Nov. 7, 1967 E. R. STEWART 3,350,953

BRAKE-DRIVE ASSEMBLY FOR MINIATURE RACING CARS

Filed Dec. 20, 1965 2 Sheets-Sheet 1

Fig. 1

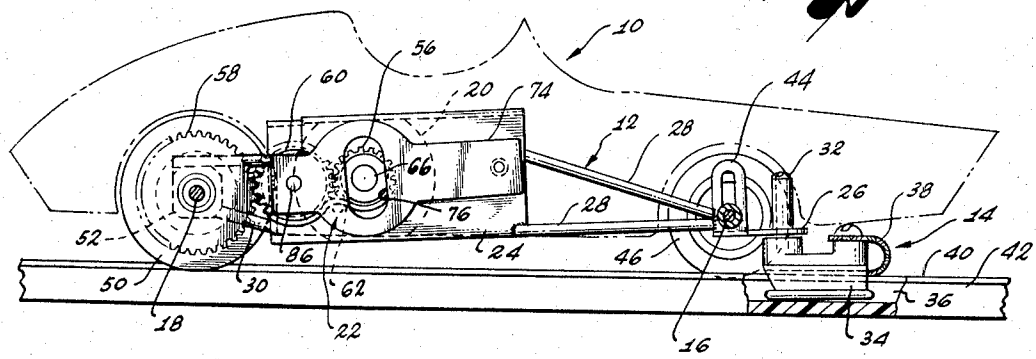

Fig. 2

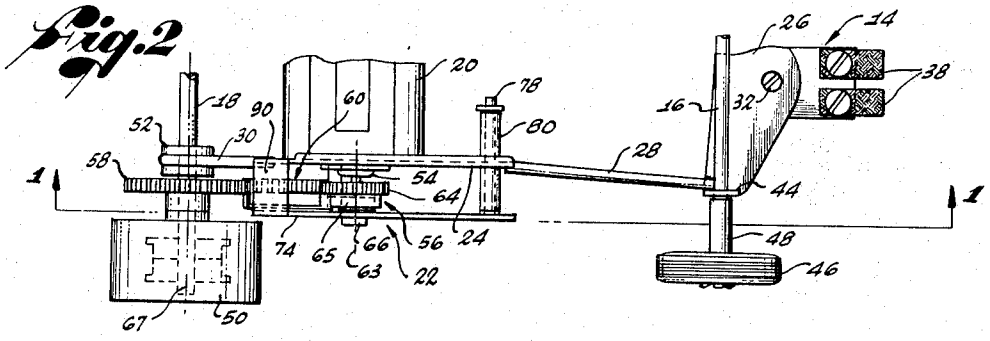

Fig. 3

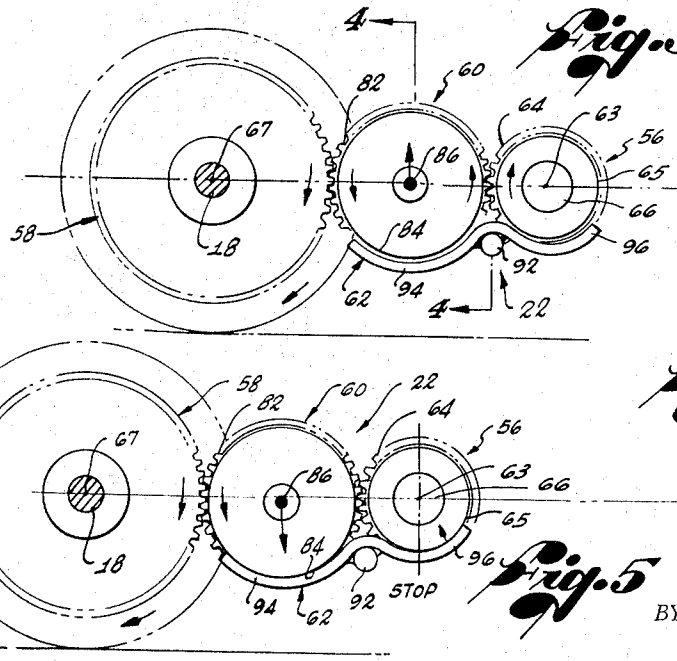

Fig. 5

Fig. 4

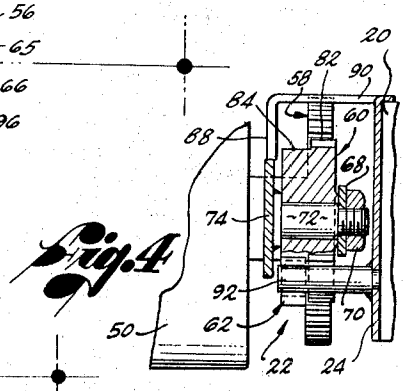

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Fig. 6

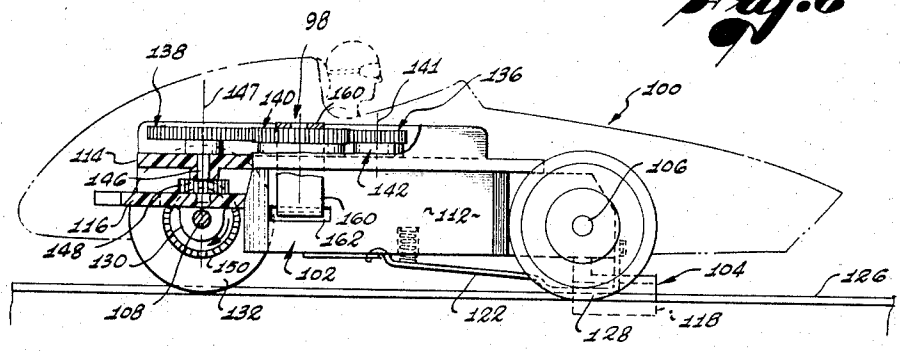


Fig. 7

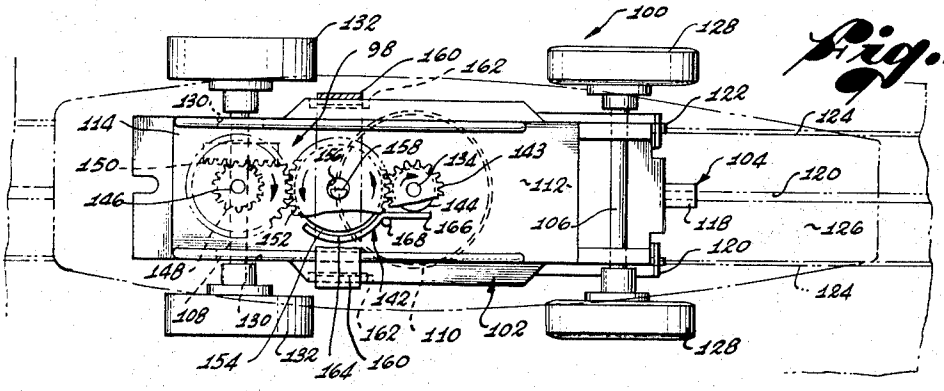
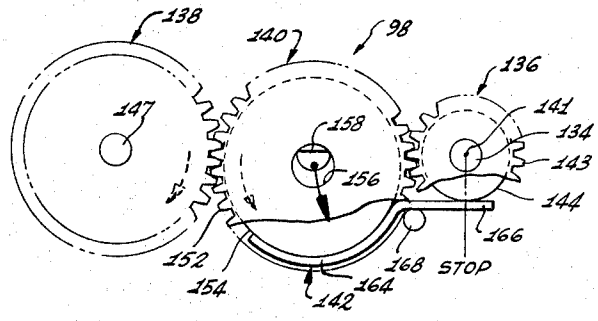


Fig. 8



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3,350,953

BRAKE-DRIVE ASSEMBLY FOR MINIATURE RACING CARS

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9 Claims. (Cl. 74—411.5)

The present invention relates to improvements in miniature cars of the "slot" racer type and, more particularly, to a novel brake-drive assembly particularly suited for such cars.

In recent years, electric motor driven miniature racing cars, and particularly those adapted for running over tracks of various forms, have become increasingly popular toys. Generally, such cars are of a "slot" racer type including a guide pin or blade riding in a slot to guide the car, and electrical pick up arms sliding along electrical conductors for supplying current to the car's motor. The magnitude of the voltage applied to the car's motor controls the motor speed of operation and hence the rate at which the car travels along the slot in the track. Thus, by regulating the voltage applied to the conductors, the car may be started, speeded up, slowed and stopped.

Unfortunately, in presently available slot racing cars, regulation of the applied voltage is the only means controlling the car's rate of travel. This does not allow for accurate or rapid stopping or slowing of the car since after the voltage supply is terminated, the car continues to move due to its own momentum. In practice, this makes it extremely difficult to control present slot racing cars, particularly during turning, the common result being that the cars often leave the tracks at the turns. This inevitably means the end of the race for the particular racer involved, materially detracts from the enjoyment of the game, and is very hard on the racing car, sometimes resulting in permanent damage thereto.

