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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in means for Connecting an Electrically Operated Toy Vehicle to Electric Supply Mains

We, TRIX VEREINIGTE SPIELWARENFABRIKEN G.M.B.H., of Kobergerstrasse 15, Nuremberg, Germany, a German body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a device for connecting to the supply mains a toy vehicle operated with direct electric current, such as electric toy or model railways.

Such network connecting devices usually comprise a transformer, a rectifier, a series resistance, a reversing switch and various fuses, signal lamps and the like. These are usually manipulated by regulating the track voltage by means of a knob, a lever or the like, whereby the speed of travel can be varied, while a further lever or knob enables the direction of travel to be reversed from forwards to rearwards and conversely. In this way the voltage can be varied from zero to a maximum in both directions of travel.

This construction has the disadvantage that two handles have to be operated, for effecting the change of direction and for effecting the change of speed. This is awkward, not only because the player as a rule has to execute other functions also, such as changing the points and the signals, whistling, lighting lamps and so forth by remote control, but also because he has to execute a number of operations in a short time, it is also defective because confusion is likely to occur, in the haste, for instance between higher and lower speed, in changing from forward to rearward travel and so forth.

It has therefore already been suggested to enable both reversal and voltage regulation to be effected with the aid of a single lever, knob or the like. Thus a contact member can be rocked from a mid or zero position in one direction, to the left for example, for forward travel, and in the opposite direction, to the right for instance, for rearward travel, traversing in both cases the range of regulation from zero to a maximum. With this arrangement a resistance is sub-divided into the desired steps, and from each of these steps a current-conducting connection leads to the co-operating contacts of the aforesaid contact member. In this case however the advantage of a single operating member for voltage regulation and reversal has to be offset by the disadvantage that resistances, which always involve a loss of power, serve as regulating members, thus resulting in heat being generated, but this is the very thing that should be avoided with direct-current devices, because rectifiers are very sensitive to heat. There is also the disadvantage that the contact path, particularly when an ample subdivision of steps is provided, becomes comparatively long, which has a disadvantageous effect on the dimensions of the apparatus as a whole, since in this case the radius of rotation of the contact member also has to be correspondingly large. The length of the contact path always has to be twice as great as a voltage range from zero to a maximum really requires.

According to the invention, therefore, in order to obviate these disadvantages, the construction is such that the immediate source of voltage, for instance the secondary winding of the transformer, can be traversed over its entire contact path from zero to the maximum in one direction by one finger and in the opposite direction by another finger of a current-collector which is coupled to a pole-changing device for the direct voltage, which always reverses when there is a change in the operative contact finger, this device not only reversing the direction of flow of the current through the vehicle motor but also transposing the connection of the circuit from one end of

the voltage-supply contact path to the other. Hence, according to the invention, only one contact path, of the length of a range of voltage from zero to a maximum, is necessary. Nevertheless both for forward and for rearward travel the entire range of voltage of the contact path of the source can be engaged. The advantageous result is a corresponding reduction in the size of the device for voltage regulation, and also a corresponding reduction in the overall dimensions of the apparatus. In addition to this, when employing the secondary winding of the transformer as the immediate source of voltage, the disadvantage of a substantial loss of power is avoided. The regulating of the operating voltage can thus be effected without consuming much power.

The construction is preferably such that the current-collector is a rotary member provided with two spreading fingers, and the reversing device is rotatable about the same axis. The angle between the spreading fingers is then greater than the contact-path angle referred to the same vertex. If desired, the current-collector may be equipped with a pointer, preferably extending in the direction of the bisector of the spreading-finger angle.

It is especially advantageous for the reversing device to consist of a rotary member with two spreading arms extending in the opposite directions to the spreading fingers, and carrying contacts which co-operate with contact-segments connected to the rectifier, the voltage source and the toy vehicle. In this case it is possible to provide additional segments, engageable by one of the spreading arms in the zero position of the current-collector, these additional segments rendering it possible to furnish to the vehicle current for other purposes, such as uncoupling, whistling, lighting, smoking and so forth.

Further advantages and features will be explained in the following description of the accompanying drawings, which illustrate the invention diagrammatically.

