

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ACES FUEL INJECTION, INC.

Petitioner,

v.

HOLLEY PERFORMANCE PRODUCTS, INC.

Patent Owner.

IPR CASE No.: IPR2026-00433

U.S. Patent No. 11,409,894

Title: FUEL INJECTION THROTTLE BODY

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,409,894**

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LIST OF EXHIBITS

EXHIBIT NO.	DESCRIPTION
Ex. 1001	U.S. Patent No. 11,409,894 (the "'894 Patent")
Ex. 1002	File History for the Application of U.S. Patent No. 11,409,894
Ex. 1003	U.S. Patent No. 7,735,475 ("Farrell")
Ex. 1004	U.S. Patent No. 9,303,578 ("Wittkopf")
Ex. 1005	U.S. Patent No. 9,115,671 ("Benoit")
Ex. 1006	Declaration of Mr. Kenneth Farrell

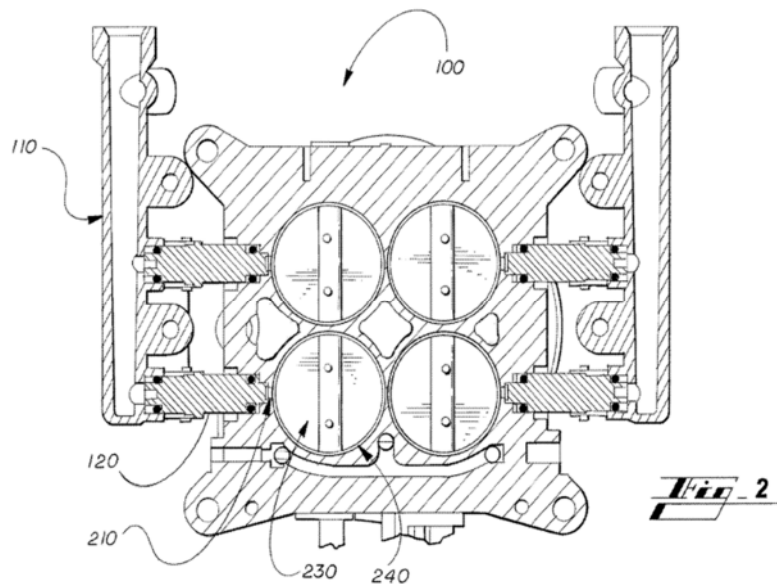
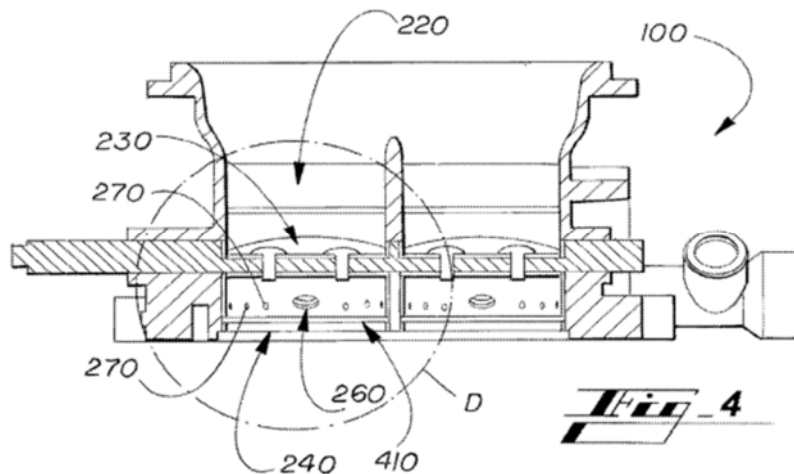
I. INTRODUCTION

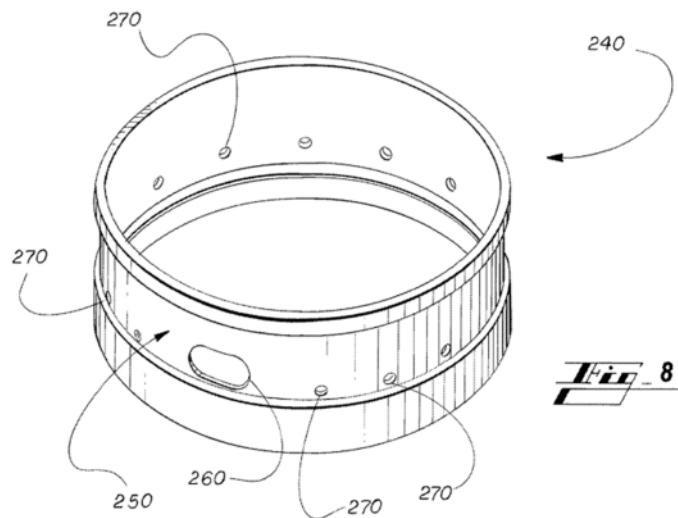
The Petitioner, Aces Fuel Injection, Inc. ("Aces"), pursuant to 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.*,¹ respectfully requests *Inter Partes* Review ("IPR") of claims 1-9 of U.S. Patent No. 11,409,894 ("the '894 Patent," Ex. 1001). Petitioner's request is supported by the Expert Declaration of Kenneth Farrell (Ex. 1006) ("Farrell Decl."), and the other exhibits submitted herewith.

In general, as illustrated in FIGS. 2, 4, and 8 below, the claims of the '894 Patent are directed to a "fuel injection throttle body for an internal combustion engine." The claimed throttle body includes an air intake (220); a fuel port (210); an electronic fuel injector (120), where the fuel port receives fuel from the fuel injector; a fuel channel (250) disposed about an inner wall of the air intake and formed by an annular ring and/or the inner wall of the air intake; a plurality of orifices (260, 270) disposed in the annular ring and in fluid communication with

¹ Unless otherwise stated, all statutory and regulatory citations herein are to 35 U.S.C. or 37 C.F.R. All exhibits cited herein have been stamped with Exhibit and page numbers (e.g., "Ex. 1002 – 1," "Ex. 1002 – 2"). Unless otherwise stated, all exhibit citations are to the stamped page numbers, not the original page numbers, or to column and line number ranges (e.g. "1:10-1:15").

the fuel channel such that pressurized fuel is forced through the fuel port, fuel channel, and orifices to mix with air moving through the air intake; a throttle shaft (not shown) and corresponding throttle plate (230) for varying airflow moving through the air intake; and an electronic control unit (or "ECU," not shown) for controlling the fuel injector.



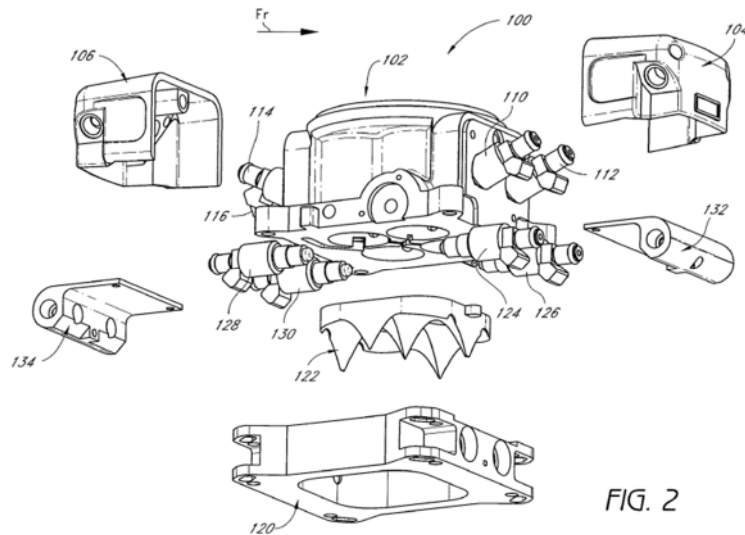
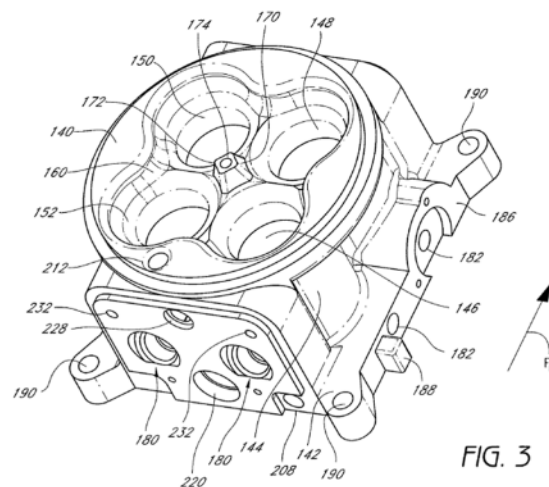


The Board should institute IPR because there is at least a reasonable likelihood that Petitioner will prevail. § 314(a). Moreover, there are no persuasive grounds for denying institution under § 314(a) or § 325(d). This is Petitioner's first petition challenging any claim of the '894 Patent, and the petition raises arguments that have not previously been presented to the Office.

As briefly outlined immediately below and as further detailed in Section X of this Petition, each of the claims of the '894 Patent is unpatentable as obvious under 35 U.S.C. § 103 ("Section 103") over Farrell in view of Wittkopf or, alternatively, in view of Benoit.

As shown in FIGS. 2 and 3 below, Farrell teaches a "fuel injection throttle body for an internal combustion engine" that is configured to replace a carburetor and that includes multiple air intakes (i.e., passages 146, 148, 150, 152) that each define a

flow path for air through the throttle body, each passage having a throttle plate and throttle shaft (not shown, but discussed starting at Col. 3, line 65) for varying airflow through the air intake. Fuel injectors (110, 112, 114, 116) are mounted to the throttle body and direct fuel into the air intake passages. An ECU (not shown, but discussed starting at Col. 8, line 48) controls operation of the fuel injectors, including their timing and amount.



Meanwhile, as shown in FIG. 4 below, Wittkopf describes a fuel port (i.e., fuel injection conduit 142) that is capable of receiving fuel from an electronic fuel injector (104), a fuel channel (i.e., circumferential groove 146) that is disposed about an inner wall of the air intake and/or an annular ring, and a plurality of orifices (i.e., grooves 144) disposed through the annular ring and in fluid communication with the fuel channel, fuel port, and electronic fuel injector to disperse fuel into the air intake.

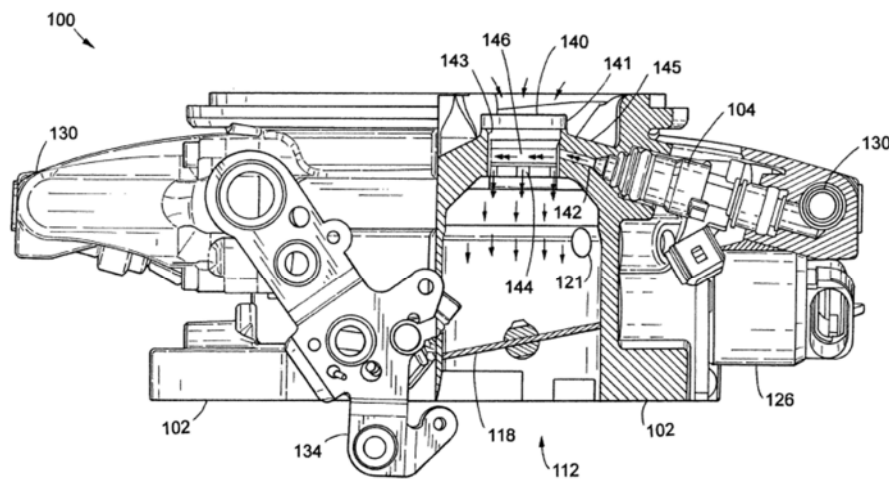
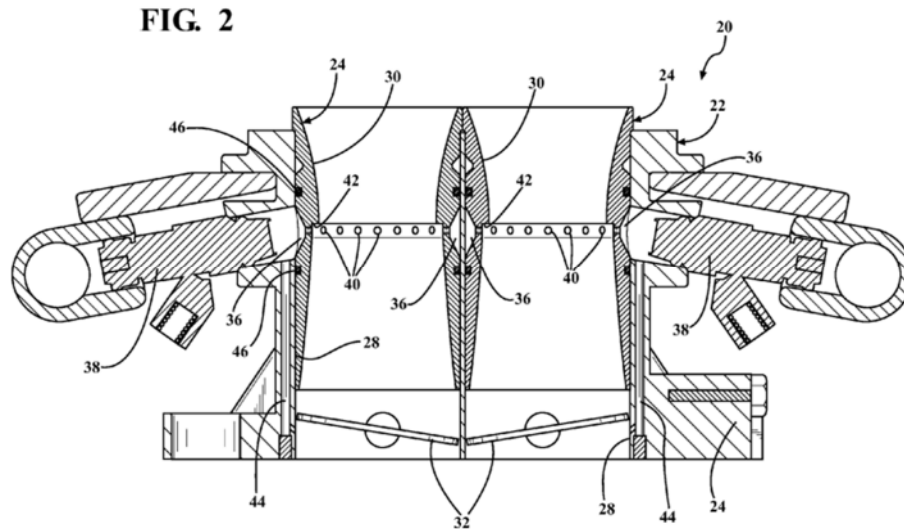


FIG. 4

Similarly and alternatively, as shown in FIG. 2 below, Benoit describes a fuel port (i.e., the area between fuel injector 38 and cavity 36) that is capable of receiving fuel from an electronic fuel injector, a fuel channel (i.e., cavity 36) that communicates with the fuel port to receive fuel, and a plurality of orifices (i.e.,

apertures 40) disposed in the annular ring and in fluid communication with the fuel channel.



Thus, the Board should institute IPR and cancel claims 1-9 of the '894 Patent under Section 103 as obvious over Farrell in view of Wittkopf or, alternatively, in view of Benoit.

II. MANDATORY NOTICES

A. Real Parties-In-Interest (37 C.F.R. § 42.8(b)(1))

Petitioner certifies that Aces Fuel Injection, Inc. is a real party-in-interest.

B. Related Matters (37 C.F.R. § 42.8(b)(2))

Petitioner identifies the following related judicial matter: *Holley Performance Products Inc. v. Aces Fuel Injection, Inc.*, Civil Action No. 1:26-cv-00059-CEA-CHS, pending in the Eastern District of Tennessee. The '894 Patent is being

asserted in that proceeding. Petitioner has not filed any concurrent petitions concerning the '894 Patent.

C. Identification of Counsel (37 C.F.R. § 42.8(b)(3))

Petitioner appoints the following counsel:

Lead Counsel	Back-up Counsel
Stephen D. Adams USPTO Reg. No. 67,581 Chambliss, Bahner & Stophel, P.C. 605 Chestnut Street, Suite 1700 Chattanooga, TN 37450 Tel: (423) 757-0211 sadams@chamblisslaw.com	John G. Jackson (to seek admission <i>pro hac vice</i>) Chambliss, Bahner & Stophel, P.C. 605 Chestnut Street, Suite 1700 Chattanooga, TN 37450 Tel: (423) 757-0246 jjackson@chamblisslaw.com Susie Lodico (to seek admission <i>pro hac vice</i>) Chambliss, Bahner & Stophel, P.C. 605 Chestnut Street, Suite 1700 Chattanooga, TN 37450 Tel: (423) 757-0271 slodico@chamblisslaw.com

Please direct all correspondence to lead counsel and back-up counsel at the contact information above. Petitioner consents to electronic mail service at the email addresses identified above.

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D. Service Information (37 C.F.R. § 42.8(b)(4))

This Petition is being served by Federal Express Next Business Day Delivery (w/ copy via email) to the correspondence address of Patent Owner's counsel of record at the following address:

Marc Lorelli
Brooks Kushman
150 W. Second St., Suite 400N
Royal Oak, MI 48067-3846
mlorelli@brookskushman.com

E. Power of Attorney (37 C.F.R. § 42.10(b))

Petitioner's Power of Attorney form is filed concurrently herewith in accordance with 37 C.F.R. § 42.10(b).

