

Dec. 4, 1956

E. PETAU

2,772,706

NOZZLE

Filed June 7, 1954

4 Sheets-Sheet 1

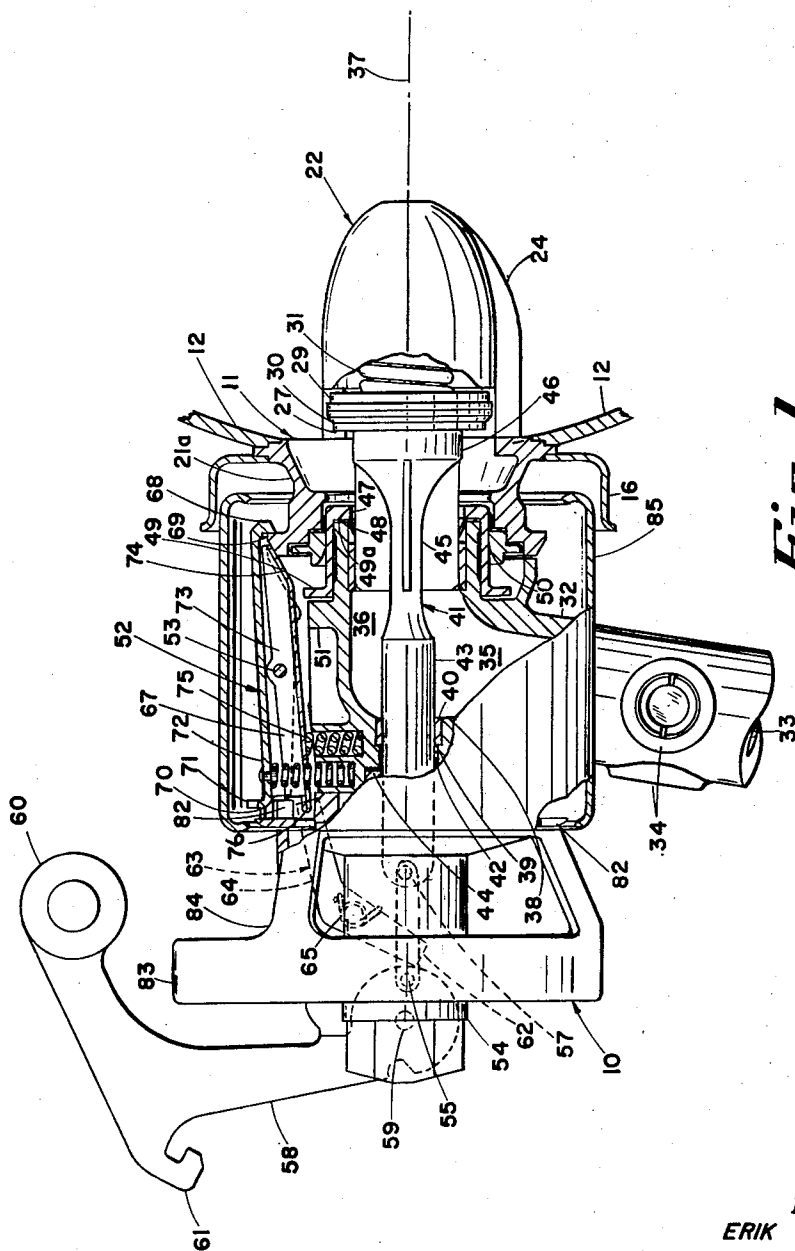


Fig. 1

INVENTOR.
ERIK PETAU

BY *D. Gordon Angus*

ATTORNEY

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4 Sheets-Sheet 2

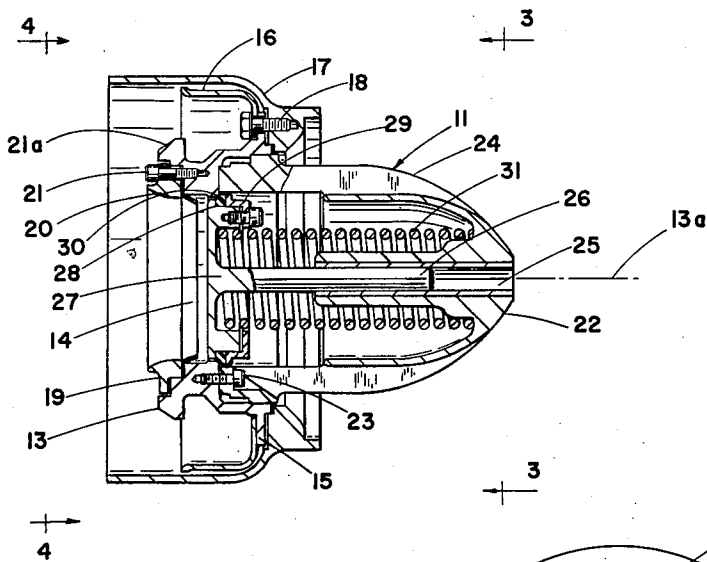


Fig. 2

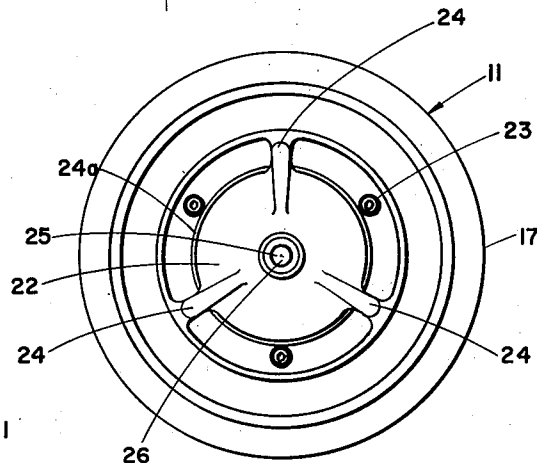


Fig. 3

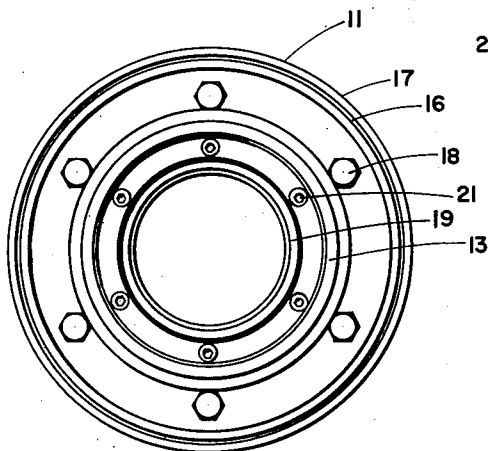


Fig. 4

INVENTOR.
ERIK PETAU
BY *D. Gordon Angus*
ATTORNEY

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E. PETAU

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4 Sheets-Sheet 3

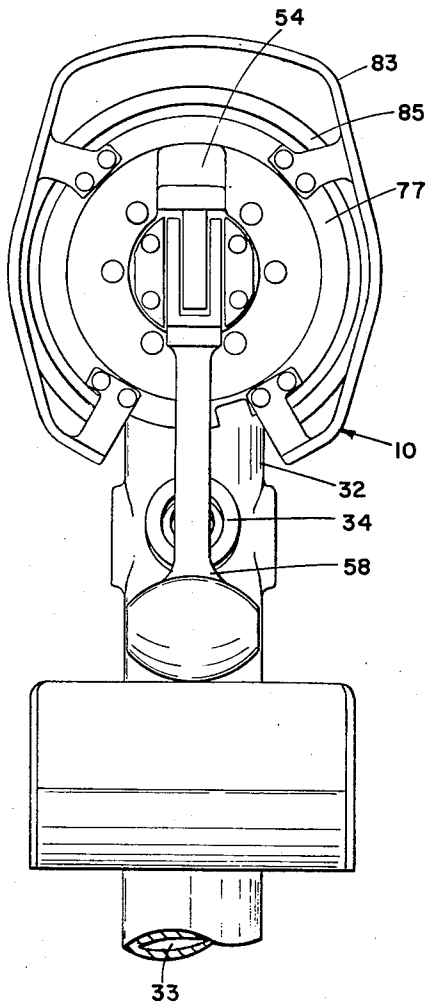


Fig. 5

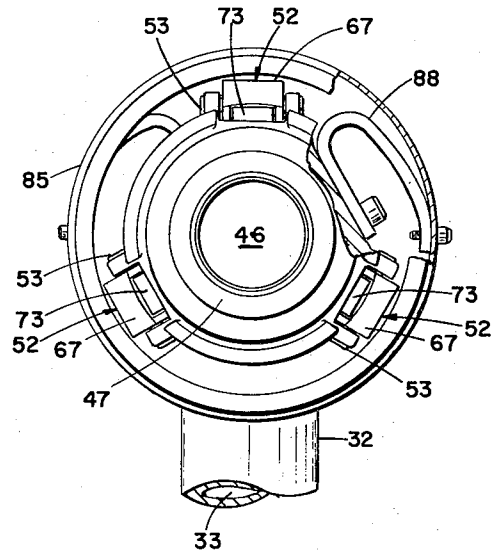


Fig. 6

INVENTOR.
ERIK PETAU
BY *D. Gordon Anguel*
ATTORNEY

Dec. 4, 1956

E. PETAU

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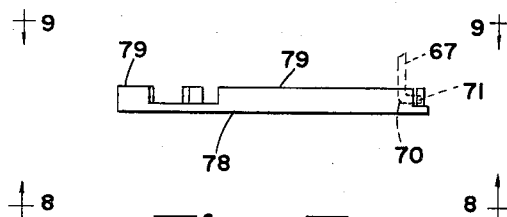


Fig. 7

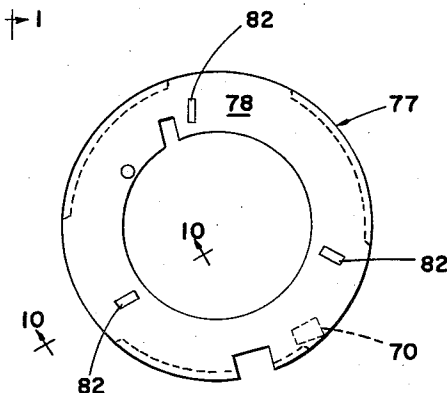


Fig. 8

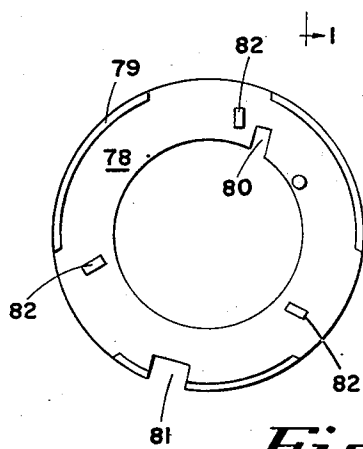


Fig. 9

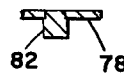


Fig. 10

