GEH - F. 36153

OP 87405 (A...)

AUSTRALIA

Patents Act 1952

598051

Form 1.
Regulation 9

APPLICATION FOR A STANDARD PATENT

80818/87

I/~~We~~ Tomiichi FUKUDA,

of 3-23-18, Denenchofu, Ohta-ku, TOKYO, JAPAN

hereby apply for the grant of a Standard Patent ~~Patent of Addition~~ for an invention entitled

"GOLF CART SYSTEM"

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 3-4-90

which is described in the accompanying ~~provisional~~ complete specification.

For a Convention application — details of basic application(s) —

NUMBER	COUNTRY	DATE OF APPLICATION
262932/1986	JAPAN	5th November, 1986

~~For an application made by virtue of section 51~~

~~Original Application No.~~ ~~by~~

~~I request that the Patent may be granted as a Patent of Addition~~

~~the Patent applied for on Application No.~~

~~to Patent No.~~ ~~in the name of~~

~~I request that the term of the Patent of Addition be the same as that for the main invention or so much of the term of the patent for the main invention as is unexpired.~~

LODGED AT SUB-OFFICE
- 5 NOV 1987
Adelaide

My address for service is COLLISON & CO., Patent Attorneys, Savings Bank Building, 97 King William Street, Adelaide, South Australia, 5000.

Dated this (Tokyo, Japan) 23rd day of October , 1987

Tomiichi Fukuda
(Signature)
Tomiichi FUKUDA.

~~(To be completed where application is made by a person other than the applicant for, or the patentee under, the patent for the main invention.)~~

FEE STAMP TO VALUE OF $175 ATTACHED
MAIL OFFICER. [signature]

~~...ion No.~~ ~~hereby consent to this application.~~

~~day of~~ ~~19~~

~~(Signature)~~

To:

THE COMMISSIONER OF PATENTS

*o/4374

This form must be accompanied by either a provisional specification (Form 9 and true copy) or by a complete specification (Form 10 and true copy).

GEH - F. 36153

AUSTRALIA Form 8

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention application made for a patent for an invention entitled:

GOLF CART SYSTEM

I, Tomiichi FUKUDA

of 3-23-18, Denenchofu, Ohta-ku, Tokyo,Japan

do solemnly and sincerely declare as follows:

1. I am the applicant for the patent

~~*(or, in the case of an application by a body corporate)*~~

~~1. I am authorized by , the applicant for the patent to make this declaration on its behalf.~~

2. The basic application as defined by section 141 of the Act was made in JAPAN on the 5th day of November , 1986 , by Tomiichi FUKUDA

~~day of , 19 , by~~

3. I am the actual inventor of the invention referred to in the basic application.

~~*(or, where a person other than the inventor is the applicant)*~~

~~3.~~

~~of~~

is ~~the actual inventor of the invention and the facts upon which~~ I am entitled ~~the is entitled to make the application are as follows~~:

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

~~*(or where a request is made under section 142AA of the Patents Act 1952, for an earlier application made in a Convention country to be disregarded)*~~

~~4. (1.) The basic application referred to in paragraph 2 of this Declaration was not the first application made~~ in a Convention country in respect of the invention the subject of the application.

(2.) An earlier application in respect of the invention the subject of the application was made in

on

(3.) A request has been ~~made to you~~ under section 142AA of the *Patents Act* 1952 to disregard that earlier application.

~~*(Here set out in succeeding sub-paragraphs the facts that show that section 142AA is applicable)*~~

Except as stated in this paragraph, the basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Tokyo, Japan this 23rd day of October , 19 87

TO:

THE COMMISSIONER OF PATENTS.

Tomiichi Fukuda

(Signature of Declarant)

Tomiichi FUKUDA

(IMPORTANT – Cross out inapplicable words in above Form.)

*0/4524

(12) PATENT ABRIDGMENT (11) Document No. AU-B-80818/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 598051

(54) Title
GOLF CART SYSTEM

International Patent Classification(s)
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(21) Application No. : 80818/87 (22) Application Date : 05.11.87

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61-262932	05.11.86	JP JAPAN

(43) Publication Date : 12.05.88

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(71) Applicant(s)
TOMIICHI FUKUDA

(72) Inventor(s)
TOMIICHI FUKUDA

(74) Attorney or Agent
COLLISON & CO.

