Jan. 2, 1951 R. DITTMANN 2,536,595

PORTABLE SPIN RIVETING TOOL

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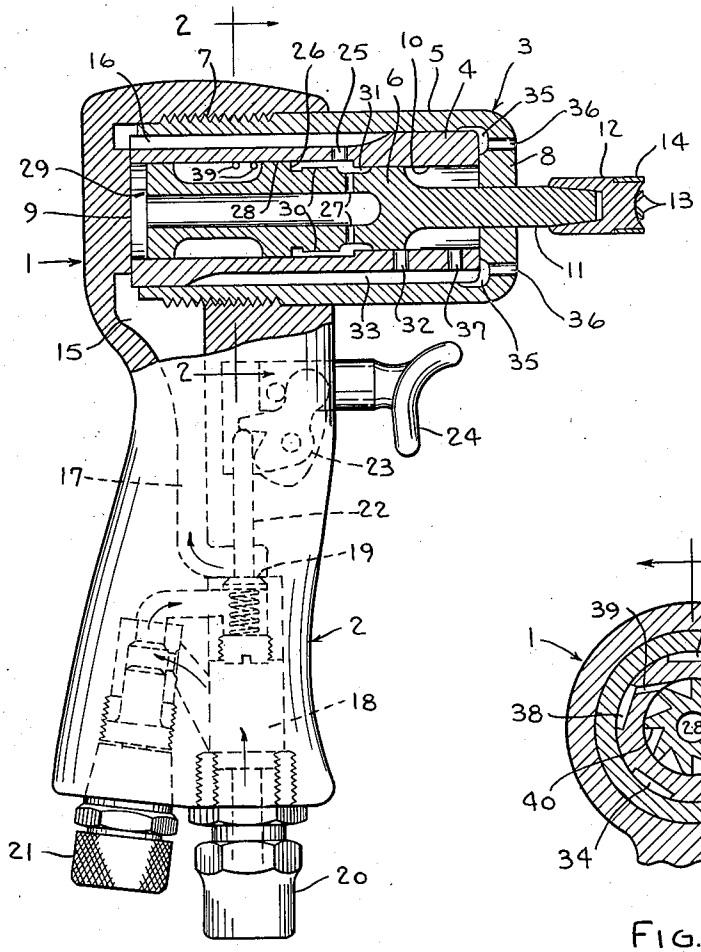

FIG. 1

FIG. 2

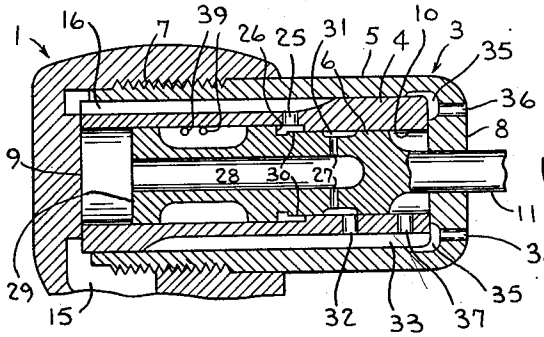

FIG. 3

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PORTABLE SPIN RIVETING TOOL

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10 Claims. (Cl. 78—53)

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This invention relates to improvements in riveting tools and more particularly to portable power actuated spin riveting tools.

The principal object and purpose of my invention is to provide a portable power actuated spin riveting tool designed to effectively upset and form a rivet head on a rivet extending into a relatively soft body material without the necessity for supporting the rivet stem between its heads to prevent bending in a riveting operation and thus permit the formation of a rivet head in a relatively soft body material where the rivet is backed-up at its preformed or manufactured head, but where the soft material provides little or no sidewise or lateral support to prevent bending of the rivet stem in riveting long thin rivets in ironing boards, army cots, certain types of trunks and crates and many similar items.

A further object of my invention is to provide a spin riveting tool in which the tool operates on the simultaneously spin and vibration principle to form the rivet heads on the rivets.

A further object of my invention is to provide vanes and high velocity air-jets in the tool motor to rotate the power element of the tool simultaneously with its percussive or hammering action.

A further object of my invention is to provide an improved motor structure for use in these portable spin riveting tools.

The invention consists further in the structural features and combinations of parts hereinafter described and claimed.

In the accompanying drawing:

Fig. 1 is a side elevational view partly in vertical section taken on line 1—1 of Fig. 2 of a portable power actuated spin riveting tool constructed in accordance with my invention;

Fig. 2 is a diametric sectional view taken through the motor section of the tool on line 2—2 of Fig. 1; and

Fig. 3 is a sectional view similar to that of Fig. 1, except that the piston member of the tool is shown at the end of its forward or riveting stroke to be hereinafter described.

