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[54] **APPARATUS FOR AUTOMATICALLY FUELLING VEHICLES**
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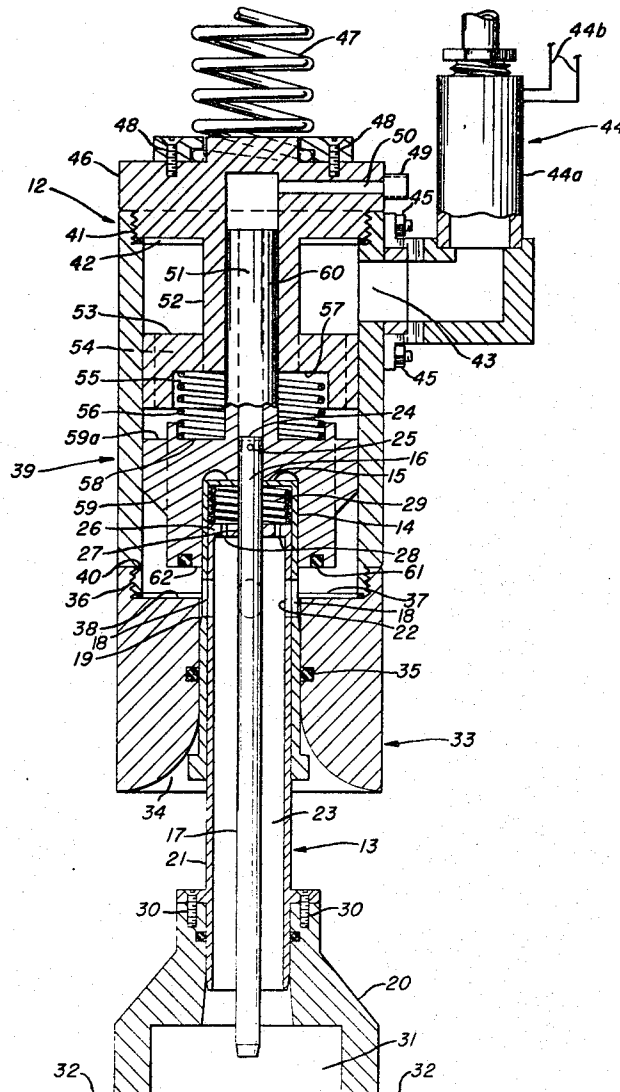
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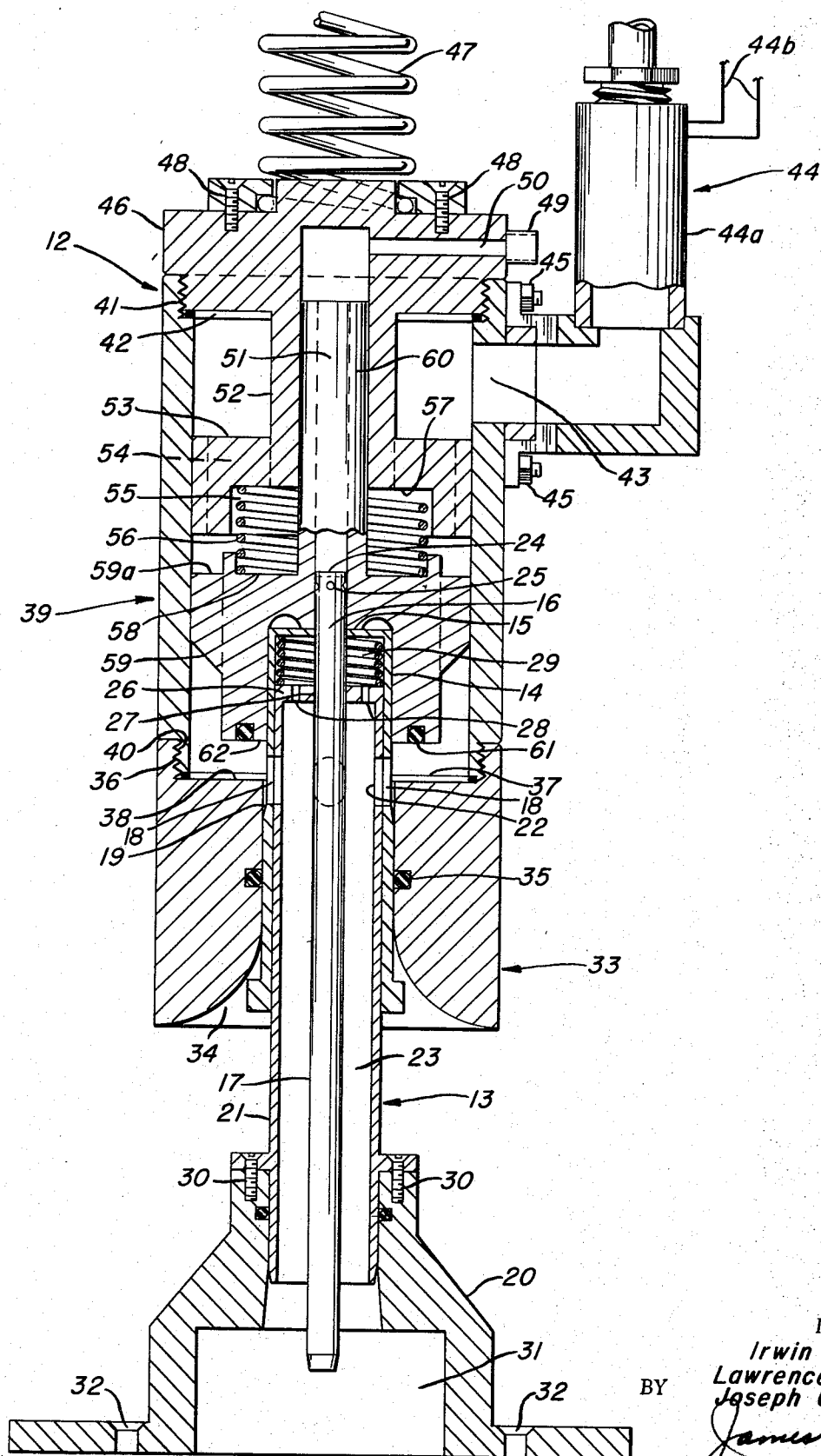
ABSTRACT: A vehicle mounted antenna or fuel receiving means having a base and an extending cylindrical member with a spring urged movable sleeve-type cap which reciprocates along the axis of the extended cylindrical member so that in one position the interior of the extending member is open to receive fluids into the annulus formed by the inside of the extended cylindrical member and a smaller coincidental conduit means rigidly disposed therein. The vehicle mounted fuel receiving means communicates with the vehicle fuel tank through a plurality of conduit means. One conduit connects the coincidental conduit with the fuel tank of the vehicle and another conduit connects the annulus between the small conduit and the extended member with the vehicle fuel tank. The inner conduit means draws a vacuum on the tank while the other conduit connected with the annulus and the tank transports the fuel from the fuel receiving means to the vehicle fuel tank.

