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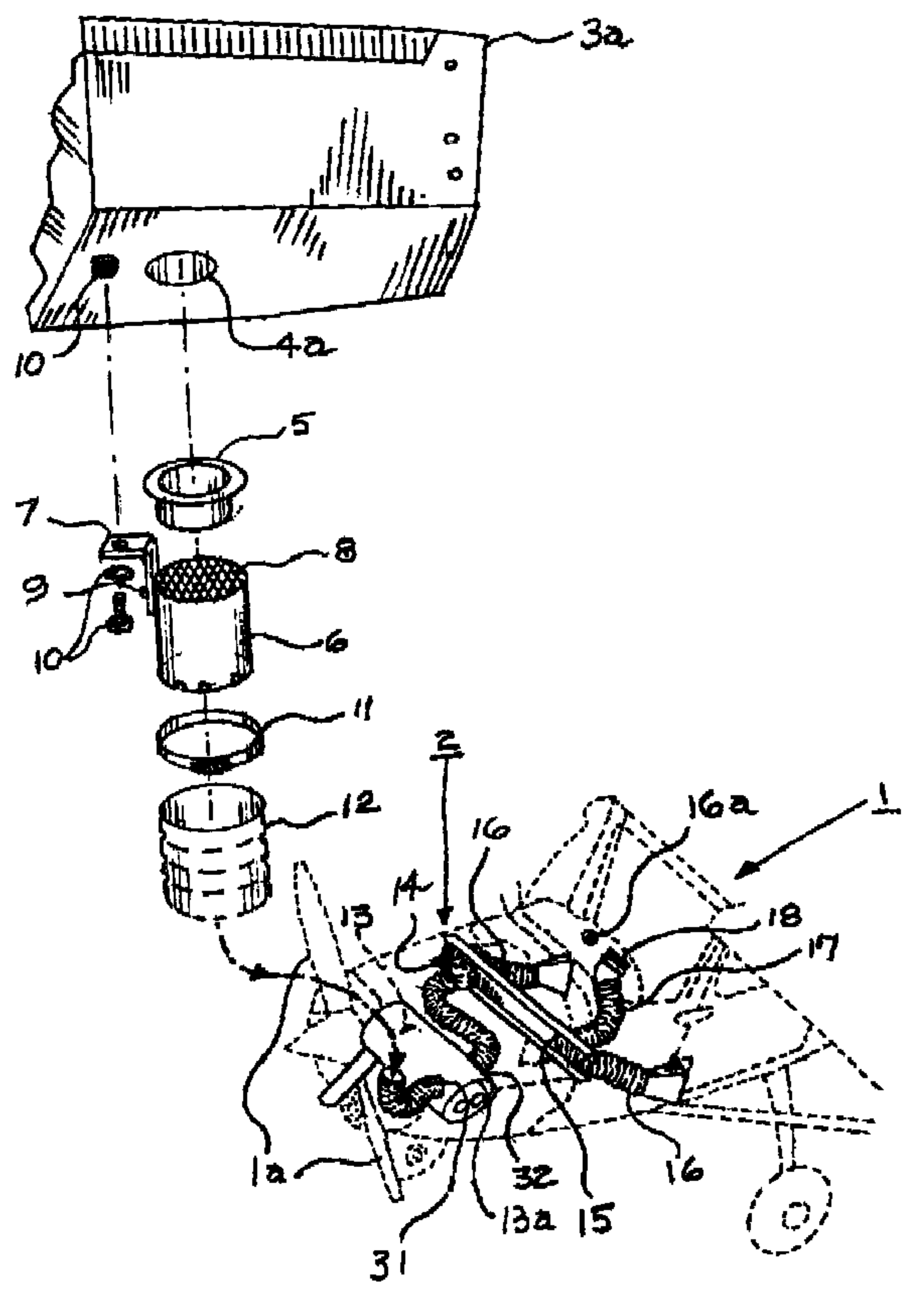
(72) Inventeur/Inventor:
REICHLE, HEINZ, CA

(73) Propriétaire/Owner:
REICHLE, HEINZ, CA

(74) Agent: PHENIX, DONALD F.

(54) Titre : SYSTEME DE CHAUFFAGE ET DE DESEMBUAGE AVEC VENTILATEUR D'APPOINT POUR PETITS AVIONS
(54) Title: BLOWER ASSISTED HEATING AND DEFOGGING SYSTEM FOR SMALL AIRCRAFT



(57) Abrégé/Abstract:
For the purposes of increasing pilot visibility and comfort in small planes during winter conditions, this invention provides an auxiliary heating system. Prior to actual flight, that is to say during startup, warmup, taxi, and takeoff, a small aircraft does not intake

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sufficient outside air to warm the cabin and defrost the windshield. The normal heating system on a small plane depends upon ram air when the plane is flying at normal speeds. This invention consists of a simple replacement part, mainly an electric blower which sucks in air from outside the aircraft and forces it through the muffler shroud and thereafter into the cabin and defroster heat ducts. The system is operated by a switch located on the control panel. Once the aircraft is in flight, the system may be shut off as there is sufficient ram air to heat the small aircraft.

ABSTRACT

For the purposes of increasing pilot visibility and comfort in small planes during winter conditions, this invention provides an auxiliary heating system. Prior to actual flight, that is to say during startup, warmup, taxi, and takeoff, a small aircraft does not intake sufficient outside air to warm the cabin and defrost the windshield. The normal heating system on a small plane depends upon ram air when the plane is flying at normal speeds. This invention consists of a simple replacement part, mainly an electric blower which sucks in air from outside the aircraft and forces it through the muffler shroud and thereafter into the cabin and defroster heat ducts. The system is operated by a switch located on the control panel. Once the aircraft is in flight, the system may be shut off as there is sufficient ram air to heat the small aircraft.

BLOWER ASSISTED HEATING AND DEFOGGING SYSTEM FOR SMALL AIRCRAFT

Field of the Invention

This invention relates to heating and defogging systems for small aircraft.

Background

Large planes, commercial aircraft, jet aircraft and military helicopters are all equipped with very extensive heating, defogging and air conditioning systems for the cabin, whether in flight or on the ground. Multi-engine, piston powered aeroplanes have auxiliary gas powered heaters which are usually ignited immediately after the engines are started. The system includes a combustion chamber, a heat exchange system and a battery-powered blower. Soon after being ignited, the auxiliary heater soon begins delivering heat to the cabin including the windshield's defrost system without the need for aircraft motion or ram effect.

Small single engine piston powered aircraft, however, are normally equipped with simple systems which, when in flight, take in ambient air and the ram speed of the aircraft pushes the ambient air past a portion of the aircraft's exhaust system and through ducts into the cabin. Unfortunately, when an aircraft is not in flight, there is no ram air pushing through the heating system. Also, some single piston engine driven aircraft have no defrost provisions. This can create serious problems in cold, wintry conditions, particularly in northern climates such as found in Canada or the northern United States. During engine start up, warm up, taxi, takeoff prior to flight, the cabin is not heated or heated insignificantly by the existing heating system. Although the comfort of the passengers and pilot is adversely affected by the cold, a more serious problem, however, is that the pilot's visibility can be poor because of fogging windows. During taxi and takeoff, this can lead to serious accidents. Therefore, it appears that an auxiliary system, for operating in cool, damp conditions that can occur in any season but occur most acutely in the winter designed for use during start up, taxi and takeoff would provide major safety benefits plus enhance pilot and passenger comfort.

A review of the literature, prior art, and aircraft now in service, has revealed to the present inventor that this cold weather problem has not been solved, and pilots and passengers in small planes continue to complain and remain at risk because of poor visibility.

Blowers have been used in heating and cooling application for some aircraft but none address the current problem. In US Patent No. 4,490,989, issued to Keen on Jan. 1, 1985, a helicopter heating and air conditioning system is described for turbine engine-powered helicopters. The invention is not directed to temporary heating during start up, taxi and takeoff but rather to a permanent system used in conjunction with an air conditioning system. A blower is used, however, it is located downstream of a condenser and is only effective for helicopter turbines. Use of this system with small planes would not be possible.

In US Patent No. 2,265,168, issued to W.E. Huffman on Dec. 9, 1941, a heat exchanger is located within the exhaust manifold or exhaust pipes, the principal idea being that the pressure produced by a blower from the cold air inlet maintains pressure through the heat exchanger greater than the pressure within the exhaust manifold. Thus the blower is not used to push air past the exhaust manifold in the takeoff or taxiing position but rather is used to continuously keep the pressure up such that if a leak in the heat exchanger develops, CO or other exhaust gases will not enter into the system which provides warmed air to the cabin. The invention does not use a typical shrouded engine muff heat exchanger which is common in present day small planes but rather the heat exchanger is found within the exhaust manifold. Furthermore, this invention is not used on a temporary basis for start up, warm up, taxi and takeoff.

The present invention provides an attachment or add on to the existing cabin heating system of a small plane. A first embodiment of the invention is an attachment that comprises a blower connected to an air intake aperture usually in the engine housing. Once the aircraft is in the air, the system may be shut off as ram air enters through the aperture automatically. The inventor replaces the normal hose attached to the aperture with another hose and a light weight three or four-inch diameter inline axial blade blower fan. The blower is mounted on the engine compartment baffle and connects with an air duct hose which leads to the inlet of the muffler shroud or heat exchanger. The boosted air from the blower warms the cabin and defogs the windshield, much improving visibility for the pilot and comfort for the passengers.

In a second embodiment a second blower is located downstream from the muffler shroud and heat exchanger system and boosts the air velocity to increase air movement through the cabin heating and windshield defrost system.

A third embodiment also includes a blower typically located in the cabin area which receives a blend of both air provided to the cabin by the blower located upstream of the muffler shroud and ambient cabin air. This provides lower temperature air to the second blower that does then not require high heat resistance properties.

In a forth embodiment the previously mentioned lightweight inline axial blade blower is located in the cabin area to take in heated or unheated cabin air accelerate it and deliver it to the windshield. Testing has shown that in cool damp conditions, directing unheated cabin air at the windshield will remove the water vapour that has condensed on the windshield recognizing that this embodiment will do nothing to improve pilot or passenger comfort. Further, some aeroplanes begin to deliver heated air to the cabin almost immediately after start up because the inlet for the air that flows through the muffler heat shroud is propelled into the intake by the aircraft propeller but the delivered air will not generally be adequate to defog the aircraft's windshield.

In very cold conditions a system that uses two blowers is usually required to do a good job of keeping the windshield defrosted at all times after start up and before established in flight to receive ram air.

Summary of the Invention

Therefore, a first embodiment of this invention seeks to provide an auxiliary heating and defrosting system, adapted to provide warmed air to the cabin and windshield of a small aircraft; said system including:

at least one blower adapted to be connected to a flange and an engine compartment baffle wall;

said flange being also connected to said engine compartment baffle wall around a pre-existing air intake aperture;

said system also including an air duct hose and a first clamp;

said clamp being adapted to secure a first end of said air duct hose around an air outlet end of said blower;

said air duct hose also including a second end;

said second end being connected by a second clamp to a muffler shroud air intake aperture;

said muffler shroud also including an air outlet aperture connected to a cabin air intake hose;

said muffler shroud encircling and enclosing an airspace about an exhaust muffler;

said exhaust muffler forming an existing portion of an exhaust system of a small aircraft engine;

said system also including electrical circuit breaker wiring and an on/off circuit breaker switch;

said electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blower, and said circuit breaker switch;

said switch being located in said small aircraft cabin; and

wherein, in operation, when said circuit breaker switch is in an “on” position, said blower forces outside ambient air through said muffler shroud into said cabin.

In a second embodiment, this invention seeks to provide an auxiliary heating and defrosting system, adapted to provide warmed air to a cabin of a small aircraft; said system including:

at least one blower adapted to be connected to a flange and an engine compartment baffle wall;

said flange being also connected to said engine compartment baffle wall around a pre-existing air intake aperture;

said system also including an air duct hose and a first clamp;

said clamp being adapted to secure a first end of said air duct hose around an air outlet end of said blower;

said air duct hose also including a second end;

said second end being connected by a second clamp to a muffler shroud air intake aperture;

said muffler shroud also including an air outlet aperture connected to a cabin air intake hose;

said cabin air intake hose being connected to a second inline blower accepting heated air and assisting the first blower in accelerating and moving the air through the aeroplane's cabin and defrost system,

said muffler shroud encircling and enclosing an airspace about an exhaust muffler;

said exhaust muffler forming an existing portion of an exhaust system of a small aircraft engine;

said system also including electrical circuit breaker wiring and at least one on/off circuit breaker switch;

said electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blowers, and said at least one circuit breaker switch;

said at least one switch for said blowers being located in said small aircraft cabin; and

wherein, in operation, when said at least one circuit breaker switch is in an "on" position, said first blower forces outside ambient air through said muffler shroud into said cabin air intake hose and said second in-line blower assist in moving greater volumes of air at higher velocities through the cabin heat and defrost system.

