



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.12.2015 Bulletin 2015/52

(51) Int Cl.:
B61K 1/00 (2006.01)

(21) Application number: **15001767.1**

(22) Date of filing: **16.06.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(30) Priority: **19.06.2014 EE 201400024**

(54) **SYSTEM AND METHOD FOR PASSENGERS TO BOARD ON AND EXIT FROM A TRAIN WITHOUT THE TRAIN STOPPING AT A TRAIN STATION**

(57) The faster arrival of the train at the destination without speeding up the train is accomplished at the expense of passengers boarding on and exiting from the train without the train stopping at train stations, which is done by swapping cars. One car (1), in which passengers wishing to exit from the train is located in the very rear of the fast moving train (3). Another car (2), in which passengers wishing to begin their journey on the train (3), which is travelling at high speeds on a main track (5), is located in front of a train station (4). The swap between the cars occurs automatically by means of a dedicated power line (7), which is located above the main track (5). This power line (7) is supplied with low-voltage high-frequency current. By means of high-frequency low-voltage

current, the car (1) in the very rear of the fast moving train is uncoupled at the moment when the current sensor / current collector makes contact with this power line (7), and at the same time, by means of the same dedicated power line (7), the other car (2), standing in front of the station (4) with passengers, is started up automatically. The other car (2) crosses the switch area on the approach track (6) of the train station (4), reaches the main track (5), speeds up, catches up to the train (3) and couples with it on the move. The uncoupled car (1) is stopped on the main track (5) and manoeuvred to the train station (4), with passengers exiting from the car (1) at the train station (4).

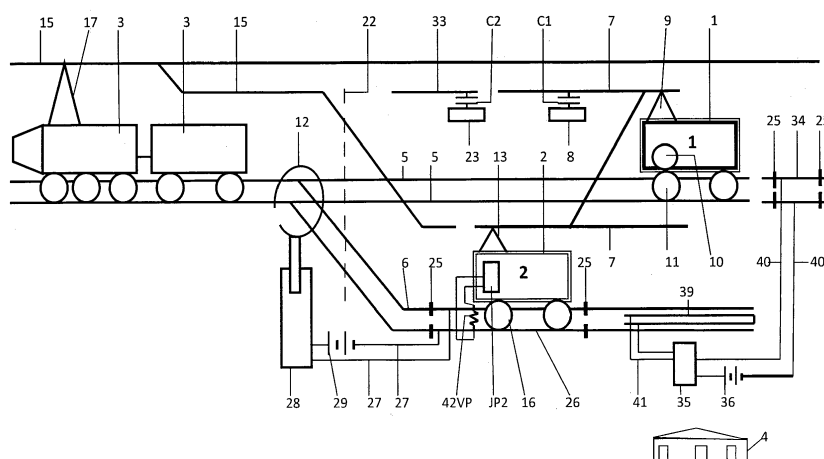


FIG 3

Description

Technical field

[0001] The invention relates to the field of rail transport services for passengers and more specifically, faster arrival of a train from the point of departure to a destination without accelerating train speed, accomplished through passengers boarding and exiting train without stopping train at train stations.

Prior art

[0002] In the early 2000s, designers (Chen Jianjun, Peng Yu-Lun) came up with an idea of a train, which could be embarked and disembarked by passengers without the train reducing its speed or stopping at stations. The idea is executed by means of a separate carriage, which picks up and drops off passengers at stations. When a moving train approaches a station, the separate carriage is put into motion and it moves on top of the moving train, travelling together with the train. When passengers wish to disembark, the separate carriage descends from the roof of the moving train near the station, the carriage stops, passengers exit and the train continues travelling without reducing its speed. Such solution contributes to faster transportation of passengers and to energy-saving (see the articles "This is the train that never stops", <http://motherboard.vice.com/blog/train-that-never-stops>; "The train that never stops moving", <http://singularityhub.com/2010/04/20/the-train-that-never-stops-still-seems-appealing-video/>).

[0003] Known is a solution (DE3911683, Christoph Bertram, published October 18, 1990), where the arrival of the train to its destination is achieved in a shorter time by not stopping the train at stations. For this purpose special carriages are used, which stop at the required stations for passengers to board and alight, while the train itself continues travelling without stopping. One carriage is intended for passengers, who wish to board the moving train, the other carriage is for passengers who wish to exit the moving train. For coupling and uncoupling of the respective carriages, the wheels of carriages have auxiliary axles set at a wider gauge, which facilitates coupling and uncoupling of the carriages.

[0004] A known solution (US222013153714, Jack Qu, published June 20, 2013) has been issued: a mobile train and dynamic stations, synchronized running control of the transportation system. A dynamic station supplies power to the train gear, the solution adds equipment, which take passengers and luggage into the train and out from the train while the train is in motion. The continuous synchronized control synchronizes the running of the moving train and dynamic stations by location and timing.

[0005] The above solutions are general, without specific solutions/embodiments.

[0006] Known is a solution (TW200918378, Peng Yu-Lun, published May 01, 2009), which treats disembarking and embarking of passengers on a moving train. The invention presents a carriage that moves separately on a side track, and a moving platform for the purpose of decoupling and coupling of the separate carriage. The separate carriage has its individual mechanism and a moving walkway to speed up the movement of passengers on and off the train.

[0007] A solution (CN202827571, Quan Hailin, published March 27, 2013) provides a rail transport system for passengers which contains a main train, an auxiliary train for disembarking passengers, an auxiliary train for embarking passengers, the main railway track, a side track, the main power supply is located in the front part of the main train, the embarking auxiliary train is located at the end of the main train, while the secondary power source is located at the end of the embarking auxiliary train and is used for controlling the coupling or decoupling of the embarking auxiliary train from the main train. The main train is always on the main track, the disembarking auxiliary train is decoupled from the main train and moves from the main track to the side track until it stops and passengers can exit and enter an auxiliary train with the same type of embarking.

[0008] An invention (CN101423064, Jianjie He, published May 06, 2009) presents a railway transportation system and a method for the passengers to embark and disembark from a train without stopping of the train. At a station the main railway includes at least one main switch, a secondary switch, an ascending caching train box and a boosting cart. The end of the main switch is connected with the main trunk road by respective switch mouths, the end of the second switch is connected to the main switch by respective switch mouth. The station is supplied with the ascending caching train box and a boosting cart, and the train is articulated with a descending caching train box. The passengers, who wish to disembark from the train, go to the descending caching train box and the passengers, who wish to embark on the train, are gathered in the ascending caching train box. When the train reaches the mouth of the first switch, it is uncoupled from the ascending caching train box while the train continues moving, the descending caching train box travels to the main switch through the mouth of the first switch and disembarking of passengers is complete. The ascending caching train box enters the main railway via the mouth of the second switch and joins the moving train in full after passing through the second switch.

[0009] The closest to this invention by its technical embodiment is a solution (CN101480954, Kaimin Han, published July 15, 2009), where next to the main track is a parallel side track, where a special car stands. When the train approaches the station along the main track, the special car will start to move in the same direction, at the right time and in parallel with the train, accelerating gradually until the car speed is synchronous with the train speed. The special mobile car is coupled with the moving

train, becoming part of the train composition. The special car belonging in the train composition is guided to the side track, its speed is reduced and the car stops. The invention is lacking a concrete and constructive solution on how the decoupling and coupling of the cart to the train would be executed in practice, and which equipment would be used for the purpose. Only a theoretical solution is provided, stating that the system could function this way.

