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(54) **Dredger for removing mud without stirring up sludge and/or other sediments.**

(57) The invention relates to a dredger for removing accumulations in canals, rivers, narrow waterways, ponds, lakes and the like without stirring up sludge and/or other sediments, characterized in that it is equipped with at least one funnel (4) which is adjustable and which contains a scraper belt for digging up the sludge and/or other sediments at the lowermost extremity of the funnel and this without any contact with the surrounding water.

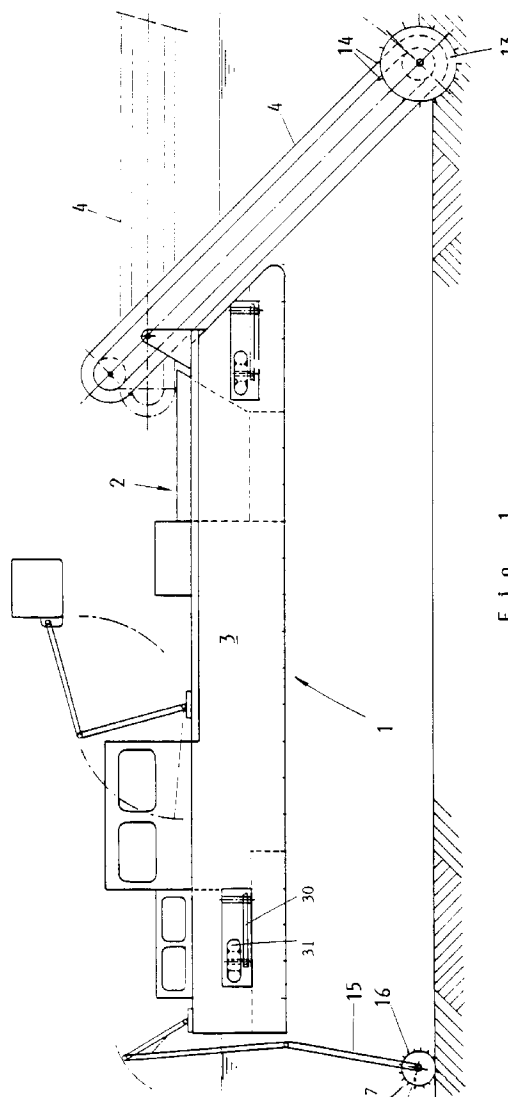


Fig. 1.

The present invention relates to a dredger in particular for removing accumulations in canals, rivers, narrow waterways, ponds, lakes and the like from the submerged bottom without stirring up sludge and/or other sediments and while adding a minimum amount of water.

In certain circumstances, when accumulations of sedimented sludge and other fine grained materials have to be removed from narrow waterways, canals and watercourses, for example in built-up areas without stirring up the sludge in the water, because this has to be avoided for example from an ecological point of view, very particular problems arise. As a consequence, use can therefore not be made of the conventional dredging techniques.

In the conventional dredging techniques, use is especially made of bucket dredgers which do not meet the stated object at all since the sludge is partially distributed in the water by stirring up and by turbulence during the vertical transport and the stated object can then not be reached at all. Suction dredgers are also not appropriate, partially for the same reasons and also because large amounts of water have to be displaced compared to the amount of dredged sludge. Separating the water and the sludge afterwards back from the so transported mixture is particularly difficult, in other words expensive and/or time consuming. The excess of water defiled with sludge and possibly with pollutants contained therein can not be discharged again in the watercourse if the surrounding water has to be kept as clean as possible and as less disturbed as possible under the hereabove sketched circumstances.

An object of the invention is therefore to design a dredger which provides a solution for the just sketched problems and which enables to remove the sludge and/or other sediments from watercourses without stirring this material up in the water and this, as already mentioned hereinabove, while adding a minimum amount of water during the vertical transport.

In order to realize this according to the invention, the dredger according to the invention is characterized in that it is equipped with at least one funnel which is adjustable under an arbitrary angle and which contains a scraper belt for digging up the sludge and/or other sediments at the lowermost extremity of the funnel and for transporting this material substantially without contact with the surrounding water to the uppermost extremity of the funnel where known means are provided for removing the dredged sludge.

