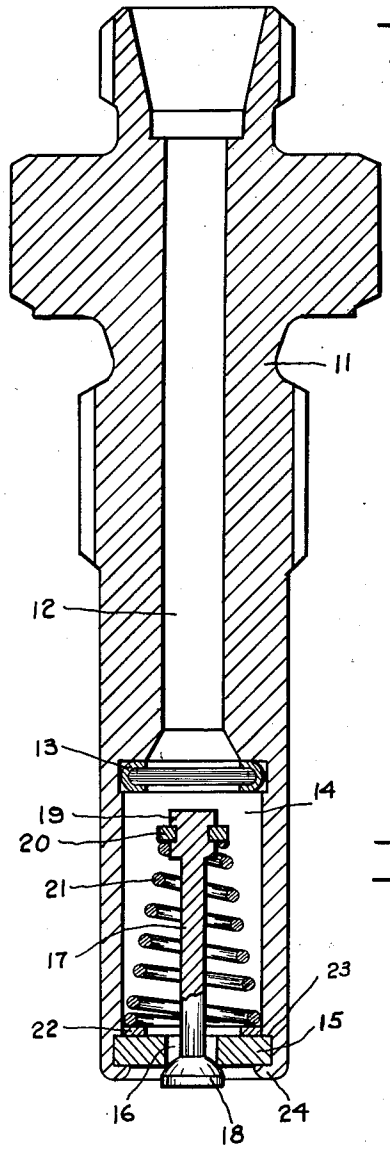
Oct. 30, 1956 S. E. MILLER 2,768,860

NOZZLE

Filed May 24, 1954

Fig. 1.



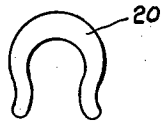


Fig. 2.

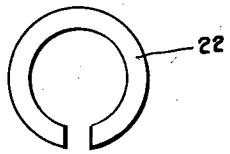


Fig. 3.

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NOZZLE

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4 Claims. (Cl. 299—107.6)

This invention relates to nozzles for fuel injection apparatus, or the like, and has particular reference to a new and improved nozzle construction which is relatively inexpensive and simple in construction yet efficient in operation and the process of making the same.

The principal object of the invention is to provide a new and improved nozzle which is relatively inexpensive and simple in construction and assembly and efficient in operation and to a new and improved method of making the same.

Another object is to provide a new and improved nozzle of the variable area or orifice type which is self centering and acts both as a check valve and variable orifice nozzle.

Another object is to provide a nozzle of the type set forth wherein the nozzle operating elements may be completely assembled as a unit and then this unit operatively connected to the nozzle body.

Another object is to provide a new and improved method of making fuel injection nozzles, or the like.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that changes may be made in the details of construction and arrangement of parts without departing from the spirit of the invention as set forth in the accompanying claims, as the preferred form has been given by way of illustration only.

Referring to the drawings:

Fig. 1 is a longitudinal sectional view of a nozzle constructed according to the invention;

Fig. 2 is a top view of one form of clip that may be embodied in the nozzle; and

Fig. 3 is a top view of one form of shim that may be embodied for varying the opening pressure of the nozzle.

Referring more particularly to the drawings wherein simple reference characters designate corresponding parts throughout, the nozzle shown embodying the invention comprises the nozzle body **11** having the central orifice **12** in which may be positioned the filter element **13**.

The nozzle body **11** is provided with the chamber **14** which communicates with the orifice **12** and said chamber **14** is adapted to contain the operative elements of the nozzle.

In the form of the invention shown, the operative portion of the nozzle comprises an annular plate **15** having a central orifice or opening **16**, through which extends the poppet valve **17** having the enlarged head **18** which head is greater in diameter than opening **16**. It will be seen from the drawing that opening **16** is substantially greater in diameter than valve **17**.

At its opposite end, poppet valve **17** is provided with the headed portion **19** which is of such diameter that it can be inserted through the opening or bore **16** and has a portion adapted to receive the spring clip **20** of the form shown in Fig. 2, or of other suitable form and which acts as a seat for the tapered coil spring **21** which has its opposite end adjacent plate **15**.

If desired, the spring **21** may be of carefully controlled tension and size so as to provide the proper or desired opening pressure to the nozzle. If the spring seats are not so carefully controlled or if it is desired to vary or change the opening pressure of the nozzle, shims **22** of the form shown in Fig. 3 may be positioned between the surface of plate **15** and the adjacent end of spring **21**.

