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(54) **TRANSPORTATION UNIT FOR A CABLE TRANSPORTATION SYSTEM, AND CABLE TRANSPORTATION SYSTEM COMPRISING SUCH A UNIT**

TRANSPORTEINHEIT FÜR EIN KABELTRANSPORTSYSTEM UND KABELTRANSPORTSYSTEM MIT SOLCH EINER EINHEIT

UNITÉ DE TRANSPORT POUR SYSTÈME DE TRANSPORT À CÂBLE, ET SYSTÈME DE TRANSPORT À CÂBLE COMPRENANT UNE TELLE UNITÉ

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Description

[0001] The present invention relates to a transportation unit for a cable transportation system.

[0002] More specifically, the present invention relates to a transportation unit which is moved in a travelling direction and comprises a suspension arm; a trolley connected to the suspension arm and which engages a rail at a turnaround station of the cable transportation system; and a chair connected to the suspension arm.

[0003] Transportation units of the above type are used for passenger transport, and the chair extends in width predominantly crosswise to the travelling direction. As a result of the tendency in the passenger cable transportation industry to increase passenger-carrying capacity per unit of time, transportation units now have a much larger capacity than in the past. More specifically, chair-lift chairs have gradually become wider and wider, to the point of now comprising eight seats in a row crosswise to the travelling direction.

[0004] While indeed increasing chair-lift carrying capacity, chairs with a large number of seats have the drawback that, when the chair is occupied only partly by a small number of passengers, and asymmetrically with respect to the cable, the entire transportation unit rotates about the cable into a tilted position.

[0005] This operating condition of the cable transportation system is acceptable up to a certain degree of tilt of the transportation unit, but becomes a problem when the transportation unit is detached from the cable, and the trolley engages a rail and is driven by an auxiliary drive device at the turnaround station.

[0006] The trolley engages the rail at relatively high speed, and, despite the lead-in of the rail, engagement produces a sharp change in the tilt angle of the transportation unit, including the chair, which is a major source of discomfort to passengers.

[0007] In order to eliminate the drawbacks of the known art, document FR 2,197,363, EP 1,342, 635, EP 1,151, 903, and EP 1,640,235 suggests arranging an articulated joint assembly between the chair and the trolley.

[0008] The shift in the position of the trolley from the ideal position with respect to the rail is thus reduced, thus reducing the intensity of any shock or sharp movements transmitted to the chair.

[0009] However the swinging movement of the chair may cause problem in the turnaround station in particular when all passenger do not seat simultaneously on the chair.

[0010] It is an object of the present invention to provide a transportation unit of the above-identified type that is free from the above mentioned problem.

[0011] According to the present invention there is provided a transportation unit according to claim 1.

[0012] The present invention also relates to a cable transportation system

[0013] According to the present invention, there is provided a cable transportation system according to claim 12.

[0014] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a partly sectioned front view, with parts removed for clarity, of a cable transportation system;

Figures 2 and 3 show larger-scale, partly sectioned front views, with parts removed for clarity, of a detail of the cable transportation system at two different operating stages;

Figure 4 shows a larger-scale, partly sectioned schematic of a lock device of the Figure 1 transportation unit;

Figure 5 shows a schematic of a variation of the lock device;

Figure 6 shows a schematic of a further variation of the lock device.

[0015] Number 1 in Figure 1 indicates as a whole a cable transportation system comprising a cable 2 extending along an endless path; a number of transportation units 3 (only one shown in Figure 1); and two turnaround stations 4 (only one shown in Figure 1).

[0016] Turnaround station 4 comprises a rail 5 with three linear cams 6, 7, 8 extending along a given path; and a drive device (not shown) for driving transportation units 3 inside turnaround station 4.

[0017] Each transportation unit 3 is moved in a travelling direction D1 by cable 2 along the path portions between the two turnaround stations 4, and by the drive device (not shown) along the path portions at turnaround stations 4.

