United States Patent

Swartz

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[54] **GAS SUPPLY CONNECTOR AND REGULATOR VALVE**

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[52] **U.S. Cl.** **137/614.06**, 251/149.9

[51] **Int. Cl.** **F16k 29/00**

[58] **Field of Search** 137/614.06, 614, 505.46; 251/149.9, 89.5; 285/91, 277, 316

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[57] **ABSTRACT**

A gas supply connector and regulator is disclosed comprising an adjustable valve connectable to a gas supply source, a regulator for adjusting the valve and automatically maintaining a constant gas flow, and means formed on the respective valve and regulator for securely coupling the valve and regulator, and safety features to prevent the release of gas from the gas supply source during coupling and uncoupling.

12 Claims, 10 Drawing Figures

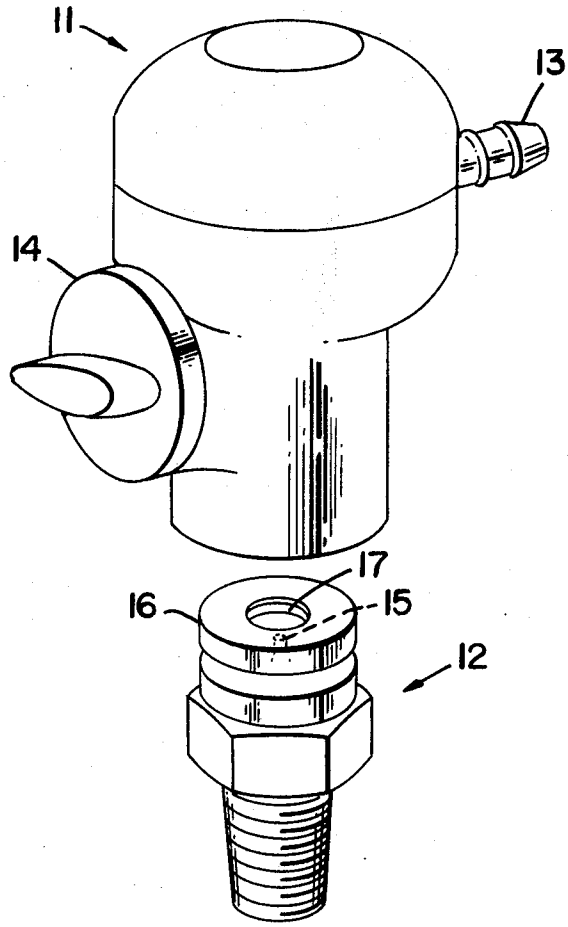
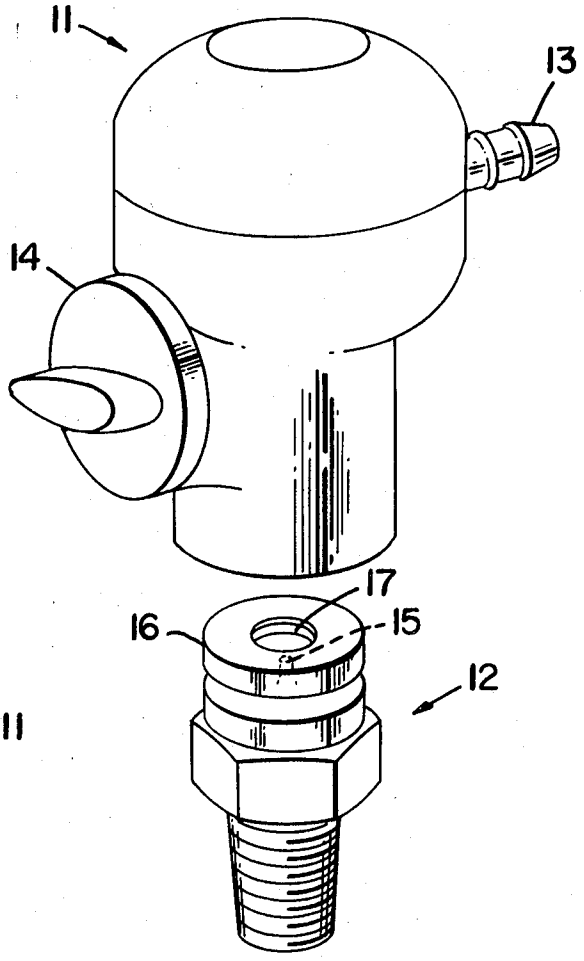