As shown in the drawing, the tool of my invention comprises connected body and handle portions 1, 2, the body portion 1 being at one end of the tool and the handle portion 2 extending to the opposite end of the tool as shown in Fig. 1. The body and handle portions 1, 2 are preferably integrally connected together, being in one-piece as shown in Fig. 1. The body portion 1 is made to mount and support the motor unit 3 of the tool, said unit extending laterally to one side of the handle portion 2 and comprised of an assembly of inner and outer sleeves or barrels 4, 5 and a piston member 6 located within the inner sleeve 4 as shown herein.

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The outer sleeve or barrel 5 has a screw threaded connection 7 with the body portion 1 within the recess or cavity into which said sleeves or barrels are inserted. This threaded connection 7 of the outer sleeve 5 with the body portion 1 enables the outer barrel 5 to be screwed tightly into the tool and tightly clamp the inner sleeve 4 within the outer sleeve 5 between the end wall 8 at the outer end of the outer sleeve 5 and a seating boss 9 provided on the body portion 1 at the inner ends of the two sleeves 4, 5 as shown in Figs. 1 and 3.

The inner sleeve 4 provides a cylinder 10 for the piston member 6. The cylinder 10 is co-extensive with the length of the inner sleeve 4 and is closed at its opposite ends by the end wall 8 and the boss 9, respectively. The piston member 6 is revolubly and reciprocably mounted in the cylinder 10 and has a rigid piston rod 11 extending outwardly of the tool through the end wall 8 of the outer sleeve or barrel 5 as illustrated in Figs. 1 and 3.

Fitted on the outer end of the rod 11 is a rivet head forming peen 12 having a complement of radially disposed prongs 13. The peens employed with the tool may have two, four or six prongs and the edges thereof are protected from cracking off under shock in the operation of the tool by a steel ring or band 14 pressed on the peen 12 as shown in Fig. 1. The peen 12 is cup-shaped as shown and the cupping of the peen depends on the type of rivet head to be formed by the tool.

The sleeves 4, 5 are substantially complementary in length and extend at their inner ends into a chamber or channel 15 formed in the body portion 1 about the boss 9 as shown in Figs. 1 and 3. The chamber or channel 15 supplies compressed air to the tool motor 3 to operate it through a longitudinally extending passage 16 in the outer surface of the inner sleeve 4 between the same and the outer sleeve 5 as shown in Figs. 1 and 3. The channel 15 connects with the compressed air supply passage 17 in the handle portion 2 of the tool as shown in Fig. 1. This passage 17 connects with a passage 18, also in the handle 2, through a spring biased throttle valve 19 mounted in the handle between said passages as indicated in dotted lines in Fig. 1. The passage 18 leads to a nipple fixture 20 secured to the outer end of the handle 2 for connection with the air supply hose (not shown) of the tool.

Mounted in the handle 2 in the supply system

of the tool is an air regulator 21 of the character disclosed in the F. P. Forss Patent No. 2,369,779, granted Feb. 20, 1945, to the assignee of the instant application. The valve 19 has stem 22 which is depressed to open the valve by the interaction of a lever 23 and a plunger or trigger 24 accessible at the outer side of the tool handle 2 to control the supply of fluid pressure to the tool motor for operating it.

Live air supplied to the tool handle 2 travels along the passage 16 from the channel 15 to a port 25 in the inner sleeve 4 and enters the cylinder 10 about the piston member 6 in advance of an abutment surface or shoulder 26 on said piston as shown in Fig. 1. Live air acting on said abutment surface 26 forces the piston 6 towards the inner end of the cylinder 10 for the return stroke of the piston as shown in Fig. 1. As the piston 6 travels rearwardly on its return stroke, ports 27 in the piston allow live air to enter the bore 28 within the piston and act on the larger pressure area 29 at the rear end the piston and force the same forwardly on its power or riveting stroke. To accomplish this motion of the piston 6, the bore 28 is arranged axially of the piston and opens through the rear end thereof on which said larger pressure area 29 is provided. As soon as the pressure action of the live air on the larger pressure area 29 overcomes that on the smaller pressure area 26, the piston 6 is automatically driven on its forward or riveting stroke as shown in Fig. 3.

As the piston 6 travels forward on its riveting stroke, ports 27 in the piston are cut off from the supply port 25 when the diameter 30 of the piston enters the complementary diameter 31 of the cylinder 10 which diameter 31 is forward of the port 25 as herein shown. This forward movement of the piston 6 continues until the ports 27 are brought into connection or registration with ports 32 in the inner sleeve 4, whereupon the rear end of the cylinder 10 exhausts to the atmosphere through said ports 32 and their respective passages 33, 34 in the outer surface of the inner sleeve 4 between the same and the outer sleeve 5 as shown in Fig. 2. Passages 33, 34 open through the front end of the inner sleeve 4 into a channel 35 which connects with exhaust ports 36 in the end wall 8 of the outer sleeve 5 about the piston rod 11 as shown in Figs. 1 and 3. The channel 35 in the embodiment shown is partly in the end wall 8 and partly in the surrounding wall of the outer sleeve 5. The front end of the cylinder 10 beyond the piston 6 is constantly connected with either or both of the exhaust passages 33, 34 by a port or ports 37.