III. FEE PAYMENT (37 C.F.R. § 42.15(a))

Petitioner has submitted payment of the required fees for this Petition set forth in § 42.15(a) at the time of filing via credit card. Petitioner will promptly remit payment of any additional fees upon notification by the Board.

IV. GROUNDS FOR STANDING

Pursuant to § 42.104(a), Petitioner certifies that the '894 Patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR on ground raised

in this petition. As demonstrated below, the '894 Patent is unpatentable as summarized in the table below:

Ground	'894 Patent Claims	Basis for Challenge
1	1-9	Claims 1-9 of U.S. Patent No. 11,409,894 to Flynn <i>et al.</i> are unpatentable under Section 103 as obvious over Farrell (Ex. 1003) in view of Wittkopf (Ex. 1004) or, alternatively, in view of Benoit (Ex. 1005)

V. TECHNICAL BACKGROUND

The present invention relates generally to fuel injection systems for internal combustion engines, and in particular to throttle body fuel injection systems designed for replacing or retrofitting carburetor-based fuel delivery systems. See, e.g., Ex. 1004, 1:8-1:10 (Wittkopf "relat[ing] generally to fuel injection systems for internal combustion engines, and in particular to single point throttle body fuel injection systems designed for retrofitting vintage carburetion fuel delivery systems").

A carburetor is a mechanical device that mixes fuel with air for internal combustion engines. Traditional carburetors use a Venturi tube to create low

pressure areas that draw fuel from a float bowl into the air stream. (Ex. 1004, 1:13-1:37) However, carburetors have inherent limitations: they cannot precisely control fuel-air ratio under varying conditions, and they provide less than optimal atomization of fuel, particularly during cold starts and transients. Fuel injection systems address these limitations by using electronic control to deliver precise amounts of atomized fuel directly into the intake manifold. (Ex. 1004, 1:38-1:58)

Throttle Body Injection (TBI) is a form of single-point fuel injection in which one or more fuel injectors are located in a throttle body that mounts to the intake manifold in place of a carburetor. (Ex. 1004, 1:66-2:3) ("single point injection, also known as throttle body injection, uses one or more fuel injectors (64) located generally in a single location the throttle body (62)"). A fuel injector is an electromechanical device that meters and atomizes fuel; application of an electrical current lifts a spring-loaded needle within a pintle valve off its seat, allowing pressurized fuel to be sprayed through an injector nozzle. (Ex. 1004, 1:51-2:11)

The duration of the injection event (i.e., the pulse width) is controlled by an Electronic Control Unit (ECU) based on engine speed and load signals, with inputs including a mass airflow sensor or MAP sensor, throttle position, and oxygen feedback. (Ex. 1004, 2:20-2:59) As explained by Mr. Farrell, these structural

features were well-understood in the industry by the time of the alleged invention.

(Ex. 1006, ¶¶ 12, 27)

A. Prior Art Throttle Body Fuel Injection Systems

Prior art throttle body fuel injection systems were designed to replace carburetors in automotive applications. U.S. Patent No. 7,735,475 to Farrell *et al.* (Ex. 1003, "Farrell") teaches a fuel injection body that is "sized and configured to replace a carburetor, such as a standard 4150 double pumper carburetor." (Ex. 1003, 2:44-2:46) The Farrell device includes a main throttle body with multiple passages (146, 148, 150, 152) extending between a top surface and a bottom surface, each passage having a throttle plate for controlling airflow. (Ex. 1003, 3:14-3:29) Fuel injectors are mounted to the throttle body and direct fuel into each of the passages (Ex. 1003, 3:46-3:64)

U.S. Patent No. 9,303,578 to Wittkopf *et al.* (Ex. 1004, "Wittkopf") improves upon basic TBI systems, including that described by Farrell, which is specifically referenced in Wittkopf, by providing an annular fuel distribution ring that introduces pressurized fuel into the air stream through downward-facing outlets at or near the bottom end of the ring. (Ex. 1004, 3:7-3:62; 4:10-4:27) The Wittkopf ring is a two-piece construction with a ring-shaped insert having axial grooves that distribute fuel circumferentially around the bore. (Ex. 1004, 4:28-4:38) Unlike

carburetor venturis, the Wittkopf distribution ring has "substantially straight sides for minimal pressure drop" and does not create low pressure zones according to the Venturi effect. (Ex. 1004, 5:51-5:63)

Next, U.S. Patent No. 9,115,671 to Benoit (Ex. 1005, "Benoit") teaches a hybrid carburetor and fuel injection assembly that uses Venturi-shaped inserts to establish low pressure regions in the airflow. (Ex. 1005, Abstract) The Benoit device includes annular cavities formed between the housing and the inserts, with a plurality of uniformly distributed apertures for delivering fuel into the low pressure region. (Ex. 1005, 3:6-3:40) This design uses pressure differential between the pressurized fuel in the cavity and the low pressure airflow to improve atomization. (Ex. 1005, 3:41-3:64)

B. Control Systems for Fuel Injection

Modern electronic fuel injection systems use a microprocessor-based ECU to control fuel delivery. The ECU determines injector pulse width based on algorithms that calculate the amount of fuel required for the current operating condition. Wittkopf teaches a "feed forward" algorithm that "controls the fuel injection as a function of the position of the idle air control motor so that as the idle air control circuit is opened, the pulse widths of the fuel injector signals are increased." (Ex. 1004, Abstract) This allows the open-loop fuel mixture to be more

accurate during idle transitions and eliminates rough, unstable idle conditions associated with prior art systems. (Ex. 1004, 4:54-4:61)

The Wittkopf system also includes driver circuitry for creating a periodic pulse signal to actuate the fuel injector, wherein the pulse width is determined as a function of the sum of a first value representative of an initial fuel pulse width and a second value representative of a position of the idle air control valve. (Ex. 1004, 8:9-8:29) Additionally, the ECU uses lookup tables for target air/fuel ratio and volumetric efficiency to determine fuel delivery across the operating range. (Ex. 1004, 2:31-2:59)

C. Aftermarket Retrofit Applications

A significant market exists for retrofitting older vehicles originally equipped with carburetors to use electronic fuel injection. This market includes classic cars, hot rods, and performance vehicles where owners desire the reliability and performance benefits of EFI while maintaining the traditional appearance of a carburetor-mounted intake. (Ex. 1003, 1:15-1:35) "The hot rod industry and the aftermarket industry in general still crave the sleek wireless appearance of a carbureted engine." (Ex. 1003, 1:39-1:41)

Throttle body fuel injection systems are particularly well-suited for these retrofit applications because they can be installed as a "bolt-in" replacement for existing

carburetors with minimal modifications to the intake manifold or surrounding components. (Ex. 1004, 2:60-3:6) This niche market has driven development of throttle body assemblies that mimic the physical dimensions and mounting patterns of popular carburetor models, such as the 4150 and 4150-style four-barrel carburetors. (Ex. 1003, 2:43-2:51)

D. Summary of Prior Art Disclosure

Accordingly, as demonstrated above, as of the priority dates of the '894 Patent, a person of ordinary skill in the art would have been familiar with the following key concepts and teachings from the prior art: (1) throttle body fuel injection systems designed to replace carburetors, including those with multiple air passages and integrated fuel injectors (Ex. 1003); (2) annular fuel distribution rings for improved fuel atomization and distribution within throttle body bores (Ex. 1004); (3) hybrid carburetor-fuel injection assemblies using Venturi-shaped passages and annular cavities for fuel delivery (Ex. 1005); (4) electronic control systems using feed-forward algorithms and idle air control to manage fuel delivery during varying operating conditions (Ex. 1004); and (5) the need for bolt-in-place retrofit systems for converting carbureted engines to electronic fuel injection. Mr. Farrell confirms from his personal experience in the field that each of these concepts was well-understood by a POSA at or before the priority date of the '894 Patent. (Ex. 1006,

¶¶ 27, 31, 32) Indeed, Mr. Farrell was himself actively developing and commercializing throttle body EFI retrofit systems incorporating these precise design features during this period. (Ex. 1006, ¶¶ 8-12)

VI. THE '894 PATENT

The '894 Patent, entitled "Fuel injection throttle body," issued on August 9, 2022.

A. Challenged Claims

Petitioner requests IPR for all of the claims of the '894 Patent and requests that the Board cancel those claims as unpatentable. The '894 Patent includes 9 claims, of which claims 1 and 5 are independent. The independent claims are reproduced below:

1. A fuel injection throttle body for an internal combustion engine, comprising:
 - an air intake extending through said fuel injection throttle body;
 - a fuel port in said fuel injection throttle body;
 - an electronic fuel injector disposed in said fuel injection throttle body, said electronic fuel injector in fluid communication with a fuel supply and with said fuel port;
 - a fuel channel disposed about an inner wall of said air intake;

said fuel channel formed by one or both of an annular ring and said inner wall of said air intake, said annular ring disposed within said air intake and along said inner wall of said air intake;
a plurality of orifices disposed in said annular ring and in fluid communication with said fuel channel;
wherein pressurized fuel is forced through said fuel port, through said fuel channel, and through said plurality of orifices in order to mix with air moving through said air intake;
a throttle shaft and throttle plate disposed within said air intake for rotation therein to vary an air flow moving through the air intake; and,
an electronic control unit to control fuel flow from said electronic fuel injector.

5. A fuel injection throttle body, comprising:

an air intake extending from an upper side of said fuel injection throttle body to a lower side and defining a flow path for air through said fuel injection throttle body;
a fuel port disposed in said fuel injection throttle body; an electronic fuel injector disposed in said fuel port of said fuel injection throttle body, said fuel port receiving fuel from said electronic fuel injector;

a fuel channel defined by an inner wall of said air intake,
an annular ring, or both;
said annular ring positioned at said inner wall of said air
intake;
a plurality of orifices disposed through said annular ring,
said plurality of orifices in fluid communication
with said fuel channel, said fuel port, and said
electronic fuel injector to disperse fuel into said air
intake;
an electronic control unit to control the electronic fuel
injector ;
a shaft extending through said air intake and a throttle
plate disposed on said shaft, said throttle plate
rotatable to vary airflow through said air intake;
said fuel injection throttle body configured to replace a
carburetor of an internal combustion engine.

Thus, both claims 1 and 5 require an air intake, a fuel port, an electronic fuel injector in fluid communication with a fuel supply and the fuel port, a fuel channel disposed about the inner wall of the air intake, an annular ring positioned at the inner wall of the air intake, and a plurality of orifices disposed through the annular ring in fluid communication with the fuel channel. Both claims also require a throttle shaft and throttle plate, and an electronic control unit. The primary structural difference between the two independent claims is that claim 1 expressly

recites a "fuel channel formed by one or both of an annular ring and said inner wall of said air intake," while claim 5 recites a "fuel channel defined by an inner wall of said air intake, an annular ring, or both," a distinction without a meaningful difference. Claim 5 additionally requires that the throttle body be "configured to replace a carburetor of an internal combustion engine."

Claims 2 and 6 depend from claims 1 and 5, respectively, and require that the plurality of orifices be oriented in either a radial direction or a non-radial direction. Claim 7 depends from claim 6 and adds the further requirement that the plurality of orifices each be spaced apart between 20 and 38 degrees. Claim 3 depends from claim 1 and requires that the throttle body be configured to replace a carburetor, the same limitation that claim 5 incorporates as an independent claim requirement. Claim 4 depends from claim 1 and requires that the fuel port have an axis substantially perpendicular to the throttle shaft. Claim 8 depends from claim 5 and requires that the fuel be atomized when entering the air intake. Claim 9 depends from claim 5 and requires that the fuel port be oriented at an angle relative to the shaft.

B. Prosecution History

The '894 Patent (U.S. Patent No. 11,409,894) issued on August 9, 2022, from Application No. 16/778,341, filed January 31, 2020. The '894 Patent claims

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priority through a chain of related applications to U.S. Provisional Application No. 61/892,706, filed October 18, 2013, which constitutes the earliest effective filing date of the '894 Patent for prior art purposes.

Specifically, the '894 Patent is a continuation of U.S. Application No. 15/986,571, filed May 22, 2018, which issued as U.S. Patent No. 10,570,866. That application was itself a division of U.S. Application No. 14/156,813, filed January 16, 2014, which issued as U.S. Patent No. 10,012,197. Application No. 14/156,813 claims priority to Provisional Application No. 61/892,706, filed October 18, 2013. The complete priority chain is therefore:

Application No.	Type	Filing Date	Patent No.
61/892,706	Provisional	Oct. 18, 2013	N/A
14/156,813	Non-provisional	Jan. 16, 2014	10,012,197
15/986,571	Divisional	May 22, 2018	10,570,866
16/778,341	Continuation	Jan. 31, 2020	11,409,894 (the '894 Patent)

Accordingly, the earliest effective filing date of the '894 Patent is October 18, 2013. As established in Section IX.A below, each of the three prior art references, namely Farrell (filed September 19, 2008; issued June 15, 2010), Wittkopf (filed

May 11, 2012; published November 14, 2013), and Benoit (filed November 7, 2012; published May 8, 2014), predates this earliest effective filing date and qualifies as prior art under post-AIA 35 U.S.C. §§ 102(a)(1) and/or 102(a)(2).

During prosecution of the '894 patent (Application No. 16/778,341), the Examiner issued a Non-Final Office Action on October 4, 2021, rejecting all 9 pending claims on multiple grounds. First, the Examiner rejected claims 1-6, 8, and 9 under 35 U.S.C. § 102(a)(1) as anticipated by U.S. Patent No. 3,800,769 to Graffman. (Ex. 1002, pp. 30-33) Second, the Examiner rejected claim 7 under Section 103 as obvious over Graffman. (Ex. 1002, pp. 33-35) Third, the Examiner rejected all claims under 35 U.S.C. § 112(b) for indefiniteness. (Ex. 1002, pp. 28-29) Finally, the Examiner rejected claims 1, 5, and 7 on the ground of nonstatutory double patenting over claims of U.S. Patent Nos. 10,012,197 and 10,570,866 (claims 1 and 5 only), parent patents in the same family. (Ex. 1002, pp. 25-27)

Prior to filing a written response, Patent Owner participated in an examiner interview on January 6, 2022, during which the Examiner and Patent Owner agreed that "Graffman fails to disclose 'an electronic fuel injector.'" (Ex. 1002, p. 9)

Patent Owner filed its written response on January 10, 2022. With respect to the § 102 rejection, Patent Owner argued that "a carburetor system is not an electronic fuel injection system" and that "[t]he primary difference between carburetion and

fuel injection is that fuel injection atomizes the fuel through a small nozzle under high pressure, while a carburetor relies on suction created by intake air accelerated through a Venturi tube to draw the fuel into the airstream." (Ex. 1002, p. 18)

Patent Owner further argued that Graffman's electric generator (i.e., element 5), which the Examiner had cited as the ECU, was "merely a pulse generator" and not an electronic control unit as required by the claims. (Ex. 1002, p. 19) Patent Owner further argued that Graffman's element (43), cited by the Examiner as an injector, was "merely a flange" and not an injector. (Ex. 1002, p. 18) Patent Owner amended the claims to explicitly require "an electronic fuel injector" rather than simply "a fuel injector," (Ex. 1002, p. 14, 18) and further amended claim 7 to remove the word "about" from the 20-38 degree spacing limitation to overcome the § 112 indefiniteness rejection. (Ex. 1002, pp. 15, 17) With respect to the double patenting rejections, Patent Owner argued that no terminal disclaimer was required because the application was a continuation of a divisional application entitled to the safe harbor provision of 35 U.S.C. § 121. (Ex. 1002, pp. 16-17)

The Examiner subsequently allowed the claims without issuing a further office action, confirming the Examiner's agreement that Graffman did not teach the claimed electronic fuel injector and ECU combination. (Ex. 1002, pp. 1-7)

The Examiner further states: "The prior art of record references fail to teach, disclose, or suggest, either alone or in combination: A fuel injection throttle body for an internal combustion engine, comprising ... an electronic fuel injector ... a fuel channel disposed about an inner wall of said air intake; said fuel channel formed by one or both of an annular ring and said inner wall of said air intake, said annular ring disposed within said air intake ... a plurality of orifices disposed in said annular ring and in fluid communication with said fuel channel; wherein pressurized fuel is forced through said fuel port, through said fuel channel, and through said plurality of orifices and the rest of the claim limitations as a whole."