This invention also seeks to provide an auxiliary heating and defrosting system, adapted to provide warmed air to the cabin and windshield of a small aircraft; said system including:

at least one blower adapted to be connected to a flange and an engine compartment baffle wall;

said flange being also connected to said engine compartment baffle wall around a pre-existing air intake aperture;

said system also including an air duct hose and a first clamp;

said clamp being adapted to secure a first end of said air duct hose around an air outlet end of said blower;

said air duct hose also including a second end;

said second end being connected by a second clamp to a muffler shroud air intake aperture;

said muffler shroud also including an air outlet aperture connected to a cabin air intake hose;

said cabin air intake hose having an outlet end directing heated air into said cabin through an aperture in a cabin firewall;

said system also comprising a second blower inlet located above said first cabin air aperture;

said second blower inlet receiving a blend of heated air and ambient cabin air and directing said air to an aircraft windshield;

said muffler shroud encircling and enclosing an airspace about an exhaust muffler;

said exhaust muffler forming an existing portion of an exhaust system of a small aircraft engine;

said system also including electrical circuit breaker wiring and at least one on/off circuit breaker switch;

said electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blowers, and said circuit breaker switch or switches;

a first switch for said first blower being located in said small aircraft cabin; and
a second switch for a second blower being located in said small aircraft cabin; and
wherein, in operation, when said circuit breaker switches are in an "on" position, either of said blowers can be operated or shutdown then relying on forces produced by outside ambient air pushed through said muffler shroud into said cabin by ram air effect caused by forward motion of the aircraft. Alternatively, a single switch could indeed control both blowers.

This invention also seeks to provide an auxiliary defrosting system, adapted to provide air to a windshield of a small aircraft; said system including:

at least one inline axial blade blower located in a cabin area with an inlet end for receiving heated or unheated ambient cabin air;

said blower having an outlet end for directing said cabin air to said windshield for removing fog from, or preventing fog from forming on, said windshield;

said blower being attached to said aircraft under an upper portion of an instrument panel, said system also including openings in a dashboard of said instrument panel for allowing air to be directed onto said windshield, said system also including electrical circuit breaker wiring and at least one on/off circuit breaker switch;

said electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blower, and said at least one circuit breaker switch;

said at least one switch for said blower when in an "on" position, or "off" position, can operate or shutdown said blower as required for providing good visibility for safe taxiing, takeoffs and in some cases, when the aircraft is in flight, typically shortly after takeoff or in the approach to landing phase where both the power to the engine and the aircraft's speed have been greatly reduced, air flow to the windshield due to ram effect may not be adequate to prevent the windshield's fogging without the assistance of an inline blower.

The present invention is extremely simple, but solves an old problem existing in small aircraft during winter conditions. Although there are thousands and thousands of light single piston engine powered aeroplanes in operation throughout the world and blowers have existed for a long time, practical means of providing the required air movement have never been devised. Forward curved blade blowers were generally used to provide air movement for auxiliary heating systems on larger aeroplanes. The idea of using a light weight, inline axial blade blower had never been conceived until the item of this invention. In this case inline axial blade blowers, capable of blowing approximately 100 to 200 cubic feet per minute, are used to provide the necessary air flow. LED lights and blower switch are generally attached to the front face of the instrument panel of the aircraft, close to the heater control to allow convenient and logical access to the blower controls and for receiving on/off information.

Brief Description of the Drawings

Figure 1 is an exploded view of the components of the present invention as installed in a Cessna 172 aircraft.

Figure 2 is a wiring diagram for the same invention as shown in Figure 1.

Figure 3 is the front view of the control panel in the same Cessna 172.

Figure 5 is a wiring diagram used in the Cessna 150.

Figure 6 is a front view of the control panel of the Cessna 150.

Figure 7 is a schematic view of the invention used in the Cessna 180 and 182 model aircraft.

Figure 8 is an exploded view of the invention used in conjunction with a Piper PA 28 series aircraft.

Figure 9 is the wiring diagram for the said Piper aircraft.

Figure 10 is a front view of the control panel of the Piper PA 28 series aircraft.

Figures 11 and 11a are a perspective cutaway view and side cutaway view of a second embodiment of the invention.

Figures 12 and 12a are a perspective cutaway view and side cutaway view of a third embodiment of the invention.

Figures 13 is a perspective cutaway view and figures 13a and 13b are side cutaway views of a fourth embodiment of the invention.

Figures 14 and 14a are a perspective cutaway view and side cutaway view of a fifth embodiment of the invention.

Detailed Description of the Drawings

Figure 1 shows an aircraft marked generally as 1, having a propeller 1a and an engine compartment marked as 2. At the front of the engine compartment is an engine compartment front baffle wall 3a. In engine baffle wall 3a is an air intake aperture 4a. When the plane is in flight at normal speed, ram air is forced through aperture 4a with movement of the aircraft. Permanently attached to engine baffle wall 3a around aperture 4a is a flange 5. This is normally attached to an air duct hose connected to an exhaust muffler shroud (air duct hose not present in Figure 1).

A blower 6 is attached with L-shaped bracket 7 by means of a bolt, nut and washer 10 to the engine baffle wall 3a. The bracket 7 is attached to the side of the blower by means of a bolt 9. The blower is equipped with a meshed covering 8 to avoid any debris entering the blower. A clamp 11 secures a downstream end of the blower 6 to an air duct hose 12. Air duct hose 12 is connected to the inlet hole 31 of a muffler shroud 13a. A muffler shroud is basically an enclosed space or compartment located around the muffler. Warmed air leaves the muffler shroud 13a via muffler shroud outlet hose 14 which is connected to muffler shroud air outlet 32.

In operation, warmed air moves through the firewall blower channel 15 and is then directed through cabin heater ducts 16 and defroster duct 17 to defroster nozzle 18.

It is to be understood that muffler shroud 13a, outlet hose 14, firewall blower channel 15, cabin heater duct 16, defroster duct 17 and defroster nozzle 18 are pre-existing parts of the Cessna 172 aircraft.

Figure 2 is a schematic view of the wiring diagram for the invention shown in Figure 1. There is a blower indicator light 19 connected to the wiring system. It is mounted on the control panel in the cabin as shown in Figure 3. The wiring system is grounded at 20 on both the cabin wall and the firewall. The blower receives power through the wiring system from the main bus bar or source of electricity in the aircraft. The bus bar is marked as 21. The circuit breaker is shown as number 22. This is connected to the blower circuit breaker switch 25 shown in Figure 3. Wiring 23, located ahead of the firewall, connects with blower 6.

On the cabin control panel, as shown in Figure 3, there is a cabin heat duct control 16a, a cabin air control 24, and as previously mentioned, the newly added blower circuit breaker switch 25. Numeral 26 is the flap control; numeral 27 is the avionics indicator; and a numeral 28 is the carburettor temperature indicator. The control panel is shown generally as 29.

It is to be understood that Figure 3 is a pre-existing control panel of the Cessna 172 model series aircraft and indicates where the new LED light 19 and circuit breaker switch 25 are to be installed.

In Figure 4, the invention is shown installed in a Cessna 150 aircraft. In the Cessna 150, there are two mufflers, each with a muffler shroud and two air intakes; hence, two blowers can be used. The muffler shrouds are shown in Figure 4 as 13a and 13b. The Cessna 150 is also equipped with air scoops 30 located above the apertures on the outside of the front engine compartment baffle wall 3. Although only one blower 6 is shown connected to flange 5 and firewall 3 by nuts and bolts 10 in Figure 4, it is understood that in this particular aircraft, a blower for each air aperture may be used and one air duct hose 12 leads to air inlet 31 of muffler shroud 13a while another blower 6 and air duct hose 12, are connected to an air inlet on muffler shroud 13b.

Figure 5 is a wiring diagram for the blower shown in Figure 4. It is similar to Figure 2 except that when using a 24-volt system, a resistor 33 is placed in the wiring system 23.

Figure 6 shows the existing control panel of the aircraft shown in Figure 4. It is understood that Figure 6 is used simply to show the installed location of the new LED light 19 and the blower on/off switch 25. Figure 6 shows a mixture control dial 34, throttle 35, a vertical speed indicator 36, an altimeter 37, a tachometer 38, an hour and meter 39, a suction gauge 40, a left-hand fuel gauge indicator 41, a right-hand fuel gauge 42, an oil temp gauge 43 and an oil pressure gauge 44.

Figure 7 is a schematic view of the invention as used in Cessna 180, 182 aircraft. Figure 7 is an illustration which shows that an air intake aperture 4b need not be in the front engine compartment baffle wall but rather can also be located in the rear engine compartment baffle wall 3b. Thus blower 6 is attached to a flange (not shown) located on rear engine compartment baffle wall 3b. Also shown in Figure 7, joined to exhaust muffler 13, are exhaust system inlets 45 and 46.

Figure 8 shows the invention as applied to a Piper PA 28 series aircraft. The air intake aperture in this particular aircraft is located in the left-hand forward engine compartment baffle 3c. The Piper PA 28 series is equipped with fresh air inlet knob 47, a cabin heat shutoff 48, defroster ducts 49 and defroster control 50.

Figure 9 is the wiring system for blower 6 for the Piper PA 28 series aircraft and is very similar to the wiring systems shown for the previous aircraft.

Figure 10 is a front view of the dash 29 for the Piper aircraft, showing in addition, an ammeter 51 and a circuit breaker panel 52, as well as the other usual controls. Placement of the blower switch 25 and the LED light 19 are indicated.

Figure 11, a perspective cutaway view, and Figure 11a, a cutaway side view, illustrate a second embodiment of the invention. Electric blower 6 is assisted by a second blower 53 which is attached to muffler shroud 13a (warmed by motor 54) by outgoing air duct hose 14. Blower 53 increases the flow of heated air through aperture 15 located in the cabin fire wall 15a. The heated accelerated air is directed to cabin outlet air duct 16 and cabin windshield duct 17 to be expelled through windshield air duct outlet 18 located on top on dash board 55. A pilot chair 56 is also shown.

Figures 12 and 12a illustrate a third embodiment of the invention, wherein the second blower 57 used to assist blower 6 is located inside the cabin firewall 15a. Blower 57 accepts heated muffler shroud 13a air and propels it through cabin heated air duct 16 and windshield heated air duct 17 and out windshield duct opening 18 located above dash board 55.

Figures 13 and 13a show a fourth embodiment of the invention. A second blower 58 assist blower 6 to bring in heated air through firewall aperture 15 and heated air duct 59. Also attached to the blower 58 is cabin air intake duct 60 which sucks in ambient air from the cabin. Ambient cabin air and heated muffler shroud air mix in blower 58 and are directed through windshield outgoing air duct 17, to outlet 18 located above the dash board 55 to direct mixed air to the windshield.

Figure 13b shows an alternative arrangement of the fourth embodiment of the inventor. The second blower labelled as 58b is attached, in a vertically disposed position, inside the cabin firewall 15a below the dashboard 55 and above the firewall aperture 15. Ambient cabin air and heated muffler shroud air mix in blower 58b and are directed through windshield outgoing air duct 17, to outlet 18 located above dashboard 55 to direct mixed air to the windshield.

Figures 14 and 14a show a fifth embodiment of the invention which is directed to removing condensation from the windshield during start up, taxiing, take off and flight. A turbo electric blower 61 is attached to the cabin firewall 15a under the dash board 55. Ambient cabin air enters through duct 62 and is expelled through duct 63 through outlet 64 directed at the windshield and located above dash board 55.

Claims

1. An auxiliary heating and defrosting system for use with an airplane with an air cooled piston engine partially enclosed by a cowling with at least one air inlet in said cowling; said engine including at least one enclosed exhaust system for allowing exhaust gases to exit said air cooled piston engine; said system comprising: at least one electrically powered blower connected to said air inlet in said cowling; said electrically powered blower having an inlet and an outlet; said blower outlet being connected to an inlet of an elongated heat shroud used for collecting heat from said aircraft engine exhaust system; said heat shroud also including an outlet; wherein said outlet from said heat shroud is ducted into said airplane cabin to deliver heated air to said airplane cabin when said air cooled piston engine is in operation and said airplane is in taxiing and stationary positions; and said blower replacing ram air which is used to heat said cabin when said aircraft is in flight.

2. A system as in Claim 1 wherein said electrically powered blower is an axial blade blower.

3. A system as in Claim 1 wherein said heated air is ducted to an airplane windshield defrost system.

4. A system as claimed in Claim 3 wherein at least two said electrically powered blowers are connected in series to deliver heated air to said airplane cabin and said windshield defrost system.

5. A system as claimed in Claim 1 wherein a second electrically powered blower is connected in series to said at least one blower for increasing volume of heated air for delivery to said airplane cabin and windshield defrost system.

