Oct. 7, 1952 W. L. TENNEY 2,612,722

MODEL JET AIRPLANE

Filed July 10, 1947 2 SHEETS—SHEET 1

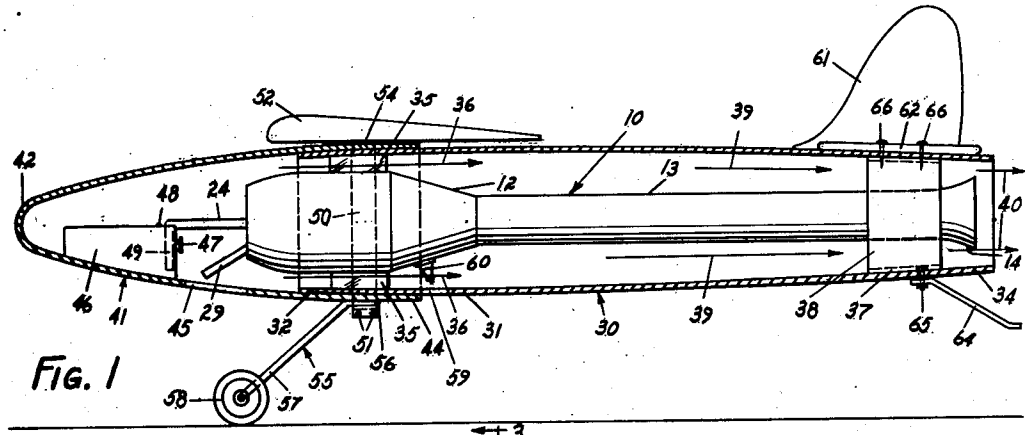


FIG. 1

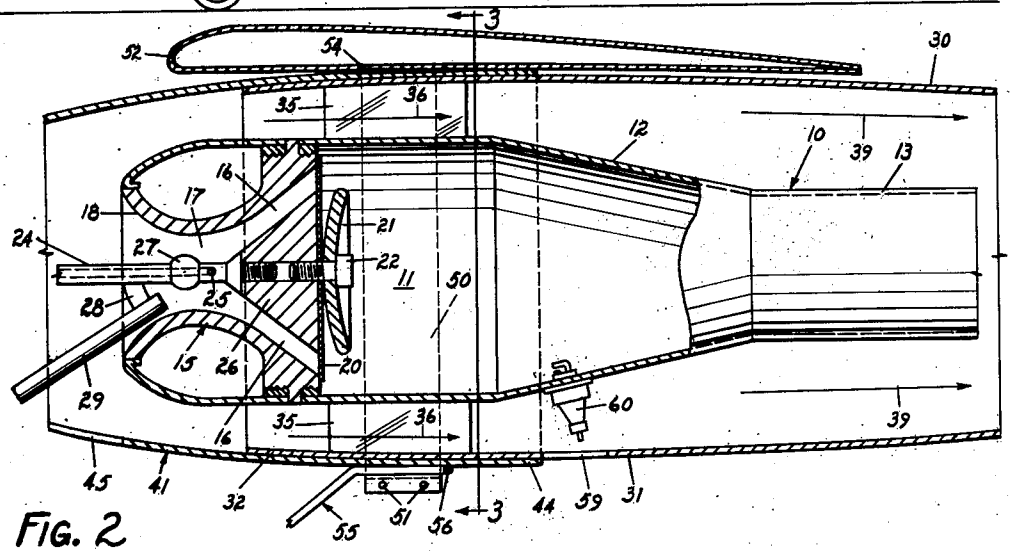


