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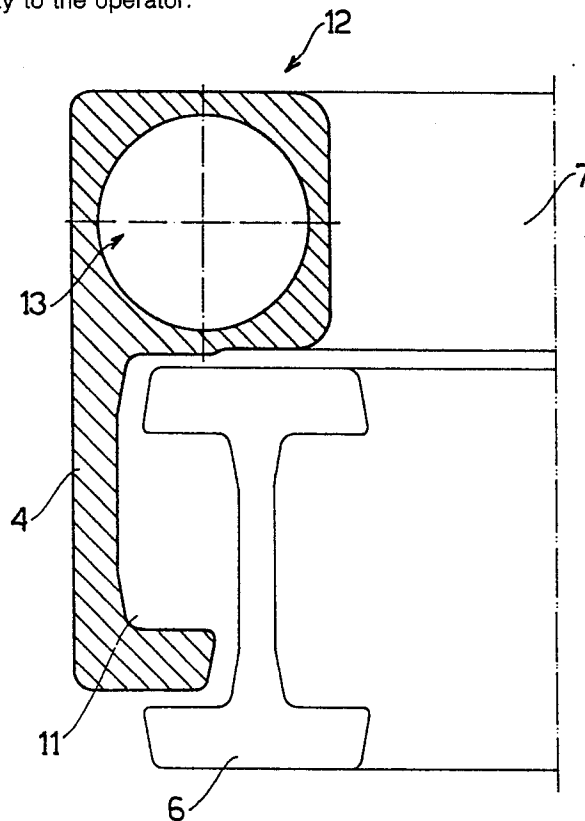
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54 **Mast for fork lifts having the lifting cylinders located inside the lateral shapes.**

57 A mast for fork lifts is described, having the cylinders which operate the lifting of the load embodied in the lateral shapes of the mast's structure.

This allow a better visibility to the operator.



**FIG 4**

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## MAST FOR FORK LIFTS HAVING THE LIFTING CYLINDERS LOCATED INSIDE THE LATERAL SHAPES.

### Field of the invention.

The following invention relates to mast particularly conceived to be used on fork lifts, with the lifting cylinders built inside the lateral shapes with which they form a single piece. The disposition of the parts in particular allows more practicability in comparison with similar known devices, together with other advantages which will be shown further on.

### Background of the invention.

The masts used on fork lifts are made of a telescopic structure, formed by one or more couples of shapes sliding along their own axis one inside the other, actioned by means of oleodynamic plungers or the like.

The load lifting brackets are mounted over the mobile part of the mast.

So far most of the fork lift manufacturers have had their masts constituted by a pair of sideways vertical guides, with the lifting plunger placed in the middle, between them.

An example of this known type mast is shown in fig (1) and includes a mobile part 1 which runs along a fixed structure 2 actioned by a plunger 3.

To increase the functionality of such devices as well as to increase the operator's visibility during operation or during translations movements with or without load, a different configuration has been used, providing the mast with a pair of lifting cylinders placed side-ways near the telescopic sliding shapes.

Although with this disposition we shall have a better visibility from the operator's seat, the problem of encumbrance still remains, as well as some assembling difficulties. It is known that manufacturers usually build brackets having different attachments to fit the masts, and those attachments come right in correspondance to where the cylinders are fit, causing quite a few problems.

### Summary of the invention.

To solve the above-mentioned drawbacks, the following invention presents a new fork-lift mast wherein the lifting cylinders are embodied in the side-ways telescopic shapes, so to leave a wide empty space without obstacles in front of the operator, and without interfering with the other components.

In the mast according to the invention the cylinders chambers are obtained in the shapes embodying a guide having a "C" section for the second sliding stage.

### Brief description of the drawings.

The following invention will now be described in detail, with reference to the enclosed drawings in which.

- Fig. 2 shows a front view of a mast according to the invention.

- Fig. 3 shows a side view of the mast of Fig. 2.

- Fig. 4 shows a section along the line AA of fig. 2

- Fig. 5 and 6 show, sectioned, some possible embodiments of the shapes for making a mast according to the invention.

### Detailed description of the invention.

The mast according to the invention comprises a first structure formed by a pair of shapes or guides 4 mounted on the fork lift, and of a second mobile structure with side-ways shapes which slide along the guides 4.