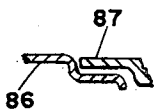


Fig. 11

INVENTOR.
ERIK PETAU
BY *D. Gordon Angus*
ATTORNEY

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2,772,706

NOZZLE

Erik Petau, Los Angeles, Calif., assignor to Aerojet-General Corporation, Azusa, Calif., a corporation of Ohio

Application June 7, 1954, Serial No. 434,753

5 Claims. (Cl. 141-346)

This invention relates to the handling of hazardous fluids, and in particular to a spill-proof nozzle and adapter combination for connecting conduits to a receptacle to be filled.

In the handling of hazardous fluids such as white fuming nitric acid it is frequently necessary to utilize pressures as high as 600 lbs. per square inch. Fluids of this type and at this pressure are so dangerous that any accidental discharge of the liquid or fumes is an extreme personnel hazard. For this reason, ordinary fluid handling nozzles and tank closures are generally unsatisfactory inasmuch as they often permit drainage, and usually lack interlocking means which positively prevent accidental discharge of the fluids.

While white fuming nitric acid is given as an example of a hazardous fluid for the handling of which this nozzle and adapter are well suited, it will be understood that the mechanism is also suited for handling a wide range of other fluid so long as the materials of construction are selected to be resistant thereto. Therefore, the type of fluid being handled is no limitation in this invention.

In addition, since this fluid handling is customarily done in the field it is necessary to provide nozzles and adapters which are sufficiently rugged to withstand a certain amount of abuse and even dropping without discharging any of the hazardous fluids.

Accordingly, it is an object of this invention to provide a simple and rugged nozzle and adapter combination which provides safety measures to prevent the opening of the nozzle when it is not connected to a tank, to provide positive protection against the removal of the nozzle from the tank while the nozzle is open, and to insure that the tank remains closed except when the nozzle is attached.

