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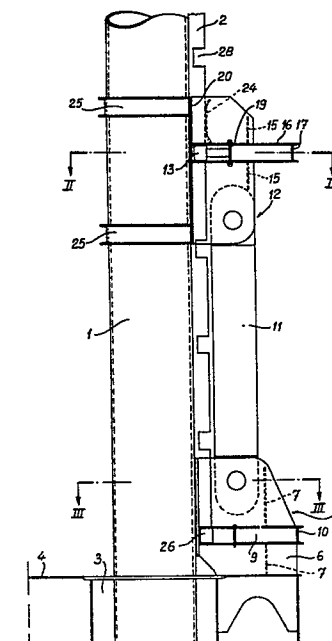
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⑤④ **Apparatus for effecting a relative linear displacement between a number of columns and a body arranged for movement along said columns.**

⑤⑦ A self-lifting pontoon (4), having a number of columns, said columns are formed by a circular pipe or pile (1) to the outside of which at least one upstanding teeth rack (2) is fixed, which rack (2) is capable of cooperating with driving and locking pawl means (6, 13) each mounted in a yoke means (5, 12) for a slidable movement in transverse direction with respect to longitudinal extension of the relative column, the yoke means (5, 12) of the driving pawl means (6, 13) being fastened to spaced apart annular members (25) mounted about the relative column for an up and down sliding movement along said column by means of a piston-cylinder assembly (11), while the yoke means (5, 12) of the locking pawl means (6, 13) is fixed to said body.



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Apparatus for effecting a relative linear displacement between a number of columns and a body arranged for movement along said columns.

The invention relates to an apparatus for effecting a relative linear displacement between a number of columns and a body arranged for movement alongs said columns, particularly in a self-lifting pontoon, each one of said columns being provided with at least one longitudinally
5 extending series of regularly spaced apart teeth capable of cooperating with a driving and a locking pawl means each one of which means is mounted in a yoke means for a slidable movement in traverse direction with respect to the longitudinal direction of the relative column so that the pawl means can be shifted into and out of a space between two teeth,
10 while the yoke of the driving pawl means may be moved slidably up and down in the longitudinal direction of the column by means of a piston-cylinder assembly connected to said yoke, said piston-cylinder assembly being connected at the other side thereof to said body. A similar apparatus is known from the Dutch Patent Specification 101,883.

15 In the known apparatus each one of said columns is in the shape of a hollow pile having a square cross section which along each one of its ribs is provided with teeth racks extending in alignment with the sides of the pile, while the piston cylinder assemblies are connected at the other ends thereof to the top of an upstanding stand construction
20 mounted on the body.

The manufacturing costs of this apparatus are high so that for relatively small bodies the costs of the lifting arrangement become disproportionally high.

The object of the invention is to provide an apparatus of the
25 above type which may be manufactured from cheap parts which are always in supply on the market.

This object is attained in that in the apparatus according to the invention each one of said column is formed by a from the constructive point of view simple body, such as a circular pipe or pile to
30 the outside of which there is fixed at least one upstanding teeth rack extending in the longitudinal direction.

Pipes and teeth racks are always in supply so that the columns can be manufactured quickly and at a low price.

For achieving that the piston-cylinder assembly is not aligned with the driving pawl means in its inserted locking position, thus a free positioning of the fastening point of the piston-cylinder assembly to the yoke of the driving pawl means, the yoke means of the driving pawl means may advantageously be fastened to at least two axially spaced annular members or a box shaped member, which members are slidably mounted about the relative column, so that a simple guiding of the yoke means is obtained and the body does not have to be provided anymore with upstanding stand constructions like in the known apparatus. This is rendered easily feasible due to the circular shape of the column.

Each one of said piston-cylinder assemblies may be pivotally connected at both its ends and be connected at its said other end to the top side of the body preferably to the yoke means of the locking pawl means, said yoke means being fixedly connected to the top side of said body.

A good guiding of the yoke of the driving pawl means may be obtained in a simple way by a guide shoe mounted in said yoke and facing the teeth rack, while a lateral movement of this yoke may be restricted by guide strips provided in said yoke at both sides of the teeth rack. A good guiding of the body along the columns may be achieved in a simple way by guide strips provided in the yokes of the locking pawl means which guide strips are arranged at both side of the teeth rack.