The shapes 4 are connected by a higher cross bar 5 and a lower one 7.

A bracket-holder plate 8 can run along the mobile structure; this plate is fixed at the end of a chain which runs over pulleys 9 mounted over the mobile structure, and at the other end, it is connected to the cross-shape 5 of the fixed structure.

The lifting of the mobile structure causes, by means of the chain return, the lifting of the plate 8 at twice the speed.

The shifting of the mobile structure occurs by means of a pair of plungers 10; the characteristic of the invention is that the chambers of the plungers 10 are obtained directly inside the shapes, a preferred shape of which is shown, sectioned, in fig. 4.

Here the shape has a C section which defines a runway 11 for the mobile part 6 and which shows, in correspondance with one of the wings, an enlarged part shown in its whole with 12, where a chamber 13 is obtained for the plunger 10.

The plungers 10 can be of any known type (simple or double effect) although hydraulic or diving plungers in this case are more advantageous.

As a matter of fact, differing from the above mentioned models in which the plunger consists

a moving wall determining the volume variation of the chamber in which the fluid flows, in the case of diving plunger the chamber keeps a constant volume and the variation of the fluid volume is determined by the variation of the portion of the plunger which is immersed in the chamber itself.

Since in this case the gaskets are applied at the open end of the cylinder instead of in the plunger, a precise total inner chamber finishing is not necessary, being sufficient to respect the previewed allowances only in correspondance with the head surface or top wall, where we find the pressure gaskets.

This will allow great economy, since it avoids a precise finishing of the shapes 4.

Different embodiment of the invention can be provided for: as an example the section of the shapes 4 could be of the type shown in fig. 5, where we find two parallel chambers, to reduce width encumbrance, or in fig. 6, where we find a unique chamber in the middle.

Of course the same solution can be applied to masts having several stages, consequently with more shapes embodying the lifting cylinder chamber.

With the shown disposition we obtain several advantages apart from having a good visibility in the area between the shapes, we obtain more rigidity of the apparatus thanks to the increase of the shapes section.

Moreover the economic advantages arising from the greater building simplicity of the system are not neglectable; it requires a lesser number of components and most of them do not need precise finishing and are of easy assembling.

The possibilities of application of the invention are not limited to fork lift masts alone, but they extend to other telescopic masts like for example the fixed emplacements, different types of self propelled vehicles, cranes etc... staying within the present invention.

The dimensions as well as the material will vary according to the requests.

## Claims

1) A mast, particularly built for fork lifts, of the kind comprising a structure, where brackets are applied, sliding along a pair of shapes fixed at the cart, characterized by the fact of providing the chambers of the cylinders that operate the lifting of the mobile part, embodied in the shapes fixed at the cart.

2) A telescopic mast according to claim 1, characterized by the fact of providing the guide of the mobile part substantially made of a C section shape with an enlarged wing, and in said wing obtaining a chamber for a lifting cylinder.

3) A telescopic mast according to claim 1, characterized by the fact of providing the guide substantially made of a C section shape with a central part, of consistent thickness, in which is obtained a chamber for a lifting cylinder.

4. A telescopic mast according to claim 3, characterized in that these lifting chambers are two, placed side by side in correspondance with the central part of the C section guide.