FIG_1



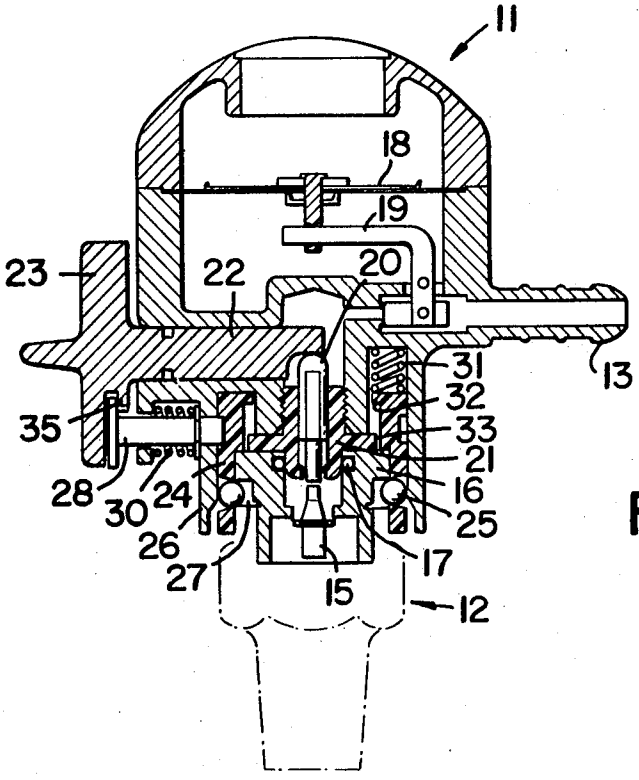


FIG_2

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