April 24, 1962 V. NAVARA 3,030,982

VALVE ARRANGEMENT FOR A METAL SPRAYING GUN

Filed Nov. 13, 1958

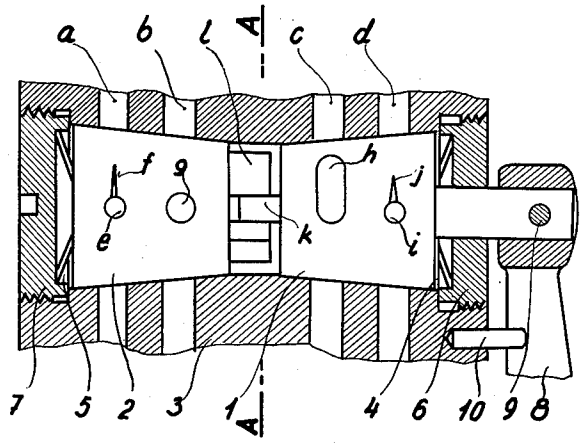


FIG. 1

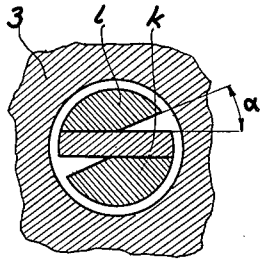


FIG. 2

INVENTOR.
Václav Navara
BY Richard Chad
Atty

United States Patent Office 3,030,982
Patented Apr. 24, 1962

3,030,982
VALVE ARRANGEMENT FOR A METAL SPRAYING GUN

Vaclav Navara, Ledec upon Sazava, Czechoslovakia, assignor to Kovo-Finis, narodni podnik, Ledec upon Sazava, Czechoslovakia

Filed Nov. 13, 1958, Ser. No. 773,729
5 Claims. (Cl. 137—630.19)

This invention relates to a valve arrangement in a metal spraying gun. Metal spraying guns must be provided with control means for shutting off the flow of gases used therein, namely oxygen, acetylene and air. In some metal spraying guns separate valves are provided for each of said gases. However, it is difficult to handle such metal spraying guns, and for this reason it has been suggested to couple the valves in such a manner that they may be controlled by a single actuating means, such as a single lever.

When a metal spraying gun is ignited the flow of oxygen must be throttled and the access of air to the burner must be prevented. Only after ignition is it permissible fully to open the flow control means for passage of the gases. In all known gas flow control means for metal spraying guns having an air motor and single actuating means, the passages for the gases are opened in the following order: air for the motor throttled acetylene for ignition throttled oxygen for ignition (in this position the ignition takes place), acetylene at full rate, oxygen at full rate, and finally air to the burner. Some of the initial steps may overlap each other. For shutting off, the same procedure is repeated in reversed order. During shutting off, the passage of the gases is diminished until the flow velocity from the burner is smaller than the velocity of burning. Thereupon the flame flashes back into the burner, the gas mixture burning out in the ports. Combustion in the ports is always incomplete, acetylene soot is formed in the burner, and clogs the ports. If the flame in the burner is not fully extinguished, it may persist for some time and may cause serious damage to the gun.

The present invention aims at removing the aforesaid drawbacks of known metal spraying guns. It is an important feature of the present invention that the flame is prevented from penetrating into the burner during shutting down. The flame is blown out after being weakened. This is achieved by delaying the closing of the air conduit leading to the burner so that a strong air current tears off the flame which has already been weakened by lack of oxygen.

A specific embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawing, in which:

FIGURE 1 shows a gas flow control arrangement of the invention in axial section, the arrangement comprising two coupled rotary valves; and

FIGURE 2 shows the control arrangement in section taken along the line A—A in FIGURE 1.

