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(71)(72) Applicant and Inventor: SIM, Nigel, Louis [GB/GB]; 10 Conniston Road, Redbridge, Southampton SO1 9PT (GB).

(74) Agent: FRANK B DEHN & CO.; Imperial House, 15/19 Kingsway, London WC2B 6UZ (GB).

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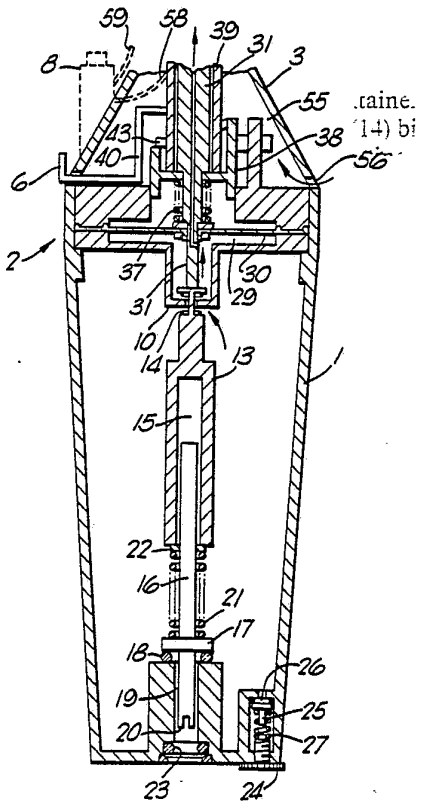
(57) Abstract

A gas heated tool such as a soldering iron has a refillable gas container (1) with an inlet valve (17, 18, 19) and an outlet valve (14) biassed mutually to the closed position by a spring (21) acting between them. The outlet valve is opened by an operating member (31) which is connected to a diaphragm (30) forming part of a differential valve. This is controlled by a rotatable tube (39) with pins (43) engaging a profile on an axially movable cam member (38) which acts on the operating member (31) through a spring (37). The control tube (39) has its upper end apertured (57) to control the admission of air in accordance with its angle of rotation. Thus, the rotation of tube (39) simultaneously adjusts the differential valve to control the flow of gas from container (1), and adjusts the mixture by adjusting the air admitted. Gas passing up operating member (31) mixes with the air and is consumed in combustion head (4).



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AMENDED CLAIMS
[received by the International Bureau on 10 March 1988 (10.03.88);
original claims 1-10 replaced by amended claims 1-47 (13 pages)]

1. A gas burning appliance comprising a mixture supplying conduit for feeding gas/air mixture to a combustion region, a jet for introducing pressurised fuel gas into the conduit, a gas flow valve for varying the flow of gas from the jet, air admission means of variable flow cross-section through which air is drawn into the conduit to mix with the gas, and control means for simultaneously adjusting the gas flow valve and adjusting the air admission means, characterised in that the control means is operative to provide a plurality of different gas/air ratios each of which is associated with one or more of a plurality of different gas flow rates in accordance with a predetermined programme.

2. An appliance as claimed in claim 1 characterised in that the programme provides a normal operating range of increasing gas flow rates in which the richness of the gas/air mixture is increased at a maximum flow rate condition.

3. An appliance as claimed in claim 2 characterised in that, in the normal operating range, the gas/air mixture is a lean mixture at a number of flow rates less than maximum.

4. An appliance as claimed in claim 2 or 3 characterised in that, in the normal operating range, the gas/air mixture is constant over a major part of the range of flow rates less than maximum.

5. An appliance as claimed in claim 2, 3 or 4 characterised in that the programme provides a starting condition in which the gas/air mixture is richer than that at the maximum flow rate in

the normal operating range but the flow rate is less than said maximum.

6. An appliance as claimed in claim 5 characterised in that the programme provides a condition in which the appliance is adapted for use in high wind situations, in which the gas flow rate and the richness of the gas/air mixture are intermediate that for the starting condition and that for the maximum flow rate condition in the normal operating range.

7. An appliance as claimed in any preceding claim, characterised in that the control means includes a cam and cam follower arrangement operatively connected between the gas flow valve and the air admission means, the cam having a profile which at least in part determines the relationship between the degree of adjustment of the gas flow valve and the degree of adjustment of the air admission means.