Summary of the invention

[0010] Boarding passengers to the train and exiting passengers from the train without the train stopping at train stations is executed by swapping the cars. One car in which passengers who wish to exit the train have gathered, is located at the tail of the fast moving train. Another car with passengers who intend to board the train, which is travelling at high speed on the trunk railway, is located in front of the train station. These cars swap places. The car, which was at the tail of the train, will be placed in front in the train station while the car, which had been in front of the train station, will be placed together with the passengers at the tail of the train moving at high speed on the trunk railway. The automatic swapping of the cars is executed, using a dedicated power line, which is located above the trunk railway, on the left or right side of the axis of the trunk railway. This power line is supplied with low-voltage high-frequency current. By means of the high-frequency low-voltage current, the car at the tail of the fast moving train is uncoupled at the moment the current sensor / current collector makes contact with this power line, and at the same time, by means of the same dedicated power line, the other car, standing in front of the station with passengers, is started up automatically. The other car crosses the switch area on the approach track of the train station, reaches the trunk railway, speeds up, catches up to the train, where a car had been uncoupled along the way, and couples with the train on the move.

List of figures

[0011] The technical nature of the invention is explained by the following figures.

Figure 1 is the structural diagram of car 1;

Figure 2 shows a situation, where car 1 has not been uncoupled from the train and car 2 is standing on the approach track;

Figure 3 shows a situation, where the current sensor / current collector 9 of car 1 is in contact with the power line 7, car 1 has been uncoupled from the train 3 and car 2 has started to move;

Figure 4 shows a situation, where car 2 has reached

the trunk railway 5 and car 1 has been manoeuvred to the approach track 6;

Figure 5 shows a situation, where car 2 has coupled with train 3 and car 1 is on the approach track 6;

Figure 6 is the layout of power lines above trunk railway 5 and approach track 6;

Figure 7 shows the electronic equipment in car 1;

Figure 8 shows the electronic equipment in car 2;

Figure 9 shows the door closing diagram of car 2;

Figure 10 is the diagram for setting the switches from normal position to trunk railway 5.

Embodiment of the invention

[0012] A system for passengers to board and to exit the train without the train stopping at a train station comprises: car 1, which is equipped with an electric motor generator 10, current sensor / current collector 9, pairs of wheels 11; and car 2, which is equipped with an electric motor generator 14, current sensor / current collector 13, pairs of wheels 16; train 3; train station 4; trunk railway 5; approach track 6; electric lines 7, 15, 33; switches 12; blocking areas 26, 34; electronic control blocks JP1 and JP2 for cars 1 and 2; receiving coil 42 PV with an iron core, installed under cars 1 and 2.

[0013] The boarding of passengers on a moving train and exiting from a moving train is executed by swapping cars 1 and 2. Inside cars 1 and 2 are passenger seats, an electric motor generator 10, 14, which is equipped with a current sensor / current collector 9, 13 located on the roofs of the cars and facilitating connecting and disconnecting the generator motors from the power network, while an electric motor generator is a device with the capacity to operate both as an electric generator and as an electric motor. The generator motor 10 is equipped with a speed reducer 21, universal-joint transmission shaft 19 and clutch 18, which enables switching on and off the pairs of wheels 11 of car 1 with the generator motor 10, so that when car 1 is moving on account of inertia, then the pairs of wheels 11 are driving the generator motor 10 and the generator motor 10 functions as an electric generator, supplying power line 7 with electric power, while electric generator motor 10 functions as the brake of car 1, braking car 1. When the generator motor 10 is supplied with electric power from power line 7, then it functions as an electric motor and drives car 1. Car 1 and car 2 are also equipped with an electronic control block JP1 in car 1 and JP2 in car 2. Under the base of cars 1 and 2 is a receiving coil 42 VP with an iron core, for closing the car doors.

[0014] Power line 7 is installed above the trunk railway 5 and approach track 6. Power line 7 is supplied with

high-frequency current by electronic generator 8 through capacitor C1.

[0015] For the complete stop of car 1 prior to the switch area 12, there is yet power line 33 above the trunk railway 5, supplied with high-frequency electric current by electronic generator 23 through capacitor C2. Generators 8 and 23 supply current at different frequencies.

[0016] For closing the doors of car 2, a blocking area 34 with an electric power supply 36 and alternative current generator 35 are placed on the trunk railway 5 prior to the train station 4. For closing the doors of car 2, in the area where passengers board car 2, two rails 39, which are mutually short-circuited, are installed in parallel between the rails in the area of approach track 6.

[0017] For setting the switches 12 from the normal position to the trunk railway 5, a blocking area 26 is placed on the approach track 6 after the rail area 39 and prior to the area of switches 12.

[0018] The method for passengers to board on the train and to exit from the train without the train stopping at a train station comprises the steps: closing the doors of car 2, travelling of car 2 and setting and switching of switch points, uncoupling of car 1 from train 3, car 1 stopping on trunk railway 5, manoeuvring car 1 to train station 4, coupling of car 2 to train 3.

[0019] Closing the doors of car 2. Car 2 is standing on approach track 6. There are passengers in front of train station 4, who wish to take a trip on train 3. The doors of car 2 close automatically as soon as the pairs of wheels 11 of train 3 or car 1 reach the blocking area 34 and short-circuit the rails of blocking area 34. When train 3 arrives in the area of power line 7 and current sensor / current collector 9 of car 1 makes contact with power line 7, car 2 starts to move automatically on that moment. Power line 7 on trunk railway 5 is preceded by blocking area 34, which is isolated from other rails by building four isolating butt joints 25 (to be in conformity with the technical requirements on the railway). On the approach track 6 of train station 4, where passengers board car 2, two additional rails 39 are mounted in parallel between the rails of approach road 6 and short-circuited (connected) from the entry side of the train station. The rails of the blocking area 34 on the trunk railway 5 are connected with the alternative current generator 35 and this generator is supplied with electric current by power supply 36. When pairs of wheels 11 of train 3 or car 1 short-circuit the rails of the blocking area 34, the alternative current generator 35 is turned on. The output of the alternative current generator 35 is connected to rails 39 from the end of the station through cable 41. These ends of rails 39 are electrically short-circuited at the other end. Car 2 is equipped with a receiving coil 42 VP with an iron core, located under car 2 above rails 39, when car 2 is located over rails 39. The receiving coil 42 VP is connected through wires to the input 42VP of the servo unit A8 in the control block JP2 of car 2 (see Figure 8). As the pairs of wheels 11 of car 1 or train 3 on the trunk railway 5 short-circuit the rails of the blocking area 34, the generator 35 is

switched on and it sends a signal to rails 39 via cable 41. The signal is received by the receiving coil 42 VP at rails 39 and from the receiving coil the signal arrives through wires to the input of the servo unit A8 that is in the control block JP2 of car 2, and the servo unit switches on the contactor K8, the contacts of contactor K8 switch on the actuator T8, the actuator T8 starts the equipment of car 2, which close the doors 37 of car 2 (see Figure 8). The blocking area 34 of the trunk railway 5 should be at such a distance from the beginning of power line 7 which is above the trunk railway 5, so that in the period when train 3 travels from the blocking area 34 to the beginning of power line 7, it would be possible to close the doors 37 of car 2 well in time, as car 2 starts to move right after the current sensor / current collector 9 of car 1 has made contact with power line 7.

[0020] Setting the switches 12 from the normal position to the trunk railway 5. When car 2 has started to move and has reached the blocking area 26 and the pairs of wheels 16 of car 2 have short-circuited the rails of the blocking area 26, the switches 12 are set automatically from the normal position to trunk railway 5. Initially, car 2 travels with the electric power supplied from power line 7, when car 2 has reached the end of power line 7 and the line ends, it moves by inertia for a few moments and then car 2 transfers to electric power supplied from the power line 15 as soon as the current sensor / current collector 13 has made contact with the power line 15. Car 2 crosses the area of switches 12 of the approach track 6 and travels on the trunk railway 5, accelerates and after a while is coupled with train 3.

