Nov. 24, 1959 C. W. WOLF 2,913,997

MOBILE UNIT AND TRACK SYSTEM THEREFOR

Filed July 30, 1958 3 Sheets-Sheet 1

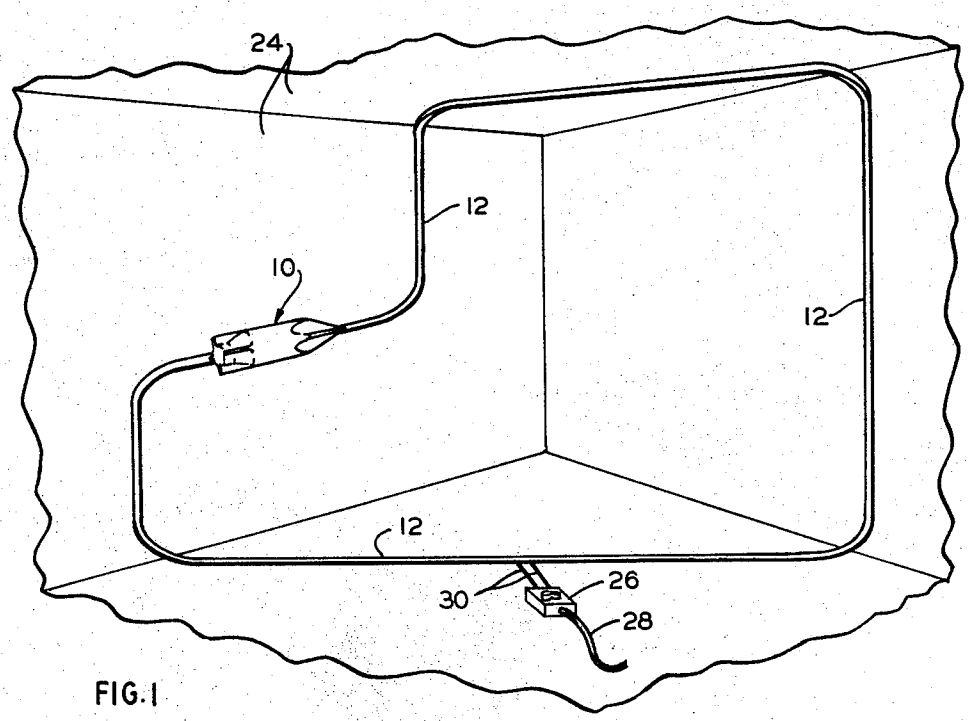

FIG. 1

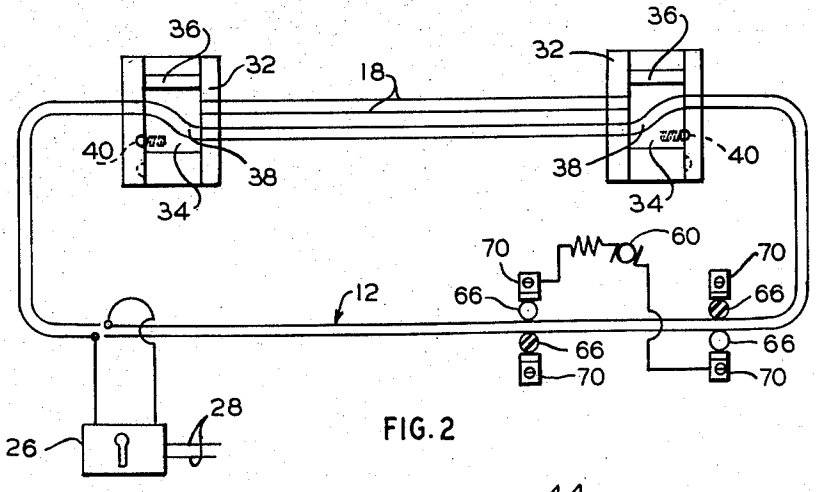

FIG. 2

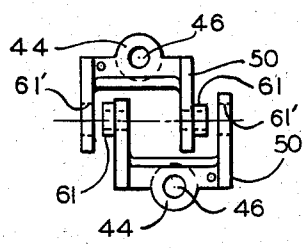

FIG. 8

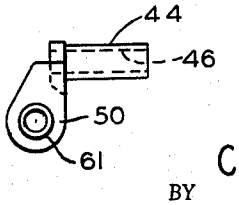

FIG. 8a

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MOBILE UNIT AND TRACK SYSTEM THEREFOR

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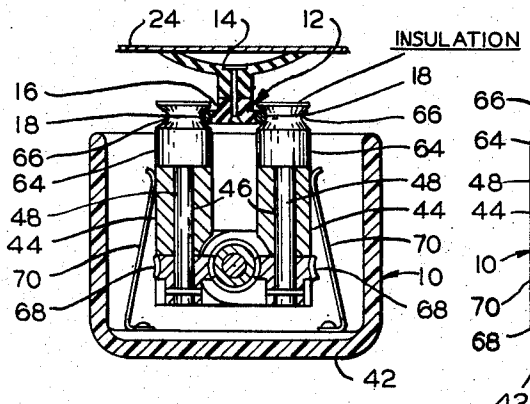

