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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Mains Connection Unit for Direct-current Driven Toys

We, ERNST VOELK, WALTER VOELK, GUNTHER KURZ and WILHELM STEIN all of German Nationality and all of 40 Kreulstrasse, Nurnberg, Germany trading as TRIX VEREINIGTE SPIELWARENFABRIKEN ERNST VOELK KG., of 40 Kruelstrasse, Nurnberg, Germany, 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 speed and direction control unit for direct current electric toys, the movement of which is variable as to direction and as to speed by means of a handle, rotary knob or the like.

Such a control unit usually includes a transformer, a rectifier, a series resistance, a polarity reverser as well as any fuses, signal lamps and the like. In general the voltage derived from a secondary winding of the transformer is regulated by means of a handle, rotary knob or the like so that the speed of the toy is varied. Another handle, rotary knob or the like operates the polarity reverser for changing the motion of the toy from forward travel to reverse travel, and *vice versa*. In both directions of travel of the toy, the voltage can be varied from zero to a maximum.

It is however already known to traverse the secondary winding of a transformer by one or other of two sliding fingers and to arranged that on changing over from one sliding finger to the other a polarity reversal takes place. With this arrangement it is necessary to make the polarity reversal when the voltage derived from the secondary winding is a minimum.

The practical advantages of this arrangement are considerable but the manufacture of the unit is rendered expensive by reason of the large number of switch elements, such as, for example, contact paths and the like which must be provided.

A further drawback is the comparatively large space requirement. This disadvantage appears in another known unit which uses a current collector which sweeps over two secondary windings arranged in one plane. Due to the windings being arranged in series with one another a construction of practically double length for a double voltage range results.

The object of the invention is to provide a control unit of the above-described type which unites the advantages of operation by a single handle, rotary knob or the like with an extremely simple construction, combined with a likewise easy assembly as well as economic production and increased reliability in operation.

To this end, according to the present invention, there is provided a speed and direction control unit for direct current electric toys the movement of which is variable as to direction and as to speed by means of a handle, rotary knob or the like which is operatively connected to a current collector and a polarity reverser wherein the current collector comprises two sliding members movable over a transformer winding from or towards a centre position upon movement of the handle, rotary knob or the like from or towards a zero position respectively such that contact points between the sliding members, and the winding are at their closest proximity at the centre position and move in opposite directions simultaneously upon movement of the handle, rotary knob or the like.

This construction of a control unit for controlling direct current electric toys now gives the considerable advantage that the ends of the transformer winding do not have to be taken to switch elements, which are thus

[*Price* 4*s.* 6*d.*]

omitted. Altogether this arrangement is extraordinarily space saving.

The handle, rotary knob or the like may be moved from its zero position in both directions with the same result of increasing the voltage supply and the polarity reverser is operated as the handle, rotary knob or the like passes in either direction through the zero position.

In one embodiment of the invention each sliding member is in the form of a sliding finger capable of traversing about half the length of the secondary winding, the current collector being rotatable about an axis which passes approximately through the electrical mid point of the secondary winding.

In this embodiment each sliding finger preferably has the form of two arcs of equal length and equal curvature joined end to end, the sliding fingers being spaced apart with their concave faces facing each other.

In another embodiment of the invention each sliding member is fixed to one of two parallel lengths of an endless cable so that they move in opposite directions upon movement of the cable. In the centre position the two sliding members are at their closest proximity and they move in opposite directions from the centre position upon operation of the handle, rotary knob or the like until they are at opposite ends of the transformer secondary winding. It is of particular advantage in this embodiment if the cable is guided around a rotory knob.

In a further embodiment each sliding member is in the form of an arm, the arms being mounted upon pivots located at one side of the transformer secondary winding and being in engagement with a cam means effectively upon rotation to cause movement of the arms simultaneously in opposite directions. The pivoted arms may be in engagement, for example under spring action, with the periphery of a cam disc located between the pivoted arms.

Alternatively, each pivoted arm may be forcibly guided by a guide slot provided in the cam means. In order to avoid such guide slots intersecting the cam means may comprise two cam discs lying one on top of the other and each having a guide slot for one of the two pivoted arms.

The polarity reverser may be arranged to provide zero voltage at the zero position of the handle, rotary knob or the like by providing, for example an interruption in the circuit of the polarity reverser at this position.