[0021] When car 2 has crossed the area of switches 12 of the approach track 6, then car 1, which was uncoupled from train 3, came to a stop on trunk railway 5 prior to the area of switches 12, and is manoeuvred together with passengers to approach track 6, in front of the train station 4, where passengers of train 3 exit from car 1.

[0022] Switching on the generator motor 14 and clutch 21 of car 2 (see Figure 8). When car 2 has been manoeuvred to the approach track 6 and is standing above rails 39 and the current sensor / current collector 13 of car 2 is in contact with power line 7, then the signal of generator 8 reaches the input of servo units A9 and A10 through power line 7 and the current sensor / current collector 13 of car 2 and filter LC3. Now the servo units A9 and A10 switch on contactor K9 and contactor K10. The contacts of contactor K9 connect the generator motor 14 of car 2 with power line 7. The contacts of contactor 10 switch on actuator T10, and actuator T10 switches on the clutch 21 of the generator motor 14. Now the generator motor 14 of car 2 is in contact with power line 7, which will be supplied with electric power by the generator motor 10 of car 1 as soon as the current sensor / current collector 9 of car 1 has made contact with power line 7 and car 2 will start to move.

[0023] Uncoupling car 1 from train 3. Train 3 travels on trunk railway 5 and the current sensor / current collector 9 of car 1 at its tail makes contact with power line 7, which

is supplied by high-frequency low-voltage generator 8 through capacitor C1 (see Figure 3 and Figure 7). Through current sensor / current collector 9 and filter LC1 the signal of generator 8 reaches the input of servo unit A1 located in the control block JB1 of car 1, and the servo unit A1 that is supplied with electric power from the mains adapter TP1, switches on the contactor K1, where the contacts close and switch on the actuator T1, which is supplied with electric power from the mains adapter TP1. Actuator T1 starts the gear, which sets the clutch 20 of car 1 in a position that facilitates uncoupling. Car 1 is uncoupled from the train (see Figure 3).

[0024] Switching on the generator motor 10 and clutch 18 of car 1. When the current sensor / current collector 9 of car 1 has made contact with power line 7, the signal of generator 8 passes through the current sensor / current collector 9 and filter LC1, reaching the inputs of servo units A3 and A4, and the servo units A3 and A4 switch on the contactors K3 and K4 (see Figure 7). The contacts of contactor K3 connect the generator motor 10 of car 1 with power line 7 through current sensor / current collector 9. The contacts of contactor K4 switch on the actuator T4. Actuator T4 switches on the clutch 18 of generator motor 10 of car 1. Now car 1 travels by inertia along the trunk railway 5 and drives the generator motor 10 by means of the pairs of wheels 11 and clutch 18, and the generator motor 10 supplies power line 7 with ascending power through the contacts of contactor K3 and current sensor / current collector 9.

[0025] Stopping the car 1 prior to the area of switches 12 (see Figure 7 and Figure 3). By the straight section of power line 7 at the end by the train station 4 there is another short power line 33, which begins and ends prior to the area of switches 12 and is supplied by the high-frequency low-voltage generator 23 with a frequency different from the frequency of generator 8. This power line is isolated from all the other power lines. When the current sensor / current collector 9 of car 1 makes contact with power line 33, the high-frequency signal received from this line reaches filter LC2 through current sensor / current collector 9 and from there the servo unit A5. The servo unit A5 switches on the contactor K5, the contacts of contactor K5 switch on the actuator T5 and the actuator T5 switches on the gear that starts the brakes 24 of car 1. Car 1 stops prior to the area of switches 12.

[0026] For car 2, switches 12 are set automatically from the normal position to the trunk railway 5. Car 2 is standing on the approach track 6 in the area of rails 39. The doors 37 of car 2 are closed, since the pairs of wheels 11 of car 1 have short-circuited the rails in the blocking area 34 of trunk railway 5 (see Figure 9). Figure 10 refers to the moment, when the current sensor / current collector 9 of car 1 has made contact with power line 7 and the car has uncoupled itself from train 3. Now the generator motor 10 of car 1 supplies the generator motor 14 of car 2 with electric power through power line 7. Car 2 has started to move and has reached the blocking area 26, which is on the approach track 6, and the pairs of wheels

16 of car 2 have short-circuited the rails of the blocking area 26 and have switched on the drive 28 of rails 12 through electrical cable 27 and the drive 28 of rails has set the switches 12 from the normal position to the trunk railway 5 (see Figure 10). Car 2 has coupled with train 3.

[0027] In the event that the voltage in the mains adapter TP1 has dropped below the permitted technical norm (limit), the servo unit A6 in car 1 sends a signal from the mains adapter TP1 (see Figure 7). The servo unit A6 switches on the contactor K6, the contacts of which switch on the actuator T6, which switches on the clutch 32, which connects the pairs of wheels of the car with generator 31. Generator 31 starts to supply the mains adapter TP1 with electric power while the car moves. The explanation provided in Figure 7 also applies to car 2 presented in Figure 8.

Claims

1. System for passengers to board on and exit from a train without the train stopping at a train station comprises a moving train, dedicated cars, a trunk railway, an approach track, switches, equipment and electronics for controlling the cars and switches, **characterized in that** the system comprises:

- dedicated cars (1, 2) which can be swapped and which are equipped with electric motor generators (10, 14) located in the car, current sensors / current collectors (9, 13) located on the roof of a car, car control blocks (JP1, JP2) and receiving coils (42PV) placed under the base of cars;
- power lines (7, 15, 33), while the power line (33) is isolated from power lines (7, 15) and is intended for stopping the car (1);
- a blocking area (34) located on the trunk railway (5) and a blocking area (26) located on the approach track;
- two rails (39) mounted in parallel between the rails of the approach track (6), short-circuited in one end.

2. System accordingly to claim 1, **characterized in that** the electric motor generator (10) is equipped with a speed reducer (21), a universal-joint transmission shaft (19) and a clutch (18), which enable switching on and off the pairs of wheels (11) of the car (1).

3. System accordingly to claims 1 and 2, **characterized in that** the blocking area (34) is positioned on the trunk railway (5) prior to the beginning of power line (7) and is isolated from the other rails by means of four isolating butt joints (25).

4. A system accordingly to claim 3, **characterized in that** the blocking area (34) is positioned on the trunk

railway (5) at such a distance from the beginning of the power line (7), which makes it possible to close the doors (37) of car (2) in the time it takes for the train (3) to travel from the blocking area (34) to the beginning of the power line (7).

