

[54] MECHANISM WHICH INCLUDES AN  
OBJECT ARRANGED TO TRAVEL  
FREELY ON A SURFACE

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[58] Field of Search .....46/240

[56] References Cited

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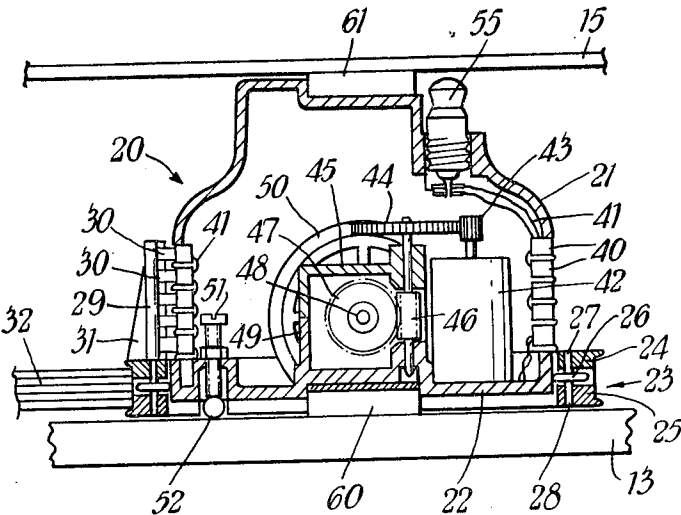
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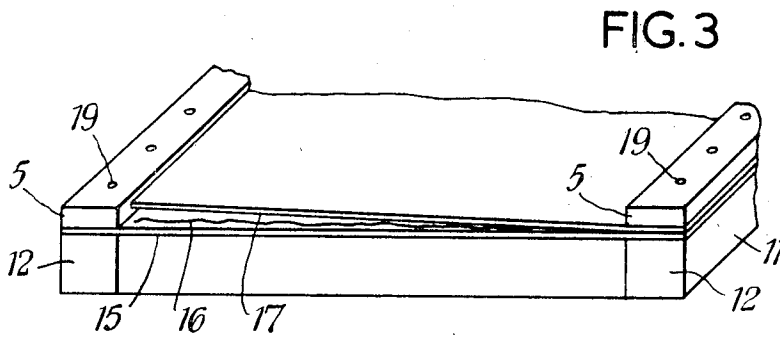
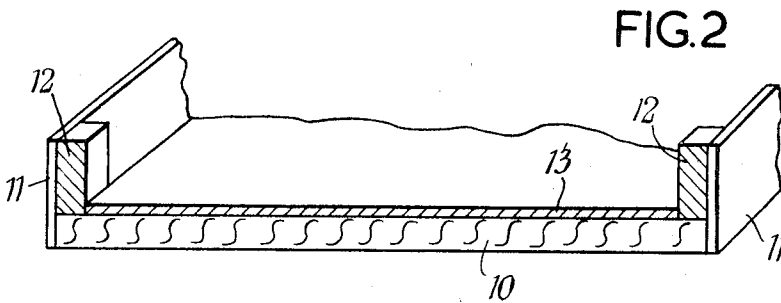
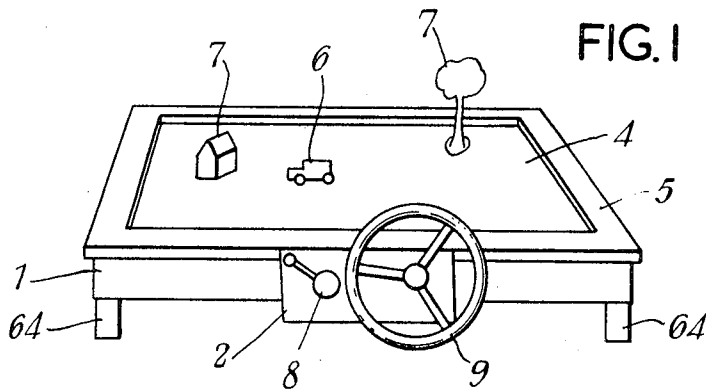
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[57] ABSTRACT