(Ex. 1002, p. 6)

Significantly, none of the prior art references relied upon in this Petition, namely Farrell (Ex. 1003), Wittkopf (Ex. 1004), or Benoit (Ex. 1005), were cited by the USPTO or otherwise substantively considered during prosecution of the '894 patent. The Examiner's statement of reasons for allowance confirms that Graffman was the principal prior art reference relied upon during prosecution, a carburetor reference that the Examiner agreed did not teach an electronic fuel injector or ECU. However, all three prior art references presented herein are expressly directed to electronic fuel injection systems with electronic control units, which are precisely the features that distinguished the claims from Graffman. The

combination of Farrell and Wittkopf, and the combination of Farrell and Benoit, each teach the complete combination of elements that the Examiner found absent from the prior art of record.

VII. PERSON OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is informed by the type of problems encountered in the art and the prior-art solutions to those problems. See *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986); see also *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). A person of ordinary skill in the art ("POSA") at the time of the alleged invention would have had either: (1) a bachelor's degree in mechanical engineering, automotive engineering, or a related field; or (2) at least two to three years of experience in the design, development, or testing of fuel injection systems for internal combustion engines, together with familiarity with throttle body fuel injection systems, carburetor-to-EFI conversions, air-fuel ratio control, and electronic control unit programming. (Ex. 1006, ¶ 14).

VIII. CLAIM CONSTRUCTION

In an IPR, the terms of challenged claims are construed "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary

skill in the art and the prosecution history pertaining to the patent," just as they are in district court. 37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313-14 (Fed. Cir. 2005) (*en banc*).

Petitioner does not believe any terms in the challenged claims require construction beyond their plain and ordinary meaning for purposes of this proceeding. Although Petitioner has attempted to identify all claim construction issues relevant to this Petition and to construe terms consistent with prevailing jurisprudence, Petitioner respectfully requests the opportunity to present additional claim construction positions in the event that further attention to claim construction is required in this proceeding. Nevertheless, Petitioner offers the following constructions to assist the Board:

A. "Annular Ring"

The term "annular ring" should be construed to mean a ring-shaped structure positioned within the air intake of the throttle body that carries a fuel channel and a plurality of orifices for distributing fuel into the air intake. The '894 Patent specification describes the annular ring as including "an annular fuel channel 250 for distributing fuel around the annular ring 240 to a plurality of fuel discharge orifices 260 and 270," with the "plurality of fuel discharge orifices 260 and 270...configured to atomize and spray the fuel into the air intake 220 from

multiple directions." (Ex. 1001, 2:46-2:50) The specification further discloses that "in various embodiments the annular ring 240 may be coupled to the throttle body 100 by one or more of a press fit, threads, a friction fit, mechanical fasteners, adhesives, and welds." (Ex. 1001, 3:51-3:54) The annular ring may be formed separately from the throttle body, or may share portions of the fuel channel with the throttle body. See Ex. 1001, 3:35-3:37 ("the annular fuel channel 250 may be a part of the throttle body 100 rather than of part of the annular ring 240").

B. "Orifice"

The term "orifice" should be construed to mean an opening through which fuel is discharged from the fuel channel into the air intake. This construction is consistent with the specification's use of "fuel discharge orifices 260 and 270" as the openings through which pressurized fuel exits the annular fuel channel and enters the air flow as atomized fuel. (Ex. 1001, 2:45-2:50) The specification confirms that the orifices "may each be a variety of shapes having close to the same orifice opening areas," (Ex. 1001, 3:9-3:10) including "circular, ovular, elliptical, and/or polygonal shapes," (Ex. 1001, 2:58) and that they are "configured to atomize and spray the fuel into the air intake 220 from multiple directions." (Ex. 1001, 2:49-2:50) The specification further teaches specific embodiment sizes, a primary fuel discharge orifice of 0.25 inch diameter or 0.28 to 0.40 inch wide ovular-slot, and secondary

fuel discharge orifices of 0.047 to 0.100 inch diameter, confirming that the orifices are discrete openings of defined size and shape. (Ex. 1001, 2:59-2:67)

C. "Fuel Channel"

The term "fuel channel" should be construed to mean a passage that distributes pressurized fuel circumferentially around the annular ring from the fuel port to the plurality of orifices. The specification describes "an annular fuel channel 250 for distributing fuel around the annular ring 240 to a plurality of fuel discharge orifices 260 and 270." (Ex. 1001, 2:46-2:48) The specification further confirms that the fuel channel may be formed by the annular ring alone, the throttle body alone, or a combination of both: "the annular fuel channel 250 may be a part of the throttle body 100 rather than of part of the annular ring 240. In other embodiments the throttle body 100 and annular ring 240 may include complimentary portions of the annular fuel channel 250." (Ex. 1001, 3:35-3:40) This construction is consistent with the claim language, which recites "a fuel channel formed by one or both of an annular ring and said inner wall of said air intake." (Ex. 1001, Claim 1)

D. "Fuel Port"

The term "fuel port" should be construed to mean the passage or opening through which pressurized fuel from the fuel injector enters the annular ring and air intake. The specification states that "[e]ach fuel injector 120 provides fuel through a fuel port 210 into an annular ring 240 positioned in an air intake 220 of the throttle body 100 below the throttle plate 230." (Ex. 1001, 2:42-2:45) The specification further confirms that the ECU "regulates the amount of fuel flowing through the fuel port 210 into the air intake 220." (Ex. 1001, 3:18-3:20) Thus, the fuel port is the interface between the fuel injector and the annular ring/throttle body, and is structurally and functionally distinct from the orifices through which fuel is ultimately discharged into the air stream.

E. "Air Intake"

The term "air intake" should be construed to mean a bore or passage in the throttle body through which air flows during engine operation and within which the annular ring is positioned. The specification discloses that "[i]n various embodiments the throttle body 100 may have one or more air intakes 220 with each air intake 220 including a throttle plate 230, a fuel injector 120, and an annular ring 240." (Ex. 1001, 3:31-3:34) The specification further describes that "the inner wall of the air intake 220 and the annular ring 240 form a smooth continuous surface to aid air flow," confirming that the air intake is the bore within

which the annular ring is received and through which air flows. (Ex. 1001, 3:44-3:46)

IX. IDENTIFICATION OF CHALLENGE AND RELIEF REQUESTED

Petitioner requests review and cancellation of claims 1-9 of the '894 Patent under Section 103 as obvious over Farrell in view of Wittkopf or, alternatively, in view of Benoit.

A. The Relevant Prior Art

Petitioner relies on the following prior art for the ground of unpatentability:

U.S. Patent No. 7,735,475 (Ex. 1003, "Farrell")

Farrell was filed on September 19, 2008, claims priority to U.S. Provisional Application No. 60/979,702, which was filed October 12, 2007, and also claims priority to U.S. Provisional Application No. 61/052,903, which was filed May 13, 2008. Farrell was initially published as US 2009/0145406 A1 on June 11, 2009, and was subsequently published as U.S. Patent No. 7,735,475 on the date of issuance which was June 15, 2010. Because the '894 Patent has an earliest effective filing date of October 18, 2013, Farrell qualifies as prior art under at least post-AIA 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

U.S. Patent No. 9,303,578 (Ex. 1004, "Wittkopf")

Wittkopf was filed on May 11, 2012, published as US 2013/0298868 A1 on November 14, 2013, and issued as U.S. Patent No. 9,303,578 on April 5, 2016.

Because Wittkopf was effectively filed before the earliest effective filing date of the '894 Patent (October 18, 2013), Wittkopf qualifies as prior art under at least post-AIA 35 U.S.C. § 102(a)(2).

U.S. Patent No. 9,115,671 (Ex. 1005, "Benoit")

Benoit was filed on November 7, 2012, was initially published as US 2014/0123944 A1 on May 8, 2014, and was subsequently published as U.S. Patent No. 9,115,671 on the date of issuance which was August 25, 2015. Because the '894 Patent has an earliest effective filing date of October 18, 2013, Benoit qualifies as prior art under at least post-AIA 35 U.S.C. § 102(a)(2).

B. Motivation to Combine

1. Farrell, Wittkopf, and Benoit Are Analogous Art

Farrell, Wittkopf, and Benoit are clearly analogous art under Section 103. For prior art to be analogous, it must satisfy one of two tests: (1) the art is from the same field of endeavor, regardless of the problem addressed; or (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved. See *In re*

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Deminski, 796 F.2d 436, 442 (Fed. Cir. 1986); see also *In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979); *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004).

All three references satisfy the first test in that they are in the same field of endeavor as the '894 Patent, relating to retrofit throttle body electronic fuel injection systems designed to replace carburetors in internal combustion engines. This field of endeavor is defined by reference to the structure and function of the claimed invention as perceived by one of ordinary skill in the art. *In re Bigio*, 381 F.3d at 1326.

Patent Owner expressly defined its invention as an electronic fuel injection system distinct from carburetor systems. (Ex. 1002, pp. 18-19) The Examiner stated that the prior art of record failed to teach the claimed electronic fuel injector, fuel channel, annular ring, and orifice arrangement recited in the claims. (Ex. 1002, p. 6)

However, unlike Graffman, each of Farrell, Wittkopf, and Benoit expressly relates to electronic fuel injection systems intended to replace carburetors on internal combustion engines, the same technological field identified by Patent Owner during prosecution. Mr. Farrell confirms that all three references are from the same field of endeavor, namely aftermarket throttle body EFI systems designed to replace carburetors on internal combustion engines, and that a POSA at the time of

the alleged invention would have recognized all three as addressing the same fundamental design challenges in that field. (Ex. 1006, ¶ 25)

2. Motivation to Combine Farrell with Wittkopf or Benoit

A POSA would have been motivated to combine the teachings of Farrell (Ex. 1003) with either Wittkopf (Ex. 1004) or Benoit (Ex. 1005) because all references are directed to aftermarket throttle body fuel injection (TBI) systems designed to replace carburetors on internal combustion engines, and all address the same fundamental technical problems: fuel distribution, mixing, and drivability in retrofit EFI systems.

Farrell teaches a fuel injection body "designed for replacement of existing carburetors." (Ex. 1003, Abstract) Wittkopf similarly discloses a throttle body fuel injection system "designed and arranged to easily replace four-barrel carburetors." (Ex. 1004, 4:12-4:14) Benoit teaches a "hybrid carburetor and fuel injection assembly for delivering a fuel and air mixture into an intake manifold of an engine." (Ex. 1005, Abstract) All three are electronic fuel injection systems utilizing electronic fuel injectors and electronic control units (ECUs), precisely the technological field Patent Owner distinguished from carburetors during prosecution.

Critically, unlike Graffman, which was the principal prior art reference relied upon by the Examiner, Farrell, Wittkopf, and Benoit each teach the specific combination the Examiner found absent from the prior art, namely, an electronic fuel injector combined with an annular ring structure having a fuel channel and plurality of orifices for distributing pressurized fuel into the air intake.

Farrell provides a known carburetor-replacement throttle body platform with multiple bores, throttle shafts/plates, injectors, and an ECU mounted on the throttle body assembly. (Ex. 1003, 2:56-2:60; 3:14-3:16; 3:65-4:4; 8:48-8:54)

Wittkopf teaches a specific and improved annular fuel distribution ring (ring 140) supplied by an injector via a conduit and groove structure, which "introduces pressurized fuel into the air stream" and provides "superior mixing" through "downward-facing outlets." (Ex. 1004, 5:51-5:54; 6:18-6:20) Wittkopf expressly identifies improved fuel distribution and mixing, particularly at idle and across operating conditions, as objectives of the annular ring approach. (Ex. 1004, 6:18-6:23)

Benoit teaches a specific annular fuel distribution structure comprising annularly-shaped cavities (36) supplied by high-pressure fuel injectors (38), with a plurality of apertures (40) that are "generally uniformly spaced from one another around the circumference" of each insert. (Ex. 1005, 3:65-4:1) Benoit teaches that "the fuel

from the annularly-shaped high pressure cavities 36 is generally uniformly delivered into the flow of air around the perimeter of the Venturi-shaped barrel 30 to create a more uniform air and fuel mixture." (Ex. 1005, 4:1-4:5)

As the named inventor of the '475 Patent, Mr. Farrell confirms from his own experience that a POSA working in this field would have recognized the known limitations of a standard throttle body platform and would have been motivated to incorporate an annular fuel distribution structure, whether Wittkopf's ring design or Benoit's cavity-and-insert design, to achieve improved fuel atomization and distribution. (Ex. 1006, ¶¶ 31, 32)

Thus, a POSA would have been motivated to incorporate either Wittkopf's annular fuel distribution ring or Benoit's annular cavity structure into Farrell's known carburetor-replacement throttle body platform to achieve the improved mixture preparation and distribution benefits described by both secondary references, while retaining Farrell's throttle body architecture, throttle shaft/plates, injector mounting, and ECU integration. This represents a predictable combination of familiar elements according to known methods to achieve an expected result. See *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

3. No Teaching Away or Incompatibility

Neither combination (Farrell + Wittkopf, nor Farrell + Benoit) would have presented any teaching away from the combination. To the contrary, each secondary reference specifically identifies the same problems, namely fuel distribution, mixing, and atomization in carburetor replacement systems, that a POSA would have sought to solve. Each reference's solution is compatible with and complementary to Farrell's throttle body platform. A POSA would have had every reason to combine these references and no reason to avoid doing so.

Moreover, because each of the proposed combinations involves substituting or adding a known annular fuel distribution structure (from Wittkopf or Benoit) into a known throttle body platform (Farrell) to achieve the predictable result of improved fuel atomization and distribution, a POSA would have had a reasonable expectation of success in making either combination. *KSR*, 550 U.S. at 421 ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.")

Mr. Farrell confirms this assessment. In his experience developing and commercializing these systems, there is no technical incompatibility between Farrell's throttle body platform and either the annular ring structure of Wittkopf or the insert-and-cavity structure of Benoit. (Ex. 1006, ¶ 24).

X. THE CLAIMS OF THE '894 PATENT ARE INVALID

As provided below and by the accompanying declaration of Mr. Kenneth Farrell (Ex. 1006), claims 1–9 of the '894 Patent are unpatentable as obvious under Section 103 over Farrell (Ex. 1003) in view of Wittkopf (Ex. 1004) or, alternatively, in view of Benoit (Ex. 1005). Mr. Farrell's declaration provides technical support for each of the claim element mappings set forth below. (Ex. 1006, ¶ 36) For each claim limitation, Petitioner provides citations to Farrell and at least one of Wittkopf or Benoit, establishing that either combination teaches the claimed subject matter.

A. Independent Claims

1. Independent Claim 1

[1.0] A fuel injection throttle body for an internal combustion engine, comprising:

The '894 Patent explains the technological context of its invention:

"Factory car producers moved away from this type of fuel injection [i.e., throttle body fuel injection or "TBI"] as government emissions standards increased in the mid-to-late 1980's. However, the aftermarket automotive parts industry started selling aftermarket TBI fuel injection systems in the late 1980's. These systems were designed to

replace the carburetor on older carbureted vehicles from
the 1960's to 1980's."

(Ex. 1001, 1:28-1:34)

The '894 Patent therefore claims a throttle body fuel injection system specifically
designed for the aftermarket carburetor-replacement market, which is the same
technological field occupied by prior art references Farrell, Wittkopf, and Benoit.

