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(54) Device for retracting a flexible hose.

(57) An installation for taking up a flexible hose (1) for conveying liquid, such as a fire hose, comprises two pairs of turning pinch elements placed opposite one another (7,8,14,15), the pinch elements of each pair defining a nip of variable nip dimension, through which nips the hose can be transported in order to expel residual liquid therefrom, which variable nip dimension can be enlarged to permit the passage of a coupling (4) present in the hose. The nip dimensions are variable independently of one another and the nips are positioned with respect to one another in such a way that the hose can continuously be held compressed by at least one of the nips.

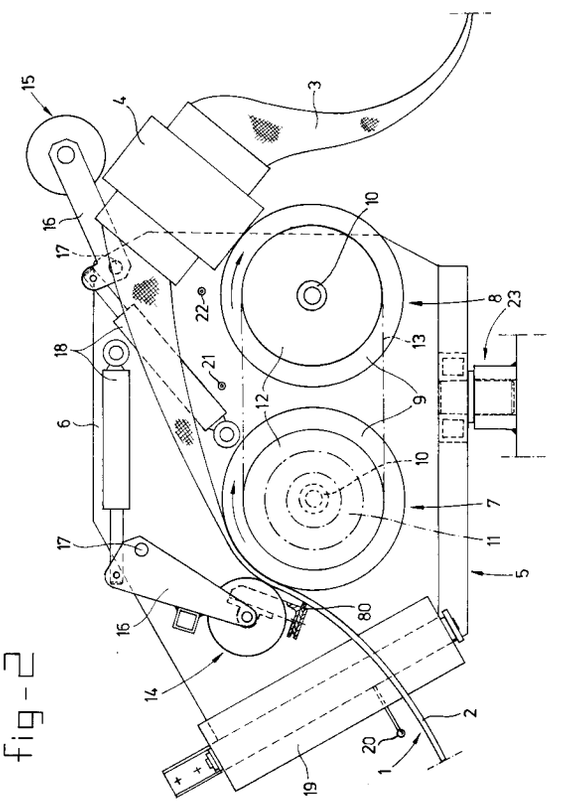

fig-2

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The invention relates to an installation for taking up a flexible hose for conveying liquid, such as a fire hose, comprising two pairs of turning pinch elements placed opposite one another, the pinch elements of each pair defining a nip of variable nip dimension, through which nips the hose can be transported in order to expel residual liquid therefrom, which variable nip dimension can be enlarged to permit the passage of a coupling present in the hose.

An installation of this type is disclosed in US-A-4452135. With this known installation the hose is conveyed over an endless conveyor belt on which a roller mechanism can be held pressed down under spring loading. With this arrangement the hose is squeezed together between the conveyor belt and the roller mechanism. The water still contained in the hose is squeezed out by this means.

Hoses of this type are made up of sections which are provided with hose couplings at both ends. The couplings are made of metal and therefore can not be compressed like the flexible material of the hose itself. Therefore at the moment the couplings have to pass, the roller mechanism moves away from the conveyor belt. Consequently, the water which has been squeezed out can flow back again. It is true that a second roller mechanism is provided which, by means of a rocker, moves towards the belt as the first roller mechanism moves away from the belt. Nevertheless, in view of the time which elapses between the release of the pressure exerted by the first roller mechanism and the application of pressure by the second roller mechanism, a relatively large amount of water can still flow back again, especially if said water is under any pressure. The quantities involved can be appreciable, especially if there are differences in height in the path taken by the hose. As a consequence of the removal of the driving force, the hose will also have a tendency to slide back under the weight of the water and the coupling.

The aim of the invention is, therefore, to provide an installation for taking up a hose which is also suitable for emptying under pressure and for transporting a hose assembled by means of couplings. This aim is achieved in that the nip dimensions are variable independently of one another and the nips are positioned with respect to one another in such a way that the hose can continuously be held compressed by at least one of the nips.

With the installation according to the invention, as soon as a coupling arrives at one of the nips between two pinch elements said elements move apart. However, the hose is still held squeezed together at the location of the other nip and, consequently, no liquid can flow back.

In particular, the nips are located such a distance apart that the hose can be held compressed at the location of both nips if the coupling is located in the region between said nips.

As the hose is taken in further the pinch elements at the location of the other nip are moved apart to permit passage of the coupling. However, the nip which has already been closed again now provides the seal.

The pinch elements can be constructed in various ways. Preferably, the pinch elements are constructed in the form of a roller body having a pliable surface, each pinch element together with another opposing pinch element defining a nip. An associated pressure roller can be located against each roller body, which pressure roller can be moved towards or away from the roller body in order, respectively, to reduce or increase the size of the nip.

The way in which the nip is adjusted to a coupling moving through it can also vary. In this context, for example, each pressure roller can be movable by means of its own drive. In this case, sensors are also provided for detection of a hose coupling, as well as adjustment means for increasing and reducing the size of the nip when a hose coupling is detected.

As an alternative, however, at least one of the pressure rollers can be pressed, under pre-loading, in the direction of the associated roller body. A construction of this type has the advantage that it is simpler and therefore less expensive.

According to a preferred embodiment each roller body is constructed in the form of a cylinder of pliable material which is closed at both ends and is pressurised internally, which cylinder can optionally be provided with a corrugated surface in order to increase friction.

Furthermore, a supporting construction can be provided on which the pinch elements are rotatably mounted, which supporting construction is rotatably supportable about a centre line which runs transversely to the centre line of the pinch elements. With the aid of a supporting construction of this type, the installation can, for example, be mounted on a container in which the entire hose can be accommodated. By virtue of the fact that the supporting construction is rotatable, said construction is able to adapt to the passage of the hose as it is taken in by means of a vehicle driven past the hose.

Said supporting construction can be movable between a working position, in which, viewed in the direction of transport, the front pair of pinch elements are at a lower height than the rear pair of pinch elements, and a rest position. In the working position the direction of transport is oriented sloping upwards, the hose taken in being able to assume a natural curve.

