Oct. 28, 1969 L. F. MEDITZ 3,474,987

HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 1

Fig. 1.

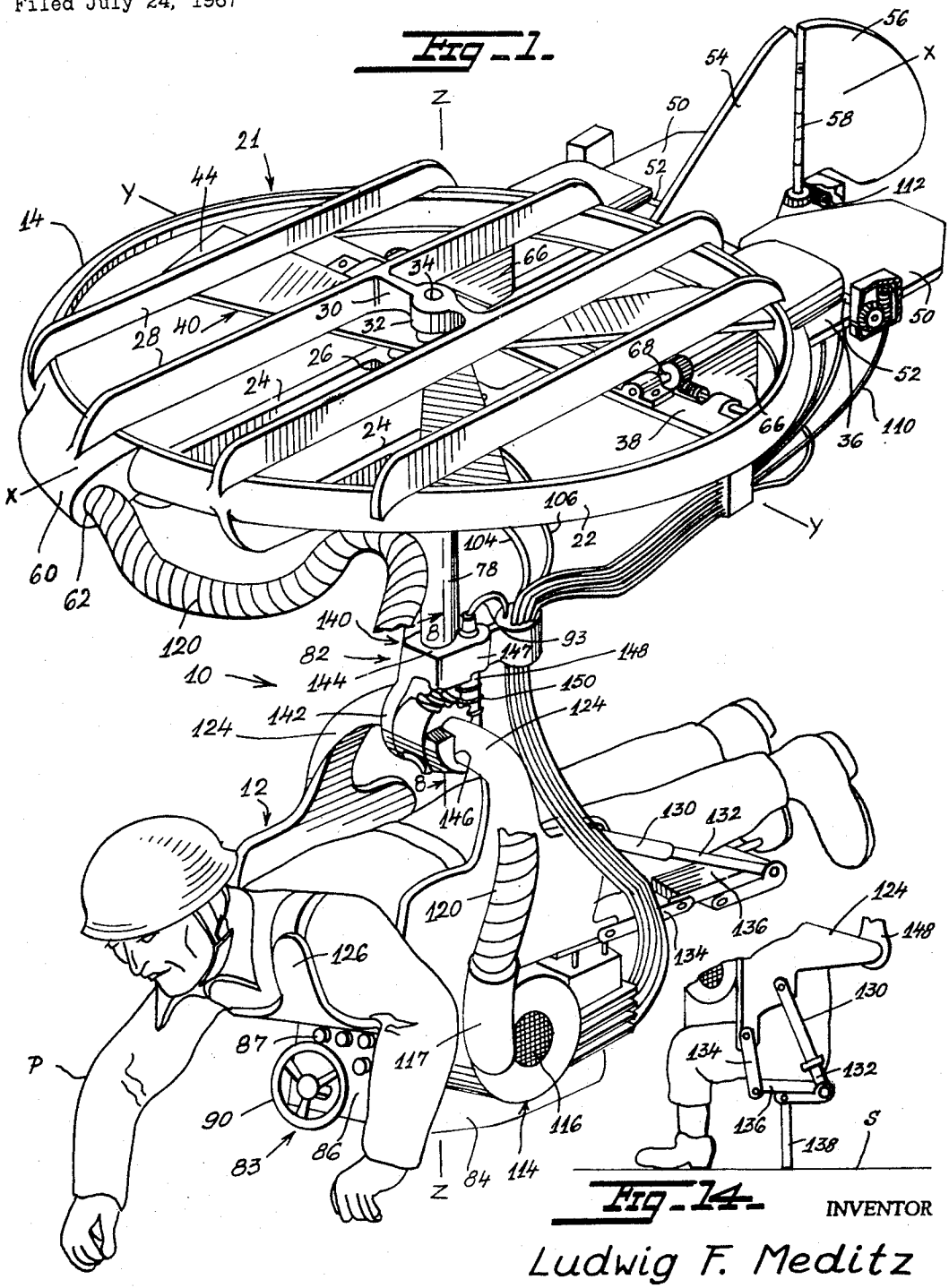

Fig. 14.

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Oct. 28, 1969 L. F. MEDITZ 3,474,987

HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 2

Fig. 2.