[0018] Each transportation unit 3 extends in width crosswise to travelling direction D1. In Figure 1, transportation unit 3 is shown being detached from cable 2, and engages rail 5 at turnaround station 4. Each transportation unit 3 comprises a suspension arm 9; a trolley 10 connected to suspension arm 9 and supporting a clamp 11 for selectively engaging cable 2 (as shown more clearly in Figures 2 and 3); a chair 12; and an articulated joint assembly 13 between chair 12 and trolley 10. In other words, suspension arm 9 is connected rigidly to trolley 10, but is hinged to chair 12 about an axis A1 parallel to travelling direction D1 of transportation unit 3 and crosswise to the width of transportation unit 3.

[0019] Chair 12 comprises an inverted-U-shaped frame 14; a seat 15; a backrest 16; a safety bar 17 which rotates about an axis A2; and four footrest assemblies 18 fixed to safety bar 17. In the Figure 1 example, chair 12 has eight seats in a row, and is substantially symmetrical with respect to a plane of symmetry P.

[0020] In the Figure 1 example, articulated joint assembly 13 is located between chair 12 and suspension arm 9, but may be located anywhere between chair 12 and trolley 10, e.g. between two portions of suspension arm 9.

[0021] Articulated joint assembly 13 comprises a pin 19 extending along axis A1; a flange 20 fixed to suspension arm 9; a flange 21 fixed to frame 14 of chair 12; a coil spring 22 between suspension arm 9 and frame 14 of chair 12; and a shock absorber 23 between suspension arm 9 and frame 14 of chair 12.

[0022] In the Figure 1 example, shock absorber 23 is located inside coil spring 22.

[0023] In one embodiment of the present invention, articulated joint assembly 13 can be locked selectively in a given position by means of a lock device 30. More specifically, shock absorber 23 between chair 12 and trolley 10 can be locked in a given position to lock articulated joint assembly 13 as a whole.

[0024] As shown more clearly in Figure 4, shock absorber 23 is a fluid shock absorber comprising a cylinder 24; and a piston 25 which slides inside cylinder 24 and divides cylinder 24 into two chambers 26, 27 communicating via a connecting circuit 28 with a constriction 29.

[0025] With reference to Figure 1, lock device 30 selectively locks shock absorber 23 and communication between chambers 26 and 27, and comprises a two-way valve 31 maintained in a normally-open position by a spring 32; and a Bowden cable 33 for overcoming the force of spring 32 (as shown schematically in Figure 4).

[0026] As shown in Figure 1, lock device 30 comprises a lever 34, which is connected to Bowden cable 33, is hinged to suspension arm 9, and is operated by a linear cam 35.

[0027] In actual use, when occupied off-balance with respect to plane of symmetry P along the path portions between the two turnaround stations 4, chair 12 rotates about axis A1 into a tilted position with respect to plane of symmetry P, so that suspension arm 9 and trolley 10 are shifted slightly with respect to the ideal position (Figure 1). As the off-balance transportation unit 3 enters turnaround station 4, trolley 10 engages rail 5 and produces shock, the degree of which depends on the deviation of trolley 10 from its ideal position, but which is anyway absorbed by suspension arm 9 and transmitted damped by articulated joint assembly 13 to prevent shock being transmitted to chair 12.

[0028] After the passengers alight and before other passengers board transportation unit 3 at turnaround station 4, chair 12 moves into a horizontal position, and articulated joint assembly 13 is locked by lock device 30 to lock chair 12 with respect to suspension arm 9 in a substantially horizontal position, and keep chair 12 in this position, even after the passengers have boarded, along the rest of the path at turnaround station 4.

[0029] In other words, articulated joint assembly 13 is locked along the path portion at turnaround station 4 extending between the passenger-alighting portion and the exit of turnaround station 4.

[0030] Alternatively, the articulated joint assembly is locked before the passengers alight.

[0031] In the Figure 5 variation, transportation unit 3 is equipped with a lock device 36, and moves along a cable system 1 in which linear cam 35 is replaced by an electrically conductive strip 37. Instead of lever 34, Bowden cable 33, and valve 31, lock device 36 comprises a sliding electric contact 38, an electric cable 39, and a two-position, two-way, normally-open solenoid valve 40 respectively.

[0032] In this variation, solenoid valve 40 is controlled by an electric signal transmitted via strip 37, sliding electric contact 38, and electric cable 39.

