Dec. 16, 1969 H. I. HAZZARD 3,483,988

FUEL FEEDING APPARATUS

Filed May 10, 1968

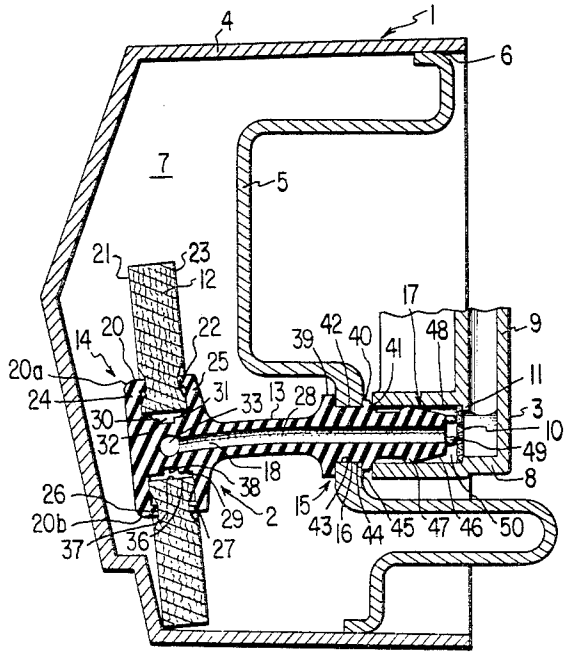


FIG. 1

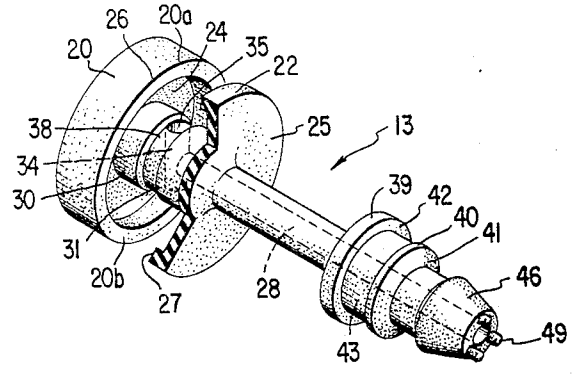


FIG. 2

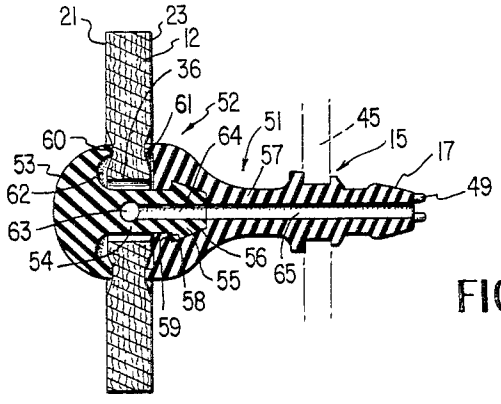


FIG. 3

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United States Patent Office 3,483,988 Patented Dec. 16, 1969

3,483,988

FUEL FEEDING APPARATUS

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Filed May 10, 1968, Ser. No. 728,173
Int. Cl. B01d 13/00
U.S. Cl. 210—232 9 Claims

ABSTRACT OF THE DISCLOSURE

A fuel pickup apparatus mounted inside a fuel tank and including a conduit supporting a wick-like web providing capillary passage means. The capillary passage means radiate outwardly from the conduit and communicate with the central passage of the conduit. This central passage extends in fluid communicating relationship with a fuel pump. Yieldably deformable clamping means serve to detachably mount the web means on a portion of the conduit means. A press fit connecting means is formed integrally with the conduit means.

This invention relates to fuel feeding apparatus uniquely adapted for incorporation in the fuel systems of small gasolene engines.

GENERAL BACKGROUND, OBJECTS, AND SCOPE OF THE INVENTION

The desirability of utilizing capillary action, or wick-type, webs to promote the flow of fuel from a fuel reservoir to a fuel pump has been long recognized. For example, in United States Ryde Patent No. 2,770,363, a structure of this nature is shown.

The advantages of the Ryde unit notwithstanding, there remains a need for improved fuel pickup units which are characterized by greater simplicity, lower cost, and greater ease in fabrication and assembly.

It would also be desirable to provide a fuel pickup arrangement which effectively unites the advantages of wick-type, fuel transfer webs and a mounting arrangement which conforms to a variety of alignment conditions.

It would also be highly advantageous to effect this uniting of desirable features in a structure which may be assembled and installed without requiring tools or fasteners.

