May 16, 1944. C. C. ANTHES 2,348,774

BLOWPIPE

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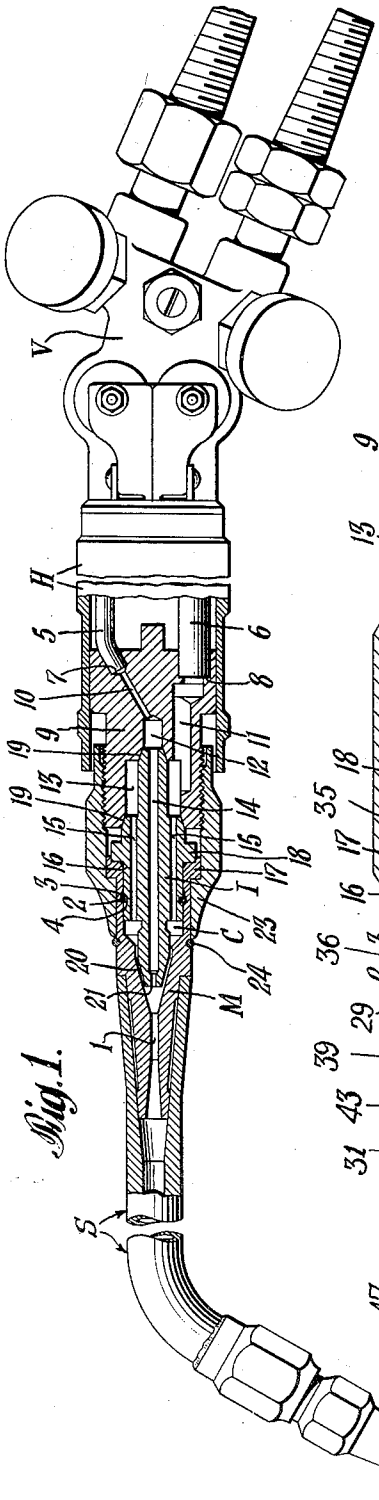


Fig. 1.

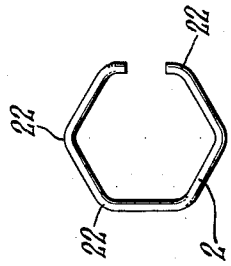


Fig. 3.

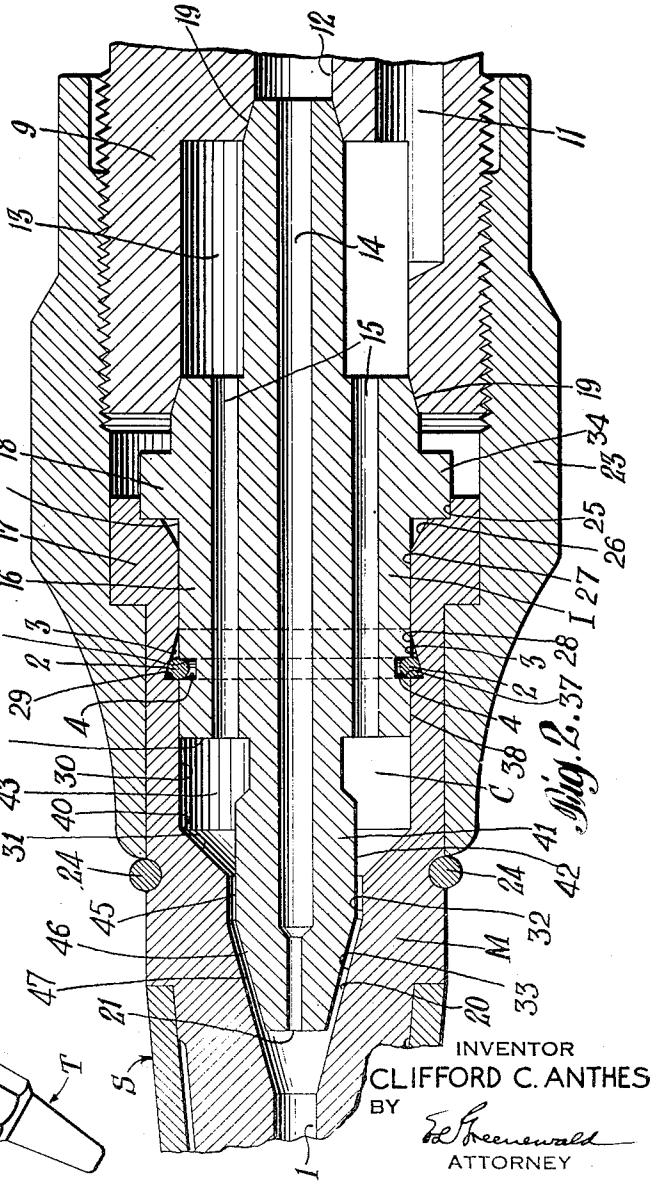


Fig. 2.