Other details and advantages of the invention will become apparent from the following description of a dredger according to the invention. This description is only given by way of example and does not limit the invention. The reference numerals relate to the annexed figures.

Figure 1 is a schematical side elevation view of a dredger according to the invention.

Figure 2 is a schematical top plan view of the dredger according to the invention.

Figure 3 is, on a larger scale, a schematical longitudinal section of the ladder together with the funnel and the scrape belt moving therein.

Figure 4 is a section according to line IV-IV of figure 3.

Figure 5 is a section according to line V-V of figure 3.

Figure 6 relates to a detail of the invention.

Figure 7 relates to a variant of the embodiment according to figure 6.

Figure 8 is, on a still larger scale, a cross-section through three funnels near the drive means of the ladders of the dredger according to the invention.

The dredger shown in these figures consists of a pontoon 1 comprising a funnel-shaped dump space 2. The hold 3 is provided for mounting components which do not belong to the essence of the invention.

On the frontside or on the side which can be considered as the stam is mounted a set of, in this case and by way of example, three ladders 4 in such a manner that they can be adjusted between an angle of about 45° and the horizontal plane. On each ladder 4, further details of which are given hereinafter, there is fixed a funnel 5 wherein scraper belts 6 are rotatably mounted. The scraper belts 6 carry transverse upright scrapers 7 (more details of these scrapers are shown in figures 3, 4 and 5).

The length and the size of the funnel are calculated in such a manner that it allows to dredge or scrape up to a sufficient depth and to transport the dredged mud within each funnel by each set of scraper belts and scrapers cooperating therewith.

From figure 4 it can be deduced amongst others that each funnel 5 is delimited in the longitudinal direction by a top plate 8 and by a supporting plate comprising upright walls 9'. On the frontside, this is at the bottom of the funnel 5, where the sludge is dug up, the lowermost plate 9 ends in the shape of an either or not adjustable knife 9" which is an extension of the lowermost extremity of the lowermost plate 9.

When use is made, as in the described embodiment, of three funnels 5 disposed next to one another, they can preferably be mutually connected by cross-beams 10 which connect the longitudinal beams 11 of different ladders, locally to one another. The scraper belts 6 are guided around gear wheels 12 at the upper and lower extremity of the longitudinal beams 11.

Since the dredger according to the invention should not be equipped with propellers because they would inevitably stir up the water in the small water courses and in the case that the use of anchor cables on winding drums is for example not flexible or desired, the dredger is moved forwards by means of one or more drive wheels 13. These drive wheels 13 are

equipped with radial pins or blades 14, the length of which may possibly be adjustable. In this way, they grip easily into the submerged bottom which is to be dug up and ensure the displacement of the dredger. These wheels 13 can be driven preferably independent from one another so that they can rotate each separately in different directions and/or at different speeds. If necessary, use can be made in an analogous way of an adjustable arm 15 mounted onto the stern of the dredger, which arm is provided on its free extremity with at least one drive wheel 16 which is preferably also provided with similar radial pins 17 or blades. When no use is made of the drive wheels 13 at the bottom of the ladders 4 for the propulsion of the dredger, it can therefore be moved forward by means of one or more drive wheels 16 on the lower extremity of the arm 15.

The ladders 4 can be adjusted under the desired angle, usually in function of the thickness and the level of the sludge layer or submerged bottom to be dug up, by making use of the structure which is shown in figures 6 and 7. Figure 6 shows guiding profiles 18 which are bent downwards above the stem of the dredger and which are fixed on shores 19. Preferably two of such guiding profiles and in particular the two middle most profiles carry a rack, indicated schematically by reference 20 in figure 6, the gear wheels 21 fixed on axles 22 cooperate with. The axles 22 are driven by a motor 23 in one direction or the other in such a manner that the ladders can be disposed in positions which vary between the horizontal position, shown in mixed line in figure 1, and the position under an angle of about 45° as shown in full lines in the same figure 1 and further in figure 6. The axles 22 driven by a motor are mounted in pieces 24 belonging to one of the transverse beams 10. The outermost ladders are only provided with free running wheels 25 (figures 6 and 7).

A variant embodiment of the device for pulling up the ladders as shown in figures 6 and 7 is represented finally in figure 8.

