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[15] **3,691,669**

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[54] **TOY FLIGHT SIMULATOR AND DISPLAY STAND**

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[52] **U.S. Cl.** .....**46/1 H**, 35/12 L

[51] **Int. Cl.** **A63h 33/00**

[58] **Field of Search**.....35/12 A, 12 B, 12 F, 12 L

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[57] **ABSTRACT**

A simulator-display stand, including a control stick and linkage to simulate flight movement with a toy airplane. The linkage includes five elements, two of which includes integral living hinges for transmitting motion of the control stick to parallel motion of the airplane in an easily manipulated, inexpensive and exciting fashion.

11 Claims, 8 Drawing Figures

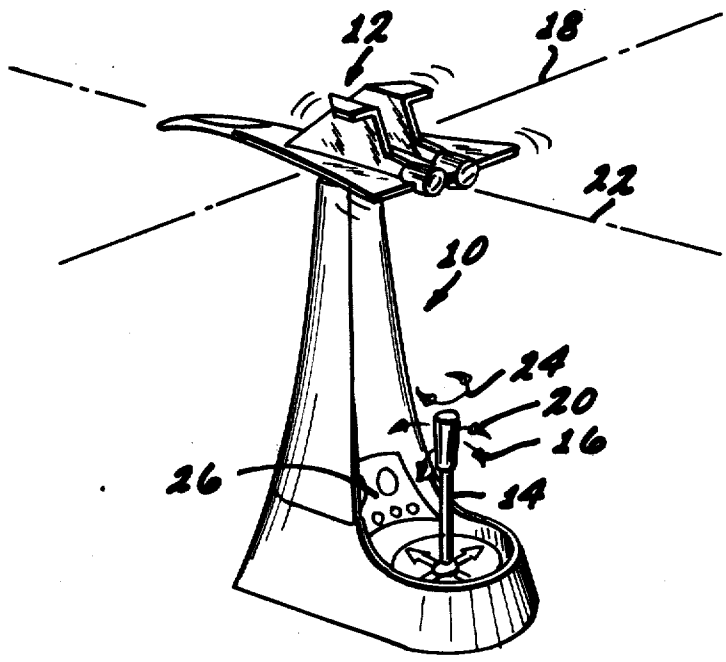


FIG. 1

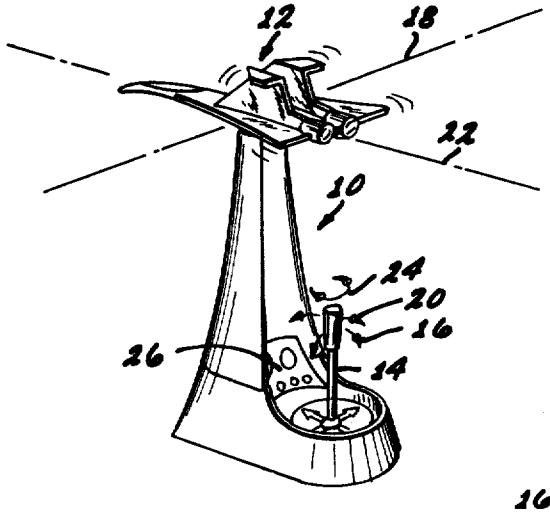


FIG. 4

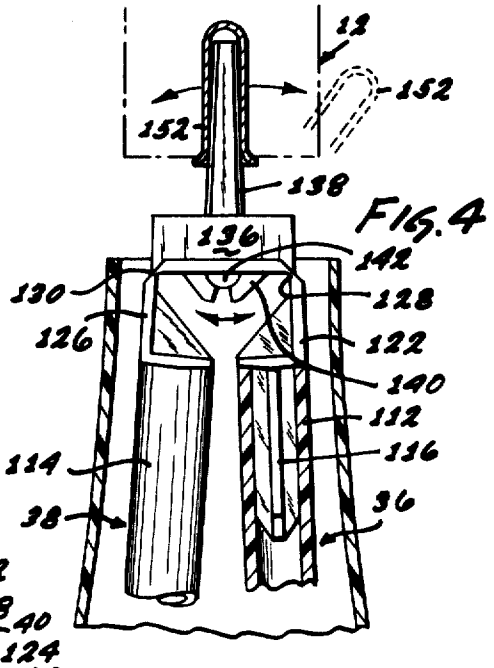


FIG. 2

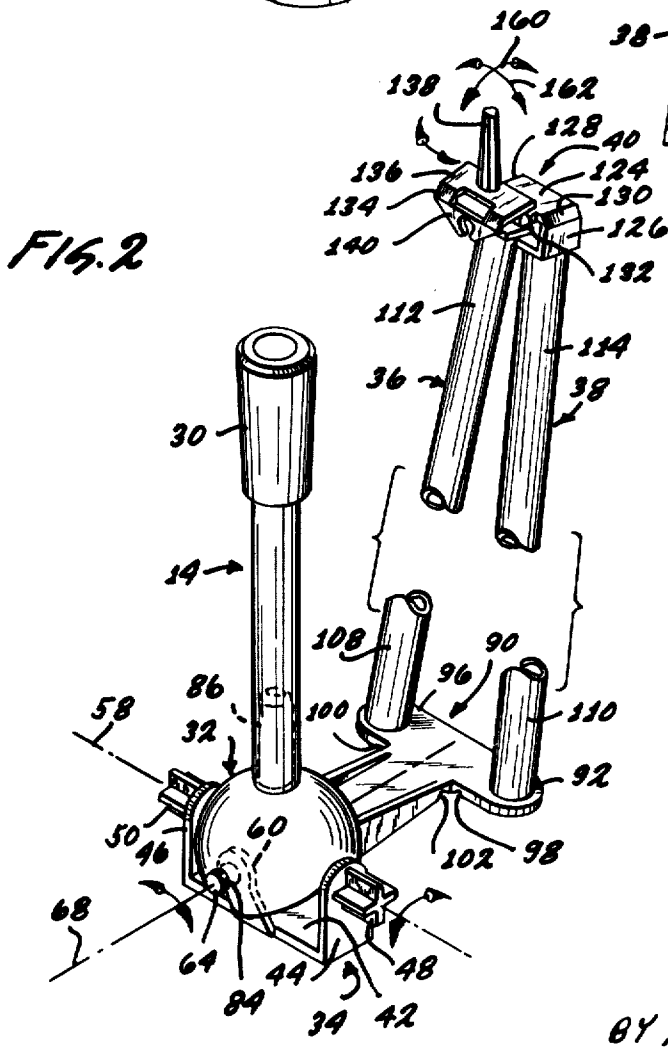
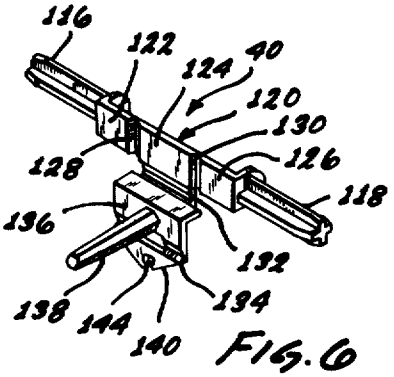