INVENTOR
CLIFFORD C. ANTHES
BY
E. C. Greenewald
ATTORNEY

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BLOWPIPE

Clifford C. Anthes, Union, N. J., assignor to Union Carbide and Carbon Corporation, a corporation of New York

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4 Claims. (Cl. 158—27.4)

This invention relates to blowpipes for mixing gases, such as acetylene and oxygen, and for discharging a combustible mixture of such gases to produce flames for use in heating, welding, and cutting metals. The invention more particularly relates to means for securing injector means within the gas-mixing tube of a blowpipe.

Blowpipes usually consist of several members which are detachably secured to one another in order to facilitate manufacture, repair, inspection, and use thereof. A set of interchangeable tips and gas mixers of different sizes is usually supplied with each blowpipe so that it may be provided and used with the proper size tip and mixer to deliver the volume of mixed gas necessary to perform different kinds of work, e. g., for welding different thickness of metal, or for cutting different metals.

Such blowpipes usually include injector means disposed within a gas-mixing tube or similar member for mixing the gases which are to be discharged from the blowpipe. The injector means usually has circular walls and is provided with seating surfaces which cooperate with corresponding seating surfaces formed in the internal circular walls of the gas-mixing tube so as to produce gas-tight joints when the injector means is secured within the gas-mixing tube. Heretofore, the injector means preferably has been detachably secured within the gas-mixing tube by a toroidal snap ring seated in a circular groove formed in an internal wall of the tube and acting against a protuberance formed on the injector means, or by a toroidal snap ring seated in a circular groove formed in a circular wall surface of the injector means and bearing against an internal wall of the gas-mixing tube. This type of construction has numerous advantages compared with other types of construction, such as a threaded connection, but it permits the injector means to move rotatively and laterally within the mixing tube when the blowpipe is jarred or moved violently. As a result of such movement, the seating surfaces on the injector means and on the walls of the mixing tube become worn and the injector means becomes loose within the tube—resulting in impaired operation of the injector means and consequent improper gas mixing and flame production.

Furthermore, with the type of construction in which a toroidal snap ring is utilized for securing the injector means within the gas-mixing tube, a large proportion of the surface of the snap ring contacts the groove or protuberance in which or against which the ring is seated. Consequently, when it is necessary to remove the injector means from the mixing tube, the relatively large frictional forces developed between the surfaces of the toroidal snap ring and the surfaces contacted by the ring, impede such removal.

To overcome these difficulties, securing means has been devised for holding an injector means within a gas-mixing tube so that the injector means is locked in position with respect to the walls of the tube, thereby substantially preventing rotation of the injector means within the tube. The securing means has been designed also to reduce to a minimum the area of contact between its surfaces and the surfaces of the gas-mixing tube which it engages as the injector means is being withdrawn from the tube, thus facilitating the removal of the injector means from the tube when necessary.

Accordingly, the principal objects of this invention are: to provide securing means for locking an injector means within a gas-mixing tube so that movement of the injector means within the tube is substantially prevented; to provide such securing means which is so designed as to permit ready dismantling and assembling of the injector means and the gas-mixing tube; and to provide a blowpipe in which the seating surfaces and joints between the various members of the blowpipe, and particularly between the injector means and the walls of the gas-mixing tube will be maintained in an accurate gas-tight condition for a longer time than has heretofore been possible. A further object of this invention is to provide resilient key means for locking a member having circular walls within a chamber which has circular walls, so as substantially to prevent movement of the member relatively to the walls of the chamber.

These and other objects and novel features of the invention will become apparent from the following description and the accompanying drawing, in which:

Fig. 1 is a longitudinal sectional view, partly in elevation, of a blowpipe embodying this invention;

Fig. 2 is an enlarged longitudinal sectional view of that portion of the blowpipe shown in Fig. 1 which contains the gas-mixing tube and injector means, and

Fig. 3 is an enlarged elevational view of a snap ring for locking the injector means within the gas-mixing tube.

