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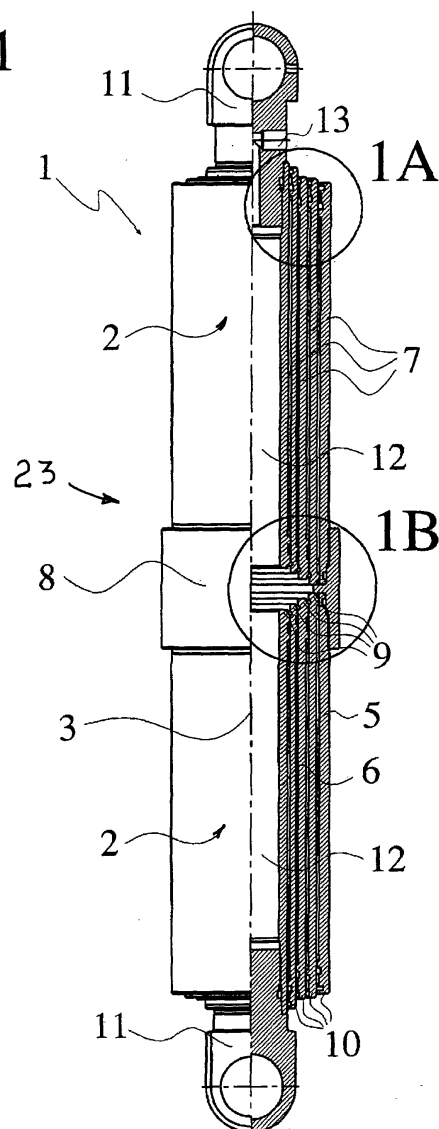
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(54) **Multistage telescopic cylinder for moving loads**

(57) A device with telescopic elements for moving loads of the type in which the telescopic elements (6, 7) are driven by an operating fluid. The device comprises at least two opposite telescopic fluid dynamic cylinders (2), whose telescopic elements (6, 7) are mobile between a home position, in which they are fully retracted inside a jacket (23), and an operating position, in which they are fully extended.

Fig. 1



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Description

[0001] The present invention relates to a telescopic fluid dynamic device for moving loads.

[0002] Preferably, but not exclusively, the present invention can be used in the sector of industrial vehicles, for moving or lifting the dump bodies of tractors and lorry trailers.

[0003] As is known, the devices currently used have a single telescopic fluid dynamic cylinder, consisting of a plurality of coaxial telescopic elements, mobile between a home position, in which the set of telescopic elements is almost fully contained in an outer jacket, and an operating position, in which the telescopic arm is fully extended, lifting the body to which it is connected.

[0004] In the latter configuration, due to the application of axial compression loads applied to its two ends, and as a result of the inevitable radial play present between the telescopic elements constituting the lifting device, the telescopic arm bends, causing a movement of the longitudinal axis of the device relative to the ideal straight line for application of the force. This results in a bending moment, proportional to this movement, null at the ends of the device and at its maximum at the centre of the length of the telescopic lifting device. This phenomenon compromises its structural strength. With the configuration described above the maximum structural strength is achieved where the telescopic element is close to an axially external connecting element where the bending moment is at its minimum and not in the middle where said moment is at its maximum.

[0005] To overcome the consequences of said disadvantage, the diameter of all of the telescopic elements is increased, thus strengthening the entire structure and consequently also the central part, subject to the greatest bending stresses. However, this increases the size and weight of the device.

[0006] The aim of the present invention is to overcome the above-mentioned disadvantages by providing a telescopic fluid dynamic device for moving loads which has maximum structural resistance at the section where the stress due to deviation from the ideal axial direction is at its maximum.

[0007] Another aim of the present invention is to provide a device which, under equal conditions of resistance to bending and of weight and longitudinal extension in the fully extended configuration, allows a reduction of the radial dimension, or similarly which, under equal conditions of dimensions and ease of assembly, has greater resistance to bending in the sections subject to the greatest stresses.

[0008] These aims and others, which are more apparent in the following description, are substantially achieved by a device for moving loads as described in the claims. Further features and advantages of the present invention are apparent in the detailed description below, with reference to the accompanying drawings, which illustrate a preferred embodiment of a device for

moving loads, without limiting the scope of its application, and in which:

- Figure 1 is view of a first operating configuration, partly in cross-section, of a device for moving loads made according to the present invention;
- Figures 1A and 1B are respectively two enlarged details of the device illustrated in Figure 1;
- Figure 2 is a view of the device illustrated in Figure 1 fully extended in the operating configuration;
- Figure 2A is a schematic view of a possible alternative embodiment of the device for moving loads in the fully extended configuration;
- Figure 3 is a view of a dump body equipped with the device illustrated in Figures 1 and 2.