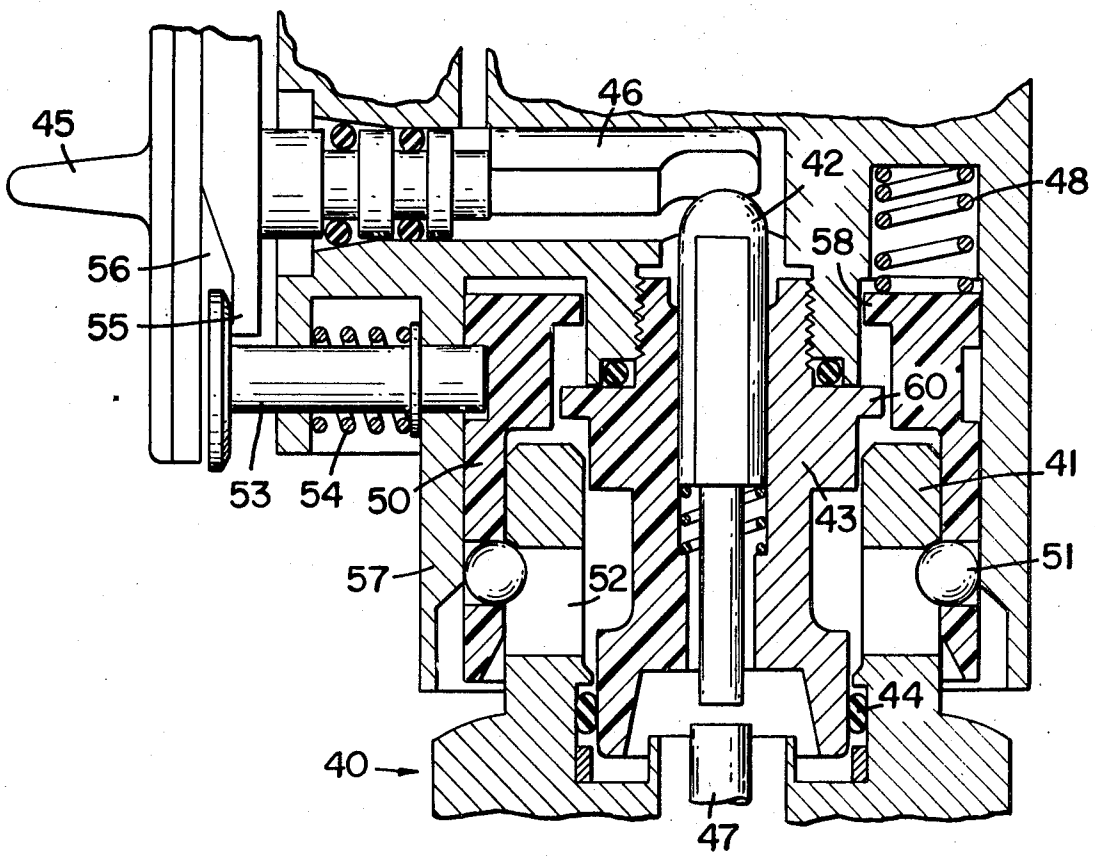
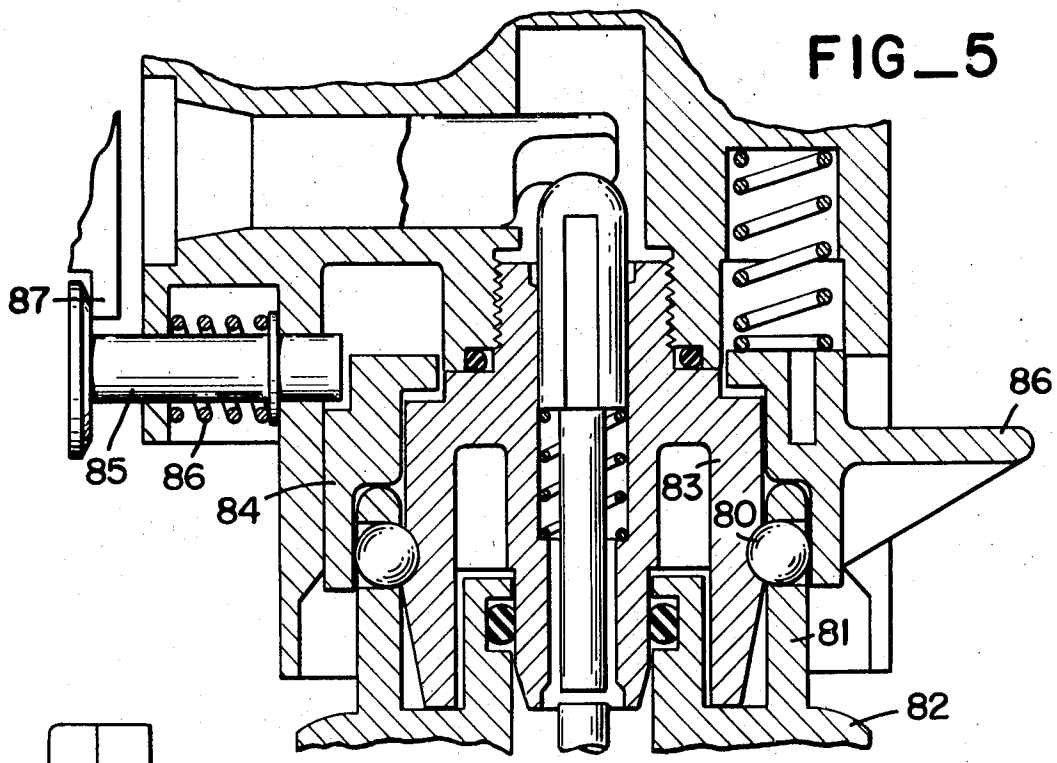