In construction, the nozzle holder **11** is formed and the nozzle unit is assembled and then placed into the chamber **14** with the plate **15** seated on shoulder **23** and the end **24** of nozzle body **11** then spun over, crimped or staked to retain the operating unit as assembled relative in the nozzle body.

If desired, the plate **15** and nozzle unit could be retained on the nozzle body by means of a threaded cap nut or the plate could be in threaded engagement with the internal thread on the adjacent portion of the nozzle body.

Nozzles of the type of this invention have many possible uses, for example, as gasoline injection nozzles wherein such nozzles would have a distinct advantage in that they do not have any tip sensitivity to manifold pressure. Further, the nozzle eliminates all dead volume and is a very inexpensive and suitable design not affected by the discharge pressure. Also, since it is unguided and self-seating, it acts as both a check valve and variable area nozzle.

It is pointed out that with the nozzle of the present invention, and the method of the present invention wherein the nozzle body is formed and the nozzle unit is also formed and assembled into a unitary construction, and then this unitary construction assembled into the nozzle body that a relatively simple and inexpensive construction and method are provided, thus greatly reducing the cost of manufacture of such device and also, allowing the manufacture of a device in which the operating unit may be replaced or changed.

From the foregoing it will be seen that I have provided a new and improved nozzle and method of making the same which possesses all of the objects and advantages set forth above.

I claim:

1. In a device of the character described, a nozzle body having a fuel passage therethrough and an integral extension portion having a chamber adjacent an end thereof and communicating with said fuel passage, an internal annular shoulder in the wall of said chamber adjacent the free end of said extension, an annular plate in said chamber having an aperture and having its periphery engaging said internal annular shoulder, the ends of said extension adjacent said annular plate being turned inwardly to form a flange overlying the periphery of said plate to thereby retain said plate on said shoulder, a valve member extending through said aperture of said plate and having a head portion of greater diameter than said aperture and adapted to control the discharge of fuel through said aperture, a spring in said chamber surrounding said valve member and means for securing said spring in position on said valve member.

2. In a device of the character described, a nozzle body having a fuel passage therethrough and an integral extension portion having a chamber adjacent an end thereof and communicating with said fuel passage, an internal annular shoulder in the wall of said chamber adjacent the free end of said extension, an annular plate in said chamber having an aperture and having its periphery engaging said internal annular shoulder, the ends of said extension adjacent said annular plate being turned inwardly to form a flange overlying the periphery of said plate to thereby retain said plate on said shoulder, a valve member extending through said aperture on said plate and having a head portion of greater diameter than said aperture and

adapted to control the discharge of fuel through said aperture, a spring in said chamber surrounding said valve member and means for securing said spring in position on said valve member, said spring surrounding said valve member being of tapered cross section with its area of greatest cross section adjacent said plate.

3. In a device of the character described, a nozzle body having a fuel passage therethrough and an integral extension portion having a chamber adjacent an end thereof and communicating with said fuel passage, an internal annular shoulder in the wall of said chamber adjacent the free end of said extension, an annular plate in said chamber having an aperture and having its periphery engaging said internal annular shoulder, the ends of said extension adjacent said annular plate being turned inwardly to form a flange overlying the periphery of said plate to thereby retain said plate on said shoulder, a valve member extending through said aperture on said plate and having a head portion of greater diameter than said aperture and adapted to control the discharge of fuel through said aperture, a spring in said chamber surrounding said valve member and means for securing said spring in position on said valve member, said spring surrounding said valve member being of tapered cross section with its area of greatest cross section adjacent said plate, said means for securing said spring in position on said valve member comprising a detachable clip.

4. In a device of the character described, a nozzle body having a fuel passage therethrough and an integral extension portion having a chamber adjacent an end thereof and communicating with said fuel passage, an internal annular shoulder in the wall of said chamber adjacent the free end of said extension, an annular plate in said chamber having an aperture and having its periphery engaging said internal annular shoulder, the ends of said extension adjacent said annular plate being turned inwardly to form a flange overlying the periphery of said plate to thereby retain said plate on said shoulder, a valve member extending through said aperture on said plate and having a head portion of greater diameter than said aperture and adapted to control the discharge of fuel through said aperture, a spring in said chamber surrounding said valve member and means for securing said spring in position on said valve member, said plate, valve and spring being assembled as a separate unit and said unit then being secured in operative position on said body.

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