FIG. 2

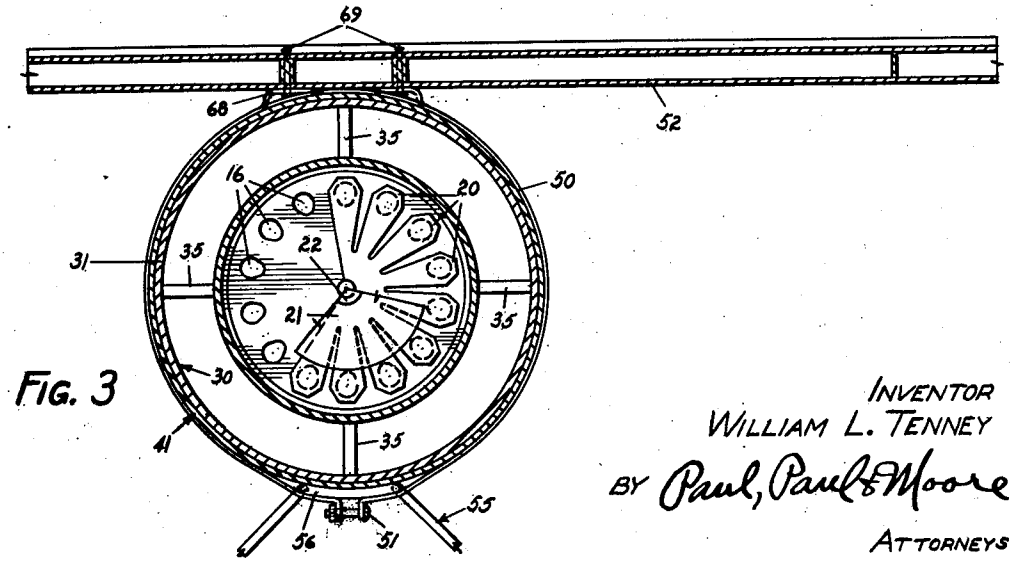


FIG. 3

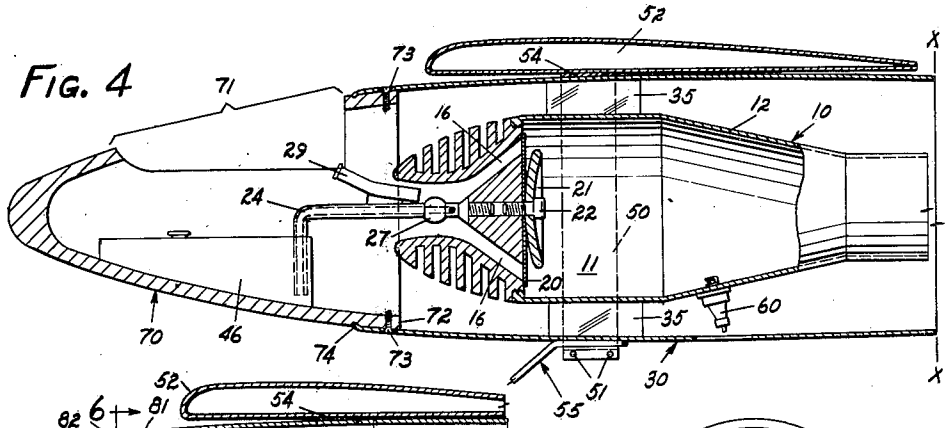
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FIG. 4