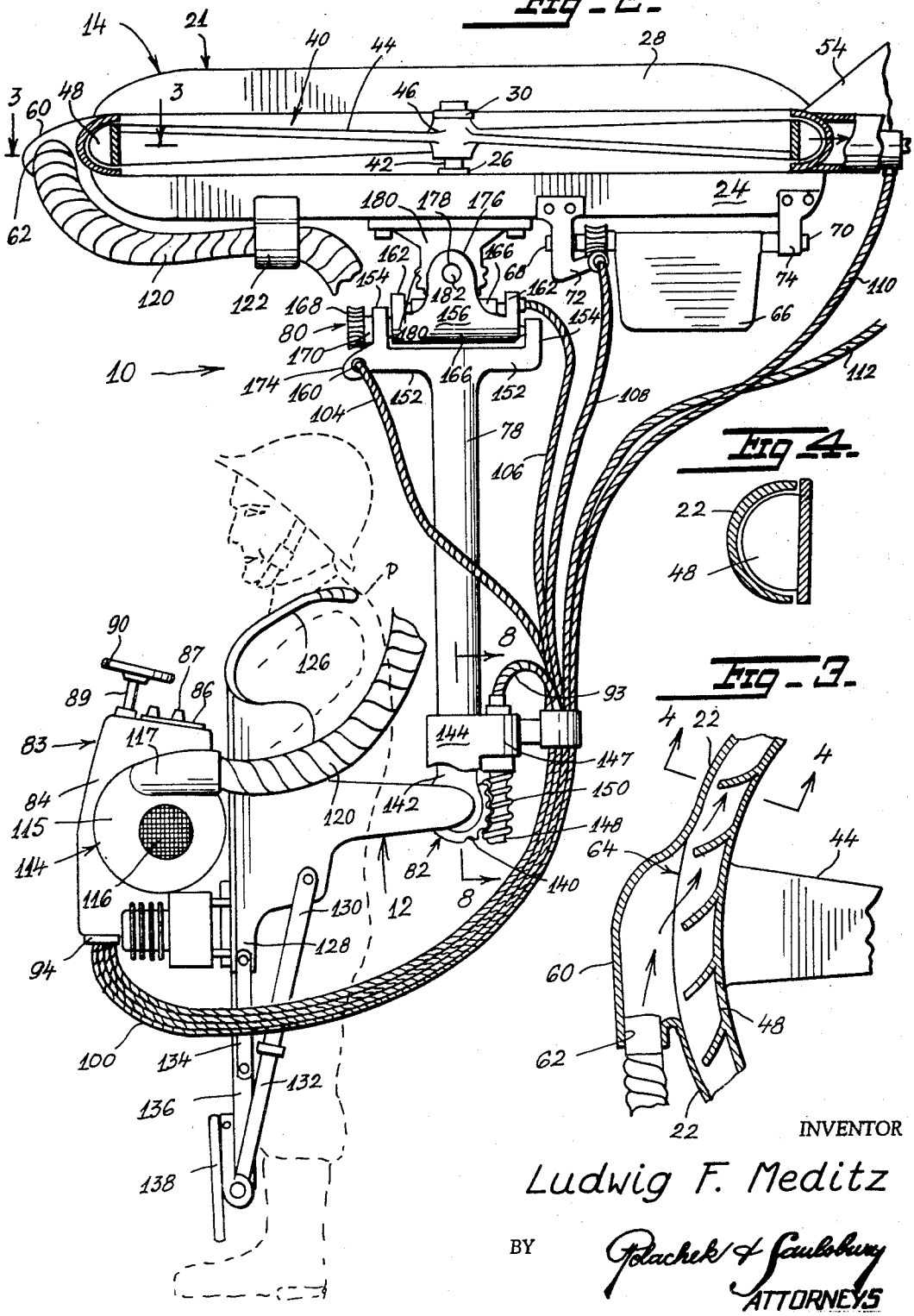

Fig. 4.

Fig. 3.

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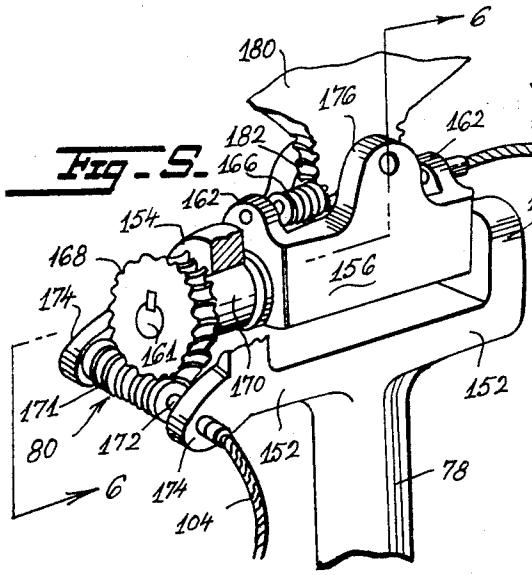
HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 3

Fig - 5.



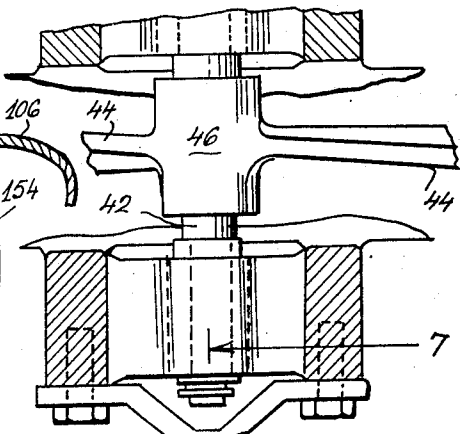


Fig - 6.

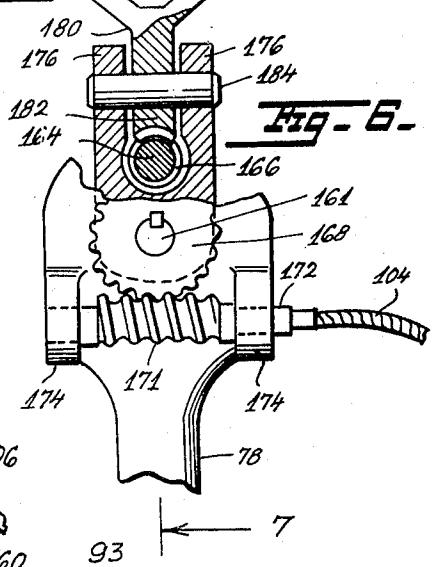


Fig - 7.