FIG. 4

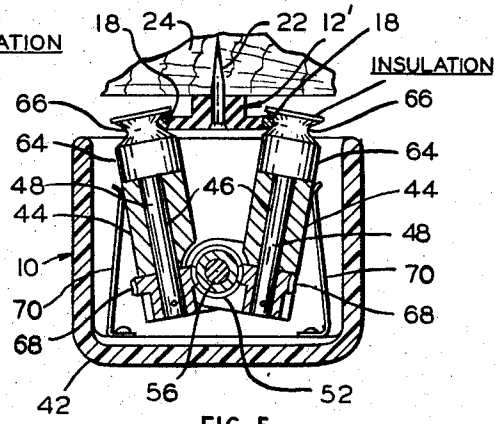

FIG. 5

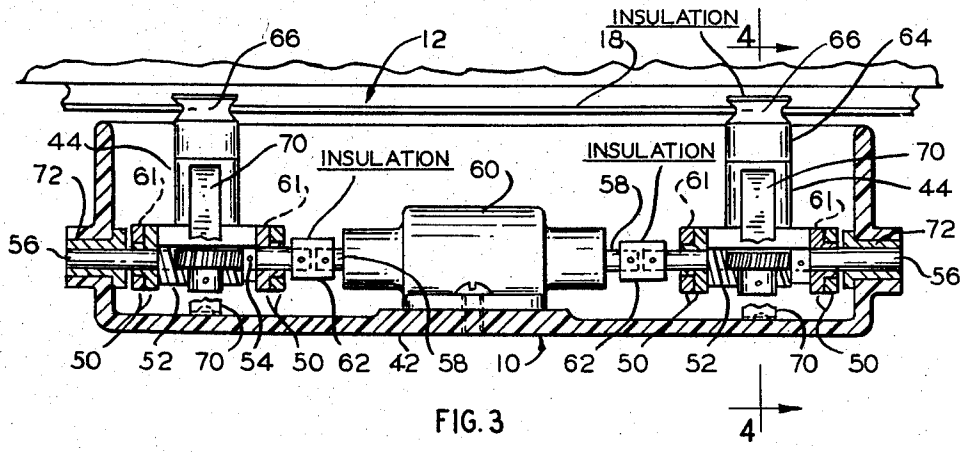

FIG. 3

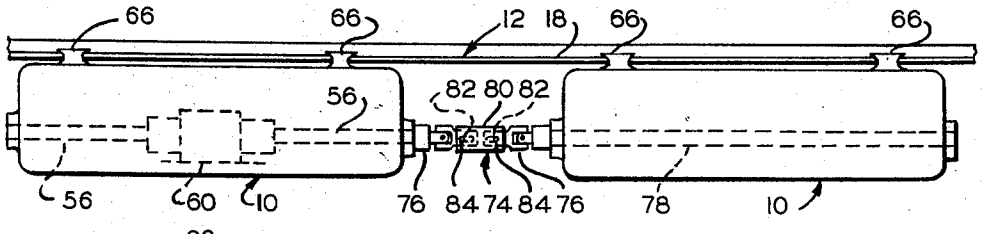

FIG. 6

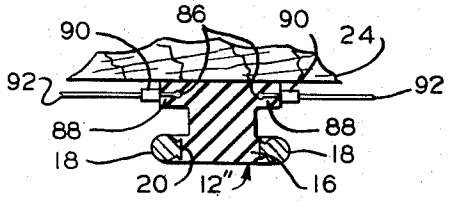

FIG. 7

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MOBILE UNIT AND TRACK SYSTEM THEREFOR

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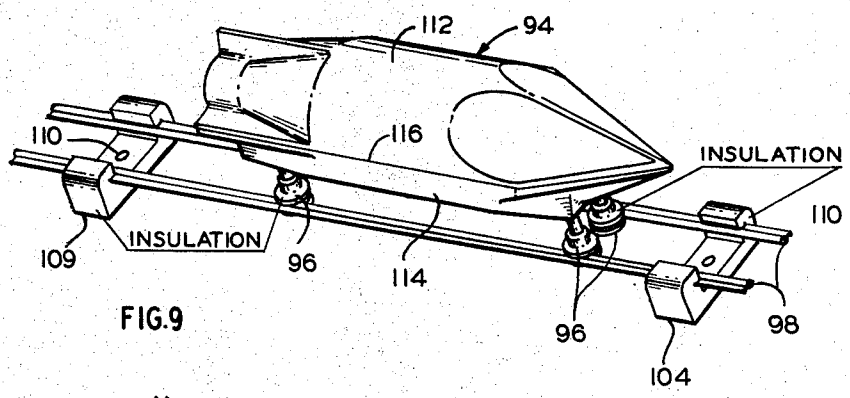

FIG.9

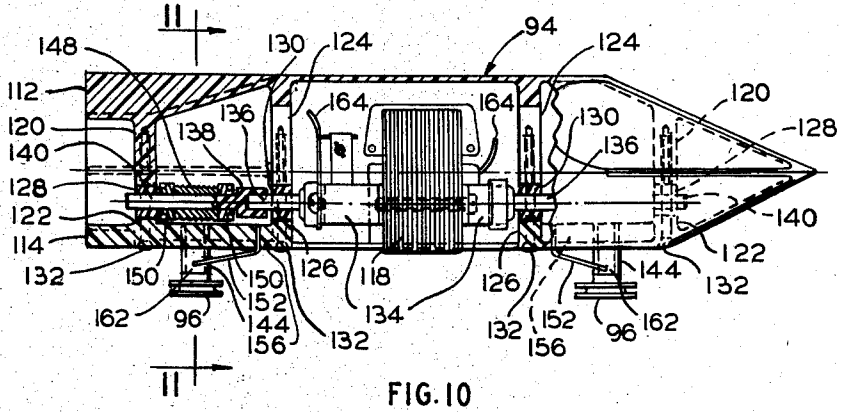

FIG.10

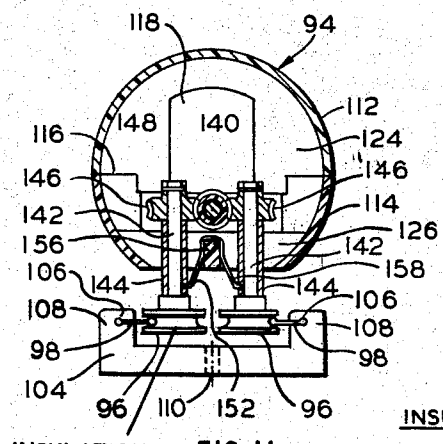

FIG.11

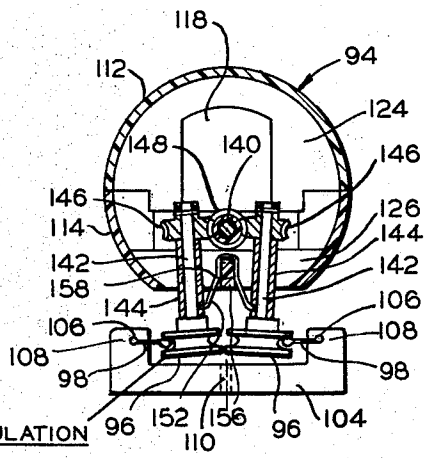

FIG.12

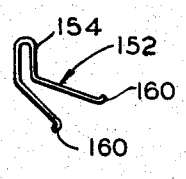

FIG.13

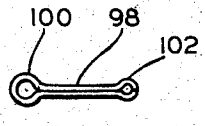

FIG.14

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Patented Nov. 24, 1959

2,913,997

MOBILE UNIT AND TRACK SYSTEM THEREFOR

Carl W. Wolf, York, Pa.