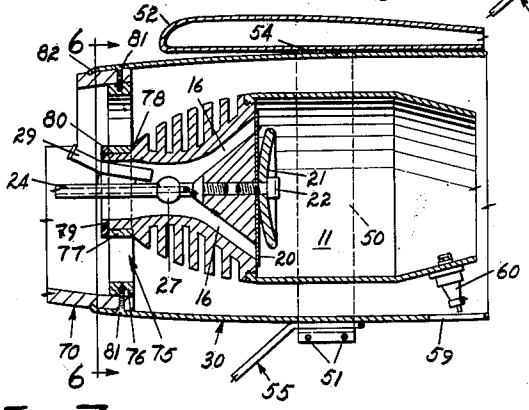


FIG. 7

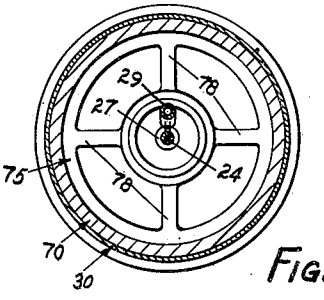


FIG. 6

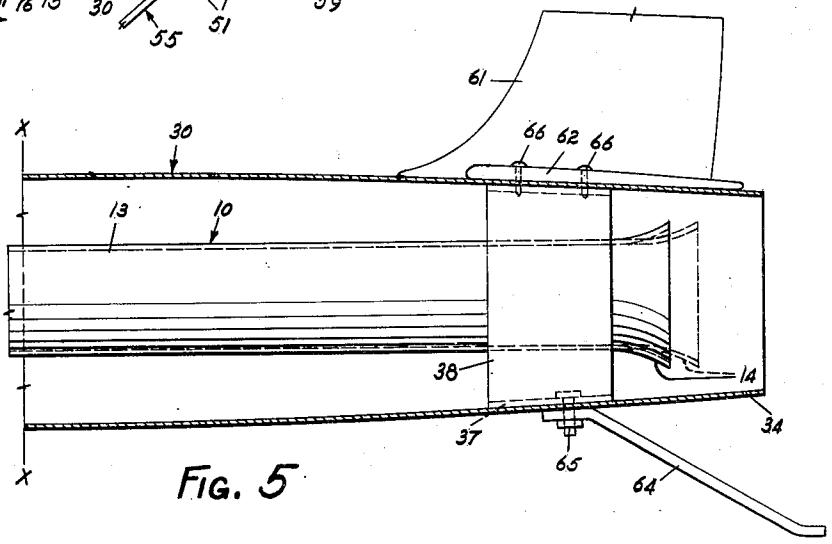


FIG. 5

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MODEL JET AIRPLANE

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2 Claims. (Cl. 46—76)

1

This invention relates to model airplanes of the jet propelled type and more particularly to an article of manufacture comprising a kit suitable for use by model airplane enthusiasts or builders in preparing the finished model easily from the factory fabricated parts.

It is an object of the invention to provide an improved model airplane of the jet propelled type wherein the structure is constructed so as to increase the thrust of the jet unit by utilizing the heat energy added to the cooling air, and to provide adequate cooling for the model structure so that wood or plastic wings, tail surfaces, and nose piece may be used, and also to provide an improved model airplane kit of factory fabricated parts capable of being easily assembled into the finished airplane by the model airplane builder. It is also an object of the invention to provide an improved model airplane wherein the jet propulsion unit is enclosed in a metal fuselage in a manner so as to provide adequate cooling of the jet propulsion unit and model airplane structure. It is a further object of the invention to provide an improved model airplane assembly and a kit of parts capable of being so assembled wherein the model airplane fuel supply is carried in the nose of the airplane. It is also an object of the invention to provide a model airplane and a kit of parts therefor in which the fuselage and jet propulsion unit are substantially complete and require only the assembling of the exterior appendages, more particularly the wing and tail appendages, running gear and tail skid, where used, in order to provide a complete operative unit.

Other and further objects of the invention are those inherent in the apparatus herein illustrated, described and claimed.

The invention is illustrated with reference to the drawings in which corresponding numerals refer to the same parts and in which:

Figure 1 is a longitudinal section, with certain parts in elevation, of the model airplane of the present invention;

Figure 2 is an enlarged partial longitudinal section showing the interior of the jet propulsion unit;

Figure 3 is a transverse section in the direction of arrows 3—3 of Figure 2 and showing the valve backstop and also the valve broken away at various levels to show their construction;

Figures 4 and 5, taken together, are a longitudinal section of a somewhat modified form of the invention, the entire view comprising Figures 4 and 5 being obtained when the two figures are assembled with the line X—X of Figure 4 joined at the line X—X of Figure 5;

Figure 6 is a transverse section taken along the lines and in the direction of arrows 6—6 of Figure 7;

Figure 7 is a fragmentary longitudinal section showing a further slightly modified form of the invention.

2

Referring to the drawings the model airplane of Figures 1–3 comprises a jet propulsion unit designated in its entirety as 10. This jet propulsion unit, per se, forms no part of the present invention as one element in the combination of this invention. The jet unit may be of the types described and claimed in the copending applications of William L. Tenney and Charles B. Marks, Serial No. 649,882, filed February 25, 1946, for Pulse Jet Engine, since matured into Patent No. 2,609,660, and Serial No. 660,118, filed April 6, 1946, for Pulse Jet Unit with Mounting and Cooling Construction, and the copending application of Leroy E. Black, Charles B. Marks and William L. Tenney, Serial No. 661,280 filed April 11, 1946, for Pulse Jet Device, since matured into Patent Number 2,587,100.