FIG_3

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FIG_5



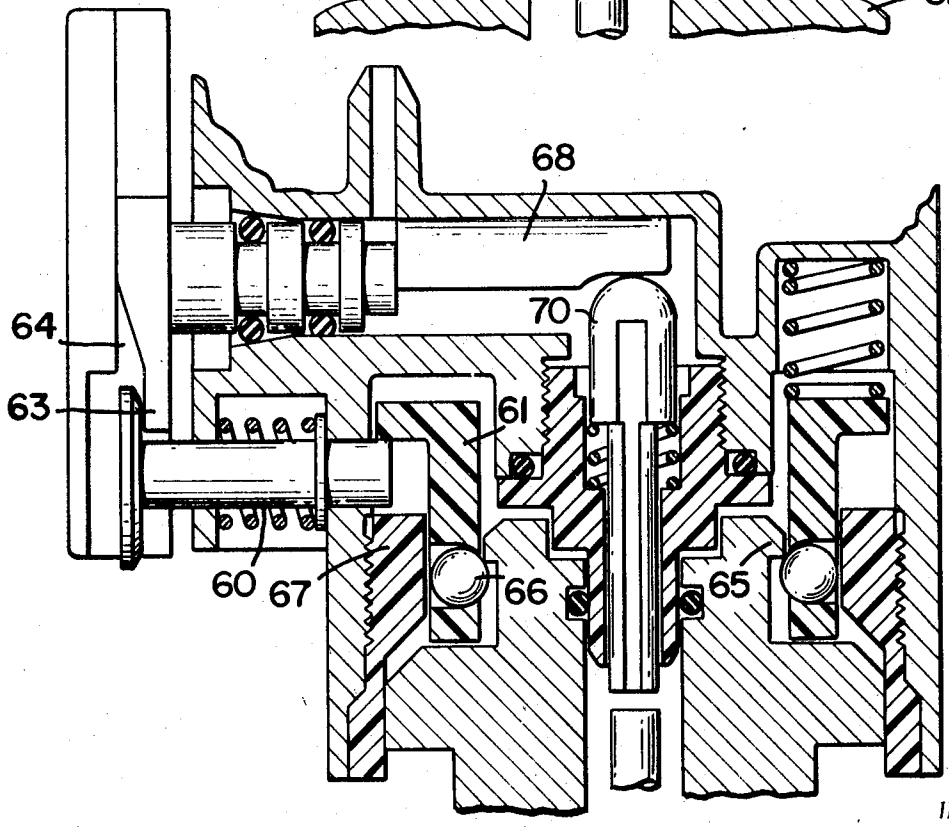


FIG_4

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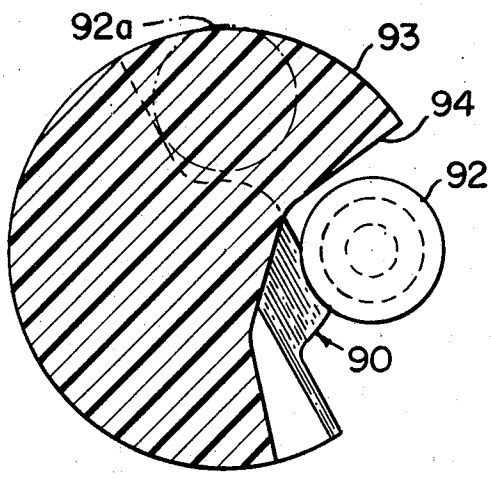


FIG_7

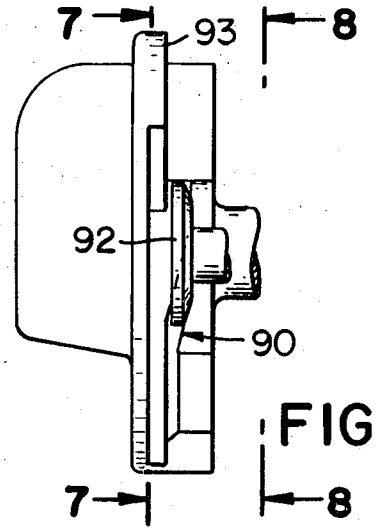


FIG_6

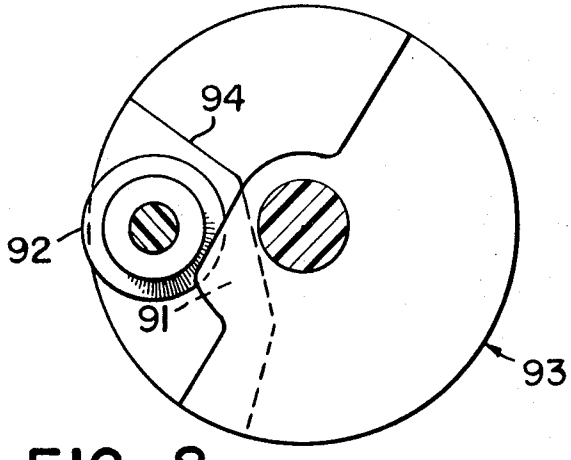


FIG_8

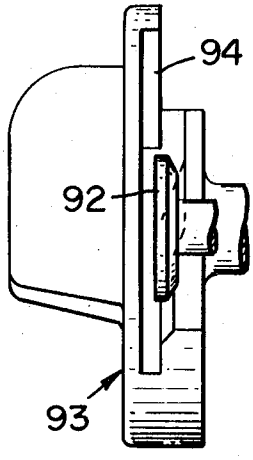


FIG_9

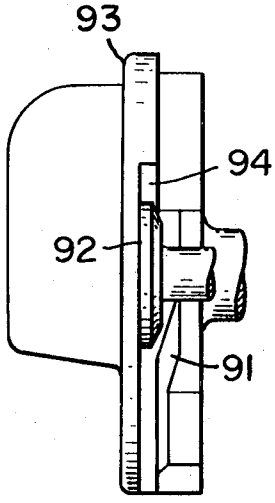


FIG_10

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GAS SUPPLY CONNECTOR AND REGULATOR VALVE

This invention relates to a new and improved gas supply connector and regulator for delivering an adjustable and regulated gas flow from a gas supply source.

It is an object of the present invention to provide means for securely coupling an adjustable valve connectable to a gas supply source and a regulator to thereby provide reliable delivery of an adjustable and regulated gas flow from a gas supply source.

Another object of the invention is to provide safety features in the coupling means between an adjustable valve connectable to a gas supply source and a regulator to prevent release of gas during coupling and uncoupling.

A further object of the present invention is to provide a safety feature simultaneously engageable with the connecting means between the valve and regulator and the actuator means for opening the valve so that the regulator and valve may not be uncoupled when the valve is actuated in an open position and whereby the actuator means may not be turned to on position when the valve and regulator are uncoupled to thereby prevent release of gas during coupling and uncoupling.