It thus is an object of the invention to provide an improved pickup structure which is characterized by a wick-like web supported on a flexible conduit. With this arrangement, the wick is free to receive fuel from virtually the entire volume of the fuel reservoir within which the wick is mounted.

It is a principal object of the invention to attain these advantages for the wick pickup unit with an arrangement which enables the conduit to be secured to the wick and the wall of a fuel tank without tools or separate fasteners.

It is also a principal object of the invention to provide a fuel pickup which remains operable over a significant range of misalignment between a fuel conduit leading to a fuel pump and the outlet of the fuel tank.

It is also a principal object of the invention to provide such an improved fuel pickup unit which vastly reduces the number of components previously required for such installation.

In accomplishing the foregoing objects, there is presented, through this invention, a fuel delivery apparatus intended to be utilized in conjunction with fuel reservoir and a conduit leading to a fuel pump. This apparatus comprises an elastomeric and radially flexible conduit

means. Wick-like web means provide capillary passage means. Yieldablly deformable clamping means serve to detachably mount the web means on a portion of the conduit means, with the web means extending transversely of the conduit means and providing capillary passage means encircling the conduit means. A press-fit connecting means is formed integrally with the conduit means. Mounting aperture means is formed in wall means of the fuel reservoir. The press-fit connecting means yieldably anchors the conduit means in this aperture means in response to limited axial movement of the conduit means and the press-fit connecting means through the mounting aperture means.

A passage means carried by the conduit means is disposed in fluid communicating relationship with the capillary passage means of the web means. Radially compressible, elastomeric and deformable seal means is carried by and formed integrally with the conduit means. This seal means is telescopingly and sealingly engaged with the conduit which extends to the fuel pump, with the passage means being in fluid communicating relation with the conduit.

An independently significant facet of the invention resides in a fuel pickup comprising a flexible conduit supporting, in consecutively axially displaced relation, elastomeric wick gripping means, elastomeric mounting means, and elastomeric seal means engageable with a fuel conduit. The elastomeric seal means and the elastomeric mounting means are spaced axially of the conduit and are able to be mutually displaced while remaining operable to perform their mounting and sealing functions.

DRAWINGS

In describing the invention, reference wil be made to a preferred embodiment shown in the appended drawings.

In the drawings:

FIGURE 1 provides a sectioned view of a fuel tank and fuel pickup unit illustrating positional relationships existing between the fuel tank, the fuel pickup, and a conduit leading to a fuel pump;

FIGURE 2 provides an enlarged, partially sectioned, perspective view of a flexible conduit incorporated in the FIGURE 1 assembly, which conduit serves to support a wick-like web; and

FIGURE 3 provides a longitudinally sectioned illustration of a modified wick or web clamping arrangement which may be incorporated in the flexible conduit shown shown in FIGURES 1 and 2.

OVERALL STRUCTURE

FIGURE 1 illustrates, in a sectioned format, the general structural details of an assembly comprising a fuel tank **1**, a fuel pickup **2**, and a conduit **3** leading to a fuel pump.

It will be understood that these components are illustrated in a format uniquely suited to be utilized in conjunction with a small gasolene engine of the type used, for example, on chain saws.

Reservoir or fuel tank **1** is defined by wall means including a generally cup-like portion **4** and an end wall **5**. End wall **5** may be joined to cup portion **4** by conventional, adhesive fastening joint means **6** so as to form a closed fuel reservoir **7**.

Conduit **3** comprises an L-shaped conduit portion including a leg **8** communicating with the fuel pickup unit **2** and another leg **9** leading to a fuel pump, not shown. A wire screen filter unit **10** may be mounted in the leg **8** and supported on an angular ledge **11**. The function of this screen **10** is to prevent solid materials from having

access to the interior of the conduit 3 when the fuel conduit 3 is separated from the fuel tank or reservoir 7.

Fuel pickup unit 2 includes, as one of its principal components, a rectangular sheet 12 of wick material such as felt. As will be apparent, however, sheet 12 may assume a variety of peripheral configurations, i.e., it has a circular periphery, an irregular periphery, etc. This web-like member 12 provides capillary passage means operable to transmit fuel in virtually any direction along the median plane of the web unit.

Pickup unit 2 also comprises an elastomeric and laterally flexible somewhat beam-like conduit 13. Conduit 13 is fabricated, for example, from oil and gasolene resistant synthetic rubber such as "buna-N." Obviously, other commercially available gasolene resistant, elastomers may be employed in fabricating the conduit 13.