This invention is carried out in combination with a tank for receiving fluids and a conduit for supplying same, the nozzle controlling the flow through the conduit, and the adapter serving to seal the tank except when the nozzle is attached and opened.

A feature of the invention resides in the provision of an adapter having a passage therethrough with a closure member which normally closes the passage and thereby the tank but which can be opened for admission of fluids to said tank. The nozzle, which constitutes a feature of the invention, comprises a nozzle body having an interior flow chamber which interconnects the supply conduit and an outlet through the nozzle for discharge therefrom. A poppet valve serves to close the outlet as well as to open the adapter when the nozzle is opened, said poppet valve being actuated by a handle.

Further features of the invention reside in the provision of safety interlock means which prevent the opening of the handle and therefore the poppet valve unless the nozzle is attached to the adapter, and also locking means which prevent the nozzle from being withdrawn from the adapter while said nozzle is open, said interlock and locking means being controlled by a cam plate. These and other features of this invention will be fully under-

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stood from the following detailed description and the accompanying drawings:

Fig. 1 is an elevation, partly in cross-section of a connected adapter and nozzle combination according to the invention with the nozzle open to permit stream flow;

Fig. 2 is a cross sectional elevation of the adapter of Fig. 1;

Fig. 3 is an end view taken at line 3-3 of Fig. 2;

Fig. 4 is an end view taken at line 4-4 of Fig. 2;

Fig. 5 is a view of the top of the nozzle of Fig. 1;

Fig. 6 is a rear view of Fig. 5;

Fig. 7 is a detailed side elevation of a cam plate from the nozzle of Fig. 1;

Fig. 8 is a bottom view taken at line 8-8 of Fig. 7;

Fig. 9 is a top view taken at line 9-9 of Fig. 7;

Fig. 10 is a cross section view taken at line 10-10 of Fig. 8; and

Fig. 11 is a fragmentary cross-section view of a means for preventing confusion between filling and return connections.

Fig. 1 shows a nozzle assembly 10 and an adapter assembly 11 joined together. The adapter assembly 11 is intended to be attached directly to an opening in a tank wall 12 so as to provide a means for nozzle attachment during the filling operation, and means for sealing the tank when the nozzle is withdrawn.

Figs. 2-4 show the construction of the adapter assembly in detail. An adapter body 13 is a generally circular structure having a central axis 13a and a central passage 14 therethrough, and an attachment flange 15. To this attachment flange there is fitted a fill mating member 16 which is annularly shaped, and also there is an attachment ring 17 which can be fitted directly to the tank to plug the hole in the tank wall. The adapter body 13, the fill mating member 16, and the attachment ring 17 are all held together by means of bolts 18 threaded into the attachment ring 17. To the lefthand inner face of the adapter body 13 there is fastened an annular seal ring 19 having an interior sealing face 20. This seal ring 19 is attached to the adapter body by means of bolts 21. The adapter body also has a continuous annular flange 21a at its outer periphery, said flange serving as hook-engaging means.

A poppet guide member 22 is attached by means of bolts 23 to the adapter body 13 inside the tank. This poppet guide member has three legs 24 which are spaced from one another so as to leave gaps 24a therebetween. At the central portion of the poppet guide member distant from the adapter body there is a guide passage 25 within which a poppet pin 26 can reciprocate. This poppet pin joins to a valve plug 27 or closure member which is adapted to seal the central passage 14 of the adapter body 13. A seal 28 is held to the outside of the valve plug 27 by means of a collar 29 so that said seal 28 can bear against a sharp inner edge 30 on the adapter body. A compressible spring 31 is disposed around the poppet pin 26 between the valve plug 27 and the poppet guide member 22 so as to force the valve plug away from said poppet guide member, thereby normally closing the central passage 14 in the adapter.