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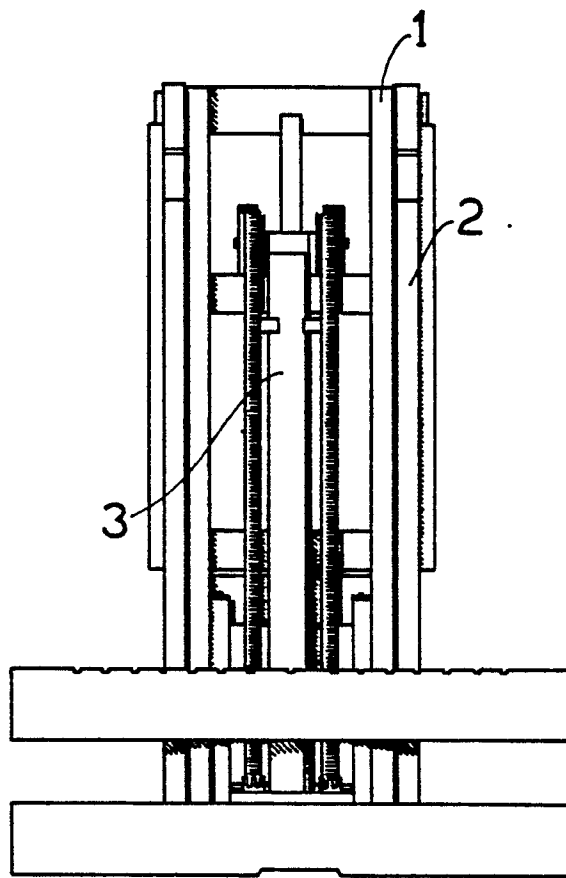
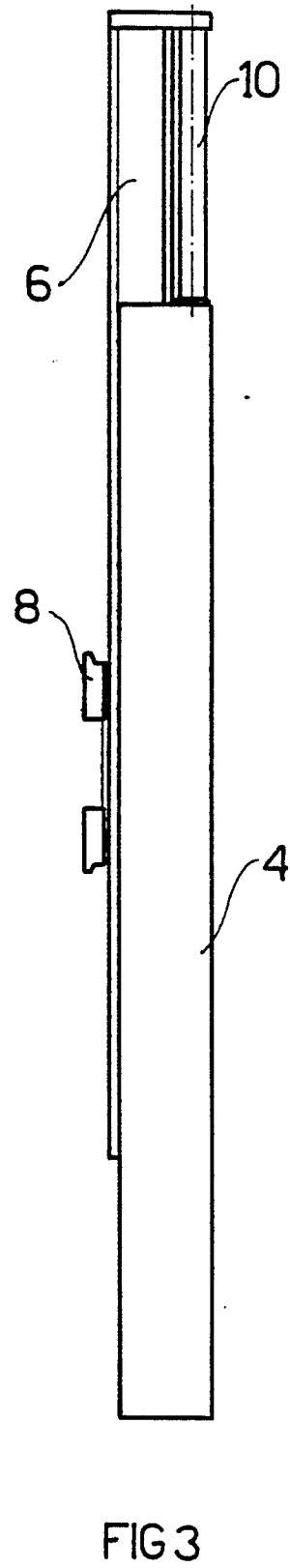
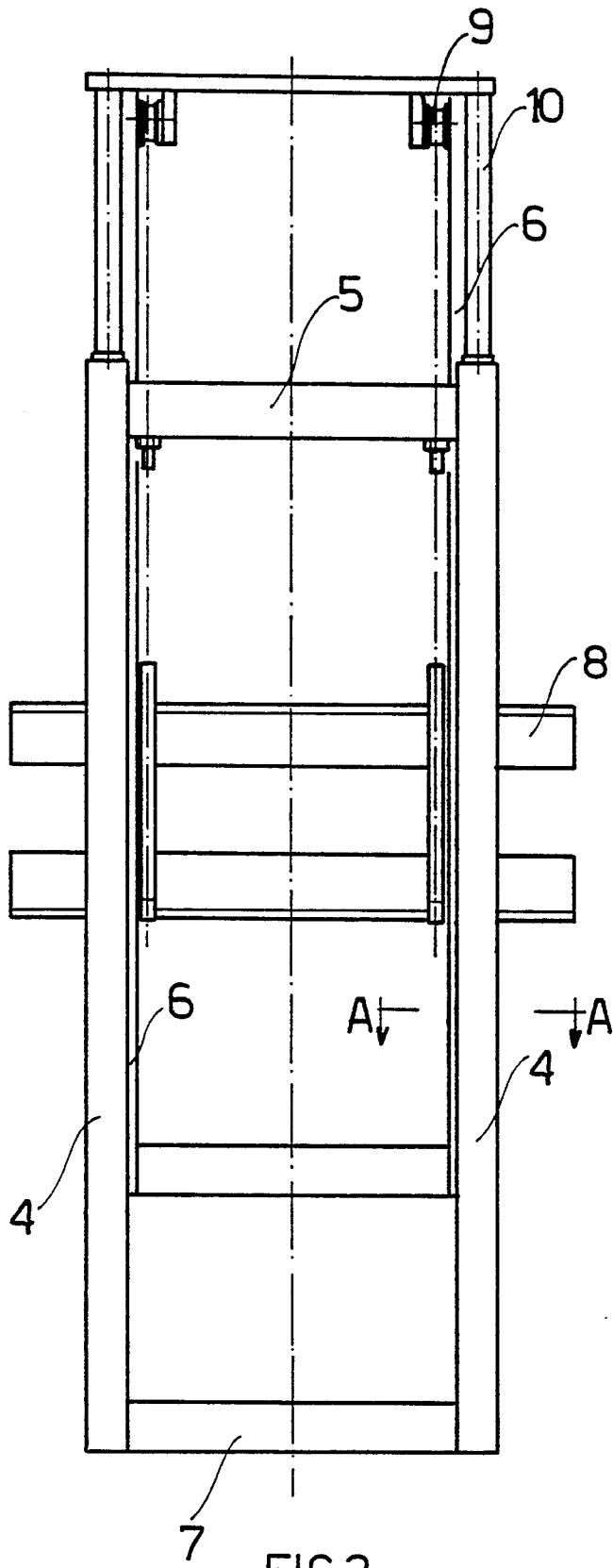