[0033] In the Figure 6 variation, transportation unit 3 comprises, instead of shock absorber 23, a rubber silent-block-type shock absorber 41; and, instead of lock device 30, a lock device 42 comprising linear cam 35, lever 34, Bowden cable 33, a brake clamp 43 connected to the suspension arm, and a rod 44 connected to chair 12 - in the example shown, to frame 14 of chair 12 - and engaged by brake clamp 43.

[0034] In this variation, Bowden cable 33 provides for closing the normally-open brake clamp 43, and for gripping rod 44 to lock chair 12 in a given position with respect to suspension arm 9.

Claims

1. A transportation unit for a cable transportation system (1) is moved in a travelling direction (D1) and comprises a suspension arm (9); a trolley (10) connected to the suspension arm (9) and which engages a rail (5) at a turnaround station (4) of the cable transportation system (1); a chair (12) connected to the suspension arm (9); and an articulated joint assembly (13) between the chair (12) and the trolley (10); the transportation unit being **characterized by** comprising a lock device (30; 36; 42) for locking the articulated joint assembly (13) and the chair (12) in a given position with respect to the trolley (10).

2. A transportation unit as claimed in Claim 1, **characterized in that** the articulated joint assembly (13) comprises a hinge pin (19) substantially parallel to the travelling direction (D1).

3. A transportation unit as claimed in Claim 2, **characterized in that** the articulated joint assembly (13) comprises a first and a second flange (20, 21) connected to each other by the hinge pin (19).

4. A transportation unit as claimed in any one of Claims 1 to 3, **characterized in that** the articulated joint assembly (13) comprises an elastic member (22) between the chair (12) and the trolley (10).

5. A transportation unit as claimed in any one of the foregoing Claims, **characterized by** comprising a shock absorber (23) between the chair (12) and the trolley (10).

6. A transportation unit as claimed in Claim 5, **characterized in that** the shock absorber (23) is a fluid shock absorber comprising a cylinder (24); and a piston (25) dividing the cylinder into two communicating chambers (26, 27).

7. A transportation unit as claimed in Claim 6, **characterized in that** the shock absorber (23) comprises a circuit (28) connecting the communicating chambers (26, 27) of the cylinder (24); the transportation unit (3) comprising a lock device (30; 36) in turn comprising a valve (31; 40) located along the circuit (28) to selectively open and close the circuit (28).

8. A transportation unit as claimed in Claim 7, **characterized in that** the lock device (30; 36) comprises a spring (32) for keeping the valve (31; 40) open.

9. A transportation unit as claimed in Claim 8, **characterized in that** the lock device (30) comprises a lever (34), which is activated by a linear cam (8) at the turnaround station (4) and is connected to the valve (31) by a mechanical transmission (34) to selectively close the valve (31) and to lock the articulated joint assembly (13) in a given position.

10. A transportation unit as claimed in Claim 8, **characterized in that** said valve is a solenoid valve (40) ; the lock device (36) comprising an electric cable (39) connectable to a conductive strip (37) at the turnaround station (4) to transmit an opening signal to the solenoid valve (40).

11. A transportation unit as claimed in any one of the claims from 1 to 4, **characterized in that** the lock device (42) comprises a brake clamp (43) which grips a rod (44) to lock said articulated joint assembly (13).

12. A cable transportation system (1) comprising a cable extending along an endless path between two turnaround stations (4) to move, in a travelling direction (D1), a number of transportation units (3), each of which comprises a suspension arm (9); a trolley (10) connected to the suspension arm (9) and which engages a rail (5) at a turnaround station (4) of the cable transportation system (1); and a chair (12) connected to the suspension arm (9) ; the cable transportation system (1) being **characterized in that** each transportation unit (3) is configured as claimed in at least one of the foregoing claims.

Patentansprüche

1. Eine Transporteinheit für ein Kabeltransportsystem (1) wird in eine Fahrtrichtung (D1) bewegt und umfasst einen Aufhängungsarm (9); eine Katze (10), die mit dem Aufhängungsarm (9) verbunden ist und die an einer Wendestation (4) des Kabeltransportsystems (1) in eine Schiene (5) eingreift; einen Sessel (12), der mit dem Aufhängungsarm (9) verbunden ist; und eine gelenkige Verbindungsanordnung (13) zwischen dem Sessel (12) und der Katze (10); wobei die Transporteinheit **dadurch gekennzeichnet ist, dass** sie eine Sperr- bzw. Arretiervorrichtung (30; 36; 42) zum Arretieren der gelenkigen Verbindungsanordnung (13) und des Sessels (12) in einer vorgegebenen Position in Bezug auf die Katze (10) umfasst.