Farrell is directly in this field. Its title itself declares its purpose: "Fuel Injection
Body Sized to Replace Carburetor Body." (Ex. 1003, Title) The Abstract similarly
states: "A fuel injection unit is designed for replacement of existing carburetors."

(Ex. 1003, Abstract)

Farrell explains this same market context in its Background:

"Carbureted automobiles ceased to be manufactured in
large numbers. The carburetor was replaced with
electronic fuel injection (EFI), which has become the
standard of the auto manufacturing industry. The hot rod
industry and the aftermarket industry in general are
beginning to accept EFI as an alternative to carburetion."

(Ex. 1003, 1:21-1:26)

Thus, Farrell's throttle body fuel injection system is precisely the type of aftermarket system described in the '894 Patent, namely, one that is designed to retrofit onto carbureted vehicles to convert them to electronic fuel injection.

Farrell discloses:

"[T]he fuel injection body 100 comprises a main throttle body 102, a first end cap 104 and a second end cap 106. Each of the end caps 104, 106 generally covers two fuel injectors, for a total of four fuel injectors 110, 112, 114, 116, that are mounted to the main throttle body 102."

(Ex. 1003, 2:56-2:60; FIG. 2)

Farrell teaches a fuel injection body "designed for replacement of existing carburetors" for internal combustion engines. (Ex. 1003, Abstract; 1:18–19)

Farrell's system therefore provides the foundational structure, which includes a throttle body with multiple air intakes (passages 146, 148, 150, 152), fuel injectors, throttle plates on shafts, and an ECU, all designed for the same carburetor-replacement purpose as the '894 Patent. Wittkopf similarly discloses a throttle body fuel injection system "designed and arranged to easily replace four-barrel carburetors." (Ex. 1004, 4:13–4:14) Benoit teaches a hybrid fuel injection and carburetor assembly for delivering a fuel and air mixture into an intake manifold of an engine. (Ex. 1005, Abstract; 2:65–3:2) All three references are directed to

aftermarket carburetor-replacement fuel injection systems for internal combustion engines, the precise technological field of the '894 Patent. (Ex. 1006, ¶ 25)

[1.1] an air intake extending through said fuel injection throttle body;

Farrell discloses a main throttle body (102) through which multiple air passages extend. According to Farrell, the "top surface 140 and the lower flange 142 are spaced apart by a main portion 144 of the main throttle body 102." (Ex. 1003, 3:12-3:14; FIG. 4) Further, "[f]our passages 146, 148, 150, 152 extend through at least a majority of the main portion 144 from the top surface 140 through the lower flange 142." (Ex. 1003, 3:14-3:16; FIGS. 4 and 8) Each of these passages defines an air intake extending through the throttle body. Each passage further "defines a venturi" having a "tubular shape that is constricted in the middle and flared at both ends," and "[a]ir flowing through the venturi will increase in velocity through the constricted portion and the air pressure will drop while passing through the constricted portion." (Ex. 1003, 3:20–29; FIG. 5)

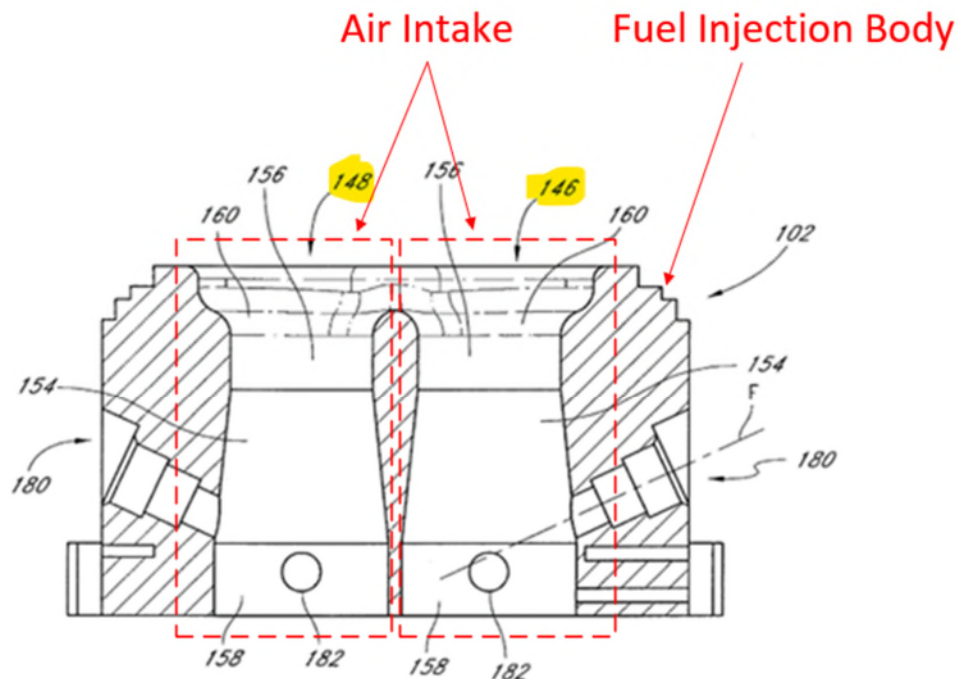
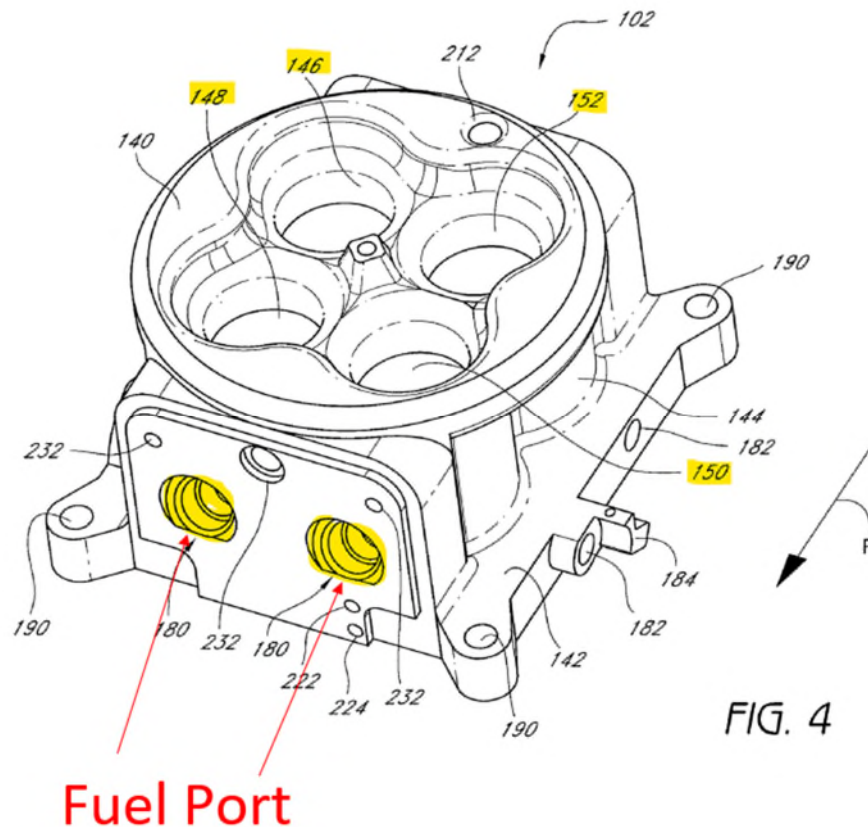


FIG. 5

[1.2] a fuel port in said fuel injection throttle body;

Farrell teaches this limitation. Farrell discloses that "each passageway 146, 148, 150, 152 intersects with a fuel injector receptacle 180" and that "each of the receptacles 180 extends from a side surface of the main throttle body 102 into a corresponding one of the passageways 146, 148, 150, 152." (Ex. 1003, 3:46-51; FIG. 5) Farrell further expressly discloses that fuel flows through the fuel introduction ports (244) and fuel distribution passages (242) to supply the fuel injectors (110, 112, 114, 116), confirming that the receptacles (180) are the openings through which pressurized fuel from the fuel injectors is introduced into

each air intake passageway. Ex. 1003, 6:19-6:34 ("fuel supplied to the fuel distribution passages 242 can be supplied to the fuel injectors 110, 112, 114, 116... [f]uel would pass from the fuel introduction port through the fuel distribution passages... [t]he fuel in the four fuel distribution passages 242 would then be supplied to the fuel injectors 110, 112, 114, 116") A POSA would understand that Farrell's receptacles (180) constitute fuel ports, i.e., openings in the throttle body through which fuel from the fuel injectors is introduced into the air intake passageways.



To the extent any further support is needed, both Wittkopf and Benoit expressly teach this limitation in unambiguous terms, confirming that this is a well-known and standard structural feature of throttle body fuel injection systems.

Wittkopf expressly teaches a fuel injection conduit (142) formed within a radial spoke (145) of the fuel distribution ring (140) through which each fuel injector (104) delivers fuel into the ring and from there into the air stream. Wittkopf states: "At least one spoke 145 for each ring 140 includes a fuel injection conduit 142 that supplies ring 140 with fuel from an injector 104," and further describes how "fuel flow[s] from injector 104 through conduit 142, through circumferential groove 146, and through axial grooves 144 to discharge downwardly at or near the bottom end of ring 140." (Ex. 1004, 6:3-6:13) A POSA would understand Wittkopf's fuel injection conduit (142), i.e., the passage through which fuel travels from the injector into the fuel distribution ring and air intake, as the fuel port through which pressurized fuel is introduced into the throttle body.

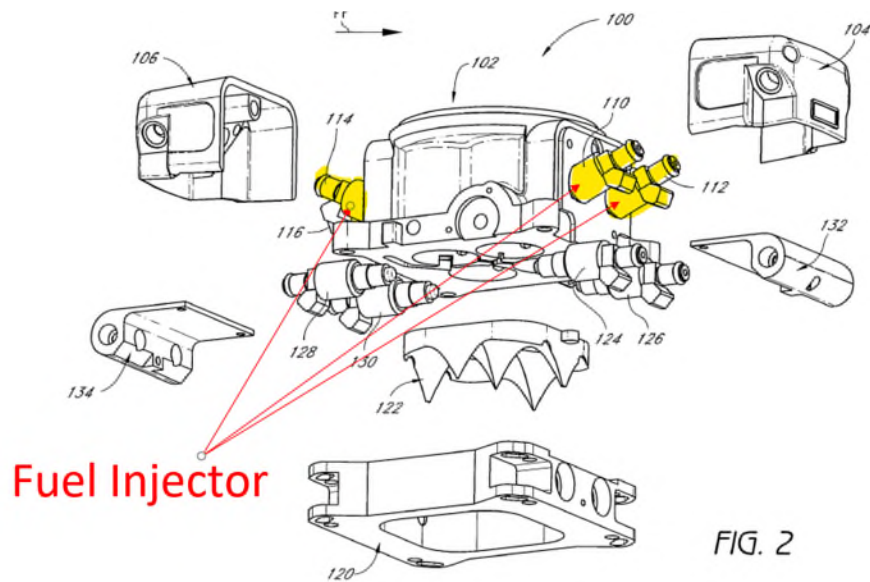
Benoit likewise expressly teaches a fuel port. Benoit discloses that each fuel injector (38) "is in fluid communication with one of the annularly shaped cavities 36 for delivering a high-pressured flow of fuel into its respective cavity 36," and that the housing "present[s] a high pressure cavity in fluid communication with said fuel injector for receiving the fuel." (Ex. 1005, Claim 2) The interface between

each fuel injector (38) and its associated high pressure cavity (36), i.e., the passage through which pressurized fuel is delivered from the injector into the annular cavity and from there through the apertures (40) into the air stream, is precisely the fuel port claimed. A POSA would readily recognize this as the functional and structural equivalent of the claimed fuel port.

Each of Farrell, Wittkopf, and Benoit therefore teaches a fuel port through which pressurized fuel from a fuel injector is introduced into the throttle body and delivered into the air intake. (Ex. 1006, ¶ 29)

[1.3] an electronic fuel injector disposed in said fuel injection throttle body, said electronic fuel injector in fluid communication with a fuel supply and with said fuel port;

Farrell teaches this limitation. Farrell discloses that "[t]he fuel injection body 100 comprises a main throttle body 102, a first end cap 104 and a second end cap 106. Each of the end caps 104, 106 generally covers two fuel injectors, for a total of four fuel injectors 110, 112, 114, 116, that are mounted to the main throttle body 102." (Ex. 1003, 2:56–2:60; FIG. 2)



Farrell further discloses that "fuel supplied to the fuel distribution passages 242 can be supplied to the fuel injectors 110, 112, 114, 116," (Ex. 1003, 6:19–6:21; FIG. 12), and that an ECU defined by the circuitry (310) mounted on the throttle body "can control the injection timing and amount" of those fuel injectors. (Ex. 1003, 8:53–8:54; FIG. 14)

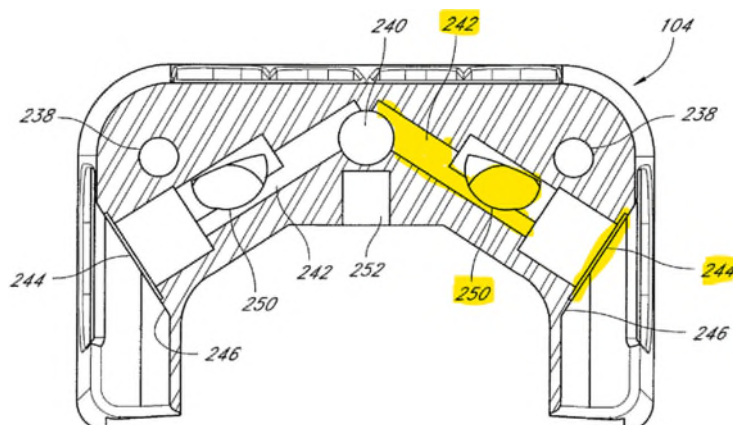


FIG. 12

Farrell's entire system is expressly directed to electronic fuel injection (EFI) as an alternative to carburetion. (Ex. 1003, Abstract; 1:17–1:19; 1:27–1:35) A POSA would understand that Farrell's injectors (110, 112, 114, 116), which are electronically controlled in timing and amount by Farrell's ECU, are electronic fuel injectors coupled to the throttle body at the fuel ports (receptacles 180).

Wittkopf expressly confirms that fuel injectors of the type used in throttle body fuel injection systems are by definition electronic, i.e., electromechanical devices. Wittkopf describes fuel injectors as "electromechanical devices that meter and atomize fuel," explaining that "application of an electrical current to a coil lifts a spring-loaded needle within a pintle valve off its seat, thereby allowing fuel under pressure to be sprayed through an injector nozzle." (Ex. 1004, 1:59-1:65) Wittkopf further discloses a fuel injector (104) mounted to the throttle body assembly that injects fuel into the bore, with a controller (132) operatively coupled to the fuel injector and driver circuitry (188) for creating a periodic pulse signal to actuate it. (Ex. 1004, Claims 12 and 13) A POSA reading Farrell in light of Wittkopf would have no doubt that Farrell's fuel injectors (110, 112, 114, 116), electronically controlled by Farrell's ECU, are the same class of electromechanical, electronically controlled fuel injectors that Wittkopf expressly describes.

Benoit likewise teaches fuel injectors (38) in fluid communication with annular cavities (36) for delivering pressurized fuel into the air intake, confirming that electronically controlled fuel injectors delivering pressurized fuel into an annular fuel distribution cavity were well-known in the art. (Ex. 1005, 3:41–3:64; Claim 2)

[1.4] a fuel channel disposed about an inner wall of said air intake; said fuel channel formed by one or both of an annular ring and said inner wall of said air intake, said annular ring disposed within said air intake and along said inner wall of said air intake;

Wittkopf teaches a two-piece annular fuel distribution ring (140) that is disposed within the throttle body bore and positioned along the inner wall of the air intake.

