June 16, 1964 N. H. STENSAGER 3,137,500

AVIATION TYPE AMUSEMENT DEVICE

Filed June 27, 1960 2 Sheets-Sheet 1

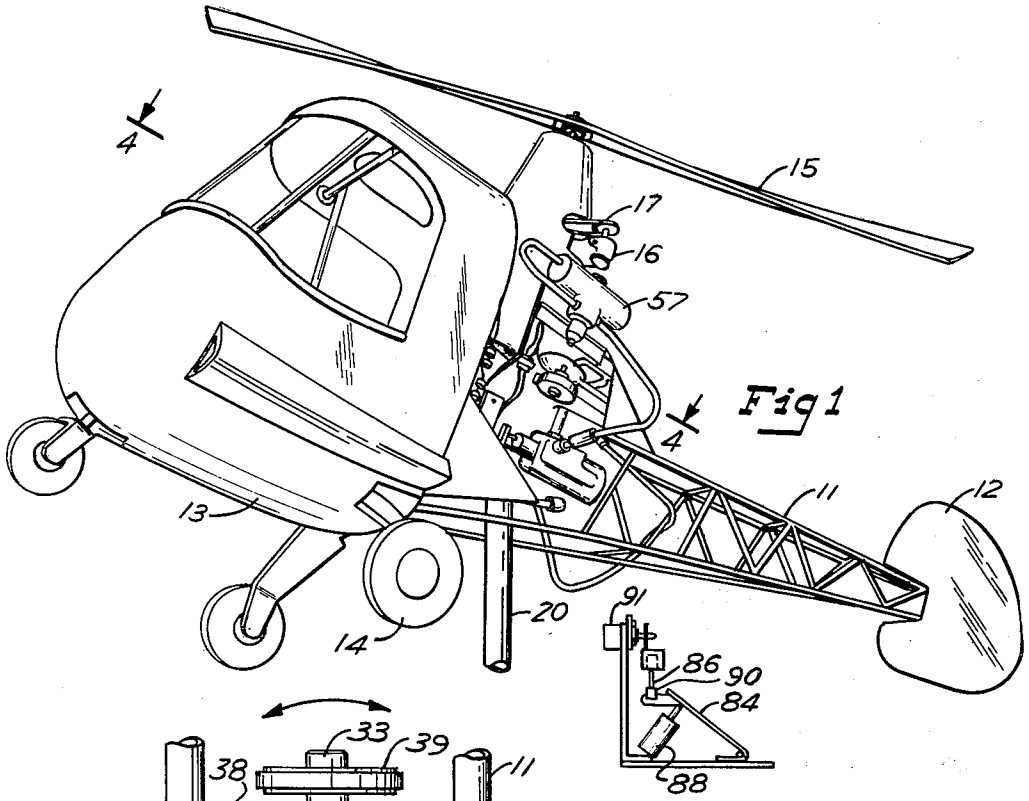

Fig 1

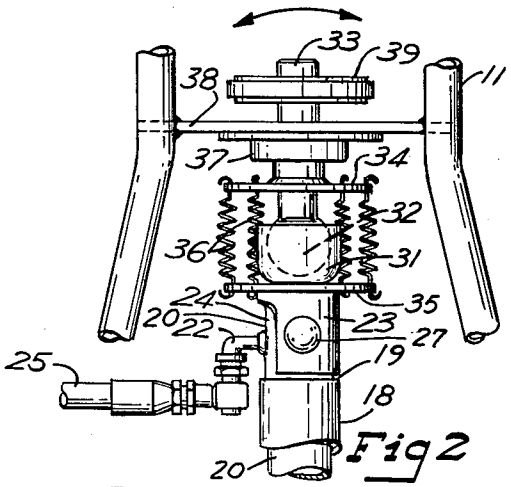

Fig 2

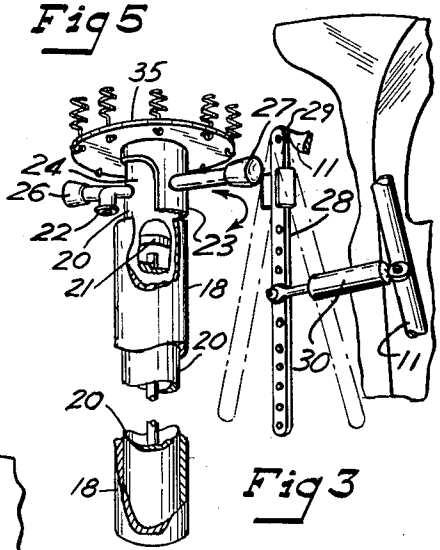

Fig 3

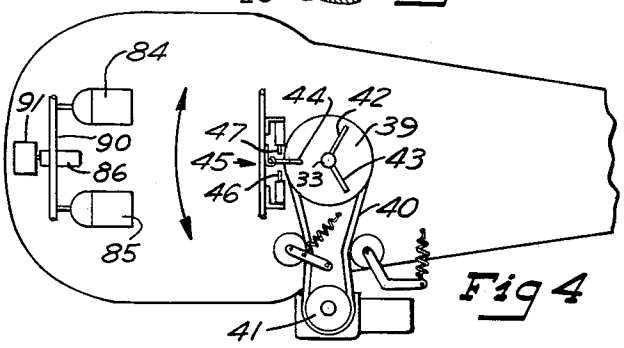

Fig 4

Fig 5

INVENTOR.
NORMAN H. STENSAGER

BY Everett J. Schroeder

ATTORNEY

June 16, 1964 N. H. STENSAGER 3,137,500

AVIATION TYPE AMUSEMENT DEVICE

Filed June 27, 1960 2 Sheets-Sheet 2

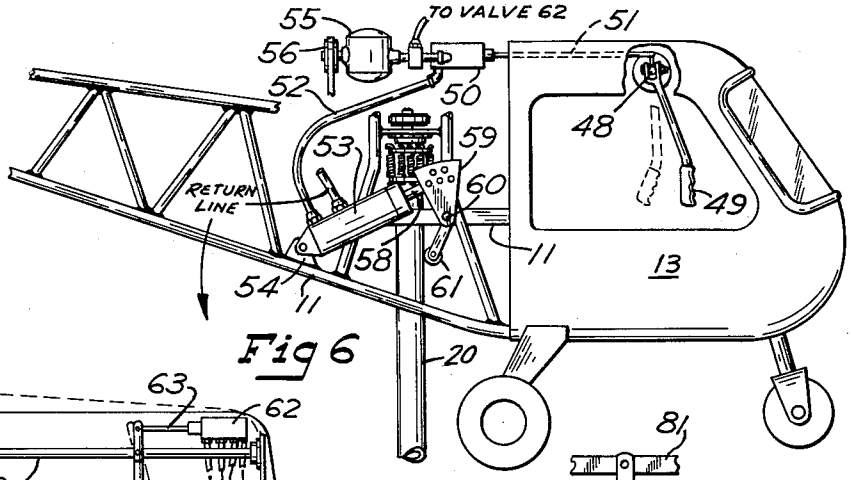

Fig 6

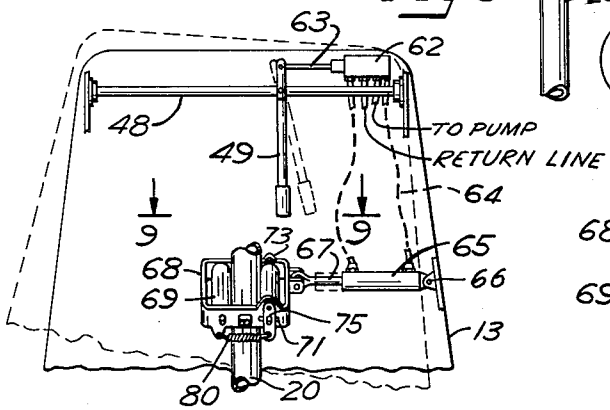

Fig 7

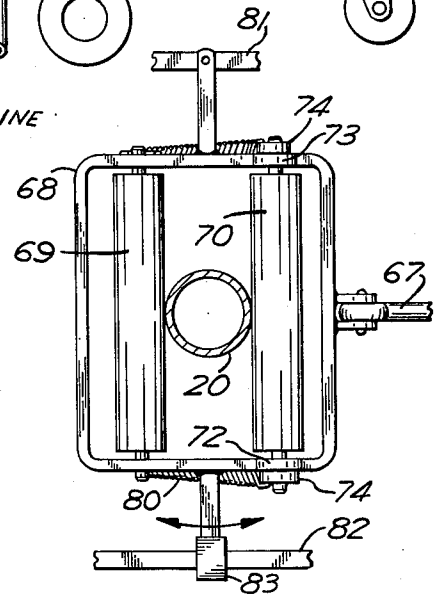

Fig 9

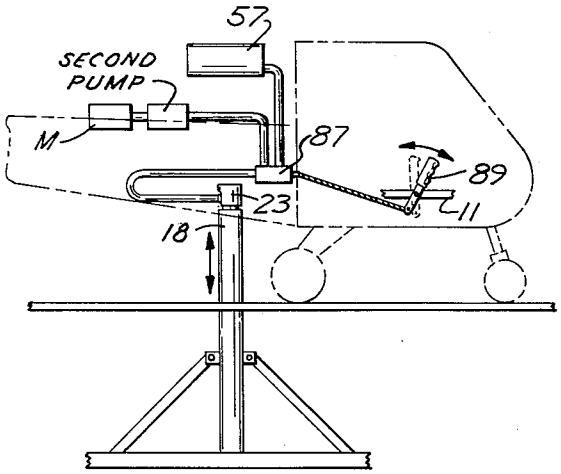

Fig 8

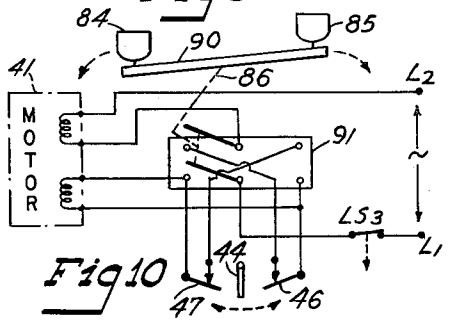

Fig 10

INVENTOR.
NORMAN H. STENSAGER
BY
Everett J. Schroeder
ATTORNEY

United States Patent Office 3,137,500 Patented June 16, 1964

3,137,500

AVIATION TYPE AMUSEMENT DEVICE