2. Transporteinheit nach Anspruch 1, **dadurch gekennzeichnet, dass** die gelenkige Verbindungsanordnung (13) einen Gelenkbolzen (19) umfasst, der im Wesentlichen parallel zu der Fahrtrichtung (D1) ist.

3. Transporteinheit nach Anspruch 2, **dadurch gekennzeichnet, dass** die gelenkige Verbindungsanordnung (13) einen ersten und einen zweiten Flansch (20, 21) umfasst, die durch den Gelenkbolzen (19) miteinander verbunden sind.

4. Transporteinheit nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die gelenkige Verbindungsanordnung (13) ein elastisches Element (22) zwischen dem Sessel (12) und der Katze (10) umfasst.

5. Transporteinheit nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie einen Stoßdämpfer (23) zwischen dem Sessel (12) und der Katze (10) umfasst.

6. Transporteinheit nach Anspruch 5, **dadurch gekennzeichnet, dass** der Stoßdämpfer (23) ein Fluidstoßdämpfer ist, der einen Zylinder (24) und einen Kolben (25), der den Zylinder in zwei miteinander in Verbindung stehende Kammern (26, 27) unterteilt, umfasst.

7. Transporteinheit nach Anspruch 6, **dadurch gekennzeichnet, dass** der Stoßdämpfer (23) einen Kreis (28) umfasst, der die miteinander in Verbindung stehenden Kammern (26, 27) des Zylinders (24) verbindet, wobei die Transporteinheit (3) eine Arretiervorrichtung (30; 36) umfasst, die ihrerseits ein Ventil (31; 40) umfasst, das entlang des Kreises (28) angeordnet ist, um den Kreis (28) selektiv zu öffnen und zu schließen.

8. Transporteinheit nach Anspruch 7, **dadurch gekennzeichnet, dass** die Arretiervorrichtung (30; 36) eine Feder (32) umfasst, um das Ventil (31; 40) offen zu halten.

9. Transporteinheit nach Anspruch 8, **dadurch gekennzeichnet, dass** die Arretiervorrichtung (30) einen Hebel (34) umfasst, der von einer linearen Nokke (8) an der Wendestation (4) aktiviert wird und der durch eine mechanische Übertragungsvorrichtung (34) mit dem Ventil (31) verbunden ist, um das Ventil (31) selektiv zu schließen und die gelenkige Verbindungsanordnung (13) in einer vorgegebenen Position zu arretieren.

10. Transporteinheit nach Anspruch 8, **dadurch gekennzeichnet, dass** das Ventil ein Magnetventil (40) ist; wobei die Arretiervorrichtung (36) ein elektrisches Kabel (39) umfasst, das mit einem leitfähigen Streifen (37) an der Wendestation (4) verbindbar ist, um ein Öffnungssignal an das Magnetventil (40) zu senden.

11. Transporteinheit nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Arretiervorrichtung (42) eine Bremsklammer (43) umfasst, die eine Stange (44) greift, um die gelenkige Verbindungsanordnung (13) zu arretieren.

12. Kabeltransportsystem (1), das ein Kabel umfasst, das sich entlang eines endlosen Wegs zwischen zwei Wendestationen (4) erstreckt, um eine Anzahl von Transporteinheiten (3) in einer Fahrtrichtung (D1) zu bewegen, wobei jede von ihnen einen Aufhängungsarm (9); eine Katze (10), die mit dem Aufhängungsarm (9) verbunden ist und die an einer Wendestation (4) des Kabeltransportsystems (1) in eine Schiene (5) eingreift; und einen Sessel (12), der mit dem Aufhängungsarm (9) verbunden ist, umfasst; wobei das Kabeltransportsystem (1) **dadurch gekennzeichnet ist, dass** jede Transporteinheit (3) aufgebaut ist wie in wenigstens einem der vorhergehenden Ansprüche beansprucht.