The piston action is of the vibratory character serving with relatively short and rapid strokes, plus its rotary action to be later described, to upset the ends of relatively long, thin rivets in relatively soft materials like rubber, fiber or wood without the necessity of such soft materials supporting the rivets between their heads to prevent bending under the force of riveting operation. The length of travel of the piston 6 is approximately the distance between the ports 25 and 32 in the inner sleeve 4. The pressure changes on the piston 6 are rapid, being automatically controlled by the reciprocal movement of the piston within the inner sleeve 4. Hence, the tool develops an intermittent hammering action of an extent sufficient to upset and form a rivet head on long, thin rivets without supporting the rivets, except by backing-up at their pre-formed headed ends.

The smaller pressure area 26 of the piston 6 is constantly exposed to the live air in all positions of the piston 6 as will be noted in Figs. 1 and 3 and the supply source for both rearward and riveting strokes of the piston 6 is through the port 25 and its passage 16. Hence, when the rear end of the cylinder 10 exhausts through the ports 32, the piston 6 will immediately and automatically be returned on its return stroke by the live air acting on the smaller pressure area 26. And this action of the tool automatically repeats without the need of a control valve.

For rotating the piston 6 simultaneously with its reciprocation to form the head of rivet being made by the tool, live air from the channel 15 enters a passage 38 in the inner sleeve 4 and travels to ports 39, 39 arranged side by side in the inner sleeve 4 and of relatively small diameter to provide for discharge of high velocity jets of live air against the operative surfaces of radially disposed vanes 40, 40 on the outer side of the piston 6 intermediate the smaller and larger pressure areas 26 and 29, respectively. These ports 39, as shown in Fig. 2, are arranged to discharge their jets across the piston 6 in a substantially tangential direction to rotate the piston at a relatively high speed to form the upset material into a rivet head in conformity with the cup-shape of the peen member 12 being used. The air exhausts form the vanes 40 on the exhaust side of the rotor at ports 41 connected with a passage 42 in the inner sleeve 4 and opening into the exhaust system 35, 36 of the tool as shown in Fig. 2. It is to be noted from Figs. 1 and 3 of the drawings that the ports 39, 39 are never closed by reciprocation of the piston 6 on its forward and return strokes but are operably connected at all times to the piston spaces or areas between the smaller and larger pressure areas 26 and 29. This means that air under pressure is constantly passing through the ports 39, 39 and applied to the piston vanes 40, 40 so as to cause rotation of the piston at all times during its upstrokes and downstrokes.

The spin riveting tool of my invention as herein shown and described is simple and inexpensive in construction and embodies in a relatively light portable tool a vibratory and rotative rivetive action as required for heading rivets in relatively soft body materials without bending as before mentioned.

The details of construction and arrangements of the parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means mounted in and supported by the body portion of the tool and including a power element, a peen carried thereby, means for simultaneously rotating and reciprocating said power element with a relatively rapid vibratory stroke for upsetting and forming by the peen a rivet head on the stem of a rivet in a relatively soft body material without necessitating lateral support for the rivet stem between its ends, said means for rotating said power element being operably connected therewith at all times for effecting rotation of said power element on its power and return strokes, and control means for the motor carried by the tool.

2. A portable hand held power actuated riveting tool comprising, connected body and han-

dle portions, motor means mounted in and supported by the body portion of the tool and including a piston member having a rod extending outwardly of the tool, a peen on said rod, means for simultaneously rotating and reciprocating the piston member with a relatively rapid vibratory stroke for upsetting and forming by means of the peen a rivet head on the stem of a rivet in a relatively soft body material without necessitating lateral support for the rivet stem between its ends, said means for rotating said piston member being operably connected at all times for effecting rotation of said piston member on its power and return strokes, and control means for the motor carried by the tool.

3. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means mounted in and supported by the body portion of the tool and including a piston member having a rod extending outwardly of the tool, a peen on the rod, said piston member having differential pressure areas and vanes therebetween, means for supplying fluid pressure to said responsive vanes and areas for simultaneously rotating and reciprocating the piston member with a relatively rapid vibratory stroke for upsetting and forming by the peen a rivet head on the stem of a rivet in a body material, said fluid pressure supplying means being operably connected at all times with said vanes to supplying fluid pressure thereto at all times for effecting rotation of said piston member on its power and return strokes, and means for controlling the supply of fluid pressure to the piston member.

4. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means including inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively mounted within the inner barrel, the outer barrel securing the motor means in place and the inner barrel within the outer barrel, a peen carried by the piston member, means for simultaneously rotating and reciprocating the piston member with a relatively rapid vibratory stroke within the inner barrel for upsetting and forming by the peen a rivet head on the stem of a rivet in a body material, said means for rotating said piston member being operably connected therewith at all times for effecting rotation of said piston member on its power and return strokes, and control means for the motor carried by the tool.

5. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively mounted within the inner barrel, the outer barrel having an end wall extening over and closing the outer end of the inner barrel and engaging the same for holding the inner barrel within the outer barrel, a rod fixed to the piston member and extending outwardly of the tool through said end wall, a peen on the rod, means for simultaneously rotating and reciprocating said piston member with a relatively rapid vibratory stroke for upsetting and forming by the peen a rivet head on the stem of a rivet in a body material, said means for rotating said piston member being operably connected therewith at all times for effecting rotation of said piston member on its power and return strokes, and means carried by

the tool for controlling the operation of the motor.

6. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively mounted within the inner barrel, a seat in the body portion of the tool for closing the inner end of the inner barrel, the outer barrel having screwed connection with the body portion of the tool and having an end wall closing and engaging the outer end of the inner barrel for clamping the inner barrel against said seat, means for simultaneously rotating and reciprocating the piston member with a relatively short vibratory stroke, said means for rotating said piston member being operably connected therewith at all times for effecting rotation of said piston member on its power and return strokes, a peen operatively connected with said piston member for forming a rivet head on the stem of a rivet, and control means for the motor carried by the tool.

7. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively mounted within the inner barrel, said piston member having means for simultaneously rotating and reciprocating the same with a relatively rapid vibratory stroke on supplying fluid pressure to said piston member, the inner barrel having ports and passages for supplying fluid pressure to the inner barrel for operation of said piston member, said ports for supplying fluid pressure for effecting rotation of said piston member being open at all times during the power and return strokes of the piston member to effect rotation of said piston member during such strokes, a peen operatively connected with the piston member for upsetting and forming a rivet head on the stem of a rivet, and means carried by the tool for controlling the supply of fluid pressure to the barrels.

8. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in the body portion of the tool and a piston member operatively disposed within the inner barrel, said piston member having means for simultaneously rotating and reciprocating the same with a relatively rapid stroke in response to fluid pressure admitted to the piston member from between the inner and outer barrels, said inner barrel having inlet and exhaust passages for the fluid pressure, the inlet passages being between the two barrels and serving to receive fluid pressure from one end of the inner barrel, and certain of said inlet and exhaust passages being operably connected at all times to the piston member during the power and return strokes of the piston member to effect rotation of said piston member during such strokes, a peen carried by the piston member for forming a rivet head on the stem of a rivet, and means carried by the tool for controlling the supply of fluid pressure to said barrels.

9. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively disposed within the inner barrel, said

body portion having a seat for the inner barrel and a supply channel about the same, said piston member having means for simultaneously rotating and reciprocating the same with a relatively rapid vibratory stroke in response to fluid pressure admitted to the piston member from between the inner and outer barrels, said inner barrel having inlet and exhaust passages for the fluid pressure, the inlet passages being between the barrels and opening into the supply channel about the seat on the body portion at the inner end of the inner barrel, certain of said inlet and exhaust passages being open and connected at all times with said piston member during the power and return strokes thereof to effect rotation of said piston member during such strokes, a peen carried by the piston member for forming a rivet head on the stem of a rivet, and means carried by the tool for controlling the supply of fluid pressure to the barrels.

10. A portable hand held power actuated riveting tool comprising, connected body and handle portions, motor means having inner and outer barrels mounted in and supported by the body portion of the tool and a piston member operatively disposed within the inner barrel, said inner barrel providing a cylinder for said piston member, said outer barrel having an end wall closing the outer end of said cylinder and engaging the adjacent end of the inner barrel for holding the same in place, means on the piston member for simultaneously rotating and reciprocating the same with a relatively rapid vibratory stroke in response to fluid pressure admitted to said cylinder, inlet and exhaust passages for the fluid pressure in the inner barrel and exhaust ports in the end wall of the outer barrel about its closing contact with the inner barrel, certain of said inlet and exhaust passages being open and connected at all times with said rotating means on the piston member to effect rotation of said piston member during such strokes, a peen operated by said piston member to form a rivet head on the stem of a rivet, and means carried by the tool for controlling the supply of fluid pressure to said barrels.

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