The nozzle 10 will now be described in detail with reference to Figs. 5 and 6 for the external structures and Fig. 1 in respect to the internal construction. With particular reference to Fig. 1, there is shown a nozzle body 32 which comprises an inlet conduit 33 having sight glasses 34 therein so that the condition of the flowing stream may be observed. This inlet conduit passes through the arm 35 of the body to enter an inner flow chamber 36 disposed at the central axis 37 of the nozzle. The main portion of the body surrounds this central axis 37 in an annular fashion, and there is an inwardly protruding shoulder 38 near the left hand end of the flow chamber as shown in

Fig. 1. This defines a poppet passage 39 through the left hand end of the nozzle body. A spacer 40 is fitted in the poppet passage 39 adjacent the shoulder 38 and on the side thereof adjacent to the flow chamber 36, thereby defining a passage for sliding movement of a poppet valve 41. Flange type seals 42 bear against the shaft 43 of the poppet valve 41 which are held in place by clamps 44. The poppet valve has a reduced cross section 45 inside the inner flow chamber 36 and expands to form a poppet plug 46 at the right hand end of the body.

The valve body has a circular outlet 47 adapted to be closed by the poppet plug 46, the flow chamber 36 interconnecting this outlet with the inlet conduit. A flange-type seal 48 is held to the inside of this outlet by means of a seal clamp 49. This flange type seal has a frusto-conical annular flange 49a adapted to slide along the poppet plug to seal the space between that plug and the valve body. This flange points toward the flow chamber 36 so as to seal against pressurized fluids therein. Such seals are more fully described in the co-pending patent application of Van Leer Serial Number 180,590, filed August 5, 1950, entitled "Seal," which is assigned to the same assignee as the instant application.

A spacer ring 50 is fixed to the clamp and is adapted to fit against the adapter body when the nozzle and adapter assembly are together. A flange 51 is provided to serve as a stop for parts of interlock assemblies 52. These interlock assemblies are mounted to the nozzle body by means of pivots 53.

An actuator housing 54 is attached to the nozzle body and has a central region in which the poppet valve shaft 43 can move. The shaft is connected by means of a connecting rod 55 and crank pins 56, 57 to an actuator handle 58. This actuator handle is pin mounted by means of a crank pin 59 to the actuator housing 54, and pin 57 is spaced from pin 59. The handle 58 conveniently has a grip 60 of a type which can be grasped by a hand covered with heavy mittens, and also has a hook 61 which is a part of a safety feature to be described. There is also a cut-out segment in the handle near the crank pin 59 into which one arm 62 of a latch 63 can fit. This latch is pivotally mounted to the actuator housing 54 and has another arm 64 which projects towards the nozzle body. This arm 64 is spring-loaded toward the poppet valve shaft 43 by means of a spring 65 between said latch 63 and the actuator housing 54. This latch 63 also has a projecting lug 66 extending therefrom for purpose later to be described.

The interlock assemblies 52 will now be described. These are provided at 120° intervals around the nozzle body. The pivotal mounting of these interlock assemblies may best be seen in Fig. 6. The outer and larger body is a retention member 67 which has a hook portion 68 at its end away from the handle, along with a spacing shoulder 69 on the inside of the hook. At the opposite end of the interlock from the hook portion 68, and on the opposite side of the pivot 53 therefrom, there is provided a projecting cam lug 70 which extends generally radially away from the central axis 37 of the nozzle and which has a slanting cam-engaging surface 71 at its radially outward extremity. A spring 72 is in opposition between the valve body and the retention member 67 to spring load the retention member so that the hook portion moves radially inward toward the central axis of the nozzle, and the projecting cam lug 70 moves radially outward therefrom.

Inside this retention member 67, which member has a generally U shaped cross-section, there is a locking member 73 which is pivoted to the same pivot 53 as the retention member 67. This locking member has a sloping end 74 which may partly rest on flange 51 and said locking member is spring loaded by means of spring 75 so that the sloping end 74 is forced toward the central axis 37, and the end toward the handle is forced away from the central axis. At the end of the locking member nearest the handle 58 there is a lug 76.

The interlocking and safety features of this nozzle and adapter assembly are primarily controlled by means of a cam plate 77 which is rotatably mounted between the nozzle body 32 and the actuator housing 54. This cam is shown in complete detail in Figs. 7-10 and comprises a flat disc 78 with an interrupted cylindrical flange 79, which flange is directed toward the nozzle body, and away from the actuator handle 58. The cam plate is provided with an interior notch 80 which will be positioned opposite the interlock 63 so that the projecting lug 66 can enter therein under certain circumstances. An exterior notch 81 is provided on the periphery of the cam plate to permit passage of the hook 61 to the inside of the flange 79. Three lug plates 82 are provided on the inside which are engageable with the lugs 76 on the locking members 73.