When the sliding members are at their closest proximity, the current collector receives only a very small voltage which is practically negligible. This small voltage may, for example, be 10 volts and the maximum voltage may be 30 volts so that movement of each of the two sliding members produces a maximum change in voltage of 10V. A central portion of the secondary winding of the transformer may be offset relatively to the two outer portions of the secondary winding in order to ensure that the sliding members do not make contact with it.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:—

Fig. 1 is a perspective view of part of a first embodiment;

Fig. 2 is a plan view of the apparatus of Fig. 1,

Fig. 3 is a section on the line III—III of Fig. 2,

Fig. 4 is a perspective view of part of a second embodiment;

Fig. 5 shows detail of the apparatus of Fig. 4;

Fig. 6 is an exploded view of a third embodiment;

Fig. 7 is an exploded view of part of a further embodiment; and

Fig. 8 shows schematically a special construction of transformer winding.

The control unit of which a part is illustrated in Figs. 1 to 3 has a transformer with an iron core 1, a primary winding 2, and insulation 4 arranged between this and a secondary winding 3. The secondary winding 3 is constructed on its upper side 7 with a contact path 5 for sliding members of a current collector indicated as a whole at 6.

The current collector 6 comprises two sliding members and a plate 8 which is rotatable with the axle 9 the axis of which passes approximately through the electrical mid point of the secondary winding 3. The sliding members take the form of sliding fingers 10 and 11 of identical construction which each consist of two arcs of equal length and equal curvature joined end to end and which are embedded symmetrically in the plate 8 with their concave faces facing each other. The lower edges 13 of the sliding fingers 10, 11, where they extend beyond the plane of the plate 8, slide over the control path 5. Upon rotation of the current collector 6 in the direction of the arrow 14 about the axis of the axle 9 from the centre position in which it is shown in Fig. 2, the contact points between the sliding fingers 10, 11 and the contact path 5 move outwardly in the direction of the ends of the winding 3 so that the contact point 15 of the sliding finger 10 finally reaches the position 15′ and the contact point 16 of the sliding finger 11 finally reaches the position 16′. When the sliding fingers 10 and 11 are in the centre position the voltage between them is a minimum and when the contact points are in the end positions 15′ and 16′ this voltage is a maximum.

The current collector 6 is also rotatable from the centre position in the direction of the arrow 17 to cause the contact points to traverse the contact path 5 in direction opposite to those described above. The lead con-

nection points of the sliding fingers 10 and 11 are indicated at 18 and 19 respectively.

Figures 4 and 5 show sliding members 20 and 21 fixed to parallel lengths 22 and 23 respectively of an endless cable, indicated at 24, which has a tension spring at 25 and is guided over guide rollers 26 as well as a guide roller 27 of a rotary knob 28. Fig. 4 shows the two sliding members 20 and 21 in a centre position opposite one another on a contact path of a secondary winding (not shown).

As Fig. 5 shows, the sliding members 20, 21 run on a current conducting lead 29. The rotational range of the rotary knob 28 from a zero position indicated by 0 (Fig. 4) is limited in both directions by stops (not shown).

In the embodiment according to Fig. 6, the sliding members move over a contact path 5 of a secondary winding 30 of a transformer and take the form of two arms 32 and 33 pivoted at pivot points 31 located to one side of the winding 30. Under the section of an insulated spring 34, the arms 32 and 33 engage on the periphery of a cam means in the form of a cam disc 35 which is fast with a rotary knob 36 and a switch member 37. With the rotation of the knob 36 in an anticlockwise direction from a zero position in which it is shown in the Figure the pivoted arms 32 and 33 move symmetrically on the contact path 5 of the winding 30 outwardly towards the ends of the winding 30. The positions of the two pivot arms indicated at 32′ and 33′ correspond to the position 35′ shown in broken lines, of the cam disc 35.

If desired the rotary knob 36 may co-operate with a scale 38 which indicates the direction of movement of the toy (i.e. either forward or in reverse) and/or the voltage tapped and hence the speed of the toy (i.e. either fast or slow).

The two pivoted arms 32 and 33 are connected via leads 39 and 40 to the input of a rectifier 41 the output of which is connected via leads 42 and 43 to contact rails 44 and 45 of a polarity reverser indicated as a whole at 46. These contact rails 44 and 45 are connected via current bridges 47 and 48 of the switch member 37 to contact rails 49 and 50 of the polarity reverser 46. These latter contact rails are connected via the leads 51 and 52 to a current consuming toy (not shown).

The contact rails 51 and 52 are separated by a gap 53. When, therefore, one of the current bridges 47, 48 passes over the gap 53, that is, when the rotary knob 36 passes through the zero position, the current paths between the contact rail 45 and the rails 49 and 50 are interrupted so that the toy receives no voltage.