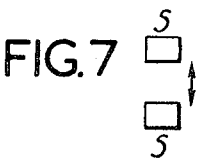
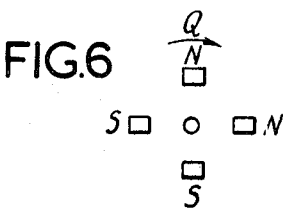
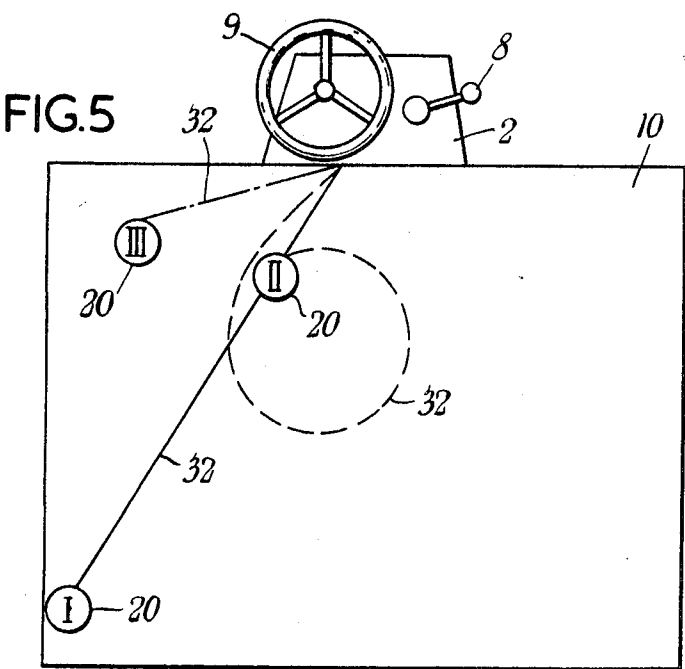
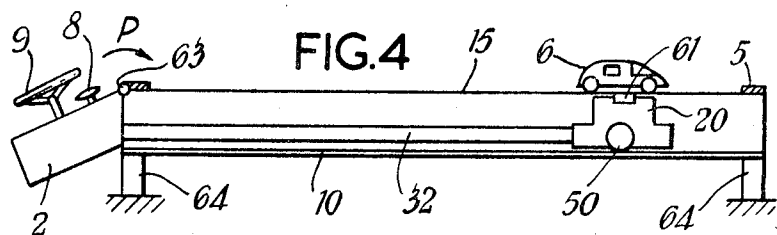
A device for use as a toy or in driver instruction in which a toy or model vehicle is guided over a marked upper surface by a motor-driven object that is freely movable over an underlying lower surface. A magnetic link is established between the object and the toy or model vehicle and the object is steered by controlling the speeds of rotation of its wheels. A flat striplike cable supplies electric power to the object and tangling of the cable is avoided by surrounding the object with a member which is rotatable relative thereto, the cable extending between said member and a fixed control panel.