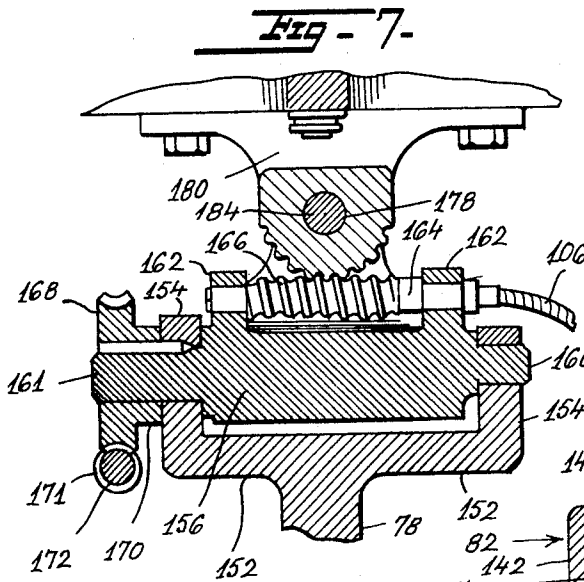
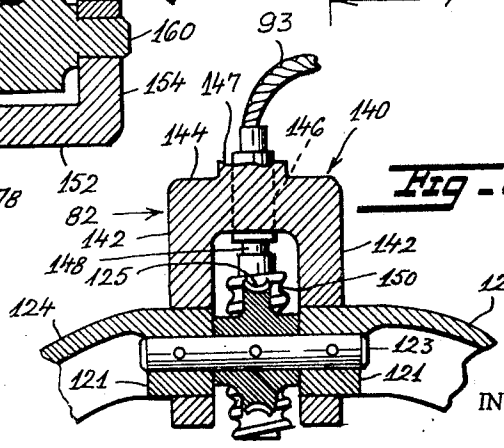


Fig - 8.



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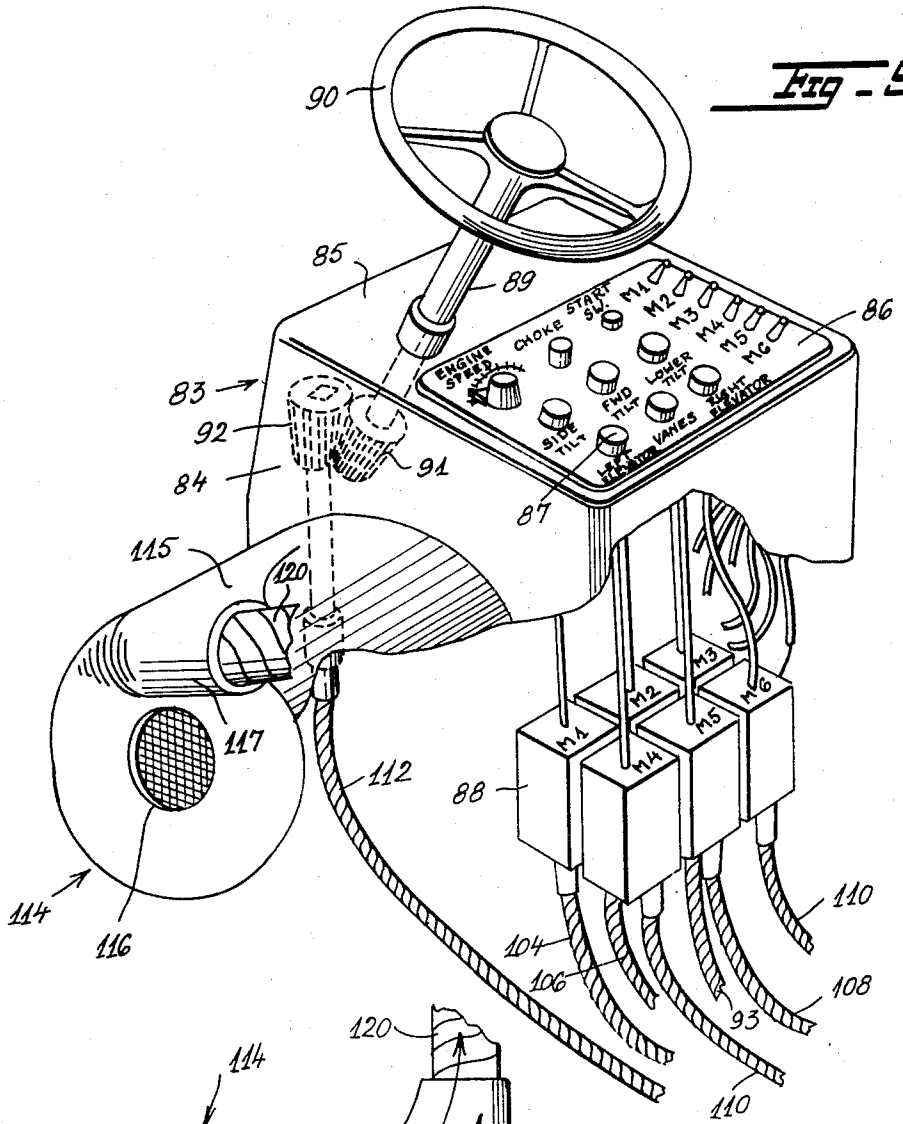
Oct. 28, 1969 L. F. MEDITZ 3,474,987

HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 4

Fig - 9.



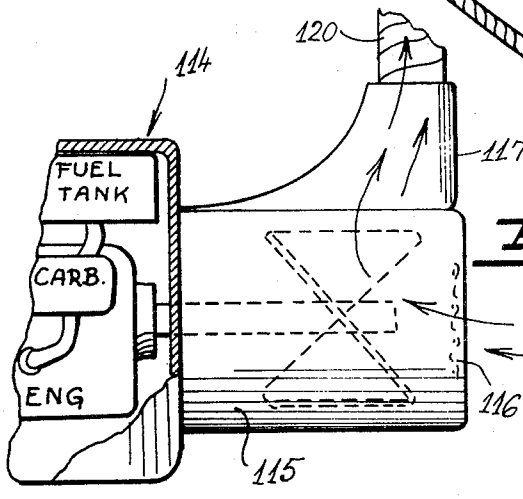


Fig - 10.

