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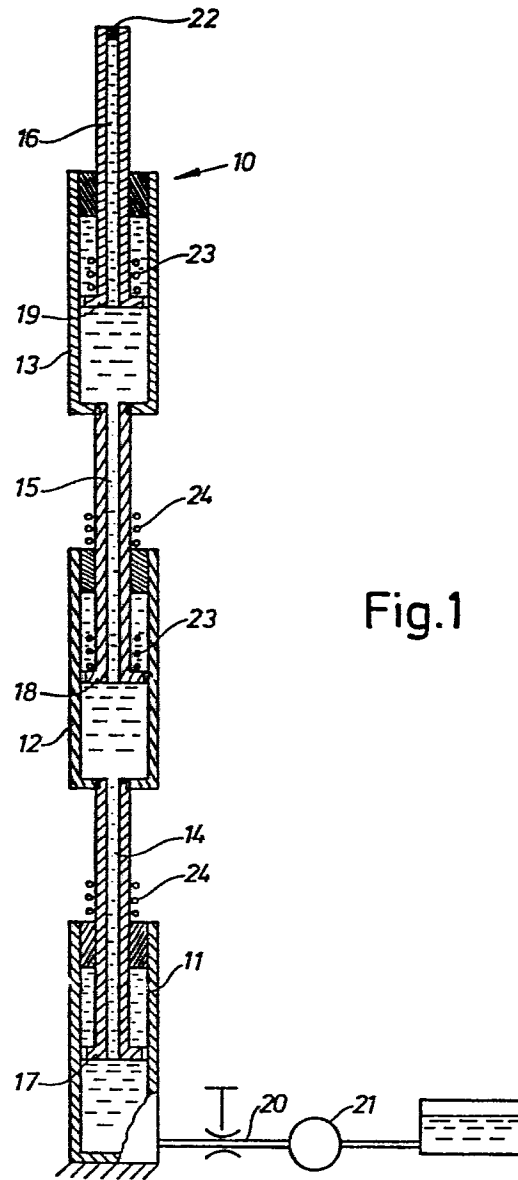
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(54) **Hydraulic cylinder for an elevator.**

(57) The invention relates to a hydraulic device for operating an elevator. The device comprises several single-acting cylinder sections (11, 12, 13) which are placed in series with each other. The cylinder sections are delivered to the place of installation separated from each other and are assembled in situ so as to form a single coherent elevator cylinder (10). The cylinder casing of a cylinder section is connected to the piston rod (14, 15, 16) of the adjacent cylinder section and the piston rod (14, 15, 16) has a channel through which the hydraulic oil is transferred from one cylinder section to a following section.



Hydraulic cylinder for an elevator

This invention relates to a hydraulic device for operating an elevator.

Installation of elevators in old buildings usually involves problems since in certain frame constructions mounting of hoisting means in the attic storey is not possible. It has thus been suggested to use hydraulic means for acting on the
5 elevator cage. The hydraulic cylinders which have been proposed are of the single-acting one-stage type acting on the elevator cage directly or via a wire. However, the lifting height of these systems is limited to 5 m and 2 x 5 m, respectively.

It is also previously known to use joined, single-acting one-stage cylinders.
10 The maximum lifting height of this type of cylinders is about 2 x 10 m. It has also been suggested to use double-acting telescopic cylinders to achieve lifting heights of 2 x 10 m.

However, also the two last-mentioned systems have drawbacks.

As a rule, the single-acting cylinders cannot be delivered assembled from the
15 factory but have to be joined in situ. Even if the cylinders are joined with great accuracy the life of the sealings for the piston will be shortened because the sealings will pass a break in the chrome layer of the cylinders. The double-acting telescopic cylinder is so designed that the different stages move simultaneously so that the oil at the piston rod side of the lowest telescopic stage will feed the next
20 stage and so on. This makes the complete cylinder large and expensive to manufacture.

