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(54) CABLE TRANSPORTATION SYSTEM COMPRISING A RESCUE VEHICLE AND METHOD OF OPERATING IT

KABELTRANSPORTSYSTEM MIT EINEM BERGUNGSFAHRZEUG UND BETRIEBSVERFAHREN DAFÜR

SYSTÈME DE TRANSPORT À CÂBLE COMPRENANT UN VÉHICULE DE SECOURS ET PROCÉDÉ DE FONCTIONNEMENT

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Description

TECHNICAL FIELD

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

[0002] More specifically, the present invention relates to a cable transportation system comprising at least one supporting cable; a haul cable; a rescue haul cable; a transportation unit; at least one rescue vehicle movable along the supporting cable and hauled by the rescue haul cable; and a station comprising a main track adjacent to the supporting cable and for supporting the transportation unit.

BACKGROUND ART

[0003] The transportation unit is transferred from the supporting cable to the main track at the station, and cooperates with actuating devices. The main track normally extends along a U-shaped path, and the actuating devices comprise a release/connecting device for releasing/connecting the transportation unit from/to the haul cable; and an auxiliary actuating device for moving the transportation unit along the main track once the transportation unit is released from the haul cable.

[0004] Cable transportation systems of the above type are often also equipped with a rescue vehicle which, in the event of stoppage of the haul cable, recovers the transportation unit and returns it to the station turnaround point to allow the passengers to alight.

[0005] To do this, known rescue vehicles are supported by the supporting cable and hauled by the rescue haul cable, which is operated by a drive pulley connected to a generator set.

[0006] The rescue vehicle is normally parked close to a station, and, when needed, is hoisted by a lifting device onto the supporting cable and connected to the rescue haul cable. The rescue vehicle setup procedure is particularly time-consuming, and involves a relatively long wait for passengers in the distressed transportation unit.

[0007] A cable transportation system of the above-identified type is disclosed in EP 265354.

DISCLOSURE OF THE INVENTION

[0008] It is an object of the present invention to provide a cable transportation system designed to eliminate the drawbacks of the known art, and which, in particular, provides for fast intervention of the rescue vehicle.

[0009] According to the present invention, there is provided a cable transportation system comprising at least one supporting cable; a haul cable; a rescue haul cable; a transportation unit; at least one rescue vehicle movable along the supporting cable and hauled by the rescue haul cable; and a station comprising a main track adjacent to the supporting cable and for supporting the transportation unit; the cable transportation system being characterized by comprising an auxiliary track for supporting the rescue vehicle in a rest position; the auxiliary track being adjacent to the main track and selectively connectable to the main track by means of a switch device.

[0010] The present invention also relates to a method of operating a cable transportation system.

[0011] According to the present invention, there is provided a method of operating a cable transportation system comprising at least one supporting cable; a haul cable; a rescue haul cable; a transportation unit; at least one rescue vehicle movable along the supporting cable and hauled by the rescue haul cable; and a station comprising a main track adjacent to the supporting cable and for supporting the transportation unit; the method comprising the step of moving the rescue vehicle along the supporting cable to recover said transportation unit in the event of a breakdown of the cable transportation system; and the method being characterized by comprising the steps of parking the rescue vehicle on an auxiliary track adjacent to the main track; connecting the auxiliary track to the main track by means of a switch device; and moving the rescue vehicle along the main track.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] 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 schematic side view, with parts removed for clarity, of a cable transportation system in accordance with the present invention;

Figure 2 shows a larger-scale view in perspective of a detail of the Figure 1 cable transportation system;

Figure 3 shows a larger-scale, schematic plan view, with parts removed for clarity, of a detail of the Figure 1 cable transportation system;

Figure 4 shows a larger-scale, schematic side view, with parts removed for clarity, of a detail of the Figure 1 cable transportation system;

Figure 5 shows a larger-scale, front view, with parts in section and parts removed for clarity, of a detail of the Figure 1 system;

Figure 6 shows a larger-scale, schematic front view, with parts in section and parts removed for clarity, of a detail of the Figure 1 system.

BEST MODE FOR CARRYING OUT THE INVENTION

[0013] Number 1 in Figure 1 indicates as a whole a cable transportation system comprising a bottom station 2; a top station 3; two intermediate roller assemblies 4 fitted to respective pylons 5; two supporting cables 6 (only one shown in Figure 1) ; a haul cable 7; a rescue haul cable 8; and a transportation unit 9 having a trolley 10 fitted to supporting cables 6 and hauled, in use, by haul cable 7, to which trolley 10 is connected by a clamp 11.

[0014] Cable transportation system 1 comprises a res-

cue vehicle 12, which, in the event of a breakdown of cable transportation system 1, provides for recovering and transferring transportation unit 9 to bottom station 2 or top station 3.

[0015] Though Figure 1 shows only one rescue vehicle 12, it is understood that the system may comprise a number of rescue vehicles 12 parked respectively at bottom station 2, top station 3, and even at any intermediate stations.

[0016] With reference to Figure 2, rescue vehicle 12 rests on supporting cables 6, is hauled by rescue haul cable 8 in a direction D, and comprises a trolley 13; an anchoring device 14 for engaging a transportation unit 9 (not shown in Figure 2); a connecting device 15 for connecting trolley 13 to rescue haul cable 8; and a rescue crew platform 16 fitted to trolley 13 to rotate about an axis A1, so that platform 16 is positioned horizontally regardless of the tilt angle of trolley 13.

[0017] In the example shown, trolley 13 supports in rotary manner four assemblies 17 (only two shown in Figure 2), each of which comprises two rollers 18 connected by a rocker arm and engaging one of supporting cables 6.

[0018] Anchoring device 14 comprises a tow hook 19 integral with trolley 13; and a tow hook 20 connected to trolley 13 by an arm 21 to pivot about an axis A2, and connected to arm 21 to pivot about an axis A3.

[0019] By means of the two tow hooks 19 and 20, trolley 13 of rescue vehicle 12 is connectable to trolley 10 of transportation unit 9 along two opposite sides.

[0020] Connecting device 15 comprises a first connecting assembly 22 fixed to rescue haul cable 8; a second connecting assembly 23 hinged to trolley 13 and engaging first connecting assembly 22 in sliding manner; and a third connecting assembly 24 anchored to trolley 13 and engaging first connecting assembly 22 in sliding manner. Rescue haul cable 8 hauls rescue vehicle 12 selectively by means of first and second connecting assembly 22, 23 or first and third connecting assembly 22, 24, depending on the pull direction of rescue haul cable 8 and the slope of supporting cables 6.

[0021] Rescue vehicle 12 also comprises a counterweight 25 connected in articulated manner to trolley 13, on the same side of trolley 13 as platform 16.

[0022] With reference to Figure 6, trolley 13 of rescue vehicle 12 comprises four rollers 26 (only two shown in Figure 6) located inwards of rollers 18 and rotating about respective axes parallel to the axes of rollers 18.

[0023] With reference to Figure 1, bottom station 2 and top station 3 comprise respective supporting structures 2b and 3b for supporting the ends of supporting cables 6, and supporting and returning haul cable 7 and rescue haul cable 8.

