TRADEMARK ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	SECURITY INTEREST

CONVEYING PARTY DATA

Name	Formerly	Execution Date	Entity Type
APT IP Holdings, LLC		04/08/2013	LIMITED LIABILITY COMPANY: WYOMING

RECEIVING PARTY DATA

Name:	Mazuma Credit Union
Street Address:	9300 Troost
City:	Kansas City
State/Country:	MISSOURI
Postal Code:	64131
Entity Type:	Credit Union: MISSOURI

PROPERTY NUMBERS Total: 15

Property Type	Number	Word Mark
Serial Number:	77613138	MOTOVOX
Serial Number:	77982138	MOTOVOX
Serial Number:	85125223	AMERICAN PERFORMANCE TECHNOLOGIES
Serial Number:	85125249	APT
Serial Number:	85125258	
Serial Number:	85125262	SMARTCARB
Serial Number:	85190038	MOTOVOX
Serial Number:	85317203	AMW
Serial Number:	85317208	AMERICAN MOTOR WORKS
Serial Number:	85317213	POWERAMW
Serial Number:	85324693	APT
Serial Number:	85398274	AMW
Serial Number:	85976500	AMERICAN MOTOR WORKS
Serial Number:	85978342	MOTOVOX

OP $390.00 77613138

Serial Number:	85978374	

CORRESPONDENCE DATA

Fax Number:

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent via US Mail.

Phone: 816-285-7800
Email: bnichols@campbell-lawfirm.com
Correspondent Name: Bruce Campbell Law Firm LLP
Address Line 1: 1220 Washington Street Ste. 202
Address Line 4: Kansas City, MISSOURI 64105

ATTORNEY DOCKET NUMBER:	0063-0002
NAME OF SUBMITTER:	Bruce Campbell
Signature:	/Bruce Campbell/
Date:	04/16/2013

Total Attachments: 53
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COLLATERAL ASSIGNMENT AND SECURITY AGREEMENT

This COLLATERAL ASSIGNMENT AND SECURITY AGREEMENT, dated as of April 8, 2013, made by APT IP Holdings, LLC, a Wyoming limited liability company (the "**Company**"), in favor of Mazuma Credit Union (the "**Holder**").

W I T N E S S E T H:

WHEREAS, the Company is an affiliate of American Performance Technologies, LLC and APT Powersport and Utility Products, LLC which are borrowers of Holder (collectively referenced to as "Borrowers"), and

WHEREAS, as a condition for Holder to agree to subordinate certain of its collateral in Borrowers to PMF Bancorp, ("the "Subordination"), Company will grant Holder a first position perfected security interest in and to Company's assets; and

WHEREAS, it is a condition to the obligation of the Holder to agree to the subordination to PMF Bancorp, that the Company shall have executed and delivered this Collateral Assignment and Security Agreement to the Holder.

NOW, THEREFORE, in consideration of the premises and to induce the Holder to enter into the Subordination, and to induce the Holder to subordinate part of its collateral in Borrower, the Company hereby agrees with the Holder as follows:

1. **Definitions.** The following terms which are defined in the Uniform Commercial Code in effect in the State of Missouri on the date hereof are used herein as so defined: Accounts, Certificated Security, Chattel Paper, Documents, Equipment, General Intangibles, Instruments, Inventory, Investment Property, Letter-of- Credit Rights, Proceeds and Supporting Obligations. The following terms shall have the following meanings:

1.1 "**Agreement**": this Collateral Assignment and Security Agreement, as the same may be amended, supplemented or otherwise modified from time to time.

1.2 "**Code**": the Uniform Commercial Code as from time to time in effect in the State of Missouri.

1.3 "**Collateral**": as defined in Section 2(Grant of Security Interest).

1.4 "**Copyrights**": (i) all copy rights arising under the laws of the United States, any other country or any political subdivision thereof, whether registered or unregistered and whether published or unpublished, all registrations and recordings thereof, and all applications in connection therewith, including, without limitation, all registrations, recordings and applications in the United States Copyright Office, and (ii) the right to obtain all renewals thereof.

1.5 "**Copyright Licenses**": any written agreement naming the Company as licensor or licensee, granting any right under any Copyright, including, without limitation, the grant of rights to manufacture, distribute, exploit and sell materials derived from any Copyright.

1.6 "**Deposit Accounts**": as defined in the Uniform Commercial Code of any applicable

jurisdiction and, in any event, including, without limitation, any demand, time, savings, passbook or like account maintained with a depositary institution.

1.7 "**Intellectual Property**": the collective reference to all rights, priorities and privileges relating to intellectual property, whether arising under United States, multinational or foreign laws or otherwise, including, without limitation, the Copyrights, the Copyright Licenses, the Patents, the Patent Licenses, the Trademarks and the Trademark Licenses, and all rights to sue at law or in equity for any infringement or other impairment thereof, including the right to receive all proceeds and damages therefrom.

1.8 "**Lien**": any mortgage, pledge, hypothecation, assignment, deposit arrangement, encumbrance, lien (statutory or other), charge or other security interest or any preference, priority or other security agreement or preferential arrangement of any kind or nature whatsoever (including any conditional sale or other title retention agreement and any capital lease having substantially the same economic effect as any of the foregoing).

1.9 "**Obligations**": the collective reference to the unpaid principal of and interest on the loans made to Borrowers by Holder and all other obligations and liabilities of the Company to the Holder, whether direct or indirect, absolute or contingent, due or to become due, or now existing or hereafter incurred, which may arise under, out of, or in connection with this Agreement.

1.10 "**Patents**": (i) all letters patent of the United States, any other country or any political subdivision thereof, all reissues and extensions thereof and all goodwill associated therewith, (ii) all applications for letters patent of the United States or any other country and all

divisions, continuations and continuations-in-part thereof and (iii) all rights to obtain any reissues or extensions of the foregoing.

1.11 "**Patent License**": all agreements, whether written or oral, providing for the grant by or to the Company of any right to manufacture, use or sell any invention covered in whole or in part by a Patent.

1.12 "**Permitted Encumbrances**": (i) liens of warehousemen, mechanics, materialmen, workers, repairmen, common carriers, or landlords, liens for taxes, assessments or other governmental charges (other than federal tax and ERISA liens), and other similar liens arising by operation of law, in each case arising in the ordinary course of business and for amounts that are not yet due and payable or which are being contested in good faith by appropriate proceedings promptly instituted and diligently conducted and for which an adequate reserve or other appropriate provision shall have been made to the extent required by generally accepted accounting principals; (ii) pledges or deposits in connection with workers compensation, unemployment insurance and other social security legislation; (iii) deposits to secure the performance of bids, trade contracts (other than for borrowed money), statutory obligations, surety and appeal bonds, performance, bonds and other obligations of a like nature incurred in the ordinary course of business; and (iv) the Lessor's interest in property leased to the Company.

1.13 "**Receivable**": any right to payment for goods sold or leased or for services rendered, whether or not such right is evidenced by an Instrument or Chattel Paper and whether or not it has been earned by performance (including, without limitation, any Account).

1.14 "**Trademarks**": (i) all trademarks, trade names, corporate names, company names,

business names, fictitious business names, trade styles, service marks, logos and other source or business identifiers, and all goodwill associated therewith, now existing or hereafter adopted or acquired, all registrations and recordings thereof, and all applications in connection therewith, whether in the United States Patent and Trademark Office or in any similar office or agency of the United States, any State thereof or any other country or any political subdivision thereof, or otherwise, and all common-law rights related thereto, and (ii) the right to obtain all renewals thereof.

1.15 "**Trademark License**" means any agreement, written or oral, providing for the grant by or to the Company of any right to use any Trademark.