The jet propulsion unit generally designated 10 includes a combustion chamber 11 which is connected by a converging section 12 to a jet pipe 13 which terminates in the flared jet and orifice 14. The front of the combustion chamber is closed by a combined air intake and valve plate assembly generally designated 15 having a plurality of intake ports 16 which are connected by intake passages that converge to form the Venturi section 17 which has a forwardly flared air intake portion 18. The ports 16 are covered by a valve plate 20 of petal configuration, one valve petal being over each of the valve ports. The valve member 20 is held in place by a curved back stop 21 which is in turn fastened tightly by the cap screw 22 so as thus to hold the valve firmly in place. Extending forwardly through the Venturi section is a fuel pipe 24 which terminates in one or more fuel orifices 25. The fuel pipe is screwed into the conical central part 26 of the valve plate and hence is held in a fixed position centrally of the Venturi section 17. The fuel pipe has a ball shaped protuberance 27 thereon and a side arm 28 which supports the pipe 29 to which a hose is attached for introducing air under pressure into the Venturi section 17 for starting. An ordinary bicycle pump or pressure supply tank suffices for purposes of starting. Once the unit is started the starting air hose connection to pipe 29 may be removed. The jet unit then operates with a self-induced resonant pulsating action, the combustion chamber and the exhaust tube which opens directly and freely thereinto forming parts of a system resonant in gases in which a rapidly occurring reversal of flow of gases takes place, causing periodic drawing in and combustion of fresh charges of fuel and air through the Venturi inlet 17 and valve 20. This produces discharge of a high velocity, rapidly pulsating and reversing flow of hot gas in the form of a jet from the open end 14 of the discharge tube.

The jet propulsion unit is enclosed within a fuselage section generally designated 30 which has a maximum girth at the mid-section 31 and is reduced very slightly in girth at its forward

end 32 and reduced gradually in the rearward direction so as to provide a smooth uninterrupted exterior section terminating at 34. The jet unit 10 is mounted by radial fins 35 which are attached to the exterior of the combustion section 11 of the jet unit and suitably fastened to the interior of the forward portion 32 of the fuselage section. The fins 35 are spaced radially so as to provide an uninterrupted passage therebetween for the flow of cooling air in the direction of arrows 36, as hereinafter more fully described.

At the rear portion 34 of the fuselage section there is provided a split interior ring 37 which likewise has on it inwardly extending fins 38 which form a support so as centrally to locate the rear end of the jet pipe in the fuselage. The rear end is preferably not fastened to these fins, since the jet pipe expands during operation and would tend to loosen the mounting 37—38 in the event the fastening was made tightly. In this manner the jet propulsion unit is spaced centrally within the fuselage so that air may flow, as explained, in the direction of arrows 36 and thence continuing in the direction of arrows 39 and 40 where it is discharged. If desired, the split ring 37 and fins 38 may be clamped onto the tail pipe 13 and not fastened to the fuselage 30. Hence, as expansion takes place upon heating, the fins 38 and ring 37 slide within the fuselage. It will be noted that the rear end of the fuselage 34 extends slightly rearwardly beyond the outwardly flared end 14 of the jet propulsion tube. The jet blast from the flared end 14 thus produces an aspirator effect which draws the cooling air through the space between the interior of the fuselage and the exterior of the jet unit. Added thrust is also obtained by this expedient.

The forward end of the model unit is composed of a nose section generally designated 41 which is smoothly tapered from a minimum diameter at the forwardly curved end 42 to a diameter such that it nests neatly over the front section 32 of the fuselage member 30, as indicated at 44. The two parts thus fit together as a lid on a can. The nose section is provided with an aperture at 45 through which connection may be made to the starting air inlet pipe 29 during starting and through which the cooling and combustion air enters the nose section. The nose section also contains a fuel tank at 46 which is suitably fastened in place by riveting or soldering. The fuel tank has a filling cap 47 which is accessible through opening 45 so that the tank can be filled when the model is held vertically. The tank is also provided with an air inlet orifice 48. The fuel pipe 24 of the jet unit extends forwardly and then dips downwardly into the fuel tank as at 49.