The ladders 4 or at least the two outer ladders can be provided sideways with a U-shaped gutter profile 26, while two or more support plates 27 are mounted on the dredger which are each provided with a pivot 28. This pivot fits in the U-shaped gutter profile 26. The ladders can be pulled up through a cable 29 up to a position which corresponds substantially to the horizontal plane. These structures can be constructed easily and are moreover simple to control.

In view of the very particular tasks for which the dredger according to the invention is designed, it is finally further provided with at least two but preferably four horizontally displaceable arms 30 which serve as so-called "fenders" and which are provided hereto with wheels 31. The arms 30 can be displaced hydraulically, mechanically through a rack or manually and can be brought in this way in a predetermined

position in order to block the dredger in its correct position. Thanks to said arms 30 provided with wheels 31, the dredger can also be displaced laterally either between two banks or two embankments or between walls, when the watercourse flows through a built-up area, such as a city. By operating the displaceable arms 30, the dredger can also be positioned in its correct position on a minimum distance from a bank, an embankment or a wall.

For removing the sludge collected in the bulk hold 2, use is made of any known technique which does not belong to the essence of the present invention.

The advantages of the dredger, the very original concept of which is described hereinabove, are very clear. The dredger can be maintained in its correct position under very particular circumstances without requiring the use of anchors, howsers or piles. Due to the scraping in the closed funnel, very little mud arrives in the surrounding water so that the desired result, i.e. a reduced or nearly unexisting stirring up and no dilution of the mud with water, is obtained. Due to their concept, the scraper belts can be moved in their funnels in either one of both directions. Notwithstanding the limited dimensions of the dredger, it has a very large dredging or scraping capacity because the amount of transported water is insignificant compared to the displaced amounts of sludge and/or other sediments.

The invention is of course not limited to the hereabove described embodiment and it could be modified in many ways without leaving the scope of the patent application.

Claims

1. A dredger in particular for removing accumulations in canals, rivers, narrow waterways, ponds, lakes and the like from the submerged bottom without stirring up sludge and/or other sediments and while adding a minimum amount of water, characterized in that it is equipped with at least one funnel (5) which is adjustable under an arbitrary angle and which contains a scraper belt (6) for digging up the sludge and/or other sediments at the lowermost extremity of the funnel (5) and for transporting this material substantially without contact with the surrounding water to the uppermost extremity of the funnel where known means are provided for removing the dredged sludge.
2. A dredger according to claim 1, characterized in that it comprises preferably three funnels (5) which are disposed next to one another.
3. A dredger according to either one of the claims 1 and 2, characterized in that said scraper belt (6)

carries transverse scrapers (7) while means are provided for moving the scraper belt (6) in said funnel (5).

provided for positioning the dredger with respect to banks, walls of a canal, a river or a narrow waterway.

4. A dredger according to any one of the claims 1 to 3, characterized in that said funnels (5) are attached to a ladder (4), the angle of which with respect to the horizontal plane is adjustable. 5
5. A dredger according to claim 4, characterized in that at least along one side of said ladder (4), there is provided a guiding profile (18) which runs downwards towards the backside of the dredger and wherein each ladder (4) is guided by two bars carrying each at least one free running support wheel so as to enable the ladder to be disposed under the desired angle. 10
15
6. A dredger according to either one of the claims 4 and 5, characterized in that said ladder is adapted to be displaced with respect to said guiding profile (18) by means of a gear wheel cooperating with a rack (20) provided in said guiding profile, which gear wheel is driven by a motor and is fixed onto an axle mounted in components of the ladder. 20
25
7. A dredger according to claim 4, characterized in that a rack (20) is provided at least along one side of said ladder (4), which rack (20) cooperates with a gear wheel (21) driven by a motor (23) which can be actuated in two opposite directions in order to bring the ladder in and out its operative position. 30
35
8. A dredger according to claim 6, characterized in that said axle (22) and the gear wheels (21) mounted thereon are driven by a motor (23) in one direction or another. 40
9. A dredger according to any one of the claims 1 to 7, characterized in that the lowermost portion of said ladder (4) is provided with drive wheels (13). 45
10. A dredger according to any one of the claims 1 to 8, characterized in that the side of the dredger opposite said ladder (4) is provided with drive wheels (16) mounted on an arm (15), the height of which is adjustable. 50
11. A dredger according to any one of the claims 8 to 10, characterized in that said drive wheels (13, 16) are provided with radial pins (14, 17) of such a length that they can grip into the sludge. 55
12. A dredger according to any one of the claims 1 to 10, characterized in that arms (30) adapted to be displaced sideways in the horizontal plane are