It will be understood that conduit 13 intersects a generally median portion of the web 12. Thus, the web 12 radiates outwardly from the conduit 13 in all circumferential directions, i.e., the body of the web 12 fully encircles the conduit 13.

Conduit 13 includes yieldably deformable clamping means 14. This yieldably deformable clamping means 14 serves to detachably mount the web means on the left end portion of the conduit 13, viewing the apparatus as shown in FIGURE 1. With this mounting arrangement, the web 12 extends transversely of the conduit 13 and provides capillary passage means encircling and radiating outwardly from this conduit.

A press-fit connecting means 15 is formed integrally with the conduit 13 and mounts the conduit 13 in a mounting aperture 16 formed in reservoir wall 5.

A radially compressible, elatomeric, and deformable seal portion 17 formed on the right end of conduit 13 is telescopingly and sealingly received within the left end of the leg 8 of conduit 3.

Passage means 18 of the conduit 13 provides fluid communication between the capillary passage means of the web 12 and the interior passage 19 of the L-shaped conduit segment 3.

The clamping means 14 includes a first, annular, elastomeric and yieldable rim 20. Rim 20 is carried by and formed integrally with the conduit 13. As illustrated in FIGURE 1, rim 20 is disposed in substantially conforming and clamping engagement with one side 21 of the web 12.

A second, annular, elastomeric and yieldable rim 22 is formed integrally with the conduit 13. This second rim 22 faces and is spaced axially from the first rim 20. Rim 22 is disposed in substantially conforming and clamping engagement with the other side 23 of the web 12.

A first, annular, elastomeric and yieldably deflectable disc spring 24 is formed integrally with, and interconnects the conduit body 13 with the rim 20. This disc spring 24 is operable, by virtue of its resilience, to yieldably maintain the rim 20 in generally conforming engagement with the side 21 of the web 12.

A second, annular, elastomeric and yieldably deflectable disc spring 25 is formed integrally with and interconnects the conduit body 13 of the rim 22. This disc spring 25 serves to yieldably maintain the second rim 22 in generally conforming engagement with the other side 23 of the web 12.

In this connection, it will be appreciated that the opposing faces 26 and 27 of the rims 20 and 22, respectively, are normally and desirably parallel and aligned with planes perpendicular to the longitudinal axis of the central passage 18 when the conduit is straight. It will also be understood that the sides 21 and 23 of the web 12 are desirably, more or less parallel to each other so as to enable the faces 26 and 27 to simultaneously engage the web sides while remaining parallel. However, the yieldable and resilient nature of the rims 20 and 22 enables the faces 26 and 27 to accommodate to limited irregularities in the web sides 21 and 23 so as to provide effective conforming engagement between the rims 20 and 22 and the web 12.

Even though parallelism between the opposing faces 26 and 27 is desirable, this parallelism may be absent with the advantages of the invention still being attained. For example, the faces 26 and 27 are able to flex to follow irregularities in the thickness of the web or to follow the web sides even when the sides are not mutually parallel.

It will also be appreciated that the disc springs 24 and 25 provide a unique, resilient, pivotlike support for the rims 20 and 22. The resiliency of the disc spring enables the rims to pivot in multiple directions, i.e., undergo a universal pivot action, with respect to the longitudinal axis of the beam 13. Thus, the rims 20 and 22 are able to conformingly engage opposite sides of the web 12 even while oriented in a skewed relationship.

With this almost complete flexibility of the rims 20 and 22, a highly effective air seal is provided. Each of the rim faces 26 and 27 engages the web so as to provide a barrier, preventing the passage of air around the outside of the web and into passage means 18. Thus, this air seal ensures that fuel only is transmitted to the passage means 18 and that this fuel moves through the controlled influence of the capillary passage means provided by the web 12.

At this point, it should also be appreciated that the disc springs 24 and 25 tend to maintain the rims 20 and 22 in the neutral position, shown in FIGURE 2, with there being a predetermined axial spacing between the rim faces 26 and 27. In this fashion, the compressive engagement between the rims and the web is limited so as to avoid undue crushing of the capillary passages in the web. In this connection, it will be appreciated that the spring action of the radially extending webs or disc springs 24 and 25 will serve to maintain the flange surfaces 26 and 27 in engagement with the web sides 21 and 23, with the faces 26 and 27 being biased into contact with the web sides.

The passage means 18 comprises a central passage portion 28 extending longitudinally of the conduit 13. Passage means 18 also includes an annulus 29 interposed auxiliary between the disc springs 24 and 25. As illustrated, the rims 20 and 22 project axially in opposite directions, somewhat across the outer periphery of this annulus 29, i.e., the rims overlap the outer periphery of annulus 29.

