M. J. BURKEL.

AIR INLET VALVE MECHANISM FOR PNEUMATIC TOOLS.

APPLICATION FILED JULY 10, 1918.

1,417,136. Patented May 23, 1922.

Fig. 1.

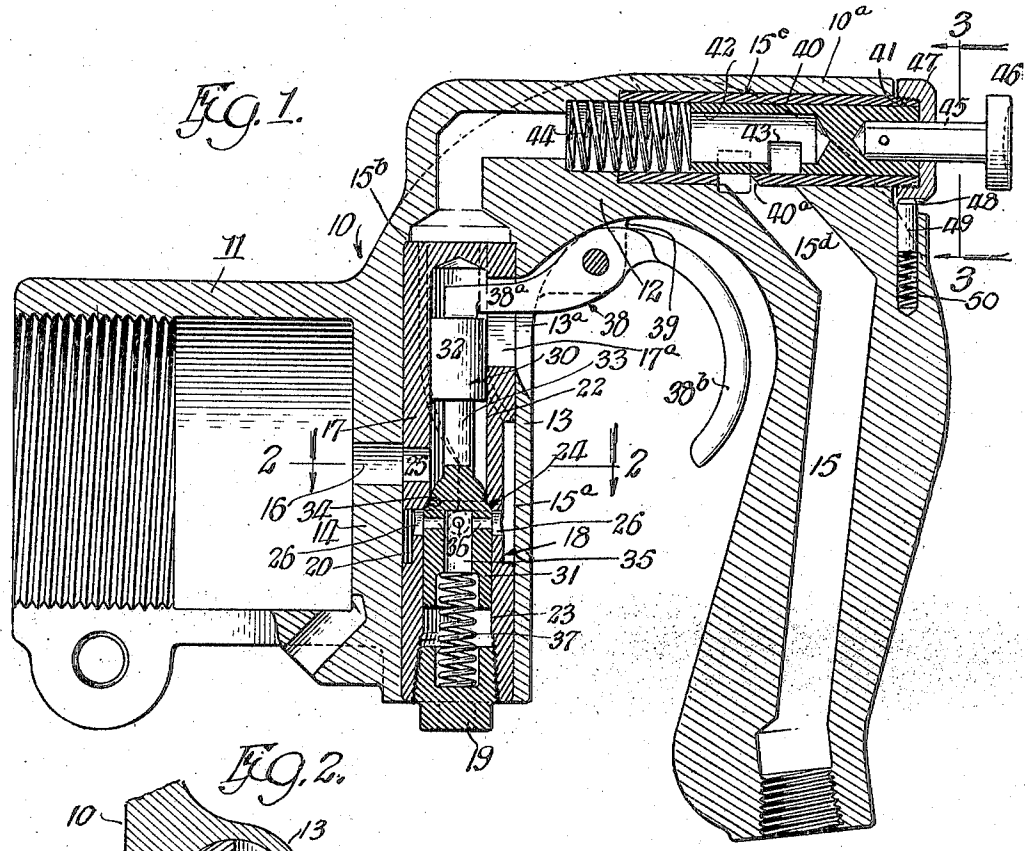


Fig. 2.

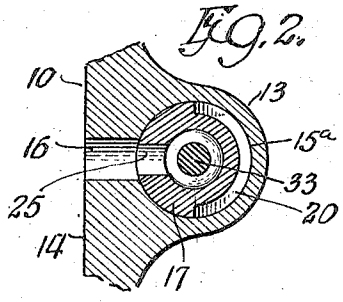


Fig. 3.

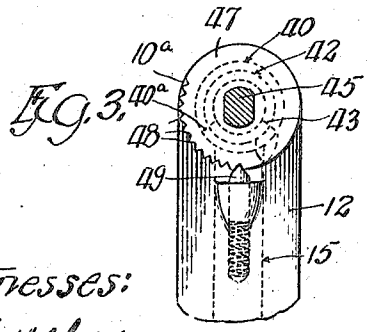


Fig. 4.

