

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte LARRY T. CLARK

Appeal No. 2003-0470
Application 09/671,870

ON BRIEF

Before FRANKFORT, MCQUADE and NASE, Administrative Patent Judges.

FRANKFORT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 5, 6 and 9 through 13. Claims 1 through 4, 7, 8 and 14 through 21, which are the only other claims pending in the application, have been withdrawn from

Appeal No. 2003-0470
Application 09/671,870

further consideration by the examiner pursuant to a restriction requirement.

Appellant's invention generally relates to a device and method for mixing flows to attenuate noise and augment thrust of a jet engine. More particularly, the subject matter on appeal is directed to a method for reducing the noise emitted by a flow of exhaust from an outlet of a jet propulsion engine having a turbine with a plurality of turbine stages. The method is set forth in claim 1 on appeal as comprising the steps of: a) segregating the exhaust flow of the jet propulsion engine into a plurality of rotating high velocity, low density jets and a plurality of rotating low pressure voids; and b) employing the low pressure voids to entrain at least a portion of a secondary flow of air, with the jets and the entrained secondary flow mixing to produce a mixed flow having a relatively higher flow rate and a relatively lower velocity than the exhaust flow.

As can be seen from appellant's specification, an arrangement for carrying out the above-noted method (e.g., Figure 3A) includes a flow mixing device which appellant has characterized as "an unsteady flow ejector." The unsteady flow ejector (10) includes a multi-blade rotor (30) which is disposed in a primary exhaust flow of the jet propulsion engine and rotates in response to a transfer of momentum from the engine core flow. The specification indicates that rotation of the rotor (30) in the primary exhaust flow generates a plurality of rotating high velocity, low density jets (32) and a plurality of rotating low pressure voids (34), with each of the voids being spaced between two of the jets. An example of the rotor (30) is shown in Figure 2A of the application drawings and includes a plurality of blades (40) affixed to a hub (42). Appellant notes (specification, page 7) that in the example shown, the rotor has four blades (40), with the rotor face angle being about 60° and having an open area ratio for the jets (32) of about 33%. The

specification goes on to note in the paragraph bridging pages 7 and 8 that

[t]hose skilled in the art will understand, however, that the configuration of the rotor 30 (e.g., the quantity of the blades 40, the shape of the blades 40 and the rotational speed of the rotor 30) must allow enough time and room for the entrained portion 18a of the secondary flow 18 to move into the low pressure voids 34.

In the context of the embodiment seen in Figure 3A, the specification (page 10) notes that the voids (34) entrain a portion of the fan flow (82) (i.e., the secondary flow), causing the engine core flow (80) and the fan flow (82) to mix and produce a mixed flow (86) having a relatively higher flow rate and a relatively lower velocity than the exhaust flow (80). The specification goes on to note that such operation of the "unsteady flow ejector" (10) attenuates the noise produced by operation of the turbojet engine core (64). The specification (page 6) indicates that essentially, the low static pressure of each of the voids

Appeal No. 2003-0470
Application 09/671,870

(34) causes a portion of the secondary flow of air to rush into and fill each of the voids, whereby entrainment of the secondary flow of air is dominated by static pressure momentum interchange which occurs in an essentially isentropic manner. It is further noted that, accordingly, the losses that result from the mixing process are relatively small as compared to other known mixing devices and ejectors which employ shear forces to mix flows.

A copy of representative claim 5, the only independent claim on appeal, can be found in Appendix A of appellant's brief.

The sole prior art reference of record relied upon by the examiner in rejecting the appealed claims is:

Paulson	5,203,164	Apr. 20, 1993
---------	-----------	---------------

Claims 5, 6 and 9 through 13 stand rejected under 35 U.S.C. §102(b) as being anticipated by Paulson.

Appeal No. 2003-0470
Application 09/671,870

Rather than attempt to reiterate the examiner's commentary with regard to the above-noted rejection and the conflicting viewpoints advanced by appellant and the examiner regarding that rejection, we make reference to the final rejection (Paper No. 9, mailed February 28, 2002) and the examiner's answer (Paper No. 15, mailed August 9, 2002) for the reasoning in support of the rejection, and to appellant's brief (Paper No. 14, filed July 29, 2002) and reply brief (Paper No. 16, filed October 7, 2002) for the arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to appellant's specification and claims, to the applied prior art Paulson reference, and to the respective positions articulated by appellant and the examiner. As a consequence of our review, we have made the determination that the examiner's rejection of claims 5,

Appeal No. 2003-0470
Application 09/671,870

6 and 9 through 13 under 35 U.S.C. § 102(b) will not be sustained. Our reasons follow.

