

[54] DUAL SAFETY CONTROL FOR A POWER TOOL

[75] Inventor: Andrew Flagge, Aurora, Ill.

[73] Assignee: Thor Power Tool Company, Aurora, Ill.

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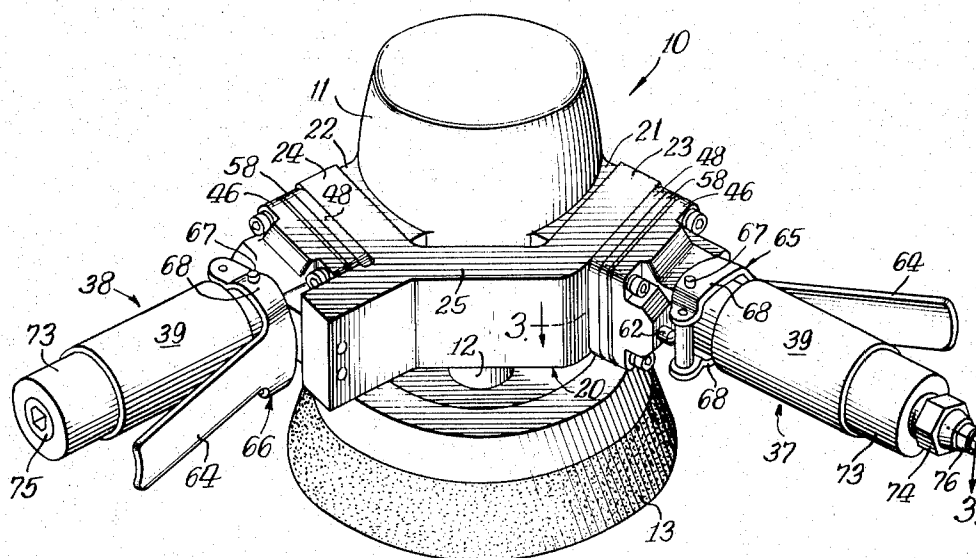
Primary Examiner—Donald G. Kelly

Attorney—Albert W. Bicknell et al.