In the embodiment according to Fig. 7 the sliding members take the form of two pivoted arms 56 and 57 mounted at 54 on a casing plate 55 for tapping the secondary winding 58 of a transformer, the iron core of which is indicated at 59. The arms 56 and 57 engage a cam means comprising cam discs 60 and 63. The cam disc 60 is rotatably mounted by means of the pin 61 of the rotary knob 62 on the plate 55 and the flat pivoted arms 56 and 57 lie on the cam disc 60. These arms are covered by the cam disc 63 which is arranged concentrically with the cam disc 60 and the rotory knob 62. The pin 61 also passes through the cam disc 63. The two cam discs 60, 63 and the rotary knob 62 are connected for mutual rotation by a further pin 64. Adjacent faces of the cam discs 60 and 63 are each provided with a guide slot 65 and 66 respectively and these slots are respectively engaged by pins 67 and 68 which are firmly connected to the pivot arms 57 and 56 respectively. Upon rotation of the knob 62 in one of the directions of rotation, indicated by the arrows 69 and 70, the ends 71 of the arms 56 and 57 are moved symmetrically in the direction of the outer ends of the winding 58 and upon turning back of the knob 62 are guided back into the position of the closest proximity, in which they are shown in Fig. 7.

Fig. 8 shows a possible embodiment of a secondary winding 72, a centre part 73 of which is offset so that it does not contact the sliding members. These thus receive in their centre position a selected voltage of 10V and each of the two outer portions of the secondary winding 72 also have a voltage of 10V across them. Consequently there results a maximum a value of 30V compared with the starting voltage of 10V.

The invention is of course not limited to the embodiment described in the foregoing and in the drawing but on the contrary numerous modifications are possible without deviating from the invention as claimed in the appended claims.

WHAT WE CLAIM IS:—

1. A speed and direction control unit for direct current electric toys the movement of which is variable as to direction and as to speed by means of a handle, rotary knob or the like which is operatively connected to a current collector and a polarity reverser wherein the current collector comprises two sliding members movable over a transformer winding from or towards a centre position upon movement of the handle, rotary knob or the like from or towards a zero position respectively such that contact points between the sliding members and the winding are at their closest proximity at the centre position and move in opposite directions simultaneously upon movement of the handle, rotary knob or the like.

2. A control unit according to claim 1 wherein the handle, rotary knob or the like

operates the polarity reverser as it passes in either direction through the zero position.

3. A control unit according to claim 1 or 2 wherein the current collector is rotatable about an axis which passes approximately through the electrical mid point of the winding and each sliding member is in the form of a sliding finger capable of traversing the respective approximate half lengths of the winding.

4. A control unit according to claim 3 wherein each sliding finger has the form of two arcs of equal length and equal curvature, the sliding fingers being spaced apart with their concave faces facing each other.

5. A control unit according to claim 1 or 2 wherein each sliding member is fixed to one of two parallel lengths of an endless cable so that the sliding members move in mutually opposite directions upon movement of the cable.

6. A control unit according to claim 5 wherein the cable is guided around a rotary knob to be moved thereby.

7. A control unit according to claim 1 or 2 wherein each sliding member is in the form of an arm, the arms being mounted upon pivots located at one side of the transformer winding and being in engagement with a cam means effective upon rotation to cause movement of the arms simultaneously in opposite directions.

8. A control unit according to claim 7 wherein the cam means is a cam disc disposed between the arms and the arms are maintained in engagement with the periphery of the cam disc by spring action.

9. A control unit according to claim 7 wherein each pivoted arm is forcibly guided by a guide slot provided in the cam means.

10. A control unit according to claim 9 wherein the cam means comprises two cam discs lying one on top of the other and each having a guide slot for one of the two pivoted arms.

11. A control unit according to any preceding claim wherein the polarity reverser is arranged to provide zero voltage when the handle, rotary knob or the like is in the zero position.

12. A control unit according to any preceding claim wherein a control portion of the transformer winding is offset relatively to the outer portions of the winding so that the sliding members do not make contact with the control portion.

13. A control unit for direct current electric toys having a current collector substantially as hereinbefore described with reference to Figures 1—3, Figures 4 and 5, Figure 6 or Figure 7 of the accompanying drawings.

