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ASSOCIATION ON FLYING MACHINE OF COMPRESSOR-JET
UNITS WITH RAM-JET UNITS
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Fig. 1

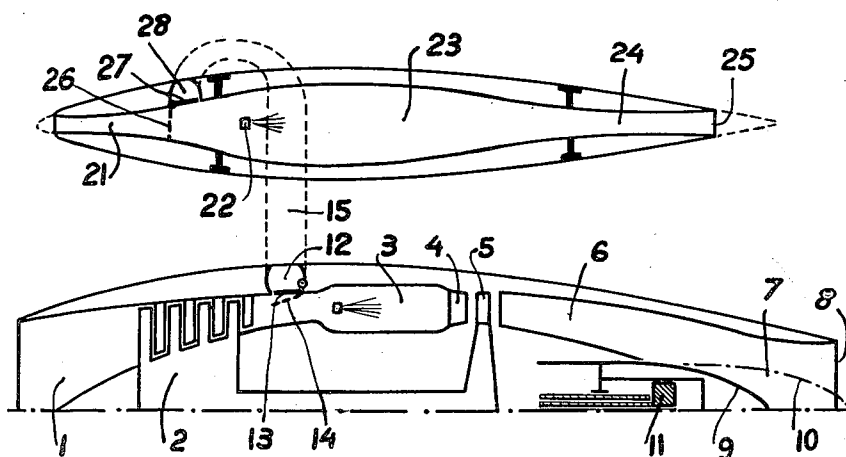
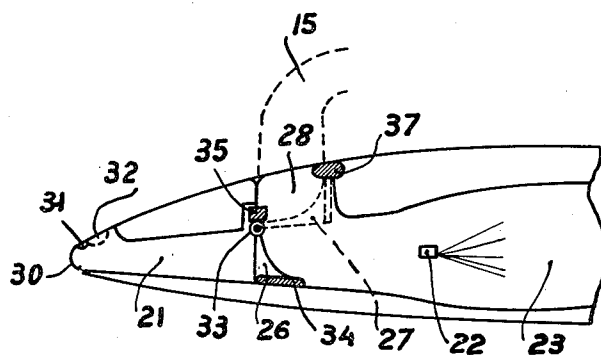


Fig. 2



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ASSOCIATION ON FLYING MACHINE OF
COMPRESSOR-JET UNITS WITH RAM-
JET UNITS

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2 Claims. (Cl. 60—35.6)

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Jet engines of the kind comprising an air compressor driven by a reciprocating engine or by a gas turbine are outclassed nowadays by ram-jet units at very high speeds, but the latter through their very nature show a poor efficiency for any speeds that do not reach considerable values so that they cannot provide any propelling lift when stationary and consequently cannot start the flying machine for taking off. A special propelling system is therefore required for supplementing them in such cases.

My invention relates to the associated application, with a view to a very high speed of flight, of ram-jet units with compressor jet units of the first type cited above. It consists when the direct collection of air by the ram-jet units is not sufficient for producing a compression ensuring a suitable efficiency of said unit, in feeding the latter with compressed air from the delivery end or an intermediary stage of the air compressor of a compressor-jet unit of the first type while the front intake of air of the ram-jet units is then closed. The ram-jet unit or units thus fed increase the thrust exerted by the first apparatuses incorporating a mechanical compressor, which latter ensure chiefly the speeding up of the flying machine and may furthermore cooperate in its propulsion up to its highest speeds.

The jet units of any kind being particularly suitable for the suction of the boundary layers on the surfaces of the flying machine, chiefly through the agency of an ejector associated with the exhaust according to applicant's copending application Serial No. 37,327, filed July 7, 1948, and entitled "Improvements in means for sucking in the boundary layers on the surfaces of reaction jet flying machines," the present invention covers also the simultaneous application of such sucking means both to the jet units incorporating mechanical compressors as to the ram-jet units associated therewith. This leads in particular to the possibility of providing advantageously for the suction of the boundary layers at various points of the flying machine through the ram-jet units operating directly or else, according to circumstances as provided for by the invention, fed with compressed air; said ram jet units show the advantage of being located as required by reason of their small bulk and weight very near the suction slots for the boundary layers and of exhausting the air sucked in in the very wake of the wing portions, tail fin or fairing from which the boundary layer has been removed.