In view of the foregoing, it is an object of the present invention to provide a brake-drive assembly which allows miniature racing cars to be accurately started, speeded up, slowed and stopped, at the will of their operators.

Another object of the present invention is to provide a novel brake-drive assembly for miniature racing cars which is automatically operable with operation of the motor of the car.

A further object of the present invention is to provide a novel brake-drive assembly for miniature racing cars which is automatically operable with operation of the motor of the car.

A further object of the present invention is to provide a brake-drive assembly of the foregoing character which is simple in design and inexpensive and easy to manufacture and maintain.

The foregoing as well as other objects and advantages of the present invention may be more clearly understood by reference to the following detailed description when taken with the accompanying drawings which set forth by way of illustration and example two forms of brake-drive assemblies embodying the features of the present invention.

In the drawings:

FIGURE 1 is a side view of one form of brake-drive assembly for a miniature racing car, the brake-drive assembly being shown connected to the frame of the car with the body of the car depicted in phantom outline;

FIGURE 2 is a fragmentary top view of the brake-drive assembly and car frame illustrated in FIGURE 1;

FIGURE 3 is a schematic representation of the brake-drive assembly illustrated in FIGURE 1 with the brake disengaged to allow free running of the miniature racing car;

FIGURE 4 is a fragmentary sectional view taken along the line 4—4 in FIGURE 3;

FIGURE 5 is a schematic representation of the brake-drive assembly illustrated in FIGURE 1 with the brake engaged to prevent forward movement of the racing car;

FIGURE 6 is a partially sectioned side view of a second form of the brake-drive assembly for a miniature racing car;

FIGURE 7 is a top view of the brake-drive assembly illustrated in FIGURE 6 with the brake disengaged to allow free running of the racing car; and

FIGURE 8 is a schematic representation of the brake assembly of FIGURES 6 and 7 with the brake engaged to prevent forward movement of the racing car.

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In FIGURES 1 and 2, the miniature racing car is represented generally by the numeral **10** and includes a frame **12** supporting a conventional guide blade, electrical pick up assembly **14**, front and rear axles **16** and **18**, an electric motor **20**, and a brake-drive assembly **22**.

To provide such support, the frame **12** comprises vertical right and left side plates **24**, a horizontal front plate **26** connected to the side plates by front support rods **28**, and a pair of rear, support rods **30** extending rearwardly from the side plates.

The guide blade, electrical pick up assembly **14** is pivotally connected to the bottom of the front plate **26** by a pivot pin member **32** such that the blade **34** of the assembly rides in a track slot **36** while the electrical pick ups **38** of the assembly ride over conductors **40** in the top of a track **42** to transmit electrical power to the motor **20**.

The front axle **16** is supported for limited vertical movement within vertical slots in a pair of axle support flanges **44** extending from the right and left edges of the front plate **26**. Thus supported, the front axle **16** is free to turn about its longitudinal axis with front wheels **46** stationed at opposite ends thereof and separated from the flanges **44** by spacer sleeves **48**.

The rear axle **18** on the other hand, carries rear wheels **50** at the ends thereof and is supported for turning within sleeve bearings **52** carried by the support rods **30**.

The motor **20** is supported by and connected between the right and left side plates **24** with its drive shaft **54** extending horizontally through the left side plate for connection to the brake-drive assembly **22**.

Basically, the brake-drive assembly **22** is connected between the motor **20** and the rear axle **18** and is adapted to turn the rear axle to drive the car **10** forward in response to operation of the motor. In addition, the brake-drive assembly **22** is adapted to automatically and immediately slow, speed up, and halt the car **10** as the motor operation slows, speeds up, and stops.

To accomplish the foregoing, the brake-drive assembly **22** includes a drive gear member **56**, a driven gear member **58**, a floating idler gear member **60**, and a lever arm **62**.

The drive gear member **56** is connected to the end of a motor drive shaft **54** for rotation therewith about a horizontal axis **63** parallel to the rear axle **18** and includes a spur gear **64**, an annular axial shoulder **65**, and an axle hub **66** of reduced radial dimension.

The driven gear member **58** is a relatively large spur gear connected to the rear axle **18** for turning therewith about its longitudinal axis **67** and in the vertical plane of the spur gear **64**.