Figure 1 shows three positions of the current-collector according to the invention, namely the zero position, the position for forward travel with maximum voltage, and the position for rearward travel with maximum voltage;

Figure 2 shows a similar current-collector coupled to a reversing device;

Figure 3 shows another constructional example; and

Figure 4 shows a current-collector which has longitudinally sliding members.

Upon a pivot 1 is rotatably mounted the current-collector 2, which has two fingers 3 and 4 spread apart so as to make an angle with one another which is somewhat greater than the angle subtended by the contact path 5 at the axis 1; this path being formed, in the example illustrated, by the secondary winding 6 of the transformer 7.

One of the aforementioned fingers, for instance the finger 3, is the scanning member for reverse travel when moving in the direction of the arrow *x*. The beginning of the contact path is then at the end 9 of the secondary winding, and the end of the contact path is at the end 8 of the winding. The voltage can therefore be regulated from zero to a maximum, and conversely. The same remark fundamentally applied when the rocking is in the opposite direction *y*, in which case the finger 4 acts as the scanning member, and the contact path 6 is traversed from the beginning of the winding at 8 to the end 9.

Abutment pins 10 and 11 serve to stop the rotation at the end positions.

It is possible to equip the current-collector 2 with a pointer 12, co-operating with a scale 13, thus giving a reading of the direction of travel and of the voltage in circuit.

With this current-collector is coupled, as already mentioned, a reversing and change-over device. This consists, in the example illustrated in Figure 2, of the two splayed-out arms 14 and 15, which are directed oppositely to the splayed-out fingers 3 and 4 of the current-collector 2. They are mounted on a rotary member 16, which, like the arms themselves, consists of non-conducting material, is rotatable about the pivot 1, and is rigidly connected with the current-collector 2. With the splayed arms 14 and 15 are associated contact bars 18, 19, 20, 21, 22, 23 and 24, which, as the drawings shows, are connected to the secondary winding 6, to the rectifier 25, and to a current-consumer 26, not shown. The arms 14 and 15 are equipped with co-operating contacts 27, 28, 29, 30, 31, 32 and 33.

When the finger 4 is sliding along the contact path 5, the contacts 27, 28, 29, and 30 of the arm 14 are operative. The rectifier 25 is then so connected that the current is supplied to the driven vehicle through the circuit elements 4, 25, 22, 28 and 23 to the load 26, and from the load through the elements 21, 29, 27, 24, 25, 19, 30 and 20 to the winding 6, in the direction necessary for forward travel. When on the other hand the finger 3 is traversing the contact path 5, the arm 15, with its contacts 31, 32 and 33 is operative, with the result that the direction of the current is altered, and the vehicle is adjusted for running backwards, the current passing through the circuit elements 3, 25, 22 32 and 21 to the load 26, and from the load through the elements 23, 31, 24, 25, 19, 33 and 18 to the winding 6.

In order to render it possible, when the current-collector 2, 3, 4 and the reversing and change-over device 14, 15, 16 are in the zero position, for current to be applied transiently for such functions as coupling, whistling, lighting, smoking and so forth, in the constructional example of Figure 2 the contact bars

21 and 23 are lengthened, and to the contact bars 22 and 24 the supplementary contact studs 34 and 35 are prefixed. In the zero position of the apparatus, therefore, through the contact 31 the contact bars 23 and 35 are connected; and through the contact 32 the contact bars 21 and 34 are connected, so that when the switch key 36 is actuated there can be supplied to the vehicle a voltage, for instance an alternating voltage higher than the operating direct voltage. Lower alternating voltages can of course also be obtained, by tappings on the secondary winding, and higher voltages by adding fixed groups of secondary windings.

As an alternative reversing device there may be associated with the current-collector 2, 3, 4, as shown in Figure 3, a cam disc having, for instance a peripheral path 38 operative for forward travel and a cam path 39 for rearward travel a spring arm 40 being pressed with its contact 41 against a co-operating contact 42 for forward travel and against a co-operating contact 43 for rearward travel, whereas the mid position, in which neither of the two contacts 42 and 43 touch the contact 41, and the spring arm 40 engages a notch 37, yields the zero position, or closes contacts that apply any current for auxiliary operations.

