Jan. 29, 1963

R. W. KISSANE

3,075,197

POWDER ACTUATED TOOL

Filed Jan. 18, 1961

3 Sheets-Sheet 1

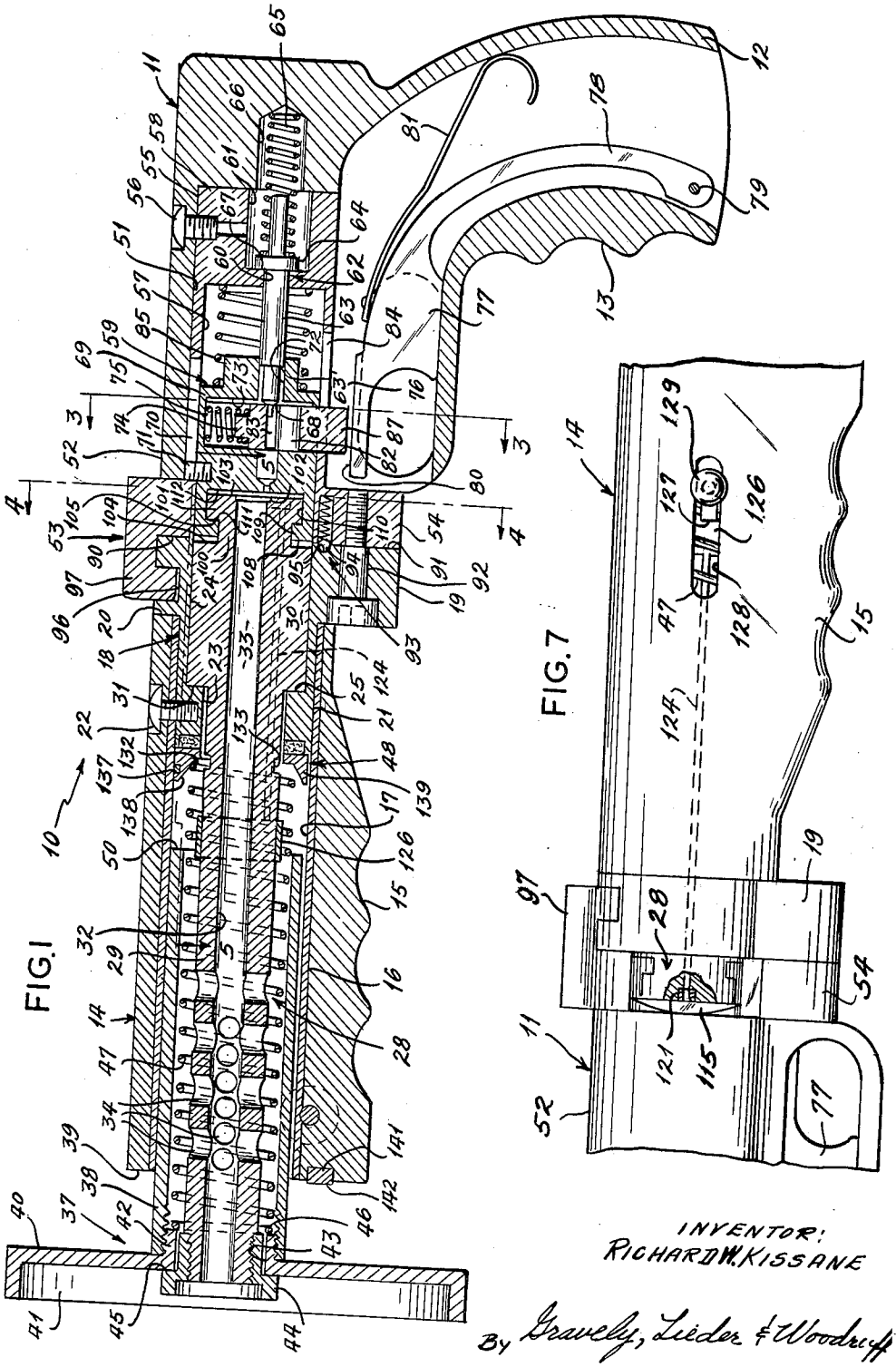


FIG. 1

FIG. 7

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3 Sheets-Sheet 2

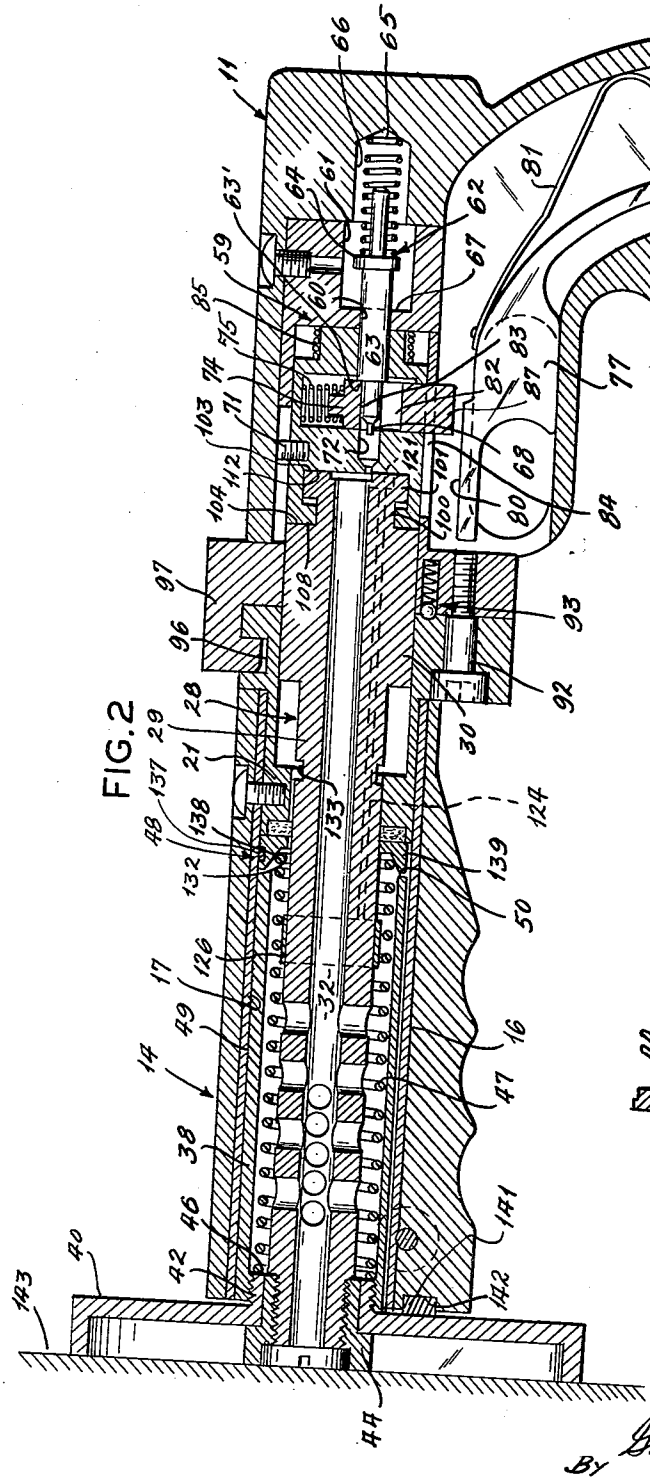


FIG. 2

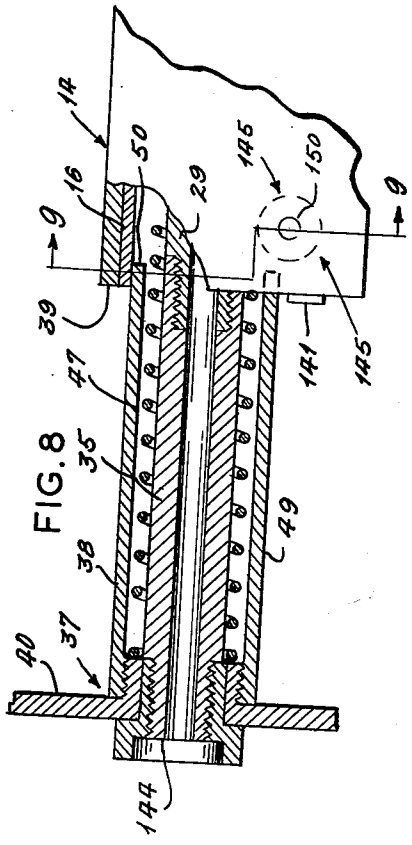