Wittkopf discloses: "[e]ach injector 104 feeds fuel into a circular fuel distribution ring 140 via a fuel injection conduit 142" (Ex. 1004, 5:51–5:52; FIGS. 3, 4) and "ring 140 is a two-piece ring formed of a ring-shaped insert 141 pressed into a ring-shaped outer housing 143.... At least one spoke 145 for each ring 140 includes a fuel injection conduit 142 that supplies ring 140 with fuel from an injector 104." (Ex. 1004, 5:64–6:5)

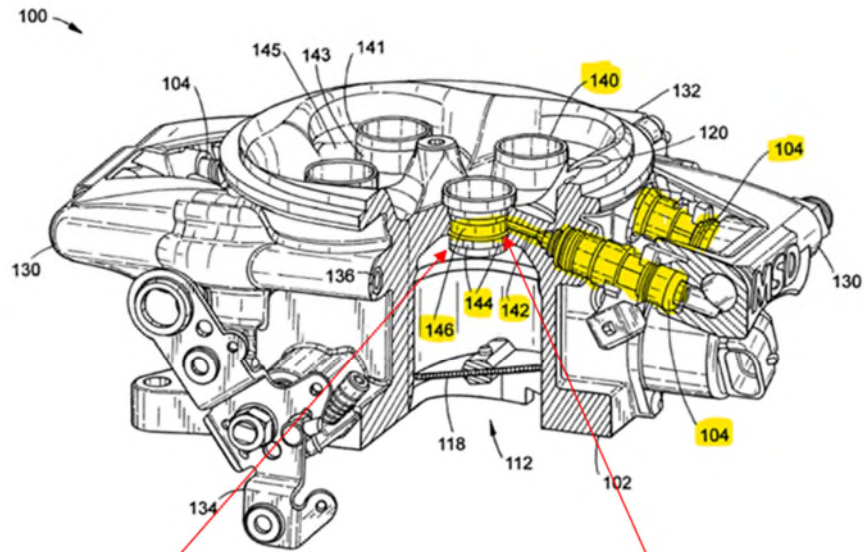


FIG. 3

Annular Ring

Fuel Channel

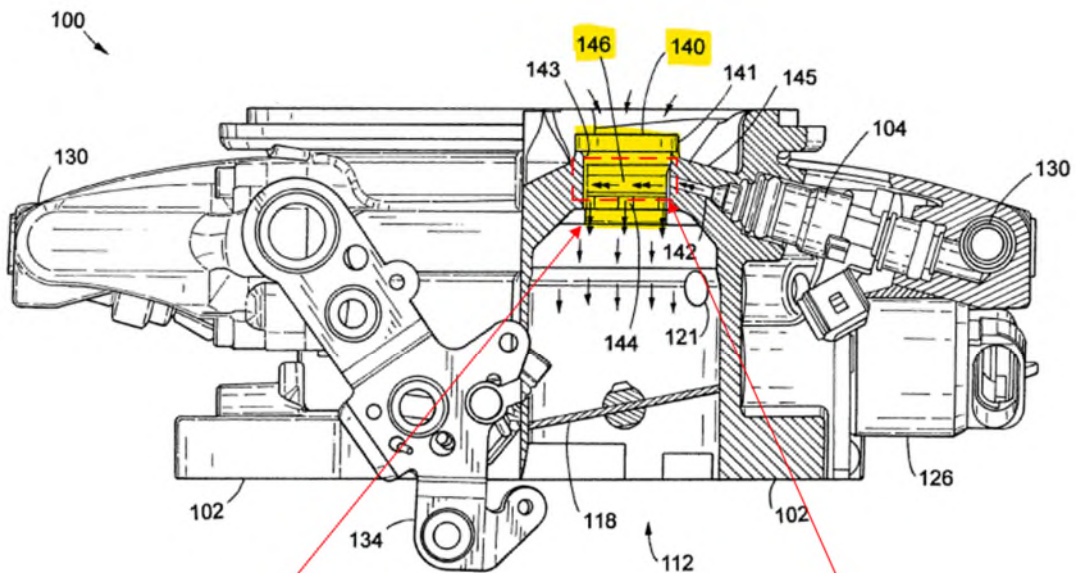


FIG. 4

Annular Ring

Fuel Channel

Wittkopf further teaches that "insert 141 includes axial grooves 144 intervalled about the exterior circumference of insert 141. A circumferential groove 146 formed about insert 141 fluidly connects axial outlet grooves 144 with fuel injection conduit 142." (Ex. 1004, 6:6–6:9) This circumferential groove 146 constitutes a fuel channel formed by the annular ring and disposed about the inner wall of the air intake. Wittkopf also teaches that the fuel channel can be formed in the throttle body, the ring, or both: "[a]lthough axial grooves 144 and circumferential groove 146 are shown formed in insert 141, in an alternative embodiment either the axial grooves, the circumferential groove, or both, may be formed within the interior of outer housing 143," and "outer housing 143 is ideally integrally formed with the throttle body casting." (Ex. 1004, 6:13-6:17; 5:66-5:67)

Alternatively, Benoit teaches annularly-shaped high pressure cavities (36) formed within the air intake bores that constitute fuel channels disposed about the inner wall of the air intake. Specifically, "each of the inserts 26 includes an outer surface with a groove 34 positioned axially between the ends and preferably in axial alignment with the narrow area or low pressure region of the Venturi-shaped barrel 30. The grooves 34 extend around the perimeter of the insert 26.... the grooves 34 of the inserts 26 cooperate with the housing 22 to present a plurality of generally annularly-shaped cavities 36." (Ex. 1005, 3:29–3:36; FIGS. 2 and 3)

FIG. 2 Fuel Channel

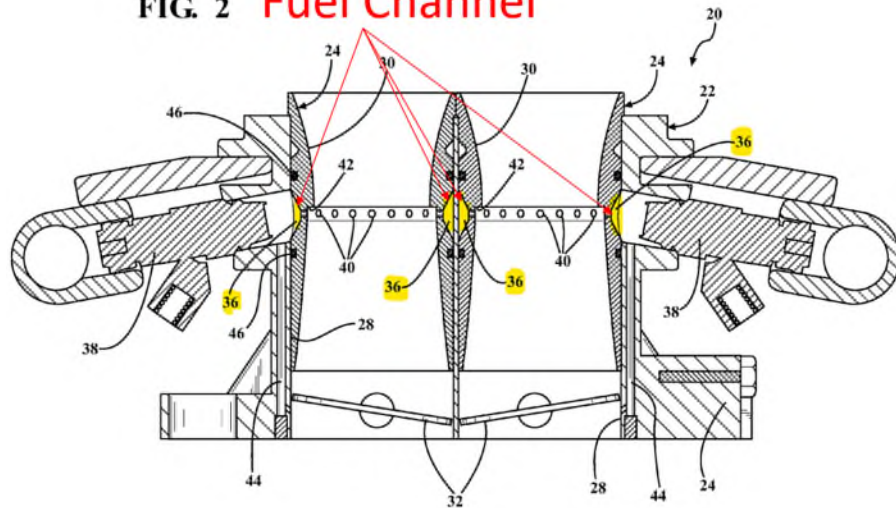
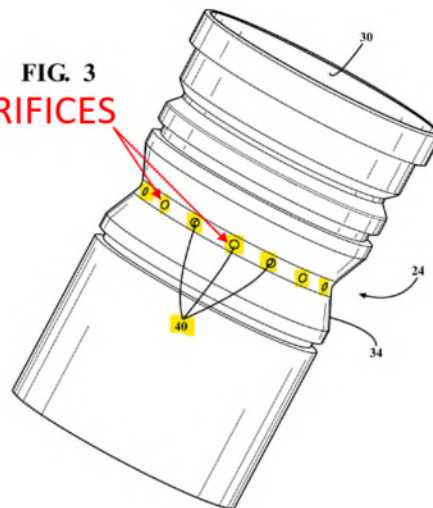


FIG. 3 ORIFICES



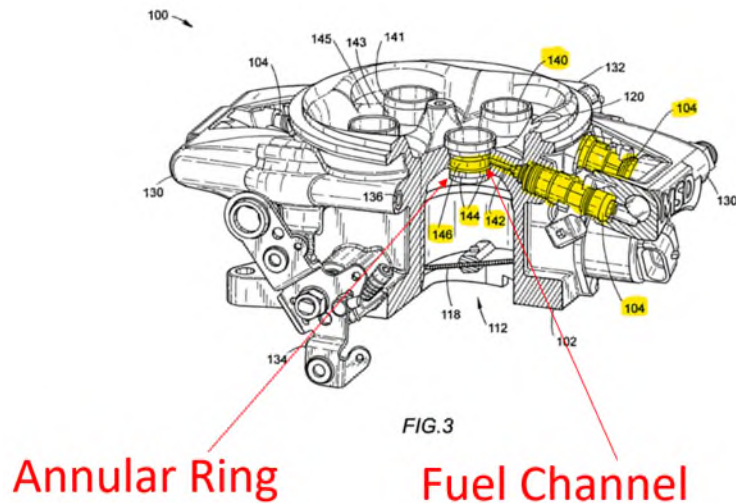
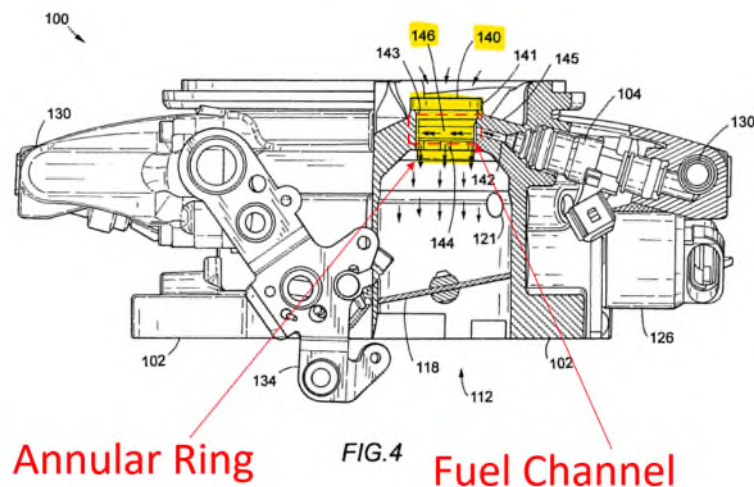
Benoit further teaches that "at least one of the inner surface of the body portion and the outer surface of the insert presents a groove, and the high pressure cavity is defined by the gap between the body portion and the insert at the location of the groove." (Ex. 1005, 2:20–2:24) The inserts 26 are positioned at the inner walls of the air intake bores 28, with "[t]he inserts 26 disposed in the cylindrical bores 28."

(Ex. 1005, 3:10–3:11; FIGS. 2, 3) A POSA would understand that Benoit's annularly-shaped cavities (36) constitute fuel channels formed by the annular ring (insert 26) and/or the inner wall of the air intake (housing 22), exactly as claimed.

[1.5] a plurality of orifices disposed in said annular ring and in fluid communication with said fuel channel; wherein pressurized fuel is forced through said fuel port, through said fuel channel, and through said plurality of orifices in order to mix with air moving through said air intake;

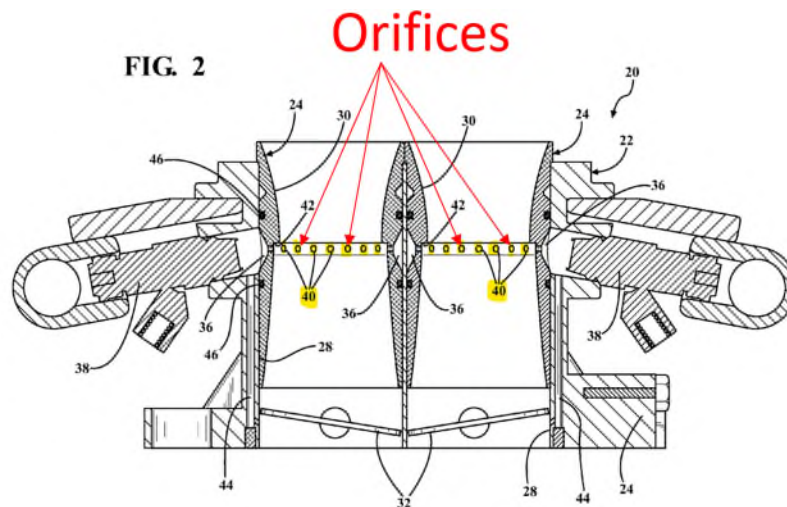
Wittkopf teaches: "Insert 141 includes axial grooves 144 intervalled about the exterior circumference of insert 141. A circumferential groove 146 formed about insert 141 fluidly connects axial outlet grooves 144 with fuel injection conduit 142, thereby allowing fuel to flow from injector 104 through conduit 142, through circumferential groove 146, and through axial grooves 144 to discharge" fuel downwardly into the air stream. (Ex. 1004, 6:6–6:17; FIGS. 3 and 4) Wittkopf further teaches: "[e]ach injector 104 feeds fuel into a circular fuel distribution ring 140 via a fuel injection conduit 142. Fuel distribution ring 140 introduces pressurized fuel into the air stream." (Ex. 1004, 5:51–5:53) Wittkopf's axial grooves 144 thus constitute a plurality of orifices disposed in the annular ring and in fluid communication with the fuel channel (circumferential groove 146),

through which pressurized fuel is forced from the fuel port, through the fuel channel, and through the orifices to mix with air in the intake.



Alternatively, Benoit teaches: "each of the fuel injectors 38 is in fluid communication with one of the annularly-shaped cavities 36 for delivering a high-pressured flow of fuel into its respective cavity 36.... Each of the exemplary

inserts 26 includes a plurality of apertures 40 which extend from the grooves 34 to the narrow areas of the Venturi-shaped barrels 30. As such, during operation of the hybrid assembly 20 a high pressure flow of fuel is delivered from the high pressure cavity 36 into the low pressure regions of the air flowing through the Venturi-shaped barrels 30." (Ex. 1005, 3:44–3:57; FIG. 2)



Benoit further teaches that "the fuel from the annularly-shaped high pressure cavities 36 is generally uniformly delivered into the flow of air around the perimeter of the Venturi-shaped barrel 30 to create a more uniform air and fuel mixture." (Ex. 1005, 4:1–4:4) Benoit's apertures (40) thus constitute a plurality of orifices disposed in the annular ring (insert 26) in fluid communication with the fuel channel (high pressure cavity 36), through which pressurized fuel is forced from the fuel port and fuel channel to mix with air in the intake.

[1.6] a throttle shaft and throttle plate disposed within said air intake for rotation therein to vary an air flow moving through the air intake; and,

Farrell teaches this limitation. Farrell discloses that "two throttle shaft apertures 182 ... extend fully through the main throttle body 102," and are "sized and configured to accommodate a throttle shaft, which is attached to a suitable throttle valve, such as a throttle plate or the like. The throttle shafts will be rotatable within the throttle shaft apertures 182." (Ex. 1003, 3:65–4:4; FIGS. 5, 7, 10) Farrell further discloses that the centerline of each fuel injector receptacle (180) "extends to a location just above a throttle valve shaft aperture 182," and that "the fuel injectors direct fuel to cover [the] upper surface [of] the throttle blade to improve fuel atomization." (Ex. 1003, 3:54–3:59) This confirms that the throttle shaft apertures (182) accommodate throttle shafts bearing throttle plates that are positioned within the air intake passages (146, 148, 150, 152) below the fuel injectors, and that those throttle plates are the surfaces upon which atomized fuel is directed, thereby confirming their operative role in regulating air flow through the passages. A POSA would understand that Farrell's throttle shafts and throttle plates, rotatable within the throttle shaft apertures (182) in the air intake passages, are disposed within the air intake for rotation therein to vary the air flow moving through the throttle body.