[0009] With reference to the accompanying drawings, the numeral 1 denotes as a whole a device for moving loads according to the present invention.

[0010] The device is of the type in which there are telescopic elements 6, 7 driven by an operating fluid. The device characteristically comprises at least two opposite telescopic fluid dynamic cylinders 2 rigidly connected to one another, whose sliding telescopic elements 6, 7 are mobile between a home position, in which they are retracted, and an operating position, in which they are extended. Appropriately, in the home position the telescopic elements 6, 7 may be retracted inside a jacket 23. The opposite telescopic fluid dynamic cylinders 2 are positioned in such a way that the respective thrust forces exerted by any pair of telescopic fluid dynamic cylinders 2 have at least two components orientated along the same line, but in opposite directions. Each telescopic fluid dynamic cylinder 2 may consist of a different number of telescopic elements 6, 7 as illustrated in Figure 2A. The same figure also shows how the corresponding telescopic elements 6, 7 of at least two different fluid dynamic cylinders 2 may, generally speaking, have different radial or longitudinal dimensions. Figure 2 illustrates a preferred configuration in which there are two fluid dynamic cylinders 2 coaxial with one another, exerting two thrust forces along the same line, but in opposite directions, and having an equal number of telescopic elements 6, 7 positioned symmetrically relative to the jacket 23. The same figure shows how the jacket 23, although it may alternatively be made in a single piece, comprises a sleeve 8 and two hollow housing elements 5, coaxial with the sleeve 8. Each hollow housing element 5 positioned externally, in the home position receives a radially innermost telescopic element 6 and a plurality of intermediate telescopic elements 7. The telescopic fluid dynamic cylinders 2 are connected to one another by a sleeve 8 at axially innermost ends 9 of the hollow housing elements 5. As is clearly illustrated in the enlarged views in Figures 1A and 1B, the hollow housing element 5 and the telescopic element 6, 7 each have a first end 9 facing the sleeve 8, visible in detail in Figure 1B, and a second end 10, opposite the first end 9, visible in detail in Figure

1A.

[0011] At the second ends 10 of the two innermost telescopic elements 6 there are two axially projecting connecting ends 11, securely connected to the innermost telescopic element 6 of both telescopic fluid dynamic cylinders 2, and such that they fully close the second end 10 of the innermost telescopic element 6.

[0012] In the preferred embodiment illustrated in Figure 1, said connecting ends 11 are also partly contained in the innermost telescopic element 6 of each telescopic fluid dynamic cylinder 2. In the particular embodiment illustrated in Figure 3, the connecting ends 11 are for connecting the device 1 to the dump body at one end, and to the bed of the tractor or the trailer at the other end. With reference to Figure 1B, on the respective outer walls 14 of the telescopic elements 6, 7 there is, close to the respective first ends 9, a first projection 15, perpendicular to the longitudinal axis 3 common to the two telescopic fluid dynamic cylinders 2.

[0013] Between the first projection 15 and the first end 9 there is a ring-shaped groove 16, which, as is widely known and used in the prior art, contains a guide ring.

[0014] Appropriately, the first base 9 of the telescopic elements 6, 7 has a rounded outward facing edge 17. Against this rounded edge 17 there rest operatively a plurality of pulling rings 18 integral, at the first bases 9, with the inner wall 19 of the intermediate telescopic elements 7. Said pulling rings 18, operatively engaging against the rounded edges 17, pull the telescopic elements immediately internally adjacent to the end of their stroke, in this way allowing the gradual extension of the device 1 for moving loads to the operating position, as illustrated in Figure 2.

[0015] With reference to Figure 1A, on the respective inner walls 19 of the intermediate telescopic elements 7 and of the hollow housing element 5 there is, close to the respective second bases 10, a second projection 20, perpendicular to the longitudinal axis 3 common to the two telescopic fluid dynamic cylinders 2. Between the second projection 20 and the second base 10 there is at least one ring-shaped groove 21, housing a seal which prevents the pressurised operating fluid from leaking out. The quantity, shape and position of the seals to be applied to the zone close to the second bases 10 depend on the construction and operating requirements of a device for lifting loads, as is already well known and used in the prior art currently in use.