Yet another object of the invention is to provide leakproof coupling by the use of O-ring seals.

According to the present invention, an adjustable valve is provided connectable to a gas supply source and normally maintained in a closed position by pressure from the gas supply, and having at its outer edge an extending sleeve forming a socket for receiving a plunger and plunger guide housed in a regulator. The annular sleeve forming the socket has formed therein holes or indentations about its outer surface to receive extendable portions of the regulator in locking relationship.

In addition to the plunger and plunger guide adapted to be received in the valve socket, the regulator includes a movable annular cylindrical section forming a sleeve adapted to axially enclose the valve socket when the regulator plunger and plunger guide are inserted in the valve socket. The walls of the movable sleeve serve as a ball retainer. The diameter of the balls retained therein is greater than the thickness of the walls, and the balls are movably retained within the walls between two positions projecting either inwardly or outwardly thereof. Coupling between the valve and regulator is secured with the regulator plunger and plunger guide inserted in the valve socket and with the ball retainer sleeve of the regulator axially enclosing the socket so that the balls extend into the holes or indentations of the valve socket to thereby prevent separation of the valve and regulator. The balls are maintained in an inwardly extending position after coupling by an outer axially enclosing wall of the regulator. A leakproof coupling is provided by an O-ring seal between the inside wall of the socket and the plunger guide. With the valve and regulator coupled, the plunger is movable within the plunger guide to operate the valve by a handle and camming rod assembly in the regulator.

According to another aspect of the invention, a lockpin is provided simultaneously engageable between the ball retainer sleeve and a camming surface on the regulator handle which operates the plunger. By means of the lockpin, the valve and regulator may not be uncoupled when the handle and plunger are in an on position. Furthermore, the handle and plunger may not be turned on until the valve and regulator are coupled due to the position of the handle relative to the locking pin. The possibility of momentary release of gas during coupling and uncoupling is thereby eliminated.

Other objects, features and advantages of the present invention will become apparent in the following specification and accompanying drawings in which:

FIG. 1 is a perspective view of a valve and regulator embodying the present invention in separated relationship;

FIG. 2 is a cross-sectional view of the regulator and valve in coupled relationship;

FIG. 3 is a detailed fragmentary cross-sectional view of another form of coupling means between a valve and regulator embodying the present invention;

FIG. 4 is a detailed fragmentary cross-sectional view of yet another form of coupling means embodying the present invention;

FIG. 5 is a detailed fragmentary cross-sectional view of another valve and regulator having a safety feature embodying the present invention;

FIG. 6 is a side elevation view of the regulator handle in an off position showing its position relative to the locking pin.

FIG. 7 is a cross-sectional view in the direction of the arrows on the line 7—7 of the actuator handle in FIG. 6 showing the camming surface and the locking pin.

FIG. 8 is a bottom plan view in the direction of the arrows on line 8—8 in FIG. 6.

FIG. 9 is a side elevation view of the regulator handle showing the camming surface engaging the head of the locking pin with the handle partially turned to the uncoupled position.

FIG. 10 is a side elevation view of the regulator handle in the uncoupled position showing the actuator handle held in the off position.

In the embodiment of the present invention illustrated in FIG. 1 there is generally provided a regulator 11 and an adjustable valve 12. The regulator includes an outlet 13 for the regulated outflow of gas and an actuator handle 14 which operates a plunger to open or close the valve 12. The valve 12 includes a valve pin 15 and an extending socket 16 adapted to receive the plunger housed in the regulator 11.

As shown more clearly in FIG. 2, the regulator includes a diaphragm 18 and a lever assembly 19 pressure sensitive to gas in the regulator and operative to vary the flow path and provide a steady flow of gas at the outlet 13. With the regulator 11 and valve 12 in coupled relation gas is released from valve 12, normally in a closed position due to gas pressure from the gas supply to which it is connected by a plunger 20 movable within a plunger guide 21 by the camming rod 22 operated by the actuator handle 23. Thus, when the plunger 20 is depressed by motion of the actuator handle and camming rod 22, the valve head 15 is depressed by plunger 20 to release gas through the valve 12 and through the regulator flow path including a channel formed in the plunger to the outlet 13.

Coupling between the regulator 11 and valve 12 is provided by an annular extension from the valve 12 forming a socket 16 in which the plunger 20 and plunger guide 21 are received, and a ball retainer sleeve 24 movably mounted by a spring 31 in the regulator to axially enclose the socket 16 of the valve 12 upon coupling. Held within the walls of ball retainer sleeve 24 are a plurality of balls 25 of steel or other suitable material having a diameter greater than the thickness of the walls and movable between two positions extending either inwardly or outwardly of the walls. The balls 25 are retained at the inner surface of the ball retainer 24 by a constriction of diameter less than the diameter of the balls and at the outer surface of the ball retainer 24 by an annular wall 26 axially enclosing the ball retainer sleeve 24. Thus, in the coupled position shown in FIG. 2 the balls are shown in the position projecting inwardly of the ball retainer sleeve 24 within a groove 27 formed in the outer surface of the socket 16 of valve 12 thereby preventing disengagement of the coupled parts. Movement of the ball retainer sleeve 24 is prohibited by lockpin 28 biased by spring 30.