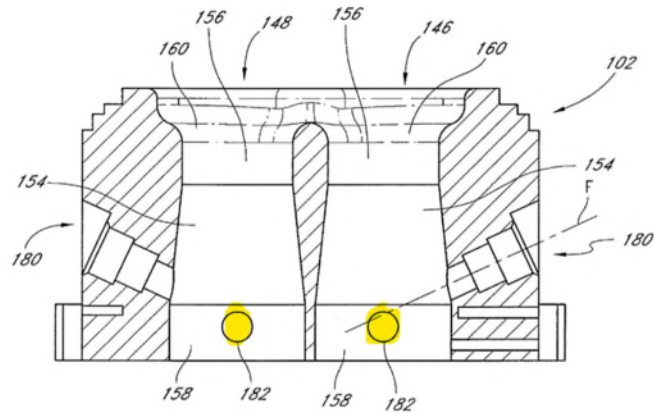


FIG. 5

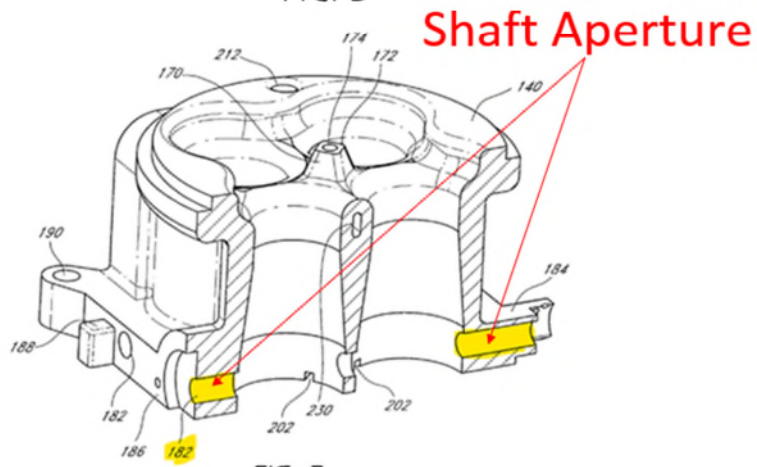


FIG. 7

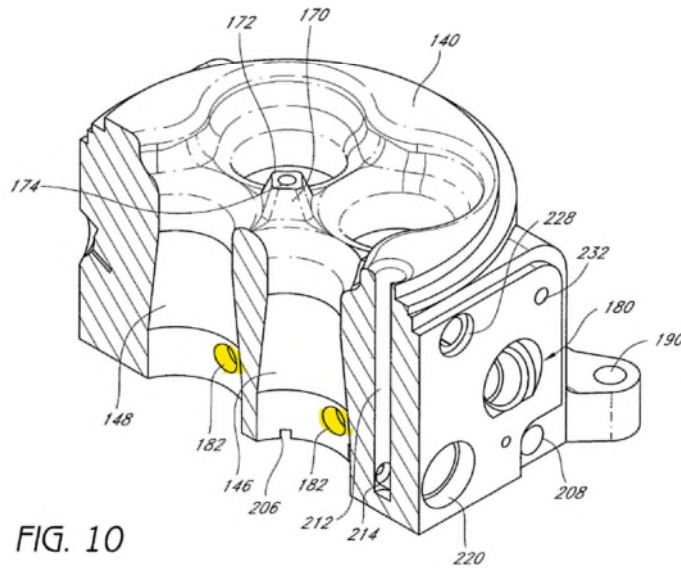


FIG. 10

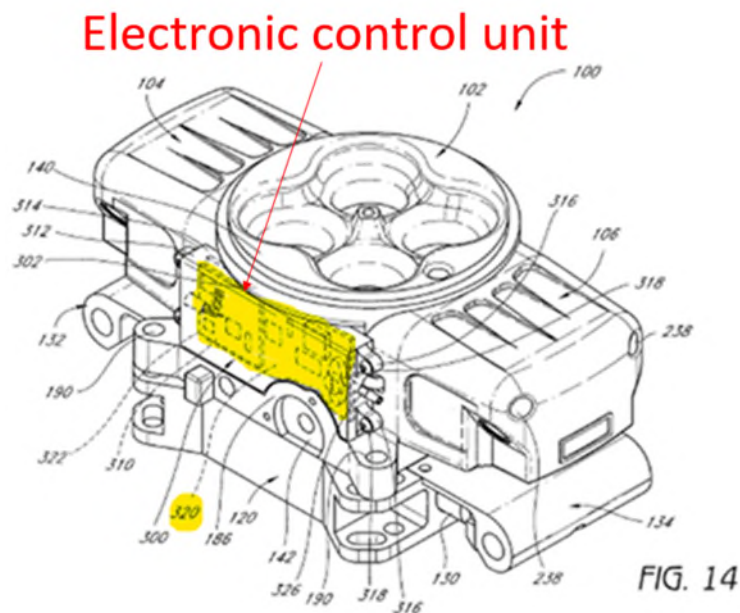
Wittkopf expressly and unambiguously teaches this limitation through both its specification and its claims. The Summary of the Invention discloses "a throttle body assembly with four main bores, each with a throttle plate and an associated fuel injector." (Ex. 1004, 4:14-4:17) The preferred embodiment confirms this structure: "throttle body assembly 100 preferably includes...four main bores 112 (each with a throttle plate 118)," with fuel injectors (104) "preferably located above the throttle plates 118." (Ex. 1004, 5:40-5:49) Wittkopf's Claim 1 expressly recites "a throttle valve (118) disposed in said bore," confirming the throttle plate is disposed within the air intake bore. (Ex. 1004, Claim 1) Wittkopf further confirms that the throttle blades regulate air flow by rotation, stating that "IAC circuitry 120 bypasses throttle blades, which are shut when the engine is idling (although a closed throttle still allows a small amount of air to enter the manifold)." (Ex. 1004, 6:36-6:39) The positional relationship of the throttle valve within the bore is further confirmed by Wittkopf's Claim 1, which places the IAC inlet port (121) "downstream of said first point and upstream of said throttle valve," establishing that the throttle valve (118) is the downstream-most control element within the bore, the element whose rotational position varies the air flow moving through the bore into the intake manifold. (Ex. 1004, Claim 1) A POSA would immediately recognize Wittkopf's throttle valve (118) disposed in bore (112) and rotatable to

control air flow as the structural and functional equivalent of the claimed throttle shaft and throttle plate disposed within the air intake for rotation therein to vary air flow.

Benoit likewise expressly teaches this limitation. Benoit's Claim 1 recites "a throttle valve disposed in each of said bores adjacent said outlet ends and pivotably connected to said housing for selectively controlling the flow of air through each of said bores." (Ex. 1005, Claim 1) The specification further confirms: "As is common with conventional carburetors, a throttle valve 32 is disposed in each of the bores 28 adjacent the ends of the Venturi-shaped barrels 30 for selectively controlling the volume of the flow of air through the barrels 30." (Ex. 1005, 3:24-3:28) Benoit further describes how the throttle valves (32) interact with the fuel delivery system — specifically, that "because the throttle valves 32 are closed (or substantially entirely closed) during idling, the pressure of the air below the throttle valves 32 is typically lower than above the throttle valves 32," confirming that the throttle valves regulate air flow by rotation within the bore. (Ex. 1005, 4:35–42.) A POSA would readily recognize Benoit's pivotably connected throttle valve (32) disposed within bore (28) for selectively controlling air flow as the structural and functional equivalent of the claimed throttle shaft and throttle plate disposed within the air intake for rotation therein to vary air flow. (Ex. 1006, ¶ 28)

[1.7] an electronic control unit to control fuel flow from said electronic fuel injector.

Farrell discloses that "a small housing 300" can be mounted to the throttle body to house circuitry including an ECU, and that "the main board 320, and particularly an ECU that is defined by the main board 320, can control the injection timing and amount." (Ex. 1003, 8:48–54; FIG. 14) A POSA would understand that controlling injection timing and amount constitutes controlling fuel flow from the electronic fuel injector as claimed.



Accordingly, each and every limitation of independent Claim 1 is taught by the combination of Farrell and Wittkopf, or alternatively, by the combination of Farrell and Benoit.

2. Independent Claim 5

Claim 5 recites substantially the same structural limitations as Claim 1, with the following differences: (1) the air intake is defined as "extending from an upper side of said fuel injection throttle body to a lower side" rather than simply "extending through"; (2) the orifices are disposed "through" rather than "in" the annular ring; (3) the throttle shaft/plate and ECU are recited as separate, expressly enumerated elements; and (4) Claim 5 expressly requires the throttle body to be "configured to replace a carburetor of an internal combustion engine." For all elements common to Claim 1, the analysis above is incorporated.

[5.0] A fuel injection throttle body, comprising:

Claim 5's preamble differs meaningfully from Claim 1's preamble in one important respect: Claim 1 recites "a fuel injection throttle body for an internal combustion engine," while Claim 5 recites simply "a fuel injection throttle body," without the "for an internal combustion engine" qualifier. However, Claim 5 then expressly requires at element [5.8] that the throttle body be "configured to replace a carburetor of an internal combustion engine," which necessarily implies the throttle body is for use with an internal combustion engine. The preamble of Claim 5 is therefore broader than Claim 1's preamble, and anything that satisfies Claim 1's preamble necessarily satisfies Claim 5's preamble as well.

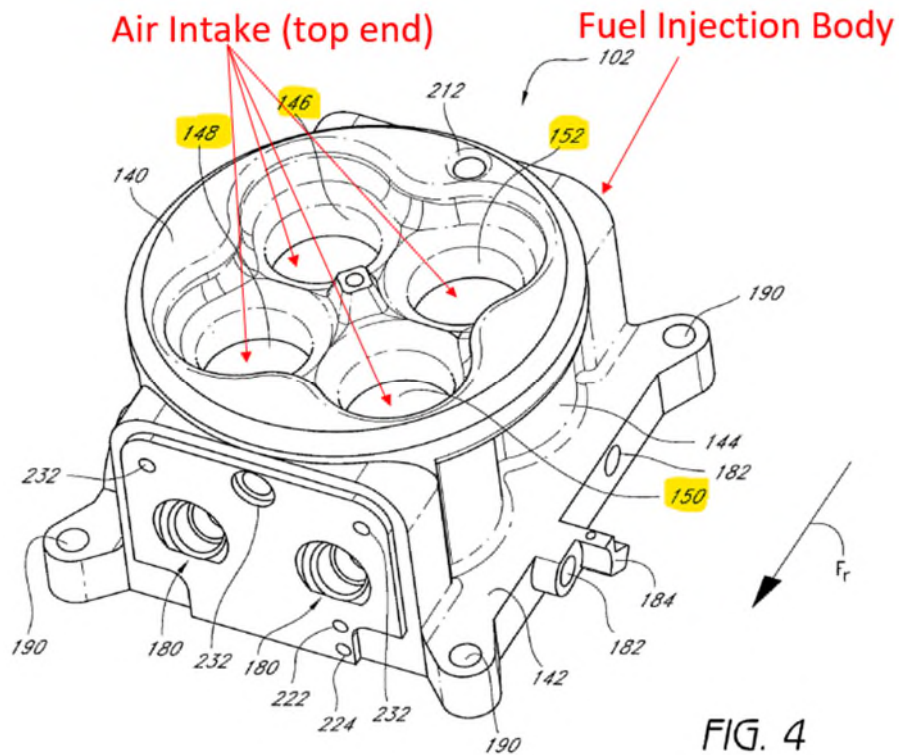
Farrell teaches a fuel injection body that "is sized and configured to replace a carburetor, such as a standard 4150 double pumper carburetor." (Ex. 1003, 2:44-2:46) Wittkopf similarly discloses a throttle body fuel injection system "designed and arranged to easily replace four-barrel carburetors." (Ex. 1004, 4:12–13) Benoit teaches a hybrid fuel injection and carburetor assembly "for delivering a fuel and air mixture into an intake manifold of an engine." (Ex. 1005, Abstract) All three references are directed to throttle body fuel injection systems, the precise subject matter recited in Claim 5's preamble. (Ex. 1006, ¶ 25)

Accordingly, the preamble of Claim 5 is taught by Farrell (Ex. 1003), Wittkopf (Ex. 1004), and Benoit (Ex. 1005), individually and in combination.

[5.1] an air intake extending from an upper side of said fuel injection throttle body to a lower side and defining a flow path for air through said fuel injection throttle body;

Farrell teaches air passages extending from an upper surface to a lower surface of the throttle body. Specifically, "the top surface 140 and the lower flange 142 are spaced apart by a main portion 144 of the main throttle body 102," and "[f]our passages 146, 148, 150, 152 extend through at least a majority of the main portion 144 from the top surface 140 through the lower flange 142." (Ex. 1003, 3:12–3:16;

FIGS. 4, 5, 8) These passages define flow paths for air extending from the upper side (top surface 140) to the lower side (lower flange 142) of the throttle body.



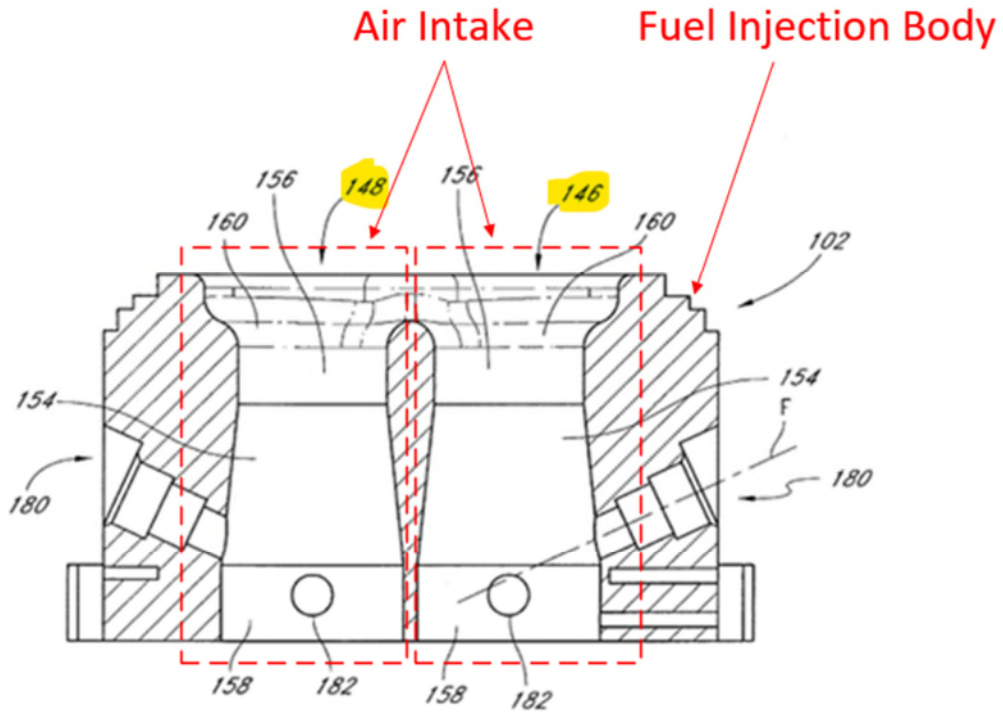
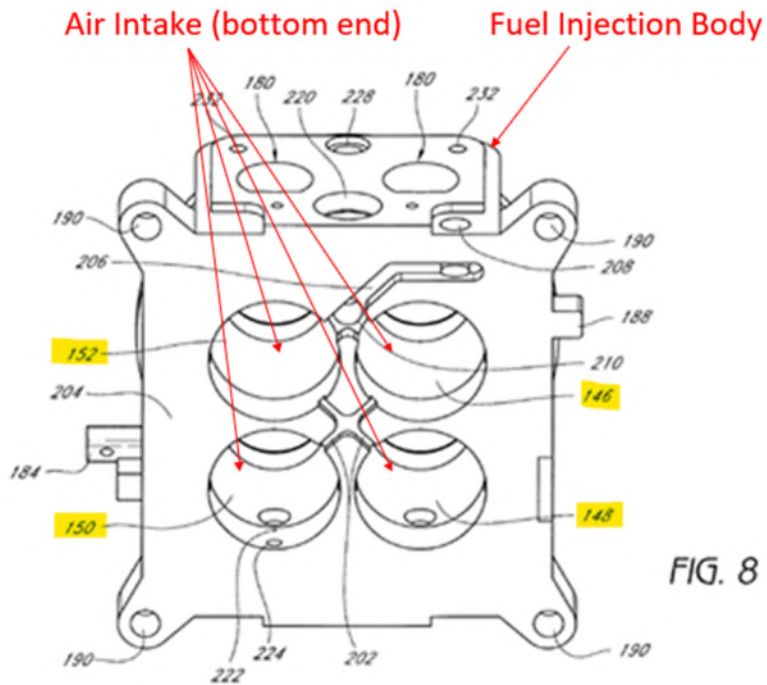
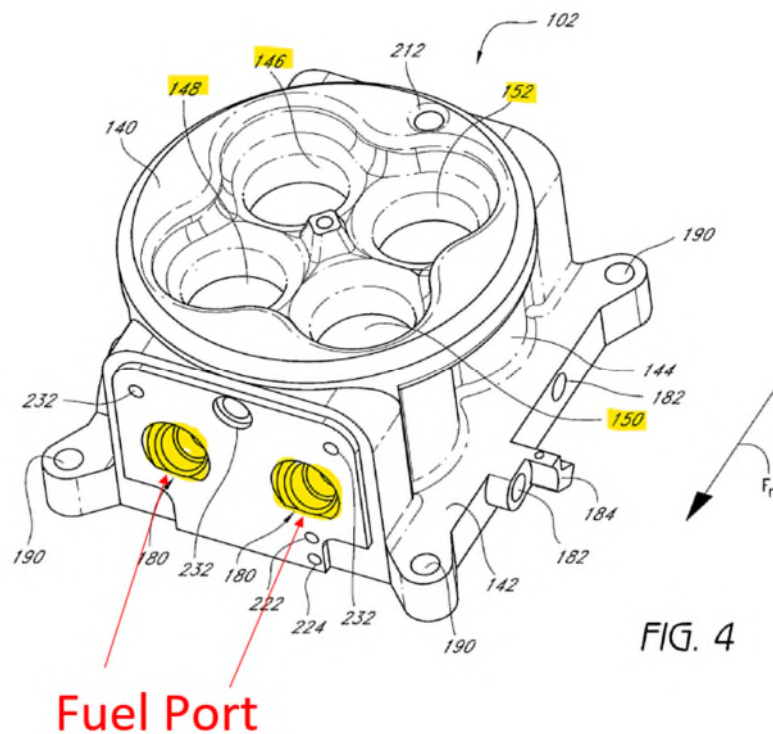