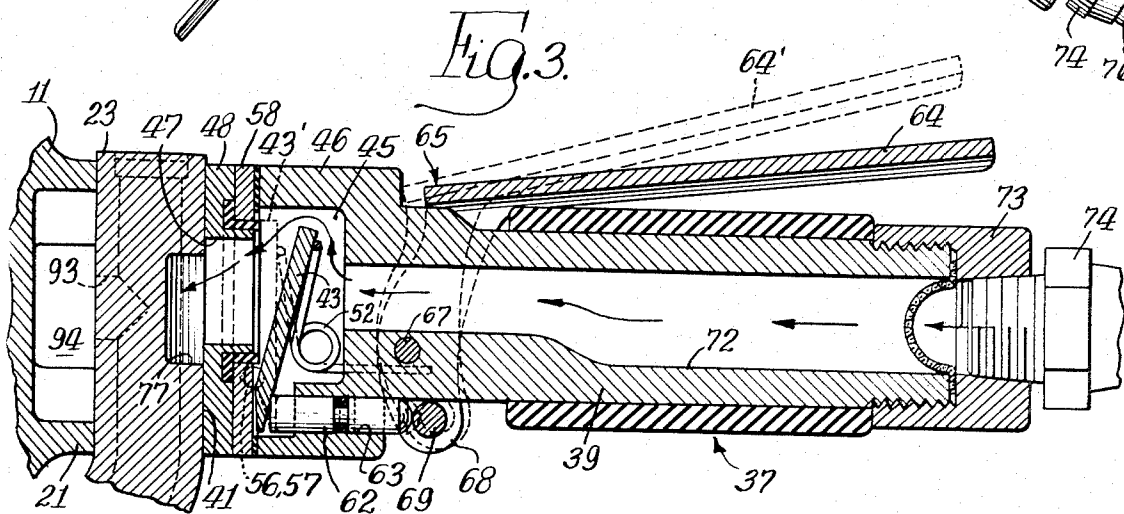
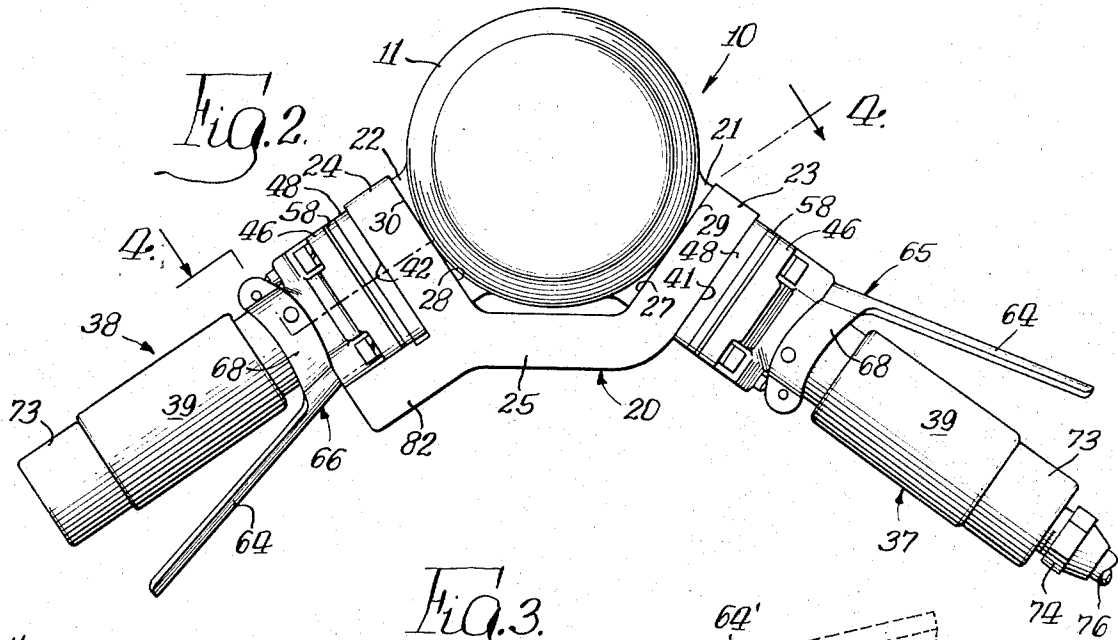
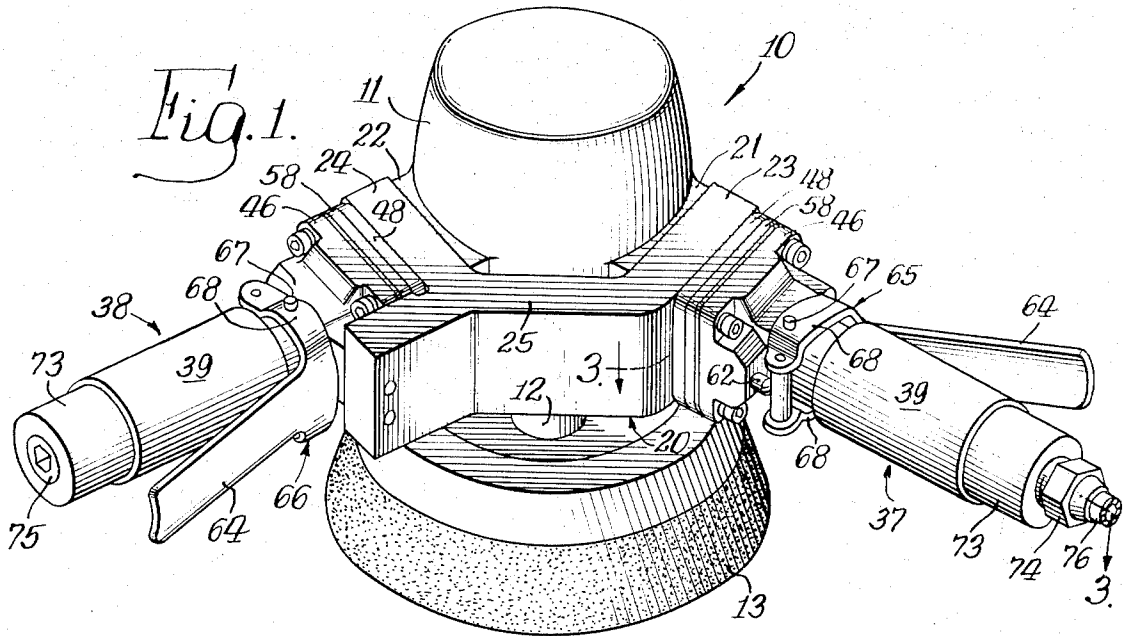
[57] ABSTRACT