[0024] With reference to Figure 3, bottom station 2 comprises a U-shaped main track 27 supported by supporting structure 2b (not shown in Figure 3) and having two parallel, side by side rails 28; and two auxiliary tracks 29, each comprising two rails 30 of the same gauge as rails 28 and connectable selectively to main track 27.

[0025] In the Figure 3 example, track 27 comprises two straight portions 31 connected by a curved portion 32; and auxiliary tracks 29 are straight and aligned with respective straight portions 31 of main track 27.

[0026] Bottom station 2 comprises two switch devices 33 for selectively connecting respective auxiliary tracks 29 to main track 27; and each switch device 33 comprises a movable portion 34 of auxiliary track 29, and a movable portion 35 of main track 27.

[0027] Movable portion 34 comprises two rails 36 hinged to respective rails 30 about respective vertical axes.

[0028] Movable portion 35 of main track 27 extends along curved portion 32, is adjacent to straight portion 31 of main track 27, and comprises two portions of rails 28.

[0029] Movable portion 35 is activated by means of actuators 37, and is movable between a work position (shown by the dash line in Figure 4), in which main track 27 is seamless, and a lowered position (shown by the continuous line in Figure 4), in which main track 27 is interrupted.

[0030] With reference to Figure 3, movable portion 34 is activated either by actuators (not shown) or by hand, and is movable between a rest position (shown by the continuous line in Figure 3), and a work position (shown by the dash line in Figure 3), in which it connects rails 30 of auxiliary track 29 to rails 28 of main track 27.

[0031] Bottom station 2 comprises actuating devices which cooperate with transportation unit 9 as it travels through bottom station 2. In the example shown, the actuating devices comprise an auxiliary actuating device 38 for moving transportation unit 9 along when transportation unit 9 is located on main track 27 and released from haul cable 7; and two release/connecting devices 39 for selectively releasing/connecting transportation unit 9 from/to haul cable 7. Auxiliary actuating device 38 is defined by a number of tyres 40, which are located over main track 27, are activated by haul cable 7, and are connected to one another in known manner, not shown in the drawings, to impart a given movement to transportation unit 9 along main track 27.

[0032] Each release/connecting device 39 comprises a linear cam 41, which is located over main track 27, substantially centrally with respect to rails 28, and has two opposite faces 42, the distance between which varies along cam 41.

[0033] In Figure 5, trolley 10 of transportation unit 9 is shown along main track 27 and engaging both auxiliary actuating device 38 and cam 41.

[0034] Trolley 10 comprises rollers 43 for engaging supporting cables 6; and rollers 44 for engaging rails 28 and rails 30. Clamp 11 of trolley 10 comprises a fixed jaw 45; and a movable jaw 46 connected to a roller 47. Trolley 10 also supports a roller 48 facing roller 47, and cam 41 is positioned so as to wedge between roller 48 and roller 47. The increasing distance between the opposite faces

42 of cam 41 moves roller 47 with respect to roller 48 to open clamp 11, and the subsequent decreasing distance between the opposite faces of the cam closes the clamp. Trolley 10 is fixed to an arm 49 supporting the cab (not shown) of transportation unit 9.

[0035] With reference to Figure 3, rescue haul cable 8 extends about two pulleys 50 - one of which is driven by an actuator, normally a generator set not shown - and over straight portions 31 of main track 27, and auxiliary tracks 29.

[0036] In Figure 4, haul cable 7 is guided by pulleys 51 and extends about a pulley 52; and rescue vehicle 12 is shown in a rest position resting on auxiliary track 29.

[0037] Each auxiliary track 29, in fact, defines a parking area for rescue vehicle 12, which, when needed, is moved along main track 27 and supporting cables 6, and, once transportation unit 9 is recovered, tows it onto main track 27. In Figure 4, rescue vehicle 12 is shown without platform 16 for the sake of clarity.

[0038] With reference to Figures 5 and 6, cam 41 is movable between the Figure 5 work position, and the Figure 6 rest position allowing transit of rescue vehicle 12 along main track 27.

[0039] Release/connecting device 39 comprises two arms 53 fixed to cam 41 and mounted to rotate, about an axis A4 parallel to cam 41, with respect to a frame 54 integral with supporting structure 2b.

[0040] Release/connecting device 39 is activated by actuators 55, which, in the example shown, are hydraulic cylinders connected to arms 53 and supporting structure 2b.

[0041] The above description specifically describes a bottom station 2 equipped with two auxiliary tracks 29, each defining a respective parking area for a respective rescue vehicle 12. It is understood, however, that bottom station 2 may be equipped with only one auxiliary track 29; or top station 3 may comprise at least one auxiliary track 29, and bottom station 2 none; or both bottom station 2 and top station 3 may comprise at least one auxiliary track 29.

[0042] In actual use, haul cable 7 of cable transportation system 1 is moved along an endless path P, and transportation unit 9 is moved along path P between bottom station 2 and top station 3. At stations 2 and 3, transportation unit 9 is released from haul cable 7, is moved by auxiliary actuating device 38 along main track 27, is decelerated to allow passengers to alight or board transportation unit 9, and is then accelerated and connected to haul cable 7.

[0043] In the event of a breakdown of cable transportation system 1, i.e. stoppage of haul cable 7, the rescue vehicle 12 parked on auxiliary track 29 comes into play. With reference to Figure 3, switch device 33 must be activated before operating rescue vehicle 12 : that is, movable portion 35 of main track 27 is lowered, and movable portion 34 of auxiliary track 29 is rotated to join auxiliary track 29 to straight portion 31 of main track 27.

[0044] Moreover, cam 41 is moved from the work position over main track 27 - in which cam 41 cooperates with transportation unit 9 to selectively release/connect transportation unit 9 from/to haul cable 7 (Figure 5) - into the rest position, in which cam 41 allows transit of rescue vehicle 12 along main track 27 (Figure 6).

[0045] Once movable portion 34 is locked into the work position, and cam 41 into the rest position, rescue haul cable 8 is moved along path P, and rescue vehicle 12 travels successively along auxiliary track 29, main track 27, and supporting cables 6 up to transportation unit 9 (Figure 1). Anchoring device 14 is fixed to trolley 10 of transportation unit 9, and rescue vehicle 12 is drawn by rescue haul cable 8, together with transportation unit 9, back to station 2. Once transportation unit 9 is located on main track 27, rescue vehicle 12 is released from transportation unit 9 and moved onto auxiliary track 29. Switch device 33 is then activated to restore the continuity of main track 27, and transportation unit 9 is pushed onto curved portion 32 of main track 27.

[0046] Switch device 33 is then activated again to connect auxiliary track 29 to main track 27, and rescue vehicle 12 performs another rescue cycle to recover another transportation unit 9.

[0047] By virtue of the present invention, rescue vehicle 12 is made available to move immediately into operation, and is also weather-protected by being housed inside the station.

Claims

1. A cable transportation system (1) comprising at least one supporting cable (6); a haul cable (7); a rescue haul cable (8); a transportation unit (9); at least one rescue vehicle (12) movable along the supporting cable (6) and hauled by the rescue haul cable (8); and a station (2; 3; 2, 3) comprising a main track (27) adjacent to the supporting cable (6) and for supporting the transportation unit (9); the cable transportation system (1) being **characterized by** comprising an auxiliary track (29) for supporting the rescue vehicle (12) in a rest position; the auxiliary track (29) being adjacent to the main track (27) and selectively connectable to the main track (27) by means of a switch device (33).