For purposes of description the invention is herein disclosed in conjunction with a welding blowpipe, although the principles may be applied

equally well to other types of blowpipes and to other apparatus in which it is desired to secure telescoped members one within another in locked position, but so that the members may be readily dismantled and assembled. For convenience in the following description, the term "acetylene" will be used to denote any suitable combustible gas, and the term "oxygen" will be used to denote any suitable combustion-supporting gas.

Referring to Fig. 1 of the drawing, the invention is shown as embodied in a welding blowpipe including a tip assembly T, a stem assembly S, an injector means I, a handle member H, and the valve block V. A gas-mixing tube M, having a gas-mixing chamber C at one end and a gas-mixture passage 1 leading therefrom to the other end is securely fixed within the stem assembly S. These members may be joined in any suitable manner as by means of threaded connections, but the injector means I is preferably secured within the gas-mixing chamber C by means of a substantially symmetrical polygonal snap ring 2 which is adapted to fit into cooperating grooves 3 and 4 correspondingly located respectively in the circular walls of the chamber C and the injector means I.

The usual nipples, valves, and conduits are provided for conducting required amounts of oxygen and acetylene respectively, to conduits 5 and 6 which terminate in gas-tight connections 7 and 8 in a forward block 9 formed integral with the handle member H and provided with passages 10 and 11 for conducting the gases into the chambers 12 and 13. The injector means or aspirator I has a unitary body, centrally and longitudinally through which an annular oxygen passage 14 is provided. A plurality of smaller annular acetylene passages 15, spaced radially around the oxygen passage 14, are formed in an enlargement 16 of the unitary body. The rear of the mixing tube M has a flange 17 against which a corresponding flange 18 formed on the enlargement 16, is adapted to seat in a gas-tight manner. Other gas-tight joints 19 are provided by other cooperating seating surfaces on the injector means I and on the walls of the chamber C and surfaces of the member 9.

Passage 20, which is defined by the several surfaces of the forward portions of the injector means I and the walls of the chamber C, permits acetylene to be aspirated from the chambers 13 through the passages 15 by injection action of the oxygen flowing through passage 14 and out of the tip 21 of the injector means I. This injection action results in thorough mixing of the oxygen and acetylene within the mixing tube M, from which the mixed gases are discharged through the gas-mixture passage 1, the stem S and the tip T.

As shown in Fig. 2 a beveled circular groove 3 is formed in a wall of the chamber C, and a circular groove 4 is formed in a surface of the injector means I in a position corresponding to that of the groove 3. The snap ring 2, which is shown in Fig. 3 is of substantially hexagonal form, although it may be of other substantially polygonal forms, and is adapted to be seated in the groove 4. The injector means I and the mixing tube M may be assembled by seating and compressing the snap ring 2 into the groove 4 and then inserting the injector means I containing the snap ring 2 into the chamber C until the flanges 17 and 18 meet. When the flanges 17 and 18 are in contact, the groove 4 registers with the groove 3 and the snap ring 2 may then expand. Portions of the ring 2, including the corners 22 are adapted to project into the groove 3, thus securing members I and M together. As will be evident, ring 2 will contact the inner surface of groove 3 at a plurality of points spaced substantially equidistantly around the periphery of the groove 3, and will contact the bottom surface of groove 4 at a plurality of points also spaced substantially equidistantly around the periphery of the groove 4, but located between the points of contact with the surface of groove 3. Because of the polygonal form of the snap ring, the injector means is substantially prevented from rotating or otherwise moving within the mixing tube even though the blowpipe is jarred or moved violently.

