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Fig. 1

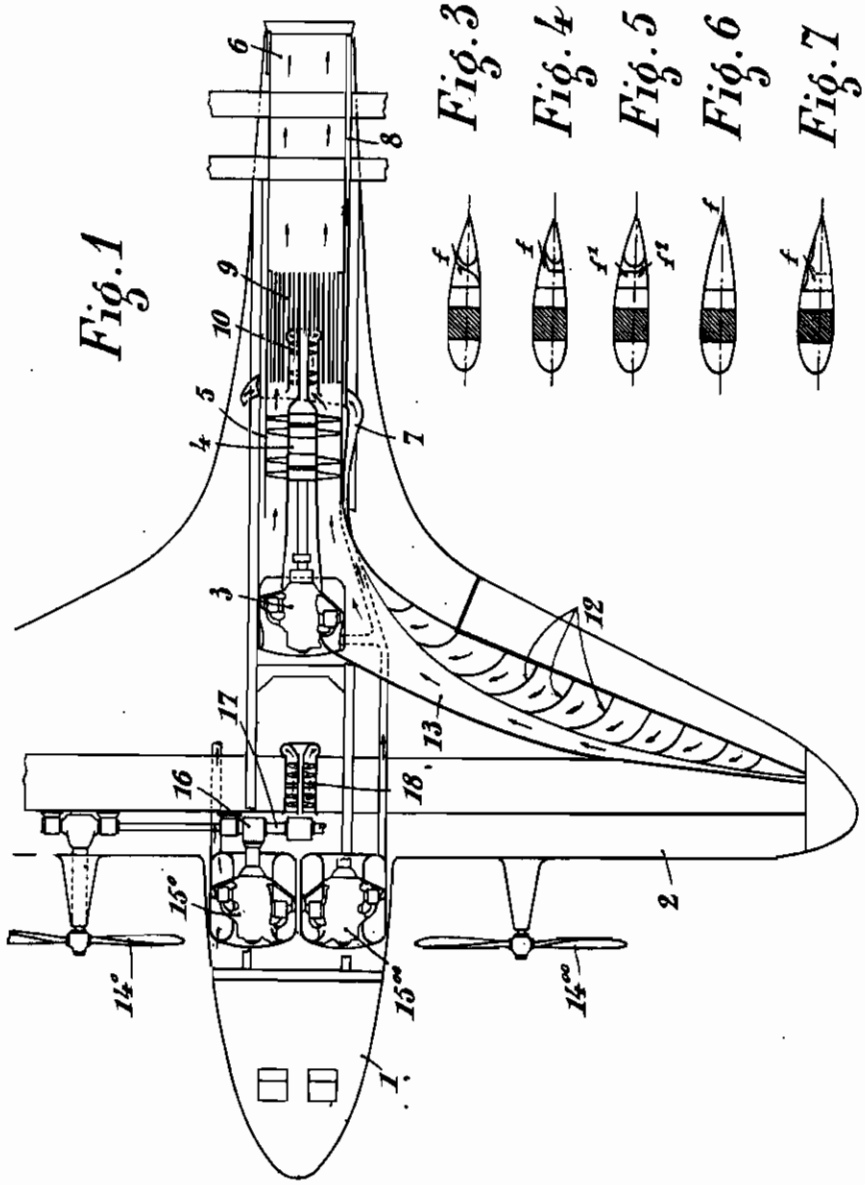

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

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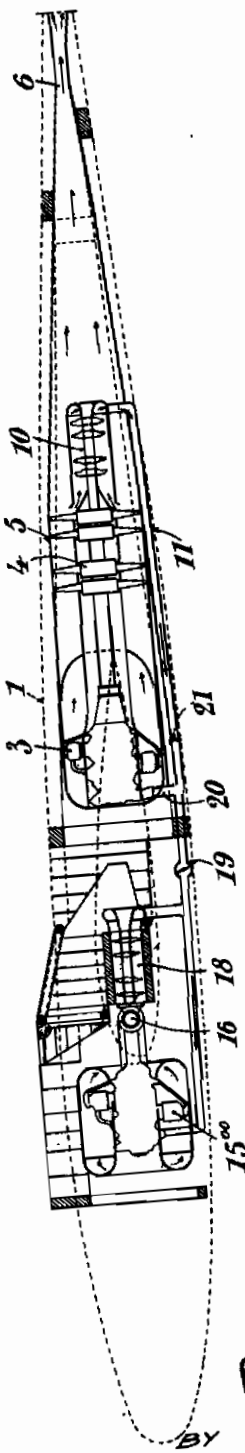
Fig. 2



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ALIEN PROPERTY CUSTODIAN

AIRCRAFTS

Paul Aimé Richard, Clichy, France; vested in the Alien Property Custodian

Application filed June 3, 1941

The present invention relates to aircrafts.

The object of the invention is to provide an aircraft which is better adapted to meet the requirements of practice than those made up to the present time.

According to an essential feature of the invention, the aircraft is provided with motor means for propelling it adapted to suck in a mass of air constituted at least partly by the air driven along by the airplane in its movement and to discharge said air through a nozzle directed rearwardly with respect to the aircraft.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a diagrammatical plan view, with some portions cut away, of an airplane made according to an embodiment of the invention;

Fig. 2 is a vertical sectional view corresponding to Fig. 1;

Fig. 3 is a diagrammatic section of a wing of an airplane according to the invention;

Fig. 4 is a view similar to Fig. 3;

Fig. 5 shows a modification of such a section;

Figs. 6 and 7 are similar views corresponding

The following detailed description will relate to the construction of an airplane according to the invention.