A dispensing head flexibly mounted on a support and communicating with a fuel supply mates with and fits over the movable sleeve-type cap of the extended cylindrical member of the fuel receiving means so that when the dispensing head and fuel receiving means are finally positioned fuel is transferred in a controlled manner from the fuel supply through the dispensing head and fuel receiving means to the vehicle fuel tank.



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APPARATUS FOR AUTOMATICALLY FUELING VEHICLES

BACKGROUND OF THE INVENTION

The retailing of motor fuel for automobiles is a major business in the United States, and is becoming increasingly important in Western Europe and in other industrial nations. In the United States alone, there are currently approximately 220,000 service stations engaged in retailing gasoline. About 50 billion gallons of gasoline are sold annually in the United States for the fueling of automobiles. Additional but much less amounts of diesel fuel are sold annually. A significant proportion, in the range of 4 to 7 cent per gallon, of the retail cost of gasoline is attributable to the operation, as currently practiced, of retail gasoline service stations. Such amount is generally referred to as the "dealer's margin", and varies generally within such range depending upon geographical location, the policies of the supplying refining company, and prevailing economic conditions. However, assuming a dealer margin of 5 cents per gallon as a conservative average, it is apparent that the cost in the United States of retailing gasoline, after the same has been delivered to the service station, totals about \$2.5 billion annually. The relative magnitude of the cost of retailing gasoline relative to the overall cost of furnishing gasoline to the public is apparent from recognition that the average retail price of gasoline in the United States, exclusive of taxes, is about 20 cents per gallon, whereas the price of crude petroleum at the wellhead averages about 7 cents per gallon (equivalent to \$2.94 per barrel). Despite the general trend in the United States to mechanize and automate operations which involve a high percentage of labor, the manner of dispensing gasoline at retail has changed little in the last four decades.