1.16 "**Vehicles**" means all cars, trucks, trailers, construction and earthmoving equipment and other vehicles covered by a certificate of title law of any state and all tires and other appurtenances to any of the foregoing.

2. Grant of Security Interest. As collateral security for the prompt and complete payment and performance when due (whether at the stated maturity, by acceleration or otherwise) of the Obligations, the Company hereby grants to the Holder a security interest in all of the following property now owned or at any time hereafter acquired by the Company or in which the Company now has or at any time in the future may acquire any right, title or interest (collectively, the "Collateral"): (a) all Accounts; (b) all Chattel Paper; (c) all Deposit Accounts; (d) all Documents; (e) all Equipment; (f) all General Intangibles; (g) all Instruments; (h) all Intellectual Property; (i) all Inventory; (j) all Investment Property; (k) all Letter-of-Credit Rights; (l) all Vehicles; (m) all other property not otherwise described above; (n) all books and records pertaining to the Collateral; and (o) to the extent not otherwise included, all Proceeds, and products of any and all

of the foregoing and all collateral security and guarantees given by any person with respect to any of the foregoing.

3. Representations and Warranties. The Company hereby represents and warrants that:

3.1 Due Authorization. All necessary member action by the Company's members has been taken to authorize Company to execute this Agreement

3.2 Title; No Other Liens. Except for the security interest granted to the Holder pursuant to this Agreement, and other than as set forth on Schedule 1, the Company owns each item of the Collateral free and clear of any and all Liens or claims of others other than Permitted Encumbrances. Other than as set forth on Schedule 1, no financing statement or other public notice with respect to all or any part of the Collateral is on file or of record in any public office, except such as have been filed in favor of the Holder pursuant to this Agreement.

3.2 Perfected First Priority Liens. The security interests granted pursuant to this Agreement (a) upon completion of the filings and other actions specified on Schedule 2 will constitute perfected security interests in the Collateral (other than security interest in vehicles granted hereunder which shall not be required to be perfected) in favor of the Holder, as collateral security for the Obligations and (b) other than as set forth on Schedule 1, are prior to all other Liens on the Collateral in existence on the date hereof.

3.3 Inventory and Equipment. The Inventory and the Equipment are kept at the locations listed on Schedule 3. **[If any.]**

3.4 Jurisdiction of Organization; Chief Executive Office. The Company's jurisdiction

of organization is Wyoming, and its chief executive office or sole place of business is located at Kansas City, Missouri. The Company has delivered to the Holder a copy of its Certificate of Organization certified by the Secretary of State of the State of Wyoming.

4. Covenants. The Company covenants and agrees with the Holder that, from and after the date of this Agreement until the Obligations shall have been paid in full:

4.1 Delivery of Instruments, Certificated Securities and Chattel Paper. If any amount payable under or in connection with any of the Collateral shall be or become evidenced by any Instrument, Certificated Security or Chattel Paper, such Instrument, Certificated Security or Chattel Paper shall be immediately delivered to the Holder, duly endorsed in a manner satisfactory to the Holder, to be held as Collateral pursuant to this Agreement.

4.2 Maintenance of Perfected Security Interest; Liens; Further Documentation.

(a) The Company shall maintain the security interest created by this Agreement as a perfected security interest having at least the priority described in Section 3.2 (Perfected First Priority Liens) and shall defend such security interest against the claims and demands of all persons whomsoever.

(b) The Company will furnish to the Holder from time to time statements and schedules further identifying and describing the assets and property of the Company and such other reports in connection therewith as the Holder may reasonably request, all in reasonable detail.

(c) The Company will not create, incur, assume or suffer to exist any Lien upon any

of its property, whether now or hereafter acquired, except for (i) the Liens created by this Agreement, (ii) those Liens set forth on Schedule 1 and (iii) Permitted Encumbrances.

(d) At any time and from time to time, upon the written request of the Holder, and at the sole expense of the Company, the Company will promptly and duly execute and deliver such further instruments and documents and take such further actions as the Holder may reasonably request for the purpose of obtaining or preserving the full benefits of this Agreement and of the rights and powers herein granted, including, without limitation, (i) the filing of any financing or continuation statements under the Uniform Commercial Code (or other similar laws) in effect in any jurisdiction with respect to the security interests created hereby and (ii) in the case of Investment Property, Deposit Accounts, Letter-of-Credit Rights and any other relevant Collateral, taking any actions necessary to enable the Holder to obtain "control" (within the meaning of the applicable Uniform Commercial Code) with respect thereto.

4.3 Changes in Locations, Name, etc. The Company will not, except upon fifteen (15) days' prior written notice to the Holder and delivery to the Holder of (a) all additional executed financing statements and other documents reasonably requested by the Holder to maintain the validity, perfection and priority of the security interests provided for herein and (b) if applicable, a written supplement to Schedule 3 showing any additional location at which Inventory or Equipment shall be kept: (a) permit any of the Inventory or Equipment to be kept at a location other than those listed on Schedule 3; (b) change its jurisdiction of organization or the location of its chief executive office or sole place of business from that specified in Section 3.4 (Jurisdiction of Organization); or (c) change its name.

4.4 Intellectual Property.

(a) Schedule 4 lists all Intellectual Property owned by the Company in its own name as of the date hereof.

(b) The Company (either itself or through licensees) will not do any act, or omit to do any act, whereby any material Patent may become forfeited, abandoned or dedicated to the public.

(c) The Company (either itself or through licensees) will not do any act that knowingly uses any material Intellectual Property to infringe the intellectual property rights of any other Person.

(d) The Company will notify the Holder immediately if it knows, or has reason to know, that any application or registration relating to any material Intellectual Property may become forfeited, abandoned or dedicated to the public, or of any adverse determination or development (including, without limitation, the institution of, or any such determination or development in, any proceeding in the United States Patent and Trademark Office, the United States Copyright Office or any court or tribunal in any country) regarding the Company's ownership of, or the validity of, any material Intellectual Property or the Company's right to register the same or to own and maintain the same.

(e) Whenever such Company, either by itself or through any agent, employee, licensee or designee, shall file an application for the registration of any Intellectual Property with the United States Patent and Trademark Office, the United States Copyright Office or any similar office or agency in any other country or any political subdivision thereof, the Company shall report such filing to the Holder within five (5) business days after the last day of the fiscal

quarter in which such filing occurs. Upon request of the Holder, the Company shall execute and deliver, and have recorded, any and all agreements, instruments, documents, and papers as the Holder may request to evidence the Holders' security interest in any Copyright, Patent or Trademark and the goodwill and general intangibles of the Company relating thereto or represented thereby.

(f) The Company will take all reasonable and necessary steps, including, without limitation, in any proceeding before the United States Patent and Trademark Office, the United States Copyright Office or any similar office or agency in any other country or any political subdivision thereof, to maintain and pursue each application (and to obtain the relevant registration) and to maintain each registration of the material Intellectual Property, including, without limitation, filing of applications for renewal, affidavits of use and affidavits of incontestability.

In the event that any material Intellectual Property is infringed, misappropriated or diluted by a third party, the Company shall (i) take such actions as the Company shall reasonably deem appropriate under the circumstances to protect such Intellectual Property and (ii) if such Intellectual Property is of material economic value, promptly notify the Holder after it learns thereof and sue for infringement, misappropriation or dilution, to seek injunctive relief where appropriate and to recover any and all damages for such infringement, misappropriation or dilution.

4.5 Notices. The Company will advise the Holder promptly, in reasonable detail, of:

(a) any Lien (other than security interests created hereby or those listed on Schedule

1) on any of the Collateral which would adversely affect the ability of the Holder to exercise any of its remedies hereunder; and

(b) of the occurrence of any other event which could reasonably be expected to have a material adverse effect on the aggregate value of the Collateral or on the security interests created hereby.