The gas flow control arrangement illustrated comprises a first conical valve plug **1**, a second conical valve plug **2**, and a valve body **3** in which the plugs **1** and **2** are rotatable about a common axis. The plugs **1** and **2** are urged into sealing engagement with the valve body **3** by disc springs **4** and **5** whose pressure is adjustable by rotation of covers **6** and **7** which are threadedly mounted on the valve body **3**. An actuating lever **8** is secured by a pin **9** to the plug **1**, and stops **10** are provided for limiting the turning of the lever **8**.

The valve body **3** has four bores, a bore *a* for acetylene, a bore *b* for air to the burner, a bore *c* for air to the motor, and a bore *d* for oxygen. These bores may be aligned with respective passages in the valve plugs. The

plug **2** has a passage *e* for acetylene having an ignition slot *f* on the plug surface, and a passage *g* for air fed to the burner. The valve plug **1** has a transversely elongated passage *h* for air to the motor and a passage *i* with ignition slot *j* for oxygen. Both plugs are coupled for delayed joint movement. An axially projecting member *k* on the plug **1** is engaged in a slot in the plug **2**. The said slot is wider in a radial plane than the member *k* so as to permit relative movement of the plugs **1** and **2** through an angle α. With such an arrangement the order of opening of the individual gas conduits differs from the order of their closure.

Assuming that the flow control device is initially in its shaft position, then during opening the plug **1** first turns through the angle α before entraining the other plug **2**. This position is illustrated in FIGURES 1 and 2. On further turning movement, air is introduced into the motor through the bore *c* provided in the body in alignment with the passage *h* provided in the first plug **1**, whereupon a throttled acetylene passage is opened through the ignition slot *f* provided at the surface of plug **2** and finally a throttled oxygen passage is opened through the other slot *j*. In this position the gun may be ignited. On further turning of the lever **8**, the passages for acetylene and oxygen are widened as wider portions of the aforesaid slots *f* and *j* are aligned with the bores *a* and *d* respectively and finally an air passage is opened to the burner through the passage *g*, and acetylene and oxygen are passed at full rate through the corresponding passages *e* and *i*.

The metal gun now is in its working position.

When the gun is being shut off, the plug **1** is turned back through the above mentioned angle α. Thereby the oxygen flow rate is first reduced. On further turning movement both plugs are turned simultaneously. The oxygen supply is shut off entirely while acetylene and air are passing to the burner, and air is passing into the motor at an almost undiminished flow rate. At this moment (or even somewhat earlier) the weak flame is briskly taken along by the violent air current which normally surrounds the burner, so that the flame breaks away from the burner and is extinguished. On further turning movement of the valve plugs all conduits are successively closed. The flame is not allowed to flash back into the burner, during shutoff and the aforementioned drawbacks of the known devices are thereby eliminated.

The breaking away and extinguishing of the flame takes place also if the passage for acetylene is arranged in the first plug **1** since in this case too the lead of the acetylene over the oxygen is such that, on shutting off, the flame is deprived of oxygen. However, the arrangement described with reference to FIGURES 1 and 2 functions in a more reliable manner.

It is quite obvious that a similar effect can also be obtained with other types of valves, if a suitable arrangement is made for delaying shutting off of the air (and, if necessary, also of the acetylene) with respect to shutting off of the oxygen.

I claim:

1. In a metal spraying apparatus of the type in which metallic material is fused in a fusion zone by a flame produced from a combustible gas and a combustion supporting gas, and the fused metal is atomized in said fusion zone by a propelling fluid, flow control means comprising the combination of

(*a*) two conduits for respective passage therethrough of a gas and of a fluid;

(*b*) a valve means arranged in each conduit, each valve means being movable between two positions for opening and closing a conduit, a first one of said valve means controlling the flow of said gas, and

the second valve means controlling the flow of said fluid;

(*c*) operating means for moving said first valve means between said positions thereof; and

(*d*) motion transmitting means operatively connected to said first and said second valve means for producing delayed opening and delayed closing movement of said second valve means when said first valve means is moved by said operating means from the closing to the opening position, and from the opening to the closing position thereof respectively.