A safety control for a portable power tool such as a pneumatically driven hand grinder. A pair of throttles are secured to the tool housing for guiding and controlling the operation of the tool when the latter is in use. A valve is mounted in each throttle and both valves are normally biased to their closed positions by springs. An operating lever is pivotally mounted on each throttle for moving its associated valve to an open position. The valves are arranged in series in a pair of connected passages which convey air under pressure from a remote source to the pneumatic drive motor of the tool. The tool is therefore rendered inoperative whenever one or the other or both of the throttle levers is intentionally or inadvertently released.

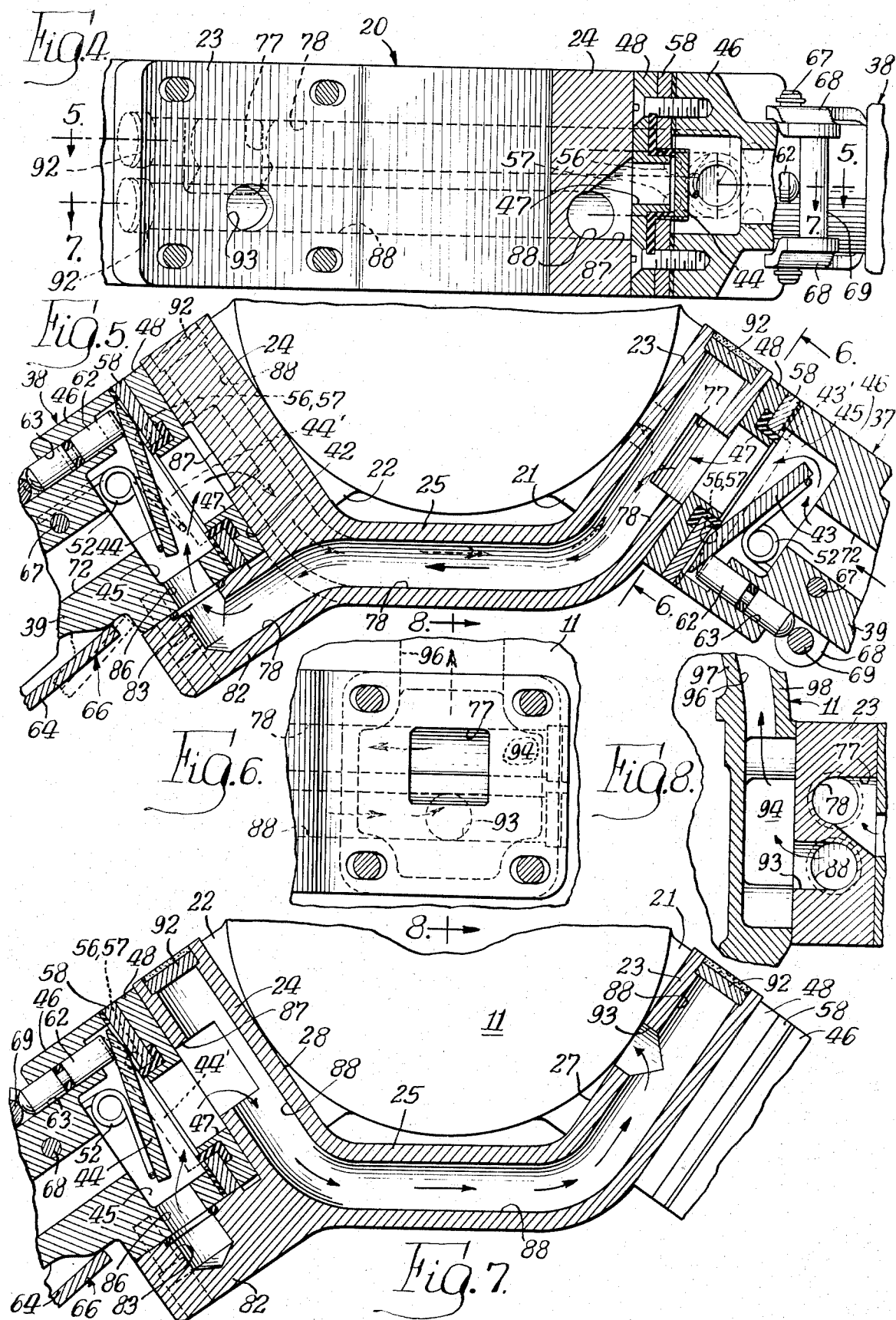
8 Claims, 8 Drawing Figures



SHEET 1 OF 2



SHEET 2 OF 2



DUAL SAFETY CONTROL FOR A POWER TOOL

This invention relates to safety controls for portable power tools, and more particularly relates to dual throttle safety control for a pneumatically driven portable grinder.

Portable power tools, such as grinders and the like, have been hazardous to operate because of the fact that users of such tool would periodically move them away from the work to observe the tool's progress, without shutting the tool off. In so doing, injuries have occurred as a result of the working or cutting element of the tool coming into contact with some part of the user's body. Injuries have also occurred as a result of the unintentional starting of such tools due to accidental bumping of the control lever thereof, or as a result of the tool being placed on a support surface or the floor by the user in a position such as to cause movement of the control lever to its starting position.

Various types of safety control arrangements have been heretofore advanced and incorporated into portable power tools to prevent injury to users thereof, and others, due to one or more of the aforementioned circumstances. Many of these arrangements utilize a single "dead man" type control mounted on or adjacent to the support or guide handle of the tool. However, the single "dead man" control arrangement has not proved entirely satisfactory since users of tool employing this type of safety control oftentimes maintain their grip on the "dead man" mechanism when removing the tool from the work area to observe the progress being made. Consequently, the safety characteristics of the mechanism are nullified. In addition, because of the placement of the actuating lever of the "dead man" mechanism, tools utilizing only one of such mechanisms were prone to accidental starting and thus were hazardous to the user and bystanders.