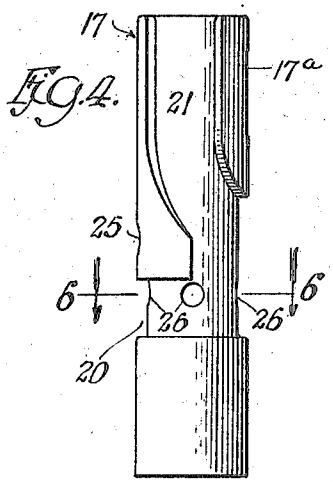


Fig. 5.

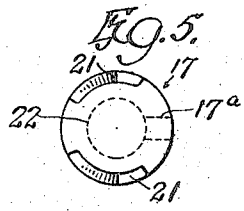
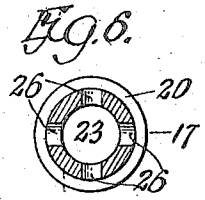


Fig. 6.



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UNITED STATES PATENT OFFICE.

MATHEW J. BURKEL, OF AURORA, ILLINOIS.

AIR-INLET-VALVE MECHANISM FOR PNEUMATIC TOOLS.

1,417,136. Specification of Letters Patent. Patented May 23, 1922.

Application filed July 10, 1918. Serial No. 244,159.

To all whom it may concern:

Be it known that I, MATHEW J. BURKEL, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Air-Inlet-Valve Mechanism for Pneumatic Tools; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in pneumatic tools and more particularly to the air inlet valve mechanism thereof, and consists of the matters hereinafter described and more particularly pointed out in the appended claims.

One of the objects of the present invention is to provide in connection with an improved air inlet valve for admitting air to the tool barrel, a normally closed throttle valve, which may be adjusted to regulate the amount of air flowing to the inlet valve so that the movement of the operating member of the tool may be determined and positively controlled for either light or heavy work.

Another object of the invention is to so arrange and locate the actuating members of the normally closed air inlet and throttle valve with reference to each other, that in case the tool accidentally slips from the operator's hands while using the same, it will be impossible for both of said actuating members to engage or catch upon some object and thus be simultaneously opened to start the tool into operation.

A further object of the invention is to so construct the tool handle, that the air passageway therein may be easily drilled. To this end, said passageway is arranged so that it may be conveniently enlarged or bored out at points throughout its length, for the reception of both the air inlet valve mechanism and the throttle valve mechanism associated therewith.

These objects as well as others, together with the many advantages of my invention will more fully appear as I proceed with my specification.

In the accompanying drawings:—

Figure 1 illustrates a central, longitudinal, sectional view through a pneumatic tool handle, embodying my invention.

Figure 2 represents a detail, horizontal section through a part of the tool handle, the plane of the section being indicated by the line 2—2 of Figure 1.

Figure 3 represents a detail view partly in elevation and partly in section, the plane of the section being indicated by the line 3—3 of Figure 1.

Figure 4 represents a view in side elevation of a bushing forming a part of a valve mechanism embodying my invention.

Figure 5 represents a top plan view of said bushing.

Figure 6 represents a transverse, sectional view through said bushing, the plane of the section being indicated by the line 6—6 of Figure 4.

Referring now to that embodiment of my invention illustrated in the drawings:—10 indicates as a whole, the head of a pneumatic tool. Said head includes an annular flange 11 adapted to receive the inner end of the tool barrel or body, and a handle extension 12 which, as shown in this instance, provides what is known as an "open grip" handle. The handle extension is preferably fabricated integrally with the head and is in the form of a prolongation of one end of a transversely extending boss 13 on the end wall 14 of said head.

An air inlet passageway 15 is provided in said handle extension. Said passageway terminates in an enlarged bore 15ª in the transverse boss 13 of the end wall 14, and in said end wall, coaxial with the annular flange 11, is an inlet port 16 for the admission of the air into the usual operating valve mechanism of the tool barrel (not shown).