[0016] The second projection 20 acts as a contact surface and end of stroke stop for the first projection 15, preventing the intermediate telescopic elements 7 and the innermost telescopic element 6 from coming out of the device 1 completely. In the preferred embodiment illustrated in Figures 1A and 1B, the first projection 15 and the second projection 20 are ring-shaped and completely surround the perimeter of the immediately adjacent telescopic elements which they face. The telescopic fluid dynamic cylinders 2 communicate with one another at the axially innermost ends 9 of the hollow housing el-

ements 5, allowing the operating fluid to pass from one telescopic fluid dynamic cylinder 2 to the other. In a preferred configuration the two telescopic fluid dynamic cylinders 2 form a single inner chamber 12. The moving device 1 has means which allow the operating fluid to enter the telescopic fluid dynamic cylinders 2. Said means comprise at least one hole 13 made at least at one connecting end 11 of a telescopic fluid dynamic cylinder 2 to allow the fluid to enter the inner chamber 12.

[0017] The moving device comprises an alternative embodiment in which the opposite telescopic fluid dynamic cylinders 2 are separate from one another, so that there are respective inner chambers 12 independently supplied with operating fluid. Again in this case the device has means for allowing the operating fluid to flow inside the telescopic fluid dynamic cylinders 2. Said means comprise at least one hole 13 made at all of the connecting ends 11 of the telescopic fluid dynamic cylinders 2, allowing the fluid to enter the inner chambers 12.

[0018] The configuration with a single inner chamber 12 is preferably used, so as to make the structure lighter and simplify the supply apparatus.

[0019] The sliding of the telescopic elements 6, 7 is due to the thrust exerted by the pressurised operating fluid injected into the inner chamber 12 by a fluid dynamic pump of the known type and not illustrated. The pressurised fluid fills the inner chamber 12 and pushes against a ring-shaped surface 22 of the first ends 9 of the telescopic elements 6, 7. The telescopic element which comes out first is the radially outermost of the telescopic elements 6, 7, since it has a larger diameter and so the ring-shaped surface 22 of its first end 9 is larger: with the same pressure exerted equally by the operating fluid on all of the ring-shaped surfaces 22, a larger surface means a greater thrust force. As a result, the telescopic elements 6, 7 gradually comes out, starting with the one with the largest diameter and ending with the one with the smallest diameter. This occurs almost simultaneously for both of the telescopic fluid dynamic cylinders 2, having corresponding telescopic elements with the same diameter. There may be a slight asynchronism, due to the different friction on the seals of the different telescopic elements 6, 7 of the telescopic fluid dynamic cylinder 2 connected to the bed of the tractor or the trailer. Such asynchronism does not cause significant disadvantages for operation of the device 1.

[0020] Similarly, during contraction each telescopic fluid dynamic cylinder 2 is retracted by gradually reducing the pressure in the inner chamber 12 and using the weight of the load supported. Firstly, the telescopic element 6 with a smaller diameter is retracted, since its resistant surface on which the fluid acts is the smallest, followed by the remaining intermediate telescopic elements 7 with gradually increasing diameter.

[0021] With reference to Figure 3, extension of the moving device 1 lifts and angles the dump body relative to the bed on which it rested and with which it was parallel, whilst contraction of the device allows the body to return

to the original position.

[0022] When the telescopic fluid dynamic cylinders are in the operating position, this device has greater resistance to bending since, close to the central position it has cross-sections with a diameter and surface greater than the cross-sections at the end of the device, thus counteracting the most intense bending moment close to the central position. Another advantage is that, given the increased strength of the central jacket, during full extension of the adjacent telescopic elements inserted in it, the axial stress can be minimised. A further advantage is linked to the fact that, with this configuration, under equal conditions of longitudinal extension and ease of assembly, it is possible to produce devices with smaller transversal dimensions, which are therefore lighter but stronger, or, on the contrary, under equal conditions of transversal dimensions and weight, devices with greater extension.