First and second annular ledges 30 and 31 are spaced axially or longitudinally of the conduit 13. These ledges are interposed radially between the axis of the passage portion 28 and the annulus 29. An annular groove 32 is formed in the body of the conduit 13 and is disposed radially inwardly of the annulus 29 and axially between the ledges 30 and 31. A generally radially extending passage 33 intersects the closed, right end of the passage 28 so as to provide port means 34 and 35. Each of these port means 34 and 35 provides fluid communication between the central passage 28 and the annular groove 32. The annular groove 32 in turn communicates wtih the annulus 29 and an aperture 36 formed in the web 12.

The aperture 36 is disposed in a generally intermediate location within the web 12. In a maner to be hereinafter described, the conduit 13 is assembled with the web 12, as shown in FIGURE 1, so as to position the rims 20 and 22 on opposite sides of the web with the aperture 36 located within the annulus 29 in fluid communicating relation with the port means 34 and 35. The ledges 30 and 31 insure that the wall 37, which defines the web aperture 36, does not directly engage the base 38 of the groove 32. In this manner, there is provided an unobstructed annular groove 32 which promotes an unobstructed transfer of fluid from the capillary passages of the web 12 to the transfer ports 34 and 35.

The press-fit connecting means 15 includes a first annular collar 39 projecting radially of the longitudinal axis of the conduit 13. A second collar 40, spaced axially

of conduit 13 to the right of collar 39, also projects radially of the conduit axis. A frustoconical guide cone 41 is carried by and formed integrally with the collar 40. Guide cone 41 converges away from the collars 39 and 40 and toward the seal means 17. Collars 39 and 40 define an annular groove 42 interposed axially between these two components of the conduit 13. The base 43 of the groove 42 is disposed in generally planar alignment with the wall 44 of the aperture 16. As illustrated, groove base 43 is desirably aligned in abutting and therefore sealing engagement with the aperture wall 44. This sealing engagement may be enhanced by a limited interference fit between the walls 43 and 44. This interference fit of course may result by having the diameter of the cylindrical groove base wall 43, in its relaxed state, exceed somewhat the diameter of the wall aperture 44. This sealing engagement between the walls 43 and 44, and the overall stabilization and mounting of the right end of the conduit 13, is effected by having the collars 39 and 40 located on generally opposite sides of the wall portion 45 which encircles the aperture 16. Preferably, but not necessarily, the collars 39 and 40 abuttingly engage these opposite sides of the wall portion 45 as illustrated.

The seal means 17 includes a frustoconical guide cone 46. Guide cone 46 is spaced axially to the right of press-fit connecting means 15 and converges generally away from this press-fit connection. The largest portion 47 of guide cone 46 is disposed in an interference fit relationship with the inner wall 48 of conduit leg 8. This interference fit notwithstanding, guide cone portion 47 is disposed in telescoping and sealing engagement with the wall 48.

The conduit 13 also includes a plurality of standoff lugs or supports 49. Such standoff supports 49 are iluustrated in perspective view in FIGURE 2.

These lugs 49 insure that the seal means 17 may be inserted into the conduit portion 8 to a limited extent with respect to the screen 10. When the standoff lugs 49 engage the screen 10, as shown in FIGURE 2, there still remains a maximized flow area 50. This maximized flow area 50, which is of the same areal extent as the screen 10 (except for the limited blocking off of this screen, resulting from the engagement between the lugs 49 and the screen) insures that maximized screen area is available for filter purposes.

MODE OF ASSEMBLY

The assembly of the components shown in FIGURE 1 is effected with remarkable ease.

As a first stage of assembly, the wick or web 12 is assembled on the conduit 13.

This assembly may be accomplished by grasping the rim 20 at the locations 20*a* and 20*b* and then pulling these rim portions to the left so as to fold the rim 20 and the disc spring 24. With these components thus folded so as to have reduced their width about in half, in the axial direction of the conduit, the folded spring 24 and rim 20 may then be inserted through the aperture 36 of the web 12. After the folded spring and rim have been thus pushed through the wick aperture, the rim portions 20*a* and 20*b* may be released so as to allow the rim and spring to elastically restore to their normal positions illustrated in FIGURE 1. In this restored or normal condition of the rim 20 and the rim 22, these rims conformingly engage the felt sides 21 and 23 so as to provide air seals.