The rotary shaft of the supporting construction can be supported on a holder, which holder is movably guided in an essentially vertical guide path. The desired trajectory can be obtained if the guide path is curved obliquely at its upper end and the holder on one side has a guide, such as a roller or slide block, with which it is guided in the guide path, and on the other side is supported by a cylinder jack.

To enable the installation to be used on both the left and the right of a vehicle, the guide path and cylinder jack are mounted on a guide frame for moving them in the transverse direction.

The invention also relates to a method for taking up a fire hose into a loading bay in a vehicle by means of an installation as described above mounted on said loading bay, the supporting construction being located, viewed in the normal direction of travel, at the front of the loading bay, comprising driving the vehicle forwards past the fire hose, which has been laid out on the ground, and taking up the fire hose by means of the installation at a speed which essentially corresponds to the speed at which the vehicle is moving.

The invention will now be explained in more detail with reference to a few illustrative embodiments shown in the figures.

Figure 1 shows a partially exposed, perspective view of an installation according to the invention.

Figure 2 shows a side view of the installation according to Figure 1.

Figure 3 shows a lorry equipped with an installation according to the invention.

Figure 4 shows a second embodiment of the installation according to the invention.

Figure 5 shows a third embodiment of the installation according to the invention.

Figure 6 shows a view in accordance with arrow VI in Figure 5.

Figure 7 shows a side view of a fourth embodiment.

Figure 8 shows the view according to VIII-VIII.

Figures 1 and 2 show an installation for taking up a flexible hose, which is indicated in its entirety by 1. Said flexible hose comprises hose sections 2, 3, which are attached to one another by means of coupling 4. The installation comprises a frame 5, provided with side plates 6 in which two pinch elements, constructed in the form of a roller body 7, 8 having a pliable surface, are rotatably mounted. Said rollers can, for example, comprise a cylinder of pliable material 9, which at the ends is provided with an airtight connection to a rotary hub 10, the surface of which is provided with corrugations which increases friction. Roller 7 is also drivable by means of motor 11; roller 9 is likewise drivable, via pulleys 12 and belt 13.

Each roller 7, 8 is provided with a pressure roller, 14 and 15 respectively. Said pressure rollers are rotatably mounted on swinging arms 16, which are each rotatably mounted on bearings at 17. By means of the piston cylinder devices 18, the swinging arms 16, together with pressure rollers 14, 15, can be swung towards or away from the associated roller 7 or 8, respectively.

A pair of guide rollers 19, the purpose of which is to guide the hose 1 as it moves inwards, are also provided on the frame 5.

In the position shown in Figure 1, pressure roller 14 has been swung away from the associated roller 7, so that the coupling 4 can move through the wide nip thus formed. Pressure roller 15 has been swung towards the associated roller 8 and holds the hose 1, in particular hose section 3, firmly squeezed in the narrow nip thus formed. In view of the direction of movement of the rollers 7, 8, the hose will be fed through the installation in the direction indicated by arrows. Any water present in the hose will be held back by roller 8 and pressure roller 15, so that this water is forced to flow away through the other hose section 2.

As soon as coupling 4 is in the fairly large region between rollers 7 and 8, pressure roller 14 will also be swung towards the associated roller 7. Hose section 2 is then also firmly clamped, as is hose section 3 between pressure roller 15 and roller 8,

On further movement of the hose the situation shown in Figure 2 is obtained. In this position, pressure roller 15 has been swung away from roller 8, so that the coupling 4 can move through the wide nip now formed in this location.

Any water present in hose section 2 outside the installation is, however, not able to flow into hose section 3 as hose section 2 is now held pressed flat between pressure roller 14 and associated roller 7. As a result of the interaction between pressure roller 14 and roller 7, any water present in hose section 2 is held back and, at the same time, the drive is maintained.

A scraper element 80 is attached to the swinging arms 16 for scraping clean the upper side of the hose which has been pressed flat. There will also be a scraper element (not shown) for scraping clean the underside of the hose which has been pressed flat.

In place of scraper element 80, a scraper roller (not shown) can also be provided. The latter rests with its surface against pressure roller 14, so that is moved in the opposite direction to the direction of movement of hose 2. Any small stones adhering to hose 2 can be reliably removed by means of a scraper roller of this type, which can be constructed in the form of a brush.

A corresponding scraper roller, in this case driven by roller 7, can be mounted at the underside of the hose.

Sensors 20, 21 and 22 are present to ensure that the hydraulic piston cylinder devices 18, 19 are operated at the correct times. As soon as sensor 20 detects a coupling 4, a signal is transmitted to a control unit, which incidentally is not shown, as a result of which signal piston cylinder device 18 associated with pressure roller 14 is actuated and swings said roller away from associated roller 7.

As soon as coupling 4 has arrived in the region between the two rollers 7, 8 this is detected by sensor 21, so that pressure roller 14 can be moved back. As soon as said roller has been moved back to its full ex-

tent, pressure roller 15 can then be broken away from associated roller 8 by actuating the relevant piston cylinder device 18.

When sensors 22 then detect the coupling 4, said piston cylinder devices 18 are actuated again, so that pressure roller 15 can be moved back again.

The frame 5 is mounted on a vertical rotary shaft 23 in such a way that the entire installation can adjust itself to the trajectory of the incoming hose 1, controlled by the guide rollers 19.

As is shown in Figure 3, the entire installation can be used on a lorry. To this end, the vertical rotary shaft 23 is mounted at the front of a container 24 in which the hose 1 can be stored. The lorry 25 is driven along the path followed by the hose 1, the installation being able to adjust itself to the trajectory of the incoming hose by virtue of the guide rollers 19. Despite the presence of the couplings 4, the water is still expressed from the hose 1 as the latter is taken in, as described above with reference to Figures 1 and 2.

