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Iizumi

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[54] **MACHINE TOOL LUBRICATING DEVICE**

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[52] **U.S. Cl.** ..... **184/55 A,** 137/595

[51] **Int. Cl.** **F16n 7/34**

[58] **Field of Search** ..... 184/55 R, 6.26, 55 A, 184/56 R, 56 A; 137/595, 607; 251/61.3

[56] **References Cited**

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[57] **ABSTRACT**

A lubricating device in which passages for compressed air and cutting fluid to be fed under pressure are connected to a double pipe nozzle through a pilot valve and a mixing valve, with a control pilot pressure being applied through a mechanical valve to a diaphragm located at said pilot valve, and with a gauge tube and a transparent gauge window being provided in the cutting fluid passage of said mixing valve.

1 Claim, 5 Drawing Figures

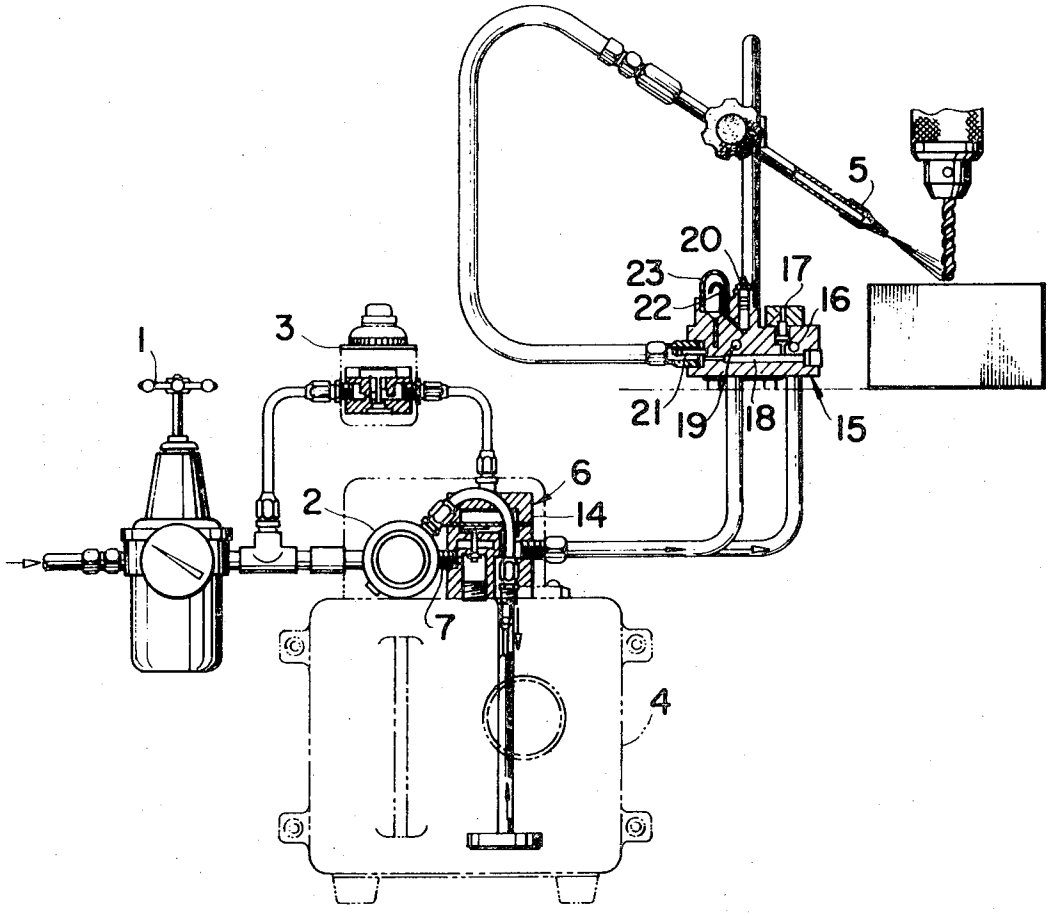


FIG. 1

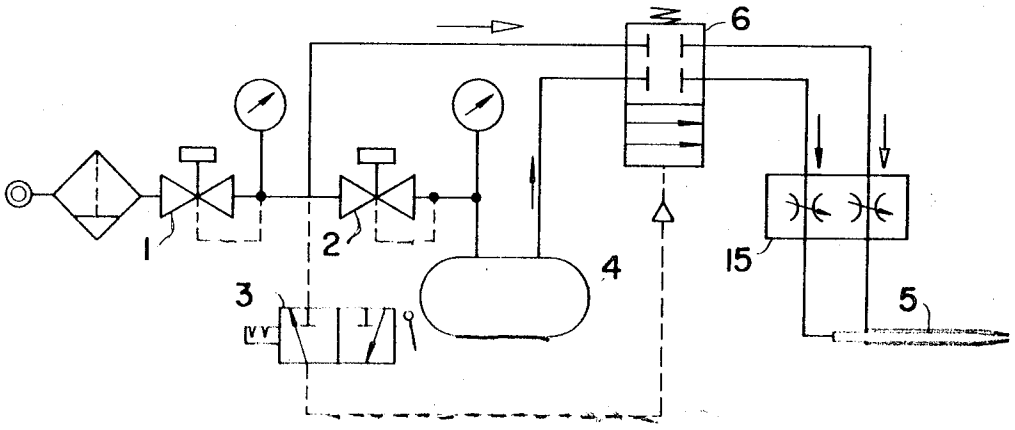
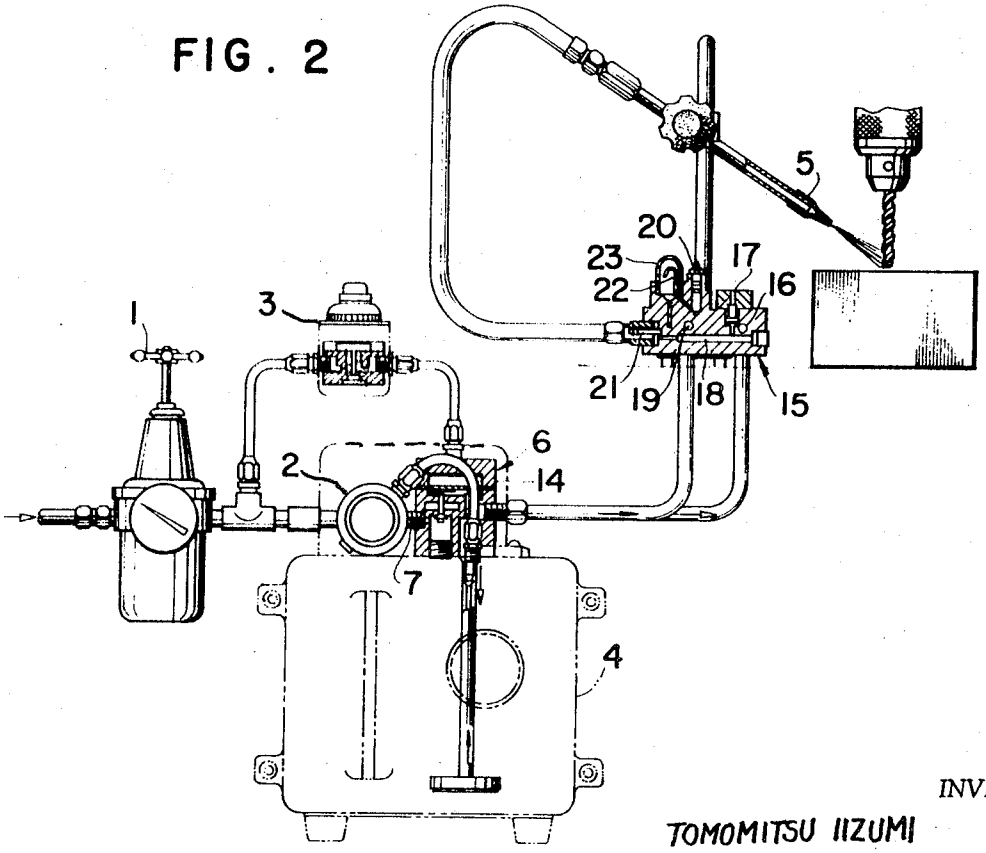