Accordingly, it is a general object of the present invention to provide a novel safety control for portable power tools.

Another object is to provide a novel safety control of the foregoing character, which is particularly adapted for use with a portable, pneumatically driven grinder.

A further object is to provide a novel safety control for a portable power tool, which requires the user to actuate two separate control members in order to render the tool operable.

A specific object is to provide a novel safety control for a portable, pneumatically driven grinder, which utilizes two separate throttles for controlling the operation of the grinder and which requires a user to use both hands to open the throttles and maintain continuous operation of the grinder.

Other objects and advantages of the invention will become apparent from the following detailed description and accompanying sheets of drawings in which:

FIG. 1 is a perspective view of a portable grinder incorporating a dual throttle safety control embodying the features of the present invention;

FIG. 2 is a top plan view of the grinder shown in FIG. 1;

FIG. 3 is an enlarged, sectional view taken substantially along the line 3—3 of FIG. 1;

FIG. 4 is a elevational view, with a portion thereof in section, taken substantially along the line 4—4 of FIG. 2;

FIG. 5 is a longitudinal sectional view taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 5;

FIG. 7 is a longitudinal sectional view taken substantially along the line 7—7 of FIG. 4; and

FIG. 8 is a fragmentary sectional view taken substantially along the line 8—8 of FIG. 6.

In FIGS. 1 and 2, a portable power tool, in this instance a hand grinder 10, is illustrated. The grinder 10 is conventional to the extent that it includes a housing 11 which is circular in cross-section and within which driving means in the form of a pneumatic motor (not shown) is mounted. A driven member in the form of a shaft 12 (FIG. 1) projects axially from one end of the housing 11 and a work performing member, in this instance a grinding wheel 13, is shown secured to the shaft 12 for rotation therewith. Thus, when a motive fluid, such as air under pressure, is supplied to the pneumatic motor in the housing 11, the shaft 12 drives the grinding wheel 13 and the tool becomes operable.