The variant in Figure 4 likewise uses two rollers 7, 8 having a pliable surface, for example the rollers as described with reference to Figures 1 and 2. Once again, there is a coupling 4 between hose sections 2 and 3.

In this embodiment three pressure rollers 26, 27, 28" are used, which are mounted on a star-shaped auxiliary frame 28. Said star-shaped auxiliary frame 28 is mounted by means of locating arm 29 so that it can swing with respect to support point 30.

As a consequence of the direction of rotation of the rollers 7, 8, the hose will be moved in the indicated direction of movement. On further movement from the position shown in Figure 4, the pressure roller 27 will be pushed away by the coupling 4. However, when this occurs pressure roller 28 continues to press hose section 2 firmly against roller 7, so that the seal is maintained and no water can flow back into the section of the hose already emptied. Finally the position indicated by the broken line is reached, in which the auxiliary frame 28, together with the locating arm 29, have moved slightly downwards. In this position pressure roller 28' holds the hose against the two rollers 7, 8 so that it is firmly sealed.

On further movement of the hose the position shown by continuous lines is reached again, except that the auxiliary frame 28 has been turned through 120° compared with the previous position.

Two rollers 7, 8 having a pliable surface are also used in the variant shown in Figures 5 and 6. However, in this case six belts 33 are fed over the pressure rollers 38, 32, which belts are accommodated in grooves 34. The belts are further fed over auxiliary rollers 35, 36.

Pressure roller 32 is mounted on support arm 37 and pressure roller 38 on support arm 39. Said support arms are held under spring pretensioning against rollers 7 and 8, respectively. To this end, the arms 37 and 39, which are at a fixed angle with respect to one another, are mounted on locating arm 42. The locating arm is pulled towards the rollers 7, 8 by means of draw spring 43.

As soon as a coupling 4 arrives at pressure roller 38, support arm 39 is swung away, against the force of the spring pretensioning, in such a way that the coupling 4 is able to move through the wide nip thus formed between the pressure roller 38 and roller 8. The support arm 39 then moves back again, such that pressure roller 38 comes into contact with roller 8. On further movement of the coupling, support arm 37 is then swung away, so that the coupling 4 is now able to move through the wide nip between pressure roller 32 and roller 7. Finally, arm 37 also moves back again, as a result of which the application of pressure on the hose between pressure roller 32 and roller 7 is again established.

In the embodiment shown in Figure 7, part of the container 24 corresponding to Figure 3 is shown. The installation for taking up a hose has two roller bodies 7, 8 and two pressure rollers 14 and 15, respectively. The positioning of the hinge points 51 and 52 and of the arms 53 and 54 on which said pressure rollers 14 and 15, respectively, are mounted differs somewhat from that according to Figure 2, although the mode of operation is identical.

The supporting construction in which said elements are accommodated and which is indicated in its entirety by 55 is rotatably mounted on the holder 57 by means of rotary shaft 56. On one side, said holder 57 is supported in the guide path 59 by means of two coaxial rollers 58, only one of which is to be seen in the side view in Figure 7. On the other side, the holder 57 is supported by means of hinge 60 at the flange 61, which is welded to the housing 62 of the piston cylinder device 63.

In the side view shown in Figure 7, the position in which the piston cylinder device 63 is fully extended is shown by continuous lines. In this position, the installation is in the working position, in which roller body 7 is somewhat lower than roller body 8.

The broken lines show the position of the piston cylinder device 63 when the piston is withdrawn. In this position, roller 58 has rolled in the guide 59 such that the holder 57, and thus the entire supporting construction 55, has tilted. In this position, the installation 50 is stored in compartment 64.

The piston rod 65 of the piston cylinder device 63 is fixed to section 66; the guide 59 is fixed to a section 67. Sections 66, 67 are connected to one another by means of brackets 68.

The framework formed by sections 66, 67 and brackets 68 is supported on one side on a rail 70 by means of rollers 69 and on the other side on a rail 72 by means of rollers 71.

The rollers 71 and the rail 72 can be seen in the top view shown in Figure 8. The rails 70, 72 extend

from the left to the right side of the compartment 64, in such a way that the installation can take in a hose to the left and the right of the lorry. The continuous lines in Figure 8 show the location of the hinge pin 56 and holder 57 in the working position. The supporting construction 55 has been omitted here. The broken lines show the supporting construction 55 in the rest position, in which it is located entirely within the compartment 64.

Figure 8 also shows the cable 73, which on the one hand is wound with both ends on the discs 74, 75, which are mounted on a common shaft 76. Both discs can be driven in the same direction by means of the motor 77. On the other hand, cable 73 is passed over cable pulleys 78 and 79, and fixed to section 66. The fixing of cable 73 is shown in the side view in Figure 7.

The framework composed of sections 66 and 67 and brackets 68 can be moved backwards and forwards over the rails 70, 72 by means of motor 77 and cable 73.

Claims

1. Installation for taking up a flexible hose for conveying liquid, such as a fire hose, comprising two pairs of turning pinch elements placed opposite one another, the pinch elements of each pair defining a nip of variable nip dimension, through which nips the hose can be transported in order to expel residual liquid therefrom, which variable nip dimension can be enlarged to permit the passage of a coupling present in the hose, characterised in that the nip dimensions are variable independently of one another and the nips are positioned with respect to one another in such a way that the hose can continuously be held compressed by at least one of the nips.

2. Installation according to Claim 1, wherein two pinch elements are provided, each of which is constructed in the form of a roller body having a pliable surface, each pinch element together with another opposing pinch element defining a nip.

3. Installation according to Claim 2, wherein each roller body is connected to a rotary drive.

4. Installation according to Claim 2 or 3, wherein an associated pressure roller is located against each roller body, which pressure roller can be moved towards or away from the roller body in order, respectively, to reduce or increase the size of the nip.