As a second stage of assembly, the press-fit unit 15 is assembled in the aperture 16. This is accomplished by moving the seal end 17 of the conduit 13 axially to the right through the aperture 16. During the initial portion of this axial movement, the cone 46, which is smaller in diameter than the aperture 16, moves freely through the aperture 16. The tapering nature of cone 46 facilitates the entry of conduit 3 into aperture 16. During the latter part of this axial movement, the guide cone 41 facilitates the resilient construction of the collar 40 so as to enable the collar 40 to be pressed through the aperture 16 into its stabilizing or locking position on the right side of the aperture 16, viewing the apparatus as shown in FIGURE 1. When the collar 40 resiliently enlarges, the left-most collar 39 will preferably be in abutting engagement with the left side of the collar 45 adjacent the aperture 16.

With the assembled wick and conduit thus press-fitted or locked in the wall 5, this wall may then be assembled with the cup portion 4 of the reservoir and joined by conventional metal adhesive joining techniques. Alternatively, the assembled wick and conduit may be inserted through a conventional fuel cap or filler hole in reservoir 7 and be manipulated so as to cause the press-fit portion 15 to be engaged with the aperture wall portion 45.

As a final stage in the assembly, the reservoir 1, now including the fuel pickup, may be installed on an engine and the seal 8 telescopingly assembled with the fuel conduit 3 which is mounted on the engine.

In this connection, it will be recognized that the guide cone 46 serves a multiple, guide function. It first facilitates the entry of the conduit 13 through the aperture 16. It then functions to facilitate the entry of the seal 17 into the aperture 48.

The axial displacement of the seal 17 from the press-fit portion 15 provides a uniquely significant, assembly advantage. Substantial axial misalignment on the order of up to about .12 inch may exist between the conduit leg 8 and the aperture 16, with press-fit portion 15 being maintained in aperture 16 and seal means 17 being fully operable. This displacement may cause the portion of the conduit 13 between the portions 15 and 17 (which may have a length of about .19 inch, an outside diameter of .25 inch, and an inside diameter of .09 inch) to be flexed. This flexing notwithstanding, the large portion 47 of the seal 17 will maintain an effective interference fit with the interior of the conduit leg 8, even though the axis of the portion 17 is canted, skewed or rotated out of alignment with the axis of the conduit leg 8. Thus, whether or not seal 17 is symmetrically aligned with conduit leg 8, sealing will be effected.

As will be appreciated, the assembly of the wick 12 and conduit 13, and the mounting of these assembled components on the wall 5, is effected without any tools or supplementary fasteners. Further, there is no critical alignment criteria.

ALTERNATIVE ARRANGEMENT FOR MOUNTING WICK

FIGURE 3 illustrates an alternative structure which may be employed to secure the wick 12.

In this alternative structure, a modified conduit 51 includes the previously discussed press-fit mounting means 15 and the seal 17. However, this modified conduit 51 incorporates a modified, press-fit, separable clamp 52.

This separable clamp 52 comprises a separable cap portion 53 including a shank 54 and a frustoconical, press-fit locking portion 55. This press-fit portion, being resilient and fabricated of material such as "buna-N," is press-fit assembled into a frustoconical aperture 56 formed in the body 57 of the modified conduit 51. As shown, once this press-fit has been effected, radially extending flanges 58 and 59 of portion 55 and body 57, respectively, serve to yieldably or detachably anchor the cap 53 onto the body 54.

Assembly of the felt wick 12 on the modified conduit 51 is effected by first inserting the fastening portion 55 through the felt aperture 36. The press-fit head 55 is then inserted into the aperture 56. When locking engagement between the head 55 and the aperture 56 occurs, air sealing flanges 60 and 61 are brought into sealing and conforming engagement with the sides 21 and 23 of the wick or web 12. The disc-spring like portion of cap 53 extending generally radially inwardly of flange 60 pro-

vides a generally constant clamping force on web **12**. Fluid transmitted by the web **12** to the aperture **36** enters an annulus **62** which communicates with a radially extending passage **63** formed in the shank **54**. This passage in turn communicates with a longitudinally extending central passage **64** of the cap unit **53**. Center passage **64** communicates with a central passage **65** of the main body portion **57** so as to thereby provide a flow path leading to and terminating within the seal **8**.

As will be understood, this modified unit may be assembled with a fuel tank and pump line in the manner previously described in connection with the FIGURE 1 embodiment.