6. An auxiliary heating and defrosting system as claimed in Claim 1, further including: an air duct hose connecting said blower outlet and said inlet of said heat

shroud, and a cabin air intake hose connecting said heat shroud outlet to an air intake entrance located in a wall of said cabin; said system also including electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blower, and an on/off circuit breaker switch; said switch being located in said small aircraft cabin; wherein, in operation, when said circuit breaker switch is in an "on" position, said blower forces air through said heat shroud into said cabin.

7. A system as claimed in claim 1, including two blowers attached respectively around two air inlets in said cowling; each of said blowers having an outlet connected to an air duct hose; each of said air duct hoses being connected to an air inlet in one of a pair of said heat shrouds; each of said heat shrouds surrounding an exhaust system, and each of said heat shroud outlets being connected to an airduct hose connected respectively to an air intake entrance located in a wall of said cabin.

8. A system as claimed in Claim 1 wherein said at least one air inlet is located in a forward wall of said cowling.

9. A system as claimed in Claim 1 wherein said at least one air inlet is located in a side wall of said cowling.

10. A system as claimed in Claim 1 wherein said one air inlet is located on a rear wall of said cowling.

11. A system as claimed in Claim 1 wherein an air scoop is located on an outside portion of said engine cowling adjacent said air inlet.

12. A system as claimed in Claim 1 wherein said blower is located within an air duct hose; downstream of said at least one air inlet, and upstream of said inlet of said elongated heat shroud.

13. An auxiliary heating and defrosting system as claimed in Claim 1; said system including:

a first blower connected to said air inlet in said cowling;

said inlet end of said blower receiving ambient air from outside the aircraft;

said outlet end of said blower discharging said ambient air received from outside the aircraft into said inlet in said heat shroud enclosing a portion of an engine exhaust system, wherein, in operation said air is heated;

said system further including a second blower also having an inlet and an outlet end;

said second blower being located downstream of said heat shroud and adapted to receive heated air through its inlet and discharging said heated air into said heating and defrosting system; where said blowers in tandem forcibly move greater amounts of air into said cabin.

14. An auxiliary heating and defrosting system as claimed in Claim 1; said system including:

a first blower connected to an opening in an engine cowling; said inlet end of said blower receiving outside air, and said outlet end of said blower discharging said air into a heat shroud wherein, in operation, said air is heated;

said system further including a second blower being located in the cabin of said aircraft, downstream of said first blower and adapted for receiving a blend of ambient cabin air and heated air from said first blower and heat shroud, and discharging said heated air and said ambient cabin air through said aircraft heating and defrosting system.

15. An auxiliary heating and defrosting system as claimed in Claim 1, further including:

an electrically powered blower located in the cabin of said small piston engine airplane; said blower having an inlet end and an outlet end; said inlet end of said blower receiving ambient cabin air; said outlet end of said blower in operation discharging said ambient air received from said cabin onto said windshield of said small engine aircraft.

16. An auxiliary heating and defrosting system as claimed in Claim 1; said system further including:

at least a second inline axial blade blower located in a cabin area with an inlet end for receiving heated or unheated ambient cabin air;

said blower having an outlet end for directing said cabin air to said windshield for removing fog from or preventing fog from forming on said windshield;

said blower being attached to said airplane under an instrument panel in said cabin area, said system also including openings in a dashboard above said instrument panel for allowing air in operation to be directed onto said windshield;

said system also including electrical circuit breaker wiring connected to an "on/off" circuit breaker switch;

said electrical circuit breaker wiring being connected to an electrical source in said aircraft, said blower, and said circuit breaker switch;

and when said switch for said blower is in an "on" position, said blower can be operated for providing good visibility for safe taxiing and takeoffs.

17. An auxiliary system for defrosting a windshield of an airplane with an air-cooled piston engine in a taxiing or stationary position, comprising:

an electrical axial inline blower mounted in a cabin of said aircraft such that an outlet of said blower is directed at said windshield, and an inlet of said blower is adapted to receive ambient cabin air when an "on/off" switch connected to circuit wiring, said blower, and an airplane electrical source, is in an operative mode.