Revendications

1. Unité de transport pour système de transport par câble (1), laquelle se déplace dans une direction de déplacement (D1) et comprend un bras de suspension (9) ; un chariot (10) qui est raccordé au bras de suspension (9) et qui s'engage avec un rail (5) au niveau d'une station de rotation (4) du système de transport par câble (1) ; une chaise (12) raccordée au bras de suspension (9) ; et un ensemble formant joint articulé (13) entre la chaise (12) et le chariot (10) ; l'unité de transport étant **caractérisée en ce qu'**elle comprend un dispositif de verrouillage (30 ; 36 ; 42) destiné à verrouiller l'ensemble formant joint articulé (13) et la chaise (12) dans une position donnée par rapport au chariot (10).

2. Unité de transport selon la revendication 1, **caractérisée en ce que** l'ensemble formant joint articulé (13) comprend une tige d'articulation (19) sensiblement parallèle à la direction de déplacement (D1).

3. Unité de transport selon la revendication 2, **caractérisée en ce que** l'ensemble formant joint articulé (13) comprend des première et deuxième brides (20, 21) raccordées l'une à l'autre par la tige d'articulation (19).

4. Unité de transport selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** l'ensemble formant joint articulé (13) comprend un élément élastique (22) disposé entre la chaise (12) et le chariot (10).

5. Unité de transport selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend un absorbeur de choc (23) disposé entre la chaise (12) et le chariot.

6. Unité de transport selon la revendication 5, **caractérisée en ce que** l'absorbeur de choc (23) est un absorbeur de choc hydraulique comprenant un cylindre (24) ; et un piston (25) divisant le cylindre en deux chambres communicantes (26, 27).

7. Unité de transport selon la revendication 6, **caractérisée en ce que** l'absorbeur de choc (23) comprend un circuit (28) raccordant les chambres communicantes (26, 27) du cylindre (24) ; l'unité de transport (3) comprenant un dispositif de verrouillage (30 ; 36) comprenant de son côté un clapet (31 ; 40) disposé dans le circuit (28) pour ouvrir et fermer sélectivement le circuit (28).

8. Unité de transport selon la revendication 7, **caractérisée en ce que** le dispositif de verrouillage (30 ; 36) comprend un ressort (32) destiné à maintenir le clapet (31 ; 40) ouvert.

9. Unité de transport selon la revendication 8, **caractérisée en ce que** le dispositif de verrouillage (30) comprend un levier (34), qui est activé par une came linéaire (8) au niveau de la station de rotation (4) et qui est connectée au clapet (31) par une transmission mécanique (34) pour fermer sélectivement le clapet (31) et verrouiller l'ensemble formant joint articulé (13) dans une position donnée.

10. Unité de transport selon la revendication 8, **caractérisée en ce que** ledit clapet est un clapet électromagnétique (40) ; le dispositif de verrouillage (36) comprenant un câble électrique (39) pouvant être raccordé à une bande conductrice (37) au niveau de la station de rotation (4) pour transmettre un signal d'ouverture au clapet électromagnétique (40).

11. Unité de transport selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** le dispositif de verrouillage (42) comprend une pince de freinage (43) qui saisit une barre (44) pour verrouiller ledit ensemble formant joint articulé (13).

12. Système de transport par câble (1) comprenant un câble s'étendant le long d'un chemin sans fin entre deux stations de rotation (4) pour déplacer, dans une direction de déplacement (D1), un certain nombre d'unités de transport (3), qui comprennent chacune un bras de suspension (9) ; un chariot (10) qui est raccordé au bras de suspension (9) et qui s'engage avec un rail (5) au niveau d'une station de rotation (4) du système de transport par câble (1) ; et une chaise (12) raccordée au bras de suspension (9) ; le système de transport par câble (1) étant **caractérisé en ce que** chaque unité de transport (3) est configuré comme revendiqué dans l'au moins une des revendications précédentes.