(56) Prior Art Documents
GB 2171969
GB 2158404
GB 1367119

(57) Claim

1. A golf cart system including a track embedded in the ground and a cart adapted to run on the track characterized in that:

said track comprises a bottom wall, a pair of opposed side walls generally vertically extending from the bottom wall, and top walls extending toward the center of the track from the upper ends of the side walls to define a slot therebetween;

said cart comprises a base frame, supporting posts vertically and downwardly extending from the base frame through the slot into the track, a wheel supporting frame mounted on the supporting posts within the track, driving wheels mounted on the wheel supporting frame and driven by a power source to run on the inner surface of the bottom wall of the track, and rollers mounted on the wheel supporting frame and urged against the inner surfaces of the side walls.

COMMONWEALTH OF AUSTRALIA 598051 Form 10

Patents Act 1952-1969

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int. Class

Application Number :
Lodged :

Complete Application No. ;
Specification Lodged :
Published :

Priority:

Related art:

This document contains the amendments made under Section 49, and is correct for printing.

TO BE COMPLETED BY APPLICANT

Name of Applicant: Tomiichi FUKUDA

Address of Applicant: 3-23-18, Denenchofu, Ohta-ku, Tokyo, JAPAN

Actual Inventor: Tomiichi FUKUDA

Address for Service: COLLISON & CO., Patent Attorneys, 117 King William Street, Adelaide, South Australia, 5000.

Complete Specification for the invention entitled: "GOLF CART SYSTEM"

The following statement is a full description of this invention, including the best method of performing it known to me:

SPECIFICATION

TITLE OF THE INVENTION

Golf Cart System

BACKGROUND OF THE INVENTION

The present invention relates to a golf cart system for installation on a golf course and, more particularly, to a golf cart system which enables a golf cart to run on the fairway of a golf course.

Heretofore several types of golf carts for carrying golfers or golf equipment have been known. These include, for example, three- and four-wheeled carts driven by a battery-powered electric motor or a small internal combustion engine. However, these carts are not suitable to be run on a golf course because their tires would come in direct contact with the grass and is likely to damage the grass. Accordingly, they have to be run on the rough or on a paved path running at the side of the rough. Recently there have been developed golf cart systems adpated to run on rails embedded in the ground of the golf course. The carts of this type do not damage the grass but, since such prior art golf cart systems use rails having a wide top surface exposed above the ground of the golf course, there is a risk that the rails will interfere with the golfers' game, as when a golf ball lands on the exposed rail surface. Thus the golf cart systems of the prior art using embedded rails also has to be installed at a place outside the rough.

When a golf cart is installed at a place outside the rough and far from the fairway, the players or their caddies have to walk back and forth between the fairway and the cart whenever they change golf clubs. This is not only troublesome for the players and caddies but also delays the progress of the game.

For solving this problem, the applicant of the present application previously developed a novel embedded-rail type golf cart system which can be installed on the fairway as disclosed, for example, in Japanese Laid-open Patent Publication No. 61/33363. This golf cart uses a track having a very narrow top surface exposed above the ground so that there is little chance of a golf ball hitting against the track even though the track is laid across the fairway.

However, since the golf cart disclosed in Japanese Laid-open Patent Publication No. 61/33363 is constructed such that driving wheels running on a lower running surface of the track and anti-overturn wheels running on an upper running surface of the track are strongly urged by springs against the lower and upper running surfaces, a heavy load (not only the dead insight of the cart itself but also the reaction force of the springs) is always applied between the driving wheels and the lower running surface of the track. This causes an excessive frictional force therebetween and also wastefully increases the consumption of the battery power or the gasoline used for driving the cart, as a result, the distance that the cart can travel per charge of the battery or per tank of gasoline is shortened.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a golf cart system which can be used on the fairway of a golf course and which is excellent both in power efficiency and in anti-overturn effect.

For achieving the object of the present invention, there is provided, according to the present invention, a golf cart system including a track embedded in the ground and a cart adapted to run along the track characterized in that: said track comprises a bottom wall, a pair of opposed side walls generally vertically extending from the bottom wall, and top walls extending toward the center of the track from upper ends of the side walls to define a slot therebetween; said cart comprises a base frame, supporting posts vertically and downwardly extending from the base frame into the track through the slot, a wheel supporting frame mounted on the supporting posts within the track, driving wheels mounted on the wheel support frame and driven by a power source to run on the inner surface of the bottom wall of the track, and rollers mounted on the wheel supporting frame and urged against the inner surfaces of the side walls.

According to the present invention, since the anti-overturn rollers are adapted to be urged against the inner surface of the side walls of the track, no reaction force from the anti-overturn rollers is applied to the inner surface of the bottom wall of the track on which the driving wheels run.