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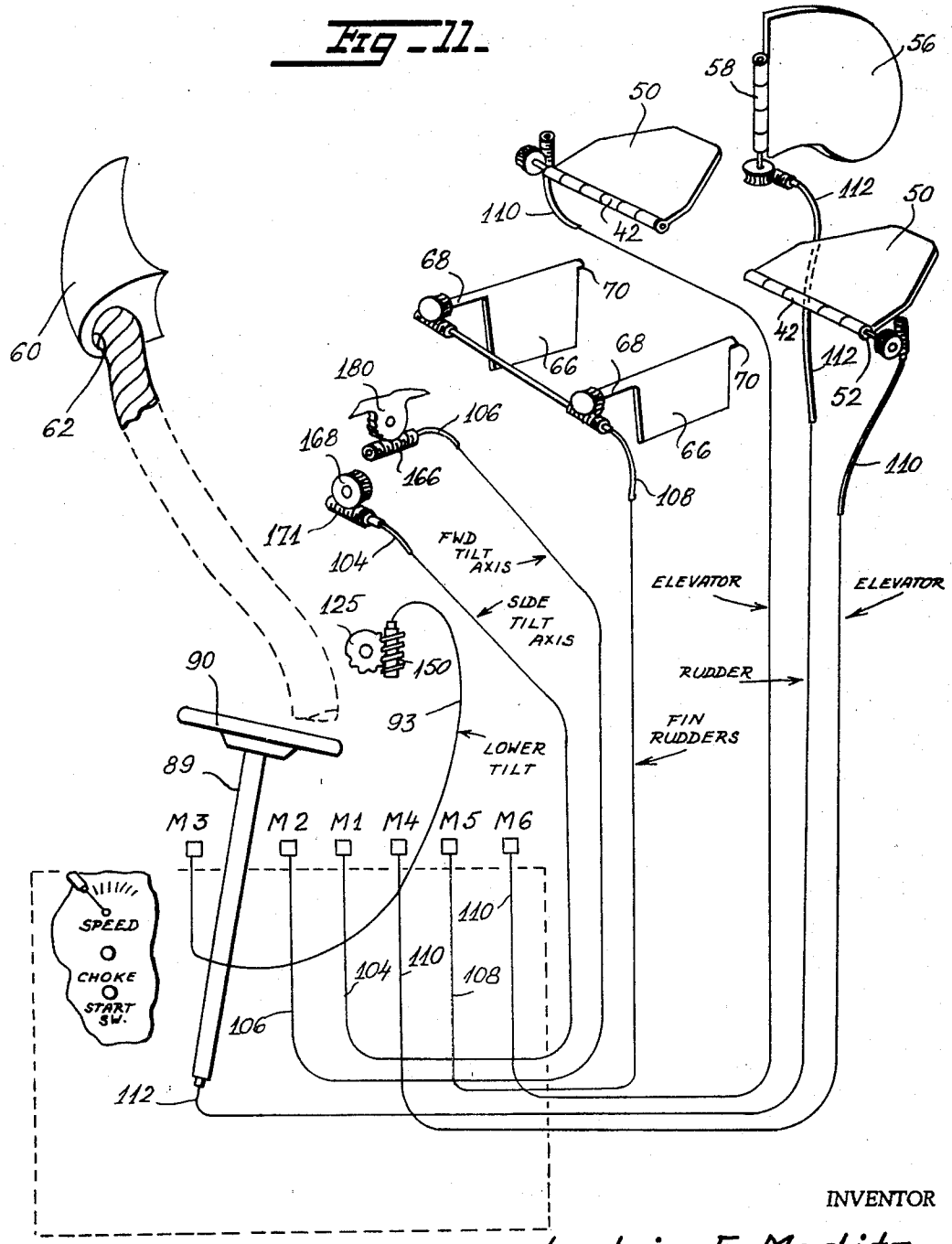
Oct. 28, 1969 L. F. MEDITZ 3,474,987

HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 5

Fig. 11.



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HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 6