8. An appliance as claimed in claim 7 characterised in that the control means includes a rotatable control member whose angular position adjusts the flow cross-section of the air admission means, one of the cam and cam follower being arranged for rotation with the control member, and the other being axially movable with a gas valve operating member in accordance with rotation of the control member.

9. An appliance as claimed in any preceding claim, characterised in that the gas flow valve is a differential valve.

10. An appliance as claimed in claim 9 characterised in that the differential valve comprises an apertured member providing an outlet for gas from a source of pressurised gas, a chamber on

the downstream side of the outlet, a movable diaphragm forming a wall of the chamber, a conduit for the supply of gas from the chamber, a valve operating member arranged for movement with the diaphragm, a valve closure member biassed to the closed position on the upstream side of the outlet, the valve operating member being movable axially in a direction to move the valve closure member to an open position, and means for exerting a biassing force on the diaphragm and valve operating member in the valve opening direction, wherein secondary sealing means are arranged to close the outlet on the downstream side thereof upon continued movement of the valve operating member, in the same direction, beyond the position at which the valve closure member is in the open condition on the upstream side of the outlet.

11. An appliance as claimed in any preceding claim characterised in that the gas is supplied from a container forming part of the appliance.

12. An appliance as claimed in claim 11, characterised in that the container is refillable and comprises an outlet valve at one end thereof biassed by means within the container to a closed position, and a gas inlet valve at the other end thereof for refilling purposes and biassed by means within the container to a closed position, wherein the gas inlet and gas outlet valves are disposed opposite each other and interconnected by spring means providing the respective biassing forces, so that a force tending to open the inlet valve for refilling purposes is transmitted as an additional closing force to the outlet valve.

13. An appliance as claimed in any preceding claim characterised in that it is in the form of

a gas heated tool with an enclosed combusion chamber having means for allowing the exit of exhaust gas.

14. An appliance as claimed in claim 13, characterised in that it is the form of a soldering iron.

15. A gas heated tool comprising a container of pressurised gas; a differential valve for regulating the flow of gas from the container to a jet, the differential valve including a movable diaphragm; means for adjusting a biassing force on the diaphragm so as to adjust the regulated pressure at which the gas is supplied; air admission means through which air is drawn to mix with the gas from the jet; a conduit for feeding the gas/air mixture to an enclosed combustion chamber having means for allowing the exit of exhaust gas; and means for adjusting the air admission means to vary the gas/air ratio of the mixture; characterised in that control means are provided which simultaneously control the adjustment of the biassing force on the diapragm and the adjustment of the air admission means so as to provide a plurality of predetermined combinations of gas flow and associated gas/air ratios, including a starting condition at which there is a relatively high gas flow and a relatively rich mixture, and at least one running condition at which there is a lower gas flow and a leaner mixture.

16. A tool as claimed in claim 15 characterised in that said relatively rich mixture for said starting condition is a gas rich mixture and said leaner mixture for said at least one running condition is an aerated mixture.

17. A tool as claimed in claim 15 or 16 characterised in that there is a predetermined high run condition with a maximum gas flow and with a mixture intermediate said relatively rich and said leaner mixtures.

18. A tool as claimed in claim 17 characterised in that in the starting condition the gas flow is less than said maximum flow.

19. A tool as claimed in claim 18 characterised in that there is a predetermined high wind operation condition in which both the gas flow and the gas/air mixture are intermediate those for the high run and starting conditions.

20. A tool as claimed in any of claims 15 to 19 characterised in that there is a plurality of predetermined running conditions in which the gas flows are different but the gas/air mixtures are the same.

21. A tool as claimed in any of claims 15 to 20 characterised in that the control means includes a cam and cam follower arrangement, the profile of the cam at least in part determining the relationship between the degree of adjustment of the biassing force on the diapragm and the degree of adjustment of the air admission means.

22. A tool as claimed in claim 21 characterised in that the control means includes a rotatable control member whose angular position adjusts the flow cross-section of the air admission means, one of the cam and cam follower being arranged for rotation with the control member, and the other being axially movable to adjust the biassing force on the diaphragm.