2. In a metal spraying apparatus of the type in which metallic material is fused in a fusion zone by a flame produced from a combustible gas and oxygen, and the fused metal is atomized in said fusion zone by air under pressure, flow control means comprising the combination of

(*a*) two conduits for respective passage therethrough of oxygen and of air under pressure to a fusion zone;

(*b*) a valve means respectively arranged in each conduit, each valve means being movable between two positions for opening and closing a conduit, a first one of said valve means controlling the flow of said oxygen, and the second valve means controlling the flow of said air under pressure;

(*c*) operating means for moving said first valve means between said positions thereof; and

(*d*) motion transmitting means operatively connected to said first and second valve means for producing delayed opening and delayed closing movement of said second valve means when said first valve means is moved by said operating means from the closing to the opening position, and from the opening to the closing position thereof respectively.

3. In a metal spraying apparatus of the type in which metallic material is fused in a fusion zone by a flame produced from a combustible gas and a combustion supporting gas, and the fused metal is atomized in said fusion zone by a propelling fluid, flow control means comprising the combination of

(*a*) two conduits for respective separate passage therethrough of a gas and of a propelling fluid to a fusion zone;

(*b*) a valve means arranged in each conduit intermediate the ends thereof, each valve means being movable between two positions for opening and closing a conduit, a first one of said valve means controlling the flow of said gas, and the second valve means controlling the flow of said fluid;

(*c*) operating means for moving said first valve means between said positions thereof; and

(*d*) motion transmitting means operatively connected to said first and second valve means for producing delayed opening and delayed closing movement of said second valve means when said first valve means is moved by said operating means from the closing to the opening position, and from the opening to the closing position thereof respectively.

4. In a metal spraying apparatus of the type in which metallic material is fused in a fusion zone by a flame produced from a combustible gas and a combustion supporting gas, and the fused metal is atomized in said fusion zone by a propelling fluid, flow control means comprising the combination of

(*a*) three conduits for respective passage therethrough of two gases and of a propelling fluid to a fusion zone;

(*b*) a valve means arranged in each conduit, each valve means being movable between two positions for opening and closing a conduit, a first and a third one of said valve means controlling the flow of said gases, and the second valve means controlling the flow of said fluid;

(*c*) operating means for moving said first valve means between said positions thereof;

(*d*) motion transmitting means operatively connected to said first and said second valve means for producing delayed opening and delayed closing movement of said second valve means when said first valve means is moved by said operating means from the closing to the opening position, and from the opening to the closing position thereof respectively; and

(*e*) connecting means fixedly connecting said third valve means to one of said first and second valve means for joint opening and closing movement therewith.

5. In a metal spraying apparatus of the type in which metallic material is fused in a fusion zone by a flame produced from a combustible gas and a combustion supporting gas, and the fused metal is atomized in said fusion zone by a propelling fluid, flow control means comprising the combination of

(*a*) three conduits for respective passage therethrough of two gases and of a propelling fluid to a fusion zone;

(*b*) a valve means arranged in each conduit, each valve means being movable between two positions for opening and closing a conduit, a first and a third one of said valve means controlling the flow of said gases and the second valve means controlling the flow of said fluid;

(*c*) operating means for moving said first valve means between said positions thereof;

(*d*) motion transmitting means operatively connected to said first and said second valve means for producing delayed opening and delayed closing movement of said second valve means when said first valve means is moved by said operating means from the closing to the opening position, and from the opening to the closing position thereof respectively; and

(*e*) connecting means fixedly connecting said third valve means to said second valve means for joint opening and closing therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

246,538	Mullaney	Aug. 30, 1881
1,011,694	Winton	Dec. 12, 1911
1,103,939	Carton	July 21, 1914
1,244,552	Shelor	Oct. 30, 1917
2,381,932	Shepard	Aug. 14, 1945
2,520,591	Wilmarth	Aug. 29, 1950