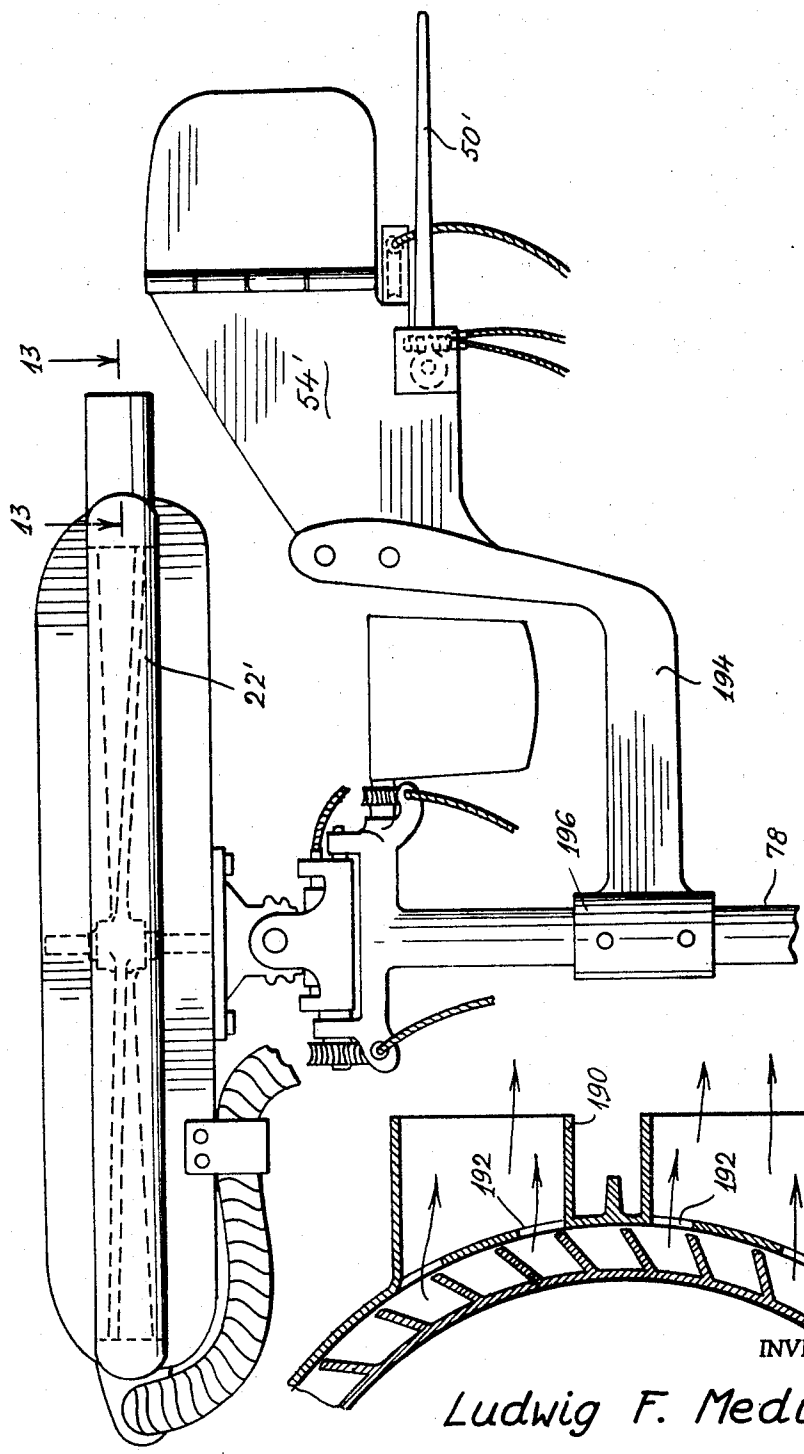

Fig - 12.

Fig - 13.

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Oct. 28, 1969 L. F. MEDITZ 3,474,987