5. Remedies. If an Event of Default shall occur and be continuing, the Holder may exercise, in addition to all other rights and remedies granted to it in this Agreement and in any other instrument or agreement securing, evidencing or relating to the Obligations, all rights and remedies of a secured party under the Code.

6. Execution of Financing Statements. Pursuant to any applicable law, the Company authorizes the Holder to file or record financing statements and other filing or recording documents or instruments with respect to the Collateral without the signature of the Company in such form and in such offices as the Holder determines appropriate to perfect the security interests of the Holder under this Agreement. The Company authorizes the Holder to use the collateral description "all personal property" in any such financing statements.

7. Enforcement Expenses; Indemnification.

(a) The Company agrees pay or reimburse the Holder for all its costs and expenses incurred in enforcing or preserving any rights under this Agreement, including, without limitation, the fees and disbursements of counsel (including the allocated fees and expenses of in-house counsel) to the Holder.

(b) The Company agrees to pay, and to save the Holder harmless from, any and all liabilities with respect to, or resulting from any delay in paying, any and all stamp, excise, sales or other taxes which may be payable or determined to be payable with respect to any of the Collateral or in connection with any of the transactions contemplated by this Agreement.

(c) The Company agrees to pay, and to save the Holder harmless from, any and all liabilities, obligations, losses, damages, penalties, actions, judgments, suits, costs, expenses or disbursements of any kind or nature whatsoever (other than those resulting from the gross negligence or willful misconduct of the Holder) with respect to the execution, delivery, enforcement, performance and administration of this Agreement.

(d) The agreements in this Section 7 (Enforcement, Expenses and Indemnification) shall survive repayment of the Obligations.

8. General.

8.1 Governing Law; Jurisdiction; Venue. This Agreement will be construed in accordance with and governed by the laws of Missouri, without giving effect to the conflict of law principles of the State of Missouri.

8.2 Waiver of Jury Trial. THE COMPANY HEREBY IRREVOCABLY AND UNCONDITIONALLY WAIVES TRIAL BY JURY IN ANY LEGAL ACTION OR PROCEEDING RELATING TO THIS AGREEMENT AND FOR ANY COUNTERCLAIM THEREIN.

8.3 Successors and Assigns. This Agreement shall be binding upon the successors and

assigns of the Company and shall inure to the benefit of the Holder and its successors and assigns.

8.4 Notices. All notices, requests and demands to or upon the Holder hereunder shall be effected in writing delivered by U.S. mail or facsimile to the following addresses:

Name: _____	Name: _____
Address: _____	Address: _____
City, State & Zip: _____	City, State & Zip: _____
Facsimile #: _____	Facsimile #: _____
Name: _____	Name: _____
Address: _____	Address: _____
City, State & Zip: _____	City, State & Zip: _____
Facsimile #: _____	Facsimile #: _____

8.5 Severability. Any provision of this Agreement, which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof, and any such prohibition or unenforceability in any jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

8.6 Construction. The titles of the sections of this Agreement are for convenience of reference only and are not to be considered in construing this Agreement. Unless the context of this Agreement clearly requires otherwise: (a) references to the plural include the singular, the

singular the plural, and the part the whole, (b) references to one gender include all genders, (c) "or" has the inclusive meaning frequently identified with the phrase "and/or," (d) "including" has the inclusive meaning frequently identified with the phrase "including but not limited to" or "including without limitation," and (e) references to "hereunder," "herein" or "hereof" relate to this Agreement as a whole. Any reference in this Agreement to any statute, rule, regulation or agreement, including this Agreement, shall be deemed to include such statute, rule, regulation or agreement as it may be modified, varied, amended or supplemented from time to time.

8.7 Entire Agreement. This Agreement embodies the entire agreement and understanding between the parties hereto with respect to the subject matter of this Agreement and supersedes all prior or contemporaneous agreements and understandings other than this Agreement relating to the subject matter hereof.

8.8 Amendments in Writing. None of the terms or provisions of this Agreement may be waived, amended, supplemented or otherwise modified except by a written instrument executed by the Company and the Holder.

8.9 No Waiver by Course of Conduct; Cumulative Remedies. The Holder shall not by any act (except by a written instrument pursuant to Section 8 (Miscellaneous)), delay, indulgence, omission or otherwise be deemed to have waived any right or remedy hereunder or to have acquiesced in any Event of Default. No failure to exercise, nor any delay in exercising, on the part of the Holder, any right, power or privilege hereunder shall operate as a waiver thereof. No single or partial exercise of any right, power or privilege hereunder shall preclude any other or further exercise thereof or the exercise of any other right, power or privilege. A waiver by the Holder of any right or remedy hereunder on any one occasion shall not be

construed as a bar to any right or remedy, which the Holder would otherwise have on any future occasion. The rights and remedies herein provided are cumulative, may be exercised singly or concurrently and are not exclusive of any other rights or remedies provided by law.

8.10 Counterparts. This Agreement may be in any number of counterparts, each of which will be deemed an original, but all of which together will constitute one instrument.

[The remainder of this page has been intentionally left blank.]

IN WITNESS WHEREOF, the undersigned has caused this Collateral Assigmment and Security Agreement to be duly executed and delivered as of the date first above written.

APT IP Holdings, LLC

By: _____

Its: Managing Member

Mazuma Credit Union

By: _____
Daniel E. Englehard

Its: Chief Lending Officer

Read and approved by all members APT IP Holdings, LLC

_____
Troy A. Covey

_____
William C. Dyess

SCHEDULE 1

Security Interests

NONE.

SCHEDULE 2

Perfected First Priority Liens

Mazuma will file financing statements with the Secretary of State's office in the State of Wyoming to perfect its security interests. In addition, Mazuma will record this Collateral Assignment and Security Agreement with the Patent and Trademark Office in Washington D.C.

SCHEDULE 3

Inventory and Equipment

NONE.

SCHEDULE 4

Intellectual Property

Patents:

USPTO Patent No.	USPTO Application No.	Patent
5,908,013	09/156,121	Two-cycle engine; Inventor William C Dyess; Application filed September 17, 1998, issued June 1, 1999; Assigned to APT IP Holdings, LLC February 18, 2009
6,505,821	09/787,769	Carburetor; Inventor William H. Edmonston; Application filed March 22, 2001, issued January 14, 2003; Assigned from Kwangsun Edmonston to APT IP Holdings, LLC on December 10, 2007

Trademarks

USPTO Serial No.	USPTO Registration No.	Trademark/Service Mark
77/613,138		Motovox: Application filed November 12, 2008; Applicant – APT IP Holdings, LLC; Assigned April 15, 2009, from American Performance Technologies, LLC to APT IP Holdings, LLC
77/982,138	4013306	Motovox®: Filed November 12, 2008; Registered August 16, 2011; Owner - APT IP Holdings, LLC
85/125,223	4127039	American Performance Technologies®: Filed September 8, 2010; Registered April 10, 2012; Owner - APT IP Holdings, LLC
85/125,249	4222422	APT: Application filed September 8, 2010; Applicant - APT IP Holdings, LLC
85/125,258		Motovox: Application filed September 8, 2010; Applicant - APT IP Holdings, LLC
85/125,262	4230475	SmartCarb: Application filed September 8, 2010; Applicant - APT IP Holdings, LLC