In the bore 15ª, which extends transversely of the longitudinal axis of the tool barrel, is the valve bushing 17 of an air inlet or admission valve, indicated as a whole at 18. This bushing is in the form of a tubular sleeve which is closed at its inner end and fits snugly within the bore 15ª and is driven into place therein from the outer end of said bore, until the inner end of said sleeve engages a shoulder 15ᵇ formed at the junction of the passageway 15 and enlarged bore 15ª. Said sleeve is held against displacement by up-setting the outer end of the boss 13 upon the outer end of the bushing, said outer end of the bushing being closed by a threaded plug 19.

The bushing 17 has an annular groove 20 which, when the bushing is within the bore

15ª, is spaced outwardly from the inlet port 16 in the end wall 14, and in the opposite sides of said bushing are longitudinal grooves 21 which begin at the closed inner end of said bushing and converge towards each other at their outer ends to merge into the annular groove 20 at a point diametrically opposite the inlet port 16, in the head end wall 14.

In said bushing 17 are inner and outer bores 22, and 23 respectively, of different diameters, at the junction of which is formed a tapered valve seat 24. A transverse port 25 connects the inner, smaller bore 22 with the inlet port 16 in the end wall 14 of the head, while annular, spaced ports 26 connect the outer, larger bore 23 with the annular groove 20.

30 indicates a piston valve plug arranged in the bores 22 and 23 of the bushing, which is adapted to control the admission of air under pressure through said bushing to the inlet port 16 in the head end wall 14. This piston valve plug includes a body 31 arranged in the larger bore 23, a head 32 arranged in the smaller bore 22 and a neck 33 of still smaller diameter, which connects said body and head together. The body is tapered at its inner end as at 34 to normally engage upon the valve seat 24 in the bushing and in the outer end of said valve body is formed a recess 35 which is normally in communication with the annular ports 26 in the bushing 17, by smaller annular ports 36. A coiled expansion spring 37 interposed between the plug 19 in the outer end of the bushing and the outer end of the valve body 31, normally holds the tapered part 34 of said valve body in engagement upon the valve seat 24.

The head 32 of the valve is operatively engaged by a trigger 38 that is fulcrumed to swing in the plane of the handle. Said trigger is fulcrumed between spaced ears 39 made integral with the crook of the handle 12 and has an arm 38ª which extends through aligned slots 13ª and 17ª formed respectively in the boss 13 and bushing 17, to engage the head of said valve, and has an operating arm 38ᵇ which is bent to conform to the shape of the crook of the handle so that it will normally be spaced from the inside of the crook, the space being sufficient so that when the handle is gripped and the operating arm 38ᵇ of the trigger is actuated by the fingers of the hand grasping the handle 15, there will be enough movement of the trigger to actuate the valve plug 30.

That part of the air passageway 15 extending parallel to the axis of the annular flange 11, is bored out as at 15ᵉ to receive a tubular sleeve 40 which has a port 40ª that communicates with an obliquely arranged part 15ᵈ of the air passageway 15 in the outer end of the handle proper. The inner end of said sleeve communicates with that part of said air passageway 15 that leads into the bore 15ª in the boss 13. The said sleeve 40 has a driving fit in said bore and the handle has a boss 10ª to provide for a part of said bore, said sleeve having a threaded outer end 41 which extends outwardly beyond the end of said boss 10ª.

In the sleeve 40 is provided a reciprocable tubular valve 42 which has a port 43 adapted to be brought into register with the port 40ª in said sleeve 40 in a manner soon to appear. An expansion coiled spring 44 arranged between a shoulder in said air passageway and the inner end of the tubular valve, holds said valve in its outermost position wherein the ports 40ª and 43 are out of register. To the outer end of the valve 42 is secured a stem 45 that has a button or head 46 which is adapted to be actuated by the thumb of the operator manipulating the tool. This stem 45 passes through a cap 47 that is rotatively engaged upon the threaded outer end 41 of the bushing 40 and the stem has flattened sides so that while said stem is free to move endwise through said cap, said stem and valve will rotate with the cap when rotative movement is imparted to said cap. Said cap has teeth 48 in its periphery which are engaged by a spring pressed pawl 49 located in a suitable recess 50 in the handle.

