The present invention relates to an injection system/device and method of using for use in an automatic transmission fluid changing machine. The device including at least a reservoir capable of containing automatic transmission fluid additives; a pressure pump; a plurality of supply lines in fluid communication with the reservoir and a supply line of an ATF changing machine via the pressure pump; and a control mechanism capable of switching the injector assembly on and off; wherein the pressure pump is capable of producing higher pressures in the automatic transmission fluid additives than exist in a fluid from the ATF changing machine.
TRANSMISSION ADDITIVE INJECTION ASSEMBLY

CLAIM OF PRIORITY

[0001] This non-provisional application claims priority to U.S. Provisional Application No. 61/303,337 filed on 11 Feb. 2010 and is hereby incorporated by reference for all purposes.

FIELD OF THE INVENTION

[0002] The present invention relates to an assembly and improved methodology for servicing and conditioning land transportation vehicles to maintain the operational efficiency of the vehicle as well as extend the useful life of the transmission of the vehicle. More particularly, the present invention describes a method, assembly, and operational parameters for the injection and circulation of chemical additives, most notably, transmission fluid and/or other chemical compounds, into a preferably sealed transmission environment via a transmission fluid flush and replacement circulation system.

[0003] In a particularly preferred embodiment, the present invention sets forth an assembly for injecting and circulating replacement transmission fluid and/or transmission cleaning and stabilizing additives directly into the transmission system of an automotive vehicle through replacement lines which are in fluid connection between the vehicle to facilitate full and complete fluid transfer between the present invention and the automotive vehicle.

BACKGROUND OF THE INVENTION

[0004] Generally speaking, the selection, purchase, and financing of an automotive vehicle is exercised with great care and consideration by consumers due to the fact that most consumers, especially business and commercial fleet buyers, rely upon the vehicle’s long-term operational viability to serve the intended purpose of reliable transport and carriage. At the same time, it is recognized that regular and preventative vehicle maintenance on the part of consumers and vehicle operators is a necessary and integral part of ensuring the operational viability of the vehicle over time.

[0005] Efforts and processes to maintain, extend, and improve the useful life of land transportation vehicles, especially automotive vehicles, have been a constant focus and pursuit since the internal combustion engine was first utilized in transportation vehicles. Of particular interest to the present invention is the ability to improve and maintain the useful life of transmissions used with vehicle engines in traditional vehicle powertrain technology. To improve and maintain both operational efficiency and the useful life of a transmission, it is well known that the automatic transmission fluid (“ATF”), the fluid and chemical compound used to assist and facilitate the operation and movement of a vehicle transmission, should ideally be changed, flushed, and/or replaced on a periodic basis or at least upon a predetermined amount of miles driven by the underlying vehicle based upon its size, type, and functionality. The specific function of ATF in a vehicle transmission is well known in the automotive field and has been the focus of many prior art products, devices, and methods.

[0006] Most notably, different types of land transportation vehicles and transmission designs create a variety of specialized ATF needs and applications. For example, certain types of vehicles, driving environments, and/or cartage/towing requirements can place a wide variety of requirements upon a vehicle transmission. Although these differing operational parameters may present separate challenges to the proper functionality of a transmission, all vehicle transmissions are reliant upon the “useful life” of the underlying ATF contained within the transmission. Very similar to the use of traditional motor oils in the vehicle environment, ATF is a chemical compound which effectively “breaks down”—on a molecular level—over time as the transmission is engaged during the operation of the vehicle. Again, similar to the use of traditional motor oil in an engine, the operational efficiency of a transmission is enhanced, maintained, and safeguarded through the periodic changing, replacing, or “flushing” of old, used, or spent ATF from the transmission and the introduction/circulation of new or clean ATF into the transmission.

[0007] As can readily be appreciated by the fact that transmission technology is well known in the art, the prior art is also likewise characterized by a number of systems/methods employed to change or replace ATF in a vehicle. Essentially, these existing and prior art methodologies generally comprise steps of removing or flushing the existing or “used” ATF from the transmission of a stationary vehicle, while simultaneously replacing or injecting new or “clean” ATF into a closed loop system, all while the vehicle is running. Such existing or prior art methods may also introduce a certain amount of new or “clean” ATF for circulation with the transmission prior to completely replacing the entire ATF (e.g. loop mode) from a source of new or “clean” ATF. Typically an ATF tank that contains the replacement ATF. In addition, with respect to traditional “non-sealed” transmissions, it is possible to manually add a designated and/or desired amount of ATF into the vehicle transmission through a designated point of entry.