FIG. 6



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FIG. 5

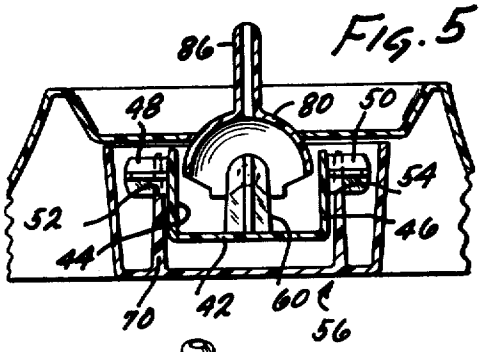


FIG. 7

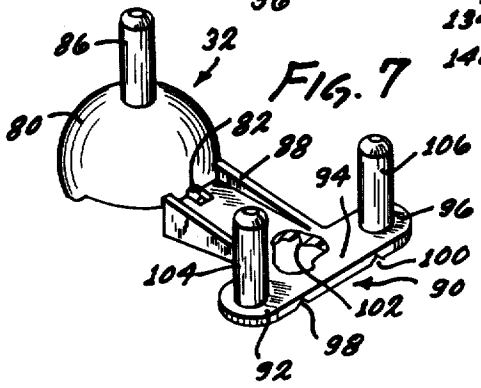


FIG. 8

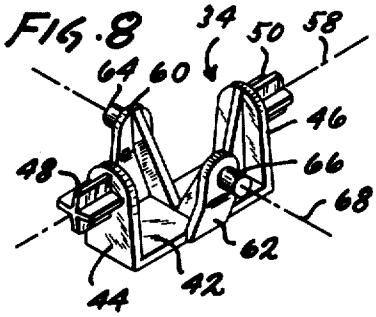
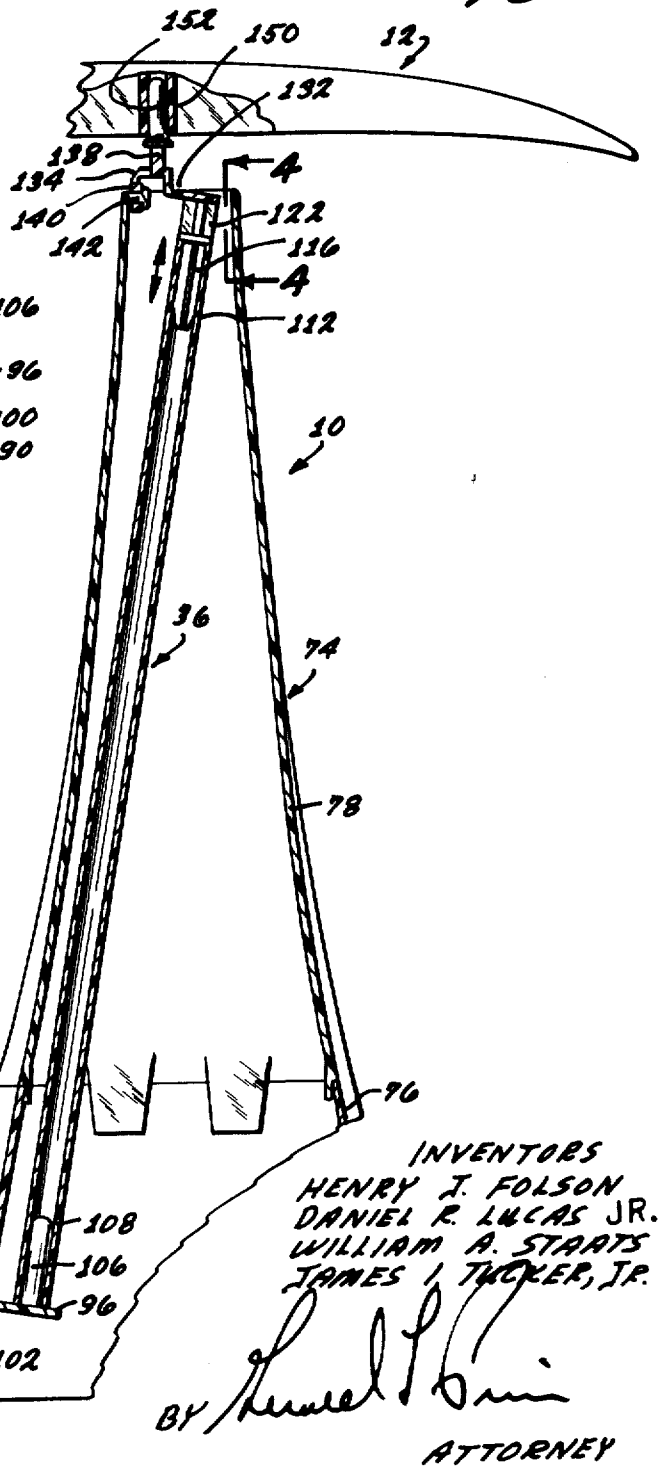


FIG. 3



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TOY FLIGHT SIMULATOR AND DISPLAY STAND

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a toy flight system and, more particularly, to a toy flight simulator and display stand for a toy vehicle, such as a toy airplane; the toy flight simulator can be easily manipulated by a young child and is inexpensively manufactured and assembled.

2 Description of the Prior Art

The prior art is replete with toy airplanes and other toy flight vehicles such as space capsules of various forms. For example, there are model airplanes, airplanes with small gasoline engines, airplanes which move along a guide line or cable, airplanes which move along a track system etc. However, in most of these toys there is illustrated the inherent dilemma between cost of production and ability to simulate real flight vehicles. Such toys are either not very realistic or are too expensive to be commercially feasible. Further, it is difficult to provide a toy which simulates realistically the control of an aircraft and yet is easily manipulated by even small children in addition to being inexpensive to produce so as to be made available for mass marketing.