Norman H. Stensager, Minneapolis, Minn., assignor to Norstan Research & Development Company, Minneapolis, Minn., a corporation of Minnesota

Filed June 27, 1960, Ser. No. 38,980
3 Claims. (Cl. 272—1)

This invention relates to amusement devices. More particularly it relates to amusement devices of the type constructed and designed to simulate the movements of flying machines and particularly helicopters.

It is a general object of my invention to provide a novel and improved amusement device of aviation type which is safe, simple and relatively inexpensive to construct and operate.

A more specific object is to provide a novel and improved amusement device adapted to simulate the movements of flying machines such as helicopters which can be manufactured relatively inexpensively and simply as compared to such devices heretofore known and capable of being operated safely, simply and at a minimum of expense.

Another object is to provide a novel and improved amusement device adapted to simulate the movements of flying machines such as helicopters in almost complete detail and reality and with safety, low initial cost of construction, and simple and inexpensive maintenance.

Another object is to provide a novel and improved amusement device adapted to simulate the movements of flying machines such as helicopters which can be operated simply and safely by children, can be quickly and easily repaired, and can be constructed through the use of many standard and readily available parts.

Another object is to provide a novel and improved amusement device of the aviation type adapted to simulate movements of flying devices such as helicopters which is highly attractive in appearance and operation to children, can be operated as a helicopter in almost all details, and is yet very safe and inexpensive in construction, operation and maintenance.