Application July 30, 1958, Serial No. 751,960
15 Claims. (Cl. 104—148)

This application is a continuation-in-part of my application Serial No. 524,777, filed July 27, 1955.

This invention relates to a mobile unit and a track system for supporting and guiding said unit during movement thereof. More particularly, the mobile unit and track system are preferably of miniature size and utilize a mono-rail principle or spaced rails, in either event however, the tracks preferably are capable of being twisted spirally in an axial direction, as well as being curved about radii within the plane of the track and transverse thereto. The range of sizes employed in toy sizes of electric trains is well suited for adaptation to the present invention although the invention also lends itself to use in somewhat larger sizes than are commonly employed in toy trains if desired, especially for advertising or utilitarian purposes.

The invention is well adapted for a variety of uses including toy constructions; advertising displays; and industrial or commercial systems such as money conveyors in stores, carrying parts from one location to another in factories, stores and the like, as well as for the transporting of dangerous material such as radio-active substances, all of which uses may embody principles of remote control for the mobile unit.

One of the principal advantages of the present invention is that the means for supporting the mobile unit upon a track are so designed that much more rapid speeds may be employed than is possible now in toy trains for example, without the danger of the mobile unit becoming derailed or otherwise accidently becoming separated from the track system. The shape of the rollers which cooperate with several types of unique designs of track which are engaged by said rollers contribute to this result. Accordingly, the unit may climb or descend vertically, or run upright, sidewise, or inverted upon the track. Also, the mobile unit adjusts itself from narrow economical track to wider, more stable track when conditions require the same.

Other advantageous features of the invention comprise the employment of a relatively few basic elements which are used in multiples and are readily interchangeable so as to minimize inventory stock; simplicity of design so as to maintain manufacturing costs at a minimum; ruggedness in construction and design features which minimize wear of the individual components; and the utilization of simple means for connecting the mobile unit to the mono-rail type track and disconnecting it therefrom.

Other advantages and objects of the invention, as well as details thereof, are set forth in the following specification and illustrated in the accompanying drawings comprising a part thereof.

In the drawings:

Fig. 1 is a fragmentary perspective view of a portion of a room in which an exemplary track unit or system has been installed and an exemplary mobile unit in the form of a toy is mounted upon said track.

Fig. 2 is a plan view of one embodiment of an exemplary track system embodying the principles of the present invention.

Fig. 3 is a longitudinal sectional view of one embodiment of a simplified mobile unit embodying the principles of the present invention and shown mounted on a section of one embodiment of track, all embodying the present principles of the invention.

Fig. 4 is a transverse sectional view of the mobile unit shown in Fig. 3 and taken on the line 4—4 of Fig. 3.

Fig. 5 is a view similar to Fig. 4 but showing a wider form of said embodiment of track utilized to support the mobile unit.

Fig. 6 is a side view of an exemplary combination of two mobile units connected together by means comprising part of the present invention.

Fig. 7 is a fragmentary sectional view taken transversely through another embodiment of track member which may be used to support said one embodiment of mobile unit illustrated in the foregoing figures in accordance with the principles of the invention and also afford additional current conductors.

Fig. 8 is an exploded top plan view of a pair of the supporting members shown in Figs. 3–5 in position to be assembled together for relative pivotal movement.

Fig. 8*a* is an end elevation of one of the supporting members shown in Fig. 8.

Fig. 9 is a perspective view of a mobile unit having another arrangement of rollers engaging another embodiment of track.

Fig. 10 is a longitudinal view of the mobile unit shown in Fig. 9, partly in vertical section to illustrate details of the mounting of the roller supporting means and drive means for the rollers, on a larger scale than in Fig. 9.

Fig. 11 is a transverse sectional view of the mobile unit taken on the line 11—11 of Fig. 10 and shown with the rollers engaging the embodiment of track shown in Fig. 9.

Fig. 12 is a view similar to Fig. 11 but showing the rollers moved together to effect disengagement of the mobile unit from the track.

Fig. 13 is a perspective view of a spring element detail used to urge the rollers of the mobile unit into engagement with the track rails.

Fig. 14 is an end view of the exemplary rail shown in Figs. 9, 11 and 12.

It is to be understood that the mobile unit **10** illustrated in the drawings is exemplary only and primarily is illustrated for purposes of affording means for containing or providing a support for the operating mechanism and the means by which the unit is supported upon a track embodying the principles of the invention. For example, in Fig. 1, the mobile unit **10** is illustrated as a rocket-like toy capable of traveling at relatively high speeds, if desired, along an exemplary track system **12** which may be affixed to the walls, ceiling, and floor of a room by any suitable means such as suction cups **14**, as illustrated in Fig. 4, or screws or nails **22** as shown in Fig. 5. However, the mobile unit may be used for utilitarian purposes such as in advertising displays, transporting objects in commercial or industrial establishments, as well as for many other useful purposes.

The embodiment of track **12** is a mono-rail type that is approximately T-shaped in cross-section as is obvious from Figs. 4, 5 and 7, but such cross-sectional shape is not to be regarded as restrictive. Where for example the mobile unit is energized by an electric motor, to be described in detail hereinafter, the track **12** comprises any desired length of supporting base member **16** which preferably is formed from suitable insulating material such as an appropriate synthetic resin, fiber, or hard rubber which, for example, may be pliable to a limited extent so as to permit bending the track into any desired

configuration as illustrated in Fig. 1. The preferred cross-sectional shape of the track **12** includes continuous electrical conduits such as copper wires **18** which are affixed to opposite edges of the head of the T-shaped supporting base member **16** such as by bonding of the metal to the resin or other insulating material. Mechanical anchorages such as the dove-tail flanges **20** which are formed integrally on the wires **18** as shown in Fig. 7, may be employed to further facilitate uniting of the wires to the supporting base member **16**, if desired. The formation of the track may be accomplished by a suitable extrusion molding process. Hence the production costs thereof are reasonable. The width of the head of the track such as the distance between the conduits **18** may be varied in accordance with the stability desired for the mobile units to run thereon. The wider the head, the greater the stability.