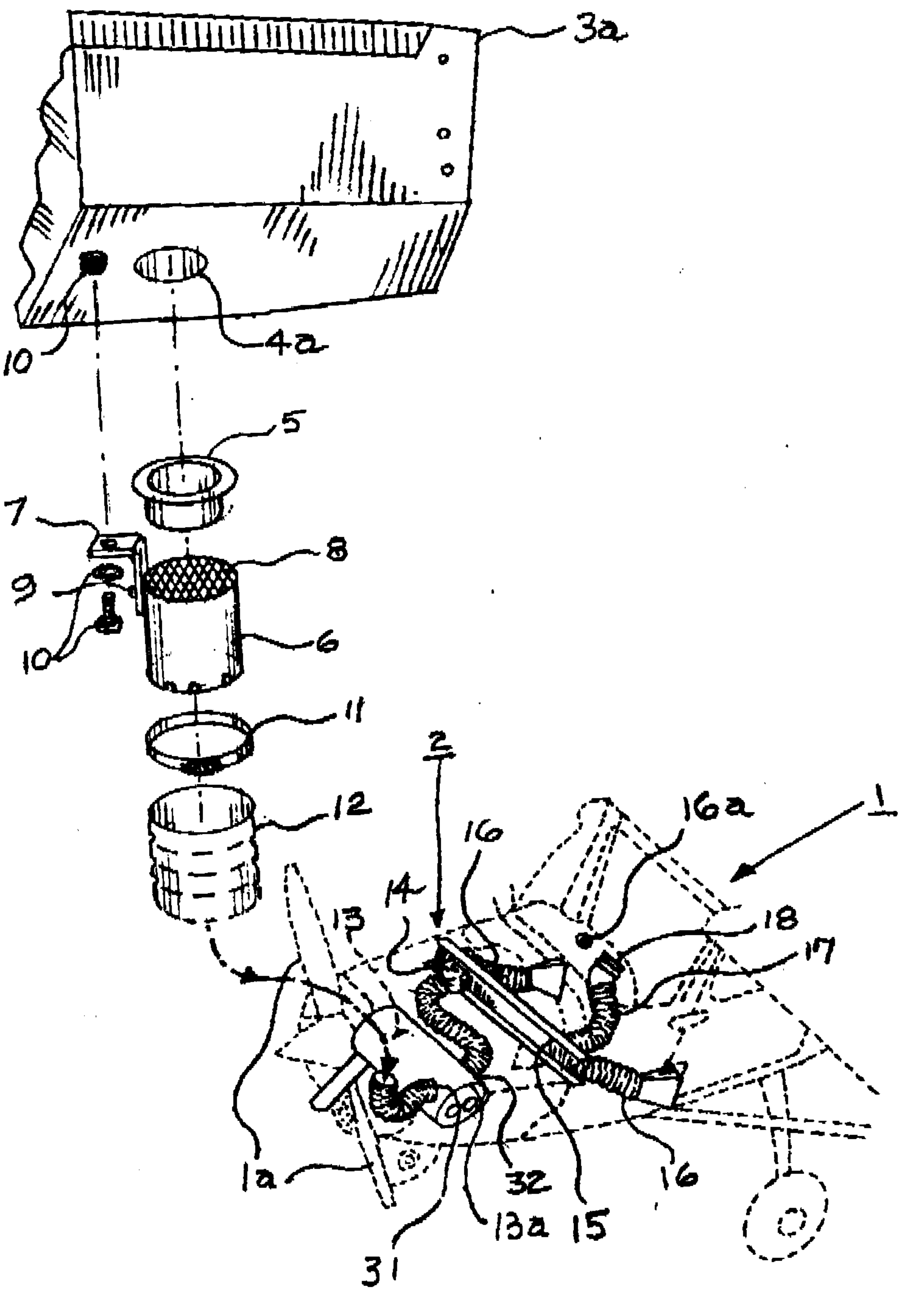

Fig. 1

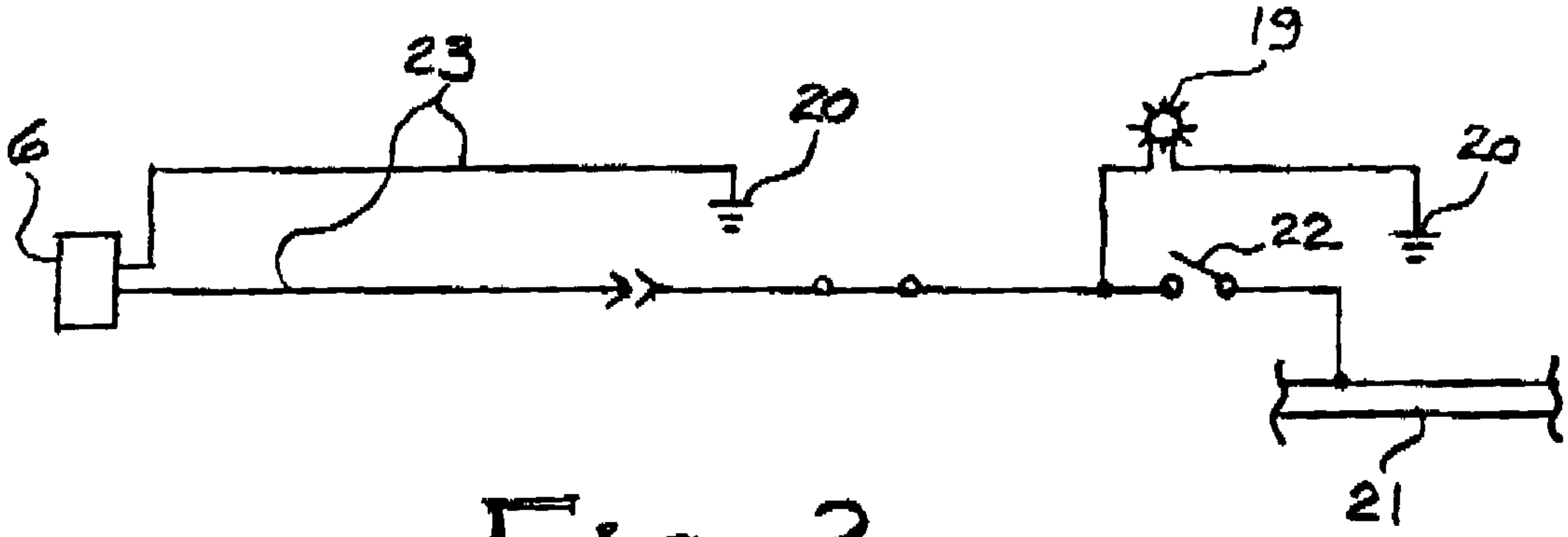

Fig. 2

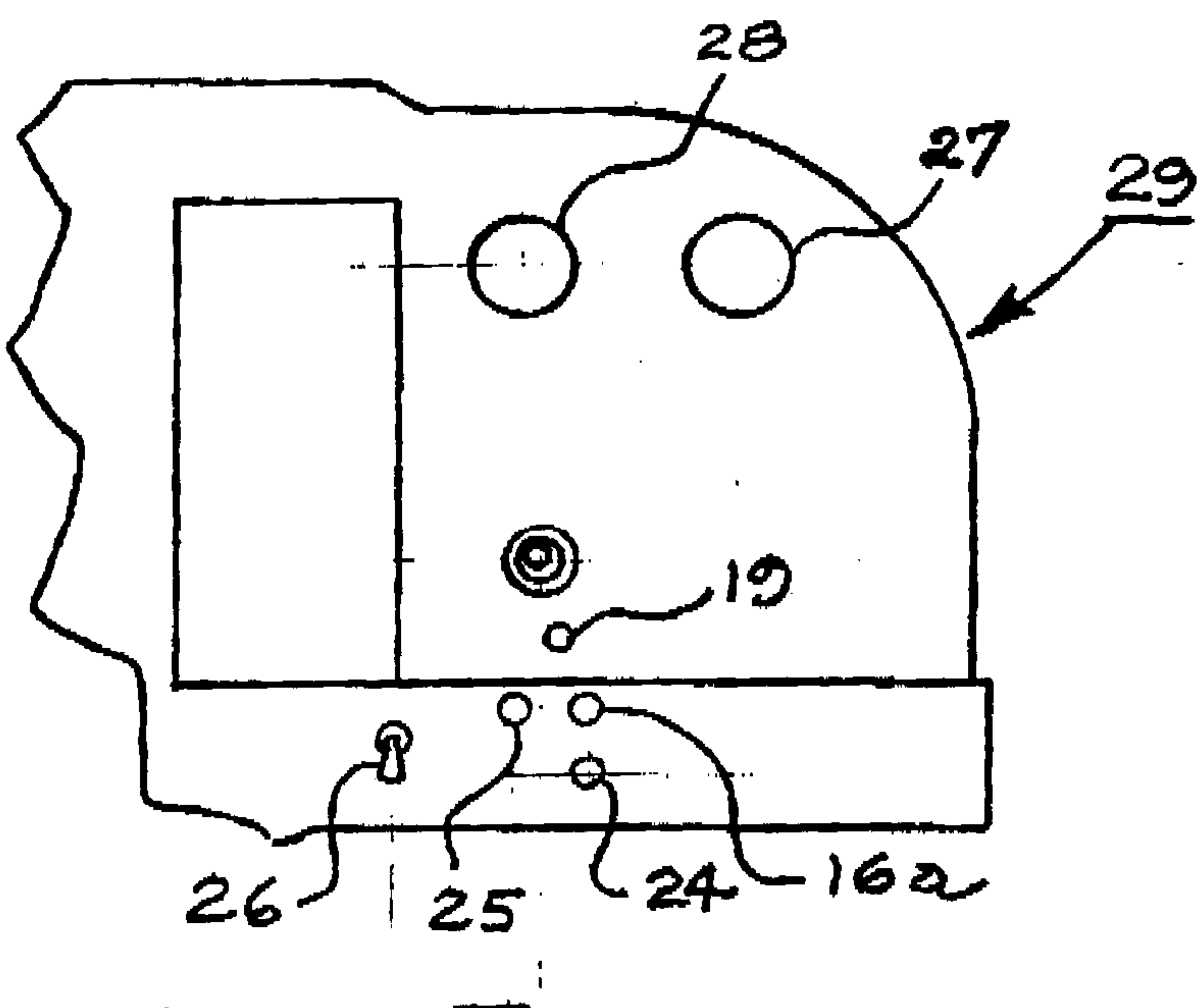

Fig. 3

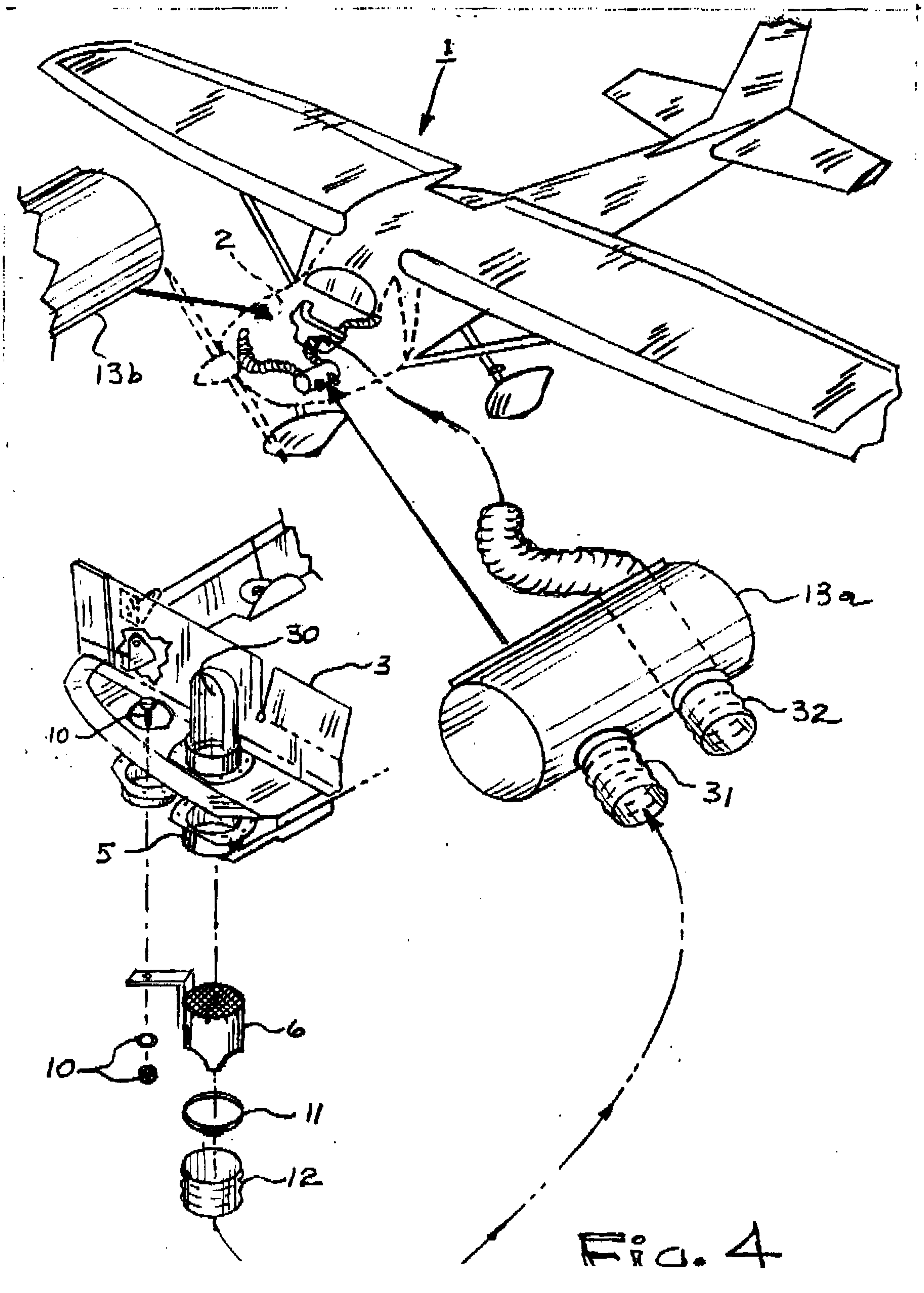

Fig. 4

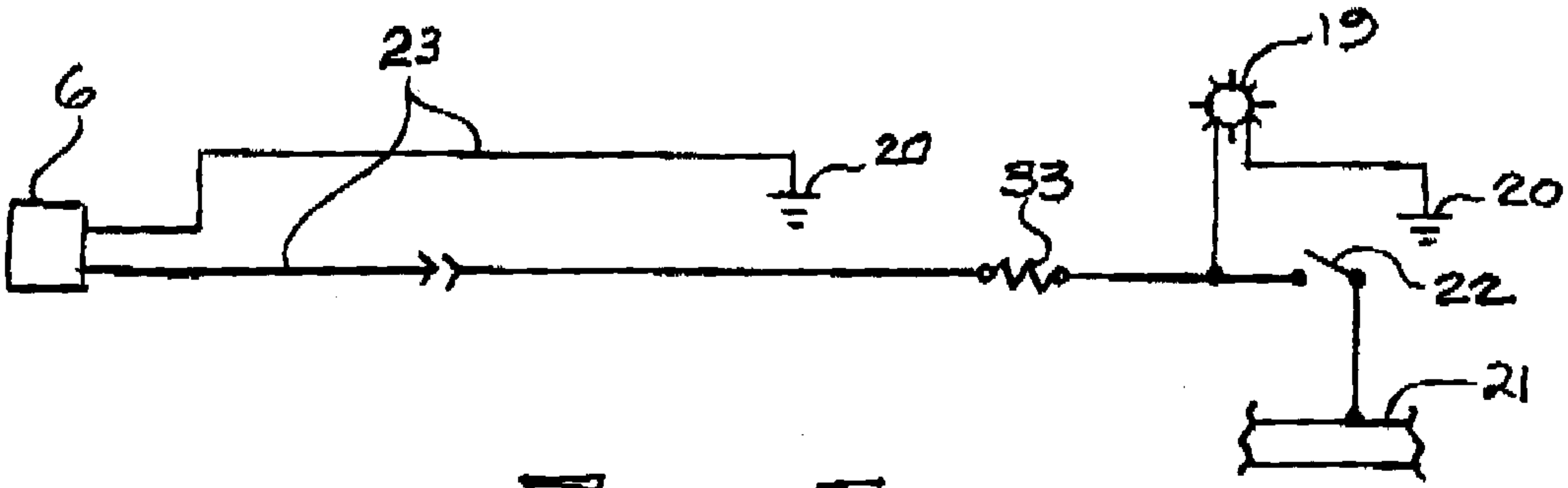
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Fig. 5

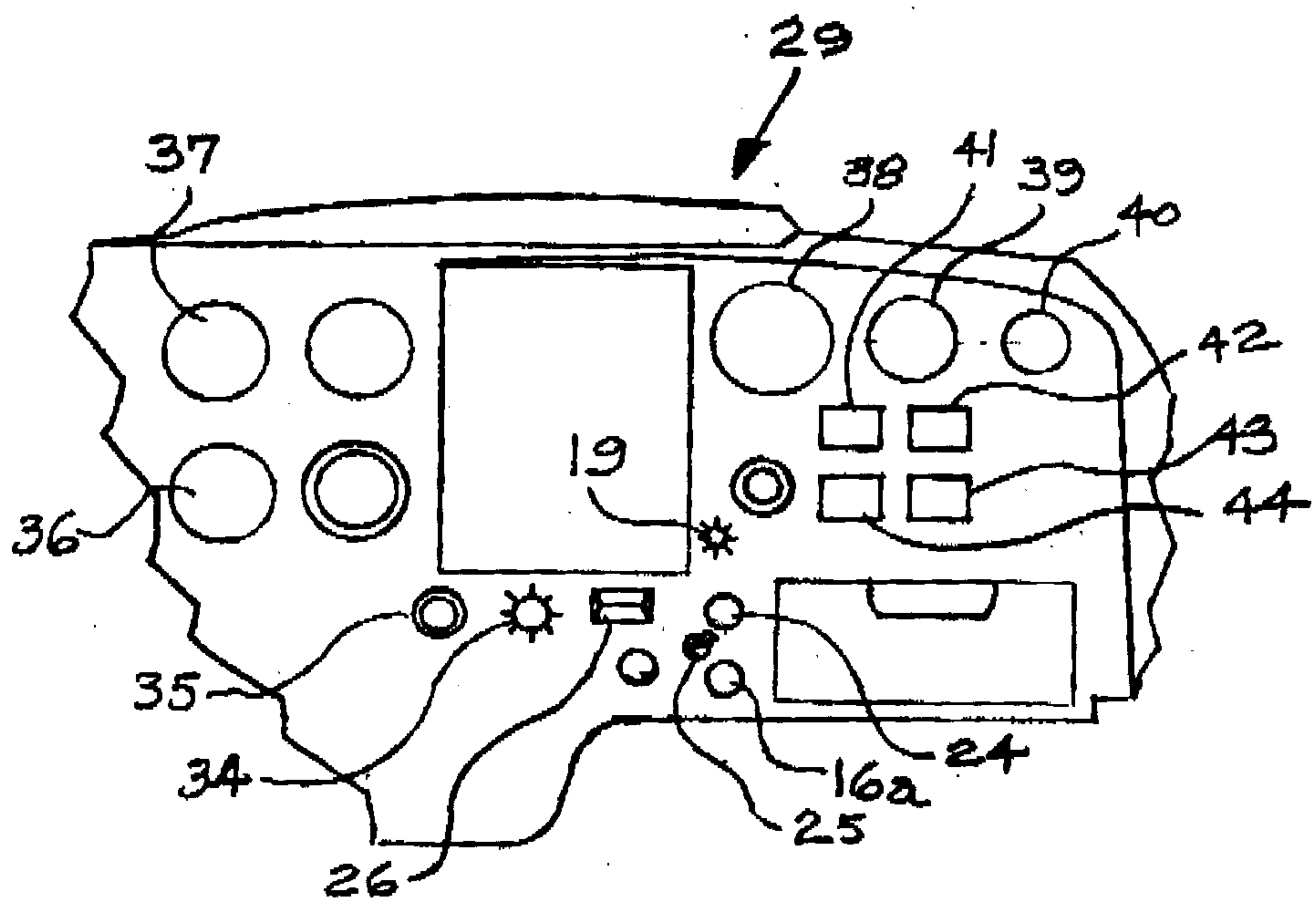
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Fig. 6