FIG. 8

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FIG. 3

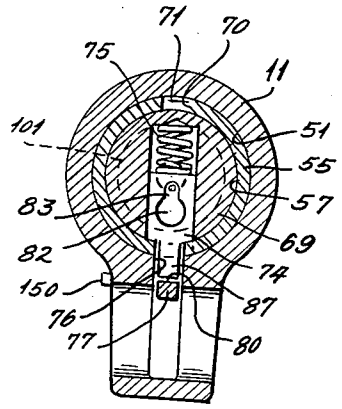


FIG. 4

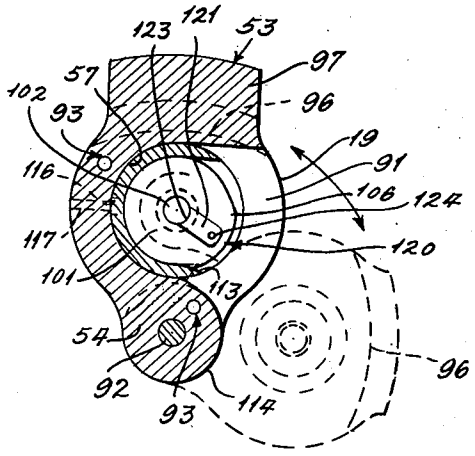


FIG. 5

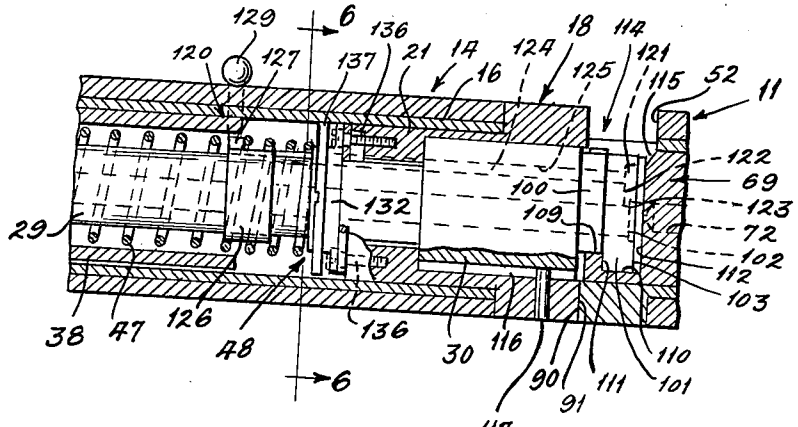


FIG. 6

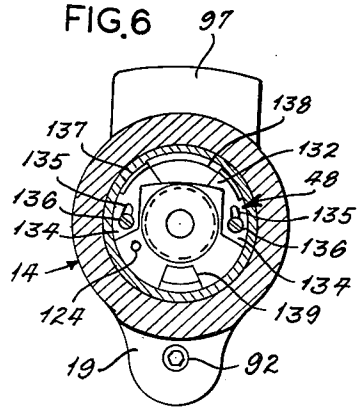
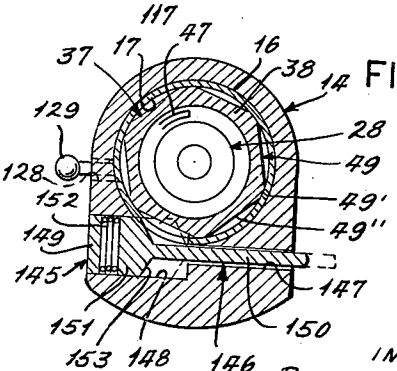


FIG. 9



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3,075,197

POWDER ACTUATED TOOL

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Filed Jan. 18, 1961, Ser. No. 83,450
13 Claims. (Cl. 1—106)

This invention relates generally to fastener driving tools and more particularly to a tool of the type for driving powder actuated fasteners.