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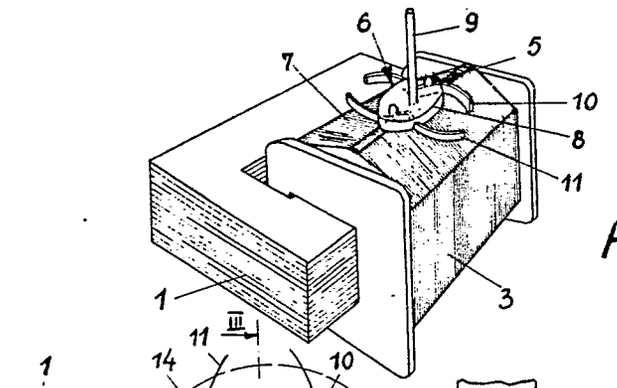


Fig.1

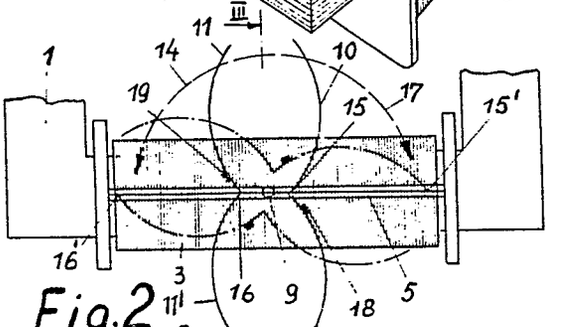


Fig.2

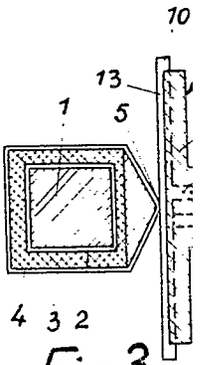


Fig.3

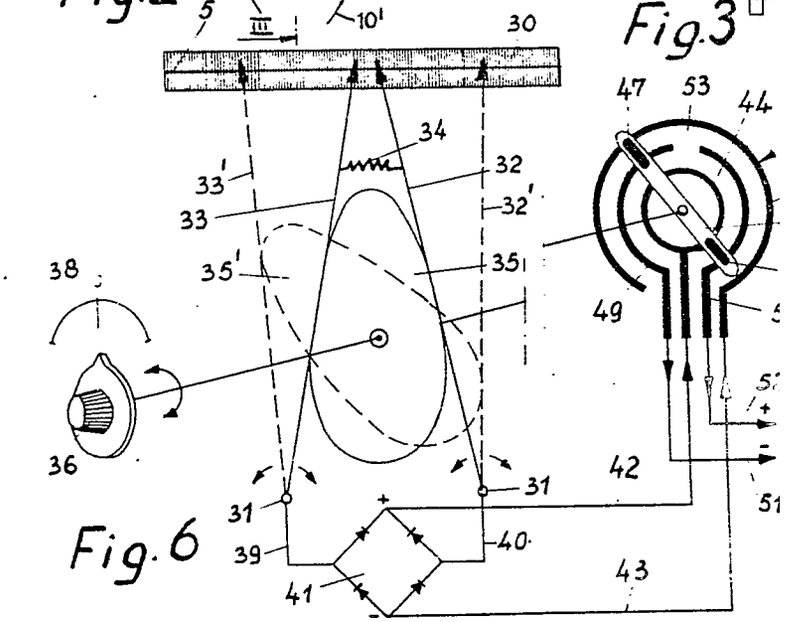


Fig.6

1029416 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheets 1 & 2

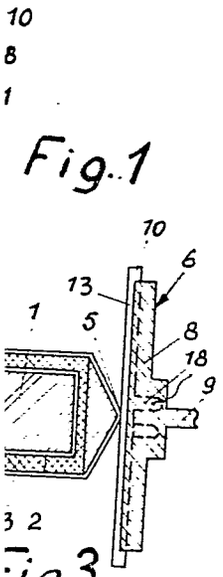
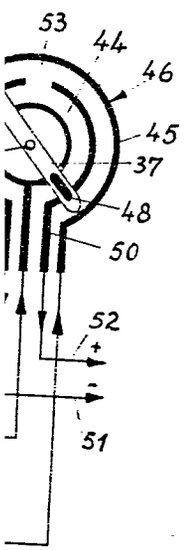


