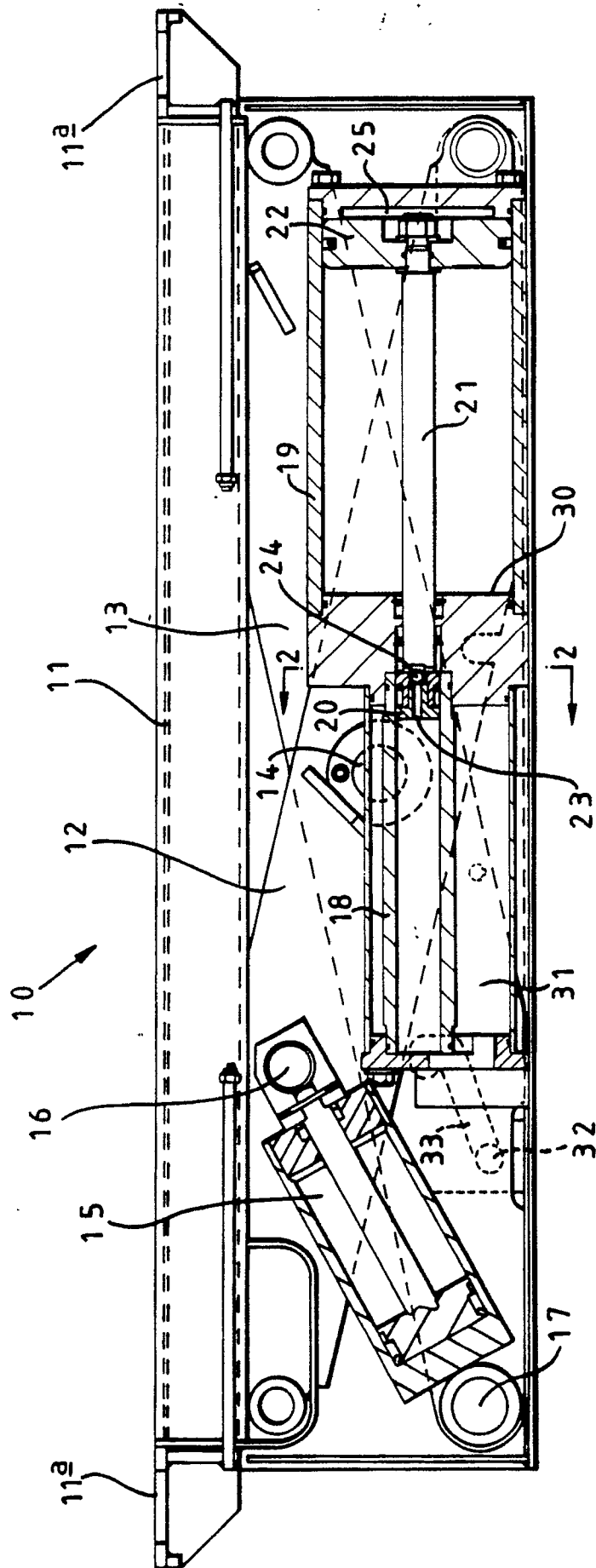


FIG 1

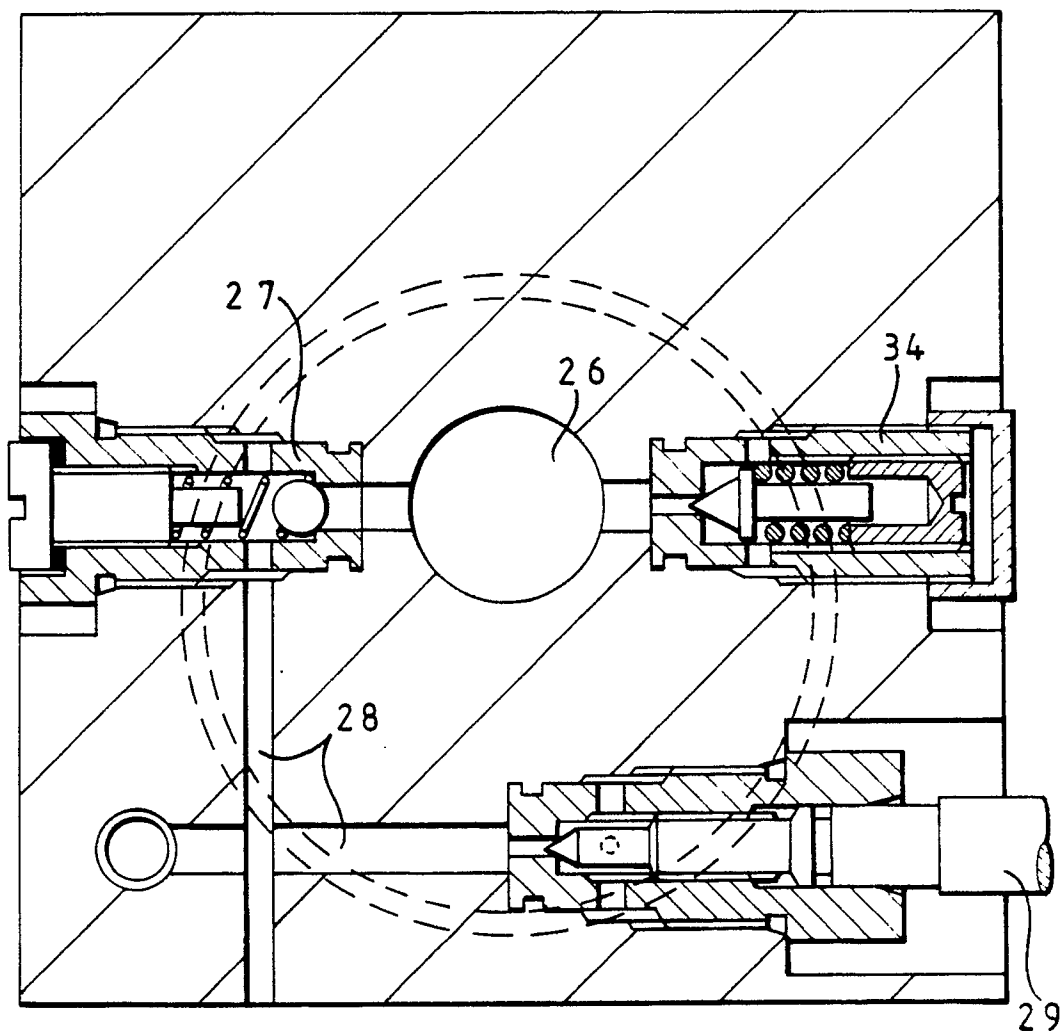


FIG 2

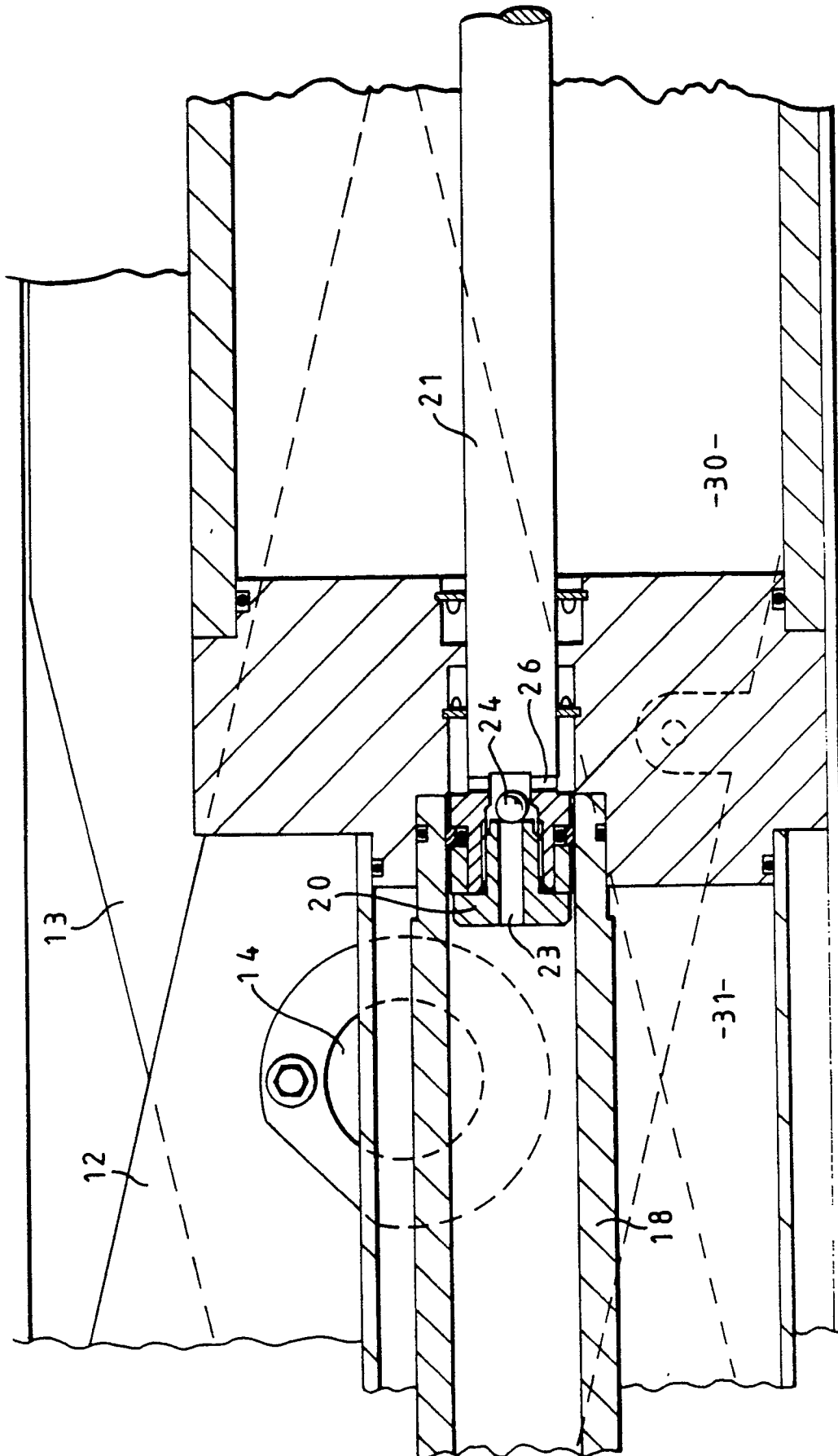


FIG 3



European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 9357

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)
Y	GB-A-1 232 983 (CASTROL LTD) * Page 2, lines 5-50; figure 1 * - - - -	1-5	B 66 F 7/08
Y	GB-A-2 091 346 (CAMTORC LTD) * Abstract; figure 1; page 2, lines 84-108; page 2, line 124 - page 3, line 52 * - - - -	1-5	
A		7	
A	DE-U-8 609 199 (SAMARIT MEDIZINTECHNIK AG) * Page 8, lines 28-34; figure 7 * - - - -	1,4	
A	FR-A-2 480 873 (TOYOOKI KOGYO K.K.) * Page 2, line 34 - page 3, line 1; page 3, lines 17-31; figures 1,2 * - - - -	1,7	
A	FR-A-2 228 389 (HALE) * Page 2, lines 7-35; figure * - - - -	1,8	
A	FR-A-1 075 780 (MERCIER) * Page 2, left-hand column, line 42 - right-hand column, line 5; figures 1,2 * - - - -	8	
A	CA-A-1 120 379 (ARGO ENGINEERING LTD) * Figures * - - - -	1	
A	POWER INTERNATIONAL, vol. 33, no. 387, 1987, pages 100-103, Morden, Surrey, GB; "Air driven compound hydraulic pumps" - - - - -		
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		13 November 90	GUTHMULLER J.A.H.
<div>CATEGORY OF CITED DOCUMENTS</div> <div>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</div> <div>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</div>			