10 Claims, 11 Drawing Figures





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FIG.8

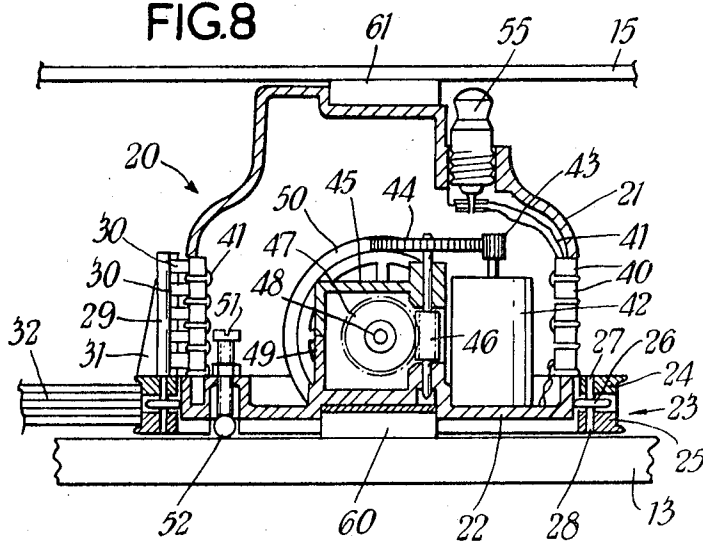
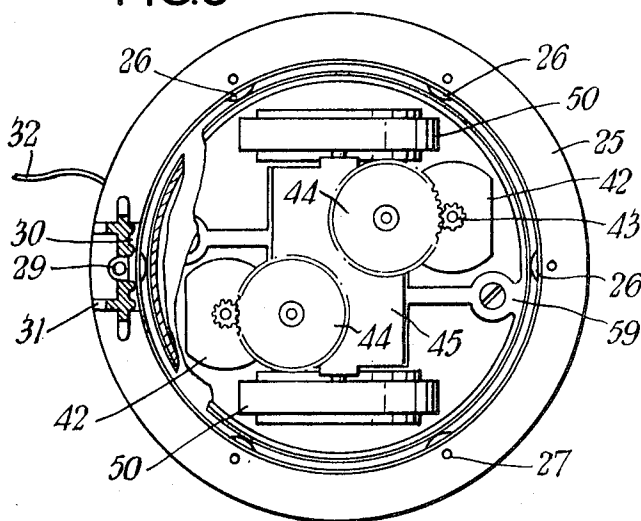
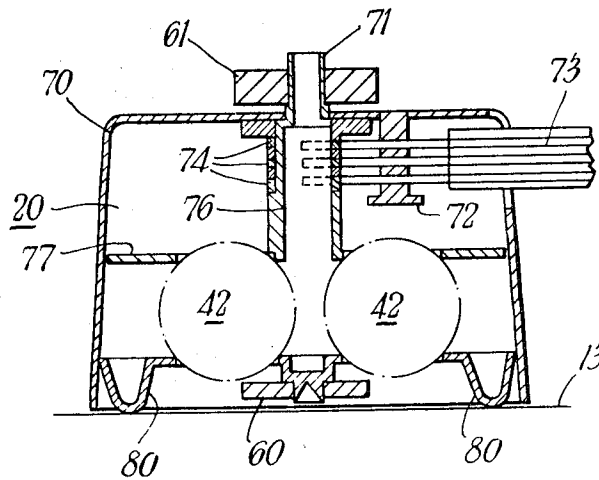


FIG.9

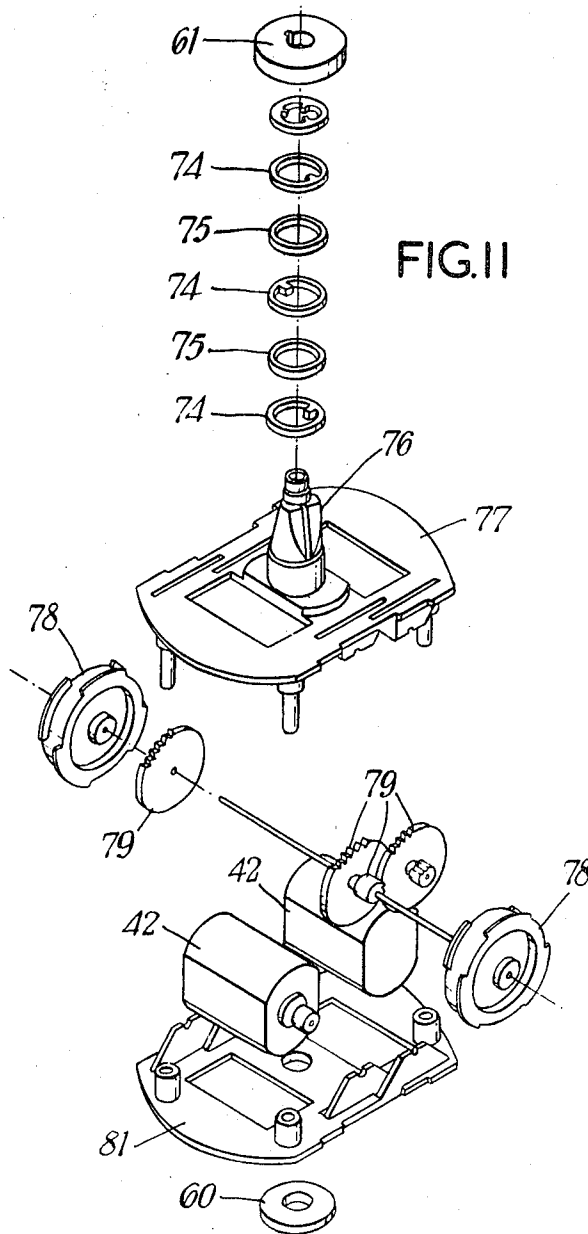


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FIG. 10



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## MECHANISM WHICH INCLUDES AN OBJECT ARRANGED TO TRAVEL FREELY ON A SURFACE