FIG. 2



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FIG. 3

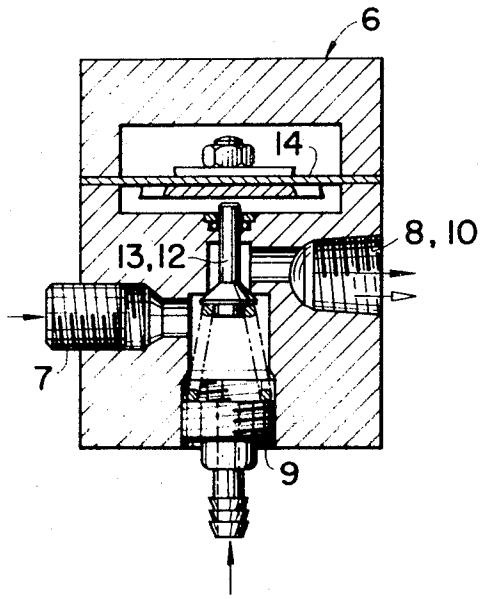


FIG. 4

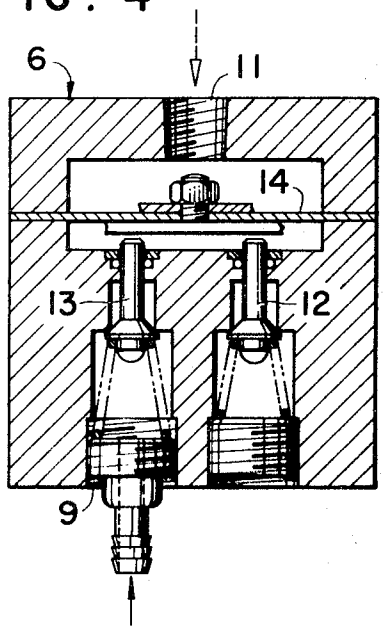
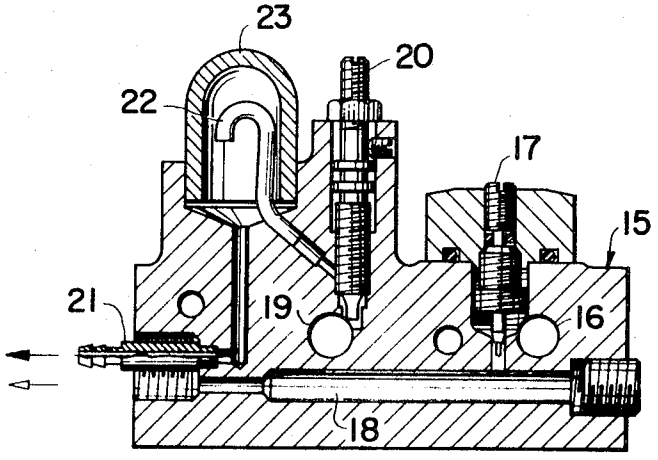


FIG. 5



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MACHINE TOOL LUBRICATING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a lubricating device for applying a cooled and atomized cutting fluid to a cutting tool after mixing said fluid with compressed air.

In order to increase the usable life of cutting tools and to improve the efficiency of the cutting operation by decreasing wear on the tool and removing chips, prior art systems have utilized the lubricating and cooling effect of a cutting fluid sprayed by means of compressed air. Inasmuch as such systems have employed electro-magnetic valves which are opened and closed by means of a microswitch or the like, the use of inflammable cutting fluids becomes very dangerous. Consequently, such a system requires a complicated explosion-proof construction, resulting in an increase in manufacturing cost. Other disadvantages of such a system are that detection of the amount of cutting fluid being fed is highly problematic, and that the cutting fluid may be sometimes fed without being atomized due to clogging of the valve by dirt, dust, or the like. Furthermore, even if such are discovered after they occur, it is difficult to ascertain their cause.