SUMMARY OF THE INVENTION

The present invention has solved the problems mentioned above by providing a toy flight simulator for a toy controlling the toy vehicle, including causing the toy flight vehicle to pitch and bank; and means connected to the housing and to the control means for transmitting motion from the control means to the toy vehicle. The invention additionally includes linkage for a toy flight simulator comprising a pivot mount adapted to be mounted to a support structure for providing rotation about two mutually perpendicular axes; a first articulate link mounted to the pivot mount and connected to a control means, the first link having three integral hinges; two motion transmitters connected to the first link; and a second articulate link having four integral hinges, a portion for connecting to a toy vehicle and a portion for pivotally connecting to the support structure, whereby the toy vehicle can be moved and controlled by the control means. The invention further includes a link comprising a unitary element having means oppositely disposed for connecting to two motion transmitters, means for connecting to an object to be moved, a portion for pivotally connecting to a support structure and four hinges; two of the hinges are for cooperating to pivot the object connecting means in a first direction and the other two of the hinges for cooperating to pivot the object connecting means in a second direction, the second direction being perpendicular to the first direction.

A general aim of the present invention is to provide a toy flight simulator which is simply constructed, easily manipulated and inexpensive to manufacture and assemble.

Another aspect of the present invention is to provide a toy flight simulator having a minimum of parts, having a rugged construction and being reliable and exciting in operation.

Other objects and advantages of the invention will appear from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the toy flight simulator and display stand and a toy airplane.

FIG. 2 is an enlarged perspective view of the toy flight simulator linkage and control stick.

FIG. 3 is an enlarged elevational sectional view of the toy flight simulator and display stand and a portion of the toy airplane.

FIG. 4 is an enlarged elevational sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is a sectional elevational view taken along line 5—5 of FIG. 3.

FIG. 6 is a perspective view of an upper articulate link in the "as molded" position.

FIG. 7 is a perspective view, partially broken away, of a lower articulate link.

FIG. 8 is a perspective view of a pivot mount.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the present invention is susceptible of various modifications and alternative constructions, an illustrative embodiment is shown in the drawings and will herein be described in detail. It should be understood, however, that it is not the intention to limit the invention to the particular form disclosed; but, on the contrary, the intention is to cover all modifications, equivalents and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to FIG. 1, there is illustrated a toy flight simulator and display stand **10** to which is mounted a toy airplane **12**. The toy simulator includes a control stick **14** which may be manipulated as indicated by the arrows to move the airplane in a controlled fashion to simulate flying a real airplane. For example, if the control stick is moved toward and away from the simulator-display stand **10**, as indicated by the arrows designated **16**, the airplane will be rotated about an axis designated **18** so that the aircraft is moved in what is termed a "pitching" motion. If the control stick is moved laterally in the direction of the arrows designated **20**, then the aircraft will rotate about a second axis designated **22** in what is called a "banking" movement. It is to be noted that the axes **18** and **20** are mutually perpendicular. Should the control stick be moved in a circular fashion such as indicated by the curved arrows designated **24**, then the aircraft will be moved simultaneously about the two axes much in the same way as a real aircraft pitches and banks. To further simulate realism, a simulated instrument panel **26** is provided affixed to the housing of the simulator-display stand.

It is to be understood that while a toy airplane is illustrated, any other toy vehicle such as a space capsule or other types of aircraft may be used without detracting from the invention herein.

An important aspect of the present invention is provided by having a linkage between the control stick and the object to be manipulated, such as the airplane, which is simply constructed, rugged, reliable and inexpensively manufactured and assembled. Referring now to FIG. 2, the control stick **14** includes a cap **30** and is connected to a first or lower articulate link **32** which is mounted to a pivot mount **34**. Connected to the first ar-

ticulate link are two motion transmitter rods **36** and **38** which in turn are connected to a second or upper articulate link **40**. The toy vehicle is mounted to the upper articulate link **40**.

Referring now to FIG. **8**, the pivot mount **34** includes a base portion **42** integral with two upstanding oppositely disposed flange portions **44** and **46**, each having laterally extending crossed arms **48** and **50**, respectively. The arms are received by corresponding slots **52** and **54**, FIG. **5**, of a support base **56**. The pivot mount is supported by the support base **56** such that the pivot mount can pivot about an axis designated **58**. The arms **48** and **50** act as journals while the wall surrounding the slots **52** and **54** act as bearings. Also integral with the base portion **42** are two additional upstanding flange portions **60** and **62** with each having lateral projecting shafts **64** and **66**, respectively. By mounting the first link **32** upon the shafts **64** and **66** (see FIG. **2**) movement about an axis designated **68** is provided. It is to be noted that the axes **58** and **68** are mutually perpendicular.