More specifically, the tube M has at one end, as shown in Fig. 2, an internal annular seat 25, a frusto-conical cam surface 26 extending inwardly and forwardly from the seat 25, and a cylindrical surface 27 of constant diameter extending forwardly from the cam surface 26, to the annular groove 3. The groove 3 has a frusto-conical cam surface 28 extending outwardly and forwardly from the cylindrical surface 27 and an annular wall 29 extending inwardly from the cam surface 28. The tube M also has a cylindrical surface 30 of constant diameter which extends forwardly from the wall 29, a frusto-conical surface 31 extending inwardly and forwardly from the cylindrical surface 30, a cylindrical surface 32 of constant diameter extending forwardly from the frusto-conical surface 31, and a frusto-conical surface 33 extending inwardly and forwardly from the cylindrical surface 32. The unitary body I is in the form of a plug having an annular shoulder 34 fitting the internal annular seat 25, a cylindrical surface 35 of constant diameter extending from the shoulder 34 to the annular groove 4 and fitting the corresponding surface 27 of the tube M. The annular groove 4 has parallel side walls 36 and 37 the forward one 37 of which is in a plane containing the wall 29 of the groove 3 in the tube M. The body I also has a cylindrical surface 38 of contant diameter extending from the wall 37 and terminating at 39 in spaced relation to the forward end 40 of the corresponding cylindrical surface 30 of the tube M. The plug I is provided with a nozzle 41 having its outer surface 42 spaced from the inside of the tube M to provide an annular gas distributing chamber 43, the nozzle 41 having a cylindrical outer surface 42 of constant diameter spaced from the corresponding inner surface 32 of the tube M to provide a cylindrical gas passage 45 extending forwardly from the chamber 43. The nozzle 41 has a frusto-conical end portion 46 spaced from the corresponding frusto-conical inner surface 33 of the tube M to provide a frusto-conical gas passage 47 extending from the cylindrical gas passage 45. The axial gas passage 14 extends through the plug I and through the nozzle 41 to the tip 21 of the latter. The longitudinal gas passage 15 also extend through the plug I but open to the gas distributing chamber 43. In spite of the fitting surfaces between the plug I and the tube M, the plug is incidentally subject to undesirable rotary and lateral movement with respect to the tube M. Such movement is inhibited according to the present invention by the polygonal split spring ring 2 which fits the groove 3 and 4 so as to inhibit relative movement between the tube M and the plug I, the arrangement being such that the plug I and the spring

ring 2 may be inserted in and withdrawn from the tube M without damage to any of the parts.

The assembled gas-mixing tube and injector means may be connected to the handle member H by a coupling nut 23 having threads for engaging corresponding threads on a flange portion of the member 9. By tightening the coupling nut 23, the seating surfaces 19 are brought together firmly. The nut 23 is held in its tightened position by a snap ring 24 seated in a circular groove formed in the external wall of the mixing tube M.

To dismantle the members I and M after the nut 23 has been removed from the member 9, it is necessary only to pull the injector means I out of the chamber C by hand, since the beveled surface of the groove 3 directs the snap ring 2 into the groove 4 as pulling force is applied to the injector means. The polygonal form of the snap ring facilitates the dismantling and assembling of the injector means and mixing tube, because when the ring is compressed within the groove 4 only small portions of the surface of the snap ring are in contact with wall surfaces of the gas-mixing chamber, thus reducing the friction between the ring and such surfaces to a minimum.

The invention has been described in connection with a blowpipe, but other applications will readily suggest themselves to those skilled in the art and other forms of snap rings or spring members than that disclosed herein may be employed without departing from the spirit and scope of the invention.

What is claimed is:

1. A blowpipe comprising, in combination, a tube having at one end a cylindrical surface of constant diameter extending forwardly from said end, an annular groove having a frusto-conical cam surface extending outwardly and forwardly from said cylindrical surface and an annular wall extending inwardly from said last-named cam surface, a cylindrical surface of constant diameter extending forwardly from said wall, a frusto-conical surface extending inwardly and forwardly from said last-named cylindrical surface, a cylindrical surface of constant diameter extending forwardly from said last-named frusto-conical surface, and a frusto-conical surface extending inwardly and forwardly from said last-named cylindrical surface; a plug having a cylindrical surface of constant diameter fitting the corresponding surface of said tube, an annular groove having parallel side walls the forward one of which is in a plane containing the wall of said groove in said tube, a cylindrical surface of constant diameter extending from said wall and terminating in spaced relation to the forward end of the corresponding cylindrical surface of said tube, a nozzle having its outer surface spaced from the inside of said tube to provide an annular gas distributing chamber, said nozzle having a cylindrical outer surface of constant diameter spaced from the corresponding inner surface of said tube to provide a cylindrical gas passage extending forwardly from said chamber, said nozzle also having a frusto-conical end portion spaced from the corresponding frusto-conical inner surface of said tube to provide a frusto-conical gas passage extending from said cylindrical gas passage; said tube having an axial gas passage extending therethrough and through said nozzle; said tube also having a plurality of longitudinal gas passages opening to said gas distributing chamber; said plug being incidentally subject to undesirable rotary and lateral movement with respect to said tube; and means for inhibiting such movement comprising a polygonal split spring ring fitting said grooves so as to inhibit relative movement between said tube and said plug; the arrangement being such that said plug and spring ring may be withdrawn from said tube without damage to any of the parts.