This invention relates to devices which comprise an object that is motor driven in such a way that it can move freely on a surface in response to electric current which it receives from a stationary control panel through the intermediary of a flexible cable and a multiple slip ring mounted on said object.

Such a device may be designed, for example, to cause toy or model vehicles to travel over a further overlying surface in a realistic manner, such toy or model vehicles thus being controlled from the panel mentioned above. For steering the object in such a device, it is necessary to ensure that the flexible electricity supply cable which interconnects the object and the control panel does not become entangled with itself and that the travelling object can perform any movement, for example a large number of circular movements, without the supply cable giving difficulties.

According to the invention, there is provided a device comprising an object that is motor driven in such a way that it can move freely on a surface in response to electric current which it receives from a stationary control panel through the intermediary of a flexible cable and a multiple slip ring mounted on said object, wherein the object is surrounded by a member which is rotatable relative to the object, said member being formed with a cylindrical outer surface around which the cable, that is of flat striplike formation, can wind, and wherein the surrounding member includes a support for a plurality of contacts that are connected to corresponding conductors of said cable and are also in wiping engagement with corresponding rings of the multiple slipping the construction and arrangement of the device being such that, during the use thereof, the object travelling in response to electric current received from the panel can cause toy or model vehicles to travel over a further surface in a realistic manner.

The further surface will normally be located over and above the surface upon which the travelling object is freely movable and can be marked, and/or physically provided as appropriate, with roads, squares, trees, houses and so on so that a child or other person can sit at the control panel and operate a steering wheel generally similar to that of a motor car. The supply cable is invisibly located beneath the upper surface on which at least one toy or model vehicle travels and, clearly, is not impeded by any model houses, trees or other objects mounted on said upper surface. Instructional devices can be similarly made for use in teaching driving, it being readily possible for the controls to be constructed in the same general way as those of an average motor car so that a pupil can see, as an outside observer, what effect his steering has upon the toy car which he is controlling on the upper surface of the device.

The travelling object located on the lower surface may comprise, for the transmission of its movement to the toy or model vehicle located on the upper surface, an upwardly directed permanent magnet which will be located immediately beneath the upper surface and which will thus carry the overlying toy or model vehicle with it provided that said toy or model vehicle is constructed from, or provided with, a magnetically active material. It will be evident that the plate which affords the upper surface should be formed from a magnetically inactive material through which a magnetic field can pass without hindrance when the drive is to be transmitted from the lower moving object to the upper toy or model vehicle in this way.

The lower travelling object may comprise a signal generator which is adapted to be actuated through the supply cable and which acts on a signal receiver disposed in the overlying toy or model vehicle. In this way, a number of signals can be transmitted to the toy or model vehicle as well as simple steering movements. For instance, a toy or model vehicle such as a crane or dredger may have its moving parts operated in this way. There may be employed as the signal generator an upwardly directed rotary magnet which drives a corresponding downwardly directed moving magnet or a moving iron in a receiver portion of the toy or model vehicle. The moving magnet in the lower travelling object is controlled through the

supply cable from the control panel, while the moving magnet or moving iron is arranged to actuate, for example, the arm of a hoisting crane in the toy or model vehicle.

Signal transmission may also be effected by means of a vertically movable lifting magnet which raises and lowers a magnet or iron member of like or opposite polarity disposed in the receiver portion of the toy or model vehicle. The signal generator may also be a rocking magnet which actuates a rocking magnet or rocking iron member in the receiver of the toy or model vehicle. The signal transmission from the signal generator to the signal receiver may also be effected by means of high frequency, ultrasonically or optically.