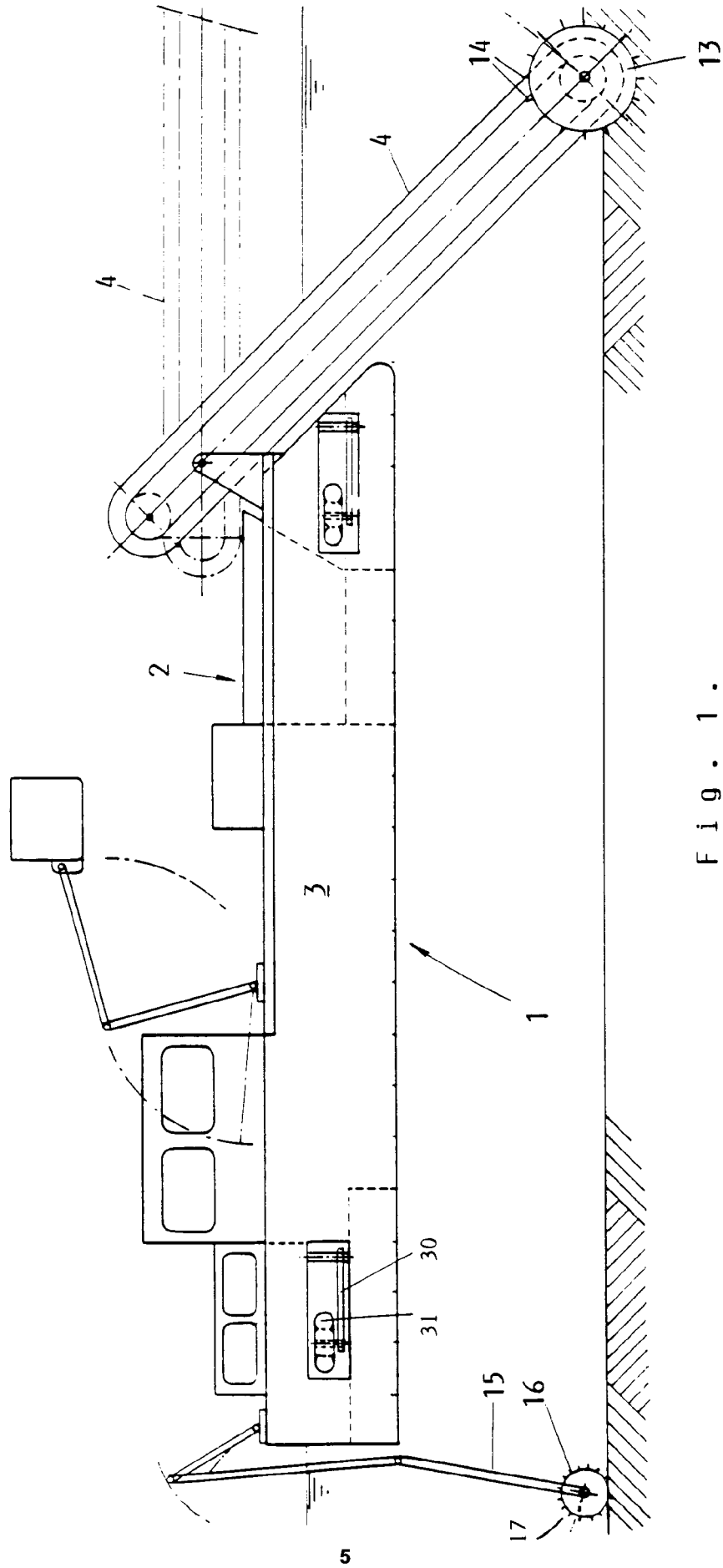