SUMMARY OF MAJOR ADVANTAGES AND SCOPE OF THE INVENTION

A principal advantage of the invention resides in the vastly simplified structure of a wick type fuel pickup. A one or two piece molded assembly takes the place of a number of separate elements previously utilized. This molded, flexible conduit may be expeditiously assembly with a wicking felt by using either the folded technique described in connection with the FIGURE 1 embodiment or the press-fit technique described in connection with the FIGURE 3 embodiment. Either of these techniques may be effected without recourse to tools or separate fasteners and without adhering to precision alignment criteria.

The assembled conduit and wick may then be mounted in the wall of a fuel tank by the simple use of passing the press-fit portion of the conduit through an aperture in a fuel tank wall. Here again, no tools or separate fasteners are required.

The wick **12**, in extending transversely of the conduit **13** for a substantial areal extent, is able to absorb fuel from virtually all portions of the interior of the reservoir **7**. This absorption may result either from immersion of the wick **12** or from splashing of fuel onto the wick.

Even the connection of the conduit to a fuel pump is effected without separate fasteners or tools.

It will thus be appreciated that, all in all, the structure of this invention provides a more efficient fuel pickup unit characterized by clearly enhanced structural simplicity. This structure totally eliminates the necessity for extraneous fasteners or tools.

It will further be noted that the air seals provided by thus unit are capable of conforming to limited irregularities in the wick so as to provide a more effective overall seal. Because of the resilient nature of the disc springs which support the rim type air seals, these will remain functional even though they may be canted with respect to each other.

It is also significant to note that the disc springs provide for a highly controlled clamping action which minimizes adverse felt crushing forces. With the disc springs tending to not converge beyond their neutral position, it is ensured that the felt will not be crushed beyond the gap which exists between the rims when their supporting disc springs are unstressed. With this controlled clamping, the felt wick may be dimensioned so as to ensure that excessive crushing does not take place.

Thus, the spring-like flanges **24** and **25** function to cause the flanges **22** and **20** to maintain a substantially uniform squeezing action on the wick **12**. Within substantial variations of wick thickness, this squeezing action will remain substantially constant without closing off the capillary passages. The substantially constant nature of the squeeze results from the spring discs **24** and **25** effecting their resilient biasing action in a substantially radially extending posture. Deviations from this radially extending posture resulting from anticipated differences in wick thickness will not substantially affect the biasing action of the spring flanges.

This ability of the spring discs **24** and **25** to maintain a constant biasing action on the faces **26** and **27** is significant even with respect to an individual, installed wick or web **12**. During operation, the wick may absorb water and increase its thickness by as much as 25 percent. However, even when such swelling occurs, the discs **24** and **25** will effectively maintain their more or less constant biasing action on the surfaces or faces **26** and **27**.

The ability of the seal **17** to be displaced from the mounting means **15**, with the seal **17** and mounting means **15** both remaining operable is highly significant. In some installations, misalignment of the conduit **3** and fuel tank outlet **16** will be present. Such misalignment, within reasonable limits, will not impair the ability of the seal **17** and the mounting means **15** to perform their sealing and mounting functions.

In describing the invention, reference has been made to preferred embodiments. However, those skilled in the fuel handling art and familiar with the disclosure of the invention may well recognize additions, deletions, substitutions or other modifications which would fall within the purview of the invention as set forth in the appended claims.

I claim:

1. A fuel delivery apparatus comprising:
elastomeric, laterally flexible, conduit means;
yieldably deformable clamping means operable to detachably mount web means on a portion of said conduit means, with said web means extending transversely of said conduit means and providing capillary passage means encircling said conduit means;
press-fit connecting means formed integrally with said conduit means;
said press-fit connecting means being operable to yieldably anchor said conduit means in fuel reservoir aperture means in response to limited axial movement of said conduit means and said press-fit connecting means through said aperture means;
passage means carried by said conduit means, said passage means being in fluid communicating relationship with said capillary passage means of said web means;
radially compressible, elastomeric and deformable seal means carried by and formed integrally with said conduit means, said seal means being operable to telescopingly and sealingly engage fuel conduit means extending to a fuel pump, with said passage means being in fluid communicating relation with said fuel conduit means.

2. An apparatus as described in claim 1:
wherein said yieldably deformable clamping means includes:
first, generally annular, air sealing means disposed in generally conforming engagement with one side of said web means,
first, generally elastic, mounting means for said first air sealing means operable to tend to hold said first air sealing means in a first predetermined position;
second, generally annular, air sealing means disposed in generally conforming engagement with another side of said web means, and
second, generally elastic, mounting means for said second air sealing means operable to tend to hold said second air sealing means in a second predetermined position;
said first and second predetermined positions of said first and second air seals, respectively, being spaced longitudinally of said conduit means, and
said first mounting means being operable to permit universal pivotal movement of said first air sealing means in relation to the longitudinal axis of said conduit means.