Despite the rather poor economics of conventional fuel dispensing practices today which are further complicated by the manpower shortage, few commercial installations for automatically dispensing fuel to vehicles have been commercially reduced to practice although the need is a great and demanding one. Predominantly, the conventional method commonly carried out for dispensing gasoline and other fuels at the typical service station is done with the assistance of at least one attendant. The attendant is informed by the vehicle operator or passenger of the amount and grade of fuel desired and then the attendant manually opens the vehicle fuel tank and fills the tank by means of a nozzle connected to the conventional filling station pump. Generally, while the vehicle tank is being filled the attendant, to utilize his time, performs other services for the purchaser followed by the removal of the nozzle from the tank and the closing of the tank before the attendant is paid for the purchase in cash or through a credit card transaction.

The apparatus and method of this invention constitutes only a part of an entire system for automatically dispensing fuel to vehicles in a manner that does not require the presence of an individual prepared to function as an attendant during the purchase of vehicle fuel at the conventional filling station. The portions of this invention for automatically filling motor vehicles includes a dispensing head and a vehicle mounted fuel receiving means. The dispensing head when finally positioned over the fuel receiving means which may be mounted on a fender of a motor vehicle provides a novel apparatus and method for transferring fuel from a source of supply to a motor vehicle tank without the aid of an attendant.

Illustrative of the prior art disclosing filling methods and apparatus are such patents as Sheets et al., U.S. Pat. No. 3,100,006; Darwin, U.S. Pat. No. 3,095,020; and Mays, U.S. Pat. No. 3,079,960 wherein various designs are exhibited; however, none of the known art anticipates nor even suggests the novel method and apparatus disclosed and claimed herein.

SUMMARY OF THE INVENTION

The invention concerns a novel dispensing head and vehicle mounted fuel receiving means utilized in a system for automatically filling vehicles when fuel is dispensed from a source of supply to a vehicle fuel tank.

The vehicle mounted fuel receiving means includes a mounting means for fastening the fuel receiving means to a part of the vehicle. Extending from the support member is a substantially cylindrical member having a spring urged movable sleeve-type cap at the extended end. Positioned in the cylinder wall of said cap about midway on the longitudinal axis are a plurality of openings aligned beltlike about said movable sleeve. Disposed centrally within the hollow cylindrical extended member is a smaller but substantially coincidental conduit rigidly held within the hollow cylinder to form an annulus. The conduit extends through an opening in the end of the movable sleeve so that the closed end of the conduit is flush with the closed end of said movable sleeve.

A dispensing head mating with the fuel receiving means includes a substantially cylindrical piece having an opening for receiving the fuel receiving means and for moving the fuel receiving means sleeve so that in the final position the dispensing head communicates with the annulus of the fuel receiving means and with the rigid conduit means disposed therein. The dispensing head includes a receiving end for admitting the antenna, a guided spring urged plunger rigidly mounted on a shaft including an inlet end for receiving gasoline, a vacuum port, and a flexible mounting member.

BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of the structural elements of this novel apparatus will be augmented by reference to the attached drawing wherein:

The FIG. is a sectional elevation view of the dispensing head and the vehicle mounted fuel receiving means in the final, communicating position.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the FIG., numeral 12 generally designates the dispensing head and numeral 13 generally designates the vehicle mounted fuel receiving means or antenna. The fuel receiving means may be mounted on an exterior portion of an automobile, truck, etc., such as on the upper portion of the left front fender or any other generally standardized location. The fuel receiving means 13 includes the movable cap-type sleeve 14 having a top 15 with an opening 16 which accommodates the internal conduit 17. Sleeve 14 has a plurality of openings 18 forming a belt about midway of its longitudinal axis and an outwardly projecting exterior surface 19 commencing below said openings 18.