2. A cable transportation system as claimed in Claim 1, **characterized in that** the main track (27) comprises two straight portions (31), and a curved portion (32) between the two straight portions (31); said auxiliary track (29) being aligned with one of said straight portions (31).

3. A cable transportation system as claimed in Claim 1 or 2, **characterized in that** the main track (27) and the auxiliary track (29) are coplanar.

4. A cable transportation system as claimed in any one

of Claims 1 to 3, **characterized in that** said switch device (33) comprises a first movable portion (35) of the main track (27), which is movable selectively between a work position, in which the first movable portion (35) is aligned with the rest of the main track (27), and a rest position, in which the first movable portion (35) interrupts the continuity of the main track (27); and a second movable portion (34) of the auxiliary track (29), which is movable selectively between a work position, in which it joins the auxiliary track (29) to one of the straight portions (31) of the main track (27), and a rest position, in which the second movable portion (34) disconnects the auxiliary track (29) from the main track (27).

5. A cable transportation system as claimed in any one of the foregoing Claims, **characterized by** comprising actuating devices (38, 39) extending at least partly along the main track (27); and at least one of the actuating devices (38, 39) is movable selectively between a work position, in which said actuating device (39) cooperates with said transportation unit (9), and a rest position, in which said actuating device (39) permits transit of the rescue vehicle (12) along the main track (27).

6. A cable transportation system as claimed in Claim 5, **characterized in that** the transportation unit (9) comprises a trolley (10), and a clamp (11) fitted to the trolley (10) and selectively releasable/connectable from/to the haul cable (7); the actuating device (39) comprising a cam (41) which, in said work position, cooperates with the clamp (11) to activate the clamp (11); and arms (53) for supporting the cam (41), and which pivot about an axis (A4) to selectively move the cam (41) between the work position and the rest position.

7. A cable transportation system as claimed in Claim 6, **characterized by** comprising actuators (55) connected to said arms (53).

8. A cable transportation system as claimed in any one of the foregoing Claims, **characterized by** comprising a further auxiliary track (29) for supporting a further rescue vehicle (12); the further auxiliary track (29) being adjacent to the main track (27) and connectable selectively to the main track (27) by means of a further switch device (33).

9. A cable transportation system as claimed in any one of the foregoing Claims, **characterized by** comprising two supporting cables (6); said main track (27) being defined by two side by side first rails (28); and said auxiliary track (29) being defined by two second rails (30) of the same gauge as said first rails (28).

10. A cable transportation system as claimed in Claim 9, **characterized in that** said haul cable (7) is located below the supporting cable (6), and said rescue haul cable (8) is located over the supporting cable (6).

11. A cable transportation system as claimed in any one of the foregoing Claims, **characterized in that** the rescue vehicle (12) comprises a further trolley (13); and a counterweight (25) connected to said further trolley (13).

12. A cable transportation system as claimed in any one of the foregoing Claims, **characterized by** comprising two stations (2, 3); each of the two stations (2, 3) being equipped with at least one auxiliary track (29) for supporting at least one respective rescue vehicle (12) in a rest position.

13. A method of operating a cable transportation system comprising at least one supporting cable (6); a haul cable (7); a rescue haul cable (8); a transportation unit (9); at least one rescue vehicle (12) movable along the supporting cable (6) and hauled by the rescue haul cable (8); and a station (2; 3; 2, 3) comprising a main track adjacent to the supporting cable and for supporting the transportation unit; the method comprising the step of moving the rescue vehicle (12) along the supporting cable (6) to recover said transportation unit (9) in the event of a breakdown of the cable transportation system (1); and the method being **characterized by** comprising the steps of parking the rescue vehicle (12) on an auxiliary track (29) adjacent to the main track (27); connecting the auxiliary track (29) to the main track (27) by means of a switch device (33); and moving the rescue vehicle (12) along the main track (27).

14. A method as claimed in Claim 13, **characterized in that** the switch device (33) provides for selectively aligning a first movable portion (35) of the main track (27) with the rest of the main track (27) in a work position, and disconnecting the first movable portion (35) in a rest position, in which the first movable portion (35) interrupts the continuity of the main track (27); and for selectively aligning a second portion (34) of the auxiliary track (29) in a work position, in which it joins the auxiliary track (29) to a straight portion (31) of the main track (27), and disconnecting the second portion (34) in a rest position, in which the second portion (34) disconnects the auxiliary track (29) from the main track (27).

15. A method as claimed in Claim 13 or 14, **characterized by** selectively moving a cam (41) between a work position over the main track (27), in which the cam (41) cooperates with said transportation unit (9) to selectively release/connect the transportation unit (9) from/to the haul cable (7), and a rest position, in

which the cam (41) permits transit of the rescue vehicle (12) along the main track (27).

16. A method as claimed in Claim 15, **characterized by** rotating the cam (41) about an axis (A4) parallel to the cam (41); said cam (41) being a linear cam.

Patentansprüche

1. Seiltransportsystem (1), das zumindest ein Tragseil (6); ein Förderseil (7); ein Bergungs-Förderseil (8); eine Transporteinheit (9); zumindest ein Bergungsfahrzeug (12), das entlang des Tragseils (6) bewegbar ist, und das durch das Bergungs-Förderseil (8) getrieben wird; und eine Station (2; 3; 2, 3) umfasst, die einen Hauptstrang oder eine Hauptspur (*main track*) (27) umfasst, der zum Tragseil (6) benachbart ist und der die Transporteinheit (9) trägt; wobei das Seiltransportsystem (1) **dadurch gekennzeichnet ist, dass** es einen zusätzlichen Strang oder Hilfsstrang (*auxiliary track*) (29) umfasst, um das Bergungsfahrzeug (12) in einer Ruhestellung zu tragen; wobei der zusätzliche Strang (29) zum Hauptstrang (27) benachbart ist und selektiv mittels einer Umschaltvorrichtung (33) an den Hauptstrang (27) anschließbar ist.

2. Seiltransportsystem nach Anspruch 1, **dadurch gekennzeichnet, dass** der Hauptstrang (27) zwei gerade Teilstücke (31) umfasst, und zwischen den beiden geraden Teilstücken (31) ein gekrümmtes Teilstück (32); wobei der genannte zusätzliche Strang (29) mit einem der genannten Teilstücke (31) ausgefluchtet ist.

3. Seiltransportsystem nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Hauptstrang (27) und der zusätzliche Strang (29) komplanar sind.

4. Seiltransportsystem nach einem der Ansprüche von 1 bis 3, **dadurch gekennzeichnet, dass** die genannte Umschaltvorrichtung (33) ein erstes bewegliches Teilstück (35) des Hauptstrangs (27) umfasst, das selektiv zwischen einer Arbeitsstellung, in der das erste bewegliche Teilstück (35) mit dem restlichen Hauptstrang (27) fluchtet, und einer Ruhestellung, in der das erste bewegliche Teilstück (35) die Kontinuität des Hauptstrangs (27) unterbricht, bewegbar ist; und ein zweites bewegliches Teilstück (34) des zusätzlichen Strangs (29) umfasst, das selektiv zwischen einer Arbeitsstellung, in der es den zusätzlichen Strang (29) an eines der geraden Teilstücke (31) des Hauptstrangs (27) anschließt, und einer Ruhestellung, bei der das zweite bewegliche Teilstück (34) den zusätzlichen Strang (29) vom Hauptstrang (27) trennt, bewegbar ist.

5. Seiltransportsystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es Antriebsvorrichtungen (38, 39) umfasst, die sich wenigstens zum Teil entlang des Hauptstrangs (27) erstrecken; und dass zumindest eine der Antriebsvorrichtungen (38, 39) selektiv zwischen einer Arbeitsstellung, in der die genannte Antriebsvorrichtung (39) mit der genannten Transporteinheit (9) zusammenwirkt, und einer Ruhestellung bewegbar ist, in der die genannte Antriebsvorrichtung (39) dem Bergungsfahrzeug (12) die Durchfahrt entlang des Hauptstrangs (27) erlaubt.

6. Seiltransportsystem nach Anspruch 5, **dadurch gekennzeichnet, dass** die Transporteinheit (9) einen Wagen (*trolley*) (10) und einen an den Wagen (10) angebrachten Spannbügel (11) umfasst, der selektiv von/mit dem Förderseil (7) trennbar/verbindbar ist; wobei die Antriebsvorrichtung (39) einen Nocken (41) umfasst, der in der genannten Arbeitsstellung mit dem Spannbügel (11) zusammenwirkt um den Spannbügel (11) zu aktivieren; und Arme (53), um den Nocken (41) zu tragen, die um eine Achse (A4) schwenkbar sind, um selektiv den Nokken (41) zwischen der Arbeitsstellung und der Ruhestellung zu bewegen.

7. Seiltransportsystem nach Anspruch 6, **dadurch gekennzeichnet, dass** es Aktoren (55) umfasst, die mit den genannten Armen (53) verbunden sind.

8. Seiltransportsystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es einen weiteren zusätzlichen Strang (29) umfasst um ein weiteres Bergungsfahrzeug (12) zu tragen; wobei der weitere zusätzliche Strang (29) zum Hauptstrang (27) benachbart und selektiv mit dem Hauptstrang (27) mittels einer weiteren Umschaltvorrichtung (33) verbindbar ist.

9. Seiltransportsystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es zwei Tragseile (6) umfasst; wobei der genannte Hauptstrang (27) durch zwei nebeneinander angeordnete ersten Schienen (28) definiert ist; und wobei der genannte zusätzliche Strang (29) durch zwei zweite Schienen (30) definiert ist, die die gleiche Spurweite (gauge) aufweisen wie die genannten ersten Schienen (28).

10. Seiltransportsystem nach Anspruch 9, **dadurch gekennzeichnet, dass** das genannte Förderseil (7) unterhalb des Tragseils (6) angeordnet ist, und dass das genannte Bergungs-Förderseil (8) oberhalb der Tragseils (6) angeordnet ist.

11. Seiltransportsystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass**

das Bergungsfahrzeug einen weiteren Wagen (13) umfasst; und ein mit dem genannten weiteren Wagen (13) verbundenes Gegengewicht (25).

12. Seiltransportsystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es zwei Stationen (2, 3) umfasst; wobei jede der beiden Stationen (2, 3) mit mindestens einem zusätzlichen Strang (29) ausgerüstet ist, um jeweils mindestens ein Bergungsfahrzeug (12) in einer Ruhestellung zu tragen.

13. Verfahren zum Betrieb eines Seiltransportsystems, dass mindestens ein Tragseil (6); ein Förderseil (7); ein Bergungs-Förderseil (8); eine Transporteinheit (9); zumindest ein Bergungsfahrzeug (12), das entlang des Tragseils (6) bewegbar ist, und das durch das Bergungs-Förderseil (8) getrieben wird; und eine Station (2; 3; 2, 3) umfasst, die einen Hauptstrang umfasst, der zum Tragseil benachbart ist und zum Tragen der Transporteinheit dient; wobei das Verfahren den Schritt umfasst, der darin besteht, das Bergungsfahrzeug (12) entlang des Tragseils (6) zu bewegen, um die genannte Transporteinheit (9) im Falle einer Störung des Seiltransportsystems (1) bergen zu können; und wobei das Verfahren **dadurch gekennzeichnet ist, dass** es die Schritte umfasst, die darin bestehen, das Bergungsfahrzeug (12) an einem zum Hauptstrang (27) benachbarten zusätzlichen Strang (29) zu parken; den zusätzlichen Strang (29) mit dem Hauptstrang (27) durch eine Umschaltvorrichtung (33) zu verbinden; und das Bergungsfahrzeug (12) entlang des Hauptstrangs (27) zu bewegen.

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet, dass** die Umschaltvorrichtung (33) selektiv für das Ausrichten eines ersten bewegbaren Teilstücks (35) des Hauptstrangs (27) mit dem restlichen Hauptstrang (27) in einer Arbeitsstellung sorgt, und für eine Trennung des ersten bewegbaren Teilstücks (35) in einer Ruhestellung, in der das erste bewegbare Teilstück (35) die Kontinuität des Hauptstrangs (27) unterbricht; und selektiv für das Ausrichten eines zweiten bewegbaren Teilstücks (34) des zusätzlichen Strangs (29) in einer Arbeitsstellung, in der sie den zusätzlichen Strang (29) mit einem geraden Teilstück (31) des Hauptstrangs (27) verbindet, und für eine Trennung des zweiten Teilstücks (34) in einer Ruhestellung, in der das zweite Teilstück (34) den zusätzlichen Strang (29) vom Hauptstrang (27) trennt.

15. Verfahren nach Anspruch 13 oder 14, **dadurch gekennzeichnet, dass** ein Nocken (41) selektiv zwischen einer Arbeitsstellung oberhalb des Hauptstrangs (27), in der der Nocken mit der genannten Transporteinheit (9) zusammenwirkt, um die Transporteinheit (9) selektiv von/mit dem Förderseil (7) freizugeben/zu verbinden, und einer Ruhestellung bewegt wird, in der der Nocken (41) die Durchfahrt des Bergungsfahrzeug (12) entlang des Hauptstrangs (27) erlaubt.

16. Verfahren nach Anspruch 15, **gekennzeichnet durch** eine Rotation des Nocken (41) um eine zum Nocken (41) parallele Achse (A4), wobei der genannte Nokken (41) ein linearer Nocken ist.

Revendications

1. Système de transport à câbles (1) comprenant au moins un câble de support (6) ; un câble de traction (7) ; un câble de traction de secours (8) ; une unité de transport (9) ; au moins un véhicule de secours (12) mobile le long du câble de support (6) et tracté par le câble de traction de secours (8) ; et une station (2 ; 3 ; 2, 3) comprenant une piste principale (27) adjacente au câble de support (6) et destinée à supporter l'unité de transport (9) ; le système de transport à câbles (1) étant **caractérisé en ce qu'**il comprend une piste auxiliaire (29) destinée à supporter le véhicule de secours (12) dans une position de repos ; la piste auxiliaire (29) étant adjacente à la piste principale (27) et pouvant être raccordée sélectivement à la piste principale (27) au moyen d'un dispositif de commutation (33).