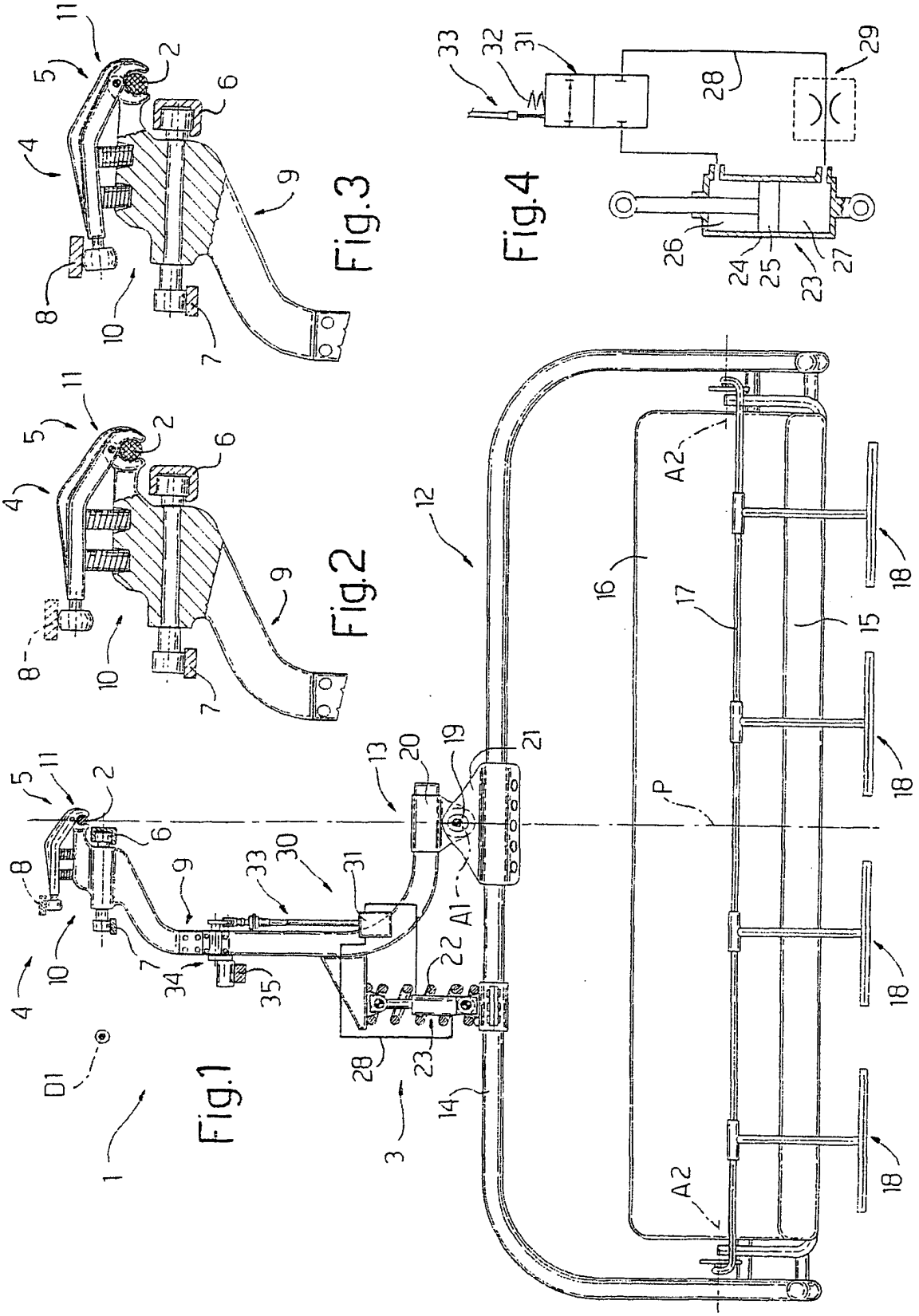
Fig.1
Fig.2
Fig.3
Fig.4
D1
A1
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Fig. 6