That is, since only the dead weight of the cart itself acts between the driving wheels and their running surface (i.e. no excessive frictional force acts therebetween), it is possible to reduce the consumption of electric power or gasoline by the source of driving power.

BRIEF DESCRIPTION OF THE INVENTION

Other objects and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment of the present invention taken in reference to the accompanying drawings in which:

Fig. 1 is a cross-sectional side elevation of a golf cart of the present invention schematically showing the structure of a cart and a track thereof;

Fig. 2 is a cross-sectional plan view taken along the line II-II of Fig. 1;

Fig. 3 is a cross-sectional end view of the track taken along the line III-III of Fig. 1;

Fig. 4 is an explanatory view showing forces acting on the cart and the track when the cart travels along a curved track portion;

Fig. 5 is a partial cross-sectional view showing a second embodiment of a supporting structure for anti-overturn rollers of the cart;

Fig. 6 is a perspective view showing a third embodiment of a supporting structure for anti-overturn rollers of the cart; and

Fig. 7 is an explanatory skelton view showing the action of the roller supporting structure of Fig. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Fig. 1, a golf cart system 1 of the present invention includes a track 10 and a cart 50 which runs along the track 10. The detailed structure of the track 10 will be described with reference to Fig. 3. The track 10 of the golf cart system 1 of the present invention comprises a bottom wall 10a, a pair of oppositely facing side walls 10b generally vertically extending from the bottom wall 10a, and top walls 10c extending from the top ends of the side walls 10b toward the center of the track 10 to define as track groove 10e therebetween. Formed on the inside of the bottom wall 10a are running surfaces 11 on which the driving wheels 65 run. As can be seen in Fig. 3, the width of the groove 10e is much smaller than the overall width of the track 10, i.e. than the distance between the opposing side walls 10b and 10b. More specifically, the groove 10e is slightly larger than the diameter of a golf ball and therefore the width of the portion of the track exposed at the ground (the grass surface) G is also very narrow, there is little chance of a golf ball hitting against the track 10 even if the track 10 is embedded in the fairway of a golf course. This makes it possible to install the golf cart system 1 of the present invention in the fairway of a golf course.

The cart 50 has a base frame 51 on which supporting beds 52 and pillows 53 for supporting golf bags and other golf equipment are mounted via pipe frames 54. The base frame 51 also supports thereon a power source such as an electric motor (or a small internal combustion engine) 55 for driving the cart 50, a pulley (or sprocket) 56 secured to the output shaft of the motor 55 and intermediate pulleys (or sprockets) 57. The power from the motor 55 is transmitted to the intermediate pulleys 57 via belts (or chains) 58. All the components are concealed by a cover 59. The cart 50 shown in Fig. 1 is designed for carrying only golf equipment. However, other types of carts for passengers or for both passengers and golf equipment may be designed.

Supporting posts 60 extends vertically and downwardly from the under side of the base frame 51 through a track groove 10e into the interior of the track 10, as best shown in Fig. 3. A wheel supporting frame 63 is mounted on the posts 60 via pins 62. As shown in Figs. 1 and 3, driving wheels 65 are rotatably mounted on the frame 63 via bearings 64. A pulley (or sprocket) 67 is secured to the axle shaft 66 of each of the driving wheels 65 and a belt (or chain) 68 is wound around the pulley 67 and the intermediate pulley 57. Thus, the power of the motor 55 is transmitted to the driving wheels 65 via the belts 58, intermediate pulleys 57, belts 68 and pulleys 67 so that the driving wheels 65 can run on running surfaces 11 formed on the bottom wall 10a. As can be seen in Fig. 3, the running surfaces 11 are inclined

downwardly toward each other to be suitable for truncated-conically shaped driving wheels. However, they may be formed as horizontal surfaces suitable for use with cylindrical driving wheels.

It is preferable to mount, on the top surfaces of the top walls 10c, groove covers 13 of suitable elastic material such as rubber or artificial turf which are usually in closed condition but are opened by the posts 60 when the cart 50 moves along the track 10. The provision of the groove covers 13 makes it possible to prevent irregular bounding of golf balls if they should accidentally hit the track 10 and also prevents the entry of dirt or other debris such as dead leaves into the track 10. A recess 14 may be formed generally at the center of the bottom wall 10a so as to form a trough for rainwater entering the track.