5. Method for passengers to board on and exit from a train without the train stopping at a train station, **characterized in that** the boarding of passengers to the train and exiting of passengers from the train is executed by swapping the dedicated cars (1, 2), while the method comprises the following steps:

- the passengers wishing to board on the train (3) are gathered in a car (2) which stands on the approach track (6);
- the doors (37) of the car (2) are closed automatically as soon as the pairs of wheels (11) of the train (3) or car (1) reach the blocking area (34) and short-circuit the rails of the blocking area (34);
- the car (2) starts to move on the approach track (6) automatically as soon as the train (3) has reached the area of the power line (7) and the current sensor / current collector (9) has made contact with the power line (7);
- the movement of the car (2) is initially powered by electricity from the power line (7), after the end of the power line (7) the car (2) moves by inertia and then transfer to power supply from the railway contact line (15) as soon as the current sensor / current collector (13) of the car (2) has made contact with it;
- switches (12) are set automatically from the normal position to the trunk railway (5), when the car (2) has reached the blocking area (26) and the pairs of wheels (16) of the car (2) have short-circuited the rails of the blocking area (26);
- the car (2) travels across the switch area (12) of the approach track (6);
- the car (2) travels on the trunk railway (5), accelerates and couples with the train (3);
- the car (1) is uncoupled from the train (3) while the train (3) moves on the trunk railway (5), upon contact between the current sensor / current collector (9) of the car (1) and the power line (7), consequently activating the equipment, which set the brake (20) of the car (1) in a position, which facilitates uncoupling;
- the car (1) is uncoupled from the train (3) before the car (2) has travelled across the switch area (12) of the approach track (6);
- as the car (2) crosses the switch area (12) of the approach track (6), the car (1) is stopped on the trunk railway (5) prior to the switch area (12) as a result of a contact between its current sensor / current collector (9) and the power line (33);
- the car (1) with passengers is manoeuvred to

the train station (4);

- doors of car (1) are opened and passengers exit the car (1) at a train station (4).

6. Method accordingly to claim 5, **characterized in that** the generator motor (10) of the car (1) supplies the generator motor (14) of car (2) with electric power through power line (7).