As illustrated most clearly in FIGURE 4, the idler gear member **60** is secured by a washer **68** and a nut **70** for turning around and on a horizontal stub shaft **72** extending inwardly from a vertical pivot plate **74**. The pivot plate **74** includes an arcuate slot **76** receiving the axial hub **66** of the drive gear member **56**, extends along the outside of the left side plate **24** of the frame **12**, and is supported at its front end by a horizontal pivot pin **78** extending through a sleeve **80** connected to the front end of the side plate **24**. Thus supported, the pivot plate **74** is adapted to swing in a vertical plane parallel to, and supports the idler gear member **60** between, the drive and driven gear members **56** and **58**.

More particularly, the idler gear member **60**, like the drive gear member **56**, includes a spur gear **82**, here of intermediate size, and an annular axial shoulder **84**. The spur gear **82** extends in the vertical plane of, between and mates with the spur gear **64** and the driven gear member **58** for turning about a horizontal axis **86** parallel to the axes **63** and **67**. Thus arranged, the idler gear member **60** is adapted to transfer driving rotation between the drive and driven gear members **56** and **58** causing the racing car **10** to speed up and slow down with changes in angular drive velocity of the motor drive shaft **54**.

In addition, in the brake-drive assembly **22**, and due to the support provided by the pivot plate **74**, the idler gear member **60** is essentially a floating gear. That is, while turning with the drive and driven gear members **56** and **58**, the idler gear member **60** also moves up and down transverse to the axes **63** and **67** and between predetermined limits. The upper limit is set by a vertical flange **88** which extends down from a cross arm **90** connected to the left side plate **24** to engage the top of the pivot plate **74** (see FIGURE 4). The lower limit is established by the lever arm **62** of the brake-drive assembly **22**.

In particular, the lever arm **62** is generally W-shaped and lies below the annular shoulders **65** and **84** of the drive and idler gear member **56** and **60**. Also, the lever arm **62** is connected at a midpoint to a horizontal pivot pin **92** extending outwardly from the left side plate **24** in a vertical plane tangential to the drive and idler gear members **56** and **60**. Thus arranged, as the idler gear member **60** moves vertically into and out of engagement with the concave rear portion **94** of the lever arm **62**, the lever arm **62** turns in a vertical plane about the pivot pin **92** to move the concave front end portion **96** of the arm into and out of engagement with the annular shoulder **65** of the drive gear member **56** thereby energizing and deenergizing the brake portion of the brake-drive assembly **22**.

More particularly, when the racing car **10** is stationary and the motor **20** is deenergized, the idler gear member **60** bears against the rear portion **94** of the lever arm **62** to pivot the front portion **96** against the drive gear member **56** to resist turning thereof. The friction force exerted on the drive gear member **56** by the lever arm **62**, however, is insufficient to prevent driving rotation of the motor drive shaft **54**. Hence, when the motor **20** is energized, the drive shaft **54** turns in a clockwise direction and produces a like rotation of the drive gear member **56** and a counterclockwise turning of the idler gear member **60**. Initially, the driven gear member **58** is stationary. Therefore, the idler gear member **60** not only turns in a counterclockwise direction but it also climbs upwardly over the driven gear member. As this occurs, the idler gear member moves away from the lever arm **62** which is then free to turn about the pivot pin **92** to release the drive gear member and effectively deenergize the brake portion of the assembly **22**.

Thereafter, continued turning of the idler gear member **60** with the drive gear member **56** produces a clockwise turning of the driven gear member **58** and rear axle **18** to drive the racing car **10** in a forward direction. Also, with increases and decreases in the angular velocity

of the motor drive shaft **54**, the idler gear member **60** instantaneously moves up and down over the driven gear member between the upper and lower limits set by the flange **88** and the lever arm **62**.

In particular, as angular velocity of the drive shaft **54** increases relative to the driven gear member **58**, the idler gear member **60** is instantaneously rotated at the increased angular velocity of the drive gear member and climbs up over the slower turning driven gear member until the increased angular velocity is transmitted to the driven gear member.

Conversely, as the turning of the motor drive shaft **54** slows relative to the driven gear member **58**, the rotation of the idler gear member initially slows and the faster turning driven gear member causes the idler gear member to move down over the driven gear member **56** until the reduction in angular velocity is transmitted to the driven gear member.