2. Système de transport à câbles selon la revendication 1, **caractérisé en ce que** la piste principale (27) comprend deux portions rectilignes (31), et une portion incurvée (32) située entre les deux portions rectilignes (31) ; ladite piste auxiliaire (29) étant alignée avec l'une desdites portions rectilignes (31).

3. Système de transport à câbles selon la revendication 1 ou 2, **caractérisé en ce que** la piste principale (27) et la piste auxiliaire (29) sont coplanaires.

4. Système de transport à câbles selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** ledit dispositif de commutation (33) comprend une première portion mobile (35) de la piste principale (27), qui est mobile sélectivement entre une position de travail, dans laquelle la première portion mobile (35) est alignée avec le reste de la piste principale (27), et une position de repos dans laquelle la première portion mobile (35) interrompt la continuité de la piste principale (27) ; et une seconde portion mobile (34) de la piste auxiliaire (29), qui est mobile sélectivement entre une position de travail, dans laquelle elle raccorde la piste auxiliaire (29) à l'une des portions rectilignes (31) de la piste principale (27), et une position de repos, dans laquelle la seconde portion mobile (34) déconnecte la piste

auxiliaire (29) de la piste principale (27).

5. Système de transport à câbles selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des dispositifs d'actionnement (38, 39) s'étendant au moins partiellement le long de la piste principale (27) ; et au moins un des dispositifs d'actionnement (38, 39) est mobile sélectivement entre une position de travail, dans laquelle ledit dispositif d'actionnement (39) coopère avec ladite unité de transport (9), et une position de repos, dans laquelle le dispositif d'actionnement (39) permet le passage du véhicule de secours (12) le long de la piste principale (27).

6. Système de transport à câbles selon la revendication 5, **caractérisé en ce que** l'unité de transport (9) comprend un chariot (10), et un élément de serrage (11) monté sur le chariot (10) et pouvant être sélectivement libéré du câble de traction (7) et raccordé à celui-ci ; le dispositif d'actionnement (39) comprend une came (41) qui, dans la position de travail, coopère avec l'élément de serrage (11) pour activer l'élément de serrage (11) ; et des bras (53) destinés à supporter la came (41), et pivotant autour d'un axe (A4) pour déplacer sélectivement la came (41) entre la position de travail et la position de repos.

7. Système de transport à câbles selon la revendication 6, **caractérisé en ce qu'**il comprend des actionneurs (55) raccordés auxdits bras (53).

8. Système de transport à câbles selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend une piste auxiliaire supplémentaire (29) destinée à supporter un véhicule de secours supplémentaire (12) ; la piste auxiliaire supplémentaire (29) étant adjacente à la piste principale (27) et pouvant être raccordée sélectivement à la piste principale (27) au moyen d'un dispositif de commutation supplémentaire (33).

9. Système de transport à câbles selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend un câble de support (6) ; ladite piste principale (27) étant définie par deux premiers rails (28) disposés côte à côte ; et ladite piste auxiliaire (29) étant définie par deux seconds rails (30) de même écartement que lesdits premiers rails (28).

10. Système de transport à câbles selon la revendication 9, **caractérisé en ce que** ledit câble de traction (7) est situé au-dessous du câble de support (6), et ledit câble de traction de secours (8) est situé au-dessus du câble de support (6).

11. Système de transport à câbles selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le véhicule de secours (12) comprend un chariot supplémentaire (13) ; et un contrepoids (25) raccordé audit chariot supplémentaire (13).

12. Système de transport à câbles selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend deux stations (2, 3) ; chacune des deux stations (2, 3) étant équipée d'au moins une piste auxiliaire (29) destinée à supporter au moins un véhicule de secours respectif (12) dans une position de repos.

13. Procédé de fonctionnement d'un système de transport à câbles comprenant au moins un câble de support (6) ; un câble de traction (7) ; un câble de traction de secours (8) ; une unité de transport (9) ; au moins un véhicule de secours (12) mobile le long du câble de support (6) et tracté par le câble de traction de secours (8) ; et une station (2 ; 3 ; 2, 3) comprenant une piste principale adjacente au câble de support et destinée à supporter l'unité de transport ; le procédé comprenant l'étape consistant à déplacer le véhicule de secours (12) le long du câble de support (6) pour récupérer ladite unité de transport (9) en cas de panne du système de transport à câbles (1) ; et le procédé est **caractérisé en ce qu'**il comprend les étapes consistant à parquer le véhicule de secours (12) sur une piste auxiliaire (29) adjacente à la piste principale (27) ; raccorder la piste auxiliaire (29) à la piste principale (27) au moyen d'un dispositif de commutation (33) ; et déplacer le véhicule de secours (12) le long de la piste principale (27).

14. Procédé selon la revendication 13, **caractérisé en ce que** le dispositif de commutation (33) permet d'aligner sélectivement une première portion mobile (35) de la piste principale (27) avec le reste de la piste principale (27) dans une position de travail, et de déconnecter la première portion mobile (35) dans une position de repos, dans laquelle la première portion mobile (35) interrompt la continuité de la piste principale (27) ; et d'aligner sélectivement une seconde portion (34) de la piste auxiliaire (29) dans une position de travail, dans laquelle elle raccorde la piste auxiliaire (29) à une portion rectiligne (31) de la piste principale (27), et de déconnecter la seconde portion (34) dans une position de repos, dans laquelle la seconde portion (34) déconnecte la piste auxiliaire (29) de la piste principale (27).

15. Procédé selon la revendication 13 ou 14, **caractérisé par** le déplacement sélectif d'une came (41) entre une position de travail au-dessus de la piste principale (27), dans laquelle la came (41) coopère avec ladite unité de transport (9) pour libérer/connecter sélectivement l'unité de transport (9) du/au câble de traction (7), et une position de repos, dans laquelle la came (41) permet le passage du véhicule

de secours (12) le long de la piste principale (27).

16. Procédé selon la revendication 15, **caractérisé par** la rotation de la came (41) autour d'un axe (A4) parallèle à la came (41) ; ladite came (41) étant une came linéaire.