3. A fuel delivery apparatus comprising:
wall means defining a fuel reservoir;

a fuel conduit adjacent said wall means and operable to transmit fuel from said fuel reservoir to a fuel pump;

elastomeric, laterally flexible, conduit means;

yieldably deformable clamping means detachably mounting said web means on a portion of said conduit means, with said web means extending transversely of said conduit means and providing capillary passage means encircling said conduit means;

press-fit connecting means formed integrally with said conduit means;

mounting aperture means formed in said wall means;

said press-fit connecting means yieldably anchoring said conduit means in said aperture means in response to limited axial movement of said conduit means and said press-fit connecting means through said aperture means;

passage means carried by said conduit means, said passage means being in fluid communicating relationship with said capillary passage means of said web means;

radially compressible, elastomeric and deformable seal means carried by and formed integrally with said conduit means, said seal means being telescopingly and sealingly engaged with said fuel conduit extending to said fuel pump, with said passage means being in fluid communicating relation with said fuel conduit.

4. An apparatus as described in claim 3:

wherein said press-fit connecting means comprises:

first, annular collar means projecting radially from a portion of said conduit means,

second annular collar means spaced axially from said first annular collar means and projecting radially outwardly of said conduit means,

first, frustoconical guide cone means carried by said second collar means and converging axially away from said first collar means and said clamping means, and

annular groove means interposed axially between said first and second collar means,

said annular groove means being interposed in generally planar and peripherally abutting alignment with said aperture means, with said first and second collars being disposed in generally abutting engagement with opposite sides of a portion of said wall means encircling said aperture means;

said seal means including second frustoconical guide cone means converging axially generally away from said press-fit connecting means;

said apparatus further including:

filtering means mounted in said fuel conduit and extending transversely of a passage portion thereof, and

standoff support means formed integrally on said second frustoconical guide means and operable to space said conduit means from said filtering means.

5. An apparatus as described in claim 3:

wherein said clamping means comprises:

first, annular, elastomeric and yieldable rim means carried by and formed integrally with said conduit means and disposed in substantially conforming and clamping engagement with one side of said web means,

second, annular, elastomeric and yieldable rim means carried by and formed integrally with said conduit means and disposed in substantially conforming and clamping engagement with another side of said web means,

first, annular, elastomeric and yieldably deflectable disc spring means formed integrally with and interconnecting said conduit means and said first annular rim means,

said first disc spring means being operable to yieldably maintain said first annular rim means in said generally conforming engagement with said one side of said web means, and

second, annular, elastomeric and yieldably deflectable disc spring means formed integrally with and interconnecting said conduit means and said second annular rim means, said second disc means being operable to yieldably maintain said second annular rim means in said generally conforming engagement with said other side of said web means; and

wherein said passage means comprises:

a central passage extending longitudinally of said conduit means,

an annulus defined by and interposed axially between said first and second disc spring means,

first and second, generally annular, ledge means spaced axially along said conduit means and interposed radially between the axis of said central passage and said annulus,

annular groove means disposed radially inwardly of said annulus and interposed axially between said first and second ledge means, and generally radially extending port means providing fluid communication between said central passage and said annular groove.

6. An apparatus as described in claim 5:

wherein said web means includes a mounting aperture; and

wherein said first annular rim means and said first disc spring means are resiliently foldable and operable to pass through said aperture means of said web means and thereafter unfold generally outwardly of said conduit means to bring said first rim means into conforming and clamping engagement with said one side of said web means.

7. A fuel delivery apparatus comprising:

wall means defining a fuel reservoir;

a fuel conduit adjacent said wall means and operable to transmit fuel from said fuel reservoir to a fuel pump;

elastomeric, laterally flexible conduit means;

web means providing capillary passage means;

yieldably deformable clamping means detachably mounting said web means on a portion of said conduit means with said web means extending transversely of said conduit means and providing capillary passage means encircling said conduit means, said clamping means including:

first, annular, elastomeric and yieldable rim means carried by and formed integrally with said conduit means and disposed in substantially conforming and clamping engagement with one side of said web means,

second, annular, elastomeric and yieldable rim means carried by and formed integrally with said conduit means and disposed in substantially conforming and clamping engagement with another side of said web means,

first, annular, elastomeric and yieldably deflectable disc spring means formed integrally with and interconnecting said conduit means and said first annular rim means,

said first disc spring means being operable to yieldably maintain said first annular rim means in said generally conforming engagement with said one side of said web means, and