5. Installation according to Claim 4, wherein each pressure roller is movable by means of its own drive.

6. Installation according to Claim 5, wherein sensors are provided for detection of a hose coupling, as well as adjustment means for increasing the size of the nip when a hose coupling is detected.

7. Installation according to Claim 4, 5 or 6, wherein each pressure roller is pressed, under pre-loading, in the direction of the associated roller body.

8. Installation according to one of the preceding claims, wherein a scraper element is located in the drive direction in front of at least one nip for scraping clean one or both sides of the hose pressed flat in the nip.

9. Installation according to one of Claims 2-8, wherein each roller body is constructed in the form of a cylinder of pliable material which is closed at both ends and is pressurised internally.

10. Installation according to one of the preceding claims, wherein the surface of each nip element has a corrugated structure in order to increase friction.

11. Installation according to one of the preceding claims, wherein a supporting construction is provided on which the pinch elements are rotatably mounted, which supporting construction is rotatably supportable about a vertical centre line which runs transversely to the centre line of the pinch elements.

12. Installation according to Claim 11, wherein the supporting construction is movable between a working position, in which, viewed in the direction of transport, the front pair of pinch elements are at a lower height than the rear pair of pinch elements, and a rest position.

13. Installation according to Claim 11 or 12, wherein the supporting construction has a rotary shaft which is supported on a holder, which holder is movably guided in an essentially vertical guide path.

14. Installation according to Claim 13, wherein the guide path is curved obliquely at its upper end and the holder on one side has a guide, such as a roller or slide block, with which it is guided in the guide path, and on the other side is supported by a cylinder jack.

15. Installation according to Claim 14, wherein the guide path and cylinder jack are mounted on a

guide frame for moving them in the transverse direction.

16. Method for taking up a fire hose into a loading bay of a vehicle by means of an installation according to one of Claims 11 to 15 mounted on said loading bay, the supporting construction being located, viewed in the normal direction of travel, at the front of the loading bay, comprising driving the vehicle forwards past the fire hose, which has been laid out on the ground, and taking up the fire hose by means of the installation at a speed which essentially corresponds to the speed at which the vehicle is moving.