The examiner's position in the final rejection (Paper No. 9, page 2) appears to hinge on the determination that Paulson discloses a noise suppressor (10) attached to the aft end of a turbojet engine (11), wherein the noise suppressor includes a free-running turbofan wheel (34), at least a portion (41) of which is located in the exhaust flow from the jet engine, and the examiner's stated conclusion that Paulson discloses "an apparatus identical to the one disclosed [by appellant], performing the same method steps as those claimed, and therefore producing the same flow as the one disclosed [by appellant]." In that regard, the examiner is apparently of the view that segregation into a plurality of rotating high velocity, low density jets and a plurality of rotating low pressure voids in the system of Paulson "is a result of the rotor rotation, as the axial

Appeal No. 2003-0470
Application 09/671,870

flow in-between the blades produced the jets and the wakes of the blades were low pressure voids resulting from the blade's vortex dynamics."

Our problem with the examiner's position as set forth in the final rejection is that we find no identity between the turbofan wheel (34) of Paulson and the rotor (30) as seen, for example, in Figure 2A of appellant's drawings, and can conceive of no reason why one of ordinary skill in the art would have been led to conclude that the turbofan wheel (34) of Paulson would perform the same method steps as those claimed by appellant, or produce the same flow as the rotor (30) disclosed by appellant.

In the examiner's answer (page 3), the examiner merely makes note that claims 5, 6 and 9 through 13 are rejected under 35 U.S.C. § 102(b), and indicates that such rejection is set forth in prior Office Action, Paper No. 9. In the remainder of the answer (pages 3-5), the examiner,

Appeal No. 2003-0470
Application 09/671,870

for the first time, attempts to elaborate on why the noise suppressor as seen in Paulson would "inherently" perform the steps of appellant's method as set forth in the claims on appeal, and makes reference to six patents and two textbooks to support such inherency positions.

Even if we were to agree with the examiner that free rotation of the turbine section blades (43) of the turbofan wheel (34) of Paulson in the exhaust flow from the turbojet engine (11) therein would inherently produce a segregated flow including a plurality of rotating high velocity, low density jets and a plurality of rotating low pressure voids located closely adjacent the trailing edges of the turbine section blades (43), we see no basis for the examiner's further conclusion that any flow around the tips of fan blades (50) in the fan section (42) located outboard of the ring (45) of the turbofan wheel (34) in Paulson would provide a secondary flow of air which, under any set of

circumstances, could reasonably be expected to be entrained in or by the low pressure voids that would be located immediately downstream of the turbine section blades (43). As can be seen in the various embodiments of the noise suppressor of Paulson, and from the description of the operation thereof, e.g., in column 6, lines 36-59, the fan section (42) compresses air entering the inlet (53) and moving through the air flow passage (52), thereby providing a compressed air flow downstream of the fan section which forms a generally cylindrical column of compressed air surrounding the jet exhaust downstream of the turbine section (41). In our view, this cylindrical column of compressed air surrounding the jet exhaust stream would completely block any portion of the air flow from around the tips of fan blades (50) from reaching the transient low pressure voids that would be formed immediately downstream of the turbine section blades (43). In this regard, we agree with appellant's arguments as set forth on pages 3-7

Appeal No. 2003-0470
Application 09/671,870

of the reply brief and the conclusion therein that the examiner has failed to establish a prima facie case of anticipation.

In our opinion, the examiner's position is totally without support in the applied Paulson patent and is entirely based on speculation and conjecture on the examiner's part. In this regard, we note that it is well settled that inherency may not be established by probabilities or possibilities, but must instead be "the natural result flowing from the operation as taught." See In re Oelrich, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981). In the present case, neither the Paulson patent nor the examiner provides an adequate factual basis to establish that the natural result flowing from following the teachings of that patent would be a method for reducing noise emitted by a flow of exhaust from a jet propulsion engine like that

Appeal No. 2003-0470
Application 09/671,870

claimed by appellant. Accordingly, since all the limitations of appellant's claims 5, 6 and 9 through 13 are not found in Paulson, either expressly or under principles of inherency, it follows that the examiner's rejection of those claims under 35 U.S.C. § 102(b) relying on Paulson will not be sustained.

In accordance with the foregoing, it is clear that the decision of the examiner is reversed.

REVERSED

CHARLES E. FRANKFORT)	
Administrative Patent Judge)	
)	
)	
)	
)	BOARD OF PATENT
JOHN P. MCQUADE)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
)	
)	
JEFFREY V. NASE)	
Administrative Patent Judge)	

CEF:psb

Appeal No. 2003-0470
Application 09/671,870

Harness Dickey & Pierce PLC
P.O. Box 828
Bloomfield Hills, MI 48303