FIG. 5



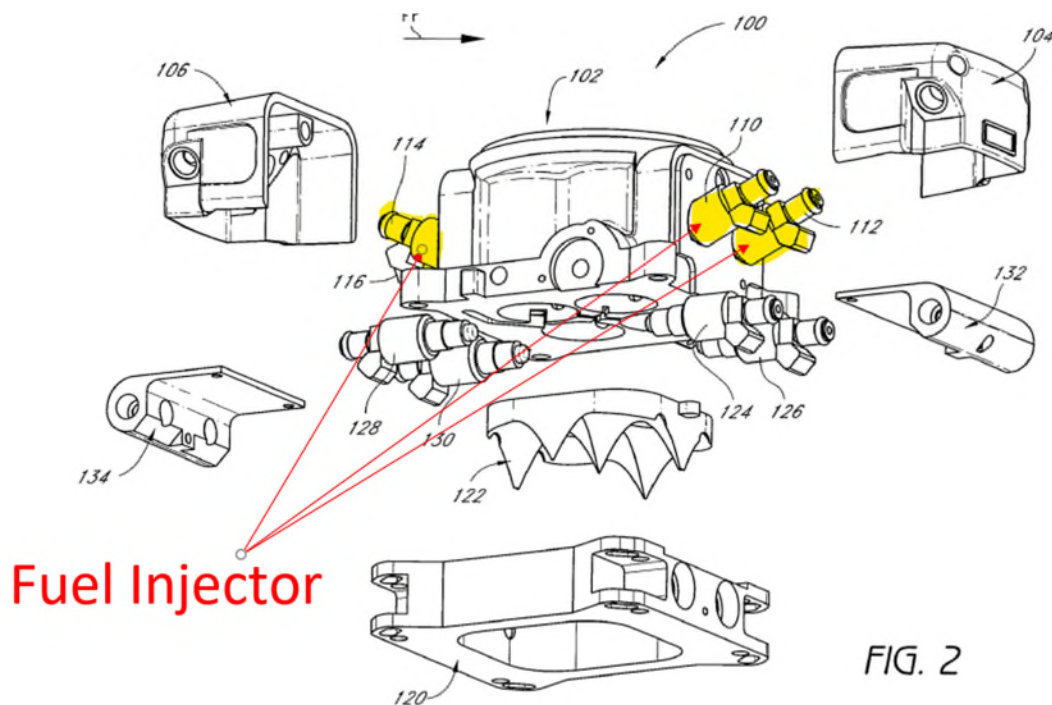
[5.2] a fuel port disposed in said fuel injection throttle body;

Farrell's injector receptacles (180) extending from the side surface of the main throttle body into each of the passageways (146, 148, 150, 152), through which pressurized fuel from the fuel injectors is introduced into the air intake passageways, constitute fuel ports disposed in the fuel injection throttle body. (Ex. 1003, 3:46–3:51; FIG. 5) Wittkopf's fuel injection conduit (142) and Benoit's high pressure cavity (36) likewise teach this limitation. The full analysis of this limitation, including supporting citations to all three references, is set forth above at [1.2] and is incorporated herein by reference in its entirety.



[5.3] an electronic fuel injector disposed in said fuel port of said fuel injection throttle body, said fuel port receiving fuel from said electronic fuel injector;

Farrell's fuel injectors (110, 112, 114, 116), electronically controlled in timing and amount by Farrell's ECU (circuitry 310), are mounted to the throttle body and deliver pressurized fuel through the fuel ports (receptacles 180) into the air intake passageways. (Ex. 1003, 2:56–2:60; 6:16–6:22; FIG. 2) Wittkopf's express description of fuel injectors as "electromechanical devices" actuated by "application of an electrical current" confirms that this class of injector was well-known in the art. (Ex. 1004, 1:59-1:65) The full analysis of this limitation is set forth above at [1.3] and is incorporated herein by reference in its entirety.



[5.4] a fuel channel defined by an inner wall of said air intake, an annular ring, or both; said annular ring positioned at said inner wall of said air intake;

For the same reasons set forth at [1.4] above, incorporated herein by reference, Wittkopf's two-piece annular ring (140) positioned within and along the inner wall of the bore defines a circumferential fuel channel (146) formed by the insert (141) and/or the outer housing (143), which is integrally formed with the throttle body casting. (Ex. 1004, 5:64–6:17; FIG. 3) Benoit's annularly-shaped cavities (36), formed by grooves (34) in inserts (26) cooperating with the housing (22), likewise define fuel channels at the inner wall of each air intake bore, with inserts (26) positioned at the inner walls of bores (28). (Ex. 1005, 3:6–4:20; FIGS. 2, 3)

[5.5] a plurality of orifices disposed through said annular ring, said plurality of orifices in fluid communication with said fuel channel, said fuel port, and said electronic fuel injector to disperse fuel into said air intake;

See analysis for [1.5] above which is incorporated herein by reference. Wittkopf's axial grooves (144) function as orifices disposed through the annular ring insert (141), extending from the circumferential groove (fuel channel 146) through the ring structure to discharge fuel into the air stream. (Ex. 1004, 6:6–6:17; FIG. 3)

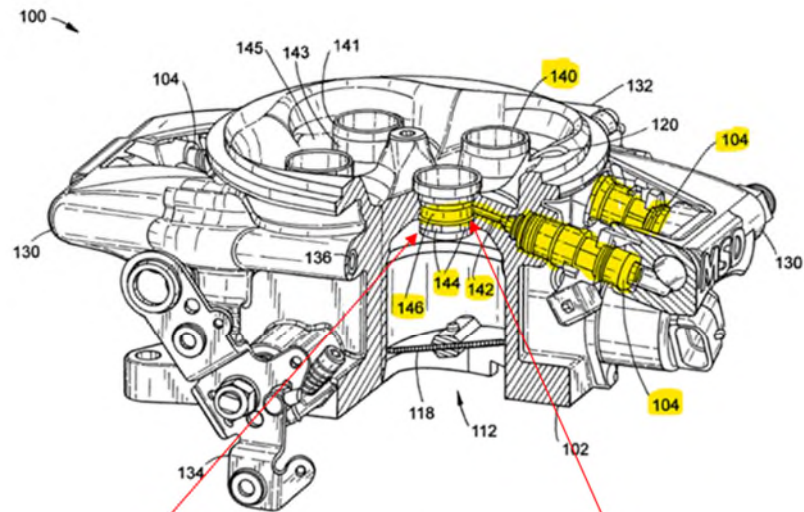
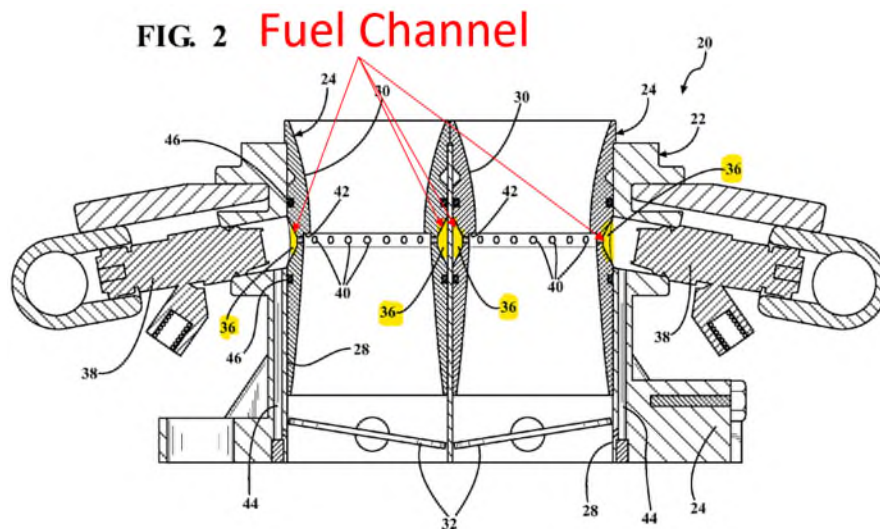


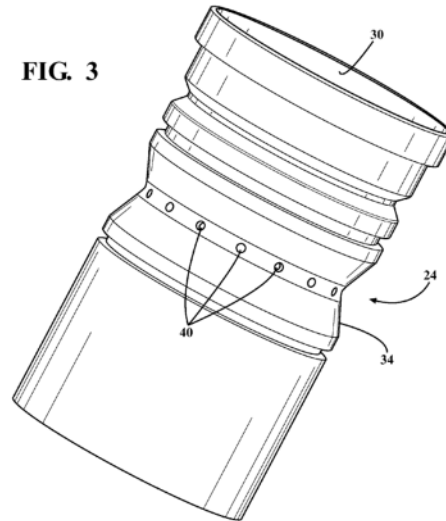
FIG. 3

Annular Ring

Fuel Channel

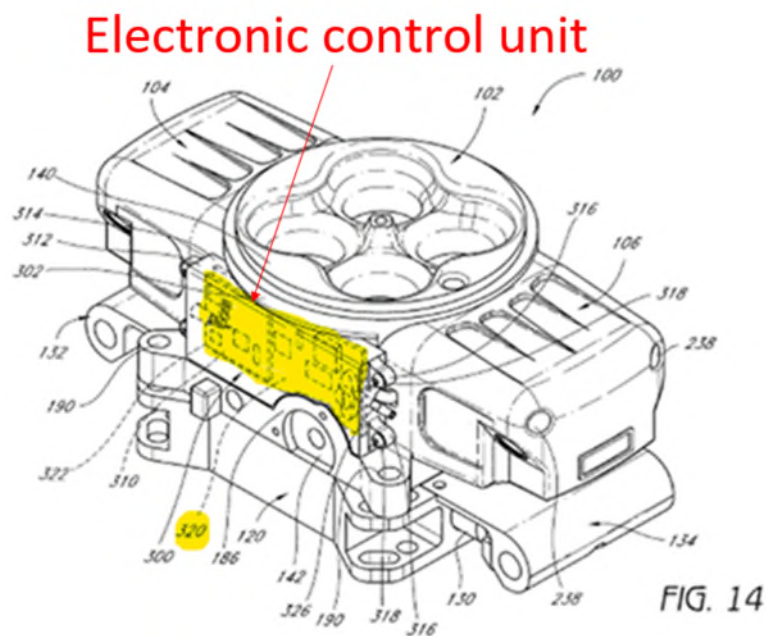
Alternatively, Benoit's apertures (40) extend through the inserts (26) from the grooves (34) (fuel channels) through the insert structure to the Venturi-shaped barrels (30) (air intake), dispersing fuel into the air intake. (Ex. 1005, 3:48–3:55; FIGS. 2, 3)





[5.6] an electronic control unit to control the electronic fuel injector;

See analysis for [1.7] above, which is incorporated herein by reference. Farrell teaches an ECU mounted on the throttle body that "can control the injection timing and amount." (Ex. 1003, 8:48–8:54; FIG. 14)



[5.7] a shaft extending through said air intake and a throttle plate disposed on said shaft, said throttle plate rotatable to vary airflow through said air intake;

Farrell teaches throttle shaft apertures (182) sized and configured to accommodate a throttle shaft bearing a throttle plate rotatable to vary airflow through the air intake passageways. (Ex. 1003, 3:65–4:4; FIGS. 5, 10)

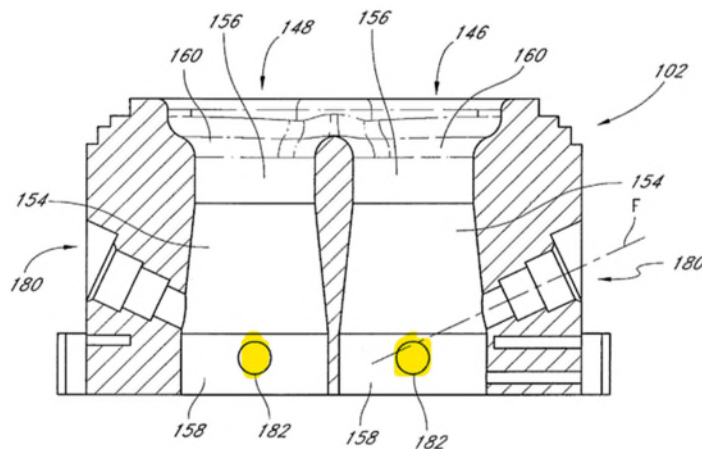


FIG. 5

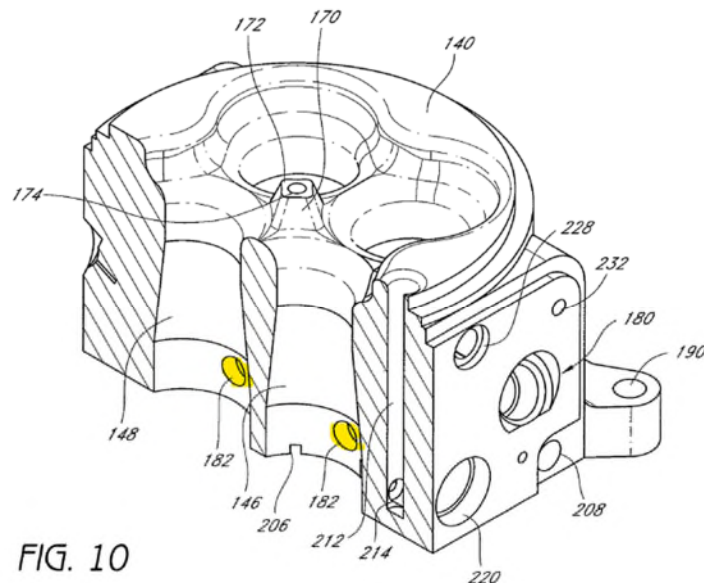


FIG. 10

Wittkopf expressly confirms throttle plates (118) disposed within bores (112) that are "shut when the engine is idling," directly controlling air flow by rotation. (Ex. 1004, 6:37–6:38; Claim 1) Benoit's Claim 1 likewise expressly recites "a throttle valve...pivotably connected to said housing for selectively controlling the flow of air through each of said bores." (Ex. 1005, Claim 1) The full analysis of this limitation is set forth above at [1.6] and is incorporated herein by reference in its entirety.