If the continuous-current leads from the rectifier 25 are connected to the contact springs 42 and 43, the contact spring 41 will receive positive or negative voltage according as it is brought into contact with the contact spring 42 or the contact spring 43. The contact spring 41 accordingly constitutes one of the leads of the motor of the toy. The other lead to the motor may come from similar contact spring associated in a similar manner with two co-operating contact springs, the contact spring 41 being mechanically connected with the corresponding contact spring electrically connected to the motor so that they are moved together by the cam disc but receive voltage of opposite polarity from the rectifier. For instance, when the spring arm 40 is sliding over the normal periphery 38 of the cam disc 37, the contact spring 41 will be in contact with the contact spring 42, whereas the contact spring which is mechanically connected with (but of course electrically insulated from) the contact spring 42 will move in the same direction as the contact spring 42, but will receive current of opposite polarity. When on the contrary the spring arm 40 rides up on to the cam path 39, the connections are reversed, and the direction of current through the motor is also reversed. The direction of running of the motor is of course also reversed. When the spring arm 40 lodges in the hollow between the peripheral surface 38 and the cam surface 39, the spring contact 41 does not touch either the contact R2 or the contact 43; and the same applies to the corresponding group of spring contacts.

In Figure 4, 3 and 4 are the fingers, which are conductively connected with one another by means of the bridge-like current-collector 2. The distance between the fingers 3 and 4 is greater than the length of the secondary coil 6, and the fingers 3 and 4 are slidable along the straight contact path 5. As they move, either the finger 3 or the finger 4 slides over the secondary coil 6, so that by means of these fingers voltage can be tapped off. The same result can therefore be obtained with the slidable construction of the fingers 3 and 4 of Figure 4 as with the rotatable fingers 3 and 4 of Figures 1 to 3.

The invention is of course not restricted to the constructional example illustrated, in which the secondary winding of a transformer serves as the immediate source of voltage. It is also suitable for any other source of voltage, particularly for stepped transformers. It is also applicable to resistance coils, which would take the place of the transformer winding 6.

Either the whole or only part of the secondary winding (if this is what forms the source of voltage) may be traversed. This secondary may also be assembled from separate winding sections. The apparatus may be equipped with cut-outs of a magnetic, thermal or other suitable construction, and with pilot indicating lamps. Tappings may be provided on the transformer, which enable voltages to be taken off.

When it is a question of a track lay-out for multi-train operation, a device according to the invention is to be provided for each circuit. There may for instance be provided a transformer with a plurality of secondaries on different transformer limbs, so that the device for a number of driven vehicles can be lodged in one casing.

What we claim is:—

1. A network connecting device for toy vehicles driven by direct electric current, for instance electric toy or model railways, wherein by means of a handle, for instance a rotary knob, both the reversal for forward and backward travel and the voltage-regulation for the purpose of varying the speed of the vehicle are effected, characterised by the feature that the immediate source of voltage, for instance the secondary coil of a transformer, is traversed over its entire contact path from zero to a maximum in one direction by one finger and in the opposite direction by another finger of a current-collector, which is coupled to a reversing device for the direct voltage, which changes over each time there is a change in the contact finger which is operative, means being also provided to transpose the connection of the motor circuit from one end of the contact path to the other when the motor is reversed.

2. A network connecting device as claimed

in claim 1, characterised by the feature that the current-collector is a rotatable member provided with two diverging fingers, and the reversing device is rotatable about the axis of the current-collector.

3. A network connecting device as claimed in claim 2, characterised by the feature that the angle between the divergent fingers is greater than the angle subtended by the contact path at the same vertex.

4. A network connecting device as claimed in claim 1, 2 or 3, characterised by the feature that with the voltage-collector is associated a pointer, which preferably extends along the bisector of the angle between the divergent fingers, and which co-operates with a scale, from which the operative direction of travel and the adjusted voltage can be read off.

5. A network connecting device as claimed in claim 2, characterised by the feature that the reversing device consists of a rotary member with two divergent arms, which are directed oppositely to the divergent fingers, and which carry contacts which co-operate with contact bars connected to a rectifier, to the voltage source, and to the toy vehicle.