The downward movement of the idler gear member **60** is particularly rapid and immediately energizes the brake portion of the assembly **22** when power is removed from the motor **20**. In particular, when this occurs, driving rotation is removed from the drive gear member **56** which immediately begins to slow. As this occurs, however, the driven gear member **58** continues for the moment to turn at its prior angular velocity. This causes the idler gear member **60** to move rapidly down over the drive gear member **56** to engage the rear end portion **94** and the lever arm **62**. The force of the idler gear member **60** on the lever arm **62**, in turn, causes the lever arm to turn and pivot the front end portion **96** tightly against the annular shoulder **65** of the drive gear member **56** to rapidly slow and halt the drive gear member and forward movement of the racing car **10**.

Thus, by controlling the angular velocity of driving rotation imparted to the drive shaft **54**, the brake-drive assembly **22** is automatically and immediately energized to accurately speed up, slow down and stop the racing car **10**.

An alternate form of brake-drive assembly embodying the foregoing features is shown in FIGURES 6, 7 and 8, represented by the numeral **98**, and illustrated in combination with a miniature racing car **100**.

The miniature racing car **100** includes a frame **102** supporting a guide blade, electrical pick up assembly **104**, front and rear axles **106** and **108**, an electric motor **110**, and the brake-drive assembly **98**.

The frame **102** differs somewhat from that illustrated in FIGURES 1 and 2 and includes a generally rectangular block **112** having upper and lower horizontal plates **114** and **116** extending rearwardly therefrom.

A guide blade **118** of the assembly **104** is pivotally connected to the bottom of the block **112** by a pivot pin member such that the blade rides in a track slot **120**. The electrical pickups **122** of the assembly **124** take the form of bent, metal, leaf springs attached to the front of the block **112** and to the bottom of the block to ride over conductors **124** in the top of a track **126** to transmit electrical power to the motor **110**.

The front axle **106** extends through a lateral hole in the front portion of the block **112** with front wheels **128** stationed at opposite ends thereof while the rear axle **108** is bearing supported by a pair of ears **130** extending downward from the lower plate **116** with rear wheels **132** stationed at the ends thereof.

The motor **110** is recessed within the block **112** with its drive shaft **134** extending vertically from the top of the block for connection to the brake-drive assembly **98**.

The brake-drive assembly **98** is very similar to that described in connection with FIGURES 1–5 and comprises a drive gear member **136**, a driven gear member **138**, a floating idler gear member **140**, and a lever arm **142**.

The drive gear member **136** is connected to the upper end of the motor drive shaft **134** for rotation therewith

about a vertical axis **141** and includes a spur gear **142** and a lower, annular, axial shoulder **144** of slightly reduced radial dimension.

The driven gear member **138** is a spur gear supported in the horizontal plane of the spur gear **142** on top of the mounting plate **114** with a vertical stub shaft **146** extending vertically along the axis of rotation **147** of the driven gear member immediately above the rear axle **108**. The stub shaft **146** carries a pinion gear **148** mating with a ring gear **150** carried by the rear axle **108**. Thus arranged, clockwise rotation of the driven gear member **138** produces a forward rotation of the rear axle **108** to drive the racing car **100** forward along the track **126**.

Like the drive gear member **136**, the idler gear member **140** includes a spur gear **152** and a lower, annular, axial shoulder **154**. The idler gear member **140** also includes a central hole **156** adapted to loosely receive a semicircular stub shaft **158** extending vertically from the top of the block **112**. When the idler gear member fits over the stub shaft **158**, the bottom thereof rests on top of the block **112** and the spur gear **152** lies on the horizontal plane of, between and mates with the spur gear **143** and driven gear member **138**. A retaining strap **160** extends over the top of the idler gear member **140** and the stub shaft **158** with hooked ends fitting into slots **162** in the right and left sides of the block **112** to vertically retain the idler gear member in place during operation of the racing car **100**.

The lever arm **122** lies on top of the block **112** to the left of the drive and idler gear members **136** and **140** and includes a generally concave rear portion **164** for receiving and engaging a portion of the annular shoulder **154**, and a straight front portion **166** for tangentially contracting the annular shoulder **144**. The lever arm is retained in place adjacent the drive and idler gear members by a pin **168** extending vertically from the top of the block **112** and engaging the left side of the lever arm at a junction of the front and rear portions. The pin also acts as a fulcrum about which the lever arm turns with transverse movement of the idler gear member **140** into and out of contact with the rear portion of the lever arm.