second annular, elastomeric and yieldably deflectable disc spring means formed integrally with and interconnecting said conduit means and said second annular rim means, said second disc spring means being operable to yieldably maintain said second annular rim means in said generally conforming engagement with said other side of said web means;

press-fit connecting means formed integrally with said conduit means, said press-fit connecting means including:

first, annular collar means projecting radially from a portion of said conduit means,

second annular collar means spaced axially from said first annular collar means and projecting radially outwardly of said conduit means,

first, frustoconical guide cone means carried by said second collar means and converging axially away from said first collar means and said means, and

annular groove means interposed axially between said first and second collar means,

said annular groove means being interposed in generally planar and peripherally abutting alignment with said aperture means, with said first and second collars being disposed in generally abutting engagement with opposite sides of a portion of said wall means encircling said aperture means;

mounting aperture means formed in said wall means;

said press-fit connecting means yieldably anchoring said conduit means in said aperture means in response to limited axial movement of said conduit means and said press-fit connecting means through said aperture

passage means carried by said conduit means, said passage means being in fluid communicating relationship with said fuel conduit and said capillary passage means of said web means, said passage means including:

a central passage extending longitudinally of said conduit means,

an annulus defined by and interposed axially between said first and second disc spring means,

first and second, generally annular, ledge means spaced axially along said conduit means and interposed radially between the axis of said central passage and said annulus,

annular groove means disposed radially inwardly of said annulus and interposed axially between said first and second ledge means, and

generally radially extending port means providing fluid communication between said central passage and said annular groove;

radially compressible and elastomeric deformable seal means carried by and formed integrally with said conduit means, said seal means being telescopingly and sealing engaged with said fuel conduit extending to said fuel pump, said seal means including:

second frustoconical guide cone means converging axially generally away from said press-fit connecting means;

fuel filtering means mounted in said fuel conduit and extending transversely of a passage portion thereof; and

standoff support means formed integrally on said second frustoconical guide means and operable to space said conduit means and said central passage from said filtering means.

8. A fuel delivery apparatus as described in claim 7:

wherein said clamping means includes axially separable, elastomeric fastening means interconnecting said first and second rim means;

said fastening means including a generally frustoconical socket carried by one of said rim means;

said fastening means further including generally elastomeric and frustoconical head means carried by the other of said rim means;

said head means being engageable with said socket means, with said socket means and head means enlarging generally toward said other of said rim means; and

said head means being selectively and resiliently engageable and separable from said socket means.

9. A fuel pickup comprising:

elastomeric conduit means;

elastomeric wick clamping means carried at a first axial location on said conduit means;

elastomeric means operable to impose a substantially constant clamping force on said elastomeric wick clamping means;

elastomeric mounting means carried by said conduit means at a second axial location spaced from said first axial location;

said elastomeric mounting means being operable to support said conduit means in an apertured wall portion of a fuel reservoir; and

elastomeric sealing means carried by said conduit at a third axial location displaced axially from said second axial location;

said elastomeric sealing means comprising elastomeric means operable to maintain sealing engagement with the interior of a fuel conduit while said sealing means being pivoted within said fuel conduit out of symmetrical alignment with the axis of said fuel conduit;

said elastomeric conduit means providing a portion extending axially between said mounting means and said sealing means operable to permit axial displacement of said sealing means and said mounting means.

References Cited

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REUBEN FRIEDMAN, Primary Examiner

J. W. ADEE, Assistant Examiner

U.S. Cl. X.R.

210—416

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,483,988 Dated December 16, 1969

Inventor(s) H. I. Hazzard

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 35, "wil" should be changed to -- will -- .
Column 2, line 50, the word "shown" should be omitted.
Column 4, lines 43 and 44, change "auxiliary" to -- axially -- .
Column 4, line 59, change "wtih" to -- with -- .
Column 4, line 62, change "maner" to -- manner -- .
Column 5, line 35, change "iluus-" to -- illus--- .
Column 7, line 20, change "assembly" to -- assembled -- .
Column 7, line 46, change "thus" to -- this -- .
Column 7, line 49, after "these" add -- seals --.
Column 11, between lines 2 and 3, insert -- cluding: -- .
Column 11, line 11, before "means" add -- clamping -- .
Column 11, between lines 25 and 26, insert -- means; -- .
Column 11, line 48, change "sealing" to -- sealingly -- .

Column 12, line 49, the reference cited should be changed from "Ayne" to -- Ryde -- .

SIGNED AND
SEALED
JUN 16 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER,
Commissioner of Paten