6. A network connecting device as claimed in claim 5, characterised by the feature that with the contact bars of the reversing device are associated supplementary contacts, engageable by contacts of a divergent arm in the zero position of the apparatus, over which supplementary contacts current can be communicated to the driven vehicle temporarily, for instance by means of a separate switch.

7. A network connecting device as claimed in claim 2, characterised by the feature that the reversing and change-over device consists of a rotary member with a cam disc, which controls contacts that can be connected to a rectifier.

8. A device for connecting an electrically operated toy vehicle to a supply network, substantially as hereinbefore described with reference to the accompanying drawings.

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757,222 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig.1

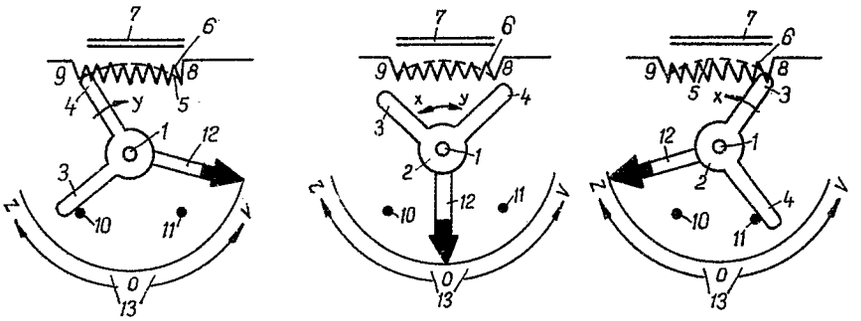

Fig.2

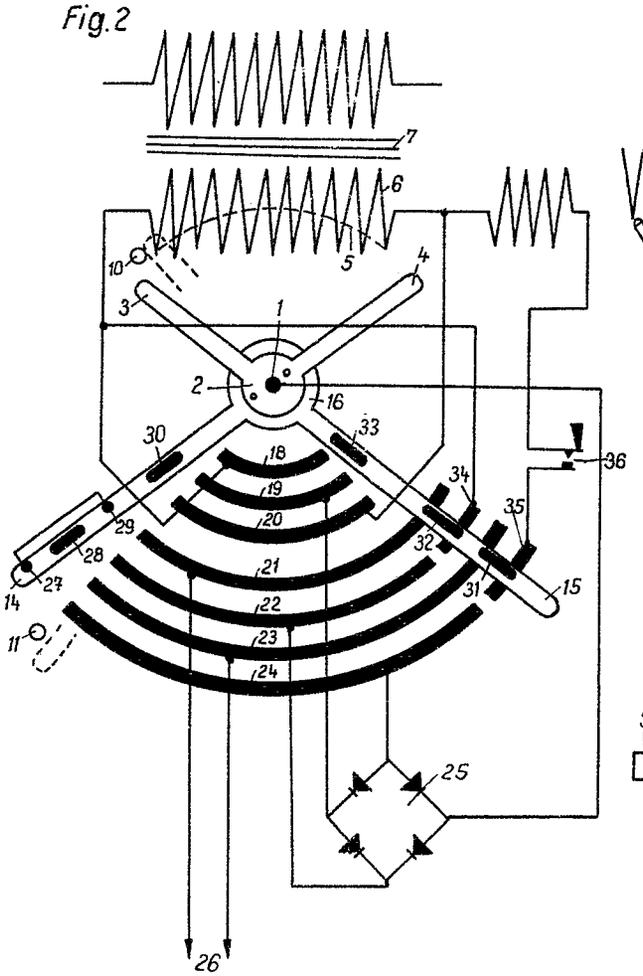

Fig.3

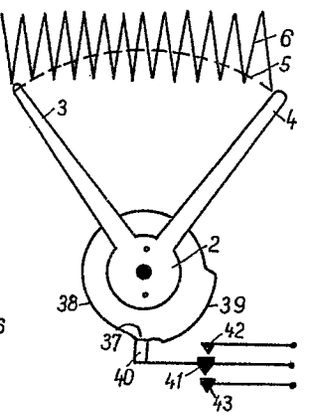
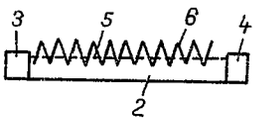
Fig.4