Referring now to FIGS. **3** and **5**, the support base **56** includes two flanges **70** and **72** which have the slots **52** and **54**, respectively, formed therein. The support base forms part of an outer housing **74** which is comprised of a lower portion **76** and an upper portion **78**. Constructing the housing in two portions **76** and **78** allow the simulator-display stand to be packaged in a disassembled condition and, therefore, be less expensively packaged while also facilitating manufacturing.

Referring now to FIG. **7**, the lower articulate link **32** includes a generally hemisphere portion **80** which is mountable to the shafts **64** and **66**, FIG. **8**, of the pivot mount **34** by providing a bearing surface **82** for the shaft **66** and a bearing surface **84**, FIG. **2**, for the shaft **64**. Integral with the hemisphere **80** is a post **86** to which is fitted the control stick **14**, FIGS. **2** and **3**. As shown, the control stick is a hollow tube. The other portion of the first articulate link **32** includes a reinforced flange **88** and a tab **90** having three regions **92**, **94** and **96** which are conveniently separated by two integral paralleled disposed hinges **98** and **100**. In turn, the tab **90** is separated from the reinforced flange by a third integral hinge **102** which is perpendicular to the position of the hinges **98** and **100**.

Each of the hinges are formed by providing a groove in the material of the link having walls which are disposed by approximately 90° so as to provide a bridge of relatively thin gauge material where the walls intersect. It is to be understood that the angular distance between the walls of the groove is only approximate and can vary plus or minus many degrees without affecting the function of the hinge which is formed. Because the hinge is integral with the portions hinged, the hinge is often referred to as a "living hinge." The tab **90** is pivotable relative the flange **88** and the hemisphere **80**, while the first region **92** and the third region **96** of the tab are movable relative the second region **94**. Integral with the first region **92** is an upstanding post **104**, while integral with the third region **96** is an upstanding post **106**.

With the first link mounted to the pivot mount **34**, rotation of the first link about the axes **58** and **68** is provided. Thus, a manipulative force applied to the control stick **14** is transmitted through the link **32** as rotation about one or both of the axes **58** and **68**. Referring now to FIGS. **2** and **3**, the motion transmitter rod **36** is mounted to the post **106** of the third region **96**, while the rod **38** is mounted to the post **104** of the first region **92**. Each of the rods **36** and **38** are tubular so as to provide a receptacle to receive the posts **106** and **104** within lower ends **108** and **110**, respectively.

Received within upper ends **112** and **114** of the rods **36** and **38**, respectively, are cross-shaped arms **116** and **118**, FIG. **6**, of the upper articulate link **40**. The upper link **40** is comprised of a tab **120** divided into three regions **122**, **124** and **126** by two integral living hinges **128** and **130**. The first region **122** is L-shaped and integral with the arm **116**, while the third region **126** is L-shaped and integral with the arm **118**. The hinges **126** and **130** are mutually parallel to one another and perpendicular to two additional living hinges **132** and **134**. The hinge **132** separates the tab **90** from a center portion **136** having a mounting post **138** to be received by the toy airplane **12**, FIG. **1**, while the hinge **134** separates the center portion **136** from an end portion **140** which pivotally connects to the upper portion **78** of the housing **74**, FIG. **3**, by receiving a blunted shaft **142** within a circular opening **144**, FIG. **6**. The articulate link **40** is shown in FIG. **6** in its "as molded" position, while in FIGS. **2** and **4**, the link is illustrated in a folded, operative position. To facilitate connection to an opening **150**, FIG. **3**, in the airplane **12**, a closed end eyelet **152** is provided to receive the post **138** in a tight-friction fit (see also FIG. **4**).

Referring now to FIGS. **2**, **3** and **4**, the airplane is controlled, as mentioned earlier, by the movement of the control stick. For example, when the control stick is moved toward or away from the rods **36** and **38**, that is, in a rotational movement about the axis **58**, the link **32** will pivot about the hinge **102** causing the tab **90** to be pivoted upwardly or downwardly thereby causing the rods **36** and **38** to be moved upwardly and downwardly. The rods in turn cause the upper link **40** to pivot about the hinges **132** and **134** (remember the end portion **140** is connected to the housing) so as to move the post **138**, as depicted by the arrows **160** in the same direction as the original motion of the control stick. Referring to FIG. **1**, this motion will cause the aircraft to pitch about the axis **18**. If the control stick is moved laterally, then the lower link will rotate about the shafts **64** and **66** of the pivot mount (that is, about the axis **68**) so as to flex the hinges **98** and **100**. This causes the rods **36** and **38** to move relative one another. This relative motion is transmitted to the upper link **40** causing movement of the two hinges **128** and **130** and pivoting of the upper link about the shaft **142** (see FIG. **4**). Therefore, the post **138** is moved in a direction as indicated by the arrows **162** which parallels the motion of the control stick. Referring to FIG. **1**, this movement would result in a banking movement of the airplane about the axis **22**.