My invention covers also the use of at least part of the jet of a ram-jet unit provided with

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a double alternative feed as defined hereinabove and housed inside a wing or tail fin for producing a blast of air on the leading edge of a high-lift flap or of a controlled flap. As my invention allows ensuring even at low speeds the feeding of a ram jet unit, such a blowing of air is thus useful at such speeds where the high lift effect is particularly sought for, chiefly for taking off or landing or a lighting on sea.

The following description and accompanying drawing will allow ascertaining how my invention may be executed, the features appearing both in the drawing and in the specification forming obviously part of said invention. In said drawing:

Fig. 1 illustrates diagrammatically an embodiment of a conventional turbo-jet unit shown merely in axial half cross section as associated with ram-jet unit in the sails or wings.

Fig. 2 is a view on an enlarged scale of the front portion of the ram-jet units forming part of the preceding arrangement.

Returning to Fig. 1, it shows by way of example a turbo-jet unit of the direct flow type with a front intake of air at 1, an axial compressor 2, combustion chambers 3 and gas turbine 4—5 adapted to drive the compressor. On the downstream end, the nozzle 6—7 provides for the exhaust of the reaction jet through the rear cross section 8. In order to modify the kinetic power of the jet according to the useful power required for the turbine, the cross section 8 may be adjusted through any suitable means such as a hollow needle valve 9 that is allowed to slide between the position illustrated in solid lines and the position shown in dot and dash lines at 10 through the agency of the pressure of oil located on either side of a stationary inner piston 11, said pressure being adjusted by means of a distributor that may be controlled automatically or otherwise.

At the delivery end of the compressor 3, a removal of air is made possible through the operation of movable shutters or valves, the outline of which is designed so as to restrict to a minimum the eddies and losses of load in the main flow of air and in the shunt flow. I have illustrated in Fig. 1 an embodiment of such a shutter constituted by a flap valve 13 adapted to move into the position 14 according to the output to be obtained. This flap valve shunts off a part of the flow of compressed air into a chamber 12 in relationship through the pipes 15 illustrated in broken lines and embedded inside the body of the flying machine, with a corresponding cham-

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ber 28 upstream with reference to the burners 22 of the ram-jet unit 21, 23, 24 shown cross sectionally, said unit being housed inside the thickness of a wing.

When this ram-jet unit is to be fed by the compressor 2 of the turbo-jet unit, its diffuser 21 is closed by the shifting of the movable shutter 26, that closes otherwise the connection of pipes 18 and chamber 28 with the ram-jet unit.

Fig. 2 illustrates on a larger scale an example of execution of the double feed provided for the ram-jet unit.

The normal air intake assuming the shape of a front intake slot in the leading edge of the wing may be closed by a cover or shutter such as 30 pivotally secured at 31 and that when shifted away from the opening at 32 opens wide the input into the ram-jet unit. At the same time the flap or shutter 26 pivotally secured at 33 closes fluid-tightly through the agency of an elastic packing such as 34 and 35 the diffuser and sets the compartment 28 fed by the compressor of the turbo-jet unit in communication with the combustion chamber 23 of the ram-jet unit.

The association of the turbo-jet unit and ram-jet unit fed in the manner disclosed forms thus a reaction jet plant with a double flow of air, the separation between the flows being obtained through a control of the communication established between chambers 28 and 23.

At higher speeds, the flap valve 26 recedes into the position 27 in which position it bears against a fluidtight packing 37 and it is locked in said position through any known or suitable means. By closing the valve 13 the communication between the fluidtight chamber 28 and the delivery end of the compressor of the turbo-jet unit is shut off, the shutter 30 being moreover open.

What I claim is:

1. In an aircraft a propelling plant comprising in combination: a ram-jet unit adapted for producing by itself a propelling thrust at high speed of flight and having a stationary fore-aft duct

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which includes an air inlet front section opening into the atmosphere, a rear discharge jet section and a combustion chamber between said sections, a compressor-jet unit for producing a propelling thrust at least for the taking-off of the aircraft and having an air compressor, power means for driving the same and a rear discharge nozzle, piping means connecting the delivering side of said compressor to a point in said duct located between said inlet front section and said combustion chamber, valve means for controlling the output of air under pressure delivered by said compressor into said piping means, valve means associated with said inlet front section forwardly of said point for opening or closing said inlet front section, and other valve means arranged at said point for closing and opening said piping means at their junction with said duct.

2. The combination of claim 1 wherein said last-named valve means comprise an oscillating shutter pivotally mounted in said duct forwardly of the junction of said piping means and said duct, said shutter being adapted for closing said piping means when it opens the front section of said duct and inversely for opening said piping means when it closes said front section.

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