The T-shaped cross-sectional formation of the track **12** renders it relatively rigid, particularly when formed from suitable resinous material and especially as reinforced by the wires **18**, whereby only occasional attaching means such as screws or nails **22**, as shown in Fig. 5 relative to track **12'**, or suction cups **14** as shown in Fig. 4 relative to track **12**, are necessary to secure the track to a supporting surface such as a wall or ceiling **24**. Supporting base member **16** may be constructed of interrupted lengths such as railway ties when electrical conduits **18** are substantially strong enough to maintain position while the mobile unit is operating along the unsupported space between the sections of base member power control means **26**, such as a conventional rheostat, is connected to the opposite wires **18** of the track, as well as to a source of current, not shown, by conventional lead wires **28**. Preferably, as shown in Fig. 2, the wires **18** are not joined at their ends in a track system but the ends of each conductor are slightly spaced apart so as to be interrupted and the positive and negative connecting wires **30** from the control box **26** respectively are connected to opposite ends of the wires **18** of the track.

Switch means also may be employed in the exemplary track system as illustrated in Fig. 2. The switches **32** have relatively fixed bases including either remotely or directly controlled transversely slidable members **34**, each of the slidable members having different suitably shaped track sections **36** and **38**. Spring pressed detents **40** or other means may be used to hold the slides of the switches in any desired position of a predetermined number of different positions so as to effect desired connections of the track and routing of the mobile units relative to the switches and track. The ends of the wires **18** in the track members **12** which are affixed to the switches, as well as the ends of the wires of the track sections on the switch slides **34**, are arranged to make suitable contact with each other in any desired position of the slides **34** relative to the switch bases **32**. Any convenient means may be used to insure positive electrical contact between the ends of the wires **18** but when the switch slides **34** are between operative positions, the circuit in all track sections is interrupted and movement of units **10** is not possible. In view of this arrangement of track switches, and current supply which may use either D.C. or A.C., with two conductors, the current only can be directed through a closed track configuration, whereby the unit cannot run off the end of a section of open track.

Referring now to the exemplary mobile unit **10**, the base member **42** may for example be cup-shaped as shown in Figs. 3 through 5 but it will be understood that any desired shape or ornamental arrangement of base member, either with or without an additional body, whether toy-like, fanciful, or utilitarian, may be attached to or substituted for the illustrated base member **42**. Preferably, the base member is molded from suitable insulating material, such as artificial resin, for purposes to be described.

Supported within the base member **42** in longitudinally spaced relationship to each other are pairs of supporting members **44** which, for example, may be castings or stampings formed from suitable metal such as bronze, aluminum or otherwise, whereby they may be elongated, as shown in Figs. 3 through 5 and 8 to furnish bearing apertures **46** which support preferably metallic rotatable shafts **48**. However, members **44** may be formed in other ways if desired such as from formed stampings having inserted bearings. The supporting members **44** also may be otherwise shaped but preferably are provided with interfitting ears **50**. As will be seen particularly from Fig. 8, the ears **50** are so arranged on the members **44** that two identical members **44** may be interfitted as shown in said figure to constitute a pair of relatively pivotally movable members, the ears **50** also having disposed therebetween driving worms **52** which are fixed by pins **54** to drive shafts **56** extending in opposite directions from and connected to the opposite ends of drive shaft **58** of electric motor **60**. Further, one ear **50** of each member **44** is provided with a laterally extending sleeve **61** which fits rotatably in a bearing **61'** aperture in the adjacent ear of the other member **44**, whereby axial alignment of members **44** is assured independently of shafts **56**, thus affording good gear and worm contact even though shafts **56** may be worn. Suitable insulating couplings **62** are used preferably to connect the ends of the motor drive shaft **58** to the drive shafts **56** in order to insulate the shafts electrically to control the circuit between the wires **18** of the tracks and the motor **60** as will be explained hereinafter.

Fixed to the outer ends of shaft **48**, and preferably integral therewith, are similar rollers **64**, one of which in each pair is metallic. The other is formed from suitable insulating material such as synthetic resin and particularly a phenolformaldehyde condensation product. The metallic roller **64** contacts one of the wires **18** of the track, while the opposite metallic roller **64** of the other pair on the opposite side of the motor **60** contacts the opposite wire **18** of the track. The insulated rollers **64** may be fastened to the shafts **48** by any suitable means such as longitudinal flutings, rivets, or otherwise, not shown. To facilitate the engagement of all of the rollers **64** with the opposite flanges comprising the edges of the head of the T-shaped track **12**, each of the rollers **64** is provided with a preferably deep circumferential groove **66** which receive said track wires and flanges. Further, the rollers on one or both sides of the rail may be serrated and the track may be made with matching serrations, if desired to afford adequate frictional engagement.

Fixed to the opposite ends of shafts **48** from the rollers **64** are worm gears **68** which mesh with the worms **52** mounted in the units comprising the individual pairs of supporting members **44**. Hence, rotation of the motor shaft **58** simultaneously will drive all four rollers **64** in unison and the rollers of each pair in opposite directions to drive the mobile unit **10** in either direction desired, motor **60** preferably being of the reversible type. Further, if desired, matching helical gears may be substituted for driving worms **52** and worm gears **68** for higher rates of peripheral speeds of rollers **66** relative to the speed of motor **60**.

In view of the construction of the supporting members **44** set forth above, it will be seen that the ears **50** thereof provide pivotally movable means having axes coaxial with drive shaft **56**, whereby the ends of the supporting members carrying the rollers **64** are pivotally movable toward and away from each other to move rollers **64** into and out of engagement with the opposite edges of the flanges of track **12**, as well as the exposed wires **18** on the outer edges of said flanges. Primarily for purposes of urging the roller ends of the supporting members **44**

toward each other and the track member, when the mobile unit is positioned thereon, each pair of supporting members **44** is provided with a pair of preferably leaf springs **70**, said springs being secured by rivets or otherwise at their opposite ends to any suitable location on the base member **42** such as the bottom as viewed in Figs. 3 through 5, the springs **70** in Fig. 3 broken away to illustrate details of the driving mechanism.