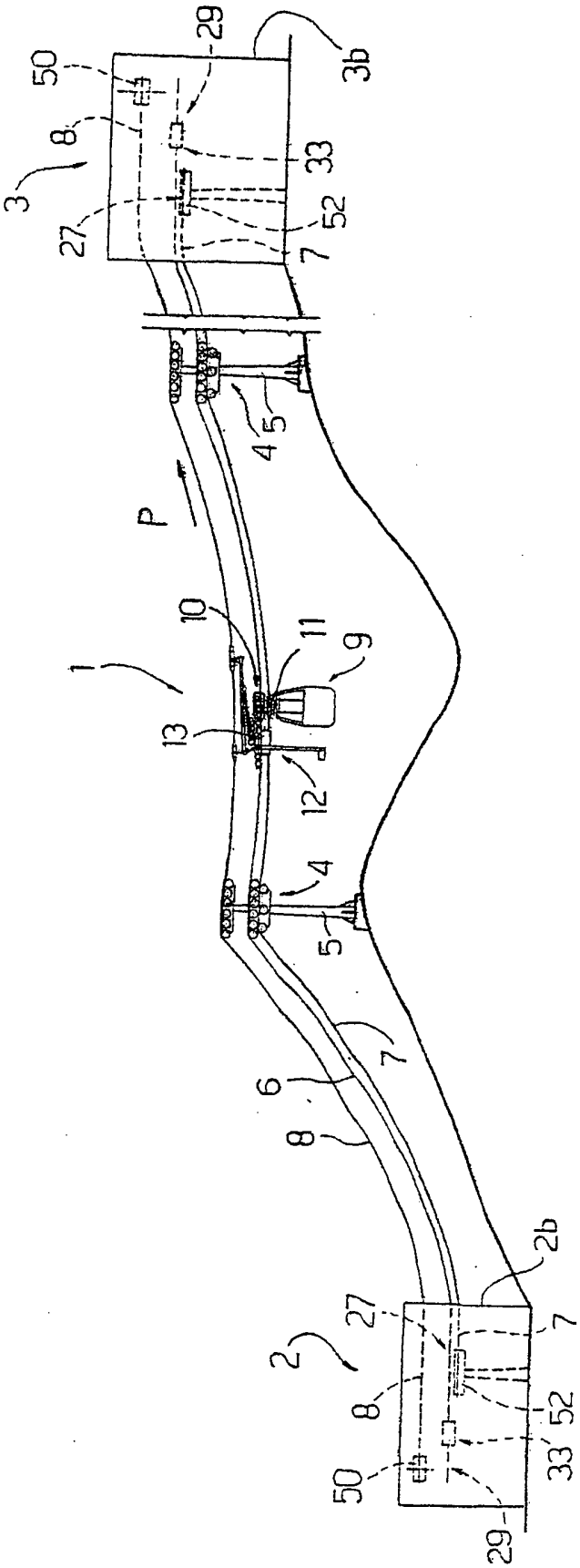
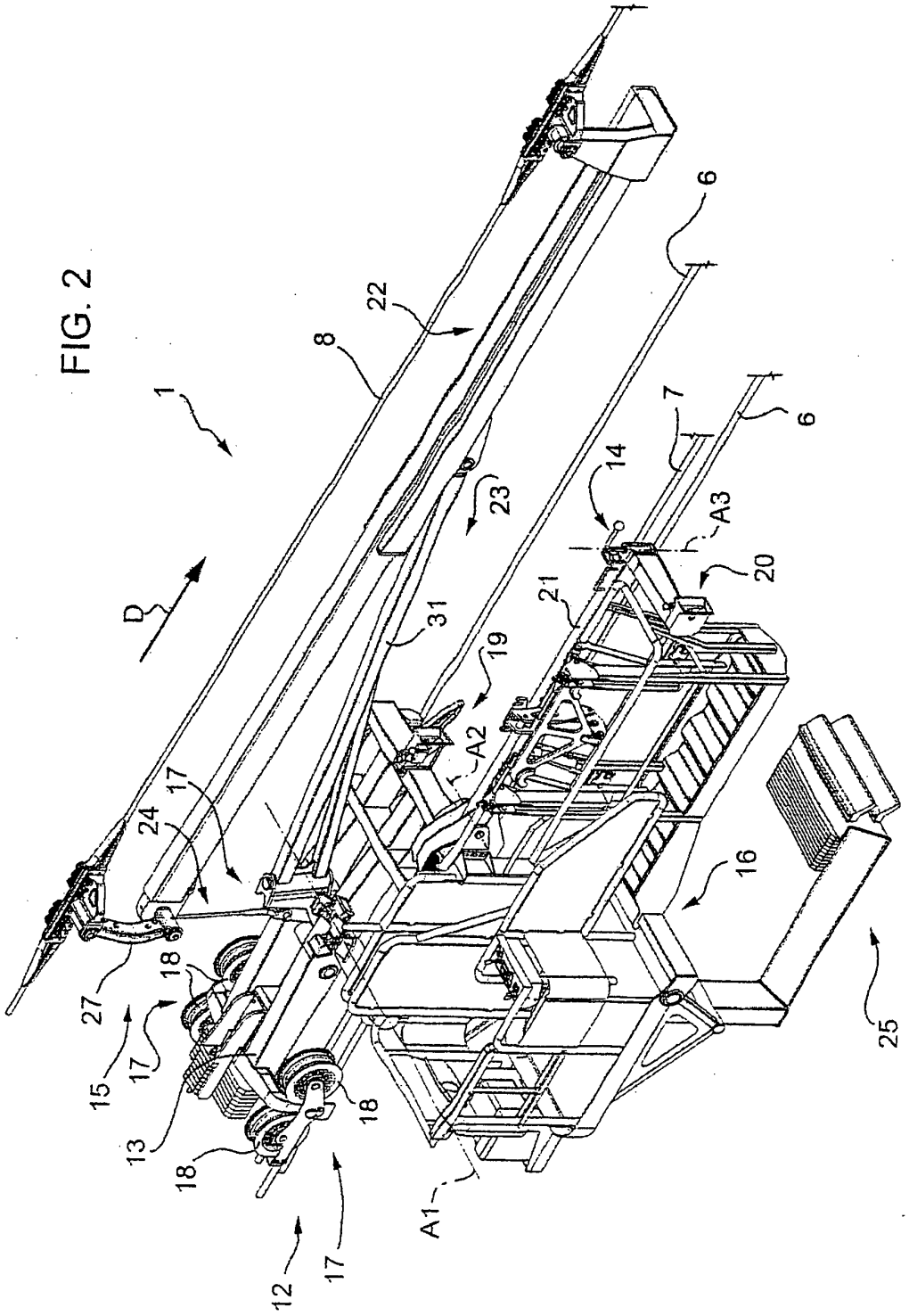


