Dec. 12, 1972 K. AHMED 3,705,996

SLIP RING ASSEMBLY

Original Filed Aug. 25, 1969 3 Sheets-Sheet 1

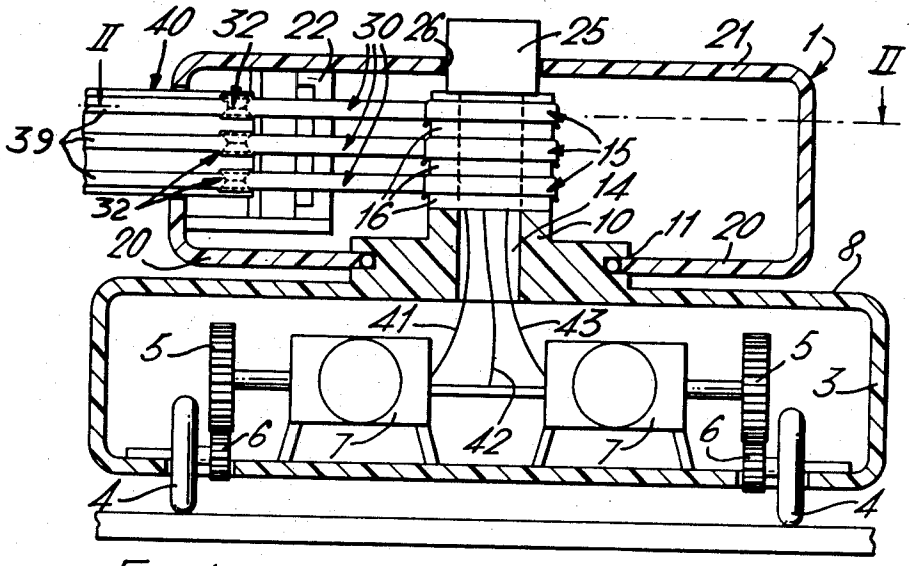


Fig. 1.

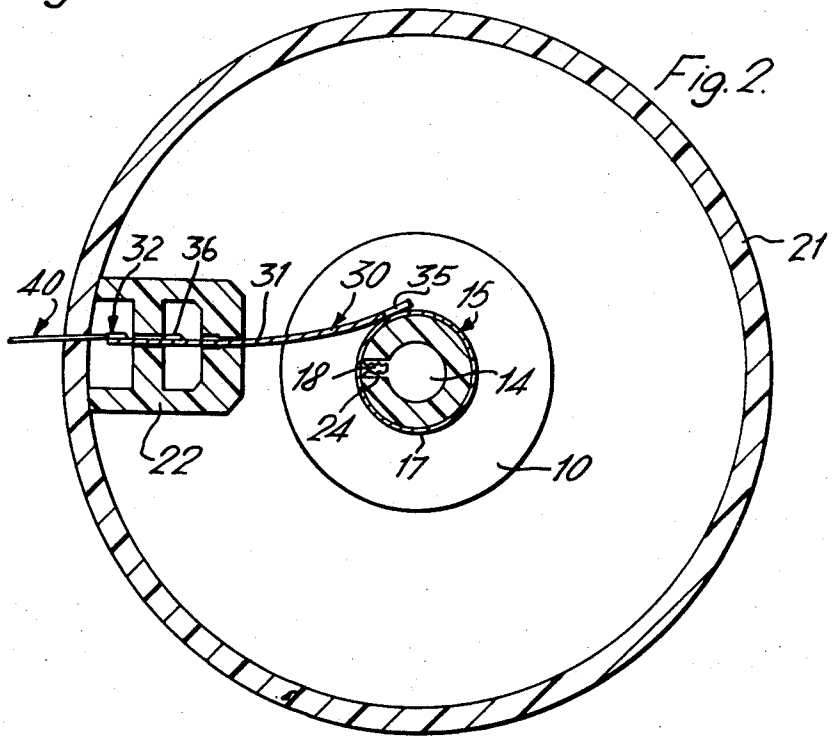


Fig. 2.