The golf cart system 1 of the present invention is provided with anti-overturn rollers 70 for preventing lateral overturn of the cart 50. The anti-overturn rollers 70 roll along the inner surfaces of the side walls 10b of the track 10 with the rollers 70 urged thereagainst. As clearly shown in Fig. 2, the anti-overturn rollers 70 comprise front rollers 70a, rear rollers 70b and central rollers 70c. All these rollers 70a, 70b and 70c are rotatably mounted on arms 71 which, in turn, are pivotably mounted on brackets 72 secured to the wheel supporting frame 63. Springs 73 act to urge the rollers 70a, 70b and 70c against the inner surfaces of the side walls 10b. In the preferred embodiment of Fig. 2, the

springs 73 for urging the central rollers 70c act as tension springs and the springs 73 for urging the front and rear rollers 70a and 70b act as compression springs. For clarity in the drawings, the arms 70 and springs 73 for one of the front rollers 70a and rear rollers 70b are omitted from Fig. 2.

As can be seen in the preferred embodiment of Figs. 1 and 3, the front and rear rollers 70a and 70b engage the side walls 10b at upper positions thereof whereas the central rollers 70c engage the side walls at lower positions thereof. The arrangement in which in addition to the front and rear rollers 70a and 70b, the central rollers 70c are provided to engage the lower portions of the side walls 10b, makes it possible to increase the returning moment which acts to restore the cart 50 to its vertical attitude in resistance to an overturning moment (the "overturning moment" meaning a moment acting to overturn the cart 50 radically outward when the cart 50 travels on a curved portion of the track 10). The reason for this will be described with reference to Fig. 4. When the cart 50 travels on a curved track 10, the central roller 70c located on the radially inward side of the cart 50 bears strongly against the side wall 10b of the radially inward side of the track 10 and is pushed by a strong reaction force F from the side wall 10b. Since the central roller 70c engage the side wall 10b at a lower position thereof, the reaction force F effectively acts to restore the cart 50 to its vertical attitude in resistance to the overturning moment M.

Fig. 5 shows a second embodiment of the golf cart system 1 of the present invention. In this embodiment, each of the anti-overturn rollers 70a, 70b and 70c is directly urged by springs 73' against the side walls 10b without using the arms 71 of the first embodiment. Each roller is supported on a rod 80 slidably mounted in a box member 81 accommodating the spring 73' therein and is adapted to be pushed out toward the side wall 10b by the spring 73' arranged between the rod 80 and the box member 81.

In a third embodiment of the golf cart 1 of the present invention, each of the anti-overturn rollers 70a, 70b and 70c is supported on a "quadric crank chain mechanism" comprising four links. Fig. 6 shows one example of the quadric crank chain mechanism wherein the central roller 70c is attached to the wheel supporting frame 63. A link A is secured to the wheel supporting frame 63, a link B is pivotably mounted on the link A, a link C is pivotably mounted on the link B, and a link D is pivotably mounted on both the links C and D. The roller 70c is rotatably mounted on the link C via bearings 82 and 83. If the link B is urged by a spring (not shown) in the direction shown by the arrow, the roller 70c is also urged against the side wall 10b of the track 10. With this supporting arrangement of the rollers 70a, 70b, and 70c by the quadric crank chain mechanism, it is possible to maintain the contacting point of the rollers relative to the side walls 10b substantially constant even if the diameter of the rollers is reduced due to wear. Fig. 7 is

a schematic view of the structure of Fig. 6 and shows two cases wherein a new roller 70c (shown by a solid line) and a used roller 70c having a reduced by wear diameter (shown by a dotted line) contact with the side wall 10b, respectively. The links A, B, C and D assume the positions shown by the solid lines when the roller 70c is still new. On the other hand, the links B, C and D move to the positions B', C' and D' shown by the dotted line when the roller 70c is worn during use (the link A does not shift its position since it is secured to the wheel supporting frame 63). Thus, the roller 70c contacts the side wall 10b substantially at a constant position P. To this end, the length of each link and the angle of the roller relative to the link C may be appropriately determined based upon the dimensions of, for example, the diameter of the rollers and the distance between the wheel supporting frame 63 and the side wall 10b.

According to the golf cart system of the present invention, since the width of the track exposed at the ground level is very narrow, there is less chance a golf ball hitting against the track. Even if a golf ball should happen to accidentally hit the exposed track portion, the ball will bound similarly as when hitting natural grass if the exposed track portion is covered by elastic members such as artificial turf. This makes it possible to install the golf cart system of the present invention on the fairway of a golf course. In addition, since the anti-overturn rollers are so arranged such that they elastically urge the side walls, the load acting

between the driving wheels and the rail is only the dead load of the cart itself and, therefore, no excessive frictional force acts therebetween. This reduces the consumption of electric power or gasoline used by the power source and thus increases the traveling distance of the cart per battery charge or tank of gasoline.