The object of this invention is to provide a cylinder which can replace the two last-mentioned cylinder types and which is simple to transport, instal and assemble. This is achieved by a device having the characteristics defined in the
25 following claims.

The invention will now be described with reference to the accompanying drawings in which Fig. 1 is a vertical section through a cylinder according to the invention and Fig. 2 more in detail shows a section through a modified cylinder.

The elevator cylinder which is denoted by 10 comprises several cylinder
5 sections 11, 12, 13 each one having a piston rod 14, 15, 16 the lower end of each rod being designed as a guide 17, 18, 19. The piston rod 14 as well as the piston rod 15 is provided with a channel in which oil flows from the cylinder section 11 to the cylinder section 12 and further to the cylinder section 13. In its upper end the piston rod of the cylinder section 11 has a thread or a conical part by means of
10 which it can be connected and locked to an opening of corresponding form in the bottom of the cylinder section 12. The lower part of the cylinder section 11 is connected via a hose 20 to an oil pump 21 by means of which oil can be pumped into the cylinder section 11. Correspondingly, the piston rod 15 runs in the cylinder section 12 and is connected to the lower part of the cylinder section 13. The
15 channel in the piston rod 16 is provided with a plug 22 sealing against the environment. The upper part of the piston rod 16 is connected to an elevator cage, not shown, for instance by a wire.

Between the guides 18, 19 of the piston rods 15, 16 and the respective cylinder section 12 and 13 a spring 23 is attached. This spring successively
20 transmits the force from the piston rod to the cylinder when the piston rod approaches its extended position, and this causes a continuous movement of the elevator as the different cylinder sections are activated. However, the spring can be replaced by other elements having a corresponding function, for instance hydraulic end position dampers. It is also possible to use restrictions in the guide 18
25 and 19, respectively, to control the flow of oil between the upper and the lower side of the guide. Between each cylinder section 11 and 12 and 12 and 13, respectively, there is also a spring 24 acting as a damper when the piston rods return to their retracted positions.

In the embodiment shown in Fig. 2, the cylinder comprises cylinder sec-
30 tions 25 and 26 each having a cylinder casing 27 and 28, respectively, and pistons 29 and 30, respectively. The cylinder section 25 has a bottom 31 with an inlet 32 for oil. The cylinder casing 27 of the cylinder section 25 is sealed from the bottom 31 by means of a sealing 33 and fastened to the bottom by means of a flange 34 and bolts 35. The pistons 29 and 30, respectively, are sleeve-shaped, each
35 one being secured to a tubular piston rod 36 and 37, respectively, and having several sealings 38 and annular supports 39. The outer end of each piston rod 36, 37 and a part of the bottom 31 have a slightly conical portion 40 which together with a surface 41 on the piston 34, 35 forms a damping unit. Further, the outer end of

each piston rod 36 and 37 has a groove 42 into which a part 43 of a fastening means 44 for the cylinder casing 28 is attached by means of a bolt connection 45. This fastening means is sealed by means of sealings 46 both from the cylinder casing 28 and from the piston rod 36.

5 Between each cylinder casing 27 and 28 and the corresponding piston rod 36 and 37, respectively, a tubular damping piston 47 is placed. The damping piston 47 moves freely between a shoulder 48 on each piston rod 36 and 37 and that side of the piston 29 and 30, respectively, which is opposite the damping piston, and the damping piston is provided with sealings 49 and strippers 50. The space 51 formed
10 between the damping piston 47 and the piston 29 and 30, respectively, communicates via a channel 52 with the interior of each tubular piston rod 36 and 37 so that oil can flow freely between these spaces. The channel thus serves as a restriction for the oil. The opposing surfaces 53 and 54 of the damping pistons 47 and the pistons 29 and 30 are designed so as to correspond to one another, the surface 53,
15 however, being mainly cylindrical and the surface 54 slightly conical. The outer part of each cylinder casing 27 and 28 has interiorly a stop plate 55 which is fixed to the casing and keeps the damping piston 47 and the piston rod in the cylinder.