INVENTOR
Kamal Ahmed

Dec. 12, 1972 K. AHMED 3,705,996

SLIP RING ASSEMBLY

Original Filed Aug. 25, 1969 3 Sheets-Sheet 2

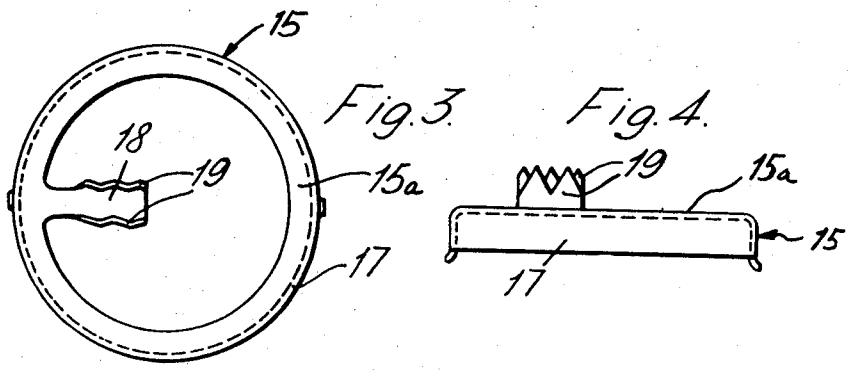


Fig. 3. Fig. 4.

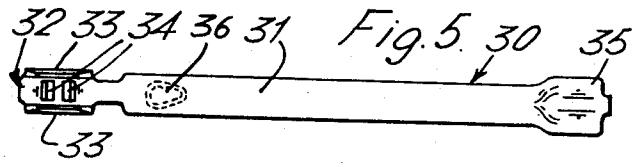


Fig. 5.

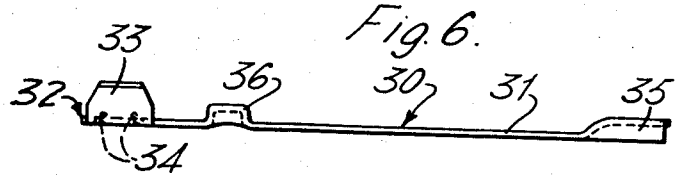


Fig. 6.

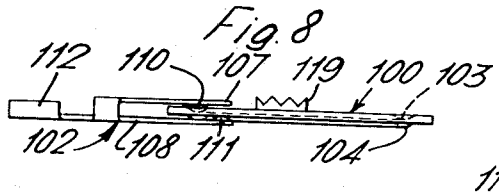


Fig. 8

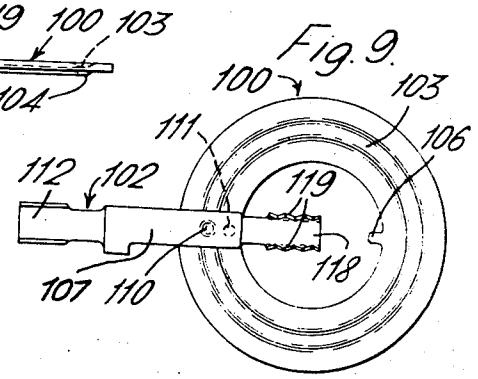


Fig. 9.