Accordingly, it is an object of the present invention to eliminate the above-described drawbacks. The invention involves provision of a lubricating device of the type in which a manually operated or interlocked mechanical mixing valve and a pilot valve are provided instead of said electromagnetic valve on the air pressure line. The opening and closing of the pilot valve is accomplished by means of a pilot pressure, and a gauge tube and window are provided in the mixing valve, which is designed to mix the cutting fluid with compressed air, said gauge window being made of a transparent resin to enable easy detection of the amount of fluid therein.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its user, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate an embodiment of the invention, in which:

FIG. 1 is a schematic block diagram of a system embodying the invention;

FIG. 2 is a diagrammatic plan view illustrating the construction of said embodiment;

FIGS. 3 and 4 are front and side sectional views, respectively, of the pilot valve of the invention; and

FIG. 5 is a front sectional view of the mixing valve.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, the outlet side of a pressure-reducing valve 1 including a filter which is designed to purify compressed air and set its pressure to a desired magnitude is branched into three outlet flow paths. One of said branches is directly connected through a pilot valve 6 and a mixing valve 15 to a double pipe nozzle 5 which directs discharging fluid to a cutting tool. Another branch is connected to the upper

part of a tank 4 through a small-sized pressure-reducing valve 2 which is designed to apply pressure to the level of the cutting fluid in the tank 4. Furthermore, said branch is connected from the bottom of said tank 4 to said double pipe nozzle 5 through said pilot valve 6 and mixing valve 15 in the same manner as described above. The remaining branch is connected to said pilot valve 6 through a select-type mechanical valve 3 which is designed to open or close the pilot valve 6 by application of a pilot signal pressure. Thus, the change-over of the pilot valve 6 is accomplished by opening or closing the mechanical valve 3 which may be of a manual type or which may be interlocked with a machine, thus performing atomized lubrication from the nozzle 5 by intermittent feed of compressed air and the cutting fluid in the tank 4. Referring next to FIGS. 3 and 4 illustrating the pilot valve 6, an air inlet 7 connected directly to the pressure-reducing valve 1 with a filter is in communication with an outlet 8 through a valve 12. An inlet 9 for the cutting fluid from the tank 4 is in communication with an outlet 10 through a valve 13. A diaphragm 14 is located above said valves 12 and 13 so that the pilot pressure can be applied from an inlet 11. The diaphragm 14 is pressed down by means of said pilot pressure to open the valves 12 and 13, thus permitting air and the cutting fluid to flow. Referring now to FIG. 5 illustrating the mixing valve 15, an air inlet 16 is in communication with an outflow passage 18 through an adjusting needle valve 17. A fluid inlet 19 is in communication with an outlet 21 through an adjusting needle valve 20, at a position on which a gauge tube 22 is provided so that the other end of said tube is located within a gauge window 23 made of a transparent resin. Thus, the amounts of air and cutting fluid are adjusted by means of the adjusting needle valves 17 and 20, and at the same time the flow condition of the cutting fluid is detected through the transparent gauge window.

As described above, this device accomplishes valve operation by applying the air pilot pressure to the diaphragm 14 located at the pilot valve 6, and therefore no electric spark or the like is necessary, thus making use of an inflammable cutting fluid quite safe. Moreover, the provision of the gauge tube 22 and the gauge window 23 at the mixing valve 15 designed to adjust air and cutting fluid permits easy detection of the amount of the cutting fluid at all times. Thus, the failure of atmoization of the cutting fluid is entirely eliminated. Even if the fluid passage is clogged at any point, such clogging will serve as a kind of guide for repair, and therefore repairing can be easily accomplished.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

I claim:

1. A lubricating device for machine cutting tools comprising:

passage means including a double pipe nozzle for feeding compressed air and cutting fluid under pressure to a cutting tool;

a pilot valve including air inlet means and air outlet means with first valve means interposed therebetween to control air flow through said pilot valve, fluid inlet means and fluid outlet means with second valve means interposed therebetween to con-

trol the fluid flow through said pilot valve, and a diaphragm arranged to control operation of said first and second valve means in response to fluid pressure applied to said diaphragm;

a mixing valve including a compressed air passage and a cutting fluid passage for mixing said air and said fluid, said pilot valve and said mixing valve each being operatively connected in said passage means to control fluid flow therethrough with said mixing valve receiving the flow of air and the flow of fluid from said pilot valve;

mechanical valve means for applying a pilot pressure to said diaphragm means to control operation of said pilot valve; and

a transparent gauge window and a gauge tube located within said transparent window, said tube and said window being provided at the cutting fluid passage of said mixing valve to enable detection of the level of cutting fluid in said device.

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