Fuel receiving means 13 also includes base 20 supporting the extended cylindrical member 21 therefrom. The extended member 21 is substantially circular in cross-section and cylindrical in shape with openings 22 positioned in an orientation so that they are alignable with openings 18 in movable sleeve 14. Disposed centrally within cylindrical member 21 is rigid substantially coincidental conduit 17 providing an annulus 23 between conduit 17 and cylinder 21. Conduit 17 terminates in a closed end 24 and has a plurality of openings located in a beltlike orientation a short distance below end 24. Extended member 21 has top 26 with a central opening 27 shaped to accommodate conduit 17, and top 26 has air ports 28. Spring member 29 is located between top 26 and sleeve end 15. Fastening means 30 connects member 21 with support 20. Support 20 is provided with base opening 31 and fastening means 32.

Dispensing head 12 has a first housing portion 33 with a bell shaped opening 34, O-ring 35, and fastening means 36 with peripheral seal 37. Seal 37 extends about the interior floor 38 which forms a surface at the top of first portion 33.

A second housing portion 39 is substantially cylindrical in shape with a generally hollow interior, the second portion terminating at each end in fastening means 40 and 41, respectively. Located below fastening means 41 is peripheral seal 42, and fuel inlet port 43 having fuel inlet means 44 attached thereto by fastening means 45. Top portion 46 has flexible support means 47 attached thereto by fastening means 48. Top portion 46 also has vacuum port 49 communicating through passageway 50 and passageway 51.

Top portion 46 includes in its unitary structure a shaftlike extension 52 terminating in a cylindrically shaped pistonlike guide 53 having openings 54 and a countersunk end 55 to receive the spring means 56. Opening 51 terminates at the countersunk floor 57 of piston 53. Spring means 56 is seated on the top countersunk floor 58 of closure means 59 and rests against the countersunk floor 57 of piston 53. Closure means 59 has hollow shaft 60 extending upward from floor 58 and shaft 60 fits snugly within passageway 51. The lower portion of closure means 59 is adapted to receive the fuel receiving means 13 and rests upon the top 15 of the sleeve-type cap 14. The closure means 59 has a peripheral seal 61 around its lower face 62.

In operation, when a vehicle is positioned in a station equipped to automatically transfer fuel from storage to the vehicle fuel tank, the vehicle having the fuel receiving means 13 mounted thereon in a standardized location such as the left front fender, the dispensing head flexibly supported from the support means 47 is moved into position above the fuel receiving means 13 by means not shown and the dispensing head moves into contact with the fuel receiving means 13. As the top portion of the fuel receiving means, namely, the spring urged movable sleeve 14, comes into contact with any portion of the bell shaped opening 34 of the first housing portion 33, the structure of the opening 34 permits continued contact and reception of the fuel receiving means.

As the fuel receiving means 13 continues to move into position the downwardly projecting bevelled surface 19 or shoulder of sleeve 14 contacts the inner wall of the opening 34 and sleeve 14 travels downward in relation to the coincidental cylindrically shaped extended member 21. As the sleeve moves downward the conduit end 24 becomes exposed through the opening in top 15. The internal conduit 17 has openings in close association with the top 15, which top is introduced into the opening of closure means 59 in communication with passageway 51 through hollow shaft 60. Spring means 29 is compressed between top 15 of sleeve 14 and top 26 of extended cylindrical member 21. The spring means is so constructed to allow sleeve 14 to move an amount sufficient to align the openings 18 in sleeve 14 with the openings 22 in the extended cylindrical member 21. This, in effect, is the final position wherein communication has been established between the fuel inlet means 44 and the vehicle fuel tank not shown.