A handling ring 83 is attached to the cam plate 77 which generally surrounds the actuator housing 54 and provides a grip for the nozzle assembly. This handling ring is conveniently attached to the cam plate by means of legs 84.

As a means for guiding the nozzles to their proper position for connection with an adapter, a shell 85 is provided which fits inside the fill mating member 16 as shown in Fig. 1.

In the handling of fluids such as white fuming nitric acid, it is necessary to vent the tank being filled back to the supply source so as to provide for overflow and also for disposition of hazardous fumes. For the return means, the same adapter and nozzle as described are satisfactory. To prevent confusion of nozzles and adapters when return lines are used in the fueling of tanks with hazardous materials, the return nozzle and adapter may advantageously be provided with a shell 86 which has a different end shape than shell 85, so as to fit in a return mating member 87 on a return adapter, shell 86 not fitting in member 16, and shell 85 not fitting in member 87. These shells may conveniently be attached to their nozzles by springy bends 88 attached at one end to the nozzle body and at the other end to the shell. The shell thereby provides a certain resilience in the event the nozzle is dropped.

The operation of the nozzle and adapter combination will now be described. The aim is to provide an absolutely safe means for filling tanks with hazardous liquids such as white fuming nitric acid, where there must be absolute certainty that there can be no accidental opening of the discharge nozzle, nor of the adapter. Of equal importance is the necessity that the nozzle and adapter be absolutely locked to each other while the nozzle is open, so that the nozzle cannot be removed from the adapter while the nozzle is open. These restrictions result in a fool-proof means for assuring that fluids will pass only into the tank.

In order to connect the nozzle to the adapter it is only necessary to place the nozzle centrally on the adapter and push the nozzle toward the adapted body with the shell 85 inserted into the fill mating member 16. Since the retention members 67 are spring loaded, they may be forced apart by the shoulder 21a on the adapter body 13. This moves the hook portions 68 outward until they snap over the edge of the adapter body. Thereafter the nozzle cannot be withdrawn from the adapter without releasing the hook portions 68. These hook portions will snap inwardly until the spacing shoulder 69 rests against the outer edge of the adapter body 13, and be held in that position by springs 72. It will be noted that there is no uniquely necessary angular alignment of the nozzle and adapter about the axis 37, since the retention members can engage the adapter in any position.

Until the nozzle is hooked to the adapter in this manner, the locking members 73 will be pivoted with the end toward the adapter inward toward central axis 37, and the lugs 76 will stand in the way of the lug plates 82 on the cam, thereby preventing rotation of the cam in one direction past the lugs 76. Also until this hooked posi-

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tion is reached, the hook 61 on the actuator handle 58 is underneath the flange 79 of the cam plate, and the handle cannot be moved until the cam plate can be turned so as to move the second notch 81 even with hook 61.

It will therefore be seen that until the cam plate can be turned, the handle cannot be moved, and that the cam plate cannot be turned until the retention members 67 have snapped over the ends of the adapter body 13 and the sloping ends 74 of locking members 73 have been forced radially outward by the adapter body so as to move the lugs 76 out of the path of the lug plates 82 on the cam.

When the nozzle is locked on to the adapter the locking members 78 are tilted so that lugs 76 no longer impede the lug plates 82. Then the cam plate can be turned so that exterior notch 81 will permit the lifting of the handle. The lifting of the handle will move the latch 63 so that its projecting lug moves into interior notch 80, and locks the cam against rotation while the handle is in a position to permit fluid flow.

At this time the poppet plug 46 will bear against the valve plug 27, pulling the actuated handle 58 over center to the position illustrated in Fig. 1 having moved the valve plug 27 off its seat to open a passage from the supply conduit through the inner flow chamber 36, past the adapter and into the tank. The flow will continue until the actuator handle is pulled back so as to slide the poppet back into the reduced cross section 45 and seal said cross section and also to permit the valve plug 27 to seat and close the tank.