HELICOPTER DEVICE

Filed July 24, 1967 7 Sheets-Sheet 7

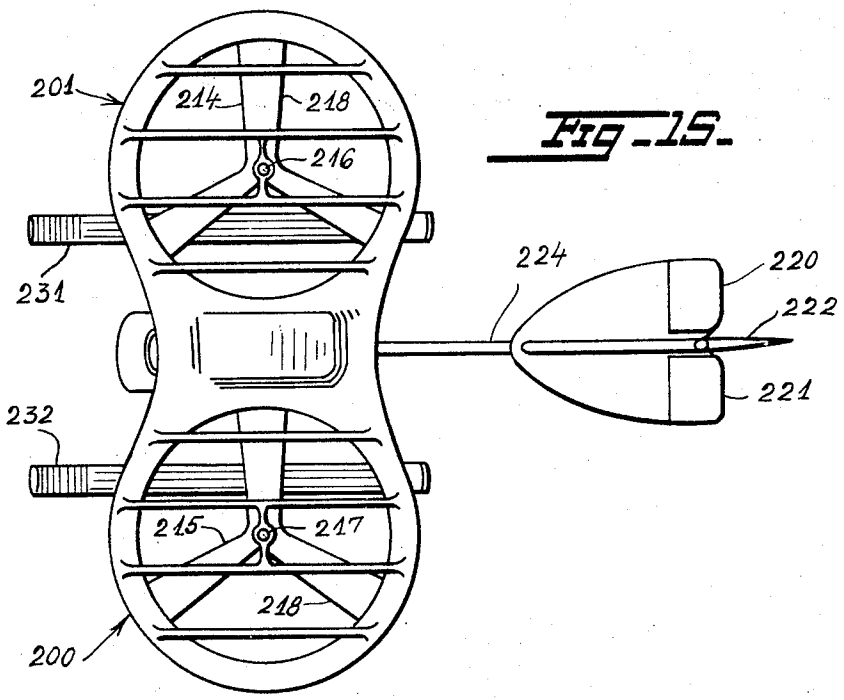

Fig - 15 -

Fig - 16 -

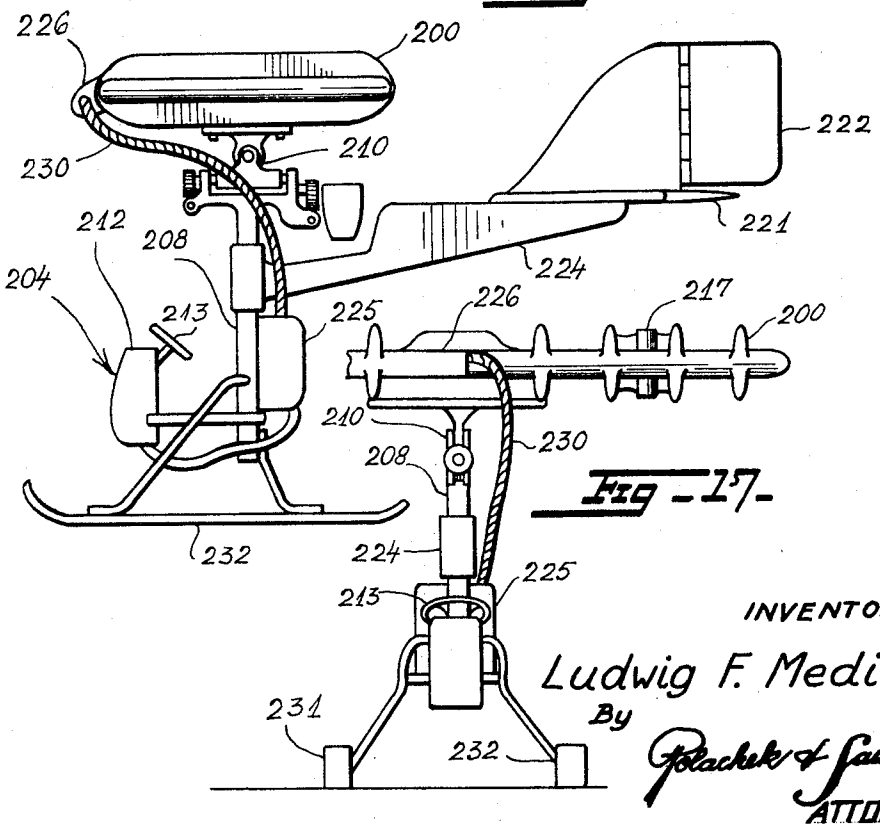

Fig - 17 -

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United States Patent Office 3,474,987
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3,474,987

HELICOPTER DEVICE

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Int. Cl. B64c 27/00
U.S. Cl. 244—4 6 Claims

ABSTRACT OF THE DISCLOSURE

A helicopter device of the harness or platform type for transporting a single person through the air, having a supporting structure to carry a single person, connected to a second structure having a power unit with controls to direct movement of the person vertically and forward as desired. Interposed between the supporting structures is a universal type arrangement which permits the rotation of the person in either a vertical or a prone position. The device includes control of both the movement of the person in the two positions and in addition the control of the operation of the power unit and control system to guide the device through the air.

This invention relates generally to V/STOL aircraft and more particularly to helicopter devices of the harness or platform type for transporting a single person through the air.

Description of the prior art

Present day devices of this type include complicated arrangements for directional control and for control of lift or vertical thrust. These arrangements make the helicopter devices heavy and prone to malfunction.

Summary of the invention

An object of this invention is to provide a helicopter device of the harness of platform type which is light, rugged and has simple means for controlling direction and lift.

Another object of this invention is to provide a personal type helicopter in which the lift can be varied without adjusting the engine setting or propeller control.

And another object of this invention is to provide control means in the aforementioned device capable of directional control.

Yet another object is to provide an improved aircraft of the helicopter type having a fan unit for hovering, vertical landing and vertical take-off, and intermediate and vertical positions for forward flight and directional control.

Still another object is to provide a ducted fan unit in a helicopter that is adapted to be driven by the exhaust or a jet engine directed against the periphery of the fan.

A further object of the invention is to provide novel universal means for mounting the fan unit for pivotable adjustment relative to the occupant pilot of the aircraft.

For further comprehension of the invention and of the objects and advantages theerof, reference will be had to the accompanying drawings forming a material part of this disclosure:

FIGURE 1 is a front perspective view of a device constructed according to a preferred embodiment of the invention;

FIG. 2 is a side elevational view of the device shown in FIG. 1;

FIG. 3 is a fragmentary sectional view of an element of the device of section 3—3 of FIG. 2;

FIG. 4 is a sectional view of the element of FIG. 3 taken substantially along line 4—4 of FIG. 3;

FIG. 5 is a detailed perspective view of the universal drive coupling utilized in the device;

FIG. 6 is an enlarged sectional view taken substantially along line 6—6 of FIG. 5;

FIG. 7 is a sectional view taken substantially along line 7—7 of FIG. 6;

FIG. 8 is a sectional view taken substantially along line 8—8 of FIGS. 1 and 2;

FIG. 9 is a perspective view showing a controlled dashboard of the device of FIG. 1;

FIG. 10 is a detailed fragmentary view of a portion of the controlled dashboard shown in FIG. 9;

FIG. 11 is a schematic perspective view of the control system of the device of FIG. 1;

FIG. 12 is a fragmentary side elevational view of the device constructed according to another embodiment of the invention;

FIG. 13 is a sectional view taken substantially along line 13—13 of FIG. 12;

FIG. 14 is a side elevational view of the pilot's seat in operative position;

FIG. 15 is a plan view of the device constructed according to still another embodiment of the invention;

FIG. 16 is a side elevational view of the device shown in FIG. 15;

FIG. 17 is a fragmentary front elevational view of the device in FIGS. 15 and 16.

Description of the preferred embodiments

An aircraft adapted to travel through the air having three axes, a longitudinal or roll axis X—X which extends fore and aft, a lateral or pitch axis Y—Y which extends from side to side, and a vertical or yaw axis Z—Z.

Referring now in detail to the various views of the drawings, an aircraft or a helicopter **10** made in accordance with the invention includes a combined control housing, air pump and pilot supporting apparatus or cradle platform assembly **12** for supporting a pilot P and a structure **14** for supporting a fan assembly **21** having an annular band **22** of arcuate-shape in cross-section. A pair of spaced arms **24, 24** extend across the space between the body of the annular band **22** and are joined midway by a cross-piece **26**. Across the top of the band are spaced arms **28** integrally joined at their ends to the top edge of the band. A cross-piece **30** extends across the middle arms **28** and is formed with a hub portion **32** having a bearing opening **34** therein. At one side of the band, a flat piece **36** extends underneath the adjacent edge of the band **22** and is secured to the bottom edge thereof. A flat piece **38** extends across the periphery of the band **22** inwardly of the piece **36** and is secured at its ends to the bottom edge of the band.