[0008] Although these prior art systems and methods can achieve effective ATF replacement and are advantageous in many vehicle applications, modern vehicles designs, as well as developments in chemical compound technology, have resulted in both more sophisticated transmission designs as well as additional specialized chemical additives (“ATF additives”) that can be used to clean and/or augment the function of ATF in a vehicle transmission. One such development in transmission design is a “sealed” transmission system which removes the traditional “dipstick” from many vehicles and also substantially curtail, if not eliminate, the ability to manually check or add both ATF and ATF additives to the sealed transmission.

[0009] Thus, there is a need in the art to develop an effective assembly which can employ and reliably replace/introduce both ATF and/or ATF additives to a wide array of transmission designs in an efficient and complete manner which ensures that the required amount of ATF, and the desired amount of ATF additives, are successfully introduced and retained within the vehicle transmission. Typically, the prior art systems/devices require that the desired ATF additive is first added directly to the ATF tank containing the new or “clean” ATF to also be placed in the vehicle transmission. One example of such an ATF additive is more commonly known as a “flush cleaner”—comprising special chemical additives used to clean the surfaces of the transmission. Another example of an ATF additive is/are various ATF conditioners that may extend the life of the ATF and/or otherwise assist in the efficient operation and/or performance of the specific transmission design. Given the specialty nature of some modern automotive vehicles (i.e. based upon towing capacity, cartage requirements, hybrid vehicles, etc.), it is anticipated that the amount and variety of ATF additives will likewise
increase to meet these more specialized automotive needs and
designs, especially in sealed transmission systems.

[0010] Accordingly, there is both a technical and industry
need to for a method which can fully and reliably introduce
the desired amount of ATF and selected ATF additive(s) into
automotive vehicles in an efficient and complete manner,
perticular for vehicles having sealed transmission designs.
Specically, it is believed that the introduction of the ATF
and/or the selected ATF additive(s) (in both quantity and
timing) may be critical for the ATF and selected ATF additive
to function as intended and thereby maintain and preserve
the operational parameters of the automotive vehicle transmis-
sion for the standard useful life of the underlying vehicle.

[0011] The present invention overcomes the drawbacks and
advantages found in these prior art systems. First, existing
systems/devices only allow for the addition of ATF through
either a fiing port in the transmission (e.g. where a tradi-
tional ATF check “dipstick” is located) or require the addition
of ATF additives directly into the replacement ATF tank housing
the “clean” ATF. This is especially true for “sealed” trans-
mission designs which do not typically utilize or possess
independent ports for ATF introduction. Second, these prior
art systems have inherent technical limitations in that less
than the full or ideal amount of ATF and/or ATF additive(s)
will actually be introduced into the vehicle transmission itself.
In addition, the prior art systems may result in decreased effec-
tiveness due to less than optimal concentrations of the
selected ATF additives being added to the vehicle transmis-
sion (i.e. less than the full amount of ATF additive). For
example, a cleaner ATF additive may remain in the new ATF
at too high of a concentration while the conditioner ATF
additive is at too low of a concentration.

[0012] The following and existing prior art devices, systems,
and literature may pertain to this subject matter and
technology, including the following patent documents:
USPUB 20080143779; U.S. Pat. No. 3,801,013; U.S. Pat.
No. 4,722,363; U.S. Pat. No. 5,626,170; U.S. Pat. No. 6,986,
283; U.S. Pat. No. 6,374,872; U.S. Pat. No. 6,378,647; U.S.
Pat. No. 6,131,701; U.S. Pat. No. 6,112,855; U.S. Pat. No.
5,806,629; U.S. Pat. No. 6,065,567; U.S. Pat. No. 6,959,740;
and U.S. Pat. No. 6,877,531, all incorporated herein by ref-
ference for all purposes.

SUMMARY OF THE INVENTION

[0013] The present invention is directed to a system/assembly,
device, and methodology designed to overcome the various
drawbacks and disadvantages found in the prior art and
described above. More particularly, the present invention is
directed to a system and methodology which provide an
effective and complete means to introduce not only ATF, but
one or more additional ATF additives, into the ATF change or
“flush” process in a designated sequence and in designated/
desired amounts depending upon the underlying vehicle
application. It should be noted that the use of the terms “sys-
tem” and “assembly” and “device” should be considered as
synonymous as it relates to the structure of the present inven-
tion.