In particular, and considering the over-all operation of the brake-drive assembly **98**, when the motor **110** is energized, it drives the drive gear member **136** in a clockwise direction as illustrated in FIGURE 7. The clockwise turning of the drive gear member produces a counterclockwise turning of the idler gear member **140** which simultaneously travels to the right over the stationary driven gear member **138**. As the idler gear member moves to the right, the curved surface of the semicircular shaft **158** engages the inside of the hole **156** to prevent further transverse movement of the idler gear member toward the right side of the racing car **100**.

The counterclockwise turning of the idler gear member **140** also rotates the driven gear member **138** in a clockwise direction to drive the racing car **100** in a forward direction.

As the rotational drive developed by the motor **110** decreases or terminates, the drive gear member **136** slows, producing an instantaneous reduction of the angular velocity of the idler gear member **140**. For the moment, however, the driven gear member **138** continues to turn at its previous angular velocity to drive the idler gear member **140** over the drive gear member **136** toward the left side of the racing car **100**. As the idler gear member moves to the left, the angular shoulder **154** engages the rear portion **164** of the lever arm **142** causing the lever arm to turn in a counterclockwise direction about the pivot pin **168**. As this occurs, the front portion **166** of the lever arm **142** presses tightly against the annular shoulder **144** of the drive gear member **136**. This produces a rapid slowing of the drive gear member, and, if no driving power is applied to the drive gear member by the motor **110**, produces a rapid halting of the racing car **100**.

In this manner, the brake portion of the brake-drive assembly **98** operates automatically in response to changes in the rotational drive from the motor **110**. In particular, driving rotation from the motor **110** to the drive gear member **136** automatically releases the brake and reduction in the rotational power developed by the motor automatically energizes the brake to rapidly halt the forward travel of the racing car **100** when the motor is deenergized.

Accordingly, the present invention provides a brake-drive assembly which allows miniature racing cars to be accurately started, speeded up, slowed and stopped at the will of their operators. In addition, the brake-drve assembly is of a simple design which is inexpensive and easy to manufacture and maintain.

While particular forms of the brake-drive assembly have been described in some detail herein, changes and modifications may be made in the illustrated forms without departing from the spirit of the present invention. It is therefore intended that the invention be limited in scope only by the terms of the following claims.

I claim:

1. A brake-drive assembly particularly suited for miniature racing cars, comprising:

a first gear member connected to a drive motor for turning about a first axis;

a second gear member for turning about a second axis;

a floating idler gear member between and mating with said first and second gear members for turning about a third axis and moving in directions transverse to said axes upon rotation of said first and second gear members;

and brake means for preventing driven rotation of said first gear member by said second gear member and automatically operable to release said first gear member in response to movement of said idler gear member transverse to said axes with driving rotation of said first gear member.

2. The assembly of claim **1**, including frame means supporting said first and second gear members with said first and second axes fixed relative to each other.

3. The assembly of claim **2**, including means for guiding and limiting movement of said idler gear member in directions transverse to said axes.

4. The assembly of claim **2**, wherein said brake means includes a lever arm having first and second end portions for contacting said first and idler gear members, and a fulcrum supporting said lever arm for turning about a fourth axis parallel and lying in a plane between said first and third axes whereby contact with said idler gear member by said second end portion rotates said first end portion to contact said first gear member and halt driven rotation thereof.

5. The assembly of claim **4**, wherein said first and idler gear members include axial annular shoulders and said first and second end portions of said lever arm contact and ride over said shoulders.

6. The assembly of claim **4**, wherein said axes lie in substantially horizontal planes and said fulcrum is below said axes and wherein said assembly further includes an axle connected to said second gear member and extending along said second axis and wheels carried by said axle.

7. The assembly of claim **6**, including means for guiding and limiting movement of said idler gear member in directions transverse to said axes comprising a support arm pivotally connected to said frame means for swinging movement in a vertical plane, a horizontal stub shaft extending from said arm along said third axis and carrying said idler gear member, and stop means extending from said frame above said arm for engaging said arm to limit upward travel of said idler gear member.

8. The assembly of claim **4**, wherein said axes lie in vertical planes and wherein said assembly includes a horizontal axle supported by said frame means, wheels

carried by said axle, and gear means between said axle and said second gear member for turning said axle in response to rotation of said second gear member.

9. The assembly of claim 8, including means for guiding and limiting movement of said idler gear member in directions transverse to said axes comprising a central hole in said idler gear and a vertical stud shaft extending from said frame means into said central hole and having a cross-sectional area less than that of said hole.

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