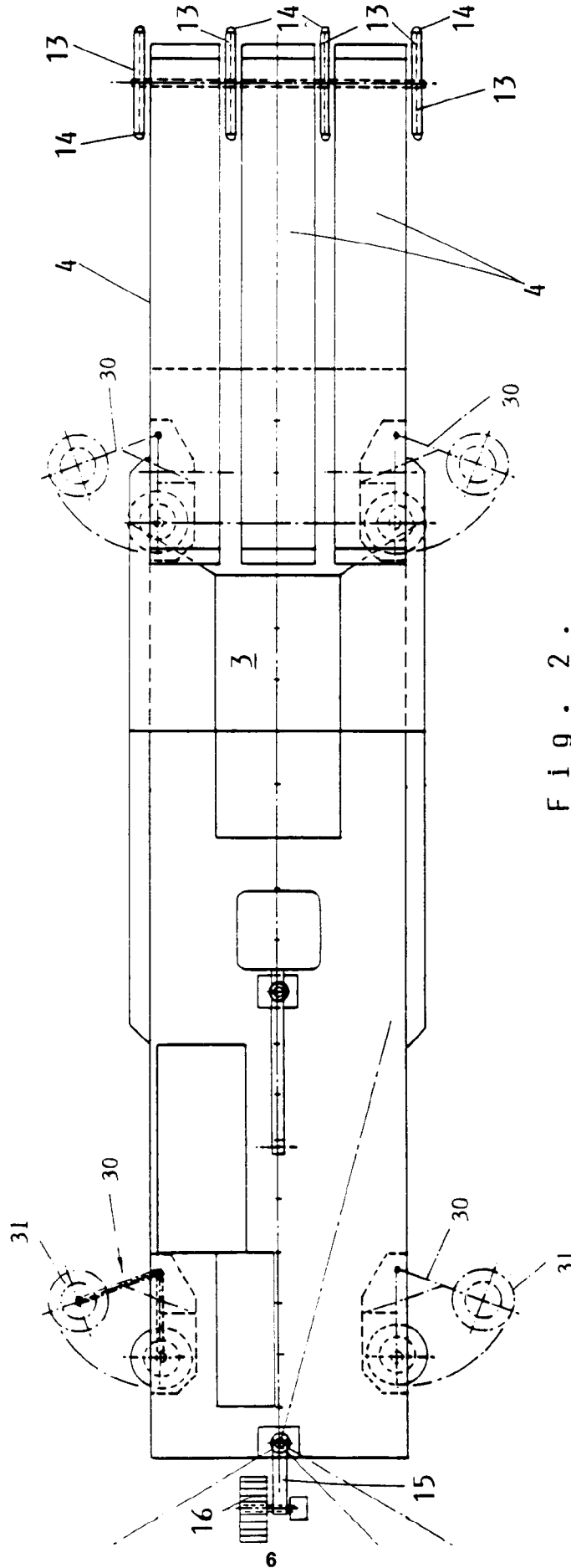