The principal object of the present invention is to provide an improved powder actuated fastener driving tool of structural simplicity, economically manufactured and efficiently, safely and easily operated.

Other objects and advantages of this invention will become apparent hereinafter.

The invention is embodied in a tool for powder actuated fastening devices and including a barrel assembly housed in a side opening housing and slidable in the housing between inoperative and operative positions, firing pin means rendered operative when the barrel is in operative position only, shield means, safety means and ejector means, and a barrel spring having an operative connection with each of said barrel assembly, shield, safety and ejector means.

The invention also consists in the parts and in the arrangements and combinations of parts described and claimed. In the accompanying drawings which form a part of this specification and wherein like numerals identify like parts wherever they occur:

FIG. 1 is a vertical cross-sectional view taken through the length of a tool embodying the invention and showing the parts in inoperative position,

FIG. 2 is a view similar to FIG. 1, but showing the parts of the tool in ready-to-fire position,

FIG. 3 is a cross-sectional view taken substantially along line 3—3 of FIG. 1,

FIG. 4 is a cross-sectional view taken substantially along line 4—4 of FIG. 1, and showing the breech in an open loading position in broken lines,

FIG. 5 is a horizontal view, partly in section, taken substantially along line 5—5 of FIG. 1,

FIG. 6 is a cross-sectional view taken substantially along line 6—6 of FIG. 5,

FIG. 7 is an elevational view, partly in cross-section, showing the ejector device of the tool,

FIG. 8 is a fragmentary sectional view of the tool showing a barrel extension device, and

FIG. 9 is a vertical cross-sectional view taken along line 9—9 of FIG. 8.

Referring now to the drawings, the tool 10 shown for purposes of illustration comprises a rear housing member 11 including a handle 12 with a finger grip portion 13, and a front housing member 14 having a hand grip 15 and a sleeve liner 16 received in the front housing 14 and defining a housing bore 17. A front breech member 18 forming a position of the tool housing has a hinge portion 19 positioned in abutment with the breech end 20 of the front housing member 14 and has a cylindrical portion 21 extending axially into the bore 17, the front housing member 14 and front breech member 18 being secured together by fastening means 22 and together forming a barrel housing or casing. The front breech member 18 has a bore 23 and counterbore 24 extending axially therethrough and forming an annular shoulder 25.

A barrel assembly 28 is slidably positioned in the front housing member 14 and front breech member 18, and includes a barrel 29 and an enlarged breech portion 30 slidable in the bore 23 and counterbore 24 of the front breech member, respectively. An annular shoulder 31 is formed between the barrel 29 and breech portion 30

for abutment against the shoulder 25 to position the barrel assembly 28 in the barrel housing, as will appear hereinafter. The barrel 29 has a bore 32 forming a powder charge and fastener receiving chamber 33 in its breech end and has a plurality of ports adjacent its muzzle end for the escape of gas therefrom. A barrel extension 35, FIG. 8, is also provided for special placement of fasteners as will be set out hereinafter.

A shield device 37 is provided for covering the area around the point of placement of the fastener (not shown) by operation of the tool 10, the shield device 37 comprising a sleeve 38 slidably mounted in the bore 17 at the muzzle end 39 of the front housing 14, and a shield 40 defining a hollow enclosure 41. The shield 40 has an annular flange 42 threaded in the end of the sleeve 38, and forming an axial opening 43 through which the muzzle end of the barrel 29 extends. A muzzle cap 44 is threaded on the end of the barrel 29 and forms an abutment, at 45, for limiting movement of the shield device 37 outwardly of the front housing 14 relative to the barrel 29. It will be seen that the inner end 46 of the shield flange 42 forms a seat for one end of a spring 47, which spring circumscribes the barrel 29 and has its other end seated against a safey mechanism 48 mounted on the front breech member 18. The sleeve 38 preferably has a hexagonal or like outer surface 49 (FIG. 9) providing limited contact areas 49′ for sliding engagement with the bore 17 of the liner 16 and flats 49″ for accommodating dust and like foreign particles. This foreign matter inevitably gets into the tool housing 14 and tends to bind the sleeve in its relative sliding movement in the housing bore 17. The sleeve 38 extends into the bore 17 a substantial distance in normal operation and is adapted to permit the use of the barrel extension 35 while having its free end 50 maintaining an operative sliding fit in the muzzle end 39 of the barrel housing 14.