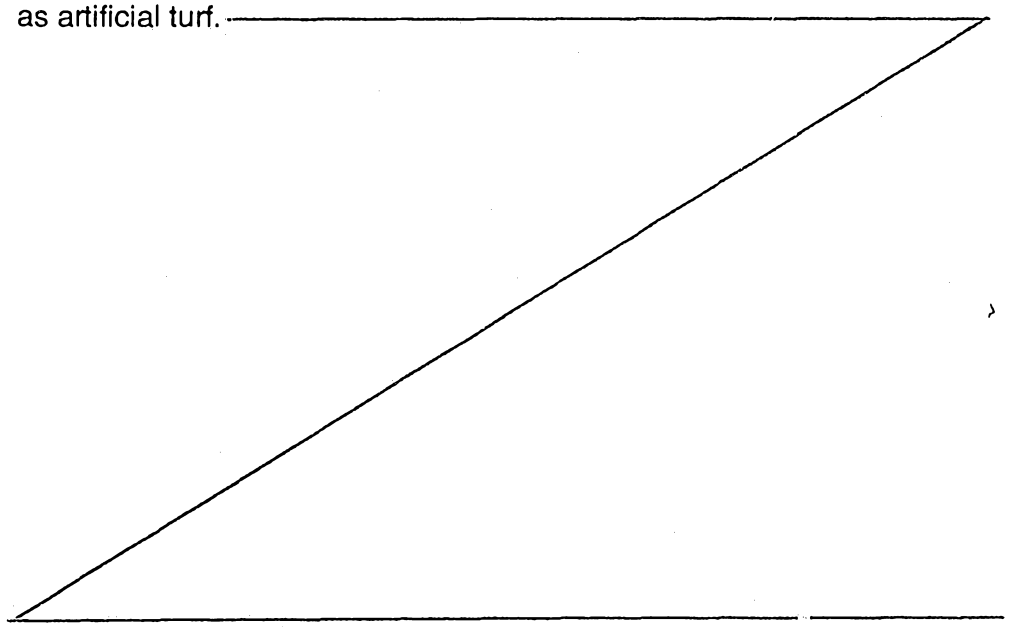
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A golf cart system including a track embedded in the ground and a cart adapted to run on the track characterized in that:

said track comprises a bottom wall, a pair of opposed side walls generally vertically extending from the bottom wall, and top walls extending toward the center of the track from the upper ends of the side walls to define a slot therebetween;

said cart comprises a base frame, supporting posts vertically and downwardly extending from the base frame through the slot into the track, a wheel supporting frame mounted on the supporting posts within the track, driving wheels mounted on the wheel supporting frame and driven by a power source to run on the inner surface of the bottom wall of the track, and rollers mounted on the wheel supporting frame and urged against the inner surfaces of the side walls.

2. A golf cart system as defined in claim 1 further characterised in that the top walls forming the slot are covered by elastic members such as artificial turf.



3. A golf cart system as defined in claim 1 or claim 2 further characterised in that the rollers on the wheel supporting frame comprise lower rollers engaging the lower portion of the inner surfaces of the side walls and upper rollers engaging the upper portion of the inner surface of the side walls.

4. A golf cart system as defined in any one of the preceding claims wherein the rollers are resiliently urged against the inner surface of the side walls.

5. A golf cart system as defined in claim 3 wherein the wheel supporting frame has mounted thereon two pairs of spaced apart driving wheels, two pairs of spaced apart lower rollers and a central pair of upper rollers.

6. A golf cart system as defined in claim 3 wherein there are two spaced supporting posts, a pair of driving wheels mounted on the wheel supporting frame beneath each supporting post, a pair of lower rollers adjacent each pair of driving wheels, and a pair of upper rollers positioned centrally between said supporting posts.

7. A golf cart system substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 5th day of November 1987.

TOMIICHI FUKUDA,
By his Patent Attorneys,
COLLISON & CO.