USPTO Serial No.	USPTO Registration No.	Trademark/Service Mark
85/190,038		Motovox: Application filed December 3, 2010; Applicant - APT IP Holdings, LLC
85/317,203		AMW: Application filed May 10, 2011; Applicant - APT IP Holdings, LLC
85/317,208		American Motor Works: Application filed May 10, 2011; Applicant - APT IP Holdings, LLC
85/317,213		PowerAMW: Application filed May 10, 2011; Applicant - APT IP Holdings, LLC
85/324,693	4230824	APTTM: Application filed May 19, 2011; Applicant - APT IP Holdings, LLC
85/398,274		AMW: Application filed August 15, 2011; Applicant - APT IP Holdings, LLC.
85/976,500		American Motor Works: Application filed May 10, 2011; Applicant - APT IP Holdings, LLC
85/978,342	4293525	Motovox: Application filed December 3, 2010; Applicant - APT IP Holdings, LLC
85/978,374	4296590	(Five pointed star Design Mark): Application filed September 8, 2010; Registrant - APT IP Holdings, LLC

United States Patent **5,908,013**
Dyess **June 1, 1999**

Two-cycle engine

Abstract

A two-cycle engine for boosting intake pressure for higher performance per displacement. The two-cycle engine includes a crankcase having a blower housing and a crankshaft therein extending through the blower housing. The blower housing has an intake opening and a discharge opening. An impeller is disposed around the crankshaft. At least one cylinder is provided with a corresponding piston therein. The cylinder has an exhaust port located on a side wall of the cylinder. An intake conduit extends along the side wall of the cylinder in a spiral rising towards the top of the cylinder and passing beneath the exhaust port to terminate at a pair of intake ports in the side wall of the cylinder. A boost plenum has an intake tube fluidly connecting the discharge opening of the blower housing to the boost plenum. The boost plenum also has a discharge tube fluidly connecting the boost plenum to the intake conduit.

Inventors: Dyess; William C. (Pinedale, WY)

Family ID: 22558187

Appl. No.: 09/156,121
Filed: September 17, 1998

Current U.S. Class:	**123/65BA** ; 123/65A; 123/65W
Current International Class:	F02B 25/00 (20060101); F02B 33/44 (20060101); F02B 25/14 (20060101); F02B 33/00 (20060101); F02B 33/40 (20060101); F02B 75/00 (20060101); F02B 75/18 (20060101); F02B 75/02 (20060101); F02B 075/02 ()
Current CPC Class:	F02B 25/14 (20130101); F02B 33/40 (20130101); F02B 33/44 (20130101); 2075/025 (20130101); F02B 2075/1808 (20130101)
Field of Search:	123/65R,65BA,65A,65W

References Cited [Referenced By]

U.S. Patent Documents

1329811	February 1920	Smith
5307792	May 1994	Takahasm et al.

Foreign Patent Documents

358456	Sep., 1931	GB

Primary Examiner: Yuen; Henry C.
Assistant Examiner: Huynh; Hai

Claims

I claim:

1. A two-cycle engine, comprising:

a crankcase having a blower housing and a crankshaft therein extending through said blower housing;

said blower housing having an intake opening and a discharge opening;

an impeller being disposed around said crankshaft such that rotating of said crankshaft rotates said impeller, said impeller being located in blower housing;

at least one cylinder having a corresponding piston therein;

said cylinder having a top, a bottom, and a generally cylindrical side wall, said side wall of said cylinder having a circumference;

said cylinder having an exhaust port located on said side wall of said cylinder;

an intake conduit extending along said side wall of said cylinder in a spiral rising towards said top of said cylinder and passing beneath said exhaust port to terminate at a pair of intake ports in said side wall of said cylinder;

a boost plenum having an intake tube fluidly connecting said discharge opening of said blower housing to said boost plenum to permit passage of fluid from said discharge opening of said blower housing into said boost plenum; and

said boost plenum having a discharge tube fluidly connecting said boost plenum to said intake conduit to permit passage of fluid from

said boost plenum into said intake conduit.

2. The two-cycle engine of claim 1, wherein said intake opening of said blower housing is positioned in a upper region of said blower housing and said discharge opening of said blower housing is positioned in a side region of said blower housing.

3. The two-cycle engine of claim 1, wherein said intake opening of said blower housing has a carburetor/throttle body boot adapted for fluidly connecting said intake opening of said blower housing to a carburetor.

4. The two-cycle engine of claim 1, wherein said intake conduit extends around said side wall of said cylinder between about one-quarter and about three-quarters of said circumference of said cylinder.

5. The two-cycle engine of claim 4, wherein said intake conduit extends around said side wall of said cylinder about one-half of said circumference of said cylinder.

6. The two-cycle engine of claim 1, wherein said intake ports are positioned on said side wall of said cylinder towards said exhaust port.

7. The two-cycle engine of claim 6, wherein said intake ports and said exhaust ports of said side wall of said cylinder generally lie in a common horizontal plane, said intake ports in said side wall of said cylinder being configured to direct fluid from said intake conduit into said cylinder in a direction along said side wall of said cylinder upwards and away from said exhaust port.

8. The two-cycle engine of claim 1, wherein said squish band is positioned towards a first side region of said side wall of said cylinder having said exhaust port located therein and said

combustion dome is located towards an opposite second side region of said side wall of said cylinder located distal said first side region.

9. The two-cycle engine of claim 1, wherein said combustion dome and said squish band each have a generally arcuate vertical cross section, said vertical cross sections of said combustion dome and said squish band each having a radius of curvature, said radius of curvature of said vertical cross section of said squish band being greater than said radius of curvature of said vertical cross section of said combustion dome.

10. A two-cycle engine, comprising:

a crankcase having crankshaft therein and a blower housing, said crankshaft extending through said blower housing;

said blower housing having an intake opening and a discharge opening, said intake opening of said blower housing being positioned in a upper region of said blower housing, said discharge opening of said blower housing being positioned in a side region of said blower housing;

said intake opening of said blower housing having a carburetor/throttle body boot adapted for fluidly connecting said intake opening of said blower housing to a carburetor;

an impeller being disposed around said crankshaft such that rotating of said crankshaft rotates said impeller, said impeller being located in blower housing;

an engine block having at least one cylinder having a corresponding piston therein;

said cylinder having a top, a bottom, and a generally cylindrical

side wall, said side wall of said cylinder having a circumference;

said cylinder having an exhaust port located on said side wall of said cylinder between said top and bottom of said cylinder;

said engine block having an intake conduit for said cylinder, said intake conduit extending around said side wall of said cylinder between about one-quarter and about three-quarters of said circumference of said cylinder in a spiral rising towards said top of said cylinder and passing beneath said exhaust port to terminate at a pair of intake ports in said side wall of said cylinder;

wherein said intake conduit extends around said side wall of said cylinder about one-half of said circumference of said cylinder;

said intake ports being positioned on said side wall of said cylinder towards said exhaust port;

said intake ports and said exhaust ports of said side wall of said cylinder generally lying in a common horizontal plane, said intake ports in said side wall of said cylinder being configured to direct fluid from said intake conduit into said cylinder in a direction along said side wall of said cylinder upwards and away from said exhaust port;

a boost plenum having an intake tube fluidly connecting said discharge opening of said blower housing to said boost plenum to permit passage of fluid from said discharge opening of said blower housing into said boost plenum;

said boost plenum having a discharge tube for each cylinder, said discharge tube of said boost plenum fluidly connecting said boost plenum to said intake conduit to permit passage of fluid from said boost plenum into said intake conduit;

a cylinder head covering said top of said cylinder, said cylinder head having a combustion chamber over said top of said cylinder;

said combustion chamber having a combustion dome and an elliptical squish band, said squish band being positioned towards a first side region of said side wall of said cylinder having said exhaust port located therein, said combustion dome being located towards an opposite second side region of said side wall of said cylinder located distal said first side region;

said combustion dome and said squish band each having a generally arcuate vertical cross section, said vertical cross sections of said combustion dome and said squish band each having a radius of curvature, said radius of curvature of said vertical cross section of said squish band being greater than said radius of curvature of said vertical cross section of said combustion dome;

an annular head gasket between said cylinder head and said engine block to provide a seal between said top of said cylinder and said combustion chamber, said head gasket having a generally V-shaped transverse cross section; and

said piston having an annular piston ring therearound and interposed between said piston and said side wall of said cylinder for providing a seal between said side wall of said cylinder and said piston, said piston ring having a generally L-shaped transverse cross section.