These and other objects and advantages of this invention will more fully appear from the following description, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a perspective view of an embodiment of my invention taken from the left hand side;

FIG. 2 is a fragmentary vertical sectional view of the ball and socket arrangement which supports the helicopter simulating device on the elevating mechanism;

FIG. 3 is a fragmentary perspective view of the upper portion of the cylinder and the shock absorbing mechanism utilized to alleviate jarring when the turning of the device is arrested;

FIG. 4 is a diagrammatic view taken approximately along 4—4 of FIG. 1 and illustrating the turning mechanism and limit switches associated therewith as well as the control pedals within the cabin;

FIG. 5 is a fragmentary side elevational view of one of the control pedals, on an enlarged scale, showing the dampening cylinder and piston positioned beneath the pedal;

FIG. 6 is a diagrammatic view of the tilting mechanism and hydraulic arrangement associated therewith of the device shown in FIG. 1;

FIG. 7 is a diagrammatic view of the banking mechanism and the hydraulic arrangement associated therewith of the device shown in FIG. 1;

FIG. 8 is a diagrammatic view of the lift mechanism and the hydraulic arrangement associated therewith of the device shown in FIGS. 1 and 3;

FIG. 9 is a horizontal sectional view taken along approximately line 9—9 of FIG. 7 and showing the details of the banking mechanism; and

FIG. 10 is a diagrammatic view of the electric wiring arrangement utilized in connection with the turning mechanism.

An embodiment of my invention as shown and illustrated in FIGS. 1–10 inclusive, includes a frame 11 constructed to resemble a helicopter in appearance and having a tail 12, a cabin 13, wheels 14 and a main rotor 15. This main rotor 15 is driven by an electric motor 16 and belt and pulley arrangement 17.

The means for elevating frame 11 is supported in an upstanding tubular support or casing 18 having a closed lower end which is suitably secured to the ground to make the same rigid as by sinking the lower end in concrete and which has an upper open end 19. This tubular support 18 is preferably made of metal and has a cylinder 20 with a closed upper end mounted therein in close fitting sliding relation so that the cylinder 20 may rise upwardly and downwardly within the bore of the support 18. Slidably mounted within the cylinder 20 is a conventional piston 21, the lower end of a rod of which bears against the closed lower end of the said tubular member 18 and serves to elevate the cylinder 20 when hydraulic fluid is introduced above the upper end of the piston through the inlet port 22. The inverted cylinder 20, as best shown in FIGS. 2 and 3 extends above the upper end of the tubular support 18.

Fitted over the upper end of the inverted cylinder 20 is a tubular cap member 23 which has a slot 24 formed therein to accommodate the inlet port 22 as is also best shown in FIGS. 2 and 3. The inlet port 22 is provided with hydraulic fluid through a flexible hydraulic line 25 which is connected to a source of hydraulic fluid under pressure as will be hereinafter set forth. Secured to the exterior of the cap member 23 is a pair of differently directed lugs 26 and 27. These lugs 26 and 27 engage a lever 28 which is pivotally mounted upon the frame as at 29 to permit the same to swing to either side of the frame.

Pivotally connected to the lever 28 in one of the openings provided therefor at a point below the point 29 is a hydraulic type shock absorber 30 which has its opposite end pivotally connected to the frame 11 as best shown in FIG. 3. The hydraulic shock absorber 30 serves to smoothly arrest the turning motion of the device with respect to casing 18 and cylinder 20 after the current has been cut off from the turning motor which drives the machine, thereby eliminating jarring, etc.

Secured, as by welding, to the upper surface of the cap member 23 is a socket element 31 having a ball element 32 received therein and together forming a ball and socket joint. The ball member 32 is disposed at the lower end of shaft 33 which extends upwardly therefrom and carries a vertically spaced disc 34 therearound. The disc 34 is connected resiliently to the disc 35 which forms the upper end of the cap member 23 by means of a plurality of coiled springs 36. These springs are preferably oriented in non-vertical position so as to connect the discs 34 and 35 at circumferentially spaced points, thereby enabling the springs 36 to more effectively prevent relative rotation between the discs 34 and 35 and the ball 32 relative to the socket 31. The springs are preferably also oriented in different directions so that some of them will retard relative rotation in one direction while the other will retard relative rotation in the other direction.