The leaf springs **70** preferably are of suitable metal and the upper ends thereof slidably engage the exterior surfaces of supporting members **44**, thus providing a centralizing effect upon base member **42** relative to the track. The strength of springs **70** also is such as to insure firm engagement of the circumferential grooves **66** of the rollers **64** with the extremities of the flanges of the track **12** and wires **18**, even when the mobile unit is traveling at relatively high speeds upon the track **12**, turning sharp corners and otherwise, as well as compensating for any irregularities in the track. The shape of the track **12** as well as the depth of the grooves **66** in the wheels **64** are such as to permit a reasonable range of track widths yet insure such above described function even at said relatively high speeds, as well as provide adequate friction to permit even vertical climbing of unit **10**. However, when it is desired to disengage the mobile unit **10** from the track, the effect of the springs **70** may be readily overcome manually to effect separation of rollers **64** from the track. Spreading of the supporting members **44** to effect connection of the unit **10** to the track likewise is readily achieved manually.

Inasmuch as one of each pair of the rollers **64** is of insulating material, and, in the exemplary illustration shown in Figs. 3 through 5, the base member **42** of mobile unit **10** also is formed from insulating material, the metallic springs **70** will make electrical contact with the metallic supporting members **44** as well as the single metallic wheel **64** of each pair of wheels, said metallic wheel of each pair likewise making electrical contact with one of the conducting wires **18** of the track. Hence, the end of either one of the springs **70** which is secured to base member **42** may conveniently be used as a connection point for a suitable wire or other conductor to the binding posts or other connecting means conventionally provided on the motor **60** according to the exemplary circuit shown in Fig. 2.

As explained above, opposite wheels in the two pairs used in each mobile unit are metallic and thereby respectively engage the opposite conductors **18** of the track **12**. The insulated coupling member **62** between the motor shaft **58** and drive shafts **56** will prevent the conduction of electricity from the supporting member units, gears, etc. to motor **60**. If desired, however, spring means such as simple helical springs may extend between members **44** of each pair to assist springs **70** in urging them toward each other. The couplings **62** also provide supporting means for one end of each of the drive shafts **56** in the exemplary construction illustrated herein, and the opposite ends of the drive shafts **56** are supported by fixed bearings **72** respectively formed in opposite ends of base member **42** as shown in Fig. 3.

In Fig. 6, a plurality of mobile units **10** are illustrated, these being coupled together by exemplary coupling means **74**, the details of which include universal joints **76**, one of which is connected to the outer end of one of the drive shafts **56** of the mobile unit shown on the left of Fig. 6, said unit including the motor **60**. However, it is contemplated that the right-hand mobile unit **10** as shown in Fig. 6 shall have no motor **60** inasmuch as it is highly possible to provide a single motor **60** capable of driving a limited number of mobile units **10** by the utilization of coupling means **74** as shown in Fig. 6. Under the circumstances, the additional mobile units **10** are each provided with a single drive shaft **78** to which worms **52** or helical gears for operating the pairs of rollers may be attached, said worms or helical gears not being shown in Fig. 6 for purposes of simplifying the illustration but will function as shown in Fig. 3.

The end drive shaft **78** adjacent coupling **74** in Fig. 6 is connected to the right-hand universal joint **76**. Under the circumstances, coupling **74**, in the exemplary form illustrated herein, comprises a sleeve **80** in which one end of each of the universal joints **76** is slidably received, said ends being provided with slots **82**, for example, and pins **84** extend through the sleeve **80** and the slots **82**. Further, the ends of the universal joints **76** which extend into sleeve **80**, as well as said sleeves, in cross-section, are formed of suitable complementary geometric shapes so as to prevent relative rotation between the members. However, longitudinal sliding may take place between the adjacent ends of universal joints **76** and sleeve **80** due to the slots **82**. Thus, when the connected mobile units **10** are moving around either an outside or an inside curve, the lengthening or shortening of the normal distance between said units may be compensated for by the slippage permitted by the coupling means **74** described above, while rotational driving movement continues. Especially on light units having correspondingly smaller power requirements, universal joints **76** and sleeve **80** may be replaced by a simple open helical spring attached to the drive and driving units to connect the same and serve as a flexible shaft.

In the event for example the weight of an object or articles to be conveyed by the units **10** is such that considerable frictional engagement between the grooves **66** of the rollers **64** and the track **12** is required, such as where the units may be moving vertically for example, it will be seen that the provision of a plurality of mobile units **10** in tandem, as illustrated in Fig. 6 will be advantageous to provide such extra frictional engagement and thus permit the movement of relatively heavy loads along the track **12**.

Under certain circumstances, such as where the invention is to be adapted to toys, but not restricting the same to such use, the embodiment of track **12''** such as shown in Fig. 7 may include one or more pairs of additional or auxiliary conductors **86** which may be disposed at any convenient location within the supporting base member **16** of the track **12**, said conductors **86** being formed therein preferably at the same time the wire conductors **18** are fabricated with the base member **16** such as by extrusion molding. At regular intervals or otherwise along the track **12**, transverse openings **88** may be formed in the base member **16** of the track, extending into conductors **86**, for the reception of insertable plug members **90**. Access to auxiliary wires may be gained at positions intermittent to openings **88** by removing insulation. It will be understood of course that the auxiliary conductors **86** may be connected to any suitable source of electric current and, by the engagement of the plug members **90** with said conductors **86**, auxiliary equipment of any required or desirable nature may be furnished with power through lead wires **92** connected to the plugs **90**.

Figs. 9 through 13 show another embodiment of the invention in which is illustrated a different arrangement of track, and engagement thereof by the rollers of the mobile unit, from that shown in the preceding figures. In this latter embodiment, the same basic principles as in the previous embodiment are utilized, namely, that the mobile unit is provided with two pairs of supporting and driving rollers, all of which are positively driven and the rollers of each pair respectively are equally and oppositely movable relative to each other by yieldable means so as to engage the track which, in this second embodiment, comprises a pair of spaced rails. However, the supporting members for the rollers and driving shafts therefor, in regard to each pair of rollers, are yieldably urged away from each other so that the rollers at all times firmly engage the rails to support the mobile unit upon the track and afford driving traction between the rollers

and the track rails. The yieldable urging or biasing of the rollers into engagement with the track members also permits the rollers to adapt themselves to any irregularities in the track, as well as facilitate removal of the mobile unit from the track and engagement thereof with the track.