Oil supplied via the inlet 32 will flow in between the bottom 31 and the piston 29 and between the piston rod 36 and the piston 30, the pistons 29, 30 with
20 the piston rods 36, 37 moving to the left in the Figure. Simultaneously, the pressure of the oil in the space 51 will increase so that the damping pistons 47 will be pressed to the shoulders 48 and be moved at the same time as the piston rods 36, 37. When one piston rod, for instance the rod 37, has reached a position so that its damping piston 47 abuts the stop plate 55, the damping piston will be moved to the
25 right relative to the piston rod so that the space 51 is reduced whereby the oil flows through the channel 52 at the same time as the piston rod 37 is retarded. This retardation decreases during the end of the movement because of the shape of the surfaces 53 and 54 and ceases entirely when the damping piston 47 meets the piston 30, i.e. when the piston rod 37 has reached its outer end position.

30 In a similar way a successive acceleration during the starting movement is achieved when the system is being drained of oil. When the piston rod 36 or 37 during further drainage of oil approaches its inner end position, the surfaces 40 and 41 will gradually cause a retardation of the movement of the piston rod, in the same way as described above.

35 Due to the fact that the elevator cylinder comprises several cylinder sections which can be delivered separated from each other to the place of installation it is possible in a simple manner to take the cylinder sections into the hoist shaft and

assemble them into an elevator cylinder of the desired length. Moreover, each piston rod during delivery will be protected in its cylinder.

C l a i m s

1. A hydraulic device for operating an elevator, characterized in that it comprises several single-acting cylinder sections (11,12,13) which are placed in series with each other and are delivered to the place of installation separated from each other and are assembled in situ so as to form a single coherent elevator
5 cylinder (10), the cylinder casing of a cylinder section being connected to the piston rod (14,15,16) of the adjacent cylinder section and the piston rod (14,15,16) having a channel through which the hydraulic oil is transferred from one cylinder section to a following section.
2. A device according to Claim 1, characterized in that the supply
10 inlet for the oil is placed at the lower cylinder section (11).
3. A device according to any preceding claim, characterized in that a force transmitting means is provided between a cylinder section and its piston rod and, if necessary, between the cylinder sections, so that the force from the piston rod in its extended position is transmitted successively to the corresponding
15 cylinder section.
4. A device according to Claim 3, characterized in that the force transmitting means is a spring (24) or a hydraulic damper (47).
5. A device according to any preceding claim, characterized in that at least one of the cylinder sections comprises a sleeve-shaped piston (29,30) support-
20 ing a tubular piston rod (36,37) on which a damping piston (47) is movably secured.
6. A device according to Claim 5, characterized in that the damping piston (47) is movable between a shoulder (48) on the piston rod (36,37) and the piston (29,30), an oil-filled space (51) being formed between the piston and the damping piston and via one channel (52) or several channels communicating with
25 the interior of the piston rod.
7. A device according to Claim 5 or Claim 6, characterized in that the cylinder casing (27,28) supports a stop means (55) with which the damping piston (47) coacts in one of its end positions.
8. A device according to any of Claims 5 - 7, characterized in that at
30 least a part of that surface (54) of the piston (29,30) which is opposite the damping piston (47) has a slightly conical shape whereas the corresponding surface (53) of the damping piston is cylindrical, or vice versa.
9. A device according to any preceding claim, characterized in that the piston rod (36,37) has a diameter which is considerably smaller than the
35 diameter of the cylinder casing (27,28).
10. A device according to any of Claims 5 - 9, characterized in that that surface of the piston (29,30) which is opposite the piston rod (36,37) of an

adjacent cylinder section has a cylindrical portion (41) coacting with a conical surface (40) in the outer part of the piston rod (36,37), or vice versa, for damping the movement of the piston rod in the inner end position of the rod.