Fig.1

Fig.3



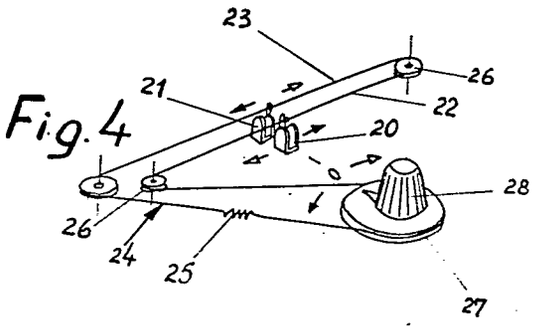


Fig.4

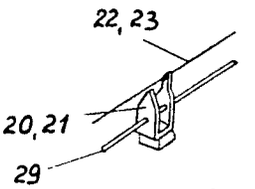


Fig.5

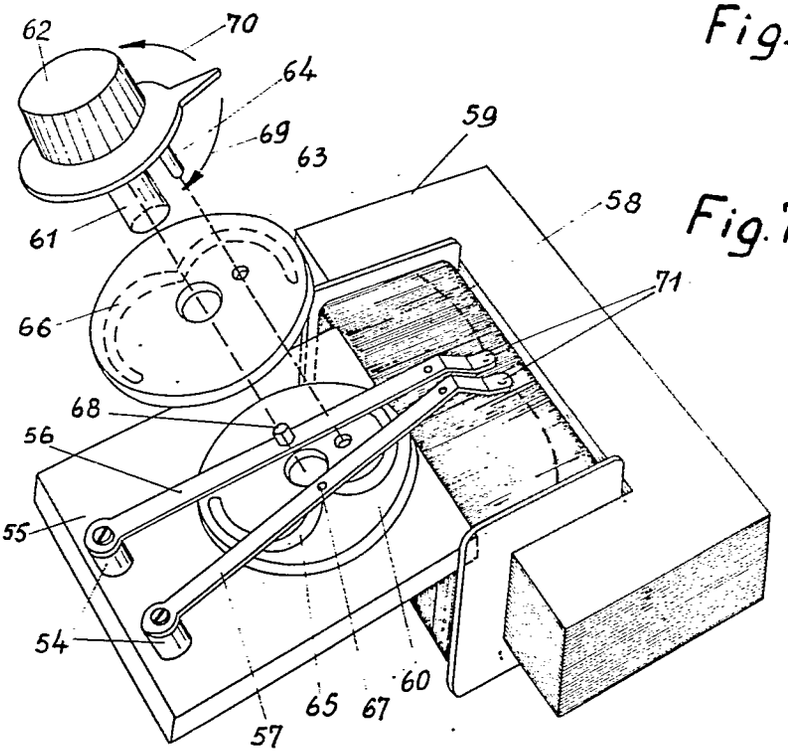


Fig.7

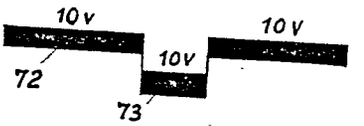


Fig.8

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Sheets 1 & 2

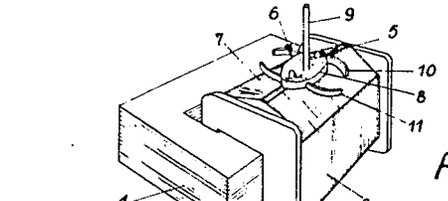

Fig.1

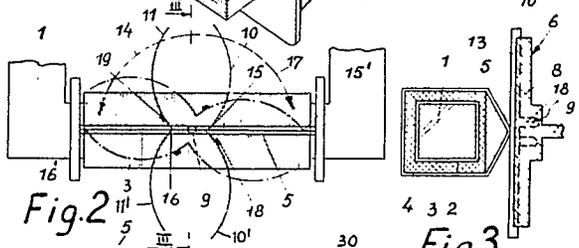

Fig.6

Fig.3

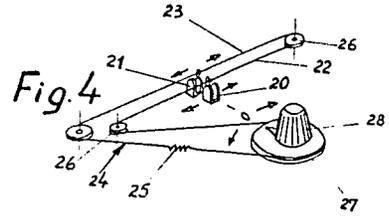

Fig.4

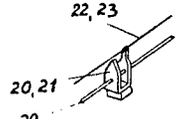

Fig.5

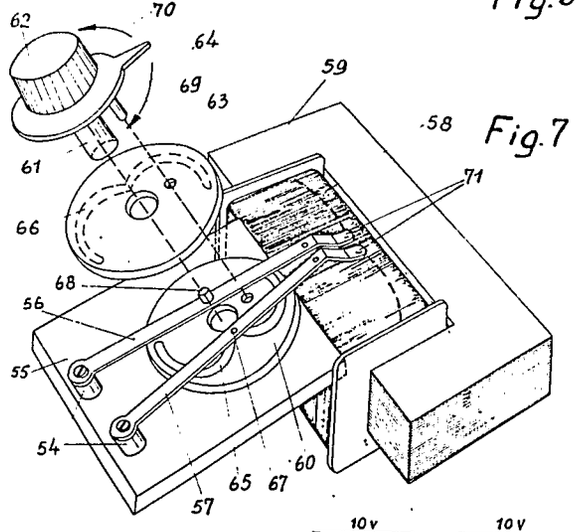

Fig.7

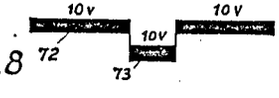

Fig.8