The essential features of this additional embodiment are shown in an overall manner in Fig. 9, wherein the mobile unit **94** has two pairs of grooved rollers **96** respectively disposed adjacent opposite ends of the unit. One roller of each pair is formed from insulating material such as synthetic resin or fiber, while the other roller of each pair is metallic and may be formed of suitable current conducting material such as brass, bronze, or the like. One roller of each pair respectively engages one of a pair of similar rails **98** which comprise a track for the unit **94**.

The similar rails **98** each preferably comprise a cylindrical edge portion **100** which is engaged by the rollers **96**, and the opposite edge is another preferably cylindrical portion **102** which anchors the rails to the supports or ties **104**. The rails **98** may conveniently be formed from strip sheet metal such as hard aluminum, the same being rolled and shaped to form rails having a cross-sectional or end shape as shown in Fig. 14. The web of track **98** is of less thickness than edge **102** which is preferably cylindrical in shape but is not so restricted. This construction affords adequate anchoring of the rails to the ties.

As best shown in Figs. 11 and 12, the ties **104** may be formed from suitable insulating material such as molded synthetic resin or fiber, preferably being somewhat yieldable so that slots **106** may be formed within projections **108** of the rails, which slots are complementary to the edges of the rails having the cylindrical portions **102** thereon, whereby the said edges of the rails may be snapped into the slots **106** of the projections **108** and be securely supported by said ties **104**. The ties also may be formed with any suitable securing means such as holes **110** to receive nails, screws, or other affixing means by which the ties **104** may be secured to a suitable supporting surface such as a sheet of plywood, wall, ceiling, floor, or otherwise. The ties **104** may be placed at suitable intervals and the central web portion of the rails between the cylindrical portions **100** and **102** is adequate to render the rails rigid so as to resist the engaging movement of the rollers **96** therewith. Further, this form of rail **98** lends itself readily to being coiled upon spools of reasonable diameter so as to facilitate the packing of the rail, especially in coil form, together with the mobile unit and power control means such as a transformer and switch, whereby all of these elements might be sold in an attractive box or package.

The mobile unit **94** preferably is formed from suitable insulating material such as molded synthetic resin and said unit comprises two somewhat similar halves **112** and **114** which meet along a median line **116**. The separability of the halves **112** and **114** facilitates the mounting of the motor **118** and the supporting means for the rollers **96** therein and the making of the unit **94** in two half sections also facilitates the molding thereof.

The half **114** of the unit **94** may be considered the base member of the unit and each of the halves **112** and **114** respectively are internally provided with pairs of cooperating transverse webs **120** and **122** respectively adjacent the opposite ends of the unit **94**, as well as pairs of intermediate cooperating transverse webs **124** and **126**. Disposed between the spaced opposing surfaces of the webs **120** and **122**, as well as between the spaced opposing surfaces of webs **124** and **126** are transverse bearing blocks **128** and **130**, for purposes to be described. Suitable pairs of transversely spaced securing means, such as bolts **132**, extend from the lower surface of half **114** of unit **94**. as viewed in Fig. 10, upwardly through the webs **122** and **126**, through the bearing blocks **128** and **130**, and into the opposing webs **120** and **124**, as clearly shown in Fig. 10 so as to secure the halves of the unit **94** together, as well as firmly fix the bearing blocks **128** and **130** in operative position. Bearing blocks **128** and **130** may be formed of suitable metal unless the halves **112** and **114** of the housing are formed of metal, in which event, blocks **128** and **130** then would be formed of insulating material such as self-lubricating resin.

The power means for the unit **94** preferably comprises the electric motor **118** which is of small size and capacity when the unit **94** is to comprise a small toy for example. In any event, the size of the motor **118** is commensurate with the size of the unit **94** and the power to be delivered thereby is selected so as to afford the unit **94** with ample power to propel the unit and any expected load thereon along the track by which it is supported. Suitable securing means such as bolts, not shown, extend between end portions of the motor frame **134** and the intermediate bearing blocks **130**, thereby anchoring the motor **118** stationarily within the unit **94**. The motor **118** is provided with an elongated drive shaft **136** which projects from opposite ends of the motor and the outer ends of the shaft respectively are connected to socketed ends **138** of gear shafts **140** which preferably are formed from rigid insulating material such as suitable synthetic resin. Appropriate interlocking means such as transverse pins, splines or press fitting, as shown, are provided between the ends of drive shaft **136** and the gear shafts **140** so that the same all rotate unitarily when the motor **118** is furnished with current by control means similar to that shown in the embodiment illustrated in Figs. 1 through 8, and particularly as shown in Figs. 1 and 2, comprising power control means **126** are illustrated.

The rollers **96** in the embodiment shown in Figs. 9 through 14 respectively are supported by shafts **142** rotatably mounted within the bearing sleeves of supporting members **144**. The rollers **96** are fixedly secured to the outer ends of shafts **142** and to the inner ends of said shafts suitable worm gears **146** are fixed, as best shown in Figs. 11 and 12. The shafts **142**, supporting members **144**, and worm gears **146** all may be formed of metal, although to facilitate the manufacturing thereof, the worm gears **146** may be molded from synthetic resin if desired. A worm **148** is fixed to each of the gear shafts **140** and is disposed between each pair of worm gears **146** as clearly shown in Figs. 11 and 12, whereby the rollers **96** of each pair will be rotated respectively in opposite directions so as to afford a uniform direction of drive to the unit **94** relative to the track comprising rails **98**.

The supporting members **144** of the embodiment shown in Figs. 9 through 14 are similar in design and function to the supporting members **44** of the embodiment shown in Figs. 1 through 8. Attention is directed to Fig. 8 particularly for further details of said supporting members not illustrated in Figs. 9 through 14. The supporting members **144** have interfitting ears **150** similar to the interfitting ears **50** of the members **44** shown in Fig. 8 and the interfitting ears **150** have bearing apertures to receive the gear shafts **140** to support the interfitting ears **150**. The outer ends of the gear shafts **140** respectively extend through a suitable bearing aperture in the outermost bearing blocks **128**, as shown in Fig. 10. The shoulders of the enlarged portions of socket ends **138** of gear shafts **140** serve to position one end of the pairs of interfitted supporting members **144** relative to shafts **140**, in an axial direction, and the transverse bearing blocks **128** serve to position the pairs of interfitting supporting members **144** in the opposite direction upon gear shaft **140**, thereby affording relatively simple supporting means for the pairs of members **144** adjacent opposite ends of the unit **94**.