The lower surface on which the lower traveling object moves may comprise a magnetically active layer and the lower object itself may be equipped with means for generating a downwardly directed magnetic field. This has the advantage that the whole device need not necessarily be horizontally disposed and could, in an extreme case, be located with both of the travelling surfaces vertically disposed. The lower travelling object is then prevented from falling off the surface on which it travels by virtue of its magnetic adhesion thereto and the same applies to the toy or model vehicle which is magnetically linked to the surface just mentioned through the intermediary of the travelling object. In the case of a device adapted for use in driving instruction, the pupil may be seated at a control panel simulating the controls of a motor car and can observe the movement of a model motor car on a vertical plane disposed in front of him, said model motor car being arranged to move in accordance with the steering imparted to it by the pupil.

The upper surface of the device upon which the or each toy or model vehicle moves may take the form of a nonmagnetic foil stretched over a wooden frame in the manner of a drum skin so as to extend parallel to the lower surface upon which the travelling object moves without appreciable deformation of the shape of the wooden frame. Alternatively, both the frame and the upper surface may be formed from synthetic plastics materials.

It has been found that the multiple slipping may take the form of a slipping plate having concentric slippings that are engaged by corresponding sets of wiping contacts. It is advantageous for the multiple slipping to comprise a plurality of slippings disposed cylindrically around the whole, or a part, of the lower travelling object. In one construction in accordance with the invention, a ring may be movable around the lower travelling object with the aid of a corresponding rotary counting and may carry a contact bridge for the slippings, the contact bridge being connected to the supply cable. The supply cable itself is of flat striplike formation and it has been found desirable to strengthen the cable strip by including therein threads of nonelectrically conducting material that have a high resistance to breakage.

The lower travelling object advantageously takes the form of a carriage having two juxtaposed individually driven wheels. The travelling object can then be steered in a simple manner by adjustment of the speeds of the rotation of the two wheels. Each wheel may be driven by a corresponding small electric motor whose speed is related to the applied voltage so that differences in the speed of rotation of the two wheels can be effected by adjusting the voltages applied to the two motors. Clearly, if the two wheels are driven at the same speed, the travelling object will move in a straight line while movement through a curve can be effected by making the voltages applied to the two motors dissimilar. The voltage difference between the two motors determines the angular velocity difference between the two wheels and thus the radius of the curve which will be described by the travelling object, the absolute voltage values in turn determining the speed of the object as a whole. An undriven wheel, or a ball or a skirt arrangement serves to stabilize the travelling object on the lower surface. In order that all the parts of the travelling object may be accommodated within a space of minimum width, said object preferably has a central upright at opposite sides of which are

mounted the driven wheels and the two electric motors, each motor driving a corresponding one of the two wheels through a reduction gear.

In order to minimize the packing space when a device in accordance with the invention is used as a toy, the control panel may be given such overall dimensions that, when parts such as a steering wheel and a speed control lever are removed, said panel has a height which is not greater than that of the travelling object, said panel being arranged so that it can be swiveled towards the housing of the device for transport purposes. With this arrangement, packing is facilitated since no special space is required for the control panel which would otherwise project from the remainder of the device at one point. The various control elements are removed for the purpose of transport and may be placed in a bag and laid inside the box which carries the remainder of the device.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 is a perspective view of a device in accordance with the invention in the form of a toy,

FIG. 2 is a perspective view of the lower surface of the device upon which the travelling object moves,

FIG. 3 is a perspective view illustrating the disposition of the upper surface upon which the or each toy or model vehicle travels,

FIG. 4 is a side elevation of the device with a sidewall removed,

FIG. 5 is a plan view of the lower surface of the device diagrammatically illustrating possible travelling movements of the object,

FIG. 6 is a diagram illustrating a rotary magnet arrangement for the transmission of signals from the travelling object to an overlying toy or model vehicle,

FIG. 7 is similar to FIG. 6 but illustrates the arrangement of a lifting magnet for the transmission of signals from the object to an overlying toy or model vehicle,

FIG. 8 is a sectional elevation, to an enlarged scale, showing the travelling object and its form of cooperation with the upper and lower surfaces,

FIG. 9 is a sectional plan view corresponding to FIG. 8 but omitting the upper surface of the device,

FIG. 10 is a sectional elevation illustrating an alternative simplified form of travelling object, and

FIG. 11 is an exploded perspective view illustrating the object of FIG. 10 in greater detail but omitting certain of the outer parts thereof.