A leakproof passageway is provided between the valve 12 and regulator 11 by an O-ring seal 17 between the socket 16 and plunger guide 21.

It is apparent that decoupling of the regulator 11 and valve 12 is possible only by withdrawal of the lockpin 28 from the indentation formed in the ball retainer 24. Upon withdrawal of lockpin 28 as hereinafter described, the ball retainer 24 mounted on spring 31 may be lowered by motion downward of the socket 16 of valve 12 until the balls 25 can assume the position extending outward of the ball retainer sleeve 24 into a groove formed in the outer enclosing wall 26. The socket 16 and valve 12 may then be withdrawn from the regulator. The ball retainer sleeve 24 includes a top extension 32 which engages a flange 33 on the plunger guide 21 to prevent the ball

retainer sleeve 24 from lowering to a point where the balls 25 may escape.

It is also apparent that with the actuator handle 23 in the position shown in FIG. 2, the lockpin may not be withdrawn. Since decoupling of the regulator 11 and valve 12 is possible only after withdrawal of the lockpin 28, uncoupling is controlled by the actuator handle 23. Only in a specified off position of the actuator handle 23 when the valve 12 is closed may the lockpin 28 be withdrawn. Withdrawal is produced by a projection 35 from the operating handle 23 which includes an inner camming surface which performs the function of withdrawing the lockpin 28 as hereinafter described. The regulator 11 and valve 12 may therefore not be uncoupled unless the valve 12 is closed, thereby eliminating the possibility of the release of gas during uncoupling. Furthermore, the actuator handle 23 includes a projecting edge on its inner surface which engages the locking pinhead to prevent the handle and plunger 20 from being turned to an on position until the valve and regulator are coupled as hereinafter described. Thus, the possibility of the release of gas upon coupling is also eliminated.

Another form of coupling means between a valve and regulator is illustrated in FIG. 3. The valve 40 is provided with an annular projection at its coupling end providing a socket 41 adapted to receive a plunger 42 and plunger guide 43 in leakproof engagement at the O-ring seal 44. In coupled engagement, the actuator handle 45 and camming surface rod 46 may be rotated to depress the plunger 42 and activate valve pin 47 in valve 40 to thereby release gas into the regulator passageway.

Movably mounted within the regulator on a spring 48 is a ball retainer sleeve 50 similar to that heretofore described. In the coupling position, balls 51 held in the retainer sleeve 50 extend inwardly from the retainer sleeve into holes 52 formed beneath lugs on the side of the socket 41 extending from the valve 40. Motion of the ball retainer sleeve 50 is prevented by lockpin 53 to thereby provide a secure coupling. The lockpin 53 is biased by spring 54 and withdrawal of the lockpin is prevented by actuator handle 45 except when the actuator handle 45 is in a certain off position thereby assuring that the valve 40 is closed. Withdrawal of the lockpin 53 which engages an indentation in the ball retainer sleeve 50 is accomplished by a projection 55 from the actuator handle 45 having a camming surface 56 which withdraws the lockpin upon rotation of the actuator handle to a certain off position.

With the lockpin withdrawn, the ball retainer sleeve 50 mounted on spring 48 may be pulled outwardly from the regulator by pressure exerted by the socket 41 on balls 51 until the balls 51 may assume a position extending outwardly from the ball retainer sleeve 50 into a groove formed in the other wall 57 axially enclosing the ball retainer 50. With the balls 51 in the outward position, the socket 41 and valve 40 may be withdrawn from the regulator. As heretofore described, top projections 58 on the ball retainer sleeve 50 engage flanges 60 extending from the plunger guide 43 to prevent lowering of the ball retainer 50 to a point where the balls 51 could be released.

The lockpin 53 further serves the purpose of engaging a projecting edge of the inner surface of the actuator handle to prevent the actuator handle 45, camming rod 46 and plunger 42 from being turned to a position to open the valve 40 until the valve and regulator are coupled, thereby preventing accidental release of gas upon coupling.