The invention will be elucidated in more detail with reference to the drawing in which

Fig. 1 shows a side elevation of a lifting apparatus according to the invention,

Fig. 2 shows a cross section along the line II-II in fig. 1, and

Fig. 3 shows a cross section along the line III-III in Fig. 1.

As shown in the figures, in the apparatus according to the invention each one of the columns is in the shape of a circular pipe 1 to which a teeth rack 2 is welded.

The pipe 1 extends through an opening 3 provided in the pontoon of which only the top side 4 is shown partially.

On the top or the deck of the pontoon there is mounted a yoke 5 for the locking pawl means 6. The yoke 5 comprises two parallel plates 6 including a cross support 7 as well as guide strips 8 welded to the end of the plates and disposed on either side of the teeth rack 2.

To the plates 6 there are fastened section irons 9 to which irons 9 a corss member 10 is welded which serves for fastening a piston-cylinder assembly actuating the pawl means 6 in a similar way as will be described below for the driving pawl means.

5 Between the plates 6 there is pivotally fastened the piston-cylinder assembly 11. At the top part this piston-cylinder assembly 11 is pivotally fastened to the yoke 12 of the driving pawl means 13.

 Likewise the yoke 12 comprises two plates 14 including a cross support 15. To these plates there are welded the section irons 16 which
10 are connected to each other at the rear side by the cross member 17. In the section irons 16 openings 18 are cut for guiding the pawl means 13 which openings are bounded at the one end by the plate elements 19 and at the other end by the guide strips 20. Furthermore there is provided a cover plate 21 having a slot 22 for passing the teeth rack 2.
15 The pawl means 13 is connected to a piston-cylinder assembly 23 which is connected at its other end to the cross member 17. Between the plates 14 a guide shoe 24 is additionally provided.

 The yoke 12 is connected to two rings 25 capable of a sliding movement along the pipe 1.

20 When the floating pontoon has to be raised along the columns the pipes 1 are lowered onto the subaqueous bottom whereupon the pawl means 13 is inserted into a space 28 between two teeth by means of the piston-cylinder assembly 23. Thereafter the piston-cylinder assembly 11 performs a retracting stroke whereby the pontoon is raised over this
25 stroke length in such a manner that the locking pawl means 26 may then be inserted in a space 28. The pawl means 13 is subsequently disengaged from the teeth rack whereupon the piston-cylinder assembly 11 moves the yoke 12 upward until the pawl means 13 is facing a higher located space 28 so that the pontoon may again be raised further after the
30 pawl means 26 is again shifted out of engagement with the teeth rack.

C L A I M S

1. An apparatus for effecting a relative linear displacement between a number of columns and a body arranged for movement along said columns, particularly in a self-lifting pontoon, each one of said columns being provided with at least one longitudinally extending series of
5 regularly spaced apart teeth capable of cooperating with a driving and a locking pawl means, each one of which is mounted in a yoke means for a slidable movement in traverse direction with respect to the longitudinal direction of the relative columns so that the pawl means can be shifted into and out of a space between two teeth, while the
10 yoke of the driving pawl means may be moved slidably up and down in the longitudinal direction of the column by means of a piston-cylinder assembly connected to said yoke, said piston cylinder assembly being connected at the other side thereof to said body, c h a r a c t e r i z e d in that each one of said columns is formed by a from the constructive
15 point of view simple body, such as a circular pipe or pile to the outside of which there is fixed at least one upstanding teeth rack extending in the longitudinal direction.

2. The apparatus of claim 1, c h a r a c t e r i z e d in that the yoke means of the driving pawl means is fastened to at least
20 two axially spaced annular members or a box shaped member, said means being slidably mounted about the relative column.

3. The apparatus of claims 1 or 2, c h a r a c t e r i z e d in that each of said piston-cylinder assemblies is at said other side connected to the top side of said body.

25 4. The apparatus of claim 3 c h a r a c t e r i z e d in that each of said piston-cylinder assemblies is connected to said yoke means of said locking pawl means, said yoke means being fixedly connected to the top of said body.

5. The apparatus of claim 3 or 4, c h a r a c t e r i z e d
30 in that each of said piston-cylinder assemblies is pivotally mounted at both ends thereof.

6. The apparatus of claims 1-5, c h a r a c t e r i z e d in that in the yoke of the driving pawl means there is provided a guide shoe facing the teeth rack.