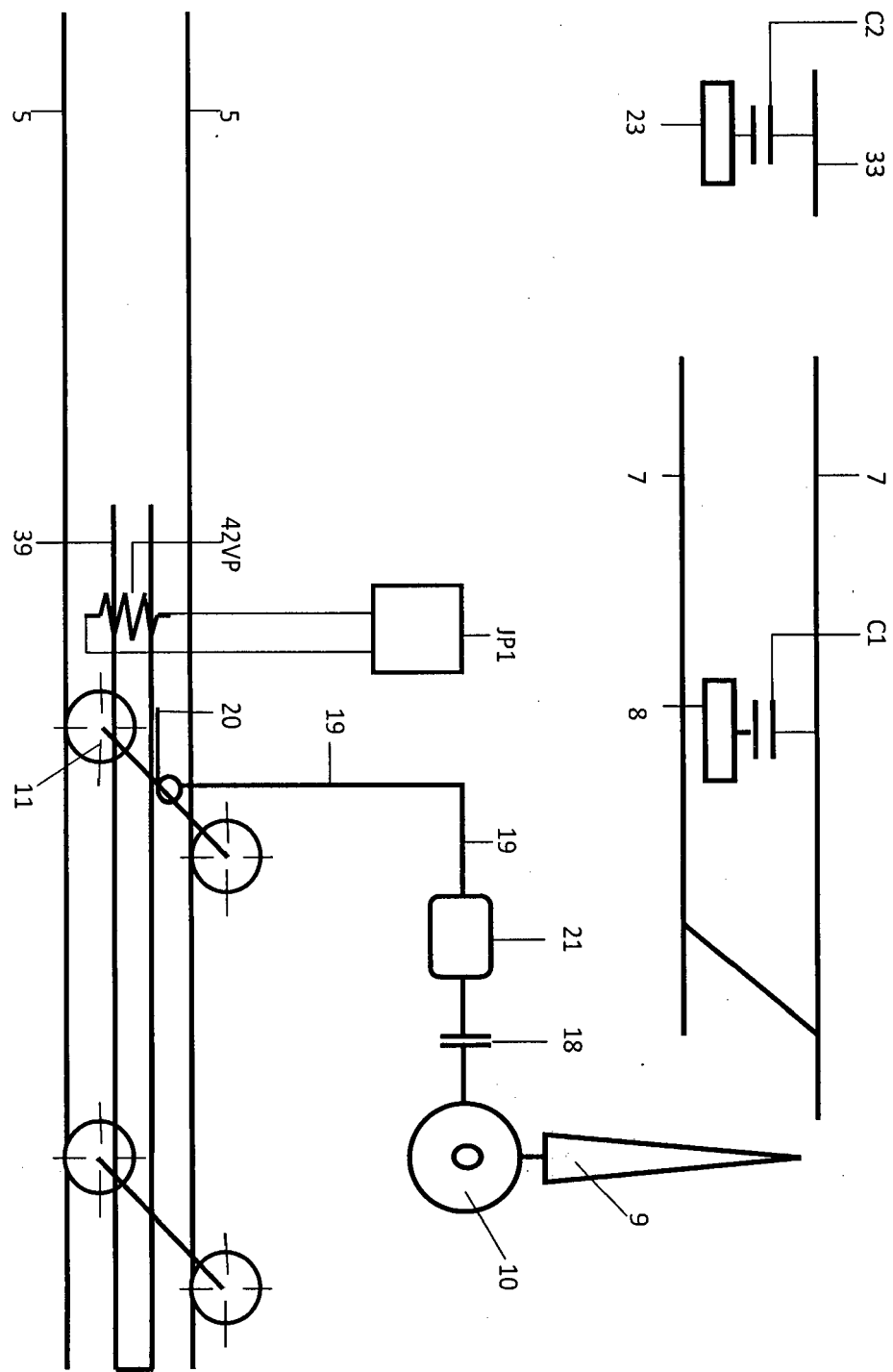


FIG 1

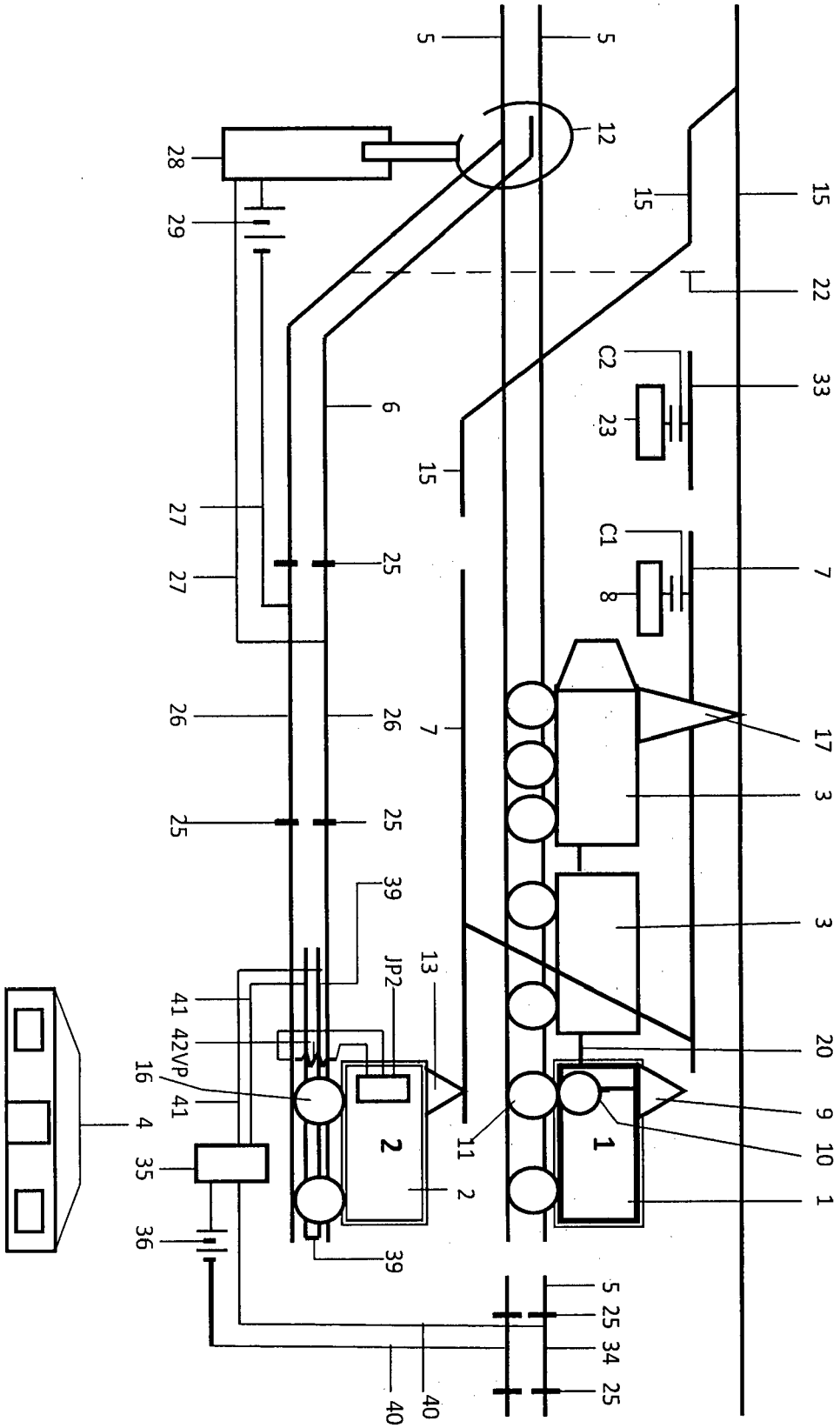


FIG 2

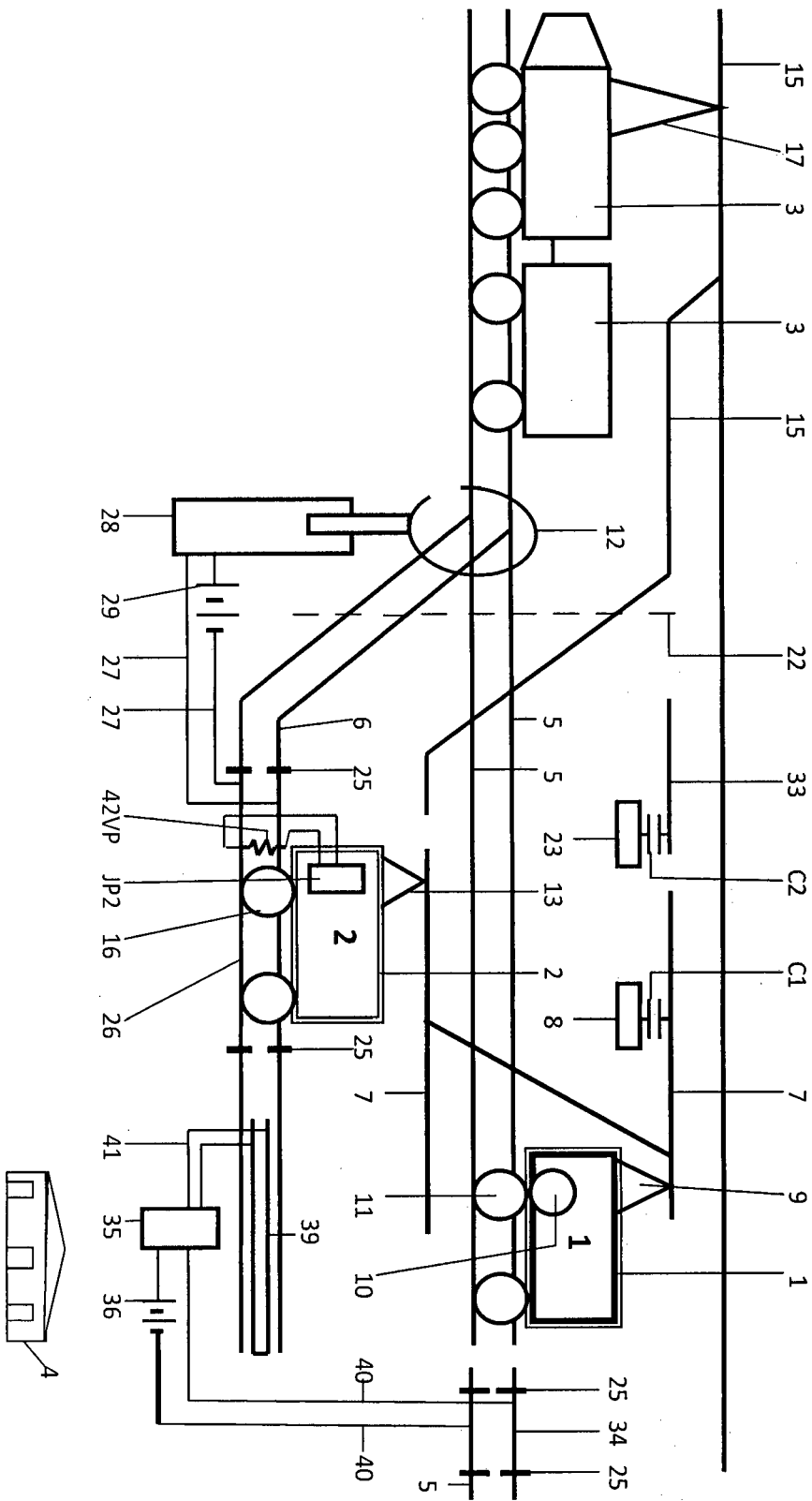