Fig. 1.



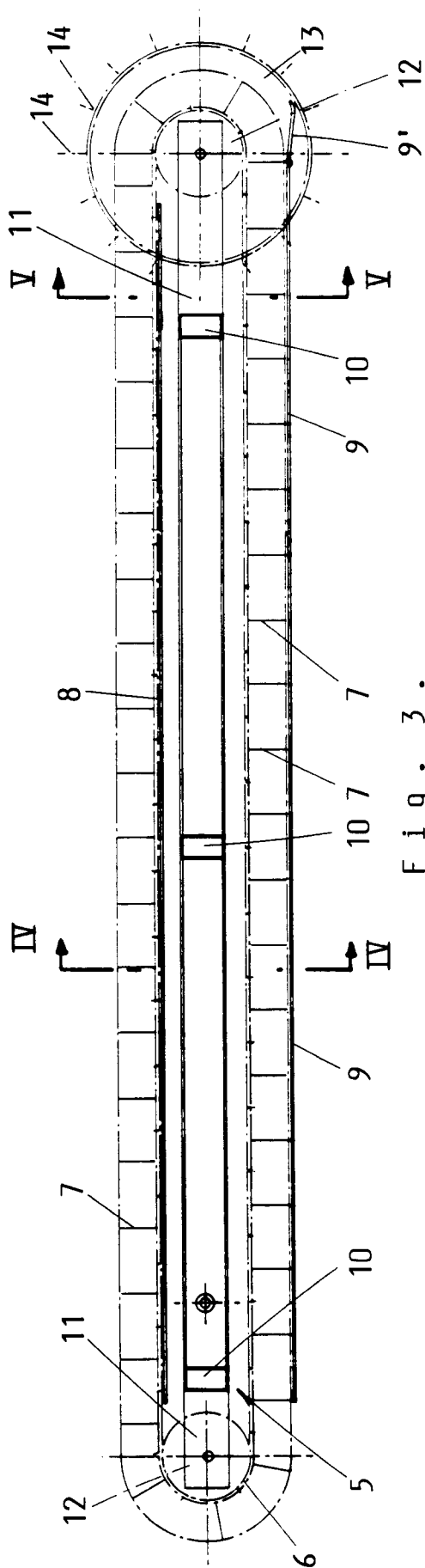


Fig. 3.

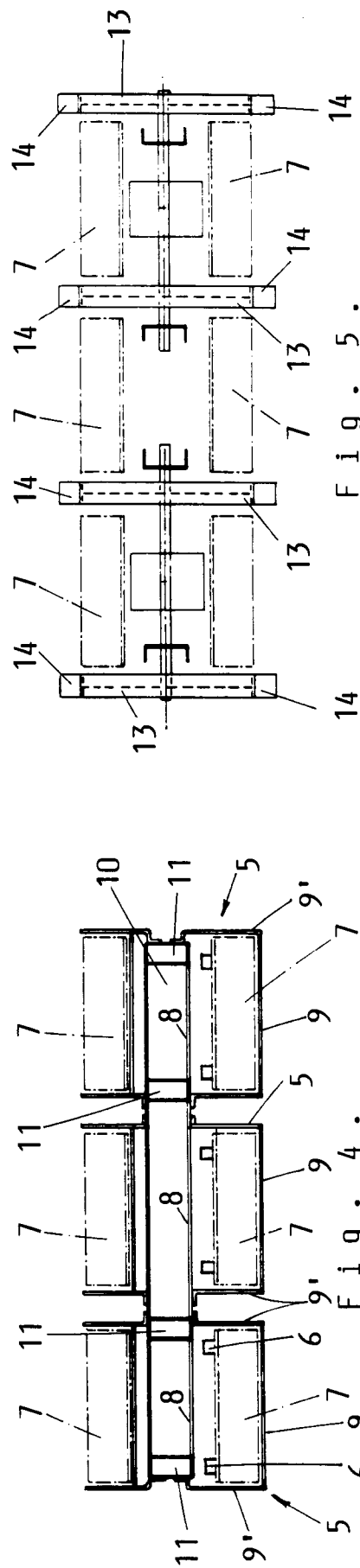


Fig. 5.