35 7. The apparatus of claims 1-6, c h a r a c t e r i z e d in that in the yokes of the pawl means there are provided guide strips mounted at both sides of the teeth rack.

fig-1

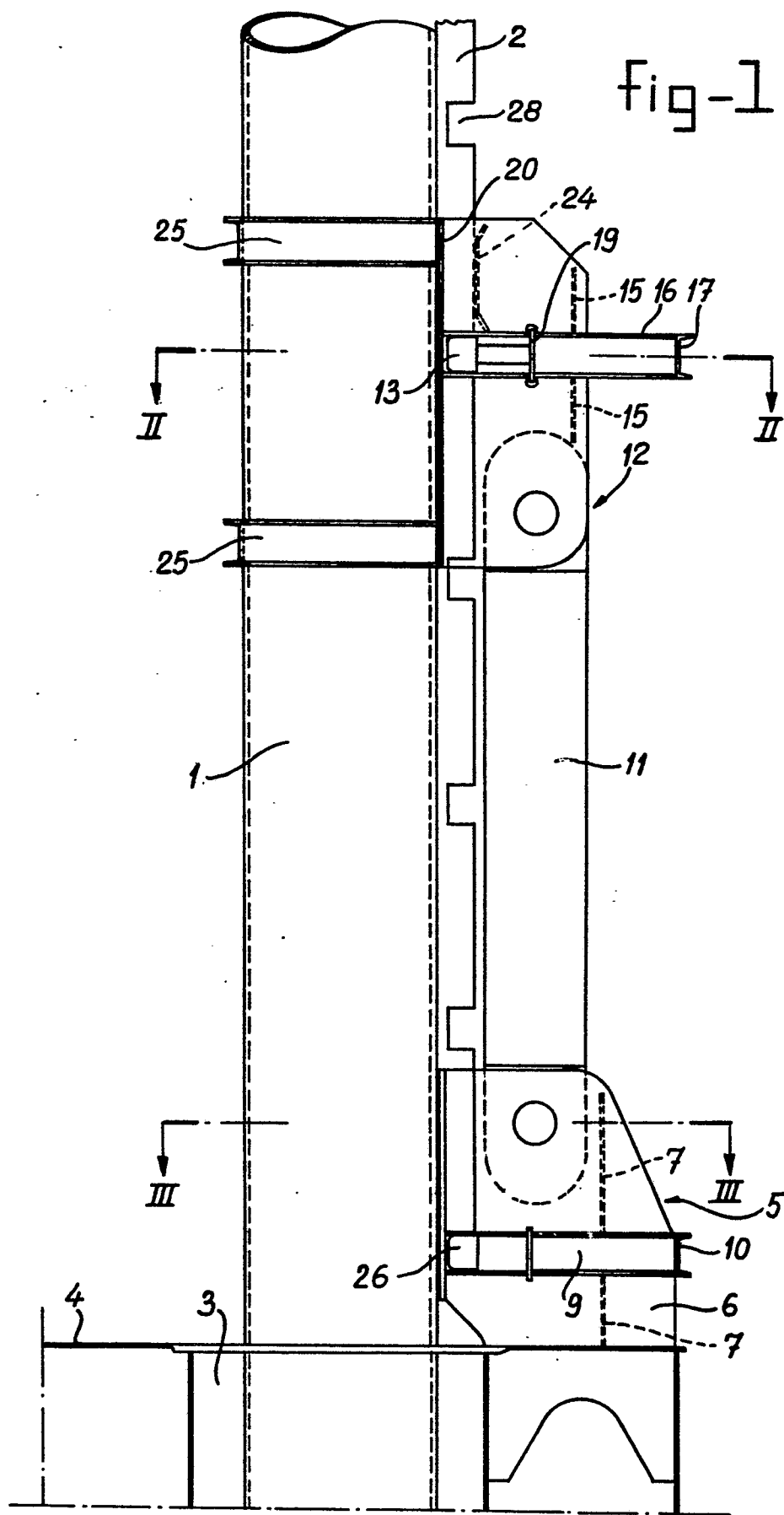


fig-2

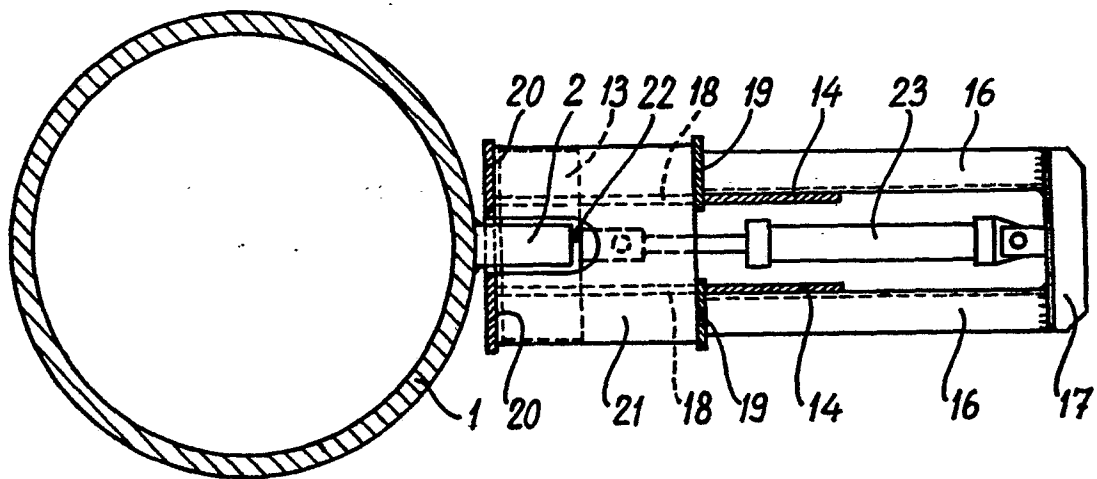
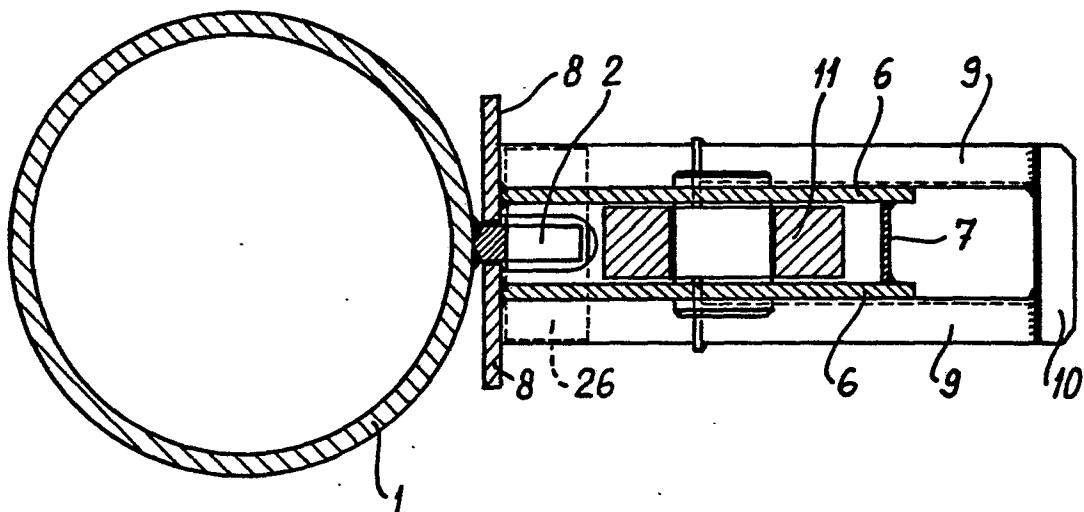


fig-3





European Patent
Office

EUROPEAN SEARCH REPORT

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Application number

EP 80 20 0317

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 3 936 032 (WASCHULZIK)</u> * Column 2, lines 45-68; column 3, lines 1-68; column 4, lines 1-31; figures 1-3 * --	1,3-5, 7	E 02 B 17/08
X	<u>NL - A - 75 08373 (MASCHINE FABRIEK HOLLAND)</u> * Page 2, lines 2-35; page 3, lines 1-22; figures 1,2 * --	1,3-5	TECHNICAL FIELDS SEARCHED (Int.Cl. ³) E 02 B
	<u>DE - B - 1 255 051 (DE LONG CORP.)</u> * Column 4, lines 5-68; column 5, lines 1-48; figures 1,9,11 * & NL - C - 110 411 --	1,6	
	<u>DE - B - 1 252 393 (WERF GUSTO)</u> * Column 2, lines 32-50; figure 1 * & NL - A - 65 00205 --	1,2	
D	<u>NL - C - 101 883 (WERF GUSTO)</u> * Whole document * ----		CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons &: member of the same patent family, corresponding document
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15-07-1980	Examiner HANNAART