The operation is as follows:—Assuming that the air passageway 15 is connected with a suitable supply of air under pressure and the inlet valve and throttle valve are closed, as they normally are under the action of the associated valve springs; the operator grasps the handle 12 with the forefingers ready to manipulate the trigger, and with the thumb ready to engage the button 46 to press the valve stem 45 inwardly.

When ready, the operator actuates the valve stem 45 and the trigger 38. Pressure on the valve stem inwardly as far as it will go, brings the port 43 in the valve 42 into register with the port 40ª in the bushing 40 and by manipulating the trigger 38, the valve plug 30 of the air inlet valve in the bore 15ª is depressed so as to remove the tapered part 34 of the said valve plug from the valve seat 24 in the bushing 17.

Air under pressure will then pass through the registering ports in the throttle valve towards the bushing 17, to pass down the channels or groves 21 in the sides of said bushing, to the annular groove 20. From the groove 20, the air will pass into the smaller bore 22 of said bushing 17, through the ports 25 and 16 to the operating valve mechanism in the tool barrel or body. No air can leak out of the bore 22 through the slots 17ª and 13ª because the head 32 of the valve plug fits the bore 22 as to present a barrier to such leakage.

Should the operator let go of either the

trigger or stem, no air could pass through the port 16 because the valve associated with either the trigger or stem would close automatically under the action of its associated spring. Should the operator let go of both the trigger 38 and stem button 46 at the same time, the same shut-off of air to the tool would occur. If only the stem 45 be moved inwardly, air would pass through to the annular groove 20, through the ports 26 and 36 into the recess 35 so that the air under pressure would then be back of the valve plug 30 and would assist the spring 37 in holding the said plug 30 in tight seating engagement upon the seat 24 in the bushing 17. Thus, no air would enter to the valve mechanism in the tool barrel or body.

This structure is advantageous as a safety feature, because when the operator is at work under such conditions that it would be impossible to let go the trigger to stop the tool without dropping the tool, to the danger of those working at a distance below him, it is only natural to grip the tool handle 12 tighter and the thumb will naturally slip off the stem button 46 when the valve 42 would automatically close off the air to the tool.

The throttle valve besides acting as a safety, also has another advantageous feature. By rotating the cap 47 and with it of course the tubular valve 42, the angular positions of the port 43 in the valve with respect to the port 40^a in the bushing 40 may be adjusted to vary the cross sectional area of the passage through which the air must pass from the passageway 15^d to the bore 15^a, when the tubular valve member 42 has been moved inwardly until said ports 43 and 40^a register. Manifestly the supply of air to the valve mechanism in the tool may be governed so that the movement of the operating member of the tool may be predetermined and positively controlled for either light or heavy work. The tubular valve member is held in the desired angular adjusted position into which it has been moved by rotation of the cap 47 upon the threads 41 at the outer end of the bushing 40, by the spring pressed pawl 49 before mentioned.

My improved valve construction possesses many advantages. The throttle valve may be adjusted to vary and govern the amount of air to be admitted to the tool barrel and after this adjustment has been made for either light or heavy work, the operator may open both valves to the limit, thus doing away with the necessity for holding the inlet valve only partly open for light work, as is now the usual practice, when it is desired to do light work with pneumatic tools now used, such holding of the inlet valve in partly open position being particularly tiresome for the operator, and unreliable.

Again, if the tool is left lying about the work operated upon, there is no danger of the tool being accidentally started into operation, with resulting injury and damage, because both the throttle valve and inlet valve have to be opened at the same time and such accidental opening of the valves is impossible on account of the arrangement and structure of the parts before mentioned.

The tool head is so designed as to be capable of being made by the drop forge method, thus insuring strength, and is shaped in a manner permitting of ready drilling and boring of the air passageways.