The general structure of this airplane is made of any suitable form, for instance that, illustrated by the drawings, corresponding to a monoplane including a fuselage 1 and a wing 2.

I dispose, for instance, on the inside of this fuselage, at least one engine 3, driving a shaft extending in the rearward direction and carrying a system of inner airscrews or the like 4 which act as a compressor system and are located in a tunnel 5.

This system of airscrews may be of any kind and constituted, for instance, by a plurality of elements some of which are driven by engine 3 in a direction opposed to the direction of rotation of the others.

The suction end of tunnel 5 is connected to inlet orifices provided along the wing or fuselage, in such manner that the air that is sucked in is, at least mostly, constituted by air driven along by the forward motion of the airplane, that is to say air which is substantially stationary with respect to the airplane.

On the other hand, I connect the discharge end of said tunnel 5 to at at least one nozzle 6, directed rearwardly with respect to the airplane. Thus the air compressed in the system of airscrews 4 is discharged into the atmosphere after having expanded in said nozzle. Preferably, this expansion is carried out in thus manner that the velocity of the air leaving the nozzle is zero, that is to say said air is ejected from the nozzle with a relative velocity equal to the translation motion of the airplane with respect to the surrounding atmosphere.

Advantageously, I provide for a heating of the expansion nozzle 6 by the exhaust gases from the engine, which gases are thus cooled.

For this purpose, according to the embodiment illustrated by the drawings, I feed the exhaust gases through a conduit 7 to a jacket 8 surrounding nozzle 6 as far as the rear edge thereof along which the cooled burnt gases escape through another nozzle the walls of which are arranged in such manner as to produce a suction sufficient for compensating for the pressure drops occurring in the exhaust circuit above described.

Fins 9 carried by the wall forming a partition between jacket 6 and the nozzle, either on the inner face of said wall or on the outer face thereof, or again on both of said faces, facilitate the exchange of heat between the burnt gases and the air that is discharged to the outside.

Such an arrangement seems to be particularly efficacious for recuperating the energy of the exhaust gases because it permits of transferring the heat of the exhaust gases to a fluid under a pressure sufficient so that its rise of temperature is capable of substantially increasing the rate of flow after expansion.

Finally, in order to supercharge engine 3, I may proceed as follows:

a.—either by sending a portion of the airstream compressed by the system of airscrews 4 to said engine for the feed thereof;

b.—or by subjecting a portion of this air stream to further compression in a compressor 10, including for instance a rotor analogous to the system of airscrews above mentioned.

In the latter case, this second compressor is advantageously fixed to the end of the rearwardly extending shaft, after system 4.

A conduit 11 serves to feed the compressed air to the engine.

Concerning the inlet orifices for the air sucked in by the system of airscrews 4, they are advantageously distributed over the whole span of the wing, and they are constituted by at least one

slot made, for instance, according to one of the arrangements illustrated in a diagrammatic manner by Figs. 3 to 7.

In the arrangement of Figs. 3 and 4, the air that is sucked in enters, at the upper part of the interval existing between wing 2 and the corresponding aileron, in the direction shown by arrow *f*, that is to say frontwardly and downwardly.

In the arrangement of Fig. 5, the air enters through two slots located one at the upper part and the other at the lower part of the same intervals, along directions shown by arrows f^1 and f^2.

In the arrangement of Fig. 6, the air in question penetrates through a slot provided along the trailing edge of the wing.

Finally, in the arrangement of Fig. 7, the air penetrates through a slot located at the rear part of the wing upper side, in a frontward and downward direction (arrow f^1).

In all cases, guiding surfaces 12 will be provided for a correct flow of the air streams into the channel 13 which connects the inlet slot with the inlet of tunnel 5, and this channel must form a gradual curve, being advantageously housed in the wing portion joining the trailing edge with the fuselage.

Advantageously, the propelling system which has been described is combined with another propelling system including external airscrews of the usual type, located either ahead of, or behind, the wing.

For instance, as shown by the drawing, I provide two propellers or external airscrews 14^0 and 14^{00} on either side of the fuselage, respectively.

These propellers may be driven as follows:

a. Either directly by engines of the conventional streamlined type carried by the wing;

b. Or, as shown by the drawings, by engines 15^0, 15^{00}, housed in fuselage 1, with the interposition of a transmission 16.

In this last mentioned embodiment, I advantageously provide a transverse transmission shaft 17, common to both of the propellers, a freewheel device being interposed between each engine and this transverse shaft, in order to avoid driving an engine which has undergone breakdown.

Of course, these two last mentioned engines 15^0 and 15^{00} may be connected:

a. On the one hand to the conduit 11 for feeding air under pressure to engine 3; and

b. On the other hand to the exhaust conduit 7 of said engine 3.

But advantageously, I provide a compressor 18 driven by transmission 18 and connected to conduit 11 ahead of a stop valve 19 itself located ahead of the conduit 20 which connects conduit 11 with the engine 3. Another stop valve 21 may be provided in conduit 11 behind conduit 20.

It is thus possible, at small height and moderate speeds, to utilize compressor 4, 10 driven by engine 3 which actuates the propelling means the efficiency of which at moderate speeds is not so good.

On the contrary, at high speeds, compressor 18 will be used preferably because in this case it becomes difficult to use the whole power of the engines on the external propellers.

Always for the same reasons, i. e. in order to obtain the best possible total efficiency, it will be advantageous to mount airscrews 4 and 14^0, 14^{00} in such manner that they can be disconnected from their driving means. The same is true of compressors 10 and 18. Furthermore, the various airscrews should be of the variable pitch type.

Whatever be the particular embodiment that is chosen, the operation and advantages thereof result sufficiently clearly from the preceding explanations for making it unnecessary to enter into further description.

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