The frame 11 is mounted on the shaft 33 for free rotation thereabouts by means of a tapered bearing 37 and a plate member 38. The plate 38 serves to support

the frame on the bearing 37. A turning sheave 39 is fixedly secured to the shaft 33 to prevent relative rotation therebetween and this sheave is driven by a belt 40 which in turn is driven by an electric motor 41. This arrangement can best be seen in the diagrammatic view shown in FIG. 4. The motor 41 is a universal A.C.-D.C. motor of the instant reversing gear head type. It is a standard series wound A.C.-D.C. type 115 volt reversing motor having the same torque in either direction. This motor 41 is fixed to the frame 11 at a point disposed laterally of the shaft 33.

Secured to the upper surface of the sheave 39 is a pair of vanes 42 and 43 which extend upwardly from the upper surface of the sheave. A vane 44 is disposed in such a position as to be engaged by the vanes 42 and 43 when the frame 11 and the vane 44 turns relative to the shaft 33 and the vanes 42 and 43. The vane 44 actuates one of a pair of limit switches of the single pole, single throw type or normally closed limit switches indicated generally by the numeral 45. As best shown in FIG. 4, these switches include a pair of circuit interrupting elements 46 and 47 disposed at opposite sides of the vane 44 in such a position that one of them will be engaged when the vane 44 is swung in one direction to break the circuit to the motor 41. The other of said elements is engaged when the vane 44 is swung in the opposite direction to break the circuit to the same motor. The operation of these switches is best illustrated in FIG. 10 and is further set out in more detail in the description thereof.

Within the cabin 13 there is a transversely extending shaft 48 upon which a stick 49 is pivotally mounted about an axis transverse to the shaft 48. Thus the stick 49 can be swung to either the right or left of the frame 11, as shown in FIG. 7, or can be moved forwardly or rearwardly to rotate the shaft 48 about its longitudinal axis as can be seen by reference to FIG. 6. When the stick 49 is moved forwardly or rearwardly to rotate the shaft 48, a control valve 50 is operated by linkage 51 to control the flow of fluid through the fluid line 52 to a hydraulic cylinder 53 which is pivotally mounted at 54 upon the frame 11. The hydraulic fluid under pressure is supplied by the pump 55 which is driven by pulley 56 and an electric motor M which is mounted on the frame 11. The supply of hydraulic fluid is taken from the tank 57 illustrated in FIG. 1 in the standard manner.

The piston rod 58 of the cylinder 53 is connected to a bell crank 59 which is pivotally mounted at 60 upon the frame 11. The bell crank 59 carries a roller member 61 at its lower end which bears against the exterior of the cylinder 20. This roller member 61 utilizes the cylinder 20 as a thrust bearing surface to tilt the frame 11 forwardly and backwardly in accordance with the introducion and withdrawal of hydraulic fluid from the cylinder 53, for as the roller 61 is pressed against the cylinder 20 by extension of the piston 58 from the cylinder 53, the forward end of the frame 11 will be elevated. The weight of the load of passengers within the cabin 13 is sufficient to cause the forward end of the cabin to remain at the lowest possible elevation permitted by the roller 61.

When the stick 49 is swung to either the left or right as viewed in FIG. 7, it operates a hydraulic fluid control valve 62 by means of linkage 63 connected to the upper end of the stick as best shown in FIG. 7. The hydraulic fluid passes through a fluid line 64 to a cylinder 65 and a double acting piston secured to a piston rod 67 which cylinder 65 is pivotally mounted at one end as at 66 upon the frame 11 at a point disposed laterally of the longitudinal axis of the cylinder.

The piston rod 67 of the cylinder 65 is pivotally connected to the forward end of a rectangular frame 68 best shown in FIG. 9. It will be noted that the piston 67 when extended urges the frame 11 laterally relative to the frame 68 which extends longitudinally of the frame 11.