23. A tool as claimed in any of claims 15 to 22, characterised in that said differential valve comprises an apertured member providing an outlet for gas from the container of pressurised gas, a chamber on the downstream side of the outlet, said movable diaphragm forming a wall of the chamber,

a conduit for the supply of gas from the chamber to the jet, a valve operating member arranged for movement with the diaphragm, a valve closure member biassed to the closed position on the upstream side of the outlet, the valve operating member being movable axially in a direction to move the valve closure member to an open position, said biassing force acting on the diaphragm and valve operating member in the valve opening direction, and secondary sealing means arranged to close the outlet on the downstream side thereof upon continued movement of the valve operating member, in the same direction, beyond the position at which the valve closure member is in the open condition on the upstream side of the outlet.

24. A tool as claimed in any of claims 15 to 23 characterised in that the gas container is refillable and comprises an outlet valve at one end thereof biassed by means within the container to a closed position, and a gas inlet valve at the other end thereof for refilling purposes and biassed by means within the container to a closed position, wherein the gas inlet and gas outlet valves are disposed opposite each other and interconnected by spring means providing the respective biassing forces, so that a force tending to open the inlet valve for refilling purposes is transmitted as an additional closing force to the outlet valve.

25. A tool as claimed in any of claims 15 to 24 characterised in that it is in the form of a soldering iron.

26. A gas burning appliance comprising a mixture supplying conduit for feeding gas/air mixture to a combustion region, a jet for introducing pressurised fuel gas into the conduit, a gas flow valve for

varying the flow of gas from the jet, air admission means of variable flow cross-section through which air is drawn into the conduit to mix with the gas, and control means for simultaneously adjusting the gas flow valve and adjusting the air admission means, characterised in that the control means includes a cam and cam follower arrangement operatively connected between the gas flow valve and the air admission means, the cam having a profile which at least in part determines the relationship between the degree of adjustment of the gas flow valve and the degree of adjustment of the air admission means so as to provide varying gas/air mixtures and gas flow rates.

27. An appliance as claimed in claim 26 characterised in that the control means includes a rotatable control member whose angular position adjusts the flow cross-section of the air admission means, one of the cam and cam follower being arranged for rotation with the control member, and the other being axially movable with a gas valve operating member in accordance with rotation of the control member.

28. An appliance as claimed in claim 26 or 27 characterised in that it is in the form of a gas heated tool with an enclosed combustion chamber having means for allowing the exit of exhaust gas.

29. An appliance as claimed in claim 28, characterised in that it is in the form of a soldering iron.

30. An appliance as claimed in any of claims 26 to 29 characterised in that the gas flow valve is a differential valve having a movable diaphragm and the control means is operative to adjust a biassing force on the diaphragm.

31. An appliance as claimed in any of claims 26 to 30 characterised in that the cam is provided with a plurality of steps on its profile representing predetermined positions of adjustment.

32. An appliance as claimed in any of claims 26 to 31 characterised in that the control means is such as to provide a starting condition at which there is a relatively high gas flow and a relatively rich mixture, and at least one running condition at which there is a lower gas flow and leaner mixture.

33. A gas burning appliance comprising a container of pressurised gas and a differential valve for controlling the flow of gas from the container, in which the valve comprises an apertured member providing an outlet for gas from the container, a chamber on the downstream side of the outlet, a movable diaphragm forming a wall of the chamber, a conduit for the supply of gas from the chamber, a valve operating member arranged for movement with the diaphragm, a valve closure member biassed to the closed position on the upstream side of the outlet, the valve operating member being movable axially in a direction to move the valve closure member to an open position, and control means for exerting a biassing force on the diaphragm and valve operating member in the valve opening direction, characterised in that secondary sealing means are arranged to close the outlet on the downstream side thereof upon continued movement of the valve operating member, in the same direction, beyond the position at which the valve closure member is in the open condition on the upstream side of the outlet.

34. A gas burning appliance having a refillable container of pressurised gas, the container including

a gas outlet valve and a gas inlet valve for refilling purposes, the inlet and outlet valves being biassed to the closed position, characterised in that means are operatively connected between the inlet and outlet valve whereby upon opening of the inlet valve for refilling purposes an additional closing force is transmitted to the outlet valve.

35. An appliance as claimed in claim 34, characterised in that the inlet and outlet valves are disposed opposite eachother and the means operatively connected between them comprises spring means providing the force biassing the valves to the closed position.

36. An appliance as claimed in claim 34 or 35, characterised in that the inlet valve is openable by engagement with filling means.