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to two-cycle engines and more particularly pertains to a new two-cycle engine for boosting intake pressure for higher performance per displacement.

2. Description of the Prior Art

The use of two-cycle engines is known in the prior art. More specifically, two-cycle engines heretofore devised and utilized are known to consist basically of familiar, expected and obvious structural configurations, notwithstanding the myriad of designs encompassed by the crowded prior art which have been developed for the fulfillment of countless objectives and requirements.

Known prior art includes U.S. Pat. No. 5,159,903 to Takahashi; U.S. Pat. No. 4,712,520 to Pasquin; U.S. Pat. No. 4,408,579 to Kusche; U.S. Pat. No. 4,964,380 to Kusche; U.S. Pat. No. 4,345,551 to Bloemers; and U.S. Pat. No. Des. 250,026 to Herenius.

While these devices fulfill their respective, particular objectives and requirements, the aforementioned patents do not disclose a new two-cycle engine. The inventive device includes a crankcase having a blower housing and a crankshaft therein extending through the blower housing. The blower housing has an intake opening and a discharge opening. An impeller is disposed around the crankshaft. At least one cylinder is provided with a corresponding piston therein. The cylinder has an exhaust port located on a side wall of the cylinder. An intake conduit extends along the side wall of the cylinder in a spiral rising towards the top of the cylinder and passing beneath the exhaust port to terminate at a pair of intake ports in the side wall of the cylinder. A boost plenum has an intake tube fluidly connecting the discharge opening of the blower housing to the boost plenum. The boost plenum also has a discharge tube fluidly connecting the boost plenum to the

intake conduit.

In these respects, the two-cycle engine according to the present invention substantially departs from the conventional concepts and designs of the prior art, and in so doing provides an apparatus primarily developed for the purpose of boosting intake pressure for higher performance per displacement.

SUMMARY OF THE INVENTION

In view of the foregoing disadvantages inherent in the known types of two-cycle engines now present in the prior art, the present invention provides a new two-cycle engine construction wherein the same can be utilized for boosting intake pressure for higher performance per displacement.

The general purpose of the present invention, which will be described subsequently in greater detail, is to provide a new two-cycle engine apparatus and method which has many of the advantages of the two-cycle engines mentioned heretofore and many novel features that result in a new two-cycle engine which is not anticipated, rendered obvious, suggested, or even implied by any of the prior art two-cycle engines, either alone or in any combination thereof.

To attain this, the present invention generally comprises a crankcase having a blower housing and a crankshaft therein extending through the blower housing. The blower housing has an intake opening and a discharge opening. An impeller is disposed around the crankshaft. At least one cylinder is provided with a corresponding piston therein. The cylinder has an exhaust port located on a side wall of the cylinder. An intake conduit extends along the side wall of the cylinder in a spiral rising towards the top of the cylinder and passing beneath the exhaust port to terminate at a pair of intake ports in the side wall of the cylinder. A boost

plenum has an intake tube fluidly connecting the discharge opening of the blower housing to the boost plenum. The boost plenum also has a discharge tube fluidly connecting the boost plenum to the intake conduit.

There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and which will form the subject matter of the claims appended hereto.

In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

Further, the purpose of the foregoing abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to

determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The abstract is neither intended to define the invention of the application, which is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

It is therefore an object of the present invention to provide a new two-cycle engine apparatus and method which has many of the advantages of the two-cycle engines mentioned heretofore and many novel features that result in a new two-cycle engine which is not anticipated, rendered obvious, suggested, or even implied by any of the prior art two-cycle engines, either alone or in any combination thereof.

It is another object of the present invention to provide a new two-cycle engine which may be easily and efficiently manufactured and marketed.

It is a further object of the present invention to provide a new two-cycle engine which is of a durable and reliable construction.

An even further object of the present invention is to provide a new two-cycle engine which is susceptible of a low cost of manufacture with regard to both materials and labor, and which accordingly is then susceptible of low prices of sale to the consuming public, thereby making such two-cycle engine economically available to the buying public.

Still yet another object of the present invention is to provide a new two-cycle engine which provides in the apparatuses and methods of the prior art some of the advantages thereof, while simultaneously overcoming some of the disadvantages normally associated therewith.

Still another object of the present invention is to provide a new

two-cycle engine for boosting intake pressure for higher performance per displacement.

Yet another object of the present invention is to provide a new two-cycle engine which includes a crankcase having a blower housing and a crankshaft therein extending through the blower housing. The blower housing has an intake opening and a discharge opening. An impeller is disposed around the crankshaft. At least one cylinder is provided with a corresponding piston therein. The cylinder has an exhaust port located on a side wall of the cylinder. An intake conduit extends along the side wall of the cylinder in a spiral rising towards the top of the cylinder and passing beneath the exhaust port to terminate at a pair of intake ports in the side wall of the cylinder. A boost plenum has an intake tube fluidly connecting the discharge opening of the blower housing to the boost plenum. The boost plenum also has a discharge tube fluidly connecting the boost plenum to the intake conduit.

Still yet another object of the present invention is to provide a new two-cycle engine that does not introduce lubricating oil into the combustion chamber, thereby reducing the high emissions typical of two-cycle engine.

Even still another object of the present invention is to provide a new two-cycle engine that may be used to provide more horse power and lower emissions to two-cycle engines of recreational vehicles including snowmobiles, personal watercraft and outboard boat motors.

These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be made to the

accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic perspective view of a new two-cycle engine according to the present invention.

FIG. 2 is a schematic break away view of a cylinder region of the present invention illustrating the intake conduit.

FIG. 3 is a schematic cross sectional view of the cylinder region of the present invention.

FIG. 4 is a schematic side cross sectional view of the cylinder region of the present invention at the end of the compression stroke.

FIG. 5 is a schematic top cross sectional view of the cylinder region of the present invention.

FIG. 6 is a schematic bottom cross sectional view of the cylinder region of the present invention looking up into the combustion chamber.

FIG. 7 is a schematic exploded perspective view of the present invention.

FIG. 8 is a schematic side view of the crankcase of the present invention.

FIG. 9 is a schematic breakaway view of the blower housing of the present invention.

FIG. 10 is a schematic cross sectional view of the blower housing of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the drawings, and in particular to FIGS. 1 through 10 thereof, a new two-cycle engine embodying the principles and concepts of the present invention and generally designated by the reference numeral 10 will be described.

As best illustrated in FIGS. 1 through 10, the two-cycle engine 10 generally comprises a crankcase 11 having a blower housing 13 and a crankshaft 12 therein extending through the blower housing 13. The blower housing 13 has an intake opening 15 and a discharge opening 16. An impeller 21 is disposed around the crankshaft 12. At least one cylinder 23 is provided with a corresponding piston 24 therein. The cylinder 23 has an exhaust port 28 located on a side wall 27 of the cylinder 23. An intake conduit 29 extends along the side wall 27 of the cylinder 23 in a spiral rising towards the top 25 of the cylinder 23 and passing beneath the exhaust port 28 to terminate at a pair of intake ports 30a,30b in the side wall 27 of the cylinder 23. A boost plenum 31 has an intake tube 32 fluidly connecting the discharge opening 16 of the blower housing 13 to the boost plenum 31. The boost plenum 31 also has a discharge tube 33 fluidly connecting the boost plenum 31 to the intake conduit 29.