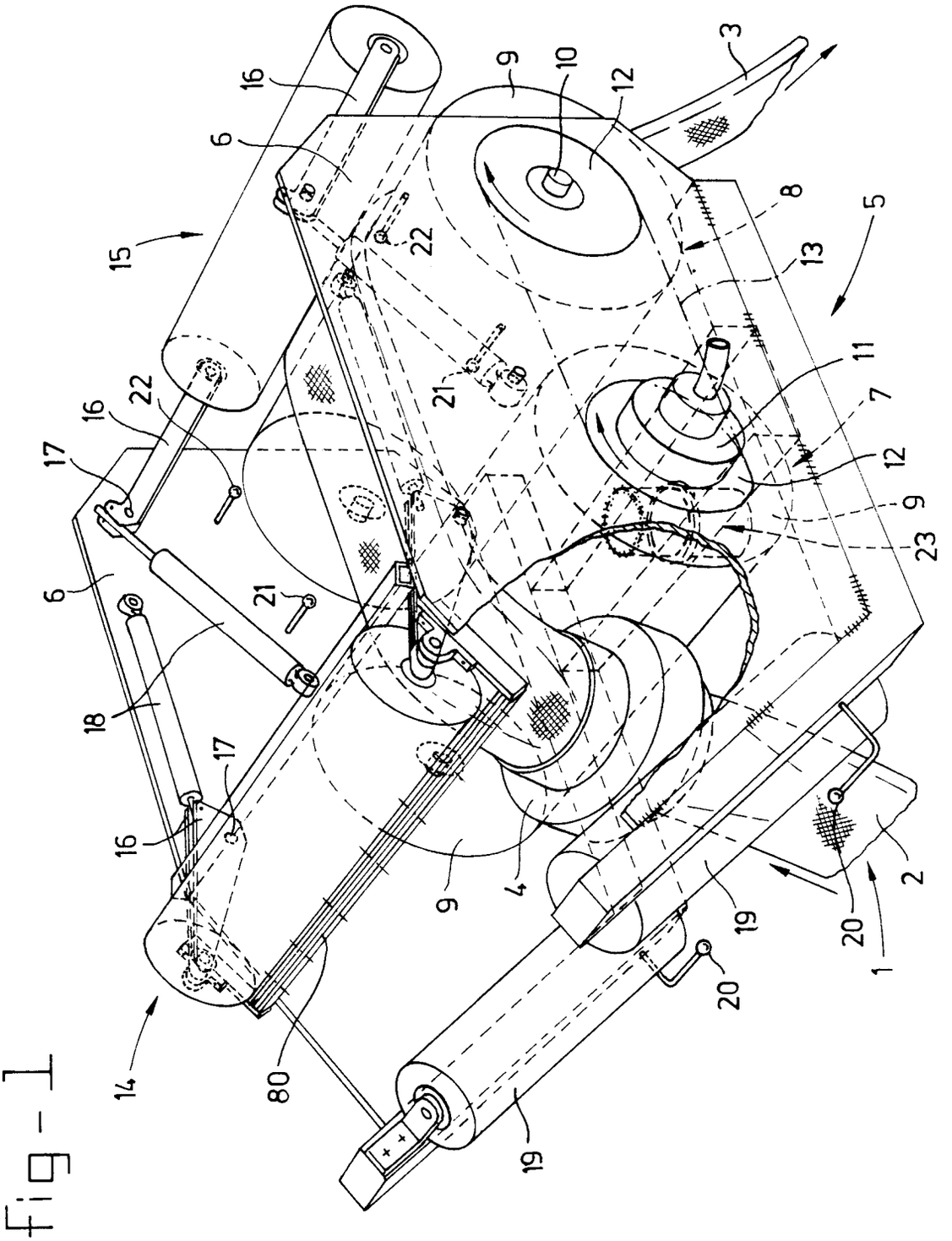


Fig - 1

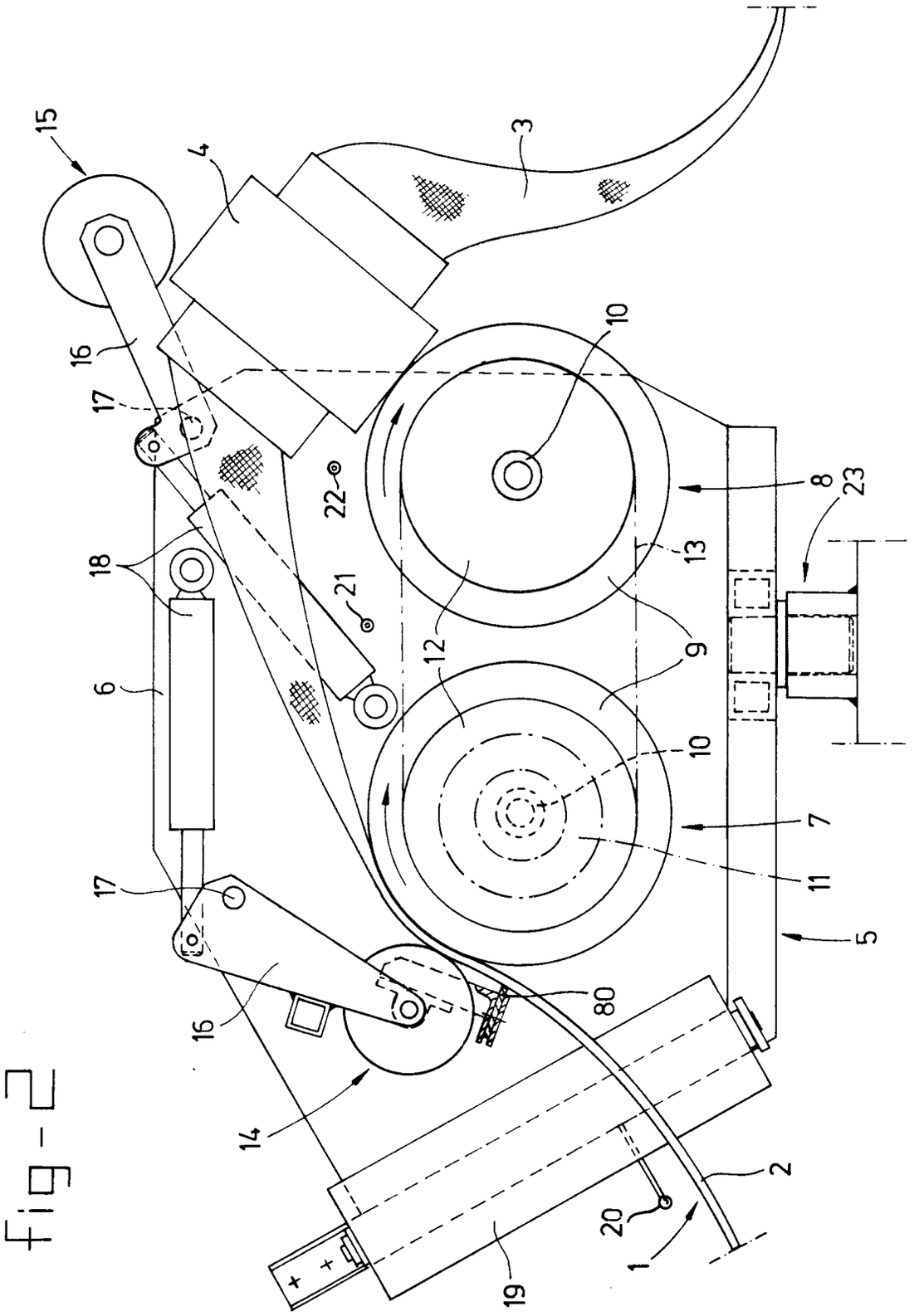


fig-2

Fig - 3

