

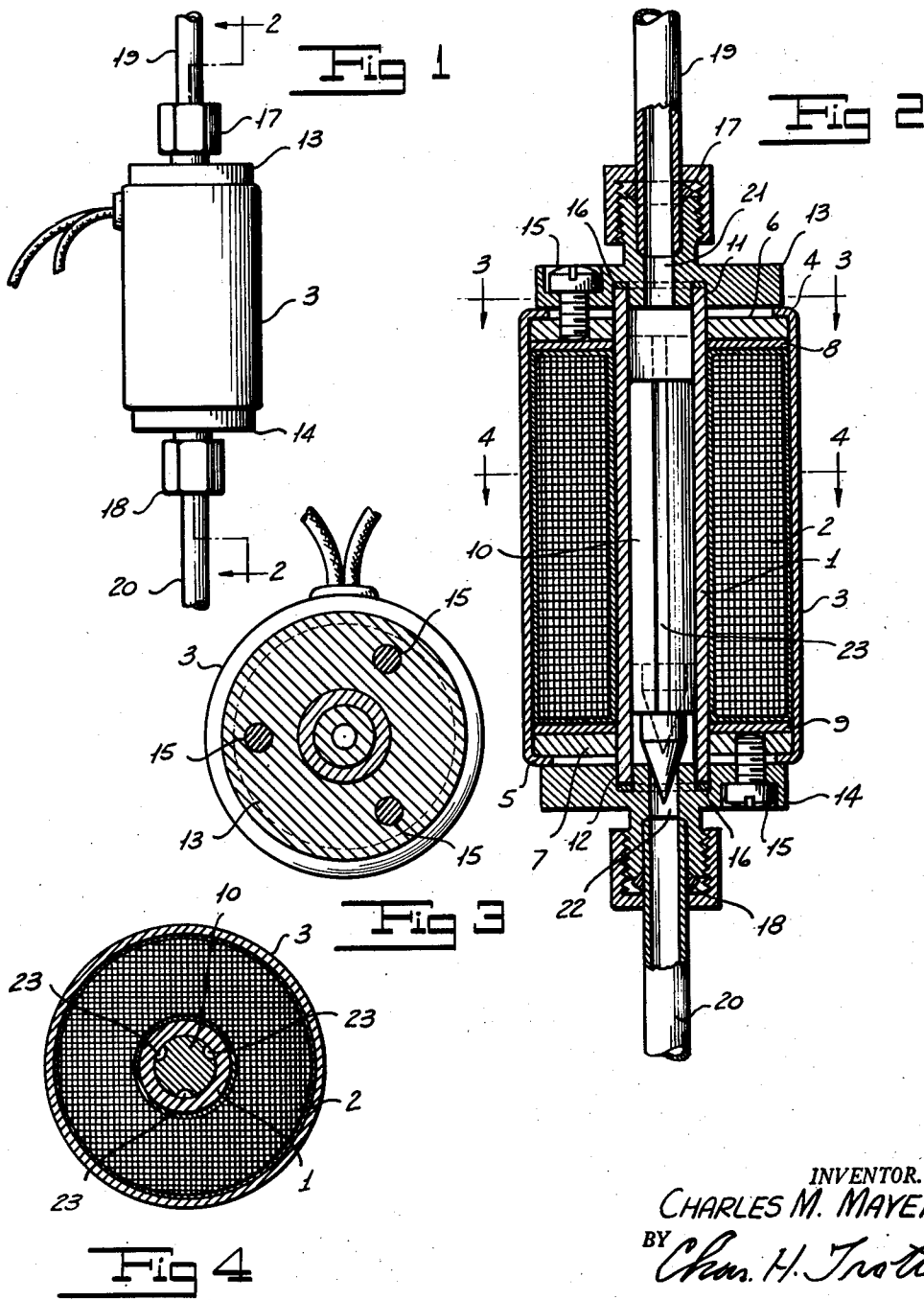
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SOLENOID OPERATED VALVE

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SOLENOID OPERATED VALVE

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This invention relates to a solenoid operated valve which is especially adapted for automatically controlling the flow of a small stream of gas to a pilot burner or the like.

The valve and the solenoid are constructed as a single unit which is interposed in a gas conduit in a vertical position. The valve which is opened by the energization of the solenoid will remain open as long as the solenoid is energized and will close by gravity as soon as the solenoid is de-energized.

The principal object of the invention is to provide a very simple efficient and inexpensive device by which the flow of a small stream of gas can be electrically controlled.

Other objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof wherein:

Fig. 1 is a side elevation of a solenoid operated valve, constructed according to my invention, interposed in a small gas conduit;

Fig. 2 is an enlarged vertical section taken on the line 2-2 of Fig. 1; and

Figs. 3 and 4 are horizontal sections taken on the lines 3-3 and 4-4 respectively of Fig. 2.