The exterior appendages of the unit may be furnished with the unit or fabricated by the model builder. In any event they are attached to the exterior of the fuselage and nose section by any suitable fastening. Thus, they may be attached to the fuselage by suitable brackets or bolted or riveted directly to the fuselage, as illustrated with reference to the tail appendages, or may be attached by a clamping band 50, illustrated with reference to the wing assembly shown, which is drawn tightly around the rear portion 44 of the nose section by means of clamping screws 51. The wing 52 is fastened to the upper portion 54 of the clamping band on the embossed flat spot 68, Figure 3, and when the band is then drawn tightly around the rear part 44 of the nose section, the wing is thus firmly fastened into place.

The clamping band 50 also serves to support a bent wire frame ground wheel assembly generally designated 55 which has a bent portion 56 that slips between the clamping band 50 and the exterior surface of the nose section at 44. When the clamping band is thus drawn tightly about the unit the portion 56 of the wheel assembly is thus likewise held firmly. The wheel support 55 is of resilient wire and extends downwardly and forwardly at 57 and serves as a journal for simple ground wheels 58. The entire unit 55 may be made of springy wire of suitable diameter, the ground wheels being journaled on the outwardly bent lower tips of the downwardly extending portions 57 and suitably fastened by a washer or cotter pin to prevent them from falling off. Where fastening other than the clamping band 50 is used, the ground wheel support 55 is attached by suitable brackets or by rivets or bolts. If desired, the landing gear may be eliminated entirely, launching being accomplished by using a take-off dolly which drops free after launching, and landing accomplished by a skid on the bottom of the fuselage.

The fuselage section is provided with a port 59 through which access may be had to the spark plug 60 which is used only during starting of the unit. Once the unit 10 is started, no external ignition is required.

The tail appendages, namely the rudder 61 and elevator section 62, are fastened by suitable screws or bolts 66 or by a clamping bar about at the rear support 37—38 and the tail skid 64 is likewise fastened to the ring 37 by a screw or bolt 65.

The model airplane kit as manufactured, includes the parts in knocked down condition and the model airplane builder, therefore, need only assemble them and apply a suitable finish to any of the parts desired in order to have a complete and operative jet propelled model airplane. Since the assembling can be accomplished with simple tools, no great skill is required to complete the model. The clamping of the bar 50 around the exterior portion 44 of the nose section 41 serves very slightly to reduce its diameter (at 44) and to hold it firmly upon the fuselage section 30 which, as previously explained, also serves to support the wing 52 and the ground wheel assembly 55. The clamping band also causes pressure to be exerted upon the interior supporting fins 35 of the jet unit 10, with the result that it too is firmly anchored once the bolts 51 are drawn tight. Thus, the entire assembly of the parts is made by the two screws 51. The entire assembly of the tail appendages 61 and 62 and skid 64 is made by a few metal screws or bolts 65 and 66. Where desired, the manufacturer may sell the unit less the wing section 52, the rudder 61 and elevator 62, there parts being left to the ingenuity of the model builder to fabricate and assemble onto the unit. These parts may be made of wood, if desired, since the illustrated structure keeps the fuselage temperature desirably low.

The details of fastening of the wing section to the clamping band 50 are best illustrated in Figure 3 wherein it will be noted that the clamping band is provided with a bumped up nearly horizontal "flat" section 68 that serves as a firm support for the under side of the wing 52 which is held in place on the band 50 by screws or rivets