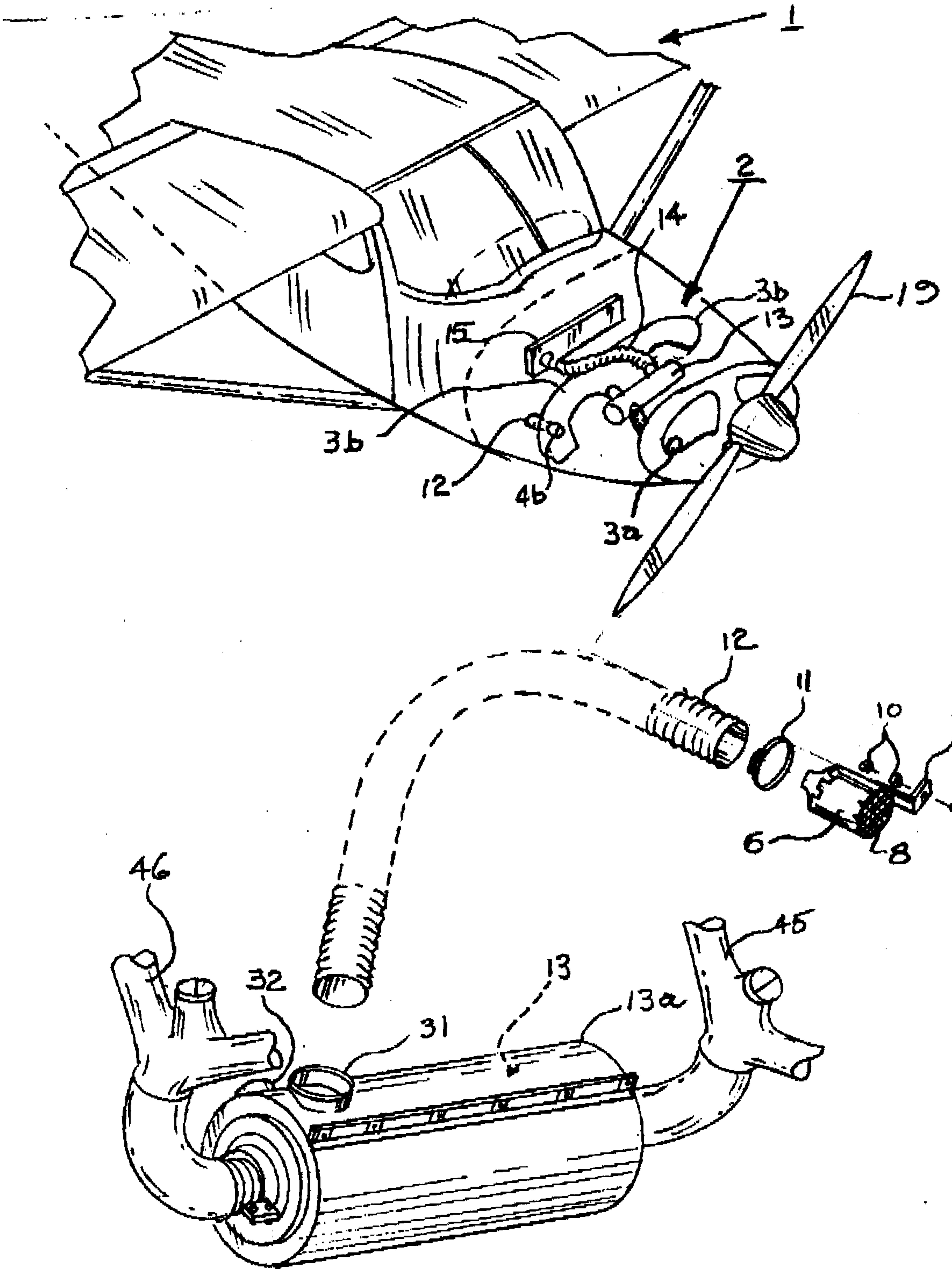


Fig. 7

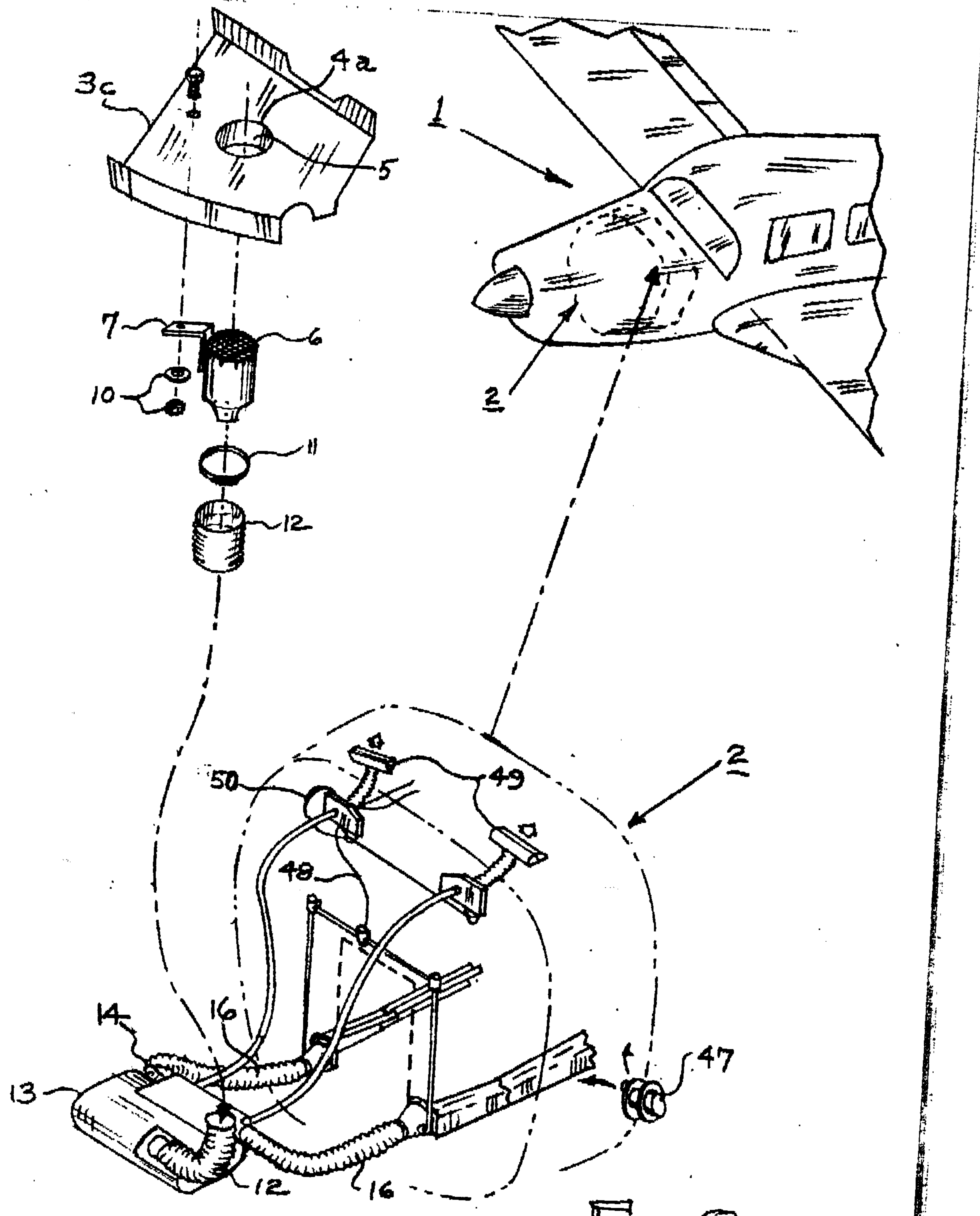


Fig. 8

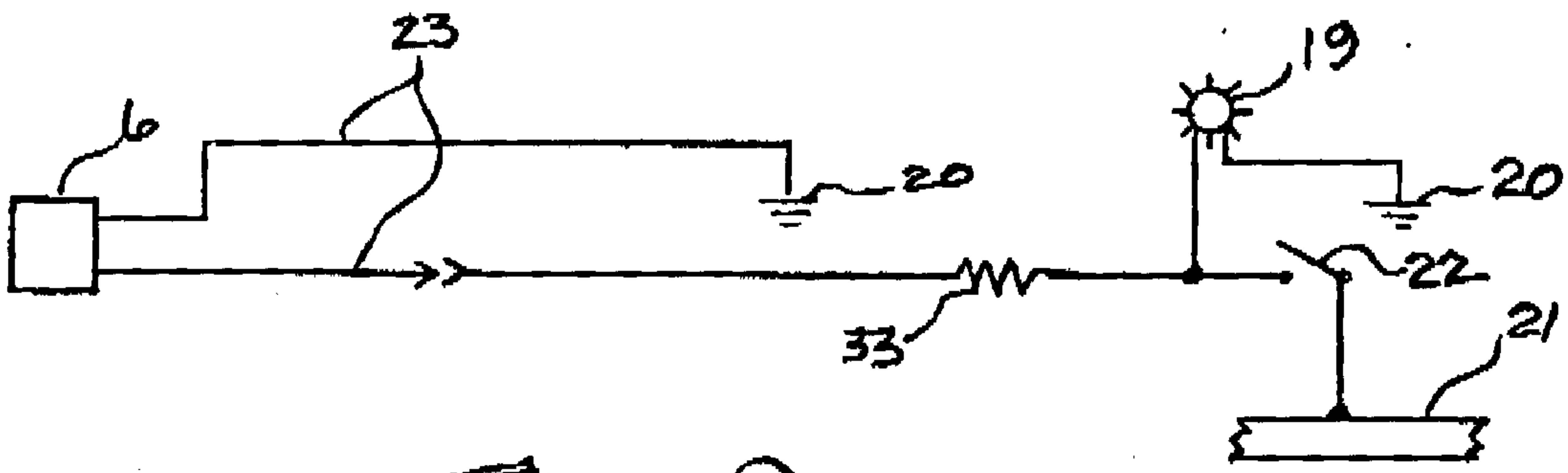


Fig. 9

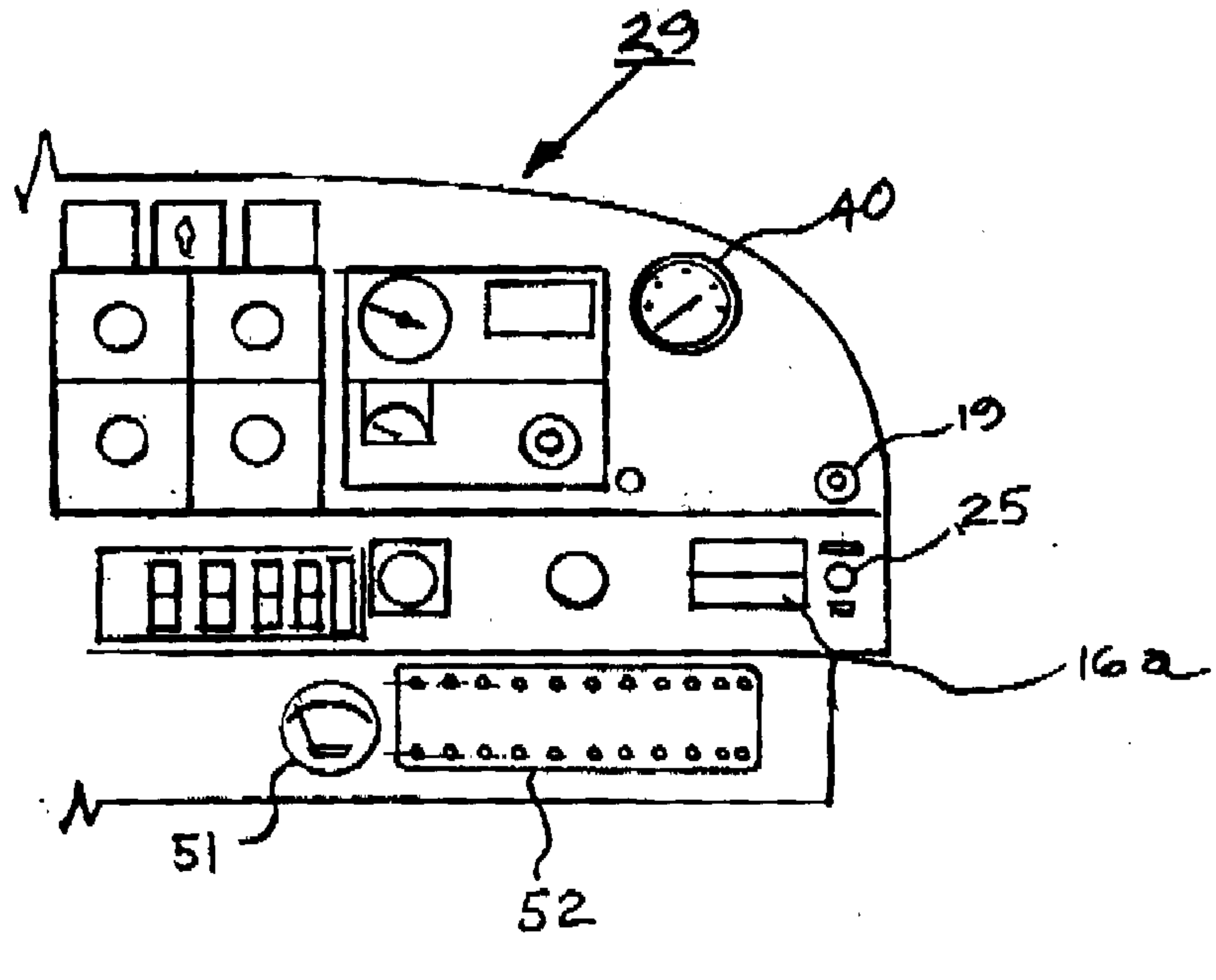