In closer detail, with reference to FIGS. 7, 8, 9, and 10, the crankcase 11 has a blower housing 13 and a crankshaft 12 therein extending through the blower housing 13. The blower housing is sealed off from the rest of the crankcase 11 by a pair of blower

seals 14a, 14b. Ideally, the blower seals are billow-type seals that billow outwards from the blower housing to seal the housing as the pressure in the blower housing increases. The blower housing 13 has an intake opening 15 and a discharge opening 16. The crank driven impeller 21 is disposed mounted on the crankshaft 12 such that rotating of the crankshaft 12 rotates the impeller 21. The impeller 21 is located in blower housing 13. In use, the impeller 21 forcing the air and fuel mixture through the blower housing 13 from the intake opening 15 of the blower housing 13 and out through the discharge opening 16 of the blower housing 13.

Preferably, the intake opening 15 of the blower housing 13 is positioned in an upper region 17 of the blower housing 13 and the discharge opening 16 of the blower housing 13 is positioned in a side region 18 of the blower housing 13. This positioning of the intake and discharge openings 15,16 of the blower housing 13 causes the intake path of the engine to be isolated from the rest of the interior of the crank case. The blower housing is preferably of a convoluted shape similar to the ram's horn design of traditional belt driven centrifugal supercharges using a discharge volute. The intake opening 15 of the blower housing 13 has a carburetor/throttle body boot 19 designed for fluidly connecting the intake opening 15 of the blower housing 13 to a carburetor/throttle body. The carburetor/throttle body boot 19 preferably comprises a rubber boot with a metal or hard plastic base 20 for mounting to the crankcase 11 over the intake opening 15.

With reference to FIGS. 2, 3, 4, 5, and 7, the engine block 22 has at least one cylinder 23 with a corresponding piston 24 therein which is connected to the crankshaft 12 to rotate the crankshaft 12. The cylinder 23 has a top 25, a bottom 26, and a generally cylindrical side wall 27 extending between the top 25 and bottom 26 of the cylinder 23. The cylinder 23 has an exhaust port 28 located on the side wall 27 of the cylinder 23 between the top 25 and bottom 26 of the cylinder 23. The engine block 22 also has an

intake conduit 29 for the cylinder 23. As illustrated in FIGS. 2 and 5, the intake conduit 29 extends around the side wall 27 of the cylinder 23 between about one-quarter and about three-quarters of the circumference of the cylinder 23 in a spiral rising in a direction from the bottom 26 of the cylinder 23 towards the top 25 of the cylinder 23 and passes beneath the exhaust port 28 to terminate at a pair of intake ports 30a,30b in the side wall 27 of the cylinder 23. Ideally, the intake conduit 29 extends around the side wall 27 of the cylinder 23 about one-half of the circumference of the cylinder 23. This configuration lets the intake boost avoid the exhaust port when entering the cylinder. By running the intake conduit beneath the exhaust port, heat can be transferred from the exhaust skirt of the piston, which will not otherwise have the cooling effect of the cold intake contained in the crankcase of a conventional two-cycle engine.

The intake ports 30a, 30b are preferably positioned on the side wall 27 of the cylinder 23 towards the exhaust port 28. The intake ports 30a,30b and the exhaust port 28 of the side wall 27 of the cylinder 23 ideally generally lie in a common horizontal plane with the intake ports 30a,30b in the side wall 27 of the cylinder 23 configured to direct fluid from the intake conduit 29 into the cylinder 23 in a direction along the side wall 27 of the cylinder 23 upwards and away from the exhaust port 28 as illustrated in FIGS. 3 and 5. The intake ports are preferably angled to propel the boosted intake high into the cylinder along the side wall of the cylinder distal the exhaust port to swirl the boosted intake around the cylinder and into the combustion chamber while avoiding the exhaust port.

With reference to FIG. 7, the boost plenum 31 has an intake tube 32 fluidly connecting the discharge opening 16 of the blower housing 13 to the boost plenum 31 to permit passage of the boosted intake from the discharge opening 16 of the blower housing 13 into the boost plenum 31. The boost plenum 31 has a discharge tube 33 for each cylinder 23. The discharge tube 33 of

the boost plenum 31 fluidly connects the boost plenum 31 to the intake conduit 29 to permit passage of boosted intake from the boost plenum 31 into the intake conduit 29. The boost plenum is basically an intake manifold that may function as a means of dissipating some of the heat put into the compression of the fuel/air mixture, or as an air to air inter-cooler, or as a reservoir to store compressed fuel/air mixture. The intake and discharge tubes 32,33 of the boost plenum 31 each preferably have a rubber isolation mount 34 for connecting the intake tube 32 to the crankcase 11 and the discharge tube 33 to the engine block 22. The isolation mounts are important for vibration and heat isolation and also for isolating the boost plenum for its resonant or sonic activity which may be used to enhance the fuel/air charge to the cylinder coincidentally with the return wave of the exhaust to promote cylinder scavenging with less likelihood of short circuiting the exhaust port.

With reference to FIGS. 3, 4, and 6, a cylinder head 35 is mounted to the engine block 22 and covers the top 25 of all of the cylinders 23. The cylinder head 35 has a combustion chamber 36 for each cylinder over the top 25 of the respective cylinder 23. The combustion chamber 36 has an offset combustion dome 37 and an elliptical squish band 38. The squish band 38 is positioned towards a first side region of the side wall 27 of the cylinder 23 has the exhaust port 28 located therein. The combustion dome 37 is located towards an opposite second side region of the side wall 27 of the cylinder 23 located distal the first side region such that the combustion dome 37 is positioned away from the exhaust port 28. The combustion dome 37 and the squish band 38 each have a generally arcuate vertical cross section. As illustrated in FIGS. 3 and 4, the vertical cross sections of the combustion dome 37 and the squish band 38 each has a radius of curvature, the radius of curvature of the vertical cross section of the squish band 38 is greater than the radius of curvature of the vertical cross section of the combustion dome 37 so that the vertical cross section of the

squish band 38 is flatter than the vertical cross section of the combustion dome 37. This design permits higher compression ratios by lowering the chance of detonation on the exhaust side to the piston by concentrating the squish band on the exhaust port side to protect the highly heated portion of the piston. The offsetting of combustion dome, the resulting angle of burn after ignition will lap up the remaining boundary layer of unburned fuel from the squish area when the piston starts its descent towards the exhaust port to reduce the amount of hydrocarbon emissions.

Preferably, an annular head gasket 39 is provided between the cylinder head 35 and the engine block 22 to provide a seal between the top 25 of the cylinder 23 and the combustion chamber 36. The head gasket 39 ideally has a generally V-shaped transverse cross section. The piston 24 preferably has an annular piston ring 40 therearound and interposed between the piston 24 and the side wall 27 of the cylinder 23 for providing a seal between the side wall 27 of the cylinder 23 and the piston 24. Ideally, the piston ring 40 has a generally L-shaped transverse cross section. These transverse cross sections are designed to work well under high cylinder pressures.

The two-cycle engine is preferably a liquid cooled engine with any number of cylinders. This two-cycle engine does not require the crankcase for induction and therefore does not require oil to be mixed in the fuel mixture and thereby consumed in the combustion process. This allows an oil recovery system to be used in crankcase.

In use, the fuel/air mixture is drawn into the blower housing through the intake opening and charged or boosted intake exits via the discharge opening into the booster plenum. From the booster plenum the boosted intake is passed through the intake conduit and into the cylinder through the intake ports.