Fig.1

FIG. 2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A1
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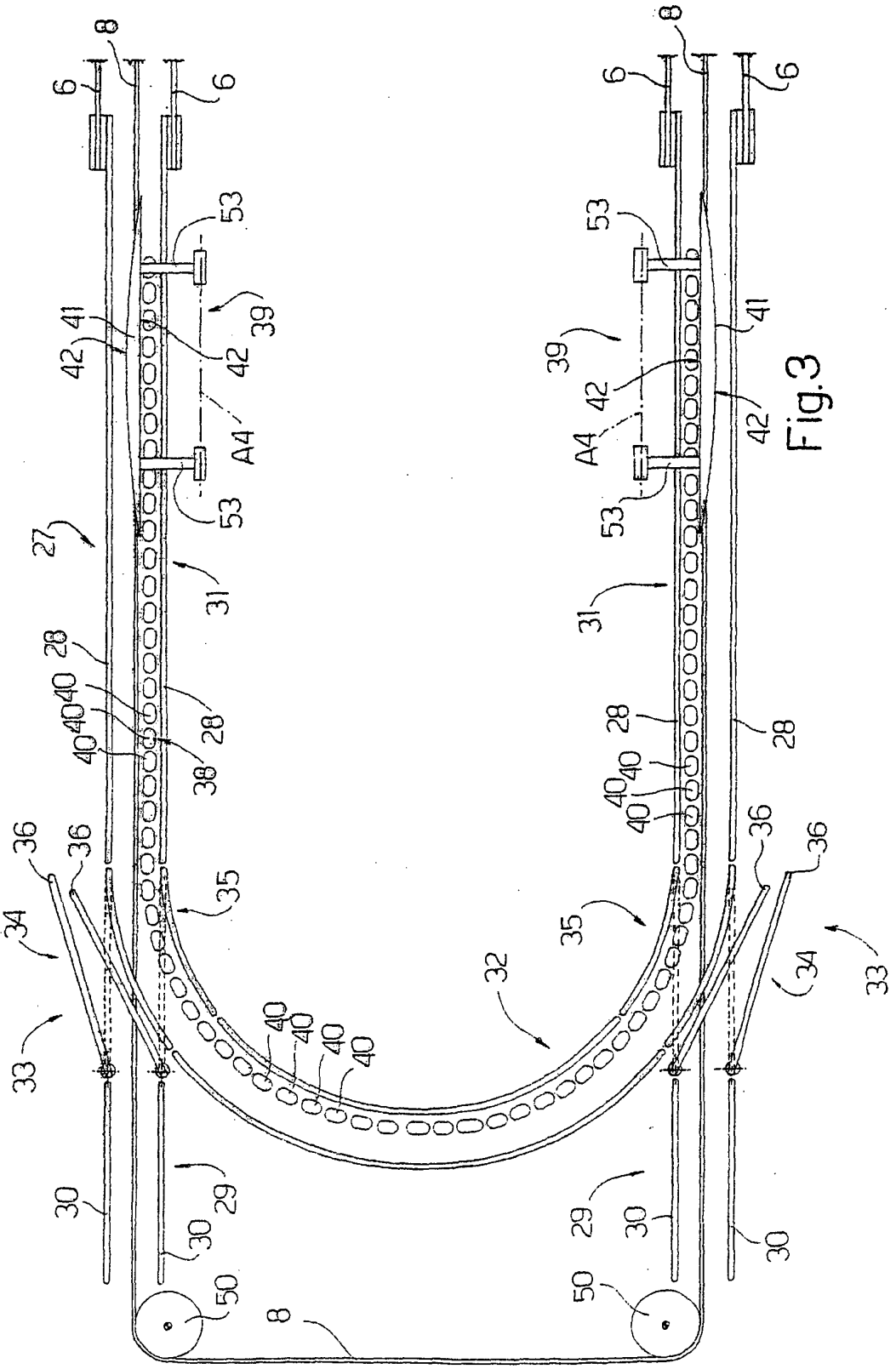

Fig.3

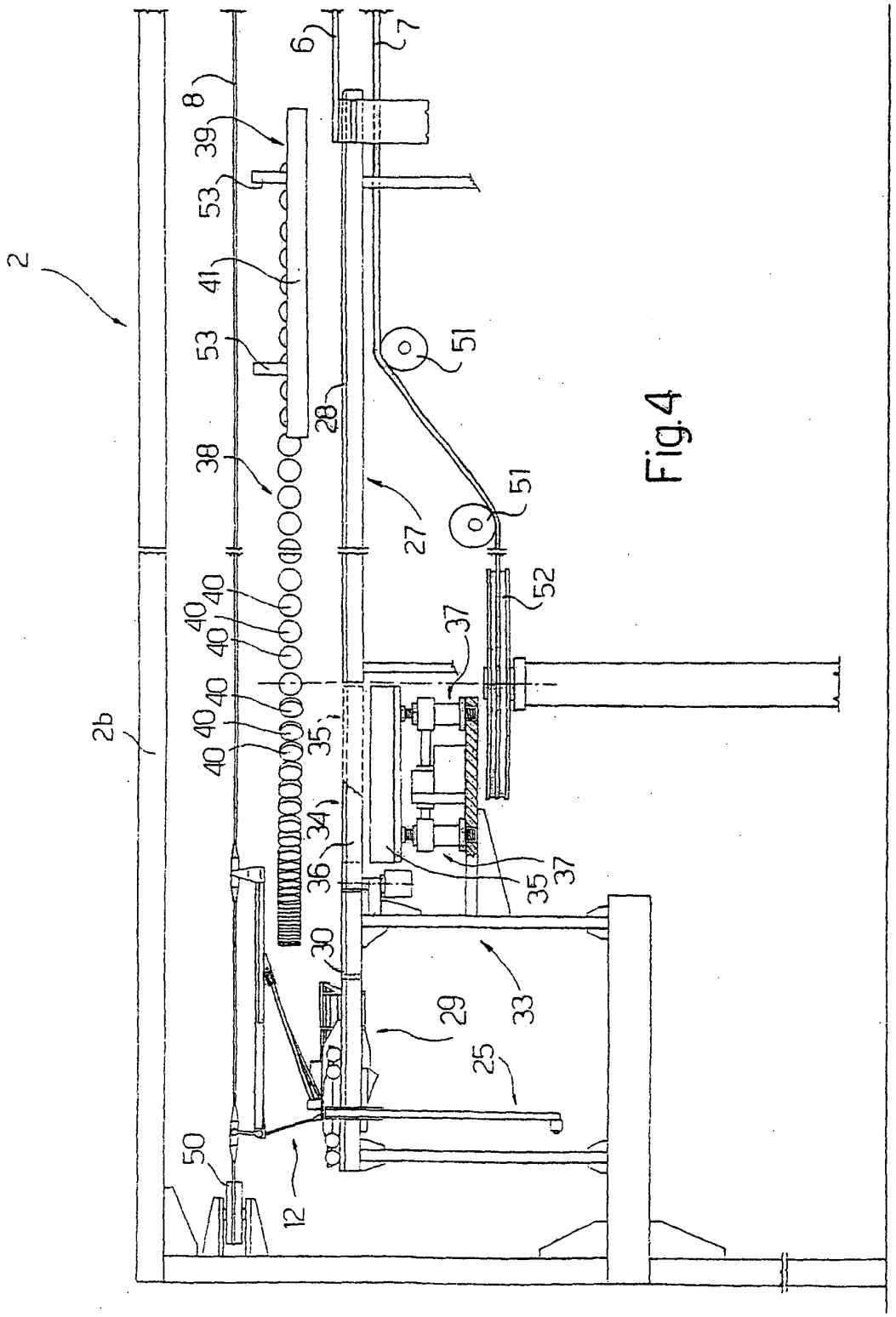
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Fig.4