FIG 3

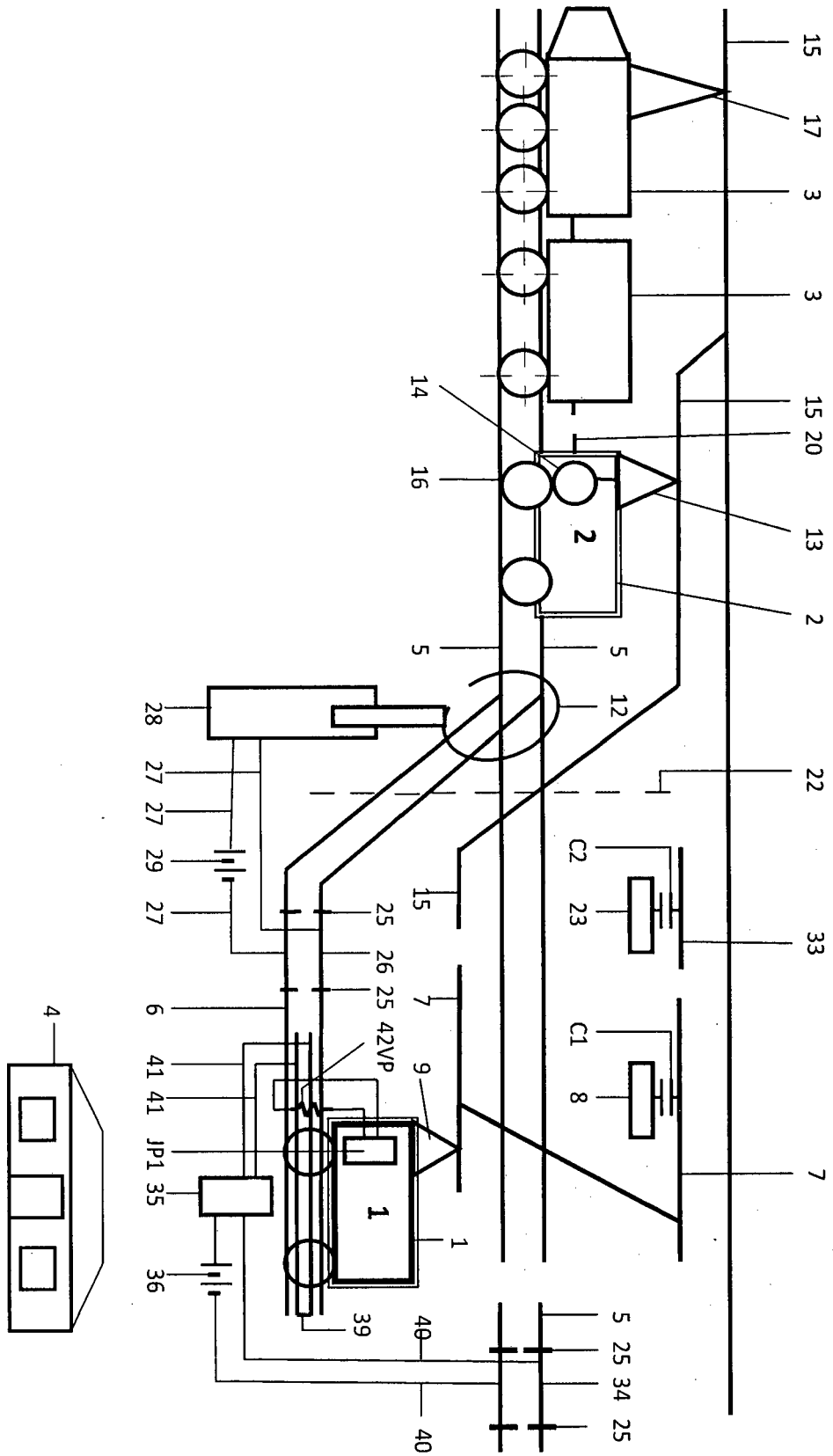


FIG 4

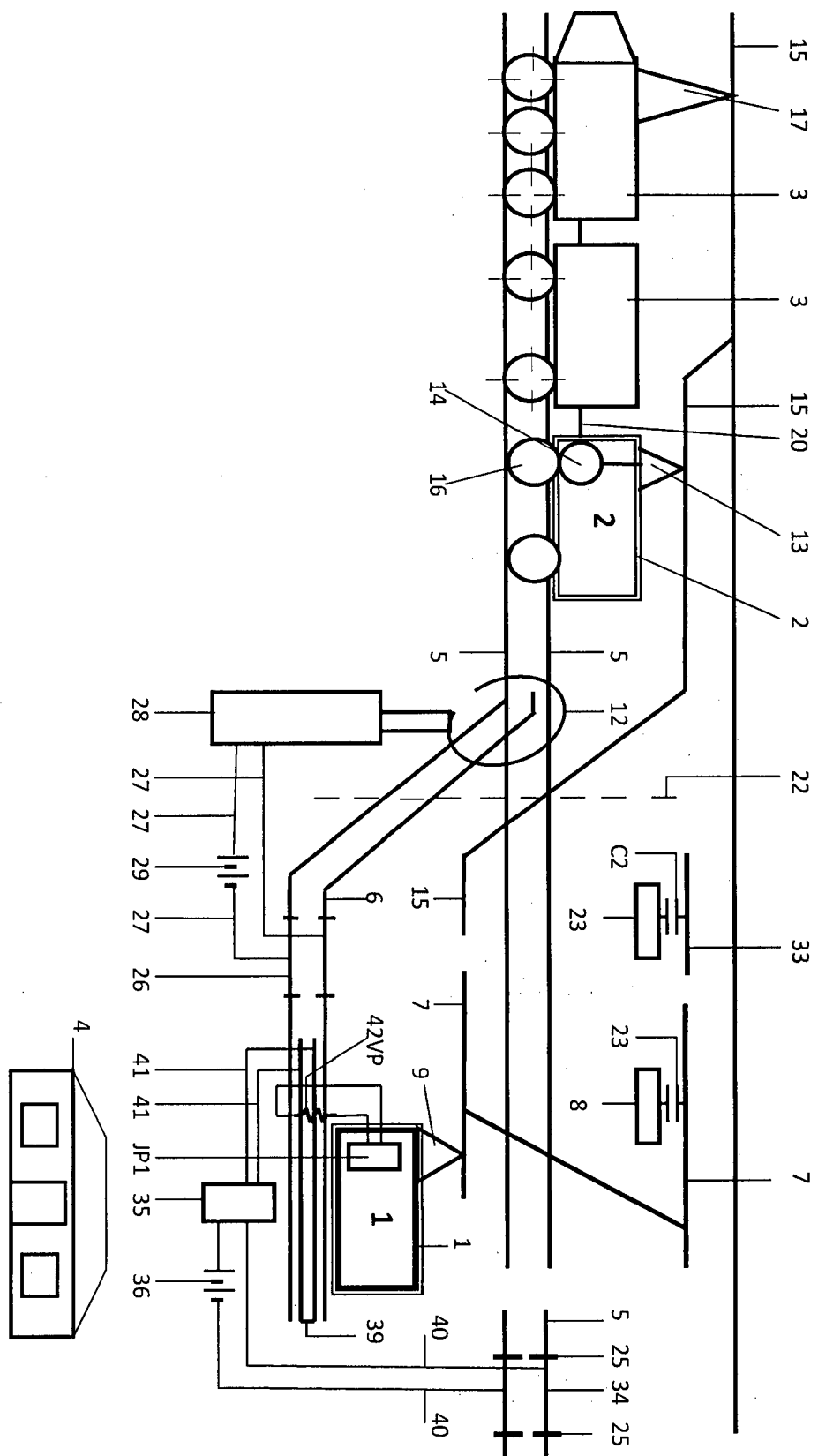


FIG 5