In summary, movement of the control stick about the axis **68** causes the airplane to move about the axis **22**, while movement of the control stick about the axis **58** causes the airplane to rotate about the axis **18**. Of course, other movements of the control stick (at an angle to both the axes **58** and **68**) causes a corresponding movement of the airplane about both of the axes **18** and **22** in a responsive fashion.

The material of the simulator-display stand may be of any suitable synthetic resin such as polypropylene and polystyrene. For example, the control stick **14**, the lower link **32**, the rods **36** and **38** and the upper link **40** may be of polypropylene, while the cap **30**, the housing **74** and the pivot mount **34** may be made of polystyrene. Each of the parts may be easily and economically molded and assembled so as to readily mass market the apparatus.

It is, of course, understood that when the airplane is not being manipulated, the housing serves as a handsome display stand for the airplane.

We claim:

1. A toy flight simulator for a toy vehicle comprising:

a support stand;

controlling means connected to said support stand for controlling a toy vehicle, and

transmitting means connected to said support stand and to said controlling means for transmitting motion from said controlling means to said toy vehicle, for causing said vehicle to pitch and bank, said transmitting means including less than six links.

2. An apparatus as claimed in claim **1**, wherein said toy vehicle is connected to one of said links, said one link having four integral hinges, two of said hinges being mutually parallel and the other two hinges being perpendicular to said first mentioned two hinges.

3. A toy flight simulator as claimed in claim **1** wherein said links comprise:

a pivotable mounting link connected to said support stand for allowing rotation about two mutually perpendicular axes;

a first articulate link mounted to said pivotable mounting link and connected to said controlling means, said first link having three integral hinges;

two motion transmitters connected to said first link; and

a second articulate link having four integral hinges, a portion for connecting to said toy vehicle and a portion for pivotably connecting to said support stand whereby said toy vehicle can be moved and controlled by said controlling means.

4. A toy flight simulator as claimed in claim **3**, wherein:

two of said hinges of said first articulate link and two of said hinges of said second articulate link move when pivoted toy vehicle is povoted about a first axis; and

the third hinge of said first articulate link and the two other hinges of said other articulate link move when said toy flight vehicle is pivoted about a second axis, said second axis being perpendicularly disposed relative said first axis.

5. A toy flight simulator as claimed in claim **4** wherein:

said first articulate link includes a portion for mounting to said pivotable mounting link and another portion having a hinged tab which tab includes the other two hinges of said first link whereby said tab is divided into three regions by said other two hinges;

said second articulate link portion for connecting to said toy vehicle is positioned between two mutually parallel hinges, said portion for pivotally connecting to said support stand is positioned opposite one of the hinges, a tab being positioned opposite the other of said hinges, said tab including the other two hinges which are mutually parallel to each other and perpendicular to said first mentioned parallel hinges, said other two hinges dividing said tab into three regions; and

one motion transmitter is connected at one end to a first region of said first link tab and at the other end to a first region of said second link tab, and the other motion transmitter is connected at one end to a third region of said first link tab and at the other end to a third region of said second link tab.

6. A toy flight simulator for a toy vehicle comprising:

a support stand;

a control means for directing the attitude of the toy vehicle; and

a linkage for transmitting movement of the control means and for moving the toy vehicle in response thereto, said linkage consisting of five links, two of said links having a plurality of integral hinges, the other three of said links being relatively rigid.

7. A toy flight simulator as claimed in claim **6** wherein one of the links of said linkage transmitts motion from said control means about each of two mutually perpendicular axes.

8. A toy flight simulator as claimed in claim **6** wherein said linkage includes two relatively rigid links communicating the motion between tow other links each of said two other links having a plurality of integral hinges.

9. A toy flight simulator as claimed in claim **8** wherein one of said other links having integral hinges transmitts motion about two mutually perpendicular axes.

10. A toy flight simulator as claimed in claim **9** wherein said one link includes four integral hinges.

11. A toy flight simulator as claimed in claim **10** wherein said four integral hinges are divided into tow sets of parallel hinges, each set mutually perpendicular to the other set.

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