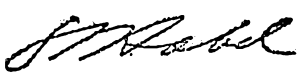


FIG.1

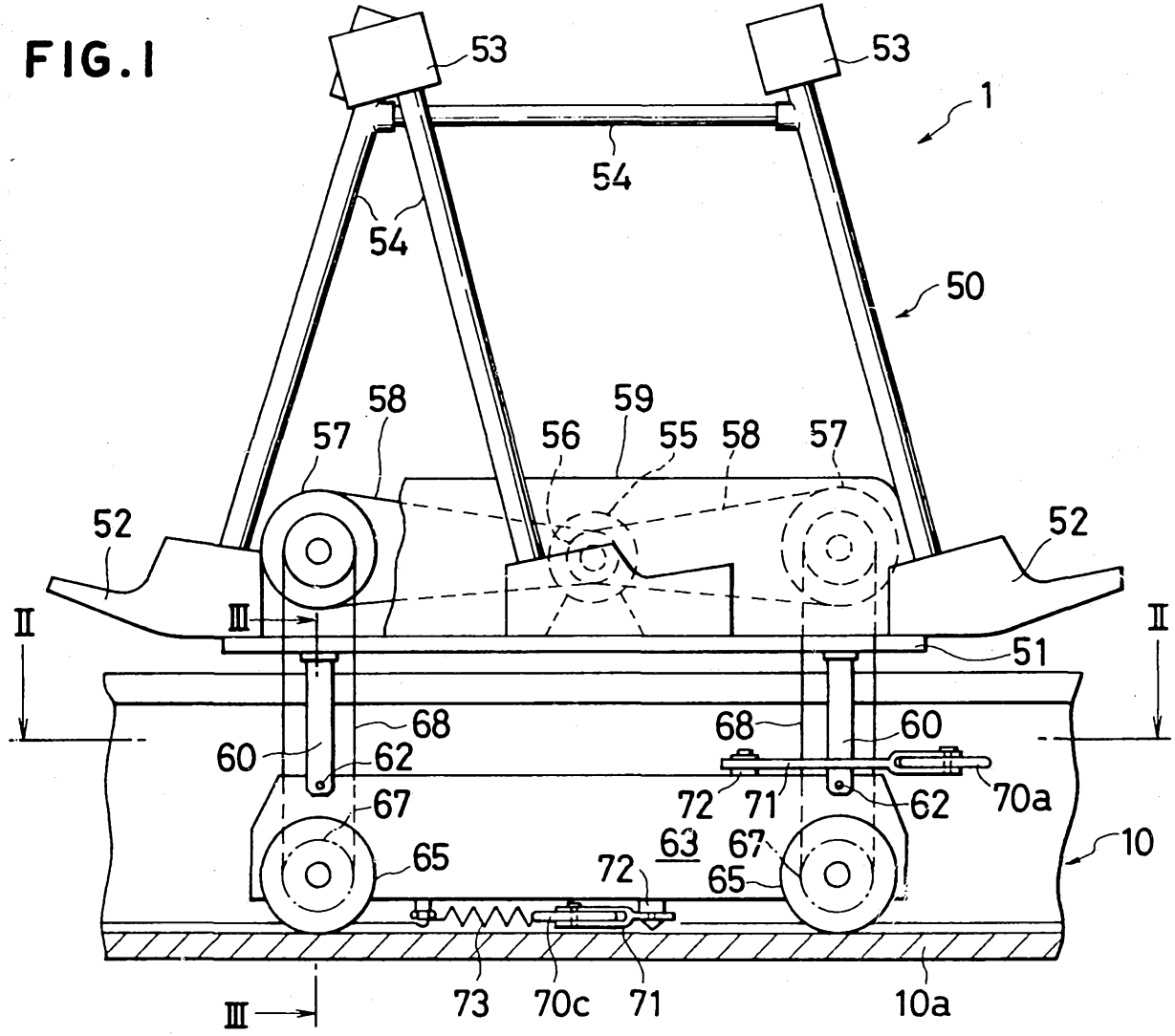


FIG.2

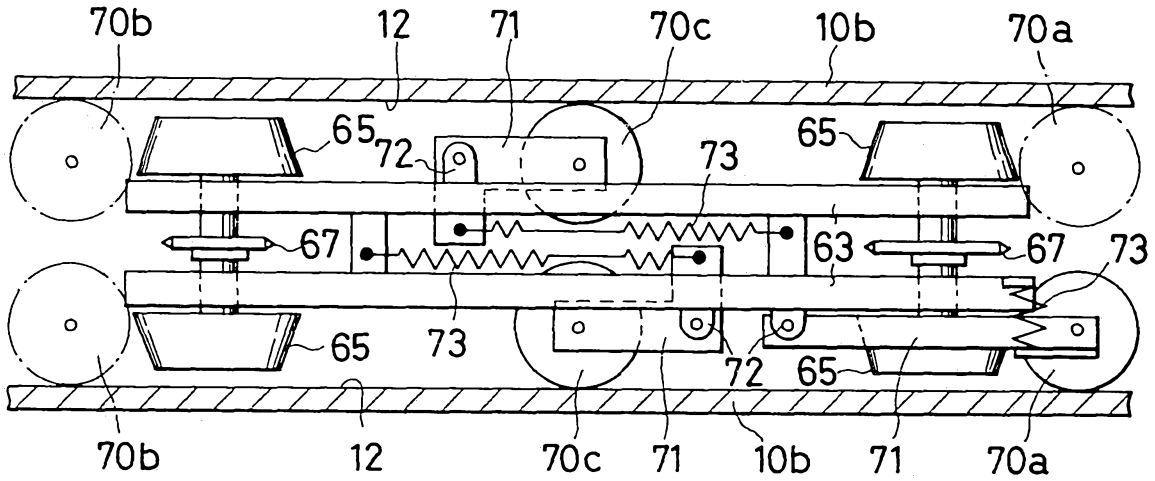