A propeller fan **40** is rotatably mounted on a shaft **42** as best shown in FIG. 2, journalled in the aligned bearing holes in the crosspieces **26** and **30**. The fan **40** includes three blades **44** radially mounted on hub portion **46** which is rotatably mounted on the shaft **42**. The free ends of the blades **44** extend outwardly to the band **22**. Formed on the ends of the blades **44** there is annular vane **48** positioned inside the body of the band **22**. At one side of the band **22**, a pair of horizontally-disposed elevators **50, 50** are hingedly secured to the outer long edge of the flat piece **36** by means of hinges **52**. A vertically-disposed stabilizer **54** is secured to the cross piece **26** supporting a rudder **56** which is connected thereto by means of a hinge **58**.

At the opposite side of the band **22** an enlargement **60** is formed on the outer surface of the periphery thereof. The enlargement **60** is formed with a central passage **62** extending therethrough and communicating with the interior of the band **22**, as indicated at **64** as best shown in FIG. 3. A pair of pivoted louvres or vanes **66, 66** as best shown in FIGS. 2 and 11 is pivotally supported on

stub shafts **68, 70** between spaced brackets **72** and **74** respectively, and fastened to the bottom arms **24, 24** at the ends thereof adjacent the stabilizers **50, 50** on both sides of the fan assembly **21**.

The combined control housing air pump and pilot supporting apparatus or cradle platform assembly **12** forming a rigid unitary structure is suspended from the fan assembly **21** of the structure **14** by means of an upright post **78**, pivotally connected at its top end as viewed in FIG. 2, to the fan assembly **21** by a universal joint structure **80**, and swingably connected at its bottom end to the cradle platform assembly or unitary structure **12** by means of gearing **82**.

A control assembly **83** comprises a substantially rectangular shaped casing **84** closed at one end by an end wall **85** and supporting a closure plate **86** through which protrude knobs **87** as best shown in FIG. 9 for actuating reversible motors **88** in the casing **84** for driving the aircraft steering controls and tilt the fan assembly **21** as desired. A steering post **89** extends through the end wall **85** and mounts a steering wheel **90** on its outer end and a bevel gear **91** on its inner end meshing with a bevel gear **92** on the end of a flexible shaft **112**. The opposite end of the casing **84** is formed with an outlet opening **94** through which extend a plurality of flexible shafts leading from the motors **88** to the fan assembly **21**, elevators **50**, rudder **56** and louvres **66**, and to the various connections of the upright post **78**. Flexible shaft **93** also extends through the outlet opening to the gearing **82**. A flexible shaft **104** leads to the left hand side of the universal joint **80** as viewed in FIG. 2 at the top of the post **78**, flexible shaft **106** leads to the right hand side thereof, flexible shaft **108** leads to each of the louvres **66, 66**, flexible shaft **110** leads to the horizontal elevators **50**, hinges **52** of the horizontal elevators **50, 50** and flexible shaft **112** leads to the hinge connection **58** of the rudder **56**.

As best shown in FIGS. 9 and 10 an air pump or blower **114** comprises a cylindrical hollow casing **115** with a ventilating mesh-protected opening **116** at one end thereof with the other end being welded to the side wall of the casing **84**. A tubular outlet **117** is formed on the periphery of the casing **115** tangentially thereof. One end of flexible metal air hose **120** is fitted in the outlet **117** with its other end in the inlet opening **62** in the enlargement **60** on the band **22** for supplying compressed air to the interior of the band **22**. A bracket **122** may be fastened to the band **22** to support and guide the metal air hose **120**.

The pilot supporting cradle apparatus **12** has a body section made of aluminum or fiber glass and arcuate-shaped in cross-section. Opposed crosspieces **124** as best shown in FIGS. 1 and 8, extend across the space between the sides of the cradle body **12** leaving a space therebetween. The free ends of the crosspieces **124** are formed with enlargements having bearing members **121** for supporting a shaft **123**. A worm gear **125** is fixed upon shaft **123**. At one end of the cradle body **12**, a pair of shoulder extensions **126** are formed on the sides thereof for supporting the shoulders of the pilot P and retains the pilot against any forward sliding movement in the cradle body. At its other end, the cradle body is formed with an extension **128** and depending from each side of the body there is a hollow cylinder **130** and a piston **132** movable therein; depending from each side of the extension **128** there is a link **134** pivotally connected thereto. The pistons and links pivotally support a seat **136** therebetween. A rod **138** is pivotally connected at one end to the center of the seat for supporting the seat on a horizontal supporting surface S as shown in FIG. 14. The control housing **84** is rigidly joined by welding or the like to the pilot-supporting cradle apparatus **12**.

The connection between the bottom end of the post **78** and the combined supporting cradle apparatus as best seen in FIG. 8 includes a yoke member **140** having a pair of spaced members **142** joined by an integral crosspiece **144** having a central opening to receive the lower end of the post **78**. The members **142** receive the enlarged ends **121** of the cross-pieces **124**, and the space therebetween receives the worm gear **125** on shaft **123**. The crosspiece **144** is formed with a lateral enlargement **147** having a hole **146** therethrough, as shown in FIG. 8 to receive a shaft **148** mounting a worm **150** meshing with the worm gear **125**. The flexible shaft **93** is operatively connected to the top end of the shaft **148**.

As best shown in FIGS. 2, 5–7, the universal joint connection **80** between the fan assembly **21** and the top of the post **78** includes a lateral extension **152** on each side of the top of the post **78**, each extension terminating in an upwardly extending bearing member **154**. A joint member **156** having a solid rectangular body with stub-shafts **160, 161** extending from the ends thereof, is interposed between the bearing members **154** with the stub shafts **160, 161** journalled in the bearing members **154**. The ends of the joint member **156** are formed with upstanding perforated lugs **162, 162** to receive a shaft **164** having a worm **166** formed therefrom. A worm gear **168** with hub portion **170** is mounted on the protruding end of stub shaft **161**. Worm gear **168** is in mesh with a worm **171** mounted on shaft **172** journalled in lugs **174** extending from one of the lateral extensions **152**. Flexible shaft **104** is operative connected to one end of the shaft **172** for turning the worm **171**. Central stem portions **176** of the joint member **156** are formed with holes **178** which are aligned with a hole on the depending joint member **180** fixed on a bottom end edge of the arms **24** centrally thereof. The bottom depending end of the joint member **180** is formed with a worm gear **182** in mesh with the worm **166**. A pivot pin **184** extends through the aligned holes in the joint members **156** and **180**.