Claims

1. A device with telescopic elements for moving loads of the type in which the telescopic elements (6, 7) are driven by an operating fluid, **characterised in that** it comprises at least two opposite telescopic fluid dynamic cylinders (2) rigidly connected to one another, the telescopic elements (6, 7) being mobile between a home position, in which they are retracted, and an operating position, in which they are extended. 25
2. The device according to claim 1, **characterised in that** in the home position the telescopic elements (6, 7) are retracted inside a jacket (23). 35
3. The device according to claim 1 or 2, **characterised in that** the fluid dynamic cylinders (2) comprise at least two telescopic elements which are coaxial with one another. 40
4. The device according to any of the foregoing claims, **characterised in that** the telescopic fluid dynamic cylinders (2) are connected to one another, by a sleeve (8), at hollow housing elements (5). 45
5. The device according to any of the foregoing claims, **characterised in that** the telescopic fluid dynamic cylinders (2) communicate with one another, allowing the operating fluid to pass from one telescopic fluid dynamic cylinder (2) to the other. 50
6. The device according to the previous claim, **characterised in that** the telescopic fluid dynamic cylinders (2) form a single inner chamber (12). 55
7. The device according to any of the claims from 1 to 4, **characterised in that** the telescopic fluid dynamic

cylinders (2) do not communicate with one another, so that there are respective inner chambers (12) independently supplied with the operating fluid.

- 5 8. The device according to claim 5 or 6 or 7, **characterised in that** it comprises supply means for allowing the operating fluid to flow inside the telescopic fluid dynamic cylinders (2).
- 10 9. The device according to claim 8 when it is dependent on claim 5 or 6, **characterised in that** the supply means comprise at least one hole (13) made at least at one connecting end (11) of a telescopic fluid dynamic cylinder (2), allowing the fluid to enter the inner chamber (12). 15
- 20 10. The device according to claim 8 when it is dependent on claim 7, **characterised in that** the supply means comprise at least one hole (13) made at all of the connecting ends (11) of the telescopic fluid dynamic cylinders (2), allowing the fluid to enter the inner chambers (12).