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FIG.3

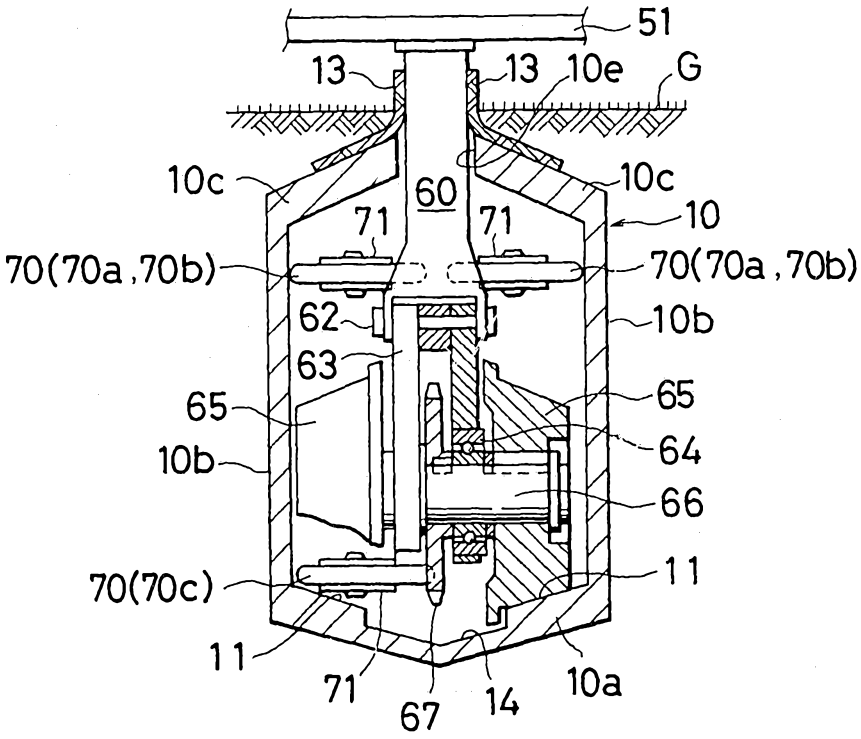
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FIG.4