For example, in operation, by pushing a knob **87** a cable, such as cable **93**, would be actuated for rotating the combined apparatus including the control casing **83**, air pump **114** and pilot supporting plate. That is the cradle platform assembly **12** may be moved to either a horizontal position as shown in FIG. 1 for flying or to a vertical position as shown in FIG. 2 for walking. When in horizontal position, the pilot P may lie prone on the supporting plate with his hands in reach of the control board and steering wheel **90** and by pushing the proper buttons can actuate the universal joint **82** for tilting the fan assembly **21** as desired, and can adjust the rudder elevators and the side flaps **66** for propulsion or rearward movement.

The supported seat **136** can be readily manipulated manually to swing the seat either horizontally for sitting thereupon as shown in FIG. 14, or vertically when not in use, as seen in FIG. 2.

Due to the worm and gear arrangement, the fan assembly **21** will remain in any position set by the pilot. Positive drive is maintained of the fan blades **44** in all adjusted positions of the fan assembly. On take-off, the fan assembly **21** is adjusted so that the fan blades **44** are disposed horizontally. Lifting air streams are produced to lift the aircraft. Once in the air the fan assembly **21** is tilted so that the blades are arranged vertically or at an angle to the horizontal. In order to obtain reverse movement of the aircraft, the blades are rotated rearwardly to a reverse position. Turning of the aircraft in horizontal flight is normally effected by the pilot's control of the rudder and elevator in a conventional manner. The flaps **66** are provided for use in braking the aircraft.

The modification of the invention shown in FIGS. 12 and 13 differs from the form of FIG. 1 in that the band **22'** is formed with a pair of closely spaced outlet ducts **190** communicating with the interior of the band by openings **192**. In this form also, the elevator **50'** and stabilizers **54'** are mounted on an L-shaped bracket **194** fixed on the post **78'** by means of a sleeve **196**.

Another modification of the invention as shown in FIGS. 15, 16, and 17 provides for a twin-type of propelling means such as fan assemblies **200** and **201** supporting a combined control housing, air pump and pilot supporting apparatus or cockpit assembly **204**. Interposed therebetween is an upright post **208**, pivotally connected at its top end as viewed in FIG. 16 to a central portion of the fan assemblies **201** and **200** by universal joint structure **210**, and swingably connected at its bottom end to the pilot assembly **204**, as more clearly described in the first embodiment of this invention.

A control assembly **212** with a steering wheel **213** having the knobs as hereinbefore described in the first embodiment actuate reversible motors not shown for driving the various steering controls and fan assemblies **200** and **201**.

Propeller fans **214**, **215** are rotatably mounted on shafts **216** and **217** respectively. Each fan **214**, **215** include three blades **218** mounted on the shafts **216** and **217** for rotation.

As in the first embodiment a pair of horizontally disposed elevators **220** and **221** with rudder **222** are hingedly secured to a body portion **224** of the aircraft.

As best shown in FIG. 16 an air pump or blower **225** connects an enlargement **226** in which is formed a central passage for communication with the interior of the fan assemblies **200** and **201** for directing pressure gases to rotate fans **214** and **215** for propulsion, through metal flexible hose **230**.

The aircraft includes a pair of skids **231** and **232** on which the aircraft may land.

In operation the aircraft of FIGS. 15 to 17 is substantially the same as those of FIGS. 1 to 14 except that in this embodiment of FIGS. 15 to 17 is provided a mechanical means of landing rather than a pilot's own two feet.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention.

I claim:

1. A helicopter device comprising means for supporting a pilot, power means for providing downwardly extending vertical thrust to the device, universal means interposed between said power means and said means for supporting the pilot, and control means connected to said power means to displace the thrust from the vertical to a longitudinal or to a lateral direction relative to the device, said control means including flexure-gear means for selectively pivoting the power means from a vertical axis to a longtudinal axis or to a lateral axis of the device.

2. The structure of claim **1**, wherein the means for supporting the pilot include flexure-gear operably controlled for positioning the pilot in either a prone or an upstanding position.

3. The structure of claim **1**, wherein the control means include flexible shafts, and reversible motors operably rotating said flexible shafts and wherein said universal means include gearing means for positioning said power means for vertical, horizontal and lateral positions and said universal means including a worm and gear arrangement means for positioning the pilot in predetermined positions relative to the power means.

4. The structure of claim **1**, wherein said power means includes a shaft, propeller fan rotatable on said shaft, annular band circumambient the periphery of said fan and in close proximity thereto, and air pump means directing air under pressure to said propeller fan for driving said propeller fan for use producing the thrust.

5. The structure of claim **4**, wherein said propeller fan includes an annular vane means connecting the propeller fan at its outward radial edges adjacent said annular band for receiving compressed air from the air pump tangentially from said annular band and for rotating said propeller fan for producing the thrust.

6. The structure of claim **1**, in which said universal means includes a post having an upper and a lower end interposed between said power means and said means for supporting the pilot, a universal yoke means positioned between said power means and the upper end of said post means for positioning said power means and a worm and gear means for positioning said pilot interposed between the lower end of said post and the means for supporting the pilot for positioning the pilot in any predetermined position.

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U.S. Cl. X.R.

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