In the embodiment of the present invention illustrated in FIG. 4 there is provided coupling means between the regulator and valve similar to that shown in FIG. 2, except for the structure of the safety feature incorporated in the coupling means. Thus, as shown in FIG. 4, the lockpin 60 engages an extension of the ball retainer 61 when the parts are in coupled engagement. Rotation of the actuator handle 62 to a certain off position results in withdrawal of the lockpin 60 by operation of the extension 63 and its camming surface 64 operating against the head on lockpin 60. With the locking pin 60 withdrawn, the ball retainer 61 may be withdrawn from the regulator by pressure exerted by the socket 65 on the balls 66 held in the ball retainer 61 until the extension on the ball retainer meets a projection 67 in the outer wall axially enclosing the ball retainer 61 and valve socket. The balls 66 may then assume a position extending outwardly from the walls of the ball retainer 61 in a groove formed in the outer enclosing wall 67. The valve may then be withdrawn from the regulator.

In the uncoupled position the locking pin is held in an outwardly extending position by the outer surface of the ball retaining sleeve. The actuator handle 62 is thereby prevented from rotating when the locking pin 60 is outwardly extending by a projecting edge on the inner surface of the actuator handle 62. Thus, coupling can only take place with the actuator handle 62 in an off position thereby preventing accidental release of gas upon coupling. Furthermore, the regulator and valve may not be uncoupled unless the locking pin is withdrawn which only occurs with the actuator handle 62 in a certain off position, thereby also preventing accidental release of gas upon uncoupling.

In the embodiment of the invention illustrated in FIG. 5, the aforedescribed safety feature is applied to a coupling means between a regulator and valve of the type in which the balls 80 are retained in the socket 81 extending outwardly from the valve 82. In this form of coupling means, the balls 80 assume a position extending inwardly of the walls of socket 81 into indentations formed in extensions of the plunger guide 83 and are retained in the inwardly extending position by a movably mounted collar 84 axially enclosing the socket 81 and plunger guide 83 in coupled position. In this form of the invention, the safety feature is accomplished by regulation of motion of the sleeve 84 by lock pin 85 biased by spring 86. The regulator and valve may be separated only by raising the sleeve 84 by means of the extension 86 after withdrawal of lockpin 85 to permit the balls 80 to assume an outwardly extending position so that the valve socket 81 is released from the regulator. The lockpin 85 is withdrawn by the extension 87 of the actuator handle and corresponding camming surface only when the actuator handle is rotated to an off position, thereby assuring that valve 82 will be closed upon uncoupling preventing accidental release of gas. Similarly, coupling may be accomplished only with the sleeve 84 moved to an upward position by extension 86 with the locking pin 85 in a withdrawn position. With the lockpin extending outwardly, the actuator handle is in an off position and cannot be turned on because of a projecting edge which engages the locking pin assuring that valve 82 will be closed upon coupling thereby preventing accidental release of gas.

Operation of the actuator handle extension and camming surface on the head of the locking pin is shown more clearly in FIGS. 6–10 where the actuator handle is shown revealing the extension 90 having a camming surface 91 which engages the head 92 of the locking pin and withdraws the locking pin upon rotation of the actuator handle 93 to a certain off position. The actuator handle 93 above the head 92 of the locking pin includes a projecting edge 94 which prevents rotation of the actuator handle 93 to an on position when the locking pin extends outwardly as when the valve and regulator are uncoupled. Thus, closure of the valve is assured during coupling and uncoupling to thereby prevent accidental release of gas during coupling and uncoupling.

In FIG. 6 the handle is in an off position but not yet in the position where the valve and regulator may be uncoupled. FIG. 9 shows the camming surface 91 engaging the head 92 of the locking pin as the handle is turned to the uncoupling position. FIG. 10 shows the handle in the position where the valve and regulator are uncoupled and the locking pin withdrawn and in which the handle may not be turned on due to the projecting edge 94 which engages the head of the locking pin. The locking pin is maintained in an outwardly extending position when the valve and regulator are uncoupled by the surface of the ball retaining sleeve.

FIGS. 7 and 8 further show the operation of the handle, FIG. 7 also showing the position of the locking pin 92*a* in phantom relative to the handle when the handle is in an on position. In the on position, the locking pin 92*a* may not be withdrawn thereby preventing uncoupling of the valve and regulator.

It is understood that the coupling means described herein may be incorporated in an adapter to be attached to the regulator. Thus, reference to a regulator herein and in the following claims includes reference to a regulator and attached adapter incorporating coupling means embodying the present invention.

Furthermore, instead of the balls retained in sleeves of the coupling means of the various regulators and valves, heretofore described, providing quick disconnect coupling and uncoupling, dogs, pawls or other suitable extending members capable of extending inwardly or outwardly of the retaining sleeve may also be used.

Although certain embodiments of the present invention have been shown and described, other adaptations and modifications would be apparent without departing from the true spirit and scope of the following claims.