Fig. 10

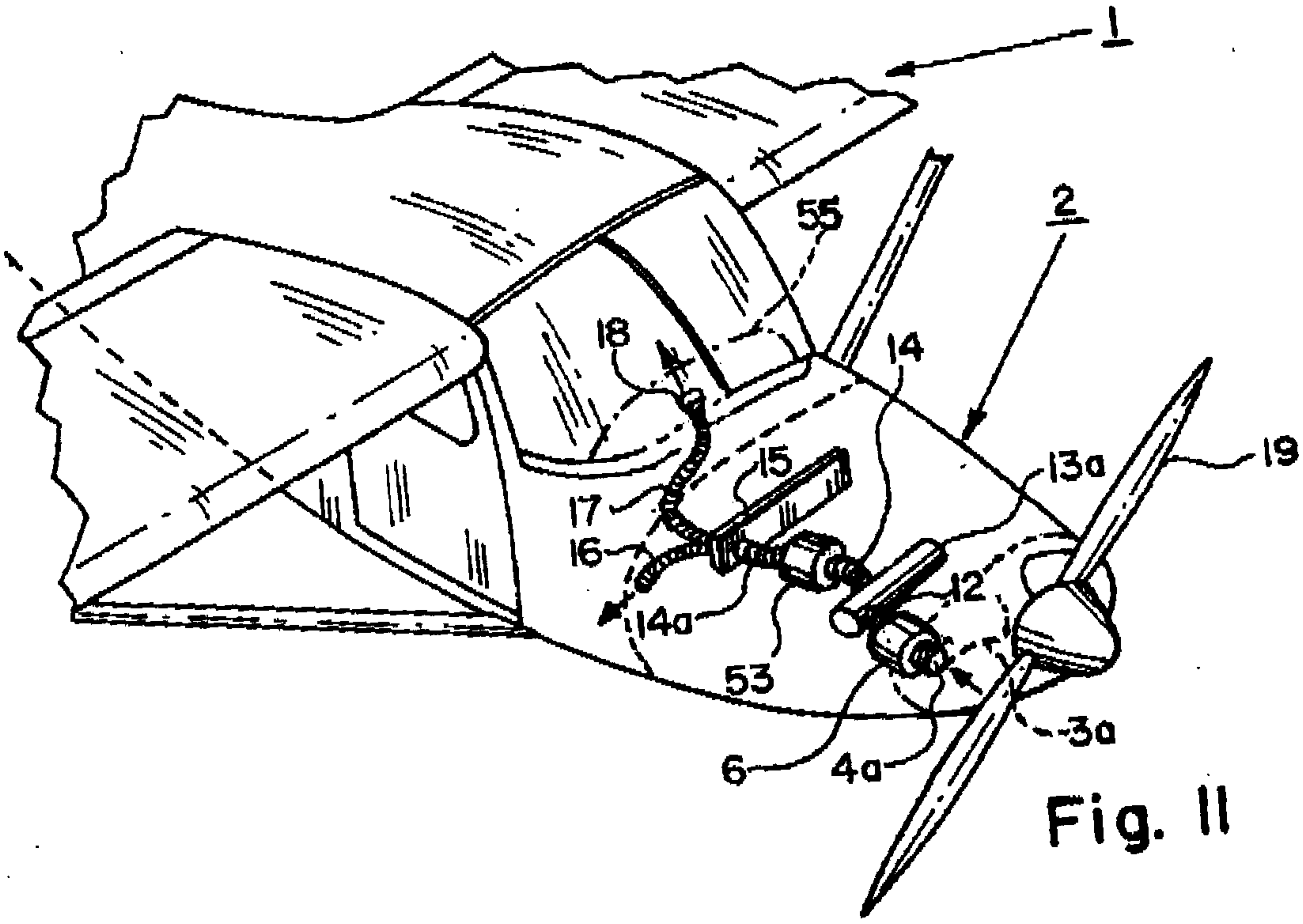


Fig. 11

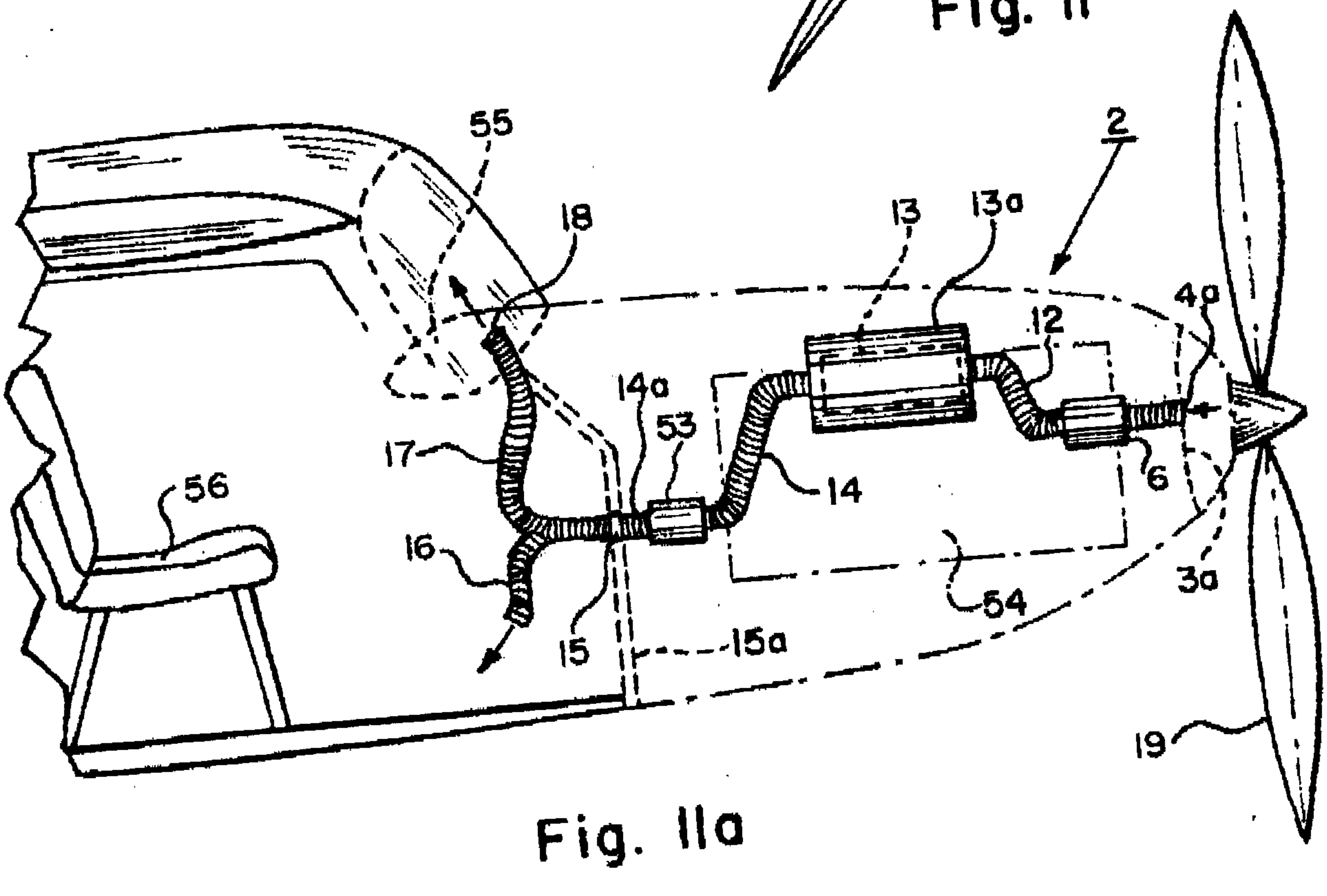


Fig. 11a

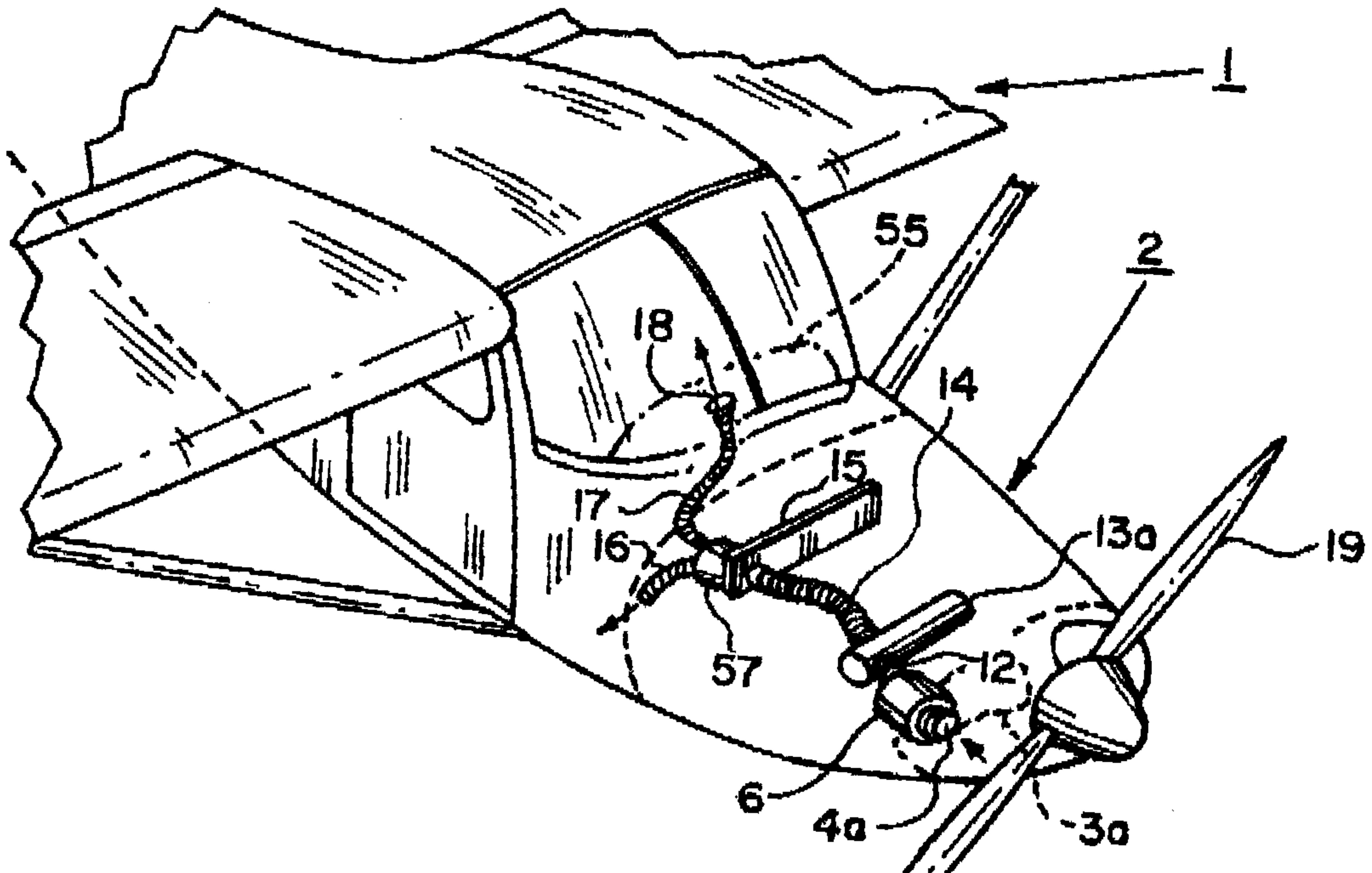


Fig. 12

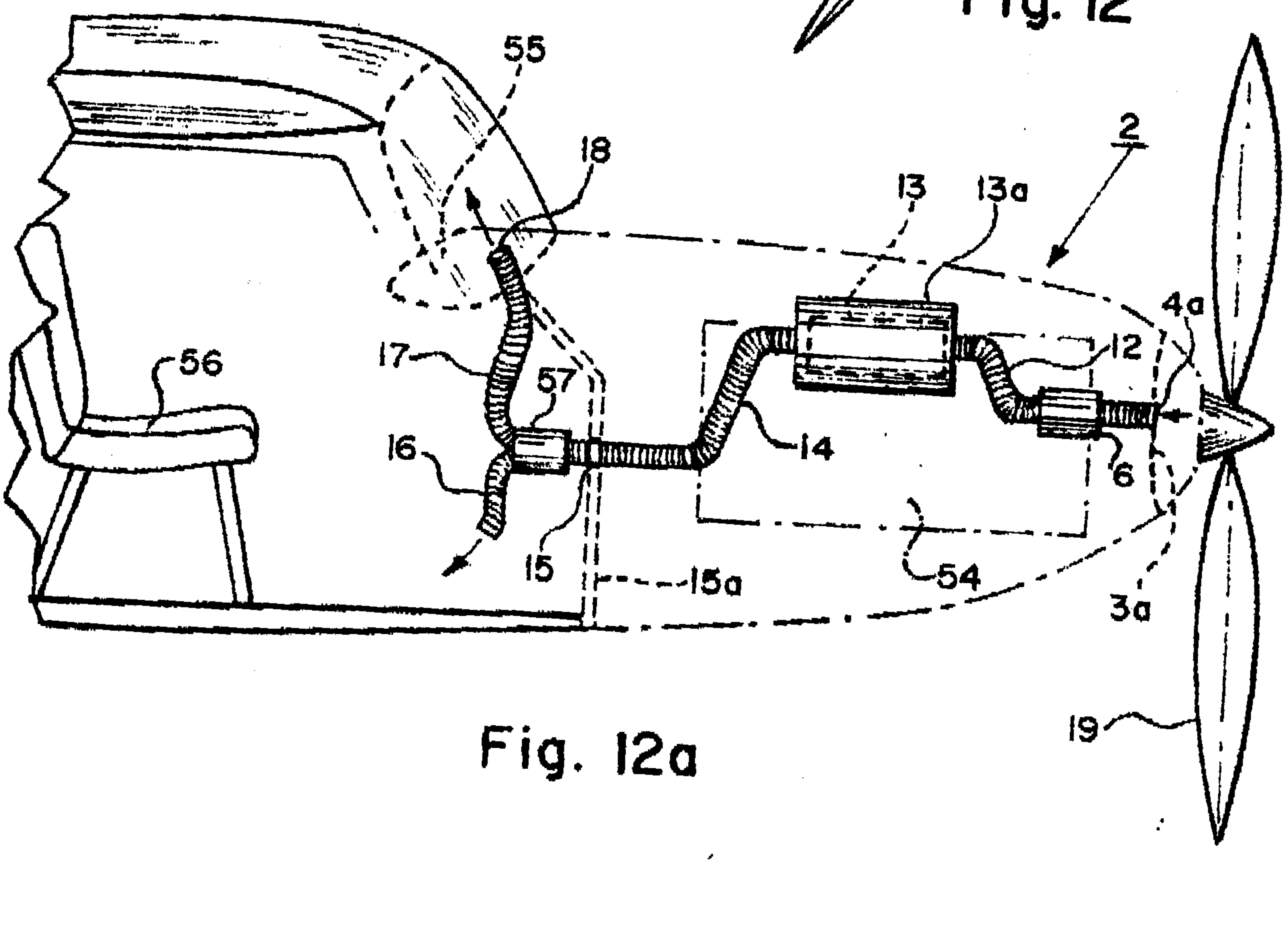