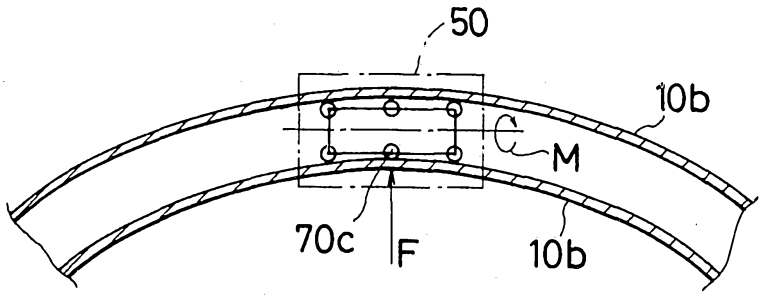

FIG.5

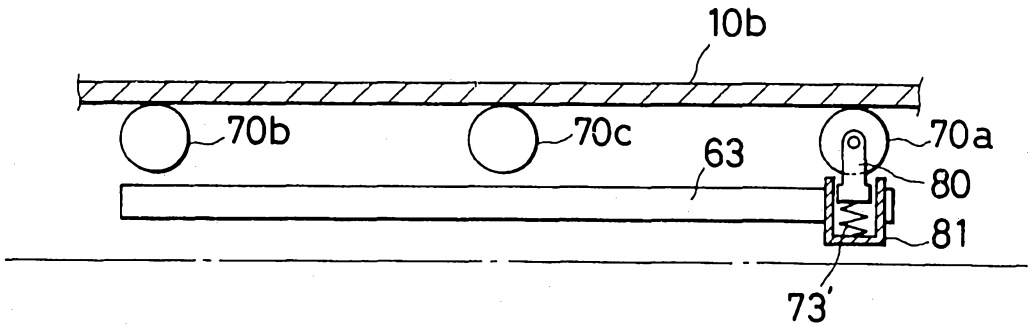

FIG.6

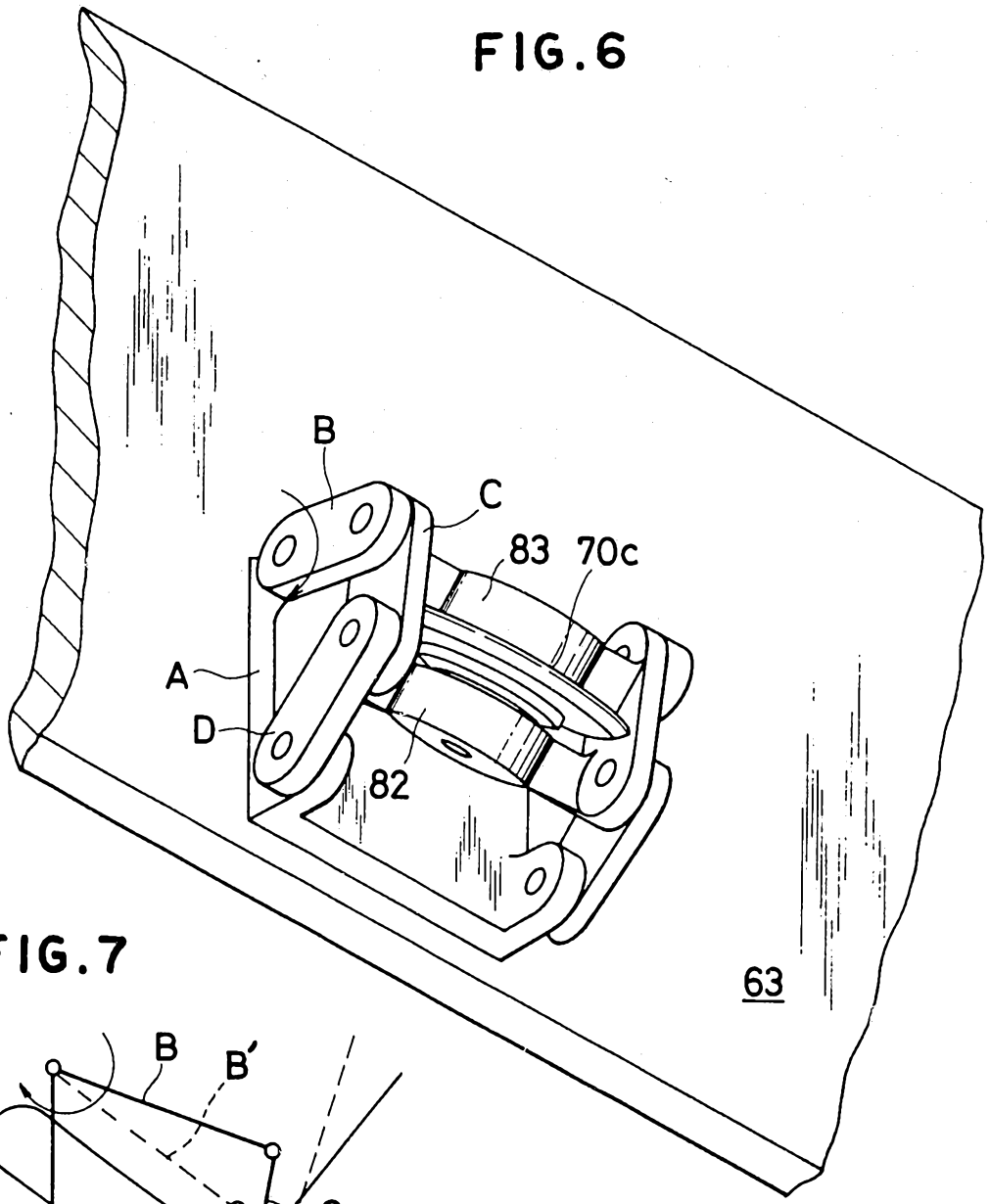

FIG.7