What is claimed is:

1. A gas supply connector and regulator comprising: regulator means having a gas flow passageway therethrough and also having coupling means comprising a movable sleeve, at least one extending member retained in the walls of said sleeve, each said extending member being movable between two positions extending either inwardly or outwardly of the walls of said sleeve, and locking means engageable with said sleeve to maintain said sleeve in a stationary position upon coupling; valve means connectable at one end to a gas supply source and having at its other end a socket formed by an extending annular portion adapted to receive portions of the regulator and also adapted to be inserted axially within the movable sleeve of the regulator means, said socket having formed in its wall portions adapted to permit extension therein of each said extending member retained in the movable sleeve of the regulator means upon coupling.

2. A gas supply connector and regulator as set forth in claim 1 wherein there is provided an O-ring seal between the socket of the valve means and the portions of the regulator means received therein.

3. A gas supply connector and regulator as set forth in claim 1 wherein said movable sleeve is movable between a coupled position and an uncoupled position, said movable sleeve being movable between said two positions only when said locking means is released.

4. A gas supply connector and regulator as set forth in claim 3 wherein there is further provided an actuator means movable between an off position and an on position to thereby actuate said valve means between a closed position and an open position, said actuator means simultaneously engaging said locking means whereby said locking means is released only when the actuator means is in an off position to thereby prevent release of gas upon coupling and uncoupling.

5. A gas supply connector and regulator as set forth in claim 4 wherein said locking means comprises a locking pin engageable with said movable sleeve and said actuator means includes a handle having an extension and camming surface engageable with the head of said locking pin whereby said locking pin is disengaged from the movable sleeve only upon rotation of the actuator means to an off position.

6. A gas supply connector and regulator as set forth in claim 5 wherein said actuator means also includes in the handle, a projecting edge engaging the locking pin head when the actuator means is in an off position and the locking pin is disengaged from the movable sleeve to prevent the actuator means from being turned to an on position until the valve means and regulator means are coupled and the locking pin reengaged with the movable sleeve.

7. A gas supply connector and regulator as set forth in claim 1 wherein each said extending member comprises a ball retained in said movable sleeve by a plurality of channels formed therein each having a constriction at the inside of the sleeve of diameter less than the diameter of the ball to thereby retain the ball in the channel at one end, said regulator means also having an outer wall axially enclosing the movable sleeve to retain the balls at the other end of the channels at the outside of the movable sleeve.

8. A gas supply connector and regulator comprising regulator means having formed therein a movable sleeve, and stationary portion spaced from and enclosed by said sleeve; valve means connectable at one end to a gas supply source and having at the other end an extending annular portion forming a socket and also have at least one extending member retained in the walls of said socket and movable between two positions extending either inwardly or outwardly of the walls of said socket, said socket being adapted to be inserted between the stationary portion and movable sleeve in the regulator means and when so inserted each said extending member being adapted to assume a position extending inwardly of the walls of said socket into indentations formed in the stationary portion of the regulator means, each said extending member being held in an inwardly extending position by the movable sleeve axially enclose the socket, and locking means engageable with said movable sleeve whereby said movable sleeve is retained in a fixed position upon coupling.

9. A gas supply connector and regulator as set forth in claim 8 wherein there is also provided actuator means movable between an off position and an on position to activate said valve means from a closed position to an open position, said actuator means simultaneously engaging said locking means whereby said locking means is releasable only when said actuator means is in an off position to thereby permit coupling and uncoupling of the regulator means only with the actuator means in an off position.

10. A gas supply connector and regulator as set forth in claim 9 wherein said locking means comprises a locking pin engageable with the movable sleeve and said actuator means includes a plastic handle having an extension and camming surface engageable with the head of said locking pin whereby said locking pin is disengaged from the movable sleeve only upon rotation of the actuator means to an off position.

11. A gas supply connector and regulator of the type comprising regulator means, valve means and coupling means between said regulator means and valve means comprising: locking pin means to engage said coupling means in coupled position to thereby prevent uncoupling, and actuator means movable between an off position and an on position to activate said valve means between a closed position and an open position, said actuator means simultaneously engaging said locking pin means whereby said locking pin means may be disengaged from said coupling means only when the actuator means is in an off position,

said actuator means comprising a rotating handle having an extension and camming surface engageable with the head of said locking pin whereby said locking pin is disengaged from the coupling means only upon rotation of the actuator means to an off position.

12. A gas supply connector and regulator as set forth in claim 11 wherein said actuator means also includes in the handle, a projecting edge engaging the locking pinhead when the actuator means is in an off position and the locking pin is disengaged from the coupling means to prevent the actuator means from being turned to an on position until the valve means and regulator means are coupled and the locking pin reengaged with the coupling means.

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