The device comprises generally a tubular spool of non-magnetic material whose bore defines a gas passageway. The spool is adapted to be interposed in a gas conduit so that it forms a part thereof. A solenoid coil is wound about the spool and a solenoid plunger is mounted in the bore of the spool. A valve, which is secured to the lower end of the solenoid plunger, is adapted to seat by gravity in a valve seat disposed therebelow in the spool bore, and to cut off the flow of gas through the conduit. When the coil is energized the solenoid plunger will center itself in the coil and raise the valve from its seat, opening the passageway. The plunger will float in the spool bore as long as the coil is energized, but will immediately drop by gravity and seat the valve as soon as the coil is again de-energized.

Referring now to the drawings by reference characters the numeral 1 indicates an open-ended tubular spool of non-magnetic material about which a solenoid coil 2 is disposed. The coil 2 may be wound for any desired voltage and wattage, and is enclosed within a cylindrical metal casing 3. The ends of the casing 3 are flanged inwardly as indicated at 4 and 5 about metallic closure discs 6 and 7. Discs 8 and 9 of insulating material are interposed between the closure discs 6 and 7 and the coil 2. A solenoid plunger 10 is mounted within the spool 1.

The ends of the tubular spool 1 extend out

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through central apertures in the closure discs 6 and 7 and into annular grooves 11 and 12 formed in the inner face of caps 13 and 14 respectively. The caps 13 and 14 are secured to the flanged ends 4 and 5 of the casing 3 by screws 15 which extend inwardly through apertures in the caps 13 and 14 and into threaded apertures in the closure discs 6 and 7. Gaskets 16 provide gas-tight joints between the ends of the spool 1 and the caps 13 and 14. The caps 13 and 14 are provided with couplings 17 and 18 respectively, by which the mechanism is removably secured to and between vertically aligned pipes or tubes 19 and 20. A central bore 21 in the cap 13 provides communication between the pipe or tube 19 and the upper end of the spool 1; and a central bore 22 in the cap 14 provides communication between the pipe or tube 20 and the lower end of the spool 1. In operation gas is adapted to flow from the tube 19 down through the spool 1, around the plunger 10, and into the tube 20. In order to assure the free passage of gas through the spool 1 the diameter of the plunger 10 is made slightly less than the internal diameter of the spool 1. Also, if desired, the plunger 10 may be vertically grooved as indicated at 23, to further facilitate the flow of gas through the spool.

In order to control the flow of gas from the pipe 19 and into the pipe 20 I provide a tapered valve plunger 24 which is secured to, or formed integral with, the lower end of the solenoid plunger 10 and extends downwardly therefrom. The valve plunger 24 is adapted to engage a valve seat 25 about the upper end of the bore 22 in the cap 14 and shut off the flow of gas into the pipe 20. Normally the valve plunger 24 seats by gravity in the valve seat 25 during the time the coil 2 is not energized. But when the coil 2 is energized the solenoid plunger 10 will center itself with respect to the coil 2 and will float within the spool 1. This raises the valve plunger 24 from the valve seat 25 permitting the free passage of gas from the pipe 19 through the spool 1 and into the pipe 20. Then, as soon as the coil 2 is again de-energized the solenoid plunger 10 will immediately drop by gravity until the valve plunger 24 engages the valve seat 25 thus shutting off the flow of gas. For best results the device should be mounted in a substantially vertical position, although it will operate when disposed at a considerable angle.

From the foregoing it will be apparent to those skilled in this art that I have provided a very simple and efficient mechanism for accomplishing the objects of my invention.

It is to be understood that I am not restricted

to the specific construction shown and described as various modifications can be made thereto within the spirit of the invention.

What is claimed is:

1. In a device of the character described the combination of an open-ended tubular spool of non-magnetic material defining a fluid passageway, a solenoid coil wound about said spool, a cylindrical casing enclosing said coil, said casing having an intumed annular flange about each end thereof, a closure disc disposed in each end of said casing between said coil and said intumed flanges, each of said closure discs having a central aperture therethrough through which said tubular spool extends, a cap removably secured to each of said closure discs with said flanges interposed between said caps and said discs, an annular groove in the inner face of each of said caps into which the ends of said tubular spool extend, coupling means by which said device is interposed in a conduit so that said spool forms a part thereof, a solenoid plunger mounted within said spool, a valve plunger secured to said solenoid plunger, and a valve seat formed in one of said caps in which said valve plunger is adapted to seat to close said fluid passageway.

2. In a device of the character described the combination of a solenoid coil having an axial bore therethrough, a cylindrical casing having an intumed annular flange at each end thereof surrounding said coil, a pair of identical closure discs, each having a central aperture therethrough, one of said discs being disposed in each end of said casing between said coil and the adjacent intumed flange with the central aperture thereof in alignment with the axial bore in said coil, a pair of identical caps each having a central fluid passageway therethrough, one of

said caps being removably secured to each of said closure discs with the adjacent intumed flange securely clamped between the cap and closure disc, an open-ended tubular spool removably mounted in said axial bore with the ends thereof extending out through the apertures in said discs and into gas-tight engagement with said caps around said fluid passageways, coupling means by which said device is removably interposed in a fluid conduit so that said spools and said fluid passageways form an integral part thereof, a solenoid plunger disposed within said tubular spool, and a valve plunger which is adapted to engage the inner end of one of said fluid passageways and cut off the flow of fluid through said spool carried by said solenoid plunger.

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