Referring to the drawings, the toy device which is illustrated in FIG. 1 has an upper playing surface 4 which is provided with a border 5 and also has a control panel 2 on which are mounted a steering wheel 9 and a speed adjustment lever 8. The lever 8 and steering wheel 9 serve, as hereinafter described, to steer a toy or model vehicle in the form of a toy motor car 6 on the surface 4 around objects 7, such as trees, houses and the like, which are situated thereon. The whole toy device is constructed as a flat box or casing 1 which rests upon legs 64. If desired, the speed adjustment lever 8 may be replaced by a pedal and the whole device can be constructed so that the pupil of a driving instructor can sit behind the wheel 9 to operate the wheel and the lever 8 or equivalent pedal in accordance with the directions of the driving instructor.

FIG. 2 of the drawings shows a lower surface 10 upon which the travelling object 20 (FIGS. 4, 8, 9, 10 and 11) moves. The surface 10 may be a plywood panel whose upper face is coated with a ferrous sheet-metal layer 13 to render it magnetically active. Alternatively, a synthetic plastics material may be used in place of plywood. Distance pieces 12 ensure the necessary spacing from an overlying upper plate 15 (affording the surface 4) which is shown in FIG. 3. Wooden or plastic sidewalls 11 conceal the interior of the device from users thereof.

FIG. 3 shows the upper plate 15, which affords the greater part of the upper surface 4 and which is preferably made from a transparent synthetic plastics material. The plate 15 is clamped to the border 5 by screws 19 or other fastenings. A second transparent plate 17, also of magnetically inactive material, lies above the plate 15 and road plans or the like 16 made from paper or cellulose may be sandwiched between the plates 17 and 15 in such a way that they can be removed and replaced with other such plans when required. As can be seen in FIG. 3 of the drawings, the plate 17 is fastened to the border 5 along only one of its edges so that it can be turned upwardly to allow ready removal of the plans 16 from therebeneath.

It can be seen from FIG. 4 of the drawings that the plate affording the lower surface 10 rests on the legs 64 and that the travelling object 20 has wheels 50. Electric current is supplied to the object 20 by way of a flexible cable 32 that is of flat striplike formation. The top of the travelling object carries a permanent magnet 61 which cooperates with a further permanent magnet in the floor of the toy or model motor car 6 which can be seen overlying the object 20 upon the upper surface 4 (plates 15 and 17).

The control panel 2 is located at the front of the device and is turnably connected to the remainder thereof by a horizontal hinge 63. It is thus possible, for the purposes of transport, to remove the steering wheel 9 and lever 8 from the panel 2 after which the panel can be turned upwardly about the axis defined by the hinge 63 in the direction indicated by an arrow P in FIG. 4 of the drawings. Packing space is saved in this way, the lever 8 and steering wheel 9 being placed in a bag or the like in the box which contains the remainder of the device.

FIG. 5 of the drawings shows diagrammatically various movements that the travelling object 20 can perform upon the plate affording the lower surface 10. FIG. 5 shows three different positions I, II and III of the travelling object 20. In position I, the travelling object is remote from the control panel 2 and substantially the whole of the supply cable 32 is utilized, said cable 32 extending rectilinearly. In position II of the object 20, said object has just negotiated a curve and is shown pulling the cable 32 behind it, substantially the whole of the cable 32 once again being unwound. In position III, however, the object 20 has just performed a series of rotations around its own vertical axis so that the cable 32 has become wound around the object 20, or a part thereof, in such a way that it can readily uncoil again when required. The way in which this occurs will be evident from the following description of FIGS. 8 to 11 of the drawings.

FIGS. 6 and 7 of the drawings merely illustrate diagrammatically the arrangement of magnets arranged to rotate in the direction Q (FIG. 6) and lifting magnets arranged to move in the directions indicated by the arrows in FIG. 7. These magnets serve for the transmission of signals from the travelling object 20 to a toy or model vehicle equivalent to the toy motor car 6 but having some cooperating parts that will be driven by said magnets. The moving parts of toy or model cranes, dredgers or tipper lorries are examples of parts which can be actuated by the magnet arrangements shown in FIGS. 6 and 7 of the drawings.