As to a further discussion of the manner of usage and operation of the present invention, the same should be apparent from the above description. Accordingly, no further discussion relating to the manner of usage and operation will be provided.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

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United States Patent **6,505,821**
Edmonston **January 14, 2003**

Carburetor

Abstract

A carburetor for an internal combustion engine including a body having an air inlet opening and air outlet opening. A throat is disposed in the body between the air inlet and outlet openings. A slide assembly is movably disposed in the body for crosswise movement across the throat. The slide assembly includes a stepped portion upstream of the throat and the lower portion of the air inlet opening is narrowed for concentrating and compressing the air entering the throat. A reservoir containing fuel is attached to the body. The fuel reservoir includes a fuel outlet located in the throat. An adjustable metering rod extends through the slide assembly and throat into the fuel reservoir. A recessed scoop is located in the body above the air inlet opening and is in air flow communication with the fuel reservoir. An air supply tube extends from the scoop to the fuel reservoir and is provided with a cone-shaped cavity and float ball therein to prevent the flow of fuel into the air supply tube if the fuel level rises in the reservoir.

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Current CPC Class: F02M 9/06 (20130101)
Field of Search: 261/44.3,44.4,49,50.1,66,69.1,DIG.56

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Parent Case Text

The present application is based on Provisional Application No. 60/103,459, entitled CARBURETOR CONSTRUCTION, filed Oct. 7, 1998 and Provisional Application No. 60/118,421 entitled FUEL OVERFLOW VALVE filed on Feb. 2, 1999.

Claims

What is claimed is:

1. A carburetor for an internal combustion engine comprising: a body having an air inlet opening and an air outlet opening; a throat disposed in the body between the air inlet and outlet openings; a slide assembly movably disposed in the body for crosswise movement across the throat; a fuel reservoir containing fuel in communication with the body, the reservoir including a fuel outlet located in the throat; an adjustable metering rod extending through the slide assembly and throat and into the reservoir; and a spring assembly located within the slide assembly for adjusting the position of the slide assembly to control the flow of air and fuel entering the body; the air inlet opening including a lower portion that is narrower in width than the upper portion thereof for concentrating and accelerating air flow past the lower end of the slide assembly.

2. The carburetor of claim 1, wherein the slide assembly includes a stepped portion upstream of the throat for concentrating and compressing the air entering the throat.

3. The carburetor of claim 2, wherein the slide assembly includes a

spring retainer portion disposed above the stepped portion.

4. The carburetor of claim 3, wherein the spring assembly is located within the spring retainer portion.

5. The carburetor of claim 4, wherein the slide assembly includes a metering rod portion.

6. The carburetor of claim 5, wherein the metering rod portion has a first and second end.

7. The carburetor of claim 6, further comprising an upper bore located in the first end of the metering rod portion and a lower bore located within the second end of the metering rod portion, wherein the metering rod extends into the lower bore.

8. The carburetor of claim 6, wherein the second end of the metering rod portion extends into the throat and is substantially flat for reducing turbulence of the air that passes underneath.

9. The carburetor of claim 1 wherein the lower surface of said slide assembly is substantially flush with the front and rear surfaces thereof to provide a smooth lower surface to reduce turbulence of the air flow past it.

10. A carburetor for an internal combustion engine comprising: a body having an air inlet opening and an air outlet opening; a throat disposed in the body between the air inlet and outlet openings; a slide assembly movably disposed in the body for crosswise movement across the throat; a fuel reservoir containing fuel in communication with the body, the reservoir including a fuel outlet located in the throat; an adjustable metering rod extending through the slide assembly and throat and into the reservoir; and a spring assembly located within the slide assembly for adjusting the position of the slide assembly to control the flow of air and fuel

entering the body; the body including a recessed scoop in an upper portion thereof above the air inlet opening which traps air in a relatively stagnant, non-turbulent state therein, said scoop being in air flow communication with the fuel reservoir.

11. The carburetor of claim 10, further comprising at least one air supply tube having opposing ends, one end of the air supply tube being located within the scoop and the other end of the air supply tube being located within the fuel reservoir, whereby air enters through the scoop and travels down the air supply tube to maintain pressure in the fuel reservoir.

12. The carburetor of claim 11 wherein a second air supply tube has one end located within the scoop and the other end located within the fuel reservoir, said one and said second air supply tubes being disposed on opposite sides of the carburetor body.

13. The carburetor of claim 11, wherein the other end of the at least one air supply tube terminates in a cone-shaped cavity that opens outwardly into the fuel reservoir.

14. The carburetor of claim 13, further comprising a float ball disposed within the cone-shaped cavity, whereby when the fuel level rises the float ball is forced into the narrow cavity to close the one air supply tube and prevent fuel from entering the air supply tube.

15. The carburetor of claim 14, further comprising a perforated retaining plate located near the wide end of the cavity for preventing the float ball from falling into the fuel reservoir.

16. A carburetor for an internal combustion engine comprising: a body having an air inlet opening and an air outlet opening; a throat disposed in the body between the air inlet and outlet openings; a slide assembly movably disposed in the body for crosswise

movement across the throat; a fuel reservoir containing fuel in communication with the body, the reservoir including a fuel outlet located in the throat; an adjustable metering rod extending through the slide assembly and throat and into the reservoir; a spring assembly located within the slide assembly for adjusting the position of the slide assembly to control the flow of air and fuel entering the body; and at least one air supply tube having one end disposed adjacent the air inlet opening and the other end located within the fuel reservoir, said other end terminating in a cone-shaped cavity that opens outwardly into said reservoir, and a float ball disposed within said cavity, whereby when the fuel level rises in said reservoir said float ball is forced into the narrow cavity end to close said air supply tube and prevent fuel from entering said air supply tube.

17. The carburetor of claim 16, further comprising a perforated retaining plate located near the wide end of said cavity for preventing the float ball from falling into the fuel reservoir.

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a carburetor for an internal combustion engine, and more particularly to a carburetor having a slide portion which compresses the air flow entering the air inlet and a screw adjusting assembly.

2. Description of the Related Art

Carburetors having a metering rod assembly and slide are known.

As disclosed in U.S. Pat. No. 5,538,673, carburetor adjustment screw devices allow for precise delivery of fuel to adjust performance of the carburetor. Slide 22 is partially angled at its lower surface. However, the slide is not configured to adequately compress and accelerate the air as it passes underneath the slide.

It is also known to utilize devices (see U.S. Pat. No. 4,530,805) or projections (see U.S. Pat. Nos. 4,459,243; 4,464,311; and 4,465,642) within the venturi of a carburetor to vary the flow therethrough.

There is a need for a carburetor of this type which includes a slide portion for increasing the velocity of the air flow past the slide portion to effect thorough mixing of the incoming fuel with the air and efficient burning of the fuel-air mixture.

SUMMARY OF THE INVENTION

An object of the present invention is to effect thorough mixing of the incoming fuel with the air and efficient burning of the fuel-air mixture by forcing the incoming air to compress before traveling under the slide, thereby increasing the velocity of the air flours past the slide and fuel inlet to the throat of the venturi.

Another object of the present invention is to concentrate and accelerate air flow past the lower portion of the slide and fuel inlet to the throat by narrowing the lower portion of the carburetor air inlet.

A further object of the present invention is to maintain a steady atmospheric pressure on the fuel in the float bowl, thereby generating uniform fuel flow and efficient mixing of the fuel with incoming air by providing air inlet openings and a scoop in the upper portion of the air inlet. The scoop serves to trap the air in a relatively stagnant, non-turbulent state at the entrance to the inlet

openings to maintain a constant pressure on the fuel in the float bowl.

Still another object of the present invention is to provide a smooth surface for the air flow to reduce turbulence of the air passing under the slide by forming the lower surface of the slide substantially flush with the front and rear surfaces thereof.