Movement of the pairs of interfitting supporting members **144** relative to the gear shafts **140**, by which they are supported, is controlled by yieldable means, preferably

a spring **152**, for each pair of members **144**, best shown in Fig. 13. Each spring has an intermediate, upstanding bight **154** which extends over an axially extending strut **156** shown in Figs. 10 through 12 to position the springs **152** relative to the lower half **114** of unit **94**. The struts **156** extend intermediately of openings **158** formed respectively in each end portion of the unit **94**, one of said openings being shown in Figs. 11 and 12. The elongated bearings of supporting members **144** and the shafts supported thereby extend through the openings **158**, one pair of such bearings extending through each opening and the struts **156** extend longitudinally of each opening **158**.

The outer ends **160** of the spring **152** are bent outwardly, away from each other, and respectively are received within suitable recesses or holes **162** formed respectively in the adjacent faces of the bearing extensions of supporting members **144**, as shown in Figs. 10 through 12. The springs **152** are of adequate strength to force the outer ends of supporting members **144**, and correspondingly the rollers **96** of each pair thereof, equally and oppositely away from each other and into engagement with the innermost cylindrical portions **100** of the rails **98** as best shown in Fig. 11. Such spreading of the outer ends of member **144** and the rollers **96** away from each other serves to center the unit **94** relative to the track comprising rails **98** and the yieldability of the springs **152** permits the rollers **96** at all times to firmly engage the rails as well as to more suitable compensate for any irregularities in the rails or differences in spacing between the opposing rail edges **100**. It is to be understood however that various types of expansible means may be used in lieu of springs **152**, as well as other anchoring means therefor, all within the spirit of the present invention.

Further, when it is desired to either attach the unit **94** to the track or remove the same therefrom however, it is only necessary to move the rollers **96** of each pair toward each other, to the position substantially shown in Fig. 12. However, when the rollers **96** engage each other, they preferably may not freely pass from between the rails, but rather, the rails must be sprung apart slightly to disengage the unit **94** from the rails **98**. This is a safety feature to prevent accidental separation. Thus, while in the embodiment shown in Figs. 1 through 8, the rollers **64** are moved toward each other to engage the opposite edges of a so-called mono-rail, in the embodiment in Figs. 9 through 14, the rollers **96** are moved away from each other in each pair respectively to engage the spaced rails **98**.

In the event the halves **112** and **114**, and particularly **114**, are desired to be of metal, it will be understood that appropriate insulation will be installed between the halves **112** and **114** and the current conducting members of the mobile unit.

The electric circuit of the motor **118** illustrated in the embodiment for Figs. 9 through 14 is more simple than the circuit shown for the embodiment shown in Figs. 1 through 8. As shown in Fig. 10, electric leads **164** extend from opposite ends of the motor **118** and the outer ends of such leads, which preferably are flexible, have terminal ends which are connected respectively to one of the supporting members **144** of each pair thereof by insertion in a hole, preferably in the supporting member of each pair which mounts the metallic roller **96**. Although the supporting members **144** are preferably metallic and engage each other, the fact that one wheel **96** of each pair is formed from insulating material, will insure that the metallic wheel of each pair will conduct current to or from the leads **164** of the motor **118**. It will be understood that the opposite wheels of each pair of rollers **96** are metallic and respectively engage different rails of the track. The ties **104** are of insulating material so as to prevent short circuiting of the current between the rails.

While the present invention has primarily been described above as utilizing electric motors, energized by trolley-like conductors, to propel the mobile units **10** and **94**, it is to be understood that other forms of power means may be used such as a battery operated electric motor or gasoline motor of suitable size. Under such circumstances, it would not be necessary to use rollers **64** and **96** made of insulating material but nevertheless the construction of the rollers, the supporting members **44** and **144**, and springs **70** and **152** could be utilized to attach the mobile unit to the tracks by the same principles as described above relative to the use of the electric motors **60** and **118**. Further, under such circumstances, the flanged track **12** and rails **98**, and the grooved rollers **64** and **96** would function primarily in a mechanical capacity alone rather than additionally in an additional electrical conducting capacity. Hence, the track **12** could have the conducting wires **18** eliminated therefrom but would still be provided with suitable curved edged flanges extending in opposite directions and resembling the T-shaped cross-sectional formation of the track **12** illustrated in Figs. 4, 5 and 7. The rails **98** would need no change.

From the foregoing, it will be seen that the present invention provides several embodiments of a simple and useful type of mobile unit and track system for supporting and guiding a mobile unit during the movement of the unit along the track. Any convenient source of power means such as an electric motor may be utilized to drive one or more of such mobile units. The mono-rail type of track and other spaced rail type shown herein may be either permanently or temporarily attached to a suitable supporting surface such as a wall, ceiling, floor or the like, including display windows, store exteriors, etc., for purposes of supporting and having mobile units of any desired configuration and ornamentation moved along said track for either utilitarian, decorative, advertising, or toy purposes. The unit or units are capable of being moved at considerably higher speeds relative to the track than is now possible with conventional toy trains, for example, which merely rest upon track rails by gravity, and the units will remain connected to the track and move therealong regardless of whether the track is connected to a floor, a vertical surface such as a wall of a room, or extends along a ceiling, whereby the mobile units depend from the track while moving along such areas of track. No accidental separation of the mobile units from the track is possible even while moving at such relatively high speeds or in depending position, yet when it is desired to disconnect the units from or connect them to such track, such operations may be achieved readily. Further, providing each unit with at least four wheels or rollers, all of which are driven, provides ample frictional engagement to propel the mobile unit along a track, regardless of whether the track is horizontal, vertical, spirally twisted curved or otherwise.

Where the unit is intended to be operated by electric power, several specific embodiments of simple and efficient electrical circuit systems and members are illustrated and described. Variations are possible therein without departure from the invention. Further, both the track and mobile units, as illustrated herein, are capable of being manufactured at reasonable costs due to their simplicity and the utilization of pluralities of similar parts, the entire structure also being rugged and capable of long life.