While in describing my invention, I have set forth the same as used in connection with an "open grip" handle, but it is apparent that the same may be as readily used in connection with a "closed grip" handle, and it is apparent that other changes in the arrangement and construction of parts may be made without departing from the spirit of the invention.

I claim as my invention:

1. In combination with the handle of a pneumatic tool, an air inlet valve, a trigger on said handle for actuating said air inlet valve, a normally closed, combined adjustable throttle and safety valve for controlling the flow of air to said inlet valve, and a depressible stem for opening said throttle valve, said depressible stem being arranged at a right angle to the inlet valve and in convenient relation to said trigger and being adapted to be actuated by the thumb of the hand grasping the handle.

2. In combination with an open grip handle for pneumatic tools having an air passageway therethrough, an air inlet valve for controlling the flow of air from said passageway to the tool, a trigger in the crook of said handle for actuating said air inlet valve, a self-closing combined throttle and safety valve in said air passageway, said throttle being capable of being adjusted to control the amount of air to said air inlet valve, and a thumb-actuated stem located on the outside of said handle in convenient gripping relation to said trigger for opening said throttle valve, said stem also being capable of being rotated to determine the amount of air to pass through said throttle valve when the same is open.

3. In combination with the handle of a pneumatic tool, an air inlet valve, a trigger on said handle for actuating said air inlet valve, a combined self-closing throttle and safety valve for controlling the flow of air to said inlet valve, a stem connected to said valve and adapted to be depressed inwardly to its fullest extent, to open said throttle, said throttle being capable of a rotative adjusting movement to control the flow of air through said passageway without interfering with the full depressing inwardly of said stem.

4. A device of the kind described, comprising a tubular head having an end wall, said end wall having a boss extending transversely thereof, and an extension prolonged beyond said head to form a crooked handle, said handle having a longitudinal passageway for the pneumatic fluid and said boss having a longitudinal bore which meets said passageway, a valve bushing in said bore, said valve bushing and boss having registering slots adjacent to the crook of the handle, means providing a tapered valve seat in said bushing, a valve plug reciprocable in said bushing and normally seating against said tapered valve seat, a trigger fulcrumed in the crook of said handle and having an arm extending through said registering slots in said boss and in said bushing, and engaging said valve plug to open the same, and a spring in said bushing and engaging said valve plug to hold said valve plug to its seat, there being registering ports in said bushing and said head for the passage of air from the interior of said bushing.

5. A device of the kind described, comprising a head having an end wall, said end wall having an extension prolonged beyond said head to form a crooked handle, said handle having a longitudinal passageway for the pneumatic fluid, a tubular bushing in said air passageway arranged parallel with the longitudinal axis of the tool, said bushing having an opening in its side which communicates with said air passageway, a spring actuated, reciprocable valve plug in said bushing, said valve plug having a port adapted to register with the hole in said bushing, and a stem fixed to said valve plug and extending without the handle for depressing said valve plug to bring its port into register with the port in said bushing, and for rotating said plug to change the angular relation of the bushing opening and plug port.

6. A device of the kind described, comprising a head having an end wall, said end wall having an extension prolonged beyond said head to form a crooked handle, said handle having a longitudinal passageway for the pneumatic fluid, a tubular bushing in said air passageway arranged parallel with the horizontal axis of the tool, said bushing having an opening in its side which communicates with said air passageway, a spring actuated reciprocable valve plug in said bushing, means operable from outside the casing to rotate said valve plug to change the angular relation of the sleeve port and said valve port, means for holding said valve plug in the desired adjusted position, and a depressible stem fixed to said valve plug and extending without the handle for bringing said ports into registering position.

In testimony that I claim the foregoing as my invention, I affix my signature in the presence of two witnesses, this 5th day of June, A. D. 1918.

MATHEW J. BURKEL.

Witnesses:
JOHN F. CAAS,
B. DAHENSCHLAGER.