Fig. 1

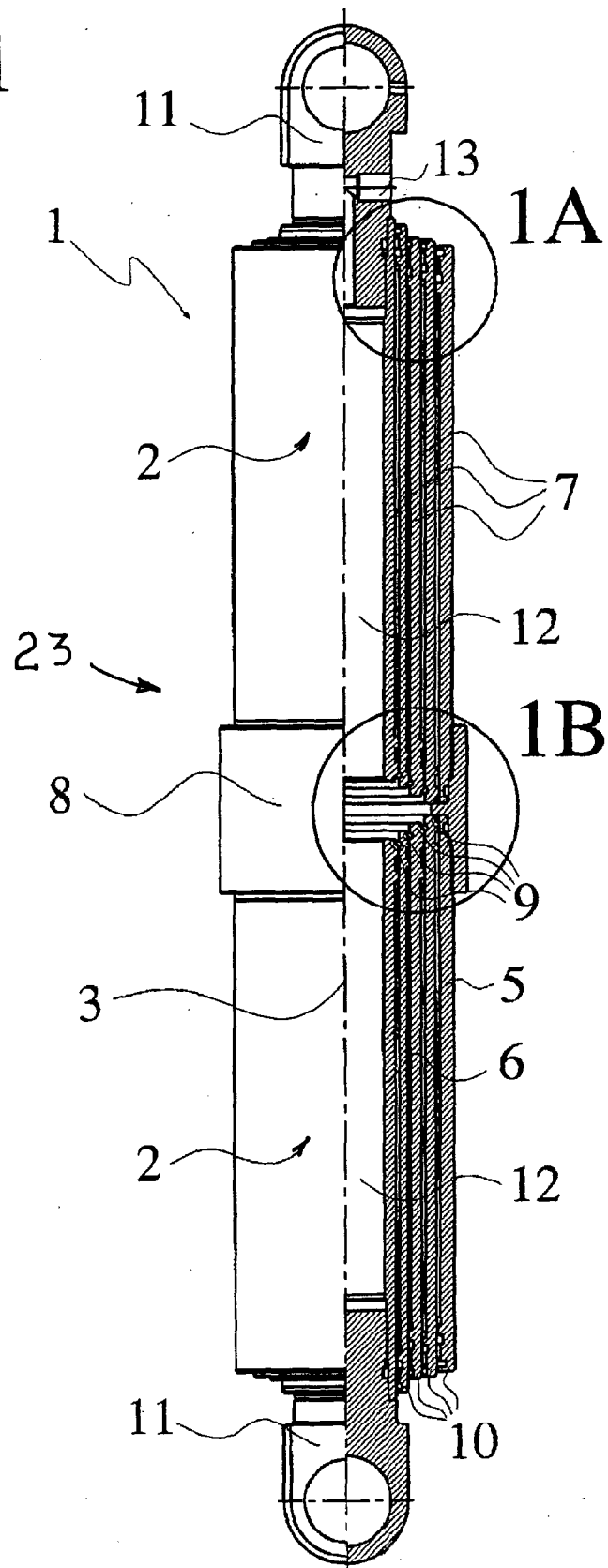


Fig. 1A

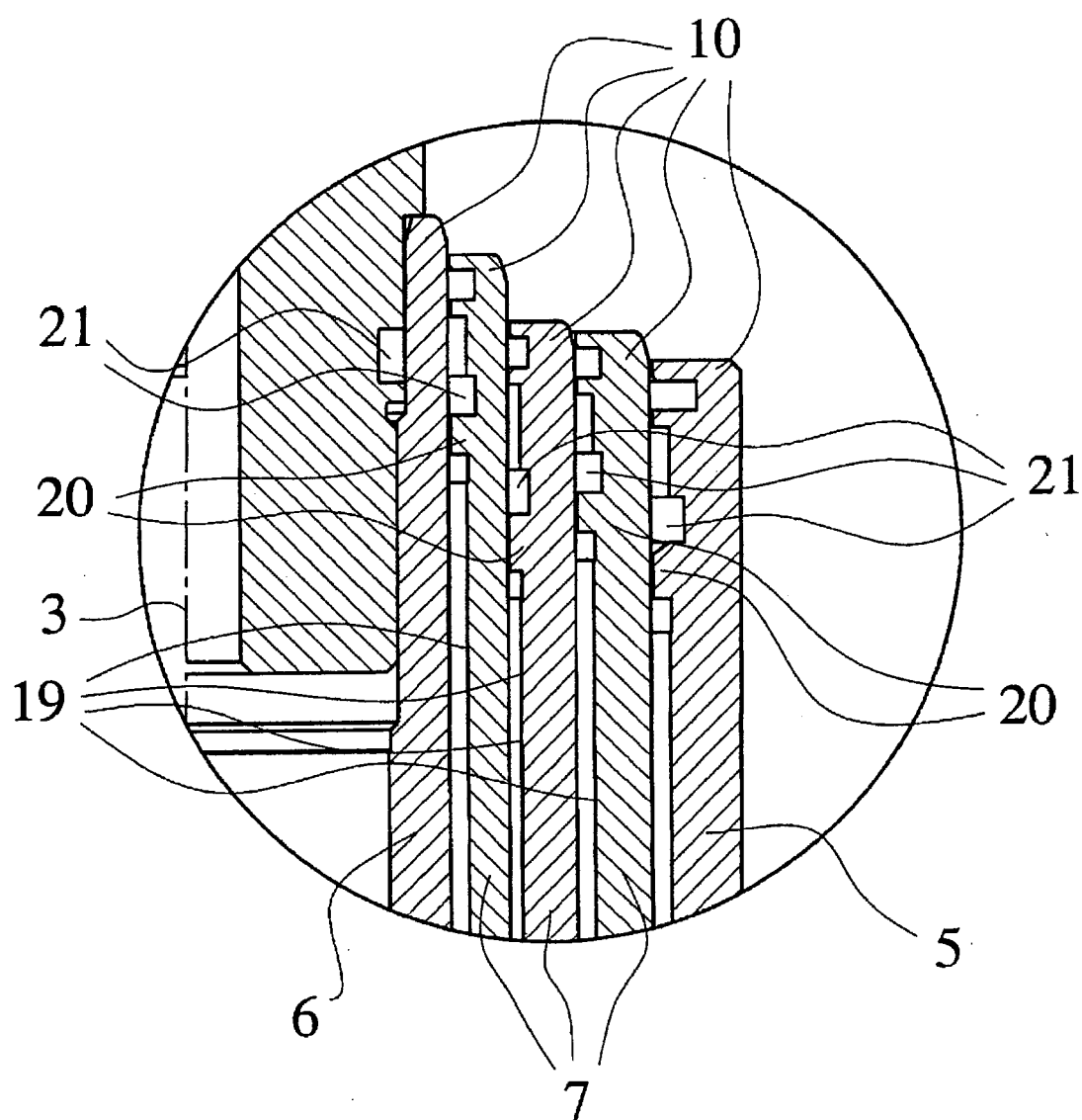


Fig. 1B

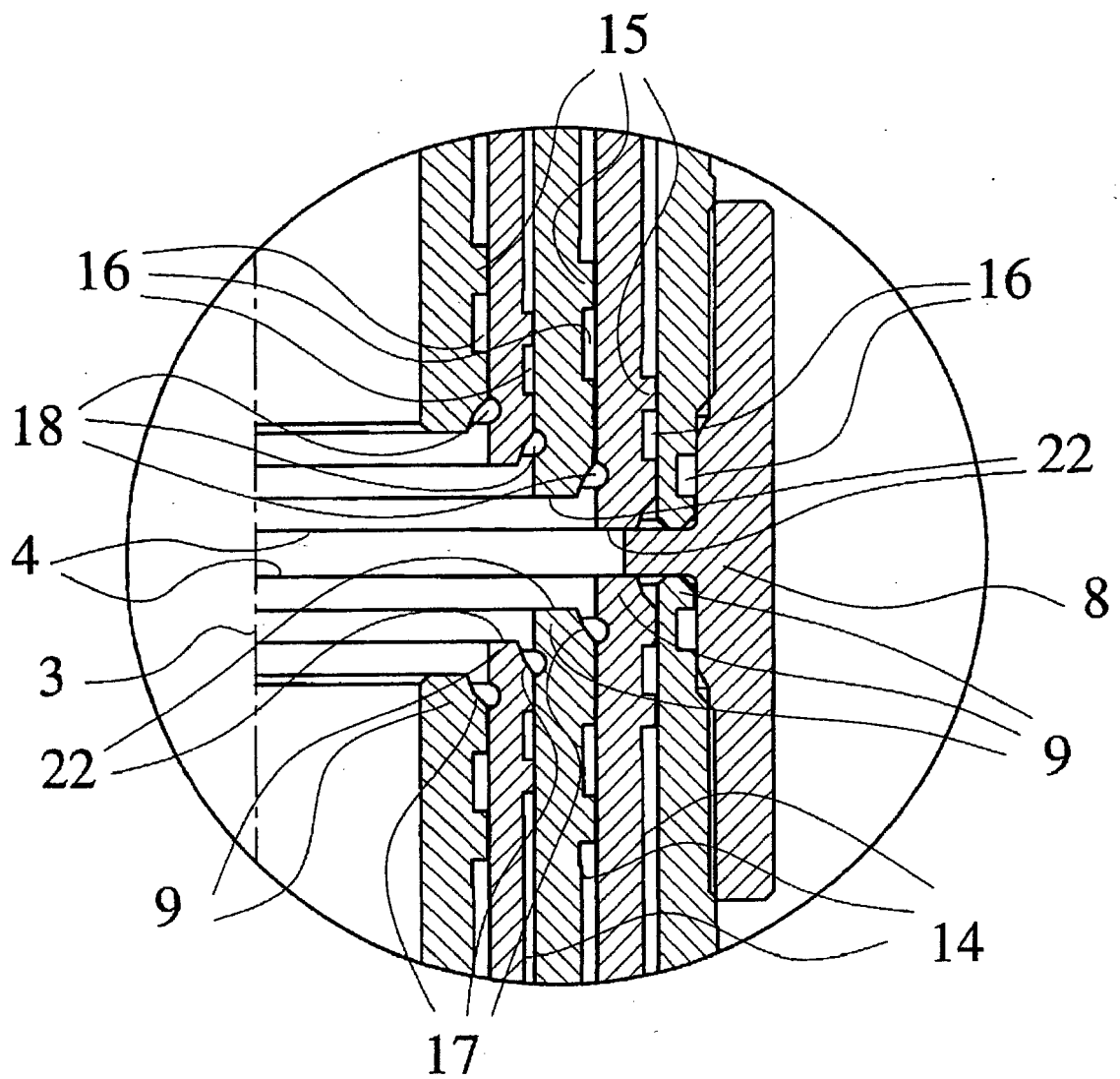


Fig. 2

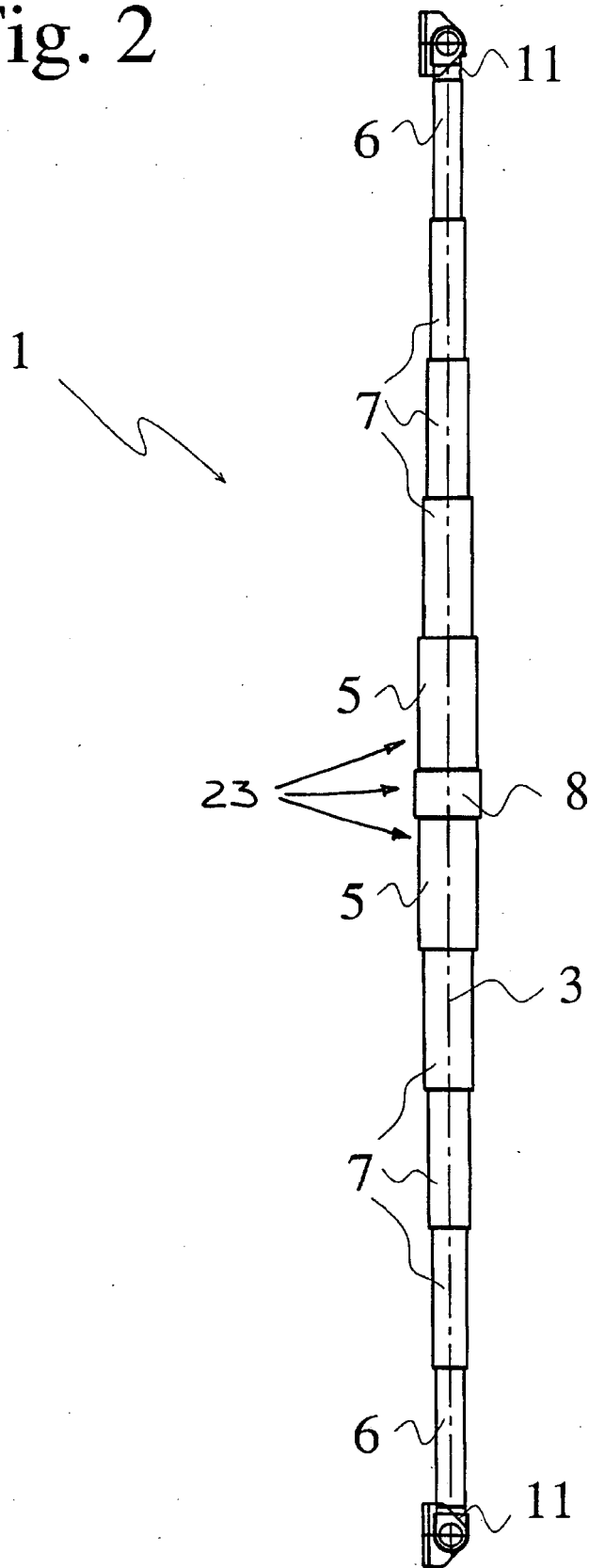


Fig. 2A

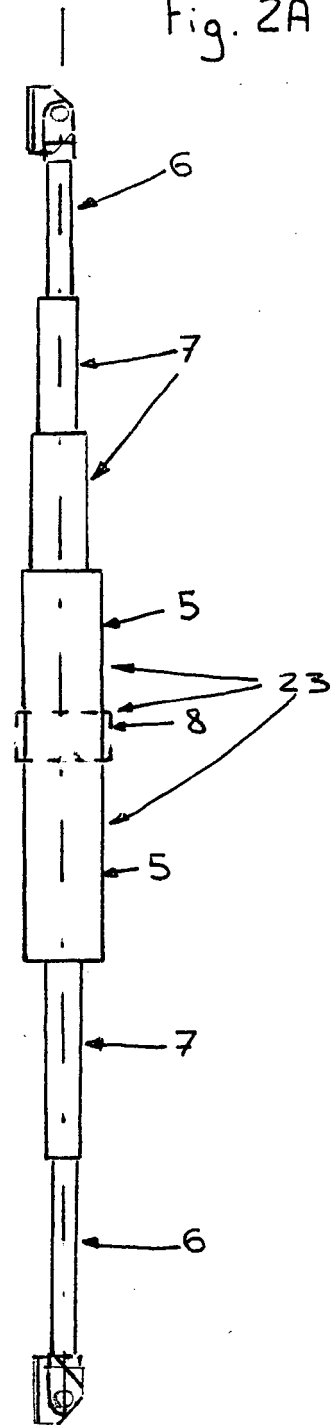
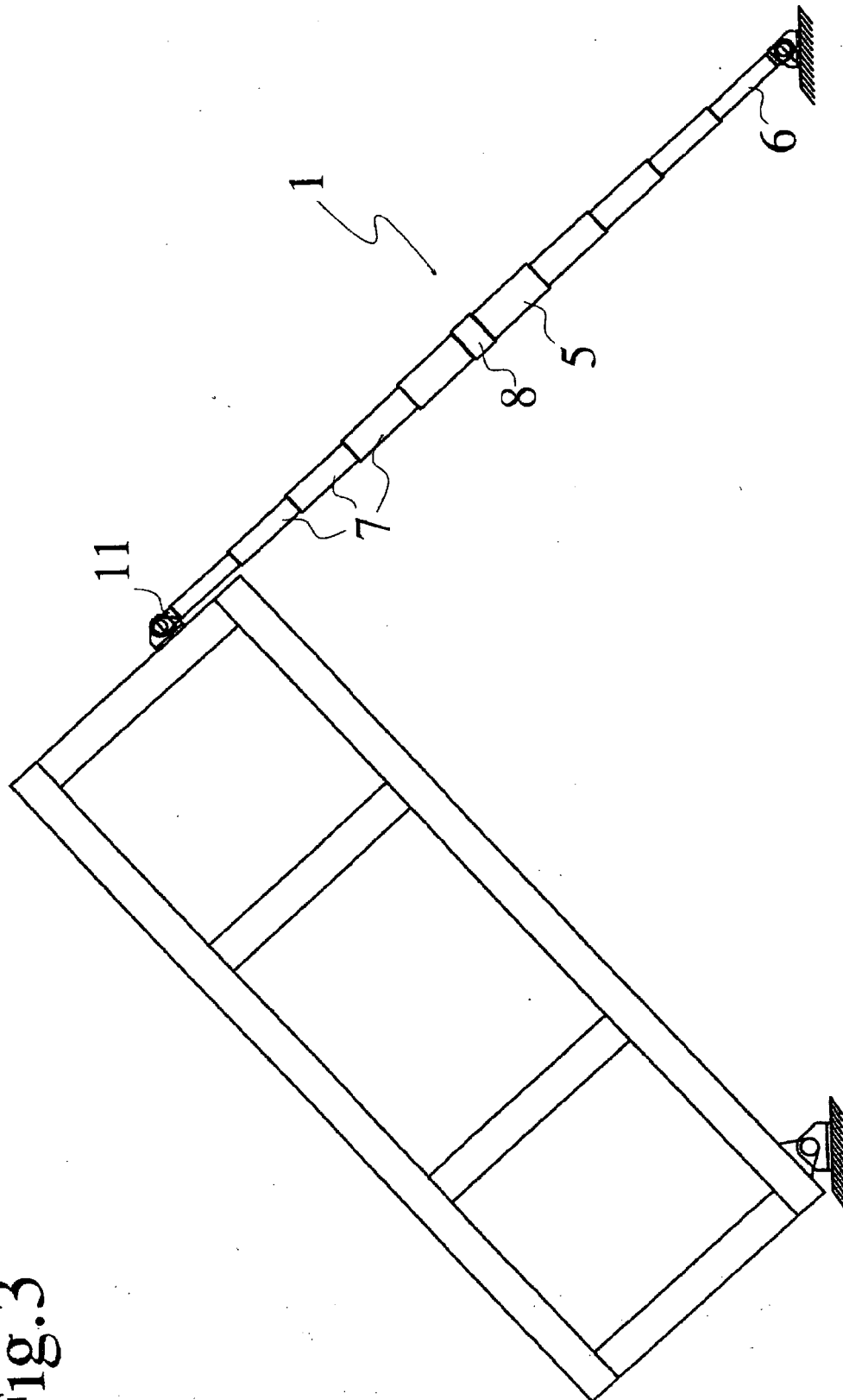


Fig.3





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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5802

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.7)
X	WO 92/20927 A (ASAHI SEIKO CO., LTD) 26 November 1992 (1992-11-26) * figure 3 *	1-6,8,9	B66F3/28 F15B15/16
X	----- AT 243 038 B (NORBERT HESS) 25 October 1965 (1965-10-25) * figures 1,3 *	1-4,7,8, 10	
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X	----- FR 2 623 571 A (CHAPEL ANDRE) 26 May 1989 (1989-05-26) * figures *	1-3,5,6, 8,9	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B66F F15B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 April 2005	Examiner Masset, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 42 5802

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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01-04-2005

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