FIGS. 8 and 9 illustrate one construction of the travelling object 20 from which it can be seen that said object has an upper housing half 21 and a lower housing half 22. A permanent magnet 60 with the aid of which the object adheres to the plate 13 (surface 10) is suspended on the lower housing half 22, said plate 13 being made of a ferrous material or being covered with a layer of ferrous metal. Alternatively, the plate 13 may be formed from a synthetic plastics material containing iron or ferrite filings as a magnetically active filler. The upper permanent magnet 61 acts, as previously described, through the nonmagnetic upper surface 4 (plate 15) upon a magnet or ferrous body in the toy or model vehicle with which the object 20 cooperates.

A ring 23 having a cylindrical outer surface surrounds the foot of the travelling object 20 and comprises an upper ring section 24 and a lower ring section 25. Mounted on these ring

sections 24 and 25, in bearings 27 and 28, are a number of small rollers 26 which run in a groove formed at the junction between the upper housing half 21 and the lower housing half 22. The ring 23 is thus rotatable around a substantially vertical central axis of the object 20.

A contact bridge 29, 31 is mounted at one point around the ring 23 and includes five wiping contacts 30. The contacts 30 are electrically connected to corresponding conductors of the cable 32 one end of which is secured to the foot of the contact bridge 29, 31. The five contacts 30 make wiping engagement with a slipring plate having five sliprings 40 that are fixed around the periphery of the upper housing half 21 in superposed relationship. Conductors 41 extend from the separate sliprings rings 40 to two motors 42, to a signal light 55 and to any other signal transmission members (not shown) such as the members which move the magnets described with reference to FIGS. 6 and 7 of the drawings.

The two motors 42 can be seen in plan in FIG. 9 of the drawings and it will be evident that the vertical output shaft of each such motor carries a corresponding small toothed pinion 43 whose teeth are in driving mesh with those of a much larger toothed pinion 44. Each pinion 44 is mounted at the uppermost end of a corresponding shaft upon which a worm 46 is also fastened. Each worm 46 drives a corresponding worm wheel 47 mounted on a horizontal driving shaft 48 of a corresponding one of the two driving wheels 50. The wheels 50 are located in an inner compartment 45 of the object 20 which compartment is fastened to the lower housing half 22 by struts 59. Towards the rear of the object 20, with reference to the intended direction of forward travel thereof, a small ball 52, which is located midway between the tracks of the two wheels 50, engages the plate 13 and serves to stabilize the object 20 for movement over that plate. The degree of projection of the ball 52 from the bottom of the object 20 can be adjusted with the aid of a set screw 51. The two small electric motors 42 are commutator motors whose speeds of rotation are dependent principally upon the voltage applied to them. Thus, when substantially equal voltage is applied to the two motors 42, the pinions 43 will be driven at substantially the same speeds and the object 20 will move forwardly in a straight direction. Clearly, when dissimilar voltages are applied to the two motors 42, the wheels 50 will be driven at different speeds and the object 20 will follow a curved path whose nature will be related to the magnitude of the dissimilarity between the applied voltages.

FIGS. 10 and 11 of the drawings illustrate a simplified construction of the travelling object 20 in which an outer casing 70 is rotatable around the remainder of the object with the aid of a vertical sleeve bearing 71 located centrally at the top of the object. The bearing 71 also carries the upper magnet 61. A post 72 projects downwardly from the top of the outer rotatable casing 70 into the interior of that casing and has three conductors fastened to it, said conductors forming part of a flat striplike cable 73 which is entered through a hole in the side of the casing 70 and effectively anchored to said post 72. The bare ends of the three conductors which are supported by the post 72 afford contacts which make wiping engagement with three superposed sliprings 74 whose arrangement can be seen best in the exploded view of FIG. 11. The three sliprings 74 are maintained apart by spacers 75 and all of them surround a central upright 76 of the object 20 which is located beneath the bearing 71 when the object is assembled. It will be evident from FIG. 10 of the drawings that the outer casing 70 has a cylindrical outer surface around which the cable 73 can wind, when required, to prevent entanglement of that cable. The cable 73 may conveniently, but not essentially, be formed from a length of the material which is commercially available in Great Britain under the Trade Name "BICCASTRIP." The cable 73 may have a length of about 18 inches (46 centimeters).