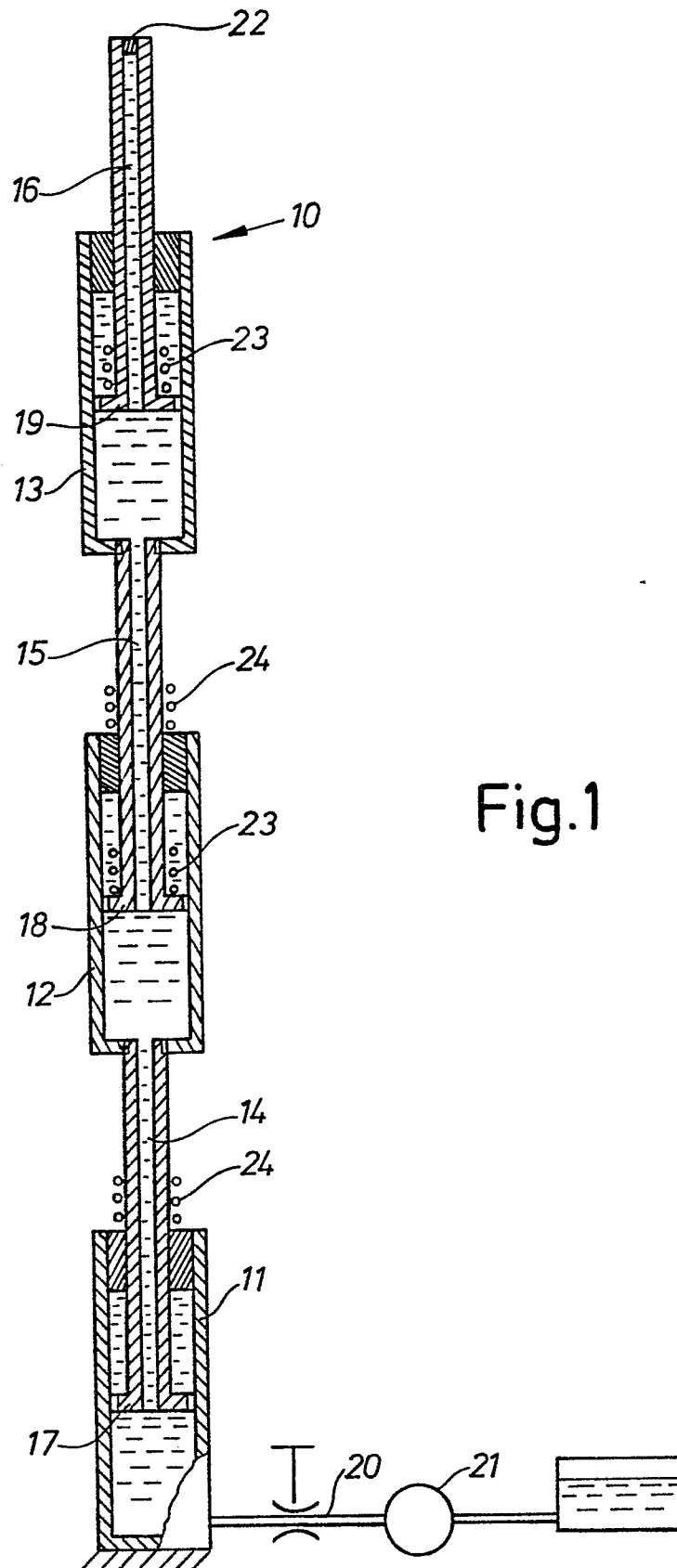


Fig.1

Fig. 2



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. 4)
X	DE-A-2 116 658 (PRESCO) * Claim 1; figure 1 *	1-3	B 66 B 9/04 F 15 B 15/16
A	--- US-A-3 968 860 (DOVER CORP.) * Column 3, line 63 - column 4, line 8; figures 1-5 *	4	
A	--- ENGINEERS DIGEST, vol. 29, no. 5, May 1968, page 9, London, GB; "Long-travel, high-speed electro-hydraulic passenger-lifts" * Whole article *	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 66 B 9/00 F 15 B 15/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-07-1985	Examiner ZAEGEL B.C.
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	