Another object of the invention is to eliminate fuel overflow if the float bowl should become excessively filled or a disturbance in the vertical position of the float bowl occurs. A conical shaped orifice containing a closed-cell or similar material ball is provided. When the ball reaches the top of the orifice it creates a seal restricting the fuel from escaping the float bowl.

In accomplishing these and other objectives of the present invention, there is provided a carburetor for an internal combustion engine including a body having an air inlet end and an air outlet. A throat is disposed in the body between the air inlet and outlet. A slide assembly is movably disposed in the body for crosswise movement across the throat. A float bowl containing fuel is attached to the body. The float bowl includes a fuel outlet located in the throat. An adjustable metering rod extends through the slide assembly and throat into the float bowl. A spring assembly is located within the slide assembly for adjusting the position of the slide assembly to control the flow of air and fuel entering the body.

Other features and advantages of the present invention will become apparent from the following descriptions of the invention which refers to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front plan view of the carburetor of the present invention in an idle condition.

FIG. 2 is a cross-sectional view of the carburetor taken along line I--I of FIG. 1.

FIG. 3 is a cross-section of the slide assembly of the present invention.

FIG. 4 is a front elevational view of the carburetor of the present invention in an idle condition illustrating the air flow through the scoop in the air inlet.

FIG. 5 is a cross-sectional view taken along line II--II of FIG. 4.

FIG. 6 is a front elevational view of the carburetor of the present invention at 1/4 throttle speed.

FIG. 7 is a cross-sectional view of the carburetor taken along line III--III of FIG. 6.

FIG. 8 is a front elevational view of the carburetor of the present invention at 1/2 throttle.

FIG. 9 is a cross-sectional view of the carburetor taken along line IV--IV of FIG. 8.

FIG. 10 is a front plan view of the carburetor of the present invention at 3/4 throttle.

FIG. 11 is a cross-sectional view of the carburetor taken along line V--V of FIG. 10.

FIG. 12 is a front elevational view of the carburetor of the present invention at full throttle.

FIG. 13 is a cross-sectional side view of the fuel overflow valve of

the carburetor of the present invention.

FIG. 14 is a cross-sectional view of the fuel overflow valve in a condition of high fuel level.

FIG. 15 is a cross-sectional view of the carburetor and fuel overflow valve in a non-vertical position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, the carburetor of the present invention is shown in an idle state of operation. Carburetor 10 comprises a body 12 having an air inlet end 14 and an air outlet end 16. A throat 18 extends between inlet 14 and outlet 16 and provides a venturi air passage for the air entering and exiting the carburetor.

Centrally disposed in throat 18 is a slide assembly 20. Slide assembly 20 moves crosswise across throat 18 within slide support 22 of body 12. The movement of slide assembly 20 will be described further herein. A float bowl or chamber 24 is secured to body 12 beneath slide assembly 20. Float bowl 24 contains a quantity of fuel which is delivered to the throat 18 through a fuel inlet 30 by the movement of a metering rod 26.

As shown in FIG. 2, metering rod 26 is adjustably secured and extends downwardly from slide assembly 20 into a fuel supply tube 28. Metering rod 26 has an enlarged head portion 27 which is slidably received within a lower bore 48 (FIG. 3) of slide assembly 20. The position of rod 26 within slide assembly 20 can be adjusted by known means and will not be described further herein. Metering rod head 27 is biased upwardly by action of a spring 32.

Referring to FIG. 3, slide assembly 20 will be described in detail. Slide assembly 20 includes a spring retainer portion 34 and a

metering rod portion 36 connected therewith. Spring retainer portion 34 is stepped upwardly, designated by numeral 38. The stepped portion 38 forces air entering from inlet 14 to compress before going under slide assembly 20, thereby increasing the velocity of the air flow past the slide and fuel outlet 29. This is especially effective for the thorough mixing of incoming fuel and air and efficient burning of the fuel-air mixture at low settings of the carburetor.

Metering rod portion 36 includes an upper and towel end 42, 44 respectively. A first bore 46 is located in upper end-42 and a second bore 48 is located in lower end 44. Metering, rod 26 extends through an opening 47 in lower end 44 into bore 48. As shown in FIG. 3, lower end 44 of slide 20 is flat such that its surface is formed substantially flush with the front and rear faces thereof. End 44 provides a smooth surface for the air flow thus reducing turbulence of the air passing under the slide.

Referring again to FIG. 1, air inlet 14 includes a narrowed lower portion 50 which concentrates and accelerates the air flow past the lower end 44 of slide 20 and fuel inlet 30. This concentrating and accelerating, of the air flow at lower portion 50 is particularly effective at low settings of the carburetors, which also effects thorough mixing of the fuel and air causing effective burning of the mixture.

Slide assembly 20 is actuated via any suitable means such as a cable (not shown) to move upwardly and downwardly across throat 18 controlling the air flow from inlet 14 across the lower surface 44 of the slide to the outlet 16.

As shown in FIGS. 4 and 5, body 12 includes a scoop 70 in an upper portion thereof above air inlet 14. Scoop 70 includes air intakes 72 of the air supply tubes 74. As shown by the arrows, air enters tubes 74 through intakes 72 and travels down the tubes

exiting via the tube ends 76 into float bowl 24 to pressurize the same. The air intakes 72 and scoop 70 maintain a steady atmospheric pressure on the fuel in the float bowl thereby generating uniform fuel flow and efficient mixing of the fuel with the incoming air. Scoop 70 also serves to trap the air in a relatively stagnant, non-turbulent state at the entrance to air intakes 72 to maintain a constant pressure on the fuel in float bowl 24.

When the engine is at idle speed, as shown in FIGS. 1 and 2, lower end 44 of slide 20 extends almost entirely across throat 18 allowing a minimum of air flow across slide 20 and fuel inlet 30. At approximately 1/4 throttle as shown in FIGS. 6 and 7, slide 20 has moved upward and air flow across slide 20 and fuel inlet 30 is increased. The stream of air passing through the venturi passageway is intermixed with the fuel to a mixture having the desired air-fuel ratio. At approximately 1/2 throttle, as shown in FIGS. 8 and 9, slide 20 is advanced across throat 18 and upwards into slide support 22. Likewise. during approximately 3/4 throttle, as shown in FIGS. 10 and 11, the venturi air passageway is almost completely opened allowing for increased air flow and fuel delivery. In FIG. 12, which illustrates full engine throttle, the air passageway is completely opened.

Referring to FIGS. 13-15, the carburetor of the present invention includes a fuel overflow valve. As shown in FIG. 13, the ends 76 of the air supply tubes 74 terminate in conical shaped cavities 80. Disposed within each cavity 80 is a float ball 82. Ball 82 can be a closed cell ball or made of a similar or another suitable material. When the fuel level 25 rises, as shown in FIG. 14, ball 82 moves upward into cavity 80 creating a seal which restricts the fuel from entering air supply tube 74. Likewise, when the fuel level 25 recedes, as shown in FIG. 13, ball 82 will resume its normal resting position at the largest opening of cavity 80.

To prevent ball 82 from falling into float bowl 24 a perforated

retaining plate or the like is located within cavity 80. Plate 84 can be a stamped plate or any other mechanically equivalent device. Because plate 84 is perforated the air entering tubes 74 can enter float bowl 24 to pressurize the same. Ball 82 eliminates fuel overflow if float bowl 24 becomes excessively full or if a disturbance in the vertical position of the float bowl occurs, as shown in FIG. 15.

Although the present invention has been described in relation to particular embodiments thereof, many other variations and modifications and other uses will become apparent to those skilled in the art. It is preferred, therefore, that the present invention be limited not by the specific disclosure herein, but only by the appended claims.

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