The object 20 has an upper portion 77 and a lower portion 81 which are both preferably formed from synthetic plastics materials, the two motors 42 being lodged between said por-

tions 77 and 81 at opposite sides of the central upright 76. In this case, the output shafts of the two motors 42 are horizontally disposed and they transmit their drive to wheels 78 (which are provided with tires that are not shown) through the intermediary of simple reduction gearing that is generally indicated by the reference 79.

Instead of providing the stabilizing ball 52, or an equivalent small wheel, the object 20 is stabilized on the plate 13 by a skirt 80 (FIG. 10) which projects downwardly from the lower portion 81 alongside the interior of the outer casing 70. The foot of said skirt 80 slides over the plate 13 and provides an adequate degree of stability in association with the magnet 60 that effects magnetic adhesion of the object 20 to said magnetically active plate 13.

It will be evident that, in the case of the simplified travelling object 20 which is shown in FIGS. 10 and 11 of the drawings, two of the three conductors forming part of the cable 73 transmit voltage from the control panel 2 to the corresponding motors 42 while the third conductor is a common earth, ground or negative conductor. Although this simple construction is adequate to control both the steering and speed of a toy or model vehicle, it will be appreciated that further conductors could be provided for cooperation with further sliprings 74 to operate additional parts, such as the signal light 55 illustrated in FIG. 8, if so desired.

I claim:

1. In a device having a first extending surface, a second extending surface, a manually operable control panel, motor-driven means for moving on said first surface in response to electrical signals received from said panel, toy vehicle means for moving on said second surface, means associated with said toy vehicle means and said motor driven means for causing said toy vehicle means to move on said second surface with said motor-driven means as said motor-driven means moves on said first surface, a multiple slip ring mounted on said motor driven moving means and having a plurality of contacts each extending around the periphery of said motor driven means, a flexible cable member having a striplike formation, having a plurality of individual electrical connectors, extending substantially perpendicular to said first surface, and connected to said panel means for carrying said electrical signals, the improvement comprising:

45 cable member means having a cylindrical outer surface for receiving the wound cable member mounted about the periphery of said motor-driven means for free rotation about said periphery, so that movement of said motor driven means when at least a portion of said cable member is wound about said outer surface and said cable member does have slack not wound on said outer surface causes said cable member means to rotate and unwind said cable member and having a plurality of electrical contacts each connecting one of said individual conductors to one of said contacts of said slipring.

2. In a device as claimed in claim 11, wherein said causing means includes an upwardly directed permanent magnet and a magnetically active portion of said toy vehicle means and wherein said second surface overlies said motor driven means and is formed from a magnetically inactive material.

3. In a device as claimed in claim 11, wherein said first surface is magnetically active, and said motor driven means includes a magnetic element designed to cooperate with said first surface and cause magnetic adhesion of the motor driven means thereto.

4. In a device as claimed in claim 11, wherein said second surface is formed from a magnetically inactive material.

5. In a device as claimed in claim 11, wherein said multiple slipring surrounds said motor driven means in substantially concentric relationship therewith, and wherein said member means includes a ring that is rotatable relative to said motor-driven means and that carries a contact bridge affording support for said motor-driven means, whereby the contacts of said bridge will make wiping engagement with the sliprings during rotation of said ring around said motor driven means.

7

6. In a device as claimed in claim 5, wherein the multiple slipring is arranged on a central upright of said motor-driven means which also includes a post fastened to an outer casing which is rotatable around the remainder of said motor-driven means, said post supporting the contacts of said bridge in such a way that they make wiping engagement with said contacts of said slipring during rotation of said casing around the remainder of said motor-driven means.

7. In a device as claimed in claim 11, wherein the motor-driven means has two juxtaposed and individually driven wheels.

8

8. In a device as claimed in claim 7, wherein said motor-driven means includes an undriven ball for stabilizing said object in association with the two wheels.

9. In a device as claimed in claim 7, wherein said motor-driven means includes a skirt which serves for stabilizing said object in association with the two wheels.

10. In a device as claimed in claim 7, wherein the two wheels are driven by corresponding electric motors through the intermediary of reduction gearing.

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