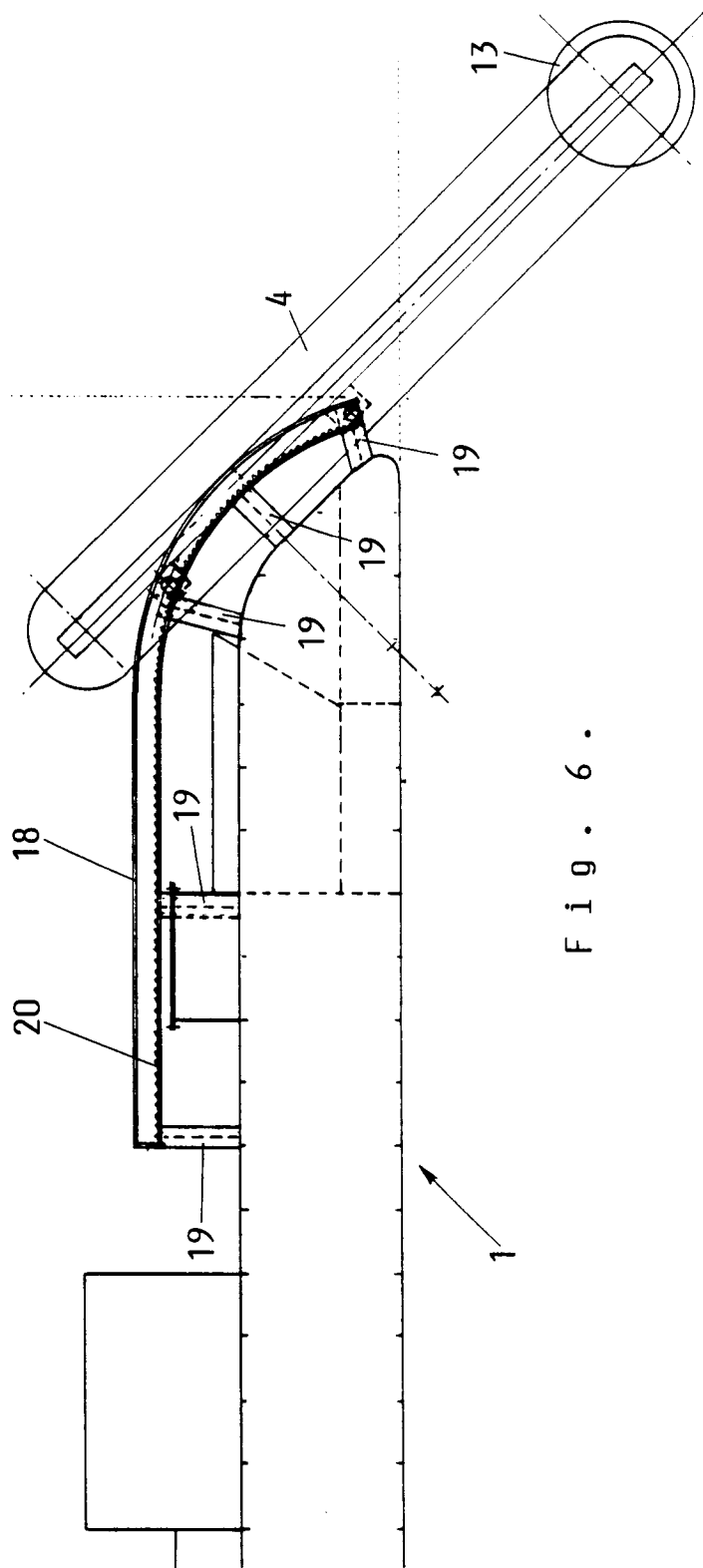


Fig. 6.

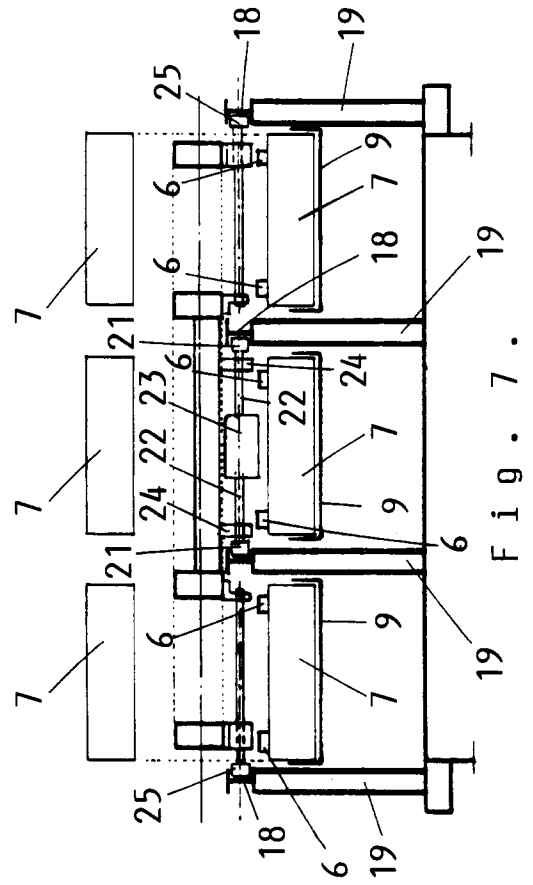


Fig. 7.