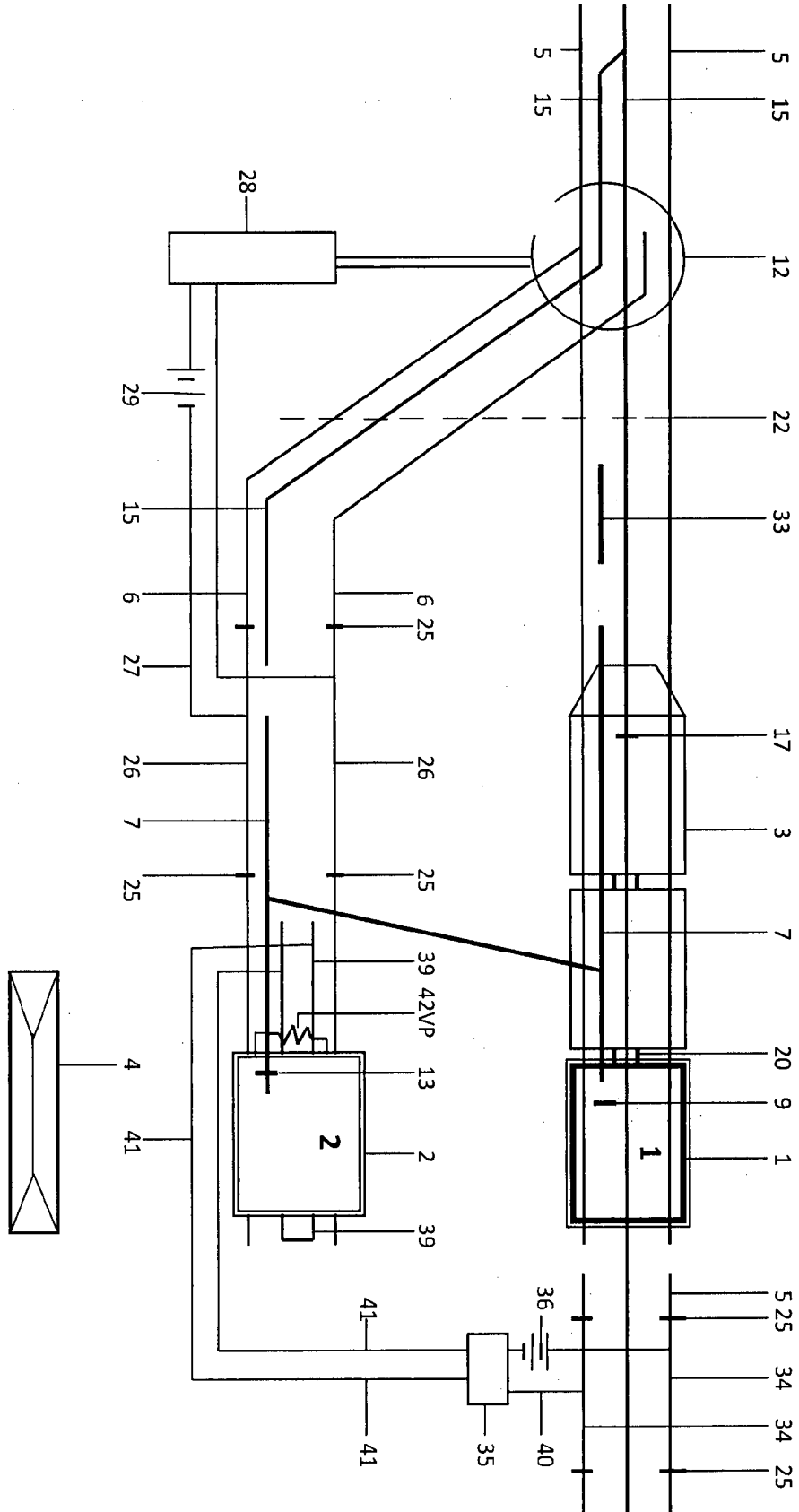


FIG 6

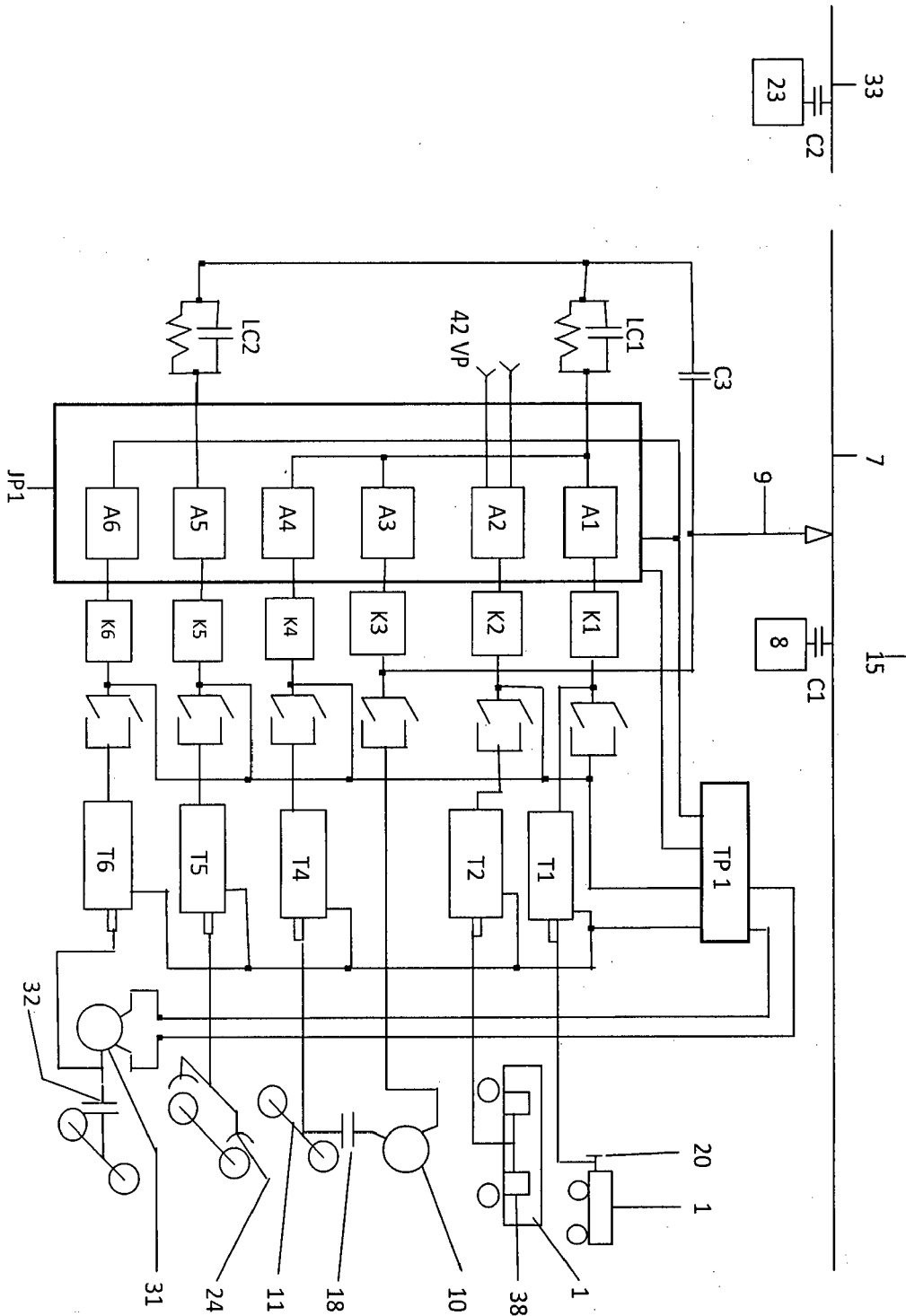
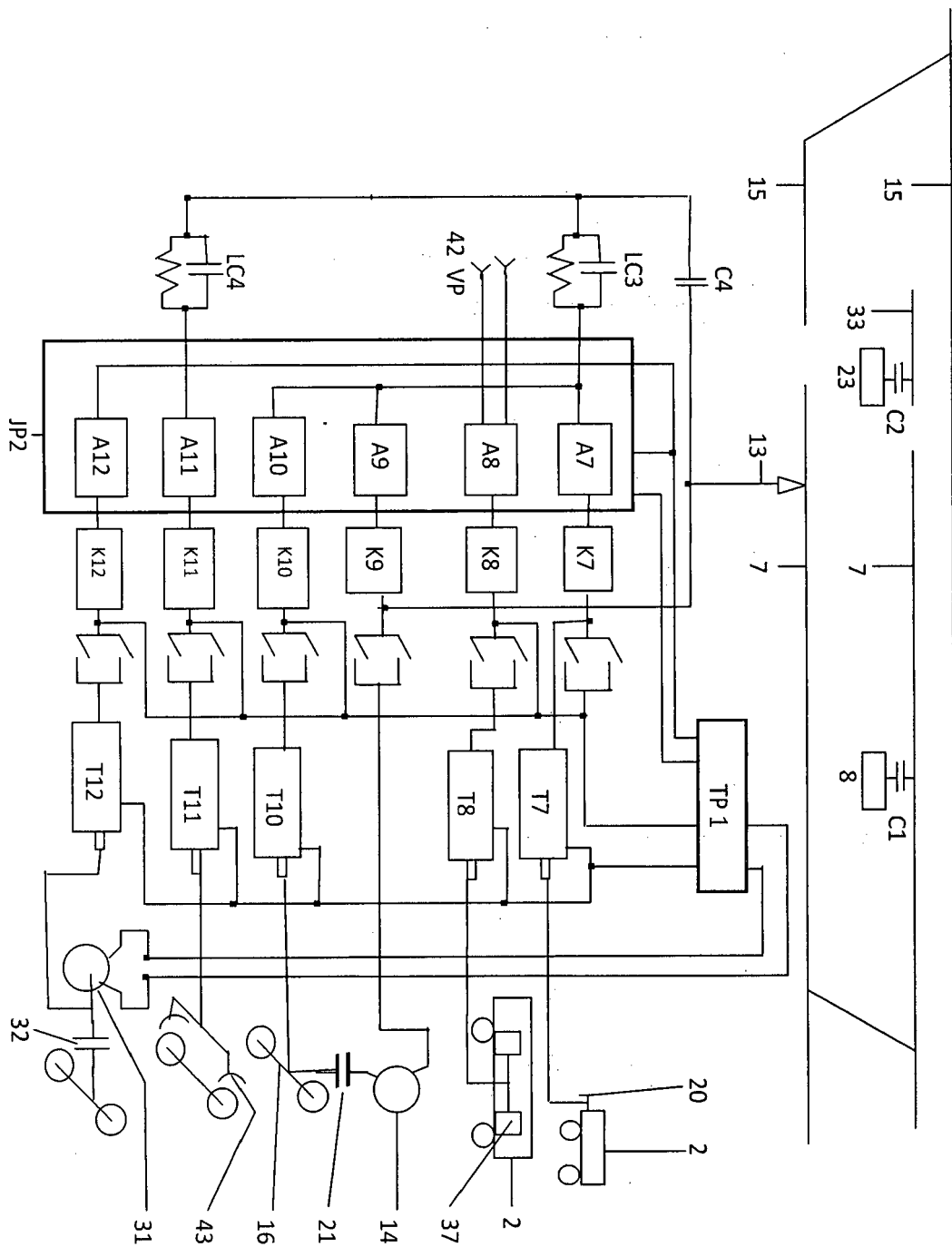