[0014] Although the present invention is most effi-
ciently employed with vehicles that are equipped with a “sealed”
transmission system, it is recognized that use and utility of
the present invention is not limited to “sealed” transmission sys-
tems and may be employed in a wide variety of transmission
applications for any number of land transportation vehicles,
as well as marine applications.

[0015] Yet another advantage of the present invention is to
provide an ATF and/or ATF additive injection system that
may be retrofiit to existing ATF change devices, preferably
outside of their pumping mechanisms, and may be controlled
independently from them.

[0016] It should be appreciated that the above referenced
advantages, attributes, aspects and examples of the present
invention are non-limiting, as others exist within the scope of
the present invention, as shown and described herein.

DESCRIPTION OF THE DRAWING

[0017] FIG. 1 is an exemplary depiction of the present
invention as assembled to an ATF replacement machine that is
hooked up to a vehicle.

[0018] FIG. 2 is an exemplary depiction of the present
invention.

DETAILED DESCRIPTION OF THE PREFERRED
EMBODIMENT

[0019] The present invention relates generally to a system
and methodology to achieve a desired, complete, and effi-
cient change or flush of automatic transmission fluid (ATF) and/
or any desired ATF additives in conjunction with the transmis-
sion of a land transportation vehicle. More particularly,
the present invention comprises either or both of a stand-alone
system or a retrofiit design for use with existing products
consisting of an injection system for introducing ATF and/or
ATF additives to the transmission of a land transportation
vehicle as part of the standard ATF changing or flush process
that is typically part of regularly scheduled maintenance for
the applicable vehicle. It is contemplated that the present
invention may be retrofiit and/or employed with prior art
and existing ATF changing or flush technology (e.g. within
the same housing) or may be a completely separate stand-
alone unit or system. For the sake of effiicient design and
operational ease of use, the injection system is preferably
packaged as part of an overall or stand-alone ATF changing or
flush product. Such an integrated system is most commonly
found and utilized at automotive repair facilities, dealers,

[0020] Turning to FIGS. 1 and 2, the present invention
comprises an ATF and/or ATF additive injection system 10
which functions and facilitates the addition of one or more
ATF additive(s) in conjunction with the flow of ATF. In short,
the present invention facilitates the introduction of both ATF
and/or one or more ATF additives into the selected vehicle as
part of the ATF changing or flush operation. It is contemplated
that the desired or selected ATF additive(s) can be introduced
into the system either simultaneously with the ATF or as part
of a separate and discrete step which allows for the desired
and verifiiable measurement of selected ATF additive(s)
which may be most benefcial for the underlying automotive
vehicle application. The injection system 10 may allow for
the introduction of desired and selected ATF additive(s) to
the vehicle independent of the existing ATF changing machine
pumping mechanism and/or the any necessary involvement
of the vehicle itself through direct introduction into the supply
lines that lead from the ATF changing machine into the
taneous vehicle transmission. It is believed that this may be particu-
larly benefcial due to the fact that the chemical and/or cor-
rrosive nature certain ATF additive(s), especially cleaning
additives, may damage or even reduce the functionality of the
pumps, hardware, or other equipment used in the changing machine technology. It is also beneficial to meter, measure, time, and control the amount and timing of the ATF additive(s) based upon the utility of specific ATF additive(s) to specific transmission designs.

The present invention consisting of an ATF additive injection system 10, as shown in FIGS. 1 and 2, may also consist of at least one reservoir 20, at least one pressure pump 30, a plurality of supply lines 40, and a control mechanism 50.

The reservoir or reservoirs 20 functions to hold and retain the ATF additive(s) before they are introduced into the ATF change or flush process. The reservoir 20 may exist in any number of configurations, shapes, or volumetric sizes capable of retaining liquid materials. The reservoir 20 is preferably large enough to hold and retain sufficient volumes of either ATF or ATF additive(s) for use in a wide variety of vehicle applications, and may also employ a preprinted or notched indicator of the liquid volume capacity of the reservoir or reservoirs 20.

In a particularly preferred embodiment, the reservoir 20 is comprised of a cylindrical tank with a tapered bottom. The tapered bottom allows substantially all the liquid contents to flow from the reservoir 20 in when the injecter system 10 is activated and operational. It is also preferable that the reservoir 20 include at least partially transparent or translucent wall section, to allow the presence and flow of the ATF additive(s) to be visually ascertained. The reservoir 20 may also include a cover 22 with a port and cap 24 (e.g. self closing) to allow for the introduction of the ATF additive(s) to the ATF tank. It may also include an exit port 26 at the bottom to allow the ATF additive(s) to flow from the ATF tank into the rest of the injector system 10.