According to the present invention, the tool 10 includes a two-handed or dual throttle safety control arrangement for controlling the operation of the grinder and preventing injury to the user and others. Such safety control arrangement includes an adapter 20 that is secured as by screws or bolts (not shown) to a pair of mounting bosses 21 and 22 provided on the side wall of the motor housing 11. The adapter 20, in the present instance, is preferably an aluminum casting and includes a pair of laterally spaced, block-like mounting portions 23 and 24 and an intermediate, connecting web portion 25. As seen in FIGS. 1 and 2, the adapter 20 has a generally U-shaped configuration with the legs of the U spread apart somewhat to permit the adapter to fit closely against and embrace the housing 11. Thus, the inner surface portions, indicated at 27 and 28, respectively, of the mounting portions 23 and 24 are ground or otherwise made flat so as to mate with the flat outer faces, indicated at 29 and 30, respectively, of the bosses 21 and 22 when the adapter 20 is secured to the housing 11.

In order to facilitate manipulation and operation of the grinder 10, first and second throttles, indicated generally at 37 and 38 in FIGS. 1 and 2, are provided. Each throttle includes handle means in the form of a pair of elongated, tubular handles 39 secured to mounting surfaces, indicated at 41 and 42, respectively, on the mounting portions 23 and 24 so that the axes of the handles 39 lie in a plane generally perpendicular to the motor shaft 12 and so that the angle between the axes of the handles 39 is about 110°. It will be understood that an angular relationship greater or less than 110° could also be utilized between the axes of the handles 39, if desired.

Referring now to FIGS. 3—6, inclusive, in conjunction with FIGS. 1 and 2, it will be seen that the throttles 37 and 38 respectively include control members in the form of valve plates 43 and 44. The valve plates 43 and 44, in the present instance, are mounted in cavities 45 in the inner enlarged portions or adapter-engaging ends, indicated at 46, of the respective handles, and are movable toward and away from ports 47 formed in plates 48 at the adapter-engaging ends of the handles. Each of the valve plates 43 and 44 is biased toward a position closing the inner end of its associated port 47 by a torsion spring 52. The closed position of the valve

plate 43 is illustrated in broken lines at 43' in FIGS. 3 and 5, and the closed position of the valve plate 44 is illustrated in broken lines at 44' in FIGS. 5 and 7.

Pivotal movement of the valve plates 43 and 44 between their aforementioned open and closed positions is provided for by two pairs of balls, the balls of each pair being indicated at 56 and 57. The pair of balls 56 and 57 associated with the valve plate 43 are carried in a pair of laterally spaced recesses in the outer surface of the valve plate 43 and in a corresponding pair of recesses in the adjacent surface of a pivot plate 58. The pivot plate 58 is disposed between the enlarged portion 46 of the handle 37 and its associated port plate 48. The balls 56 and 57 associated with the valve plate 44 are mounted in the same manner as the balls 56 and 57 associated with the valve plate 43. Consequently, a description of the mounting as the latter pair of balls will not be included.

Pivotal movement of the valve plates 43 and 44 from their closed to their open positions is effected by plungers 62, which are shiftably mounted in axially extending bores 63 in the enlarged portions 46 of the handles 39. Movement of the plunger 62 of the throttle 37 toward the valve plate 43 is effected by swinging the handle portion 64 of the lever 65 toward the handle 39 of the throttle 37, and movement of the plunger 62 of the throttle 38 toward the valve plate 44 is effected by swinging the handle portion 64 of another lever 66 toward the handle 39 of the throttle 38. Each of the levers 65 and 66 is pivotally secured to its respective handle by a cross pin 67 which extends through a transverse bore in the handle and through a pair of bifurcated arms 68 (FIG. 4) of the lever and comprising a pivot portion thereof. Another cross pin 69 is mounted in the ends of the arms 68 of each lever for engaging the outer end of its associated plunger 62 upon pivotal movement of the handle portions 64 of the levers 65 and 66 towards their respective handles 39.