37. An appliance as claimed in claims 34, 35 or 36, characterised in that the outlet valve forms part of a differential gas valve comprising an apertured member providing an outlet for gas from the container, a chamber on the downstream side of the outlet, a movable diaphragm forming a wall of the chamber, a conduit for the supply of gas from the chamber, a valve operating member arranged for movement with the diaphragm, said outlet valve of the container being in the form of a closure member biassed to the closed position on the upstream side of the outlet, the valve operating member being movable axially in a direction to move the valve closure member to an open position, and control means for exerting a biassing force on the diaphragm and valve operating member in the valve opening direction, wherein secondary sealing means are arranged to close the outlet on the downstream side thereof upon continued movement of the valve operating member, in the same direction beyond the

position at which the valve closure member is in the open condition on the upstream side of the outlet.

38. A refillable gas container for use with a gas burning appliance, the container including a gas outlet valve and a gas inlet valve for refilling purposes, the inlet and outlet valves being biassed to the closed position, characterised in that means are operatively connected between the inlet and outlet valve whereby upon opening of the inlet valve for refilling purposes an additional closing force is transmitted to the outlet valve.

39. A container as claimed in claim 38, characterised in that the inlet and outlet valves are disposed opposite eachother and the means operatively connected between them comprises spring means providing the force biassing the valves to the closed position.

40. A container as claimed in claim 38 or 39 characterised in that the inlet valve is operable by engagement with filling means.

41. A container as claimed in claim 38, 39 or 40, characterised in that the gas outlet valve comprises an apertured member providing an outlet for gas from the container, a first valve closure member biassed by said means within the chamber to a closed position on the upstream side of the outlet, a connecting member joined to the first valve closure member and extending through the outlet, and a second valve closure member joined to the connecting member on the downstream side of the outlet, whereby upon axial movement of a valve operating member to open the gas outlet valve, said first valve closure member moves against said biassing means to permit the flow of gas from the

container, but upon continued movement in the same direction the second valve closure member closes the outlet on the downstream side.

42. A refillable gas container for use with a gas burning appliance, comprising an outlet valve at one end thereof biassed by means within the container to a closed position, and a gas inlet valve at the other end thereof for refilling purposes and biassed by means within the container to a closed position, the inlet valve being openable by engagement with refilling means, characterised in that the gas inlet and gas outlet valves are disposed opposite eachother and interconnected by spring means providing the respective biassing forces, so that a force tending to open the inlet valve for refilling purposes is transmitted as an additional closing force to the outlet valve.

43. A gas container for use with a gas burning appliance, the container having a valve to be controlled in use by a valve operating member provided for the appliance, said container comprising an apertured member providing an outlet for gas from the container, and a valve closure member biassed to a closed position on the upstream side of the outlet so that in use axial movement of the valve operating member causes the valve closure member to move against the biassing force to permit the flow of gas from the container, characterised in that a connecting member is joined to the valve closure member and extends through the outlet, and a second valve closure member is joined to the connecting member on the downstream side of the outlet, whereby in use continued axial movement of the valve operating member causes the second valve closure member to close the outlet on the downstream side.

44. A gas container as claimed in claim 43 characterised in that it is refillable and includes a gas inlet valve opposite the valve closure member, and biassing means acting between the inlet valve and valve closure member so as to provide a closing force on both.

45. A gas container as claimed in claim 44, characterised in that the inlet valve is openable by engagement with refilling means urged in a direction against the action of the biassing means.

46. A gas container as claimed in claim 43, 44 or 45 characterised in that there is a chamber on the downstream side of the outlet from the container, having a wall formed by a movable diaphragm which is adapted to be connected to and move with the valve operating member of the gas burning appliance, so as to form a differential valve.

47. A differential gas valve for use with a gas burning appliance, comprising an aperturd member providing an outlet for gas from a source of pressurised gas, a chamber on the downstream side of the outlet, a movable diaphragm forming a wall of the chamber, a conduit for the supply of gas from the chamber, a valve operating member arranged for movement with the diaphragm, a valve closure member biassed to the closed position on the upstream side of the outlet, the valve operating member being movable axially in a direction to move the valve closure member to an open position, and control means for exerting a biassing force on the diaphragm and valve operating member in the valve opening direction, characterised in that secondary sealing means are arranged to close the outlet on the downstream side thereof upon continued movement of the valve operating member, in the same direction, beyond

the position at which the valve closure member is in the open condition on the upstream side of the outlet.