2. A blowpipe comprising, in combination, a tube having at one end an internal annular seat, frusto-conical cam surface extending inwardly and forwardly from said seat, a cylindrical surface of constant diameter extending forwardly from said cam surface, an annular groove having a frusto-conical cam surface extending outwardly and forwardly from said cylindrical surface and an annular wall extending inwardly from said last-named cam surface, a cylindrical surface of constant diameter extending forwardly from said wall, a frusto-conical surface extending inwardly and forwardly from said last-named cylindrical surface, a cylindrical surface of constant diameter extending forwardly from said last-named frusto-conical surface, and a frusto-conical surface extending inwardly and forwardly from said last-named cylindrical surface; a plug having an annular shoulder fitting said internal annular seat, a cylindrical surface of constant diameter extending from said shoulder and fitting the corresponding surface of said tube, an annular groove having parallel side walls the forward one of which is in a plane containing the wall of said groove in said tube, a cylindrical surface of constant diameter extending from said wall and terminating in spaced relation to the forward end of the corresponding cylindrical surface of said tube, a nozzle having its outer surface spaced from the inside of said tube to provide an annular gas distributing chamber, said nozzle having a cylindrical outer surface of constant diameter spaced from the corresponding inner surface of said tube to provide a cylindrical gas passage extending forwardly from said chamber, said nozzle also having a frusto-conical end portion spaced from the corresponding frusto-conical inner surface of said tube to provide a gas passage extending from said cylindrical gas passage; said tube having an axial gas passage extending therethrough and through said nozzle; said tube also having a plurality of longitudinal gas passages opening to said gas distributing chamber; said plug being incidentally subject to undesirable rotary and lateral movement with respect to said tube; and means for inhibiting such movement comprising a polygonal split spring ring fitting said grooves so as to inhibit relative movement between said tube and said plug; the arrangement being such that said plug and spring ring may be inserted in and withdrawn from said tube without damage to any of the parts.

3. In a blowpipe, a tube having an annular internal surface comprising a long cylindrical portion and successive adjoining portions of reduced diameter alternately frusto-conical and cylindrical; and an insert comprising a plug fitting said long cylindrical surface and a nozzle corresponding to one of said frusto-conical surfaces; the front end of said plug and the rear end of said nozzle cooperating with said tube to form a distributing chamber; said plug and the fitting surface of said tube having registering grooves, the groove in said tube having a for-

wardly and outwardly inclined cam surface; and a polygonal split spring ring fitting said grooves so as to inhibit relative movement between said tube and said plug; the arrangement being such that said plug and spring ring may be withdrawn from said tube without damage to any of the parts.

4. In a blowpipe, a tube having a cylindrical bore of constant diameter, said surface having intermediate its ends an annular groove having a frusto-conical cam surface extending outwardly and forwardly and an annular wall extending inwardly from said last-named cam surface, said tube having alternately frusto-conical surfaces and cylindrical surfaces of decreasing diameter extending from said cylindrical bore; a plug having an external surface fitting said bore and an annular groove registering with the tube groove, and said plug terminating in spaced relation to the forward end of the corresponding cylindrical surface of said tube, a nozzle having its outer surface spaced from the inside of said tube to provide an annular gas distributing chamber, a cylindrical gas passage extending forwardly from said chamber, and a frusto-conical gas passage extending from said cylindrical gas passage; said tube having an axial gas passage extending through said nozzle and a plurality of gas passages opening to said distributing chamber; said plug being incidentally subject to undesirable movement with respect to said tube; and means for inhibiting such movement comprising a polygonal spring ring fitting said grooves so as to inhibit relative movement between said tube and said plug; the arrangement being such that said plug and spring ring may be withdrawn from said tube without damage to any of the parts.

CLIFFORD C. ANTHES.