INVENTOR
Kamal Ahmed

Dec. 12, 1972 K. AHMED 3,705,996

SLIP RING ASSEMBLY

Original Filed Aug. 25, 1969 3 Sheets-Sheet 3

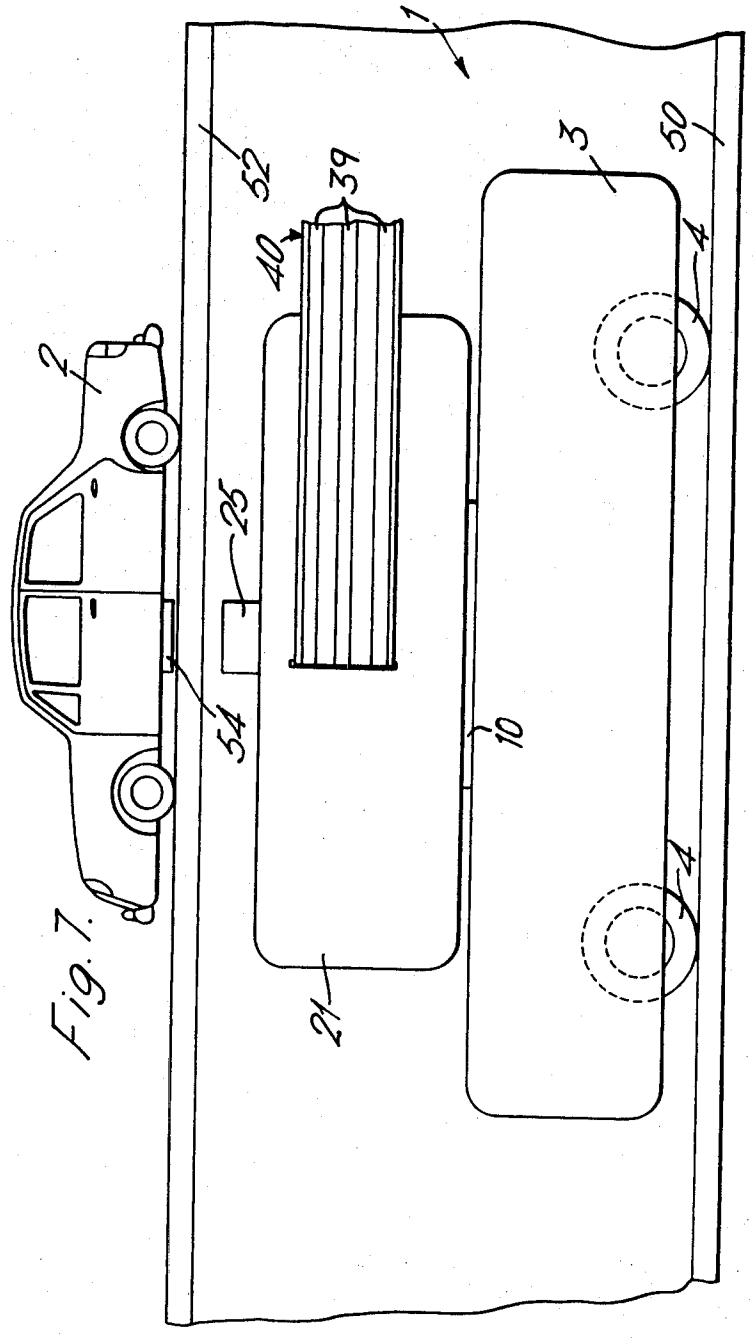


Fig. 7.

INVENTOR
Kamal Ahmed

United States Patent Office 3,705,996
Patented Dec. 12, 1972

3,705,996

SLIP RING ASSEMBLY

Kamal Ahmed, Stanmore, England, assignor to AMP Incorporated, Harrisburg, Pa.

Original application Aug. 25, 1969, Ser. No. 852,702, now Patent No. 3,574,266. Divided and this application Jan. 8, 1971, Ser. No. 104,943

Int. Cl. H01r *39/08*

U.S. Cl. 310—232 3 Claims

ABSTRACT OF THE DISCLOSURE

A carriage having a pair of driven wheels, each wheel of the pair being driven by a separate electric motor to permit differential steering of the carriage. A slip ring assembly is provided on the carriage and forms a part of a feed path for supplying power to the electric motors. The carriage can be arranged immediately below a board on which a toy vehicle stands and can be indirectly coupled to the toy vehicle by a permanent magnet.

This is a division of application Ser. No. 852,702, filed Aug. 25, 1969, now Pat. No. 3,574,266.

This invention relates to a carriage for driving and steering toy vehicles and in particular, to a slip ring assembly by which an electric current can be supplied to electric motors forming part of such a carriage.

According to one aspect of the present invention, a wheeled carriage for driving and steering toy vehicles comprises a pair of wheels, each wheel being drivable by an individual electric motor, a slip ring assembly forming part of a feed path for an electric current to each electric motor, the slip ring assembly including a plurality of slip rings mounted on the carriage and a plurality of corresponding spring contacts mounted for relative rotational movement with respect to the carriage and adapted for connection to an electrical power supply, each spring contact slidably engaging one slip ring for maintaining electrical contact with the slip ring during relative rotational movement of the spring contacts and the carriage, and means for coupling the carriage to a toy vehicle such that when the carriage is being operatively driven and steered, in response to the power supplied to the electric motors, movement of the carriage will cause corresponding movement of the toy vehicle.

According to a further aspect of the present invention, a slip ring assembly comprises a plurality of annular slip rings spaced by annular electrically insulating washers coaxially arranged with the slip rings, each slip ring having a radially inwardly extending projection for connection to a conductor wire.

According to a still further aspect of the invention, a slip ring of generally annular configuration comprises a projection extending radially inwardly towards the center of the annulus, the projection being adapted for connection to a conductor wire.

Preferably, the spring contacts are each crimped to an end of a conductor of a flat tape cable which is, at its opposite end adapted to be connected to a device, for example, a potentiometer for varying the voltage applied to each electric motor thereby enabling the carriage to be differentially steered. The tape cable can further be connected to a switch for reversing the polarity of the electric motors to permit the carriage to be driven in a reverse as well as a forward sense. The tape cable can also be connected to a device such as a rheostat for controlling the supply of current to the electric motors to effect alteration of the speed of the carriage.