As previously mentioned, the handles 39 are tubular. Thus, the interiors, indicated at 72 in FIGS. 3, 5 and 7, of such handles are hollow and elongated. The outer ends of the handles 39 are externally threaded to receive reducers 73. As best seen in FIG. 3, a fitting 74 is threaded into the reducer 73 on the handle 39 of the throttle 37, and the fitting 74 is in turn connected to the one end of a flexible fluid conduit, in this instance, an air hose 76. The opposite end of the air hose 76 is connected to a suitable source of air under pressure (not shown). Thus, air under pressure from the remote source will be communicated through the hose 76 to the reducer 73 on the handle 39 of the throttle 37, and will be available to flow through the port 47 whenever the handle portion 64 of the lever 65, and consequently the valve plate 43, are moved from their normal broken line positions (indicated at 64' and 43' in FIG. 3) toward their full line positions. The opening in the reducer 73 on the handle 39 of the throttle 38 is closed, as by an Allen screw 75 (FIG. 1).

Assuming that the user wishes to actuate the tool 10 to perform a grinding operation, he merely grasps the handles 39 of the throttles 37 and 38 and squeezes the handle portions 64 of the levers 65 and 66 toward their respective handles 39. The valve plates 43 and 44 are thus caused to pivot from their broken line positions 43' and 44' to their full line positions illustrated in FIGS. 3, 5, and 7. When this occurs, air under pressure will flow through the interior 72 of the handle 39 of the

throttle 37 to the cavity 45, around the open valve plate 43, and then through the port 47 into an inlet port 77 (FIGS. 3, 4, 5, 6 and 8) in the outer surface 41 of the mounting portion 23 of the adapter 20. On passing through the port 77, the flow of air enters a cored passage 78 in the adapter. The passage 78 extends through the adapter portions 23 and 25 and then into another portion 82. The adapter portion 82, in the present instance, extends perpendicularly to the mounting portion 24 and outwardly from the intersection of the portions 24 and 25.

On entering the adapter portion 82, the air in the passage 78 proceeds outwardly through a bore 83 which registers with a radial bore 86 in the adjacent side wall of the enlarged portion 46 of the throttle 38.

After entering the cavity 45 of the throttle 38, air under pressure flows around the open valve plate 44, outwardly through the port 47, and thence into another port 87 (FIGS. 4, 5 and 7) in the adapter portion 24. On passing through the port 87, the compressed air flows into one end of another cored passage 88 in the adapter. As best seen in FIG. 7, the passage 88 extends through the adapter portions 24, 25 and 23 in generally parallel relation with the passage 78 and is located below the passage 78 as viewed in FIG. 4. The outer ends of the passages 78 and 88 are closed by plugs 92 welded into such ends.

The air flow in passage 88 is in the reverse direction as compared to the flow through passage 78 and, on reaching the portion 23, the flow of air in the passage 88 passes outwardly through a port or opening 93 in the inner surface 27 thereof to enter a fluid entrance port in the form of a cavity 94 (FIGS. 3, 6 and 8) formed in the boss 21 of the housing 11. From the cavity 94, the air flows into one end of a duct 96 (FIGS. 6 and 8) in the housing 11, such duct being defined in part by inner and outer wall portions 97 and 98, respectively, of the housing. The other end (not shown) of the duct 96 communicates with the inlet of the pneumatic motor in the housing so that the motor will be driven and power supplied to the shaft 12 for driving the grinding wheel 13.

The passages 78 and 88 in the adapter 20 thus comprise a portion of a fluid conduit means for conducting fluid under pressure to the inlet of a fluid motor in the housing 11, and the hollow interior of the handle 39 of the throttle 37 comprises another portion of said fluid conduit means. The direction of flow of air under pressure through the throttle 37 and passages 78 and 88 in the adapter 20 is indicated by arrows.

With the foregoing construction, it will be apparent that if a user of the tool should at any time release his grip on one or the other or both of the handle portions 64 of the levers 65 and 66, either one or the other or both of the valve plates 43 and 44 will close under the influence of the springs 52 and block any further flow of air through the adapter 20 to the motor in the housing 11. Consequently, the motor will rapidly come to a stop and likewise so will the shaft 12 and grinding wheel 13. The tool 10 is thus rendered incapable of causing injury to a user or bystanders. Since the release of either the lever 65 or the lever 66 will render the tool inoperative, the safe operating characteristics thereof are unaffected by the right or left-handedness of a user.