[5.8] said fuel injection throttle body configured to replace a carburetor of an internal combustion engine.

Farrell expressly teaches a fuel injection body "designed for replacement of existing carburetors" and "sized and configured to replace a carburetor." (Ex. 1003, Abstract; 1:17–1:19) Wittkopf similarly describes a throttle body fuel injection system "designed and arranged to easily replace four-barrel carburetors." (Ex. 1004, 4:12–4:14) Benoit teaches a fuel injection assembly "preferably packaged and sold as an aftermarket product to be mounted on an existing engine," providing an improved alternative to traditional carburetion. (Ex. 1005, 2:65–3:5)

Accordingly, each and every limitation of independent Claim 5 is taught by the combination of Farrell and Wittkopf, or alternatively, by the combination of Farrell and Benoit.

B. Dependent Claims

3. Dependent Claim 2

The fuel injection throttle body of claim 1, said plurality of orifices oriented in one of a radial direction or a non-radial direction.

Wittkopf teaches orifices oriented in a non-radial direction. Wittkopf discloses "axial grooves 144 intervalled about the exterior circumference of insert 141" that extend axially (i.e., parallel to the bore axis) and "discharge downwardly at or near the bottom end of ring 140." (Ex. 1004, 6:6–6:12; FIG. 3) Wittkopf further explains that "fuel is injected through downward-facing outlets" rather than radially inward toward the bore center. (Ex. 1004, 5:62–5:63) The axial/downward orientation of these outlets is non-radial relative to the bore centerline, satisfying this limitation. (Ex. 1006, ¶ 29)

Alternatively, Benoit teaches orifices oriented in a radial direction. Benoit teaches that the apertures (40) "extend from the grooves 34 to the narrow areas of the Venturi-shaped barrels 30." (Ex. 1005, 3:48–51) These apertures extend from the outer annular groove (cavity 36) inward toward the center of the air intake barrel — i.e., in a radial direction. (Ex. 1005, FIG. 2) Benoit further confirms that the apertures are "generally uniformly spaced from one another around the circumference of each insert 26," delivering fuel "around the perimeter of the

Venturi-shaped barrel 30." (Ex. 1005, 3:65–4:4) Delivering fuel from an annular cavity via apertures uniformly spaced around the circumference into the barrel interior requires radially-oriented apertures. (Ex. 1006, ¶ 30)

4. Dependent Claim 3

The fuel injection throttle body of claim 1, said fuel injection throttle body configured to replace a carburetor.

Farrell describes a fuel injection unit that is "designed for replacement of existing carburetors" (Ex. 1003, Abstract) and "sized and configured to replace a carburetor." (Ex. 1003, 1:17–1:19) Wittkopf similarly describes a fuel injection throttle body "designed and arranged to easily replace four-barrel carburetors." (Ex. 1004, 4:11–4:13) This limitation is directly and expressly taught by the primary reference Farrell alone and is confirmed by Wittkopf.

5. Dependent Claim 4

The fuel injection throttle body of claim 1, said fuel port having an axis that is substantially perpendicular to said throttle shaft.

Farrell teaches this limitation. Farrell discloses that the fuel injector receptacles (180) "extend from a side surface of the main throttle body 102 into a corresponding one of the passageways," with each receptacle's centerline F

extending inward toward the passageway. (Ex. 1003, 3:46–3:57; FIG. 5) The throttle shaft apertures (182) "extend fully through the main throttle body 102" laterally, i.e., side to side across the throttle body. (Ex. 1003, 3:65–3:67) A POSA would understand from the relative orientations shown in FIGS. 5 and 10 that the axis of receptacle 180 is substantially perpendicular to the throttle shaft axis. (Ex. 1003, FIGS. 5, 10)

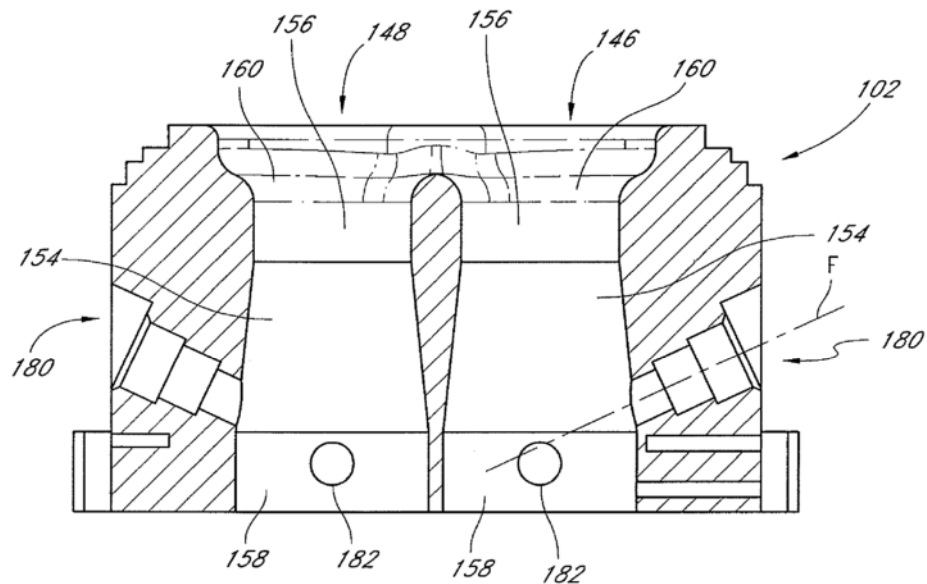
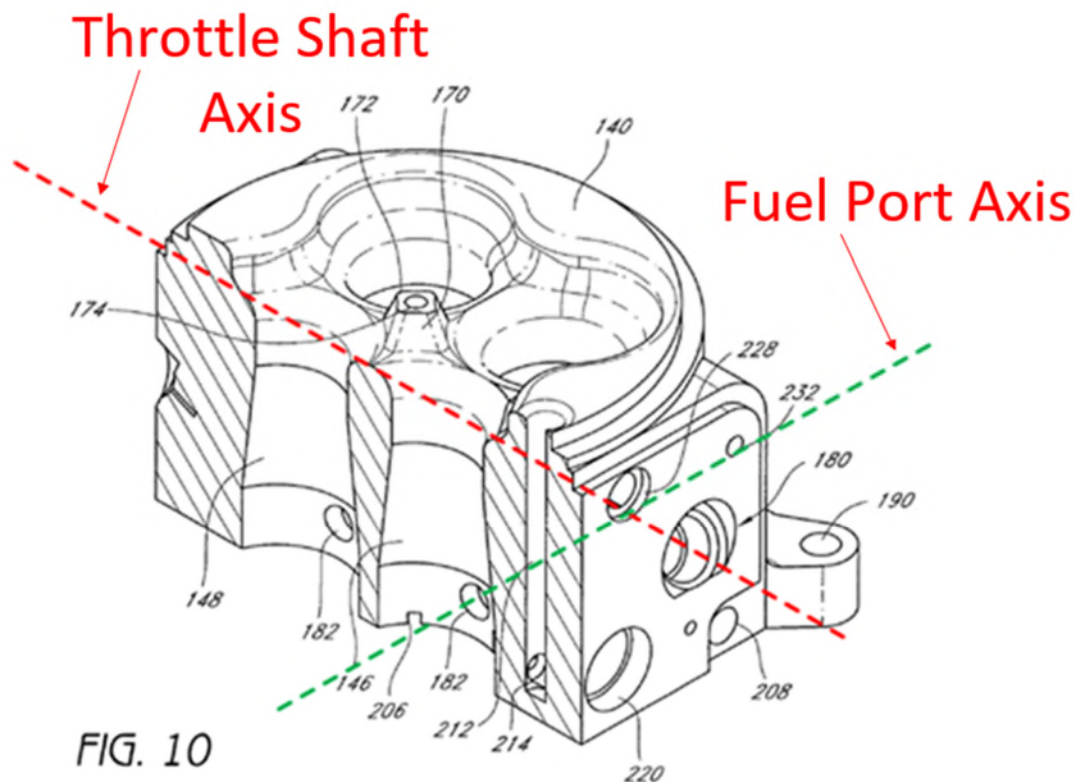


FIG. 5



6. Dependent Claim 6

The fuel injection throttle body of claim 5 wherein said plurality of orifices are either radially oriented or non-radially oriented.

Claim 6 recites the same radial/non-radial orientation limitation as Claim 2. For the same reasons set forth in the analysis of Claim 2 above, Wittkopf teaches non-radially oriented orifices (axial/downward-facing outlets) and Benoit teaches radially-oriented orifices (apertures extending from the annular cavity inward toward the barrel center). (Ex. 1004, 6:6–6:17; Ex. 1005, 3:48–3:51; 3:65–4:4)

7. Dependent Claim 7

The fuel injection throttle body of claim 6 wherein said plurality of orifices are each spaced apart between 20 and 38 degrees.

Benoit directly supports this limitation. Benoit expressly teaches that the apertures (40) "are generally uniformly spaced from one another around the circumference of each insert 26," and that "the inserts 26 could include any desirable number of apertures 40." (Ex. 1005, 3:65–4:9) Benoit further teaches that uniform circumferential spacing of the apertures achieves "a more uniform air and fuel mixture" — the express design objective of the aperture arrangement. (Ex. 1005, *Id.*)

A POSA implementing Benoit's uniformly-spaced aperture arrangement would select an aperture count to achieve the desired fuel distribution. Because the apertures are uniformly spaced around the full 360° circumference, the angular spacing between adjacent apertures is determined solely by the number of apertures selected. Selecting an aperture count between 10 and 18 apertures, each of which is a straightforward design choice for a circular fuel distribution ring, yields angular spacing that falls directly within the claimed 20–38° range:

Aperture Count	Angular Spacing (360° / Aperture Count)
10 apertures	36.0°
12 apertures	30.0°
14 apertures	25.7°
18 apertures	20.0°

Each of these configurations falls squarely within the claimed 20–38° range.

Because Benoit expressly teaches (1) uniform circumferential spacing, (2) a design objective of uniform fuel distribution around the perimeter of the bore, and (3) that "any desirable number" of apertures may be used, selecting an aperture count within the range of 10–18 to achieve that objective is precisely the type of routine optimization that "involves only routine skill in the art." *In re Aller*, 220 F.2d 456, 456 (CCPA 1955). (Ex. 1006, ¶¶ 30, 32)

Additionally and alternatively, Wittkopf expressly teaches that the number of outlets in the annular ring is a design variable that can be adjusted to achieve "superior mixing for even distribution to the cylinders": "[e]ach injection ring 140 includes six axial outlets 144, although a greater or lesser number can be used as desired." (Ex. 1004, 6:18–6:25.) Six outlets uniformly spaced around a 360° circumference yields 60° spacing, which is outside the claimed range. However, because Wittkopf expressly teaches that a greater number of outlets can be used, a

POSA seeking to optimize circumferential fuel distribution would have found it obvious to increase the outlet count to achieve tighter, more uniform spacing.

Increasing Wittkopf's outlet count to any value between 10 and 18 yields angular spacing within the claimed 20–38° range, as shown in the table above. This is a straightforward numerical optimization of a single design variable that Wittkopf expressly invites. *In re Aller*, 220 F.2d 456, 456 (CCPA 1955); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("[A] person of ordinary skill is also a person of ordinary creativity, not an automaton.") (Ex. 1006, ¶¶ 31, 33)

8. Dependent Claim 8

The fuel injection throttle body of claim 5 wherein said fuel is atomized when entering the air intake.

Benoit expressly teaches fuel atomization when fuel enters the air intake.

Specifically, Benoit states: "during operation of the hybrid assembly 20 a high pressure flow of fuel is delivered from the high pressure cavity 36 into the low pressure regions of the air flowing through the Venturi-shaped barrels 30. Because of the great pressure difference between the fuel in the high pressure cavities 36 and the flow of air in the low pressure regions of the Venturi-shaped barrels 30, the fuel atomizes in the air extremely quickly and efficiently. This leads to a more uniform and efficient combustion of the fuel and air mixture in the combustion

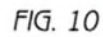
chamber of the internal combustion engine." (Ex. 1005, 3:51–3:64) Benoit accordingly expressly teaches that fuel is atomized when entering the air intake, as required by Claim 8. (Ex. 1006, ¶ 30)

Alternatively, Wittkopf expressly teaches fuel atomization. Wittkopf explains that fuel injectors "meter and atomize fuel" and that "fuel under pressure [is] sprayed through an injector nozzle to form a cone pattern of atomized fuel." (Ex. 1004, 1:60–1:65) Wittkopf further teaches that the annular ring structure introduces atomized, pressurized fuel into the air stream, and that "it is desirable that the total cross-sectional area of axial grooves 144 ... be larger than the total cross-sectional area exiting the corresponding fuel injector 104 so as to lower the kinetic energy of the fuel droplets entering the air stream," confirming that fuel enters the air intake in atomized droplet form. (Ex. 1004, 5:51–5:54; 6:6–6:32)

9. Dependent Claim 9

The fuel injection throttle body of claim 5 wherein said fuel port is oriented at an angle relative to said shaft.

Claim 9 requires the fuel port to be "oriented at an angle relative to the throttle shaft," which is substantially the same limitation as Claim 4, applied to the Claim 5 context. A POSA would understand from the disclosed orientation of centerline F



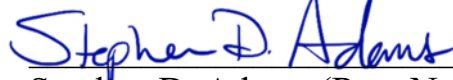
For the foregoing reasons, Petitioner respectfully requests that the Board institute IPR and cancel claims 1–9 of the '894 Patent as unpatentable under Section 103

Petition for *Inter Partes* Review of
Patent No. 11,409,894
Case IPR. IPR2026-00433

over Farrell (Ex. 1003) in view of Wittkopf (Ex. 1004) or, alternatively, in view of
Benoit (Ex. 1005).

Dated: July 23, 2026

Respectfully submitted,



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Petition for *Inter Partes* Review of
Patent No. 11,409,894
Case IPR. IPR2026-00433

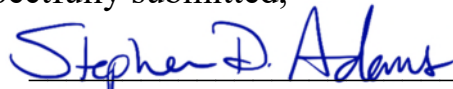
CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,409,894, including all exhibits and supporting evidence, was served in its entirety on July 22, 2026, upon the following parties by courier and electronic mail:

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Dated: July 23, 2026

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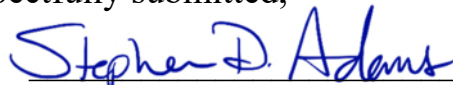
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Patent No. 11,409,894
Case IPR. IPR2026-00433

CERTIFICATE OF COMPLIANCE PURSUANT TO 37 C.F.R. § 42.24

This paper complies with the type-volume limitation of 37 C.F.R. § 42.24. The paper contains approximately 12,462 words, excluding the parts of the paper exempted by § 42.24(a). This paper also complies with the typeface requirement of § 42.6(a)(ii) and the type style requirements of § 42.6(a)(iii) & (iv).

Respectfully submitted,

Dated: July 23, 2026



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