FIG 1



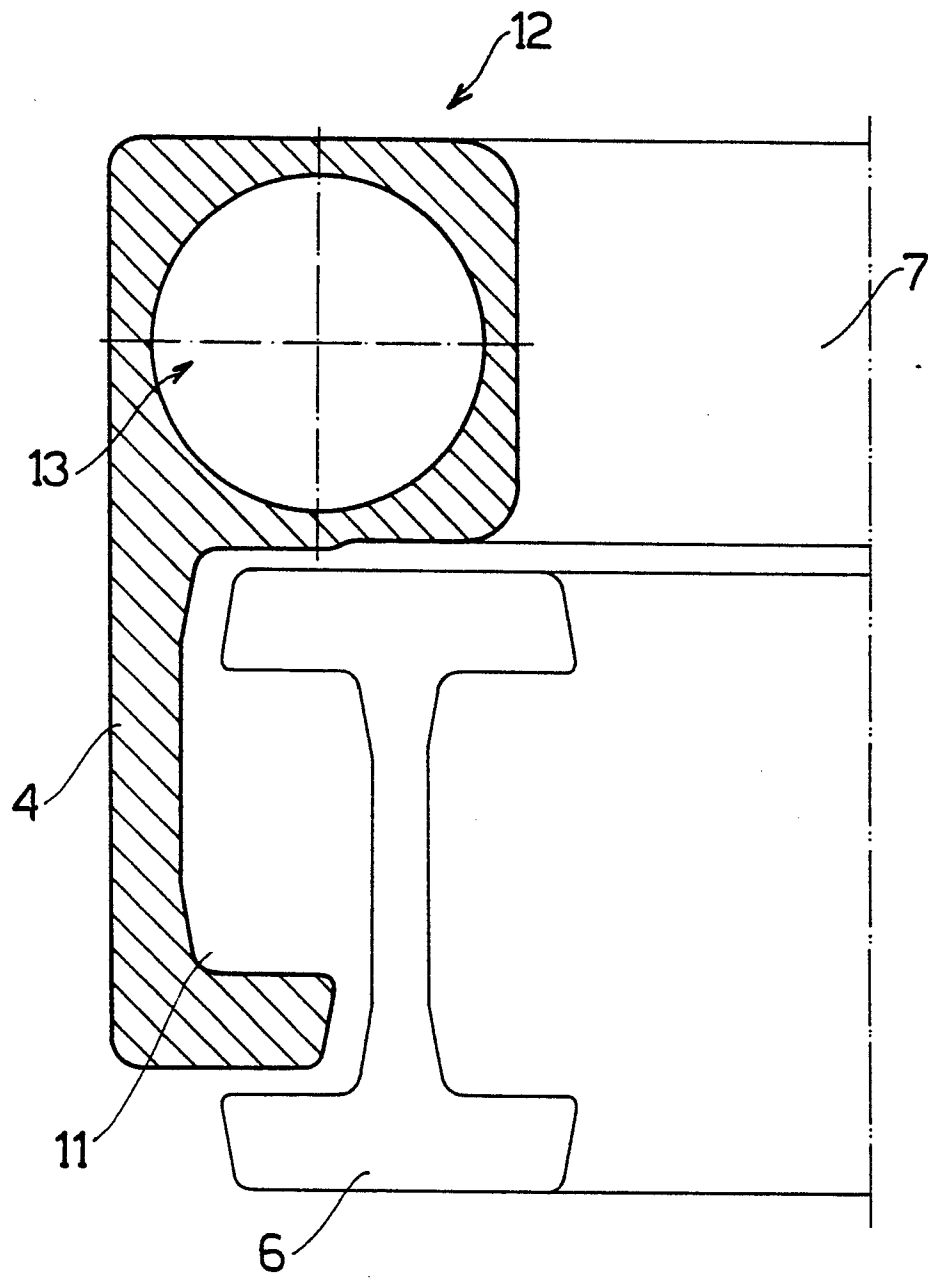


FIG 4

FIG 5

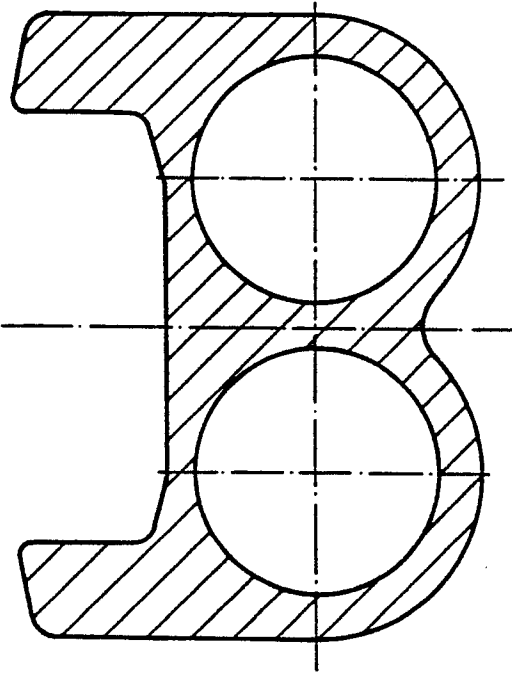
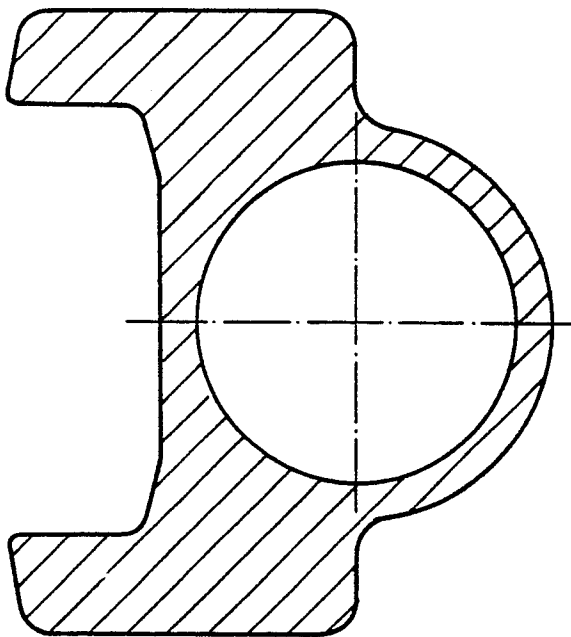


FIG 6





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	GB-A-2 091 211 (INSTITUTE ZA ELEKTOKARI I MOTOKARI) * Abstract; figures; page 1, lines 77-100 *	1,2,3	B 66 F 9/08
X	EP-A-0 047 137 (COVENTRY CLIMAX LTD) * Abstract; figures; page 4, lines 12-15; page 5, lines 9-10 *	1,2	
A	FR-A-2 192 061 (LINDE A.G.) * Figures 1-3,8-12; page 3, lines 3-15; page 4, lines 8-22 *	1	
A	US-A-2 456 320 (E.P. REPKE) * Figures 1,3,5,6,8,10-13; column 1, lines 5-10; column 3, lines 34-51 *	1	
A	DE-A-3 423 415 (KOMATSU FORKLIFT K.K.) * Figures 1,5,11,17,23,24; page 16, line 32 - page 17, line 6 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 66 F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-06-1988	Examiner GUTHMULLER J.A.H.
<b>CATEGORY OF CITED DOCUMENTS</b>			
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	