While the safety control arrangement herein disclosed has been described in connection with a portable hand grinder utilizing a pneumatic motor, it should

be understood that such control arrangement could also be applied to the other types of tools, both portable and fixed.

It should further be understood that while the safety control arrangement disclosed herein utilizes an adapter mounted on the side wall of the housing of an associated power tool to provide a mounting for a pair of throttles for controlling the operation of the tool and also to define a pair of passages for conducting fluid under pressure to the throttles in series flow relation, such throttles could instead be mounted directly on the side wall of the housing and the fluid passages could be formed in the housing. The adapter also facilitates the conversion of existing tools from single to dual safety throttle operation.

While only one embodiment of the invention has been herein illustrated and described, it will be understood that modifications and variations thereof may be effected without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. In a portable power tool including a housing having a fluid motor therein and a driven member connected to said motor and adapted to have a work performing member connected thereto, the improvement of safety control means for controlling the operation of said motor said safety control means comprising first and second throttles adapted to be secured to said housing and respectively adapted to be grasped by a user's hands, first and second control members respectively carried by said first and second throttles, said control members being operable to prevent motive fluid under pressure from being supplied to said motor when either of said control members is in a first position and to permit motive fluid under pressure to be supplied to said motor only when both of said control members are in a second position, means normally biasing said control members to said first position, and manually actuated means carried by each of said throttles for moving said first and second control members to said second position, whereby said safety control means will render said tool inoperative to drive said driven member whenever a user releases one or the other or both of said manually actuated means.

2. The safety control means of claim 1, further characterized in that said motor has a shaft, said first and second throttles respectively include first and second handle means adapted to lie in a plane generally perpendicular to the axis of said of said motor shaft and to be disposed in spaced, angularly extending relation, and said manually actuated means comprises a pair of pivotally mounted levers on said first and second handle means and having their pivot axes disposed adjacent to said housing.

3. The safety control means of claim 2, further characterized in that said motor has an inlet and an outlet,

fluid conduit means is provided for conducting fluid under pressure to said inlet, and said control members comprise a pair of valves adapted to be arranged in series in said fluid conduit means.

4. In a portable grinder or the like including a housing having a fluid motor therein and a wall having a fluid entrance port, said motor having a fluid inlet, a fluid outlet and an output shaft connected thereto, and a duct extending between said fluid entrance port and said fluid inlet, the improvement of dual control means for controlling the operation of said grinder, said control means comprising an adapter adapted to be secured to said wall of said housing and having at least a portion of a fluid conduit means therein for conducting fluid under pressure from a remote source thereof to said fluid entrance port, and first and second throttles secured to said adapter and respectively adapted to be grasped by a user's hands, said throttles having manually actuated valves therein cooperable in series flow relation with said portion of said fluid conduit means means so as to prevent fluid under pressure from being supplied to said fluid motor when either of said valves is closed and to permit fluid under pressure to be supplied to said fluid motor only when both of said valves are open.

5. The dual control means of claim 4, further characterized in that said first and second throttles respectively include first and second handle means secured to said adapter in spaced relation, and said manually actuated valves are respectively mounted in said first and second handle means.

6. The dual control means of claim 5, further characterized in that said portion of said fluid conduit means comprises a pair of elongated passages having opposite ends, said valve in said first handle means communicates with one end of one of said passages, said valve in said second handle means is positioned in a cavity therein, said cavity communicates with the other end of said one passage and with one end of said other passage, and the other end of said other passage is adapted to communicate with said fluid entrance port.

7. The dual control means of claim 6, further characterized in that said passages in said adapter are generally parallel to each other and the flow of fluid through said passages is in opposite directions.

8. The dual control means of claim 6, further characterized in that at least said first handle means has an elongated hollow interior, one end of said hollow interior is adapted to be connected to said source of fluid under pressure, and the other end of said hollow interior is connected to said cavity, whereby the hollow interior of said first handle means initially receives fluid under pressure from said source and comprises another portion of said fluid conduit means.

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