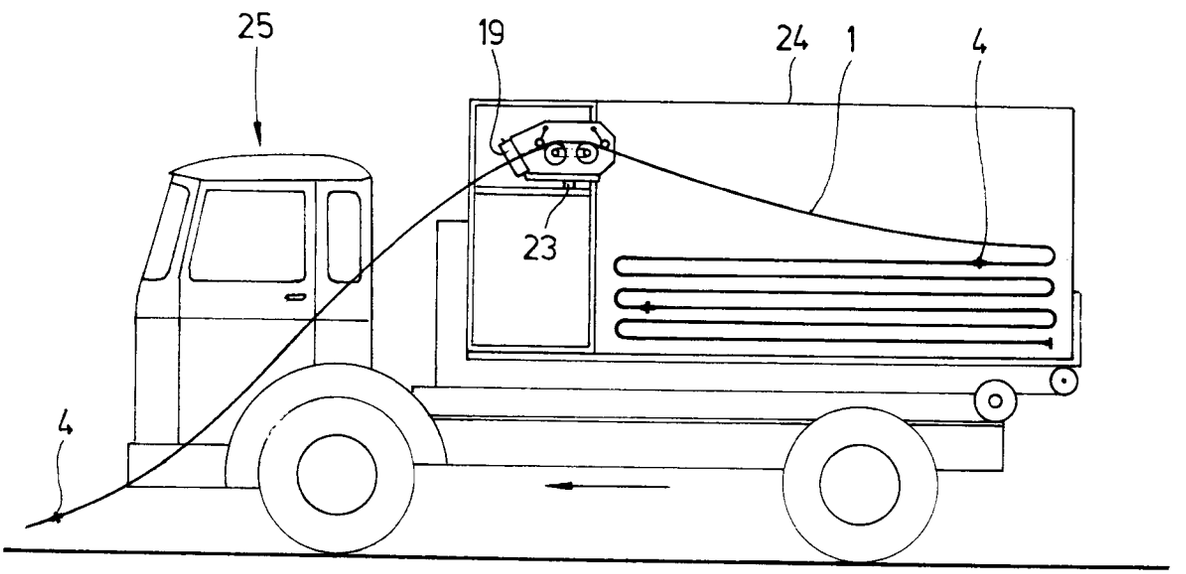


Fig-4

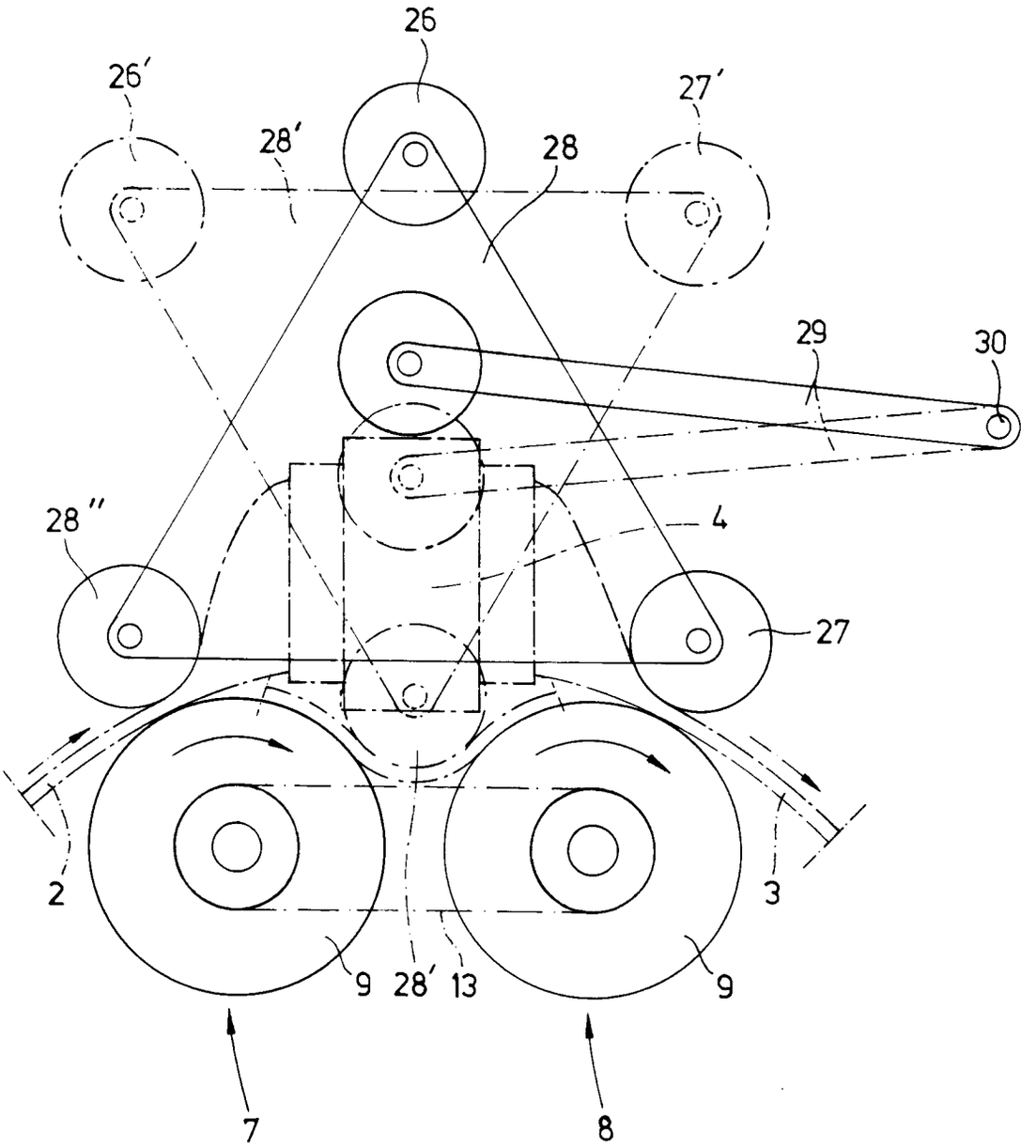


Fig-5