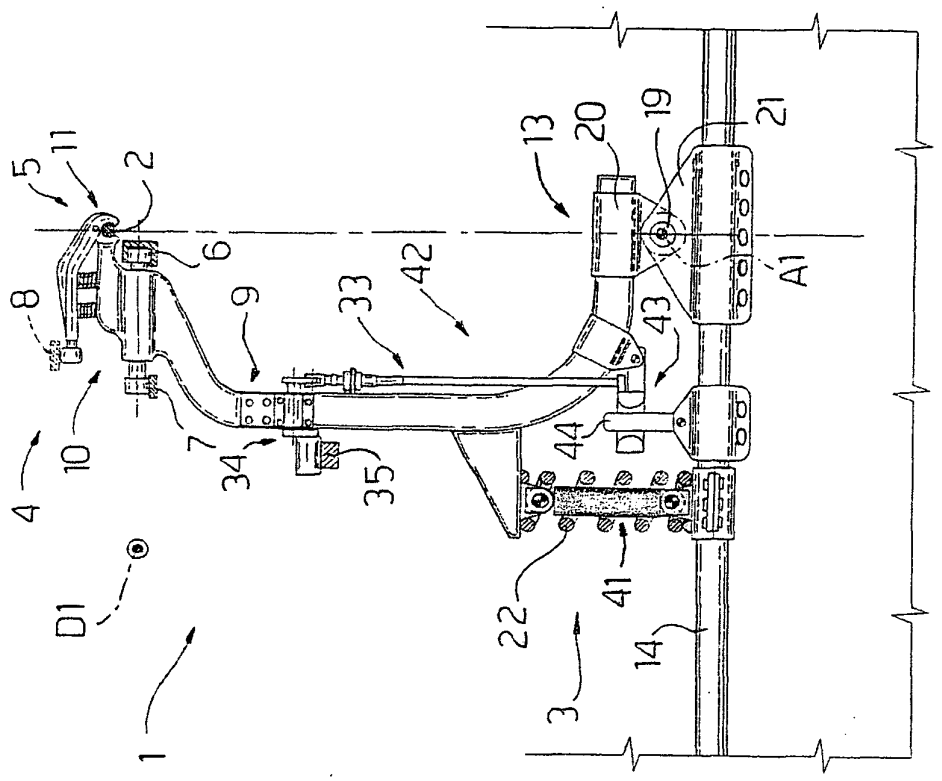
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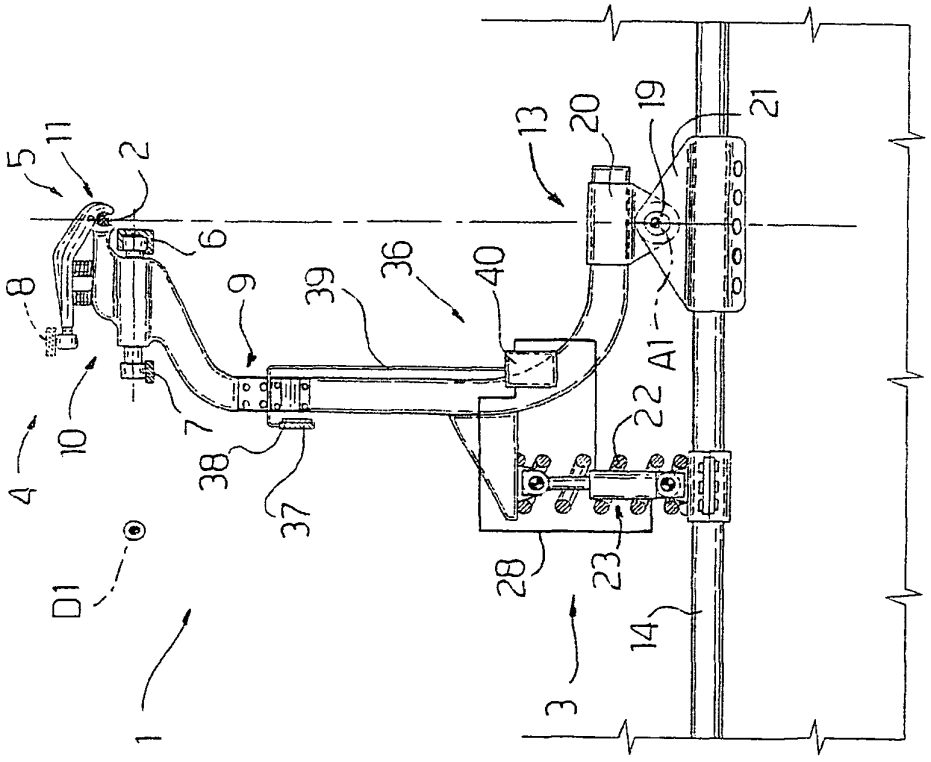
Fig. 5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