The rectangular frame 68 has a roller 69 positioned at

one side of the lift cylinder 20. This roller 69 is pivotally mounted for rotation in a fixed position relative to the frame 68. A second roller 70 is mounted on the frame 68 at the opposite side of the lift cylinder 20 and at the same elevation. This roller 70 however, is mounted for sliding movement toward and away from the cylinder 20 in slots 71 formed in the frame at opposite ends of the roller and, of course, is also capable of rotating about its longitudinal axis. A pair of upstanding lugs 72 and 73 are secured to opposite ends of the rectangular frame adjacent the ends of the roller 70 and the slots 71. To the upper end of each of the lugs 72 and 73 is pivotally secured a depending lever such as 74 which has an opening 75 therein through which the opposite ends of the roller 70 extend as best shown in FIG. 9. Springs, such as the spring 80, urge each of the levers 74 to the left as viewed in FIG. 7 to cause the roller 70 to be constantly urged against the cylinder 20.

The rectangular frame 68 is pivotally mounted at one of its ends to a cross bar 81 on the frame 11 as best shown in FIG. 9 and its opposite end is slidably mounted on a similar cross bar 82 by means of a relatively wide U-shaped yoke 83 so that the forward end of the rectangular frame 68 to which the piston rod 67 is connected is free to slide longitudinally of the cross member 82. As a result, the piston 67 when extended from the cylinder 65 will cause the frame 11 to elevate at the right hand side as viewed in FIG. 7 and upon retraction will cause the frame 11 to elevate at the left hand side as viewed in FIG. 7.

FIGS. 4 and 5 illustratively show a pair of rudder pedals 84 and 85 interconnected by a bar 90 including an arm 86 and when either pedal is depressed a standard reversing switch 91 of the two pole double throw off center position type connected to arm 86 is actuated, and since switch 91 is disposed within the electric circuit leading to motor 41 the frame is caused to turn about the shaft 33. Activation of motor 41 causes it to attempt to turn sheave 39 but since disc 34 is held against turning by the springs, the frame 11 will instead rotate about the shaft 33 in a direction opposite to that in which the motor 41 is attempting to turn. A cylinder and dampening piston 88 serves to prevent damage to the motor 41 by preventing sudden reversing of rotation of the motor.

Referring to FIG. 10, motor 41 has its field windings connected to reversing switch 91 and to limit switch interrupting elements 46 and 47. Alternating voltage is applied to the circuit to energize the field windings of motor 41 and cause it to rotate in a given direction, the direction being determined by depressing rudder pedal 84 to cause rotation in a first direction and by depressing rudder pedal 85 to cause rotation in a second direction. Once the limit of rotation has been reached, the appropriate interrupting element is actuated by vane 44 to open the circuit and motor 41 is de-energized so that it can no longer rotate to move frame 11. However, the other interrupting element is still in a closed state so that when the opposite rudder pedal is depressed, the reversing switch 91 is thrown to the other of its two positions to move the frame in a second direction and close the interrupting element which was formerly open. A safety switch LS3 is provided to insure that the turning motor 41 is not energized until wheels 14 have left their supporting surface and this may be accomplished in several ways well known to those skilled in the art.

The flow of hydraulic fluid into the cylinder 20 and above the upper end of the piston 21 is controlled by a control valve 87 which in turn is controlled by a control lever 89 positioned within the cabin 13. Manipulation of this lever 89 will cause the frame 11 to be elevated or lowered as desired in a manner readily understood by all persons familiar with hydraulic systems.

In operation, the turning movement of the frame 11 may be varied as desired by manipulation of the pedals 84 and 85. Simultaneously, the device may be caused

to bank to either the right or left by manipulating the stick **49** to the right or to the left as shown in FIG. 7. The attitude of the frame **11** can be varied by moving the stick **49** forwardly or rearwardly as desired and thereby causing the forward end of the frame to be either elevated by the roller **61** or lowered by the weight of the load. The raising and lowering movement of the frame can be controlled by manipulation of the lever **89**. It will be readily understood that when the roller **61** is caused to press against the cylinder **20**, the forward end of the frame **11** will be elevated. It will also be readily understood that when the piston **67** is extended from the cylinder **65**, the frame **11** will rock relative to the cylinder **20** so that the right hand side thereof will be elevated. The rocking motion is accomplished in the ball and socket joint comprised of the socket **31** and the ball **32**. Similarly, when the piston **67** is retracted, the frame **11** will rock or bank to the right with its left side elevated.