In those applications where the present invention is retrofitted or reconditioned to work with prior art or existing transmission flush devices (i.e. where the injector system 10 may be retrofitted with existing ATF fluid changing technology), the reservoir 20 may be attached to the existing ATF fluid changing technology via a bracket or some other means for connecting the reservoir 20 to the existing ATF fluid changing technology. In a preferred embodiment, the reservoir 20 is attached to an exterior portion of the existing ATF fluid changing technology by employing a conventional L-shaped bracket structure 28.

The pressure pump 30 functions to fluidly transfer the ATF additive(s) supplied from the reservoir 20 by introducing the ATF and/or the ATF additive(s) into the ATF changing machine's output lines (lines leading from the present invention to the transmission of the vehicle). The pressure pump or pumps 30 should be of sufficient power and located within a relatively short distance from the introduction point (e.g. where the ATF and/or ATF additive(s) enter the output lines). In a preferred embodiment, the pressure pump 30 is at least about a 50 psi (3.5 Kg/cm²) pump, more preferably at least about a 75 psi (5.2 Kg/cm²) pump and most preferably about a 100 psi (7.0 Kg/cm²) pump to 150 psi (10.5 Kg/cm²). Also in a preferred embodiment, the pressure pump 30 is no further that about 1.0 m away from the introduction point between the injector system 10 and the changing machine output lines (supply line 68). The combination of pump power and distance should be sufficient to allow either or both of the ATF or ATF additive(s) to be forced into the ATF change machine's output lines while the change machine is in operation.

The plurality of supply lines 40 functions to transport the ATF and/or the ATF additive(s) from the reservoir 20, to the pressure pump 30 and finally into the output lines of the ATF change machine. The lines should have sufficient capacity to handle the volume and pressure of the injector system 10. Additionally, there is preferably at least one air vent 42 (preferably automatically operated) and at least one check valve 44 within the system 10. The air vent 42 allows air to be purged from the injector system 10, when needed, and the check valve 44 allows flow of the ATF and/or ATF additive(s) in substantially a single direction.

The control means 50 functions to activate and deactivate the injector system 10. It is contemplated that the control means 50 may consist of a basic manually actuated electrical switch component to one through a more sophisticated switch mechanism which includes numerous subcomponents which may automatically activate and deactivate the injector system 10 based upon the desired function and/or with feedback/communication with any sensors and/or the ATF changing machine.

Generally speaking, the materials contemplated for each of the components described above are appropriate for the given functions.

In a first preferred embodiment, as shown in FIG. 1, an ATF changing machine 60 is hooked up to a vehicle with the injector system 10 is presented.

In this embodiment, the machine 60 includes two or more tanks (old ATF 62 and new ATF 64) fluidly connected to a vehicle 100 (e.g. to the transmission system (not shown)) via two or more supply lines 66, 68. There is also a bridging line 70 that connects lines 66 and 68 when the machine is used in a loop mode, a loop mode being when little or no ATF is being allowed to flow into or out of the tanks 62 and 64. The machine 60 includes a main ATF pump 72, which functions to add fluid from the new ATF tank 64 into the vehicle transmission system (via line 68).

The injector system 10, in this embodiment, includes a reservoir tank 20, a plurality of supply lines 40, a pressure pump 30 (with a control means 50) and one or more check valves 44 and at least one air vent 42. The check valve(s) function to prevent unwanted fluid from entering at least part of the system 10 from the machine 60.

In this embodiment, the reservoir tank 20 is capable of holding up to about 1.0 liters of additives, although it is contemplated that this tank 20 may be as be up to 5 times smaller or larger. It is preferred that the tank have a tapered bottom.

The supply lines 40 fluidly connect the tank 20 to the pressure pump 30 and from there to the supply line 68. One or more check valves 44 are also included in the supply path (see→arrow) injector system 10 and preferably are located after the pump 30. It is contemplated that the system 10 is capable of introducing any desired additive to the ATF fluid when the machine 60 is in loop mode or in changing mode (e.g. replacing old ATF fluid with new) by activating the injector system 10 (e.g. pushing button such as part of control means 50).