Fig. 12a

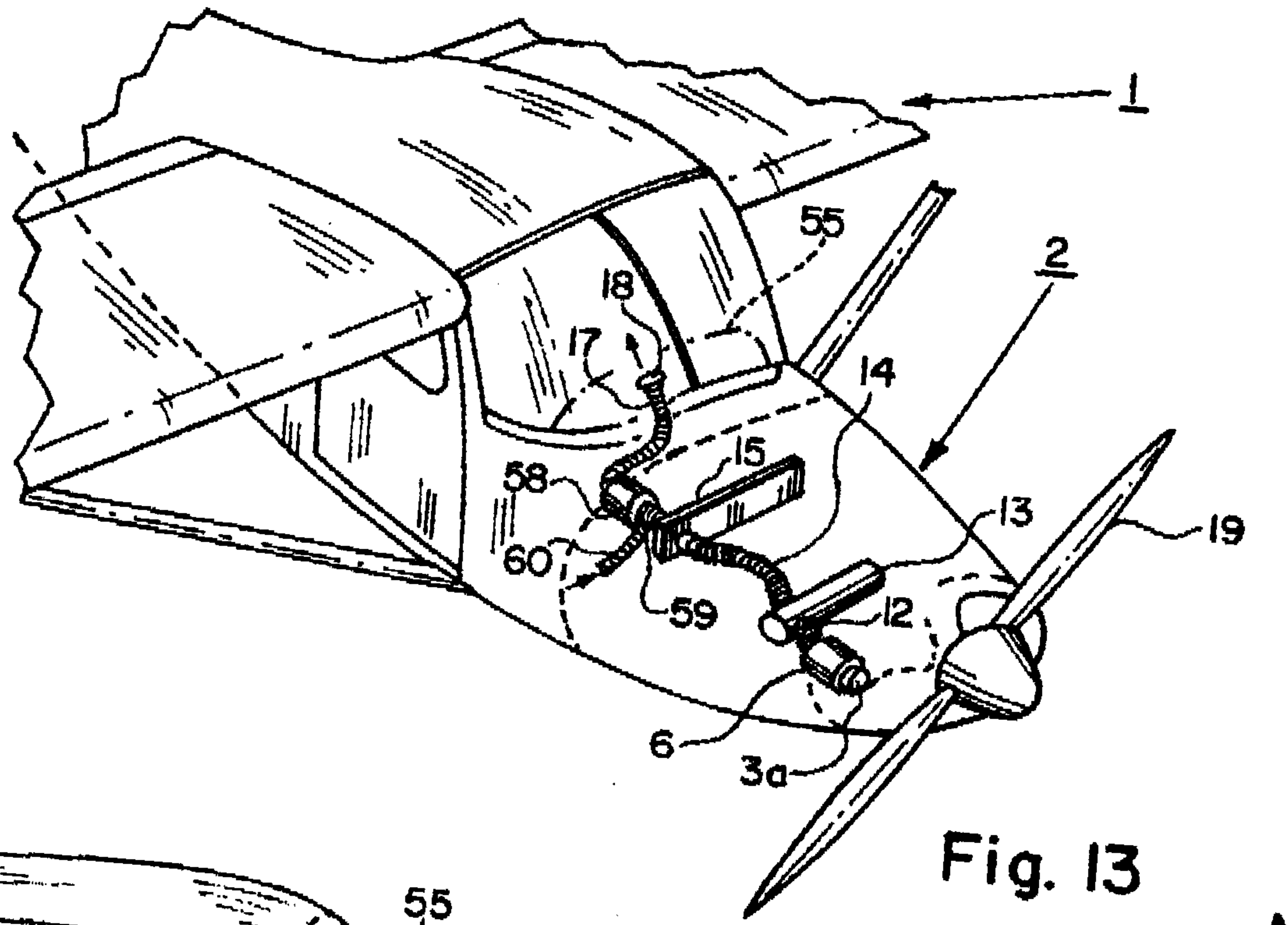


Fig. 13

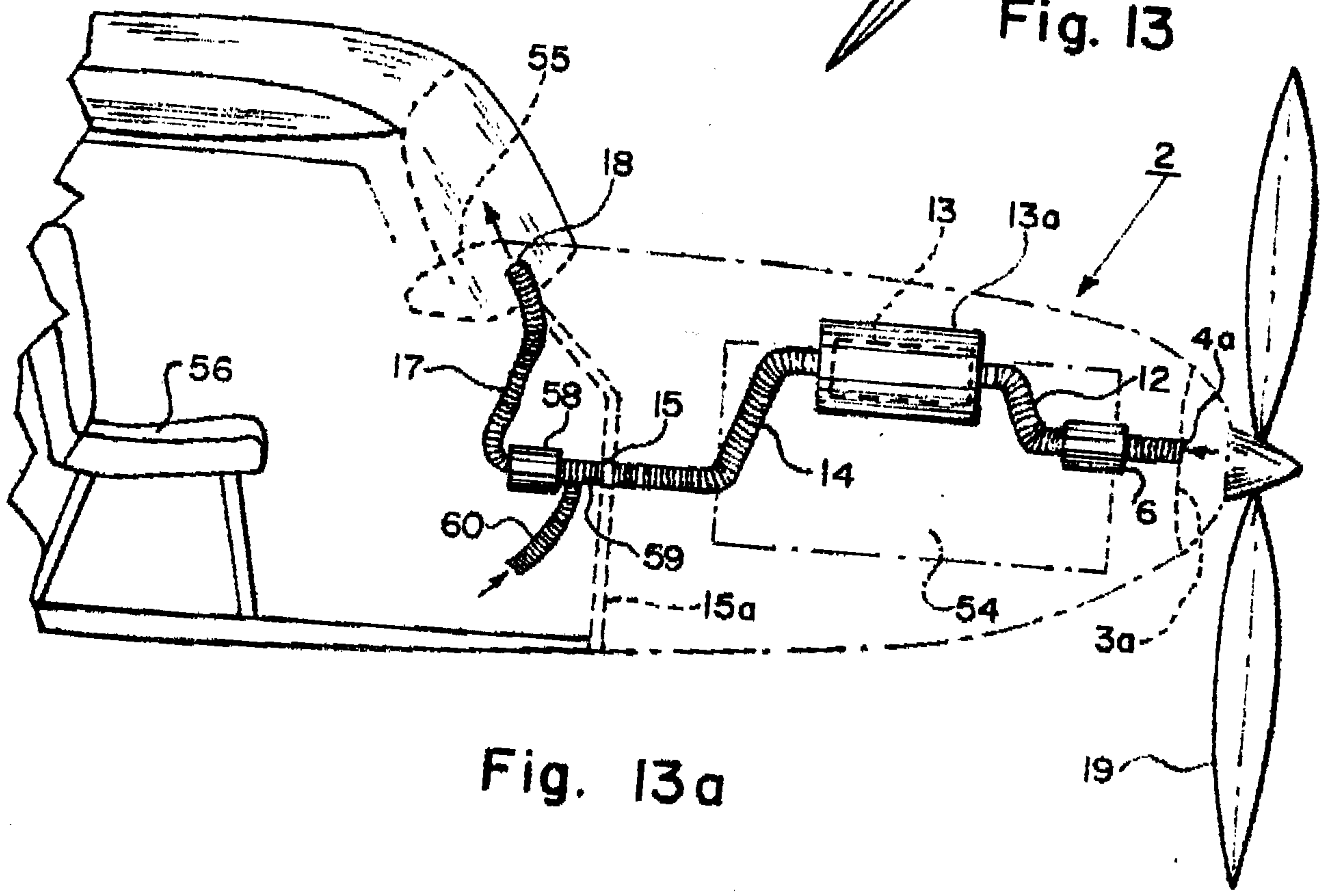


Fig. 13a

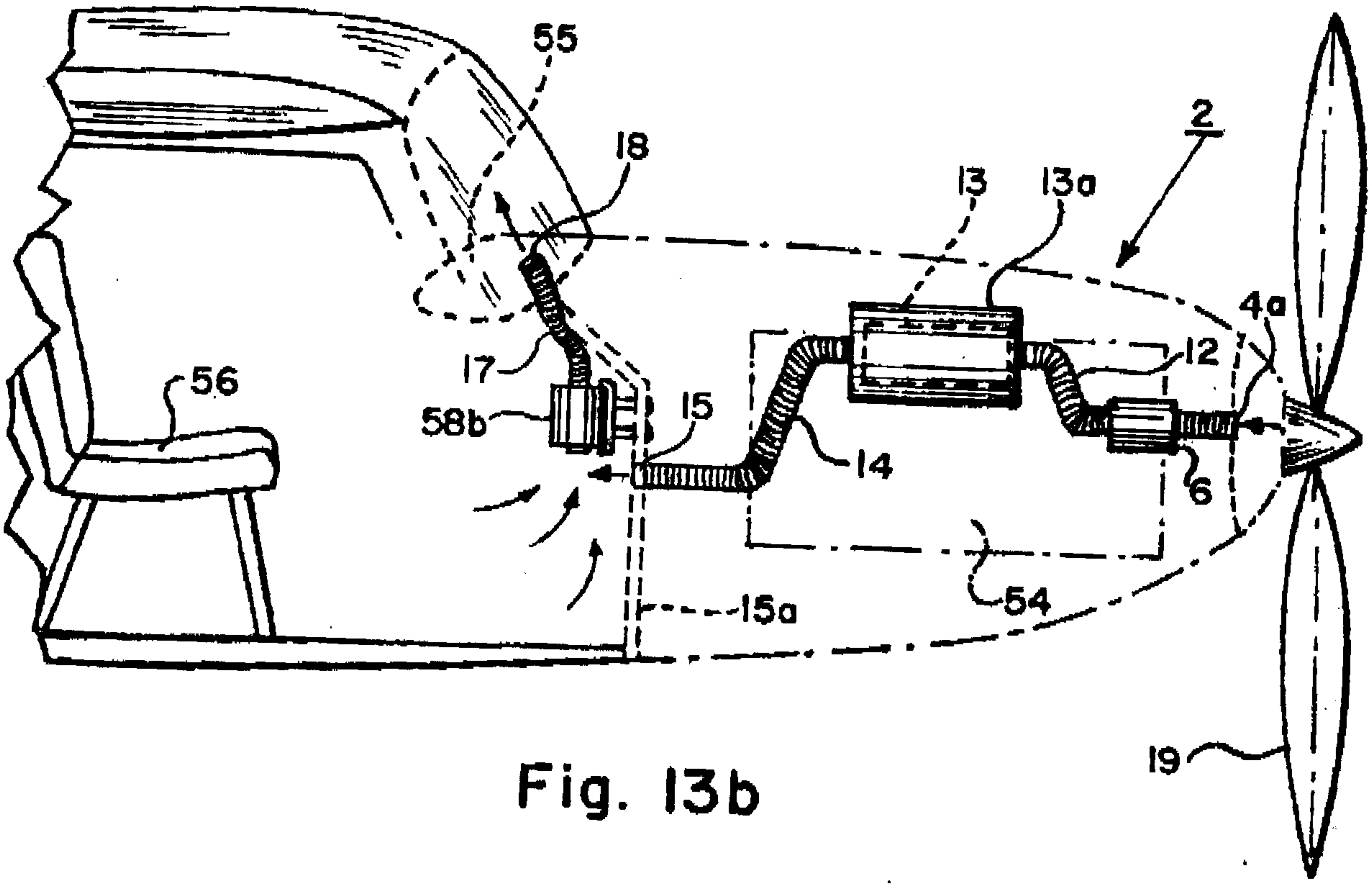


Fig. 13b