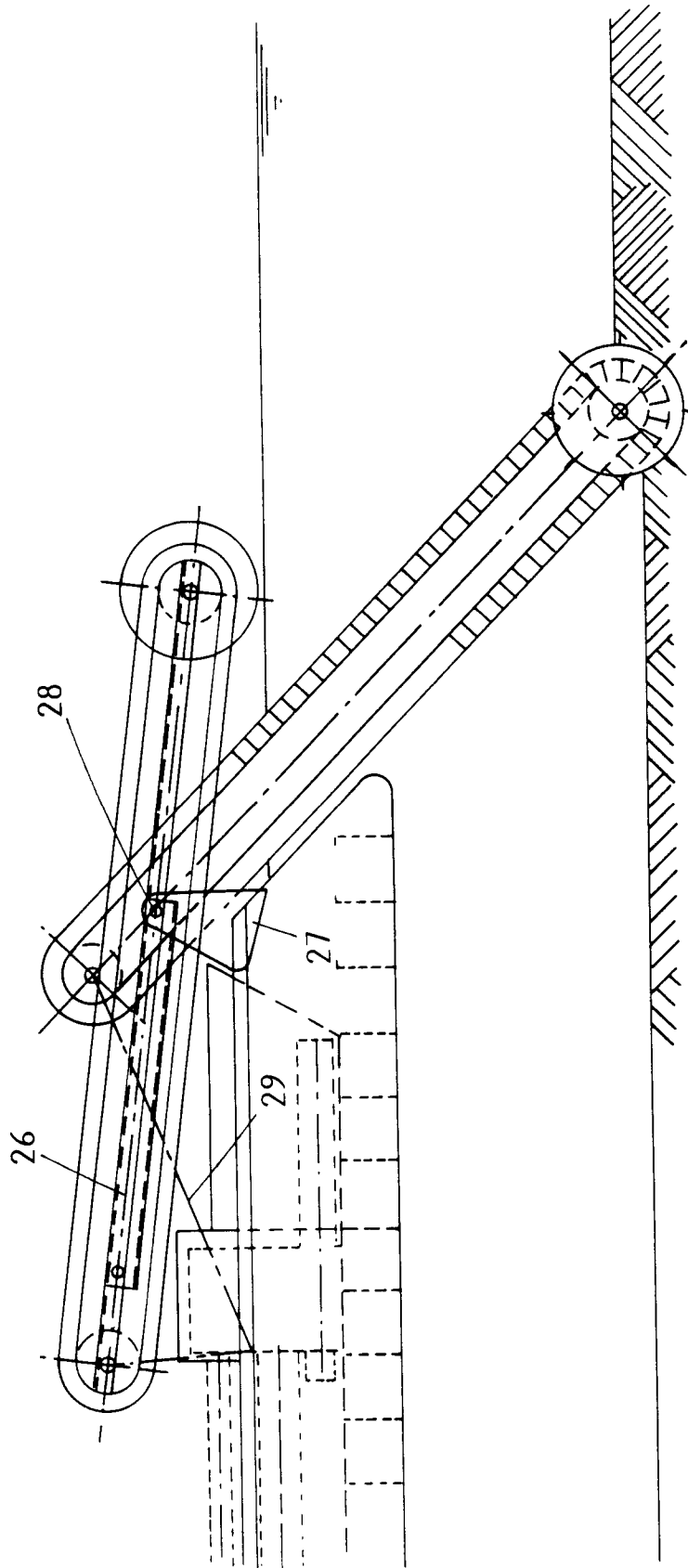


Fig. 8.



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 87 0146

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)
X	DE-A-33 455 (J. PARKER)	1,2,4	E02F5/28
Y	* the whole document *	5,9,10,12	E02F3/08
	---		E02F7/00
			E02F9/06
Y	NL-A-6 907 346 (INDUSTRIEELE HANDELSCOMBINATIE HOLLAND) * page 4, line 3 - line 8 * * figure *	5	

Y	GB-A-690 275 (SCOTTISH SEAWEEED RESEARCH ASS.) * page 4, line 93 - line 100 * * figures 1,2 *	9,10	

Y	NL-A-7 105 085 (KONIJN MACHINEBOUW) * page 2, line 16 - line 30 * * page 5, line 28 - page 6, line 2 * * figures 1,2 *	12	

A	NL-C-97 743 (G.A. KONING & ZOON) * column 3, line 7 - line 13 * * figures 1,2 *	1,2	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E02F
Place of search THE HAGUE		Date of completion of the search 08 DECEMBER 1992	Examiner ESTRELA Y CALPE J.
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			

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