As the fuel receiving means 13 moves into position sleeve 14 moves downward exposing openings 18 in sleeve 14 and openings 22 in cylinder 21 while at the same time closure means 59 having face 62 with seal 61 moves upward off floor 38 of first housing 33 to expose the openings 18 and 22. The closure means 59 moving upward presses spring 56 and permits hollow shaft 60 to move an additional increment into receiving shaft 52 while end 24 of conduit 17 moves into the closure means 59 allowing openings 25 in conduit 17 to communicate with passageways 51 and 50 respectively. Consequently, not only is fuel inlet means communicating through fuel inlet port 43 and through the dispensing head and openings 18 and 22 with the vehicle fuel tank, but also vacuum port 49 communicates with the vehicle tank through passageways 50 and 51, and openings 25 in conduit 17.

Fuel inlet means 44 having housing 44a and electrical connections 44b has within the housing 44a opening means and closing means such as solenoids for commencing and interrupting the flow of gasoline through the fuel inlet port 43, the dispensing head 12, and the fuel receiving means 13. The con-

trol means electrically connected through conductors 44b are not shown.

Port 49 located in the top portion 46 of dispensing head 12 and communicating through passageways 50 and 51 respectively with internal conduit 17 through openings 25 of conduit 17 is connected to a vacuum producing source (not shown) and communicates interiorly near the top of the vehicle fuel tank. When fuel flows through fuel inlet means 44, fuel inlet port 43, dispensing head 12, and extended cylinder 21 to the vehicle fuel tank a vacuum through port 49 is applied to the vehicle fuel tank. Should any obstruction occur, especially when the vehicle fuel tank is approaching the filled condition the level of the tank rises to the height where the vacuum line extending from internal conduit 17 is located, thus preventing, reducing, or restricting the flow of air from said tank which immediately interrupts the flow of fuel at fuel inlet means 44 as a result of the connection of port 49 through a control (not shown) with electrical connectors 44b. Thus, the vacuum applied at port 49 functions as a control mechanism and a safety device for immediately interrupting the flow of fuel at fuel inlet means 44 to prevent the inherently dangerous occurrence of situations arising during the handling of flammable materials.

When the dispensing head is finally positioned with respect to the fuel receiving means 13 a control means (not shown) directs the application of a vacuum to port 49 and the commencement of the flow of fuel through fuel inlet means 44 and fuel inlet port 43. The fuel flows into the dispensing head 12 and around the unitary shaft 52 projecting from top portion 46. The flow continues through the piston guide means 53 having openings 54 in the second housing portion 39. When the fuel reaches floor 38 of first housing 33 after flowing around closure means 59 which forms the annular opening interrupted only by three guide means 59a, the fuel passes through aligned openings 18 and 22 into the annulus of internal conduit 17 and extended cylindrical member 21. As the fuel reaches the interior of support 20 and base opening 31 a crossover may provide the connection with the annulus 23 and the internal vacuum conduit 17, or a plurality of coincidental conduits may be used to transport the fuel to the vehicle tank while maintaining a vacuum internally near the top of the tank.

The dispensing head of this invention in combination with the novel fuel receiving means provide a method and apparatus which can be utilized in a system for automatically dispensing fuel from a source of supply to a vehicle fuel tank without the aid of an attendant. The novel structure herein further provides a safe and reliable apparatus for joining a source of supply with a receiving means for carrying out the objectives inherently a part of automatically dispensing fuels to vehicles in an unattended manner.

Dimensionally the antenna can have a height of about 5 to 7 inches and a diameter of about 1 inch, the base being about 1 to 2 inches in height. The cylindrical portion of the dispensing head may have a height of about 5 to 7 inches, a diameter of about 2½ to 3 inches and the wall thickness of the second housing portion 39 can have a thickness of about ¼ of an inch. First housing portion 33 can be about 2 to 2½ inches in height, and the top portion 46 can be about ½ of an inch in height. One such embodiment of the dispensing head measured 2¾ inches in diameter and about 6¾ inches in height. The construction is generally of metal which may have a bright metal finish in order to enhance the attractiveness, particularly of the fuel receiving means which is contemplated to be in a rather conspicuous and standardized location on the exterior of a vehicle, such as, at the top of a front fender.