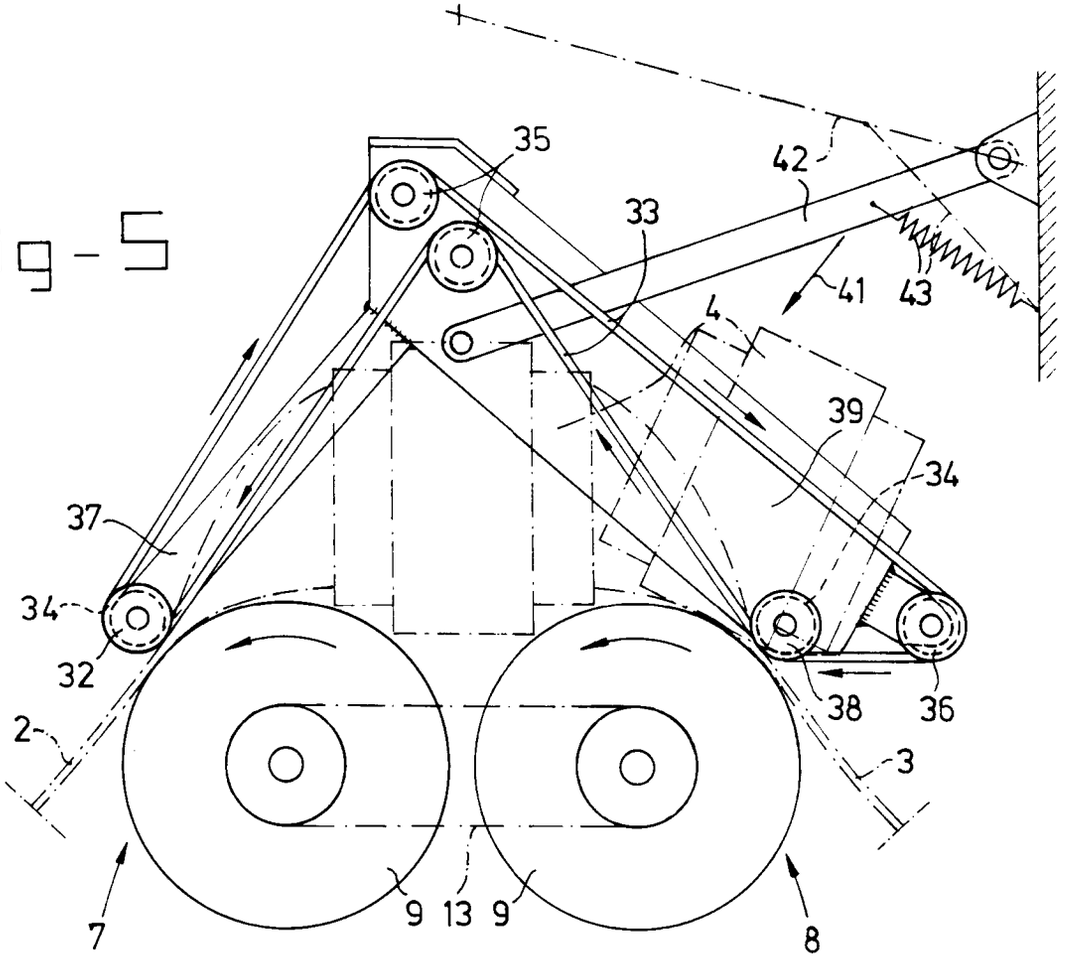


Fig-6

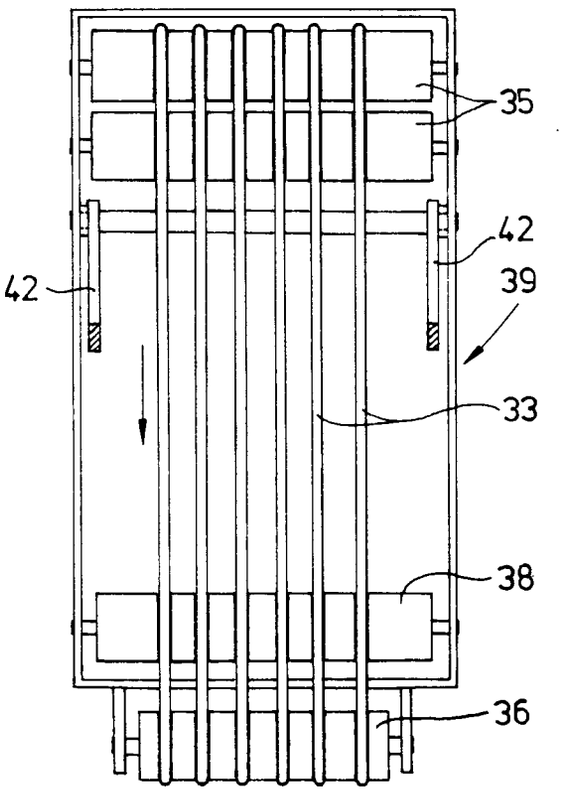
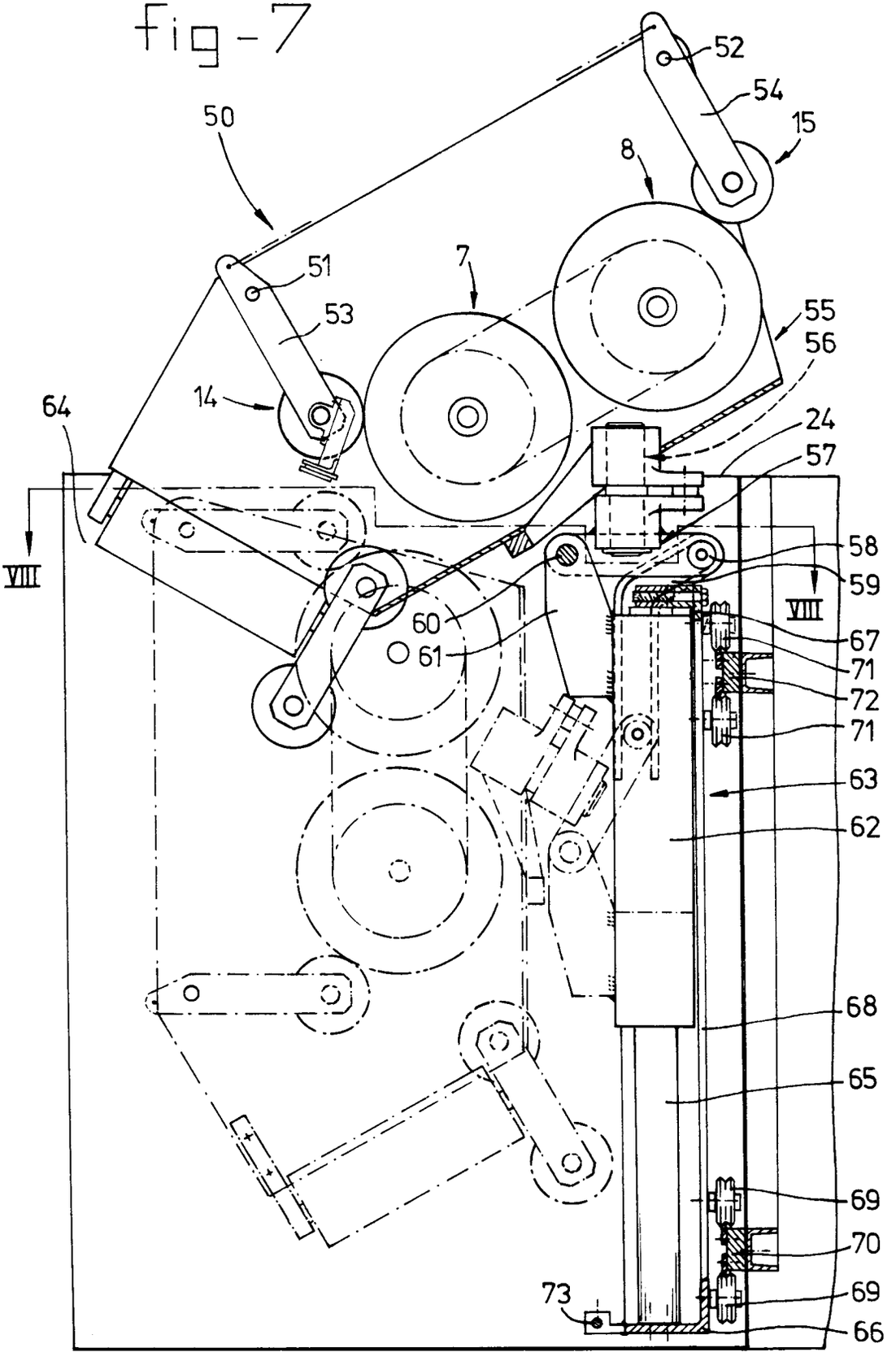