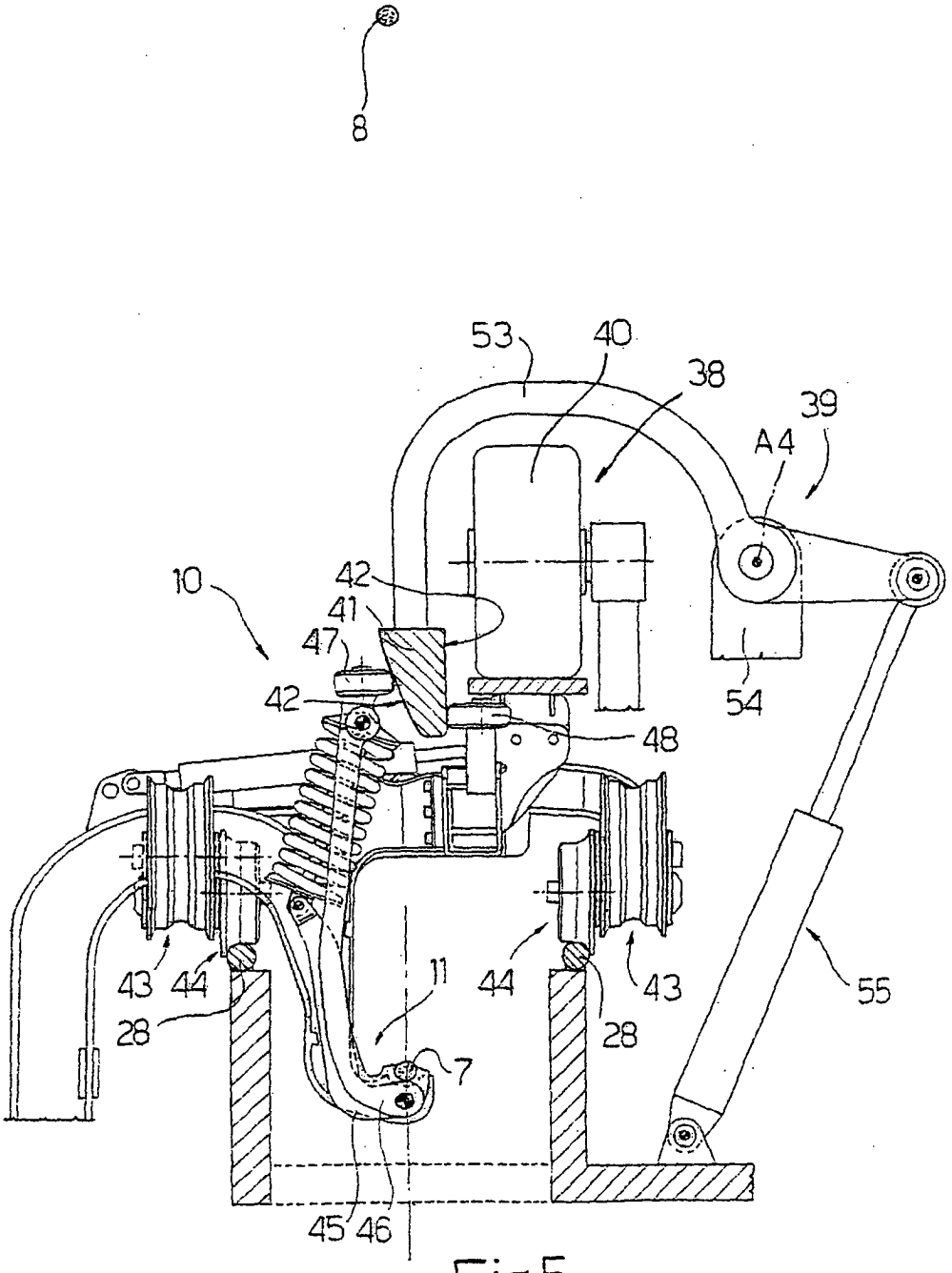

Fig.5

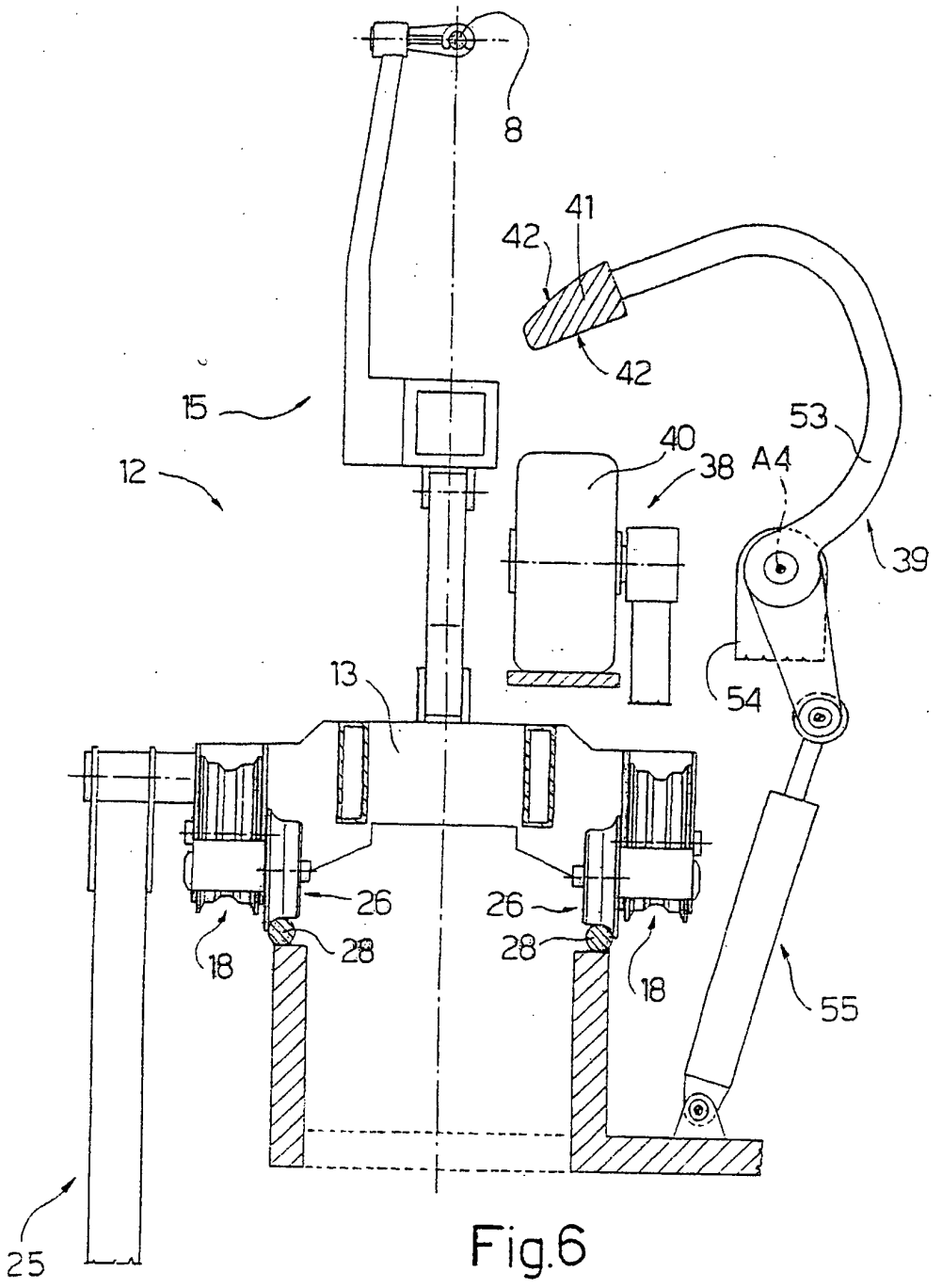

Fig.6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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