One advantage of using flat tape cable is that since tape cable can be produced having a very small thickness, in the order of 0.010 to 0.015 inch, should the carriage be steered over the cable, the step over which it must roll is very small.

In one embodiment the slip rings are of generally annular configuration and have a skirt with which the corresponding spring contact engages. The spring contact has a generally elongate body which has at one end a ferrule part for crimping to a conductor of a flat tape cable and at the opposite end a contact part formed out of the plane of the body for engaging the skirt of a slip ring.

In a modification, the slip rings are of generally annular configuration and have a groove formed in one side which gives a corresponding annular rib on the opposite side. The corresponding spring contacts each have a generally elongate body which is forked at one end, the prongs of the fork each engaging with a surface of the annulars and having means on one prong for engaging within the groove in the annulus.

The coupling means may be a permanent magnet which attracts a permanent magnet attached to the toy vehicle.

An embodiment of the invention will now be described by way of example, reference being made to the accompanying drawings, in which:

FIG. 1 is a diagrammatic cross-sectional view through a wheeled carriage according to the invention;

FIG. 2 is a diagrammatic cross-sectional view on the lines II—II of FIG. 1;

FIG. 3 is a top plan view of a slip ring;

FIG. 4 is a side elevational view of the slip ring of FIG. 3;

FIG. 5 is a top plan view of a spring contact before crimping to a conductor of a tape cable;

FIG. 6 is a side elevational view of the spring contact of FIG. 5;

FIG. 7 is a diagrammatic view showing the wheeled carriage of FIG. 1 ararnged to drive a toy vehicle;

FIG. 8 is a side elevational view of a modified slip ring and a modified spring contact; and

FIG. 9 is a top plan view of the slip ring and the spring contact of FIG. 8.

As shown in FIGS. 1 and 2, a carriage **1**, for driving and steering a toy vehicle, for example, a toy car **2**, (see FIG. 7), comprises a generally rectangular hollow base member **3** suported on four wheels **4**. Each wheel **4** of the front pair of wheels is driven through gearing **5** and **6** by an electric motor **7** mounted on the base member **3**.

A support member **10** of electrically insulating material is provided on the upper surface **8** of the base member **3**. The support member **10** has a central through hole **14**, a longitudinal slot **24** and a circumferential groove **11** extending around its outer surface. Fixedly mounted around the support member **10** are three electrically conductive slip rings **15**, separated by electrically insulating washers **16**, which form part of a slip ring assembly.

As shown in FIGS. 3 and 4, each slip ring **15** consists of an annulus **15***a* having a skirt **17** depending from its outer edge. The inside edge of the annulus has a projection **18** extending towards the center of the annulus. Each projection **18** extends into the slot **24** and has along its edges two upstanding arms **19** each having a serrated edge for crimping to a conductor wire **41, 42, 43**. Each conductor wire **41, 42, 43** extends from a projection **18** through hole **14** to one or the other of the electric motors **7** or to a commoning point between the motors.

A magnet **25** is attached to the end of the support member **10** remote from the base member **3**, which magnet **25** extends partially through a hole **26** in a cover **21**. The cover **21** has two struts **20** which engage at their inner ends in the groove **11**. The ends of the struts **20** within the groove **11** are so arranged that the struts **20**

together with the cover **21** can rotate freely around the support member **10**.

Secured to the inside surface of the cover **21** is a housing **22** into which three contact springs **30** are releasably secured.

As shown in FIGS. 5 and 6, each spring contact **30** has an elongate body **31** having at one end a ferrule part **32** comprising two upstanding arms **33** and two formed-out tines **34** and at its opposite end a contact part **35** formed out of the plane of the body **31**. Between the ferrule part **32** and the contact part **35** is a protrusion **36** which secures the spring contact within the housing **22**. Each spring contact **30** is crimped by means of ferrule part **32** to a conductor **39** of a flat tape cable **40** and its contact part **35** is arranged to slidably contact the corresponding skirt **17** of one of the slip rings **15**.

The tape cable **40** leads to a potentiometer (not shown) simulating a steering wheel such that rotation of the steering wheel relatively increases or decreases the voltage applies to one or other of the two electrical motors **7** to cause one of the pair of driven wheels **4** to rotate faster than the other wheel **4**. By differentially driving the wheels **4** a steering effect is obtained on the carriage **1**. The tape cable **40** can also be connected to a switch (not shown) for reversing the polarity of the electric motors **7** to allow the carriage **1** to be reversed. The tape cable can also be connected to a rheostat or similar device (not shown) which is arranged to simulate an accelerator pedal for increasing or decreasing the current to the electric motors to increase or decrease the speed of the carriage **1**.