Method

It is contemplated that there is an inventive method provided herein. It may include the use of the injector system 10 as described above in a process of changing the injecting and circulating replacement transmission fluid and/or transmission cleaning and stabilizing additives directly into the
transmission system of an automotive vehicle through replacement lines which are in fluid connection between the vehicle to facilitate full and complete fluid transfer between the present invention and the automotive vehicle. The contemplated method includes the steps of: providing an ATF changing machine as previously described; providing an injector system as previously described in fluid communication with the ATF changing machine; adding an additive to a reservoir of the injector system; activating the injector system while the ATF changing machine is connected to a vehicle’s automatic transmission system and the vehicle engine is running thus injecting the additive to a supply line of the ATF changing machine. It is also contemplated that the ATF changing machine may be in a closed loop mode (e.g., no new automatic transmission fluid is being added or removed from the vehicle) and the additive is a cleaning additive. It is also contemplated that the ATF changing machine may be in a mode in which “new” fluid is being added and the “old” fluid is being removed to the vehicle’s automatic transmission system and the injector system is providing an additive to the “new” fluid supply side of the ATF changing machine. Additionally, the method may include the steps of connecting the injector system to the ATF changing machine in the first place. It should be appreciated that the steps described above are an illustrative example and not limited to the order in which they are presented.

[0035] Unless stated otherwise, dimensions and geometries of the various structures depicted herein are not intended to be restrictive of the invention, and other dimensions or geometries are possible based upon given vehicle applications. Plural structural components can be provided by a single integrated structure. Alternatively, a single integrated structure might be divided into separate plural components. In addition, while a feature of the present invention may have been described in the context of only one of the illustrated embodiments, such a feature may be combined with one or more other features of other embodiments, for any given application. It will also be appreciated from the above that the fabrication of the unique structures herein and the operation thereof also constitute methods in accordance with the present invention.

[0036] The preferred embodiment of the present invention has been disclosed. A person of ordinary skill in the art would realize however, that certain modifications would come within the teachings of this invention.

[0037] Further, any numerical values recited in the above application include all values from the lower value to the upper value in increments of one unit provided that there is a separation of at least 2 units between any lower value and any higher value. As an example, if it is stated that the amount of a component or a value of a process variable such as, for example, temperature, pressure, time and the like is, for example, from 1 to 90, preferably from 20 to 80, more preferably from 30 to 70, it is intended that values such as 15 to 85, 22 to 68, 43 to 51, 30 to 32 etc. are expressly enumerated in this specification. For values which are less than one, one unit is considered to be 0.0001, 0.001, 0.01 or 0.1 as appropriate. These are only examples of what is specifically intended and all possible combinations of numerical values between the lowest value and the highest value enumerated are to be considered to be expressly stated in this application in a similar manner.

[0038] Still further, unless otherwise stated, all ranges include both endpoints and all numbers between the endpoints. The use of “about” or “approximately” in connection with a range applies to both ends of the range. Thus, “about 20 to 30” is intended to cover “about 20 to about 30”, inclusive of at least the specified endpoints.

[0039] The disclosures of all articles and references, including patent applications and publications, are incorporated by reference for all purposes.

[0040] The term “consisting essentially of” to describe a combination shall include the elements, ingredients, components or steps identified, and such other elements, ingredients, components or steps that do not materially affect the basic and novel characteristics of the combination.

[0041] The use of the terms “comprising”, “consisting”, or “including” used to describe combinations of elements, ingredients, components or steps herein also contemplates embodiments that consist essentially of the elements, ingredients, components or steps.

[0042] Plural elements, ingredients, components or steps can be provided by a single integrated element, ingredient, component or step. Alternatively, a single integrated element, ingredient, component or step might be divided into separate plural elements, ingredients, components or steps. The disclosure of “a” or “one” to describe an element, ingredient, component or step is not intended to foreclose additional elements, ingredients, components or steps.

What is claimed is:

1. An injector assembly comprising:
   a reservoir capable of containing automatic transmission fluid additives;
   a pressure pump;
   a plurality of supply lines in fluid communication with the reservoir and a supply line of an ATF changing machine via the pressure pump; and
   a control mechanism capable of switching the injector assembly on and off;

   wherein the pressure pump is capable of producing higher pressures in the automatic transmission fluid additives than exist in a fluid from the ATF changing machine.

2. The injector assembly according to claim 1, wherein a distance of the supply line between the pressure pump and the supply line of the ATF changing machine is less than 1.0 m.

3. The injector assembly according to claim 1, wherein the pressure pump is capable of producing a pressure of at least 7.0 kg/cm² in the automatic transmission fluid additives.

4. The injector assembly according to claim 1, further comprising an automatic air vent capable of at least partially purging air from the plurality of supply lines.

5. The injector assembly according to claim 1, further comprising at least one check valve.

* * * * *