fig-7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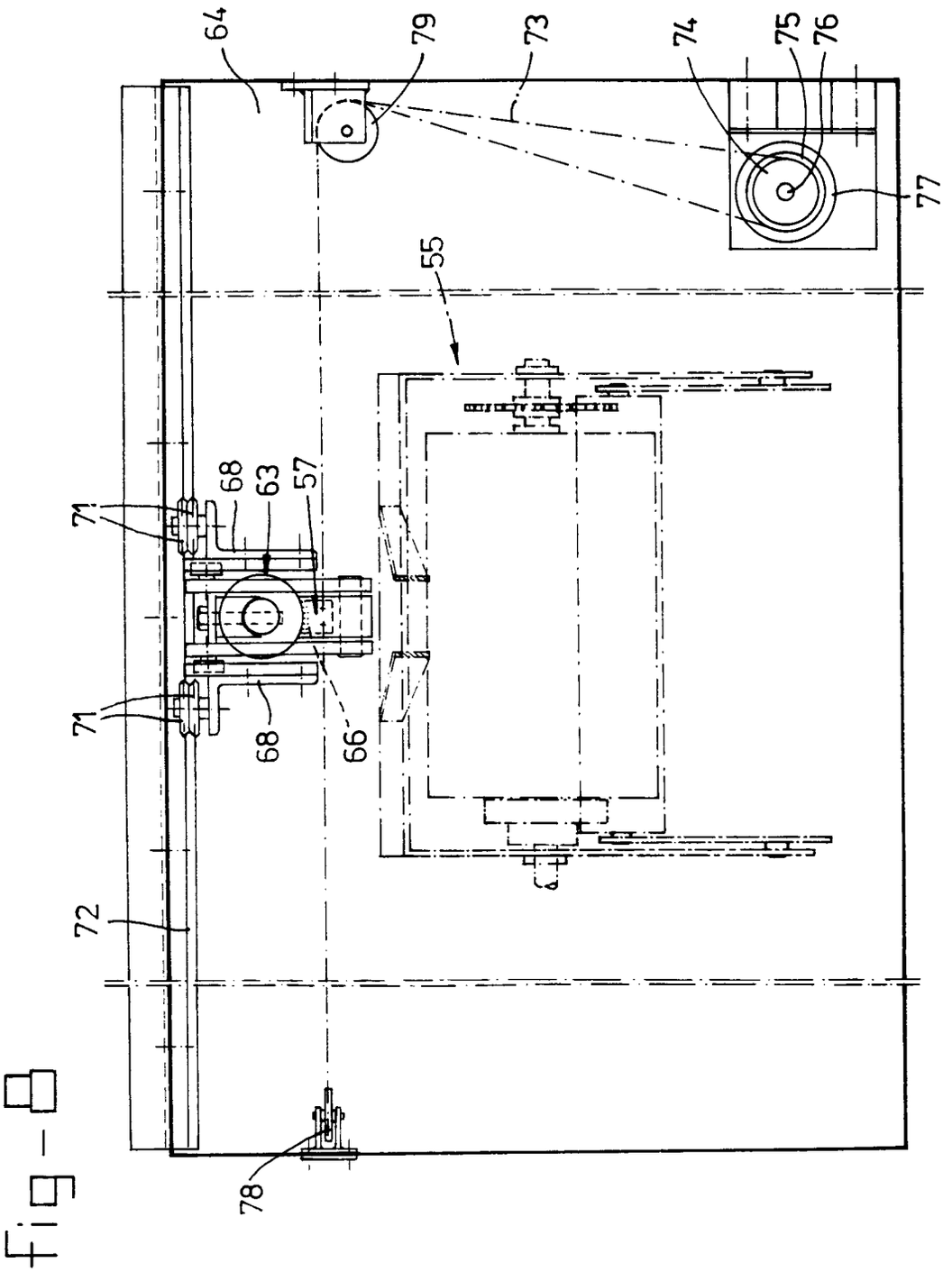

Fig - 8

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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 1796

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 A	US-A-4 452 135 (R.H.HAYES) * the whole document *	1,2 3,4,7,8, 16	A62C33/02
Y A	EP-A-0 360 603 (SHOWA KIKI SANGYO KABUSHIKI KAISHA) * column 5, line 60 - column 6, line 58; figures *	1,2 3-7	
Y A	US-A-3 866 532 (G.M.OGDEN) * the whole document *	1,2 16	
A	US-A-1 915 632 (E.MARKS)	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			A62C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 September 1994	Triantaphillou, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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