As shown in FIG. 7, the carriage **1** is placed on the upper surface of a flat board **50** so that the magnet **25** is arranged at a predetermined distance from a further board **52** arranged parallel with the board **50**. A toy car **2**, is placed on the upper surface of board **52**, which board can have roads or the like painted on its surface or toy buildings arranged on its surface. The toy car **2** has a magnet **54** attached to its body. The polarities of the magnets **25** and **54** are arranged such that attraction takes place between the magnets. Movement of the car riage **1** will, therefore, cause the toy vehicle **2** to move across the upper surface of the board **52**. The carriage **1** may be enclosed so that a person controlling the toy car **2** by means of the potentiometer, switch and rheostat will only see the toy car **2** and will not see the carriage **1**.

One advantage of the above described embodiment is that the arrangement of the spring contacts each wiping around the skirt **17** of a slip ring **15** offers very little frictional resistance to the rotational movement of the cover **21** with respect to the support member **10**. This has the effect that the response of the carriage to the steering and driving controls is fast which allows for accurate maneuvering of the carriage.

FIGS. 8 and 9 illustrate a modified slip ring assembled to a modified spring contact.

The slip ring **100** is of generally annular configuration and is of sheet brass or some suitable conductive material having an annular groove **103** formed on one surface which gives a corresponding annular rib **104** on the opposite surface. The inside edge of the annulus has a projection **118** extending towards the center of the annulus. The projection **118** has, along its edges, two upstanding arms **119**, each having a serrated edge for crimping to a conductor wire. Opposite the projection **118**, there is located a polarizing projection **106** which ensures that the annulus can be mounted and maintained in a predetermined position.

The spring contact **102** is formed as a simple stamping from phosphor bronze or some similar material, is generally elongate, and has two prongs **107, 108**, at one end which overlie each other. The upper prong **107**, as seen in FIGS. 8 and 9, is provided with a dimple **110** which engages in the groove **103** in the slip ring **100**. The other prong **108** is provided with a dimple **111** which lies alongside the radially inner surface of the rib **104** when the contact **102** is assembled with the slip ring **100**.

The spring contact **102** is further provided with a crimping ferrule **112** at the opposite end from the prongs **107, 108**. The prongs **107, 108** are resiliently biased towards each other and, therefore, grip the slip ring **100** between them. The resilience is derived from the material and is such as to enable a good electrical contact to be made between the slip ring **100** and the spring contact **102** while allowing relative sliding movement between them. The spring contact **102** is able to slide around the slip ring **100** with the dimple **110** in constant engagement with the groove **103**. The effect of the dimple **110** in the groove **103** and the dimple **111** against the rib **104** is such as to retain the slip ring **100** and the spring contact **102** together when relative rotary movement occurs.

The invention is claimed in accordance with the following:

1. A slip ring assembly comprising a hollow dielectric carrier member having a slot extending from an outside surface to an inside surface of said carrier member, a slip ring defining an annulus disposed on said carrier member and having an annular contact-engaging surface, a projection extending outwardly from an inner periphery of said annulus and extending inwardly toward a center of said slip ring, said projection being disposed in said slot, means on said projection for connection with a conductive means, a spring contact member, dielectric carrying means carrying said spring contact member, a contact section of said spring contact member electrically engaging said contact-engaging surface, and conductor-connecting means of said spring contact member for connection with other conductive means.

2. A slip ring assembly according to claim **1** wherein said annular contact-engaging surface comprises an annular skirt depending from an outer periphery of said annulus and extending along a section of said outer surface of said carrier member.

3. A slip ring assembly according to claim **1** wherein said annular contact-engaging surfaces comprises top and bottom surfaces of said annulus, an annular groove in said top surface and a corresponding annular rib in said bottom surface, said contact section having aligned prongs, one of said prongs having a dimple in engagement with said annular groove, the other of said prongs having a dimple disposed alongside a radial inner surface of said annular rib.

References Cited

UNITED STATES PATENTS

2,471,808	5/1949	Baker	310—232
2,586,595	2/1952	Ashby	191—1 R
2,417,967	3/1947	Booe	310—232
1,268,102	6/1918	Drumm	191—12.2 R
2,751,565	6/1956	Johnston	191—12.2 R
1,681,385	8/1928	Avera	191—1 R

FOREIGN PATENTS

1,292,407	4/1902	France	339—5

GERALD M. FORLENZA, Primary Examiner

D. W. KEEN, Assistant Examiner

U.S. Cl. X.R.

191—12 R