When the dispensing head 12 is finally positioned with respect to the fuel receiving means 13, communication exists between vacuum port 49, internal vacuum conduit 17, and the vehicle fuel tank (not shown). The amount of vacuum under normal operation is negligible and can be slightly below zero p.s.i.g. However, when the level of fuel in the vehicle tank reaches the vacuum line located toward the

top and internally of said tank, the amount of vacuum in the line increases substantially, thus actuating a switch, such as a diaphragm loaded switch which interrupts the flow of fuel through the dispensing head 12, fuel receiving means 13, and annulus 23. Thus, the amount of vacuum applied may range from slightly below 0 to about - 10 p.s.i.g. or more. However, the amount of vacuum or the range of negative pressure is merely enough to establish a differential pressure within the vacuum line to effectuate the interruption of the flow of fuel therein.

We claim:

1. The combination comprising:

a. fuel receiving means in communication with a fuel tank to be filled, said fuel receiving means including:

an opening through which fuel can flow into said tank;

a movable closure member normally closing said opening but movable to an open position to provide access to said opening; and

a vacuum line having one end adapted to be coupled to a vacuum source and another end in communication with said tank; and

b. fuel dispensing means adapted to be disengageably mated with said receiving means, said dispensing means including:

means through which fuel flows;

means which engage said movable closure member to move said member to the open position so that fuel can flow through said opening into said tank; and

means which place said one end of the vacuum line into communication with a vacuum source, whereby when the other end of said vacuum line is closed off by the fuel filling the tank, a vacuum forms in the line producing a signal to discontinue the flow of fuel.

2. The combination defined in claim 1 wherein the closure member includes a spring which urges said member into the closed position.

3. The combination defined in claim 1 wherein a negative pressure of from about slightly below zero to about - 10 p.s.i.g. is applied to the vacuum line when the tank is filled.

4. The combination defined in claim 1 wherein the dispensing head includes a bell-shaped entrance adapted to admit the receiving means.

5. Fuel receiving means mounted on a vehicle and in communication with the vehicle's fuel tank, said fuel receiving means including:

a tubular member having therein at least one opening;

a sleeve having therein at least one opening, said sleeve being mounted on said member and movable between a first position where the openings are misaligned and a second position where the openings are aligned, whereby fuel can pass through said aligned openings; and

a vacuum line extending through the tubular member and the sleeve, said line having one end adapted to be coupled to a vacuum source and another end in communication with the fuel tank.

6. A dispensing head adapted to mate with a fuel receiving means which is in communication with the fuel tank of a vehicle, said fuel receiving means including a vacuum line having one end in communication with the fuel tank and another end adapted to be coupled to a vacuum source, said dispensing head including:

a fuel inlet;

an entrance adapted to admit the receiving means;

closure means normally closing said entrance but with the mating of the head and receiving means being moved to an open position to place the fuel inlet and receiving means into communication so that fuel flows into the tank; and

said closure means having therein passageway means which communicate with a vacuum source and terminate in an opening adapted to receive the end of the vacuum line which is to be coupled to said vacuum source.

7. A fuel receiving means mounted on a vehicle in communication with the vehicle's fuel tank, said fuel receiving means including:

a tubular member having therein at least one opening;

a sleeve having therein at least one opening, said sleeve being mounted on said member and movable between a first position where the openings are misaligned and a second position where the openings are aligned, whereby fuel can pass through said aligned openings;

a vacuum line extending through the tubular member and the sleeve, said line having one end adapted to be coupled to a vacuum source and another end in communication with the fuel tank; and

a dispensing head adapted to mate with said fuel receiving means which is in communication with the fuel tank of said vehicle, said fuel receiving means including a vacuum line having one end in communication with the fuel tank and another end adapted to be coupled to said vacuum source, said dispensing head including:

a fuel inlet;

an entrance adapted to admit the receiving means; and

closure means normally closing said entrance but with the mating of the head and receiving means being moved to an open position to place the fuel inlet and receiving means into communication so that fuel flows into the tank;

said closure means having therein passageway means which communicate with said vacuum source and terminate in an opening to receive the end of the vacuum line which is to be coupled to said vacuum source.

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