While the invention has been shown and illustrated in its several preferred embodiments, and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

I claim:

1. Elongated track means comprising a pair of substantially parallel and transversely spaced elongated rail

members, and means connected to said rail members to support the same for engagement by the wheels of a mobile unit and arranged to be connected to a supporting surface, in combination with a mobile unit to travel upon and be supported by said track means, said unit comprising a base member, two pairs of opposed rollers having peripheral grooves therein arranged to engage the elongated rail members of said track means and receive said rails within the grooves thereof to support said unit from said rails, pairs of roller supporting means interconnected to said base member for pivotal movement in opposite directions transverse to the longitudinal axis of said unit and respectively supporting said pairs of opposed rollers for independent movement relative to said base member and each other resilient means interengaging each of said pairs of roller supporting means and simultaneously urging said supporting means of each pair substantially equally and oppositely in directions to position the rollers supported thereby respectively into supporting engagement with the rail members of said track means and maintain said mobile unit substantially centrally of said track means, said resilient means permitting said rollers to adjust automatically to variations in said track means to maintain said mobile unit centrally thereof, and power means supported by said base member and interconnected to said rollers to drive the same in rotary directions to propel said mobile unit in a desired direction along said track means.

2. The track and mobile unit combination set forth in claim 1 further characterized by said pairs of roller supporting means each comprising a pair of elongated supporting members provided with bearings and shafts respectively rotatably supported by said bearings thereof, the rollers of each pair respectively being connected to and driven by said shafts.

3. The track and mobile unit combination set forth in claim 2 further characterized by said pairs of elongated supporting members and shafts being spaced longitudinally of said mobile member, and means movably connecting each supporting member of said pairs thereof to said base member substantially along an axis extending longitudinally of said base member.

4. The track and mobile unit combination set forth in claim 3 further characterized by said means for movably connecting said supporting members to said base member comprising bearing and shaft means ertending along a common axis substantially longitudinally and centrally of said base member and parallel to said track means.

5. The track and mobile unit combination set forth in claim 2 further characterized by said resilient means comprising spring means engaging said elongated supporting members of each pair and substantially equally urging said members in opposite directions to effect engagement between the rollers of each pair respectively with the rail members of the track means therefor.

6. The track and mobile unit combination set forth in claim 2 further characterized by said elongated supporting members and shafts therein extending transversely from said base member in normal use and the rollers of each pair thereof being connected respectively to the outer ends of said shafts carried by said supporting members and extending transversely thereto.

7. The track and mobile unit combination set forth in claim 6 further including worm gears connected respectively to the inner ends of said shafts, and a driving worm for each pair of shafts commonly engaging said worm gears and operable to rotate the shafts of each pair of supporting members and the rollers thereon in opposite rotary directions.

8. Elongated track means comprising a pair of substantially parallel and transversely spaced elongated rail members and means connected to said rail members and extending therebetween to support the same for engagement by the wheels of a mobile unit and arranged to be connected to a supporting surface, in combination with a mobile unit to travel upon and be supported by said track means, said unit comprising a base member, two pairs of opposed rollers having peripheral grooves therein arranged to engage the elongated rail members of said track means, pairs of supporting members each having one end interconnected to said base member for movement of the other ends toward and away from the longitudinal axis of said unit and said pairs being spaced from each other in the direction of said axis, said pairs of supporting members adjacent said other ends thereof respectively supporting said pairs of opposed rollers for independent movement of the rollers of each pair relative to said base member and each other in opposite directions, resilient means yieldably interengaging each of said pairs of roller supporting members and simultaneously urging said members of each pair substantially equally and oppositely toward each other in directions to position the rollers supported thereby respectively into supporting engagement with the rail members of said track means and maintain said mobile unit substantially centrally of said track means, and power means supported by said base member and interconnected to said rollers to drive the same in rotary directions to propel said mobile unit in a desired direction along said track means.

9. The track and mobile unit combination set forth in claim 8 further characterized by said pairs of roller supporting members each having elongated bearings rotatably supporting shafts, said members being pivotally supported adjacent one end of each and the shafts projecting beyond the other ends thereof, the rollers of each pair respectively being connected to the projecting ends of said shafts and driven thereby, and said resilient means comprising springs engaging said other ends of said elongated bearings of said supporting members.

10. The track and mobile unit combination set forth in claim 9 further characterized by said means for movably connecting said supporting members to said base member comprising bearing and shaft means extending along a common axis substantially longitudinally and centrally of said base member.

11. The track and mobile unit combination set forth in claim 10 further including gear means connected respectively to the opposite ends of said shafts, and a driving gear for each pair of shafts engaging said gear means and operable to rotate the shafts of each pair of supporting members and the rollers thereon in opposite rotary directions.

12. Elongated track means comprising a pair of substantially parallel and transversely spaced elongated rail members, and means connected to said rail members to provide a clear space therebetween and support the same for engagement by the wheels of a mobile unit, and means operable to connect said rails to a supporting surface, in combination with a mobile unit to travel upon and be supported by said track means, said unit comprising a base member, two pairs of opposed rollers arranged to be positioned within the clear space between said rails and having peripheral grooves therein arranged to engage the elongated rail members of said track means, pairs of roller supporting members movably interconnected adjacent one end to said base member and respectively supporting said pairs of opposed rollers adjacent the other ends thereof for independent movement relative to said base member and each other in opposite directions, resilient means yieldably interengaging each of said pairs of roller supporting members adjacent said other ends thereof and simultaneously urging said other ends and rollers apart substantially equally in directions to force the rollers respectively into supporting engagement with said spaced rail members of said track means and thereby maintain said mobile unit substantially centrally of said track means, and power means supported by said base member and interconnected to

said rollers to drive the same in rotary directions to propel said mobile unit in a desired direction along said track means.

13. The track and mobile unit combination set forth in claim 12 further characterized by said pairs of roller supporting members each having elongated bearings, shafts respectively supported therein and projecting beyond said bearings and the rollers of each pair respectively connected to the projecting ends of said shafts and driven thereby.

14. The track and mobile unit combination set forth in claim 13 further including gear means connected respectively to the other ends of said shafts, and a driving gear for each pair of shafts engaging said gear means and operable to rotate the shafts of each pair of supporting members and the rollers thereon in opposite directions, said power means also comprising a motor having a shaft projecting from opposite ends thereof and a driving gear being connected to each projecting end of said shaft.

15. The track and mobile unit combination set forth in claim 12 further characterized by said base member having struts extending longitudinally thereof and said

resilient means comprising a U-shaped spring extending over each strut respectively for each pair of supporting member and the ends of said springs respectively engaging said supporting members adjacent said other ends thereof.

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