During the time that the handle is in the open position, the retention members cannot let go, since the lug 66 on latch 63 is moved by this action into the notch 80 so as to prevent the cam from being rotated. Only when the handle is closed can the latch again move so that the arm 64 withdraws from notch 80 and the cam plate can be turned. At this valve-closed position, it is safe to remove the nozzle from the adapter. However, in order to release the locking members the cam plate must be rotated by the handling ring. Such rotation moves the exterior notch 81 out of the path of the hook portion 61 so that the handle is locked by the interrupted cylindrical flange 79, and the nozzle cannot then be opened.

This turning of the cam also serves to unlock the retention members 61 by means of the impingement against the interrupted cylindrical flange 79 on the slanting cam-engaging surfaces 71 as shown in dashline in Fig. 8. This moves the retention member so that the hook portion releases the adapter body and the nozzle can be removed. As the nozzle is removed, the locking members 73 are moved by their springs so as to place the lugs 76 in the path of the lug plates 81 so that the cam plate cannot be rotated until the nozzle is once more connected with the adapter.

Thus it will be appreciated that a nozzle and adapter combination for handling hazardous liquids is provided in which there is no possibility that the fluids can escape by careless handling of the mechanism. This device contains a minimum of moving parts and is of rugged construction. All locks are positive, and dropping or jarring the nozzle will not cause leakage. The shells provide nozzle body protection, as does the handling ring, so that rough usage causes a minimum of damage.

I claim:

1. A nozzle and adapter combination for filling a tank with fluid from a conduit, said nozzle connecting with the conduit for control of flow therethrough, and said adapter being attachable to a tank so as normally to close a hole therein, comprising: an adapter comprising an adapter body having a central axis and a passage therethrough for permitting fluid flow from one side of the adapter to the other, a closure member for closing said passage, said closure normally closing said passage and being

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movably mounted so as to permit fluid flow through said passage, and hook engaging means so disposed and arranged so as to be outside the tank when the adapter is installed thereon; and a nozzle comprising a nozzle body having a central axis, an opening through a side thereof and an internal flow chamber interconnecting said conduit and said outlet, a poppet valve adapted to plug said outlet in one position and to open said outlet in another position, an actuator handle mounted on the nozzle, said poppet being slidable by movement of said handle, a cam plate rotatably mounted with respect to the nozzle body, and interlocking means pivotally mounted to said nozzle comprising a retention member having a hook portion adapted to grasp said hook engaging means and a locking member so disposed and arranged that in one position it prevents rotation of the cam plate in one direction by standing in the way of the cam plate, and in another position permits such rotation, said interlocking means being tiltable and spring loaded so that a portion of the interlocking means changes its distance from the central axis when the nozzle is connected and disconnected to and from the adapter, and latching means actuatable by said actuator handle pivotally mounted so as to be moved to prevent rotation of said cam plate in a first position of the handle and to permit rotation of the cam plate in a second position of said handle, said second position being possible only when the nozzle is closed; whereby pressing the nozzle against the adapter causes the retention members to engage the hook engagement means thereby holding the nozzle and adapter together, and the locking member to release the cam plate for rotation, whereby the handle can be turned to move the poppet and open the outlet in the nozzle body and also to open the adapter, and whereby the interlocking means prevent the detaching of the nozzle from the adapter when the poppet valve is open.

2. Apparatus according to claim 1 in which the hook engaging means is a continuous flange on said adapter, whereby the nozzle may be engaged with the adapter at any angular position relative thereto around said central axis and in which the cam plate is provided with lug plates engageable with said interlocking means and in which said cam plate has an interior notch for engagement with said latching means, and also has an exterior notch, and in which the actuator handle has a hook which can pass through said exterior notch in one position of said cam plate and cannot pass through said exterior notch in another position of said cam plate whereby the actuator handle is restrained from movement in at least one position of said cam plate.

3. Apparatus according to claim 1 in which the closure member of the adapter is a spring-loaded valve plug movable along the central axis of the nozzle by the poppet valve of said nozzle, whereby fluid flow can occur through the nozzle and the adapter simultaneously.

4. Apparatus according to claim 1 in which there are provided a plurality of interlocking means spaced around the central axis of the nozzle, said interlocking means rotating in a plane passing through said central axis.

5. Apparatus according to claim 1 in which the hook engaging means is a continuous flange on said adapter, whereby the nozzle may be engaged with the adapter at any angular position relative thereto around said central axis, and in which the pivoted interlocking means move radially toward and away from said central axis.

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