From the above, it can be readily seen that I have provided an amusement device which similates the movements of a helicopter very closely and can be operated by adults and children alike in a very simple and effective manner. This device is completely safe for utilization by youngsters and gives them the thrills which they would experience in the actual operation of a helicopter. This machine can be constructed relatively inexpensively in view of the fact that standard parts such as oil tanks, hosing, fittings, motors, pumps, valves, flow controls, and other parts may be utilized. In addition, the ball and socket arrangement which supports the frame **11** provides a maximum of freedom of movement of the frame which has not heretofore been possible in devices of this type.

It will be noted that the cylinder **20** has a closed upper end and moves in close-fitting sliding relation within the tubular support **18**. This unique arrangement provides much greater strength and permits the cylinder and pistons **20** and **21**, respectively, to be constructed of relatively light material while still providing the necessary rigidity and support. It will also be noted that the rollers **61** and the rollers **69** and **70** bear directly against the cylinder **20** to accomplish all of the banking and tilting of the frame **11** in simulating the movements of the helicopter.

It will also be noted that one of the advantages of the construction shown in FIGS. 1–10 is that the hydraulic actuating system in its entirety moves upwardly and downwardly with the movement-simulating apparatus so that there is no need for a hydraulic line to extend from the ground upwardly to the device to complicate the movement simulating actions.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of this invention which consists of the matter shown and described herein and set forth in the appended claims.

What is claimed is:

1. An amusement device comprising an upright rigid tubular support having an open upper end and a closed lower end, an upright cylinder having a closed upper end slidably mounted in close-fitting relation within the bore of said tubular support, a piston slidably received within said cylinder and having an end of a piston rod bearing against the closed lower end of said support, means for controllably introducing hydraulic fluid into said cylinder between the said piston and the closed upper end of said cylinder to cause the latter to extend from said cylinder and thereby thrust said piston upwardly within said support, hydraulically actuated flying-machine-simulating apparatus movably connected to the upper end of said cylinder and supported and moved upwardly and downwardly by said cylinder as hydraulic fluid is introduced and withdrawn from between the upper end of said cylinder and said piston, and hydraulically actuated control means bearing against the exterior walls of said cylinder and connected to said apparatus in movement controlling relation.

2. The structure defined in claim 1 wherein said hydraulically actuated control means bears against the exterior walls of said cylinder to utilize the same as a thrust-bearing surface, said control means including at least one roller member bearing against said cylinder and applying the thrust thereagainst.

3. An amusement device comprising, an upright tubular support having an open upper end and a closed lower end, a cylinder member having a closed upper end supported in upright position within said tubular support, a piston member slidably mounted within said cylinder member and having an end of a piston rod bearing against the said closed lower end of said tubular support, means for controllably introducing hydraulic fluid into said cylinder member between said piston member and the closed upper end of said cylinder to cause the latter to extend from said tubular support, flying-machine-simulating apparatus tiltably connected to and upper end of said cylinder member and supported and elevated thereby when said cylinder member is extended from said piston member, and movement control means connected to said apparatus in movement controlling relation, said control means including a first hydraulically actuated roller engaging the exterior of said cylindrical member and connected to said apparatus at a point laterally of said member to produce tilt in said apparatus, and said control means also including a pair of thrust-applying roller elements disposed at opposite sides of said cylindrical member and connected to said apparatus at said point disposed laterally of said member for causing said apparatus to bank.

References Cited in the file of this patent

UNITED STATES PATENTS

368,652	Class	Aug. 23, 1887
791,046	Praul	May 30, 1905
2,063,231	Custer	Dec. 8, 1936
2,524,238	Soule	Oct. 3, 1950
2,636,348	Murry	Apr. 28, 1953
2,695,783	Serafin	Nov. 30, 1954