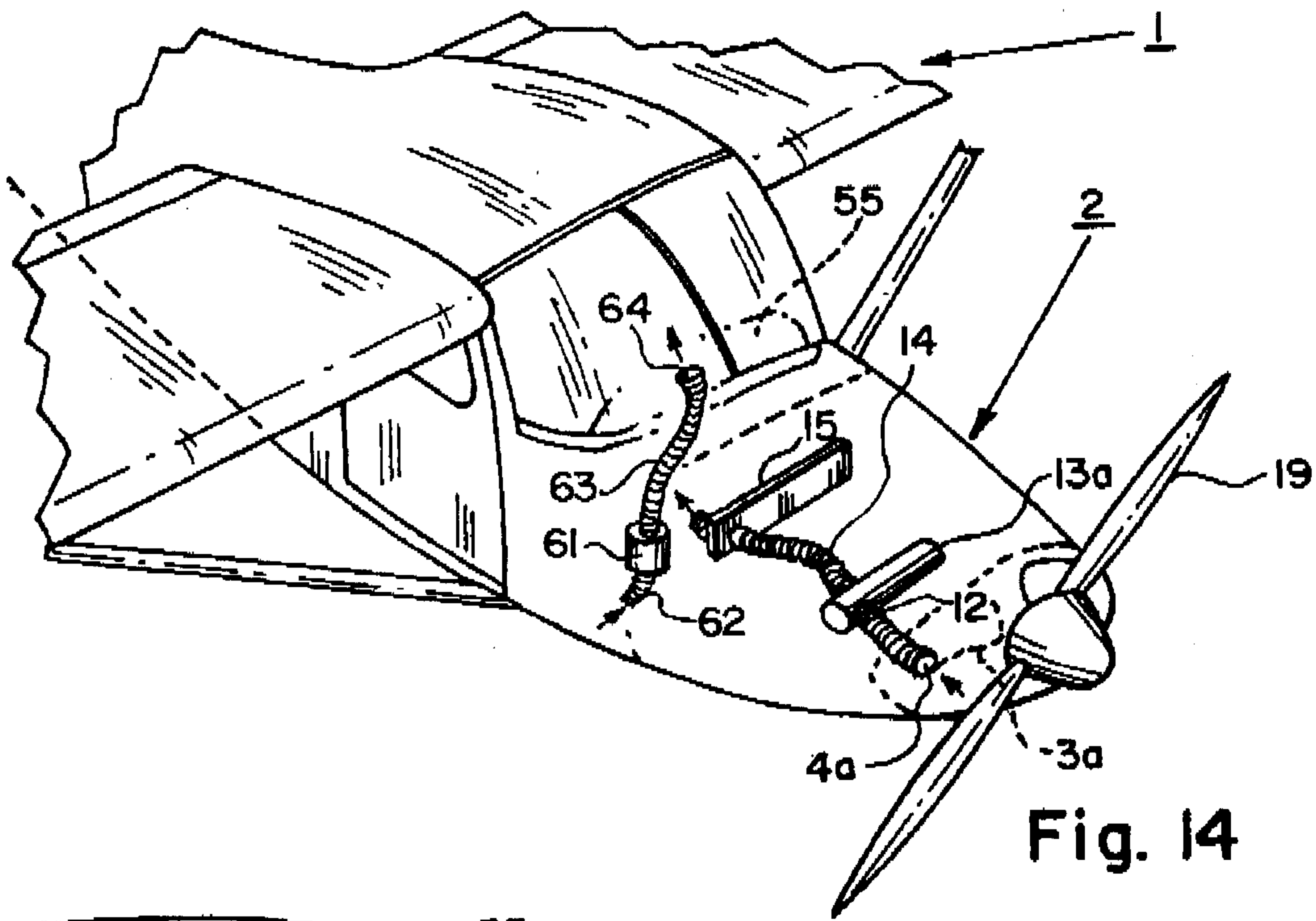


Fig. 14

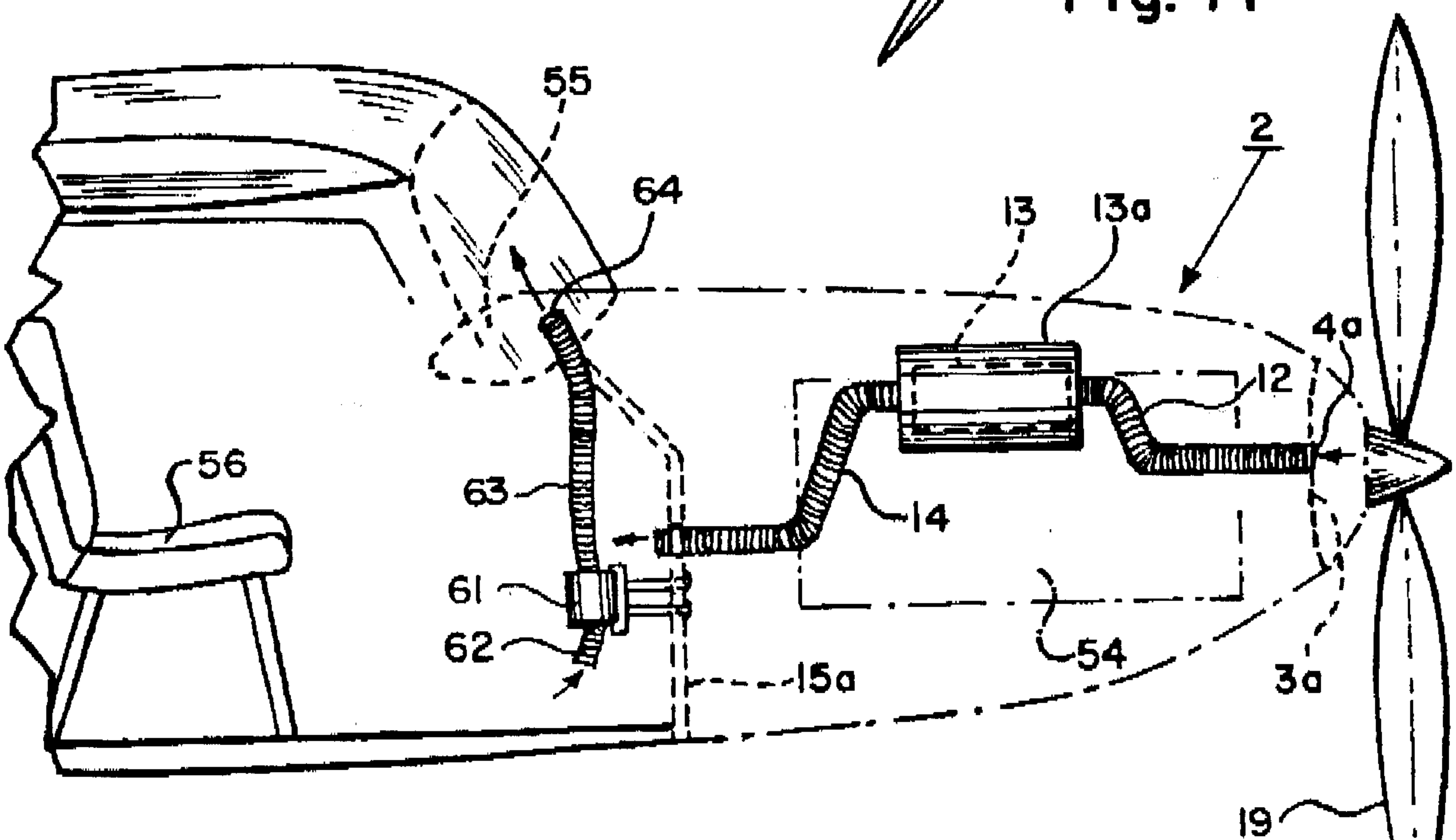
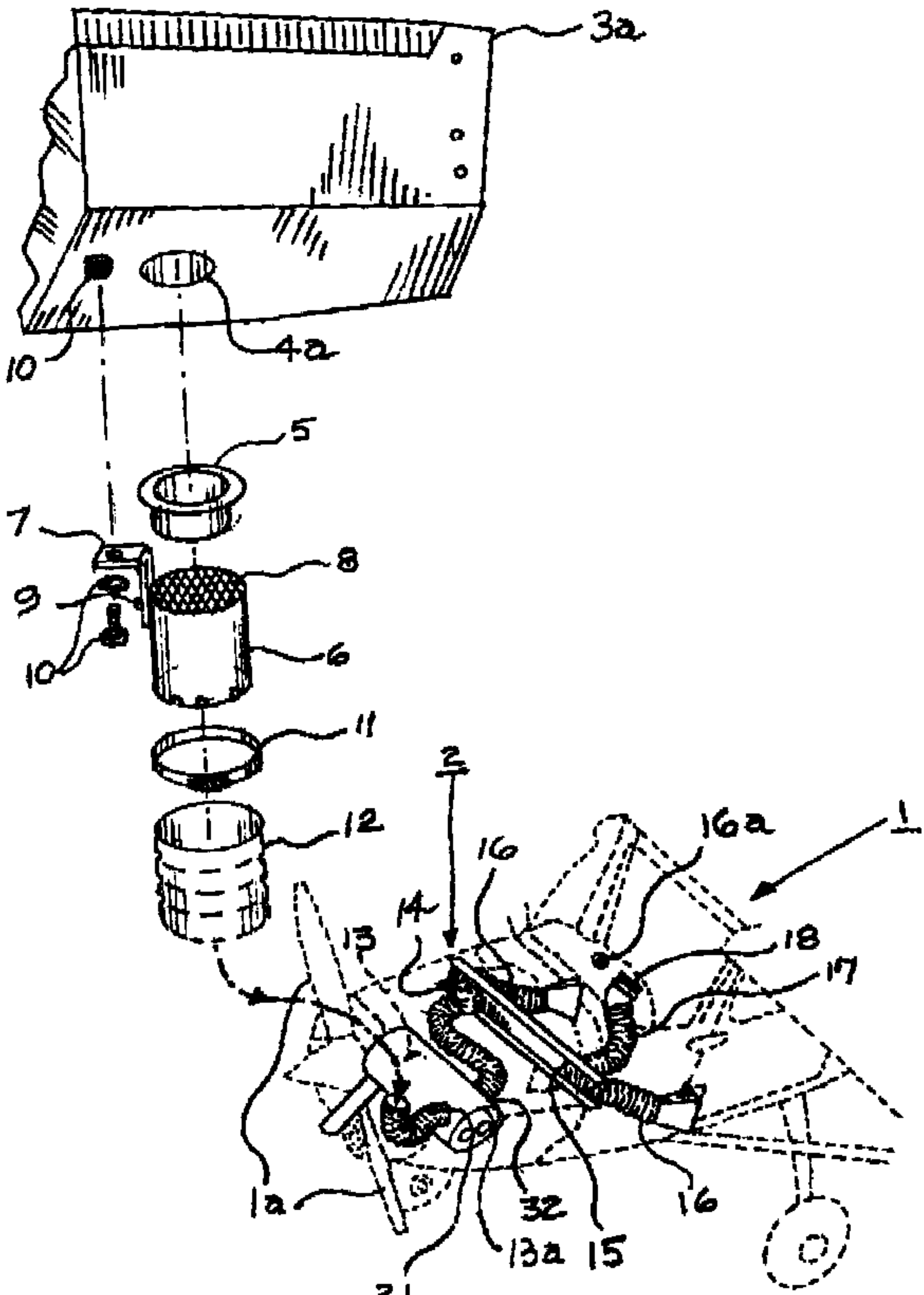


Fig. 14a



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