69. Once the wing is fastened to the clamp band 50, the remaining assembly operations are made as previously described.

In the model illustrated in Figures 1–3 the nose section 41 is of metal which is drawn or spun to the shape shown. In the model illustrated in Figures 4, 5 and 6 and also in Figure 7 the nose section is fabricated from a light weight wood such as balsa or white pine. Thus, referring to Figures 4, 5 and 6 the jet unit 10 is as previously described and is supported from the fuselage 30 by means of interior radial spacing and supporting brackets 35. The ground wheel supporting frame 55 and the wing section 52, as well as the rudder 61, elevator 62 and ground skid 64 are likewise supported as described with reference to Figures 1–3. However, the forward portion of the model is composed of a wood nose generally designated 70 which is carved out so as to provide a space to contain the gas tank 46. The upper portion of the nose section is provided with a cut out opening at the bracket 71 through which combustion and cooling air enter through the nose of the unit. The rear edge 72 of the nose section is nested into the front part of the fuselage section 30 and is held in place by a plurality of wood screws or small bolts 73 and the forward edge of the metal fuselage at 74 may then be beaded down slightly, if desired, so as to present a neat appearance at the junction of the metal and wood portions of the model. If desired, the nose piece may be reduced in diameter by the thickness of the fuselage metal so as to present a smooth exterior surface.

In Figure 7 the method of supporting the jet propulsion unit is slightly modified in that the wooden nose section 70 is provided with a support ring 75 which has a rim 76 and a central apertured hub 77 that are connected by a plurality of radial spokes 78 so as to provide a plurality of openings through which cooling air may enter through the nose and thence flow over the jet unit. In this type of mounting the front end 78 of the jet unit air intake is provided with a forward tubular extension 79 which has an exterior diameter so as to fit neatly into the opening in the hub 77 of the support ring 75 where it is held by a ring nut 80 which is threaded onto the front part of the tubular section 79. The fastening screws or bolts 81 extend from the exterior surface of the fuselage 30, thence through the shell of the wooden nose piece 70 and thence through the rim part 76 of the supporting ring thus holding all of the parts in firmly assembled relation. It is obvious that by firmly cementing the ring 76 into the wooden nose piece 70 beforehand, a firm juncture may be made between them and that the model builder can thereafter easily drill through the fuselage and assemble the nose and ring section for placing the fastening bolts 81 or simply place the fastenings 81 through apertures already provided by the manufacturer for this purpose. In this instance also the forward end 82 of the fuselage 30 may be beaded down after the assembly is made for purposes of neat appearance.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments herein except as defined by the appended claims.

What I claim is:

1. A pulse jet engine powered aircraft characterized by having a fuselage of generally tubular character with a rounded forward end and an open rear end, a wing on said fuselage, a pulse jet engine including a combustion chamber and an exhaust tube of generally tubular character opening directly into said combustion chamber and forming therewith integral parts of a system resonant in gases, said engine extending slightly forward of said wing and having a short air intake at its forward end with the discharge end of said exhaust tube extending adjacent but terminating just short of the end of said fuselage and being of smaller diameter than said fuselage, means for supporting said engine within said fuselage in spaced relation therewith around the entire circumference forming a passage for the rearward flow over the entire extent thereof of air for cooling and thrust augmentation, said supporting means including a forward support fixedly securing the combustion chamber within the fuselage and a rearward support for slidably supporting said exhaust tube within said fuselage to allow relative expansion thereof while maintaining a through passage for said rearward flow of air therethrough.

2. An airplane assembly comprising an elongated jet propulsion unit of generally tubular configuration including a combustion chamber and an elongated exhaust tube opening directly into and forming therewith integral parts of a system resonant in gases, said unit being somewhat enlarged at its forward end and said exhaust tube extending in unbroken relation and terminating at its rear end in a jet discharge outlet, an exterior generally tubular shell forming the fuselage of the airplane and enclosing said jet unit, said jet unit being supported from and in spaced relation to said exterior shell throughout its length to provide an uninterrupted space for the flow of cooling air between said unit and said fuselage, said fuselage having a hollow tapered nose section containing the fuel tank for said jet unit, said nose section being provided with an opening for servicing the fuel tank and for the entrance of air into the space between said unit and said fuselage, the air inlet in said nose section being positioned in advance of said jet unit, said fuselage being open at its rear end to form a discharge opening for a jet propulsion unit and to form the space between said unit and said fuselage for the flow of cooling air, said fuselage being extended rearwardly slightly beyond the end of said jet unit.

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