FIG 7

**FIG 8**

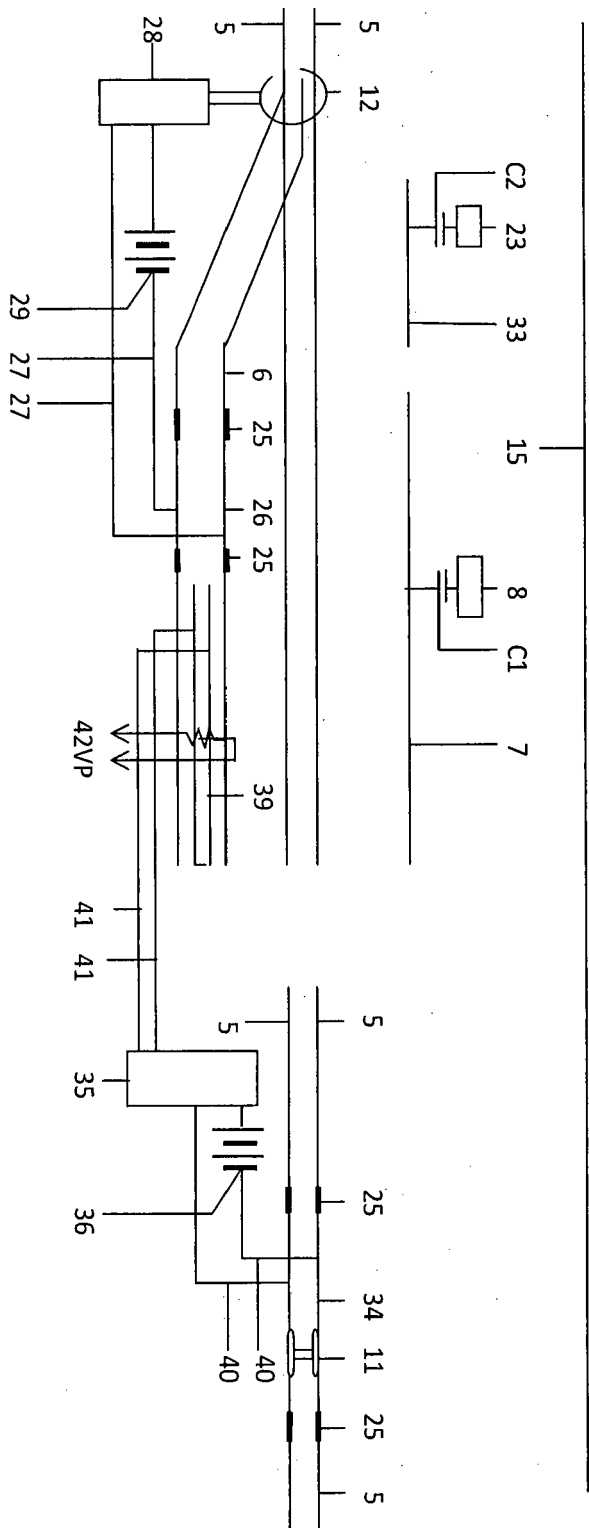


FIG 9

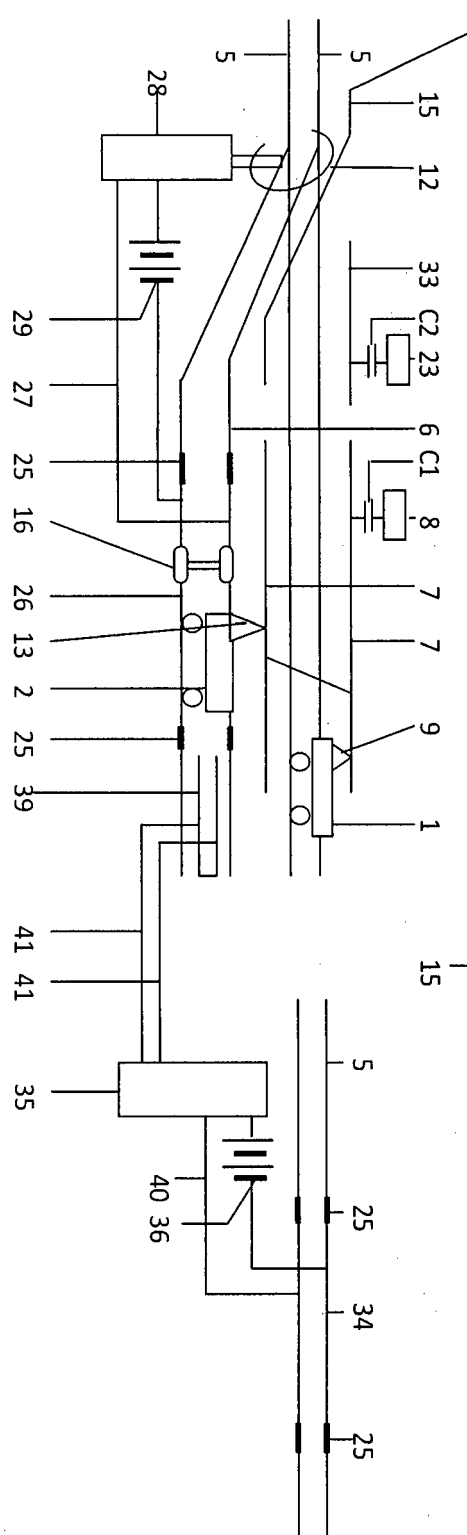


FIG 10



EUROPEAN SEARCH REPORT

Application Number
EP 15 00 1767

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 November 2015	Examiner Awad, Philippe
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			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 15 00 1767

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05-11-2015

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