The rear housing member 11 has an axial bore 51 with an open breech end 52, and a back breech member 53 forming a portion of the housing has a hinge portion 54 positioned against the breech end 52 and a cylindrical portion 55 received in the bore 51 and secured to the housing 11 by fastening means 56. The rear housing member 11 and back breech member 53 together forming a firing pin assembly housing. The cylindrical portion 55 has a bore 57 with a back wall 58 and houses a firing pin assembly 59, the bore 57 being substantially conterminous with the bore 24 of the front breech member 18. The back wall 58 has a bore 60 and a counterbore 61 forming a chamber for a firing pin member 62, the firing pin having a stepped shank portion 63 forming an annular abutment shoulder 63′ and extending through the bore 60 toward the cartridge chamber 33, an annular stop 64 being formed on the pin 62 for abutment against the shoulder 67 at the forward end of the chamber to limit forward movement of the firing pin 62 relative to the chamber. The firing pin 62 is biased forwardly by a spring 65 in the chamber, and the chamber may include a bore 66 formed in the housing 11 or the bore 61 in the back breech housing 53 or both of the bores 66 and 61. The forward end of the shank 63 carries the pin element 68 of the firing pin member 62 adapted for striking contact with powder cartridges (not shown) in the breech chamber 33.

The firing pin assembly 59 includes a cylindrical firing pin housing 69 slidably mounted in the back breech bore 57, the cylindrical portion 55 of the back breech member 53 having an axially extending slot 70 in which a guide pin 71 of the firing pin housing 69 is positioned to assure non-rotational movement thereof. The guide pin also limits the relative forward position of the firing pin housing 69 in the back breech member 53, as will become more apparent hereinafter. The firing pin housing 69

has a firing pin bore 72 extending in an axial direction therethrough, and a vertical cross bore 73 intersects the firing pin bore 72 and houses a sear 74. The sear is biased downwardly by a sear spring 75 and has a detent 87 which extends through an elongated trigger opening 76 in the housing 11. A trigger 77 is positioned in a guard opening and has a lever 78 pivoted, at 79, to the handle 12, the trigger 77 having an elongated sear contacting surface 80 arranged in operative position for contact with the sear detent 87 at all times. A leaf return spring 81 is provided for returning the trigger 77 to the position shown in FIGS. 1 and 2 after firing, and it will be noted that a large degree of leverage is provided.

The sear 74 includes a keyhole opening including a large lower bore 82 and a small upper bore 83, the bore 82 being adapted to receive the firing pin shank 63 therethrough when the tool is fired and the upper bore 83 being adapted to retain the pin element 68 when the firing pin 62 and firing pin housing 69 are in their extended inoperative positions, FIG. 1, and the surface of the sear 74 around the bore 83 engaging the abutment shoulder 63' in a lost-motion connection during cocking of the tool, FIG. 2. This lost-motion movement of the firing pin 62 relative to the housing 69 and sear 77 during actuation of the parts of the tool 10 from an inoperative position as in FIG. 1 to an operative or cocked, ready-to-fire position as in FIG. 2 will be defined more fully hereinafter. The detent 87 is elongated in an axial direction of the tool and is positioned in an elongated lower slot 84 in the cylindrical portion 55 of the back breech member to prevent rotation of the sear 74 during movement of the firing pin housing 69 between inoperative and operative positions so that the keyhole opening 82, 83 for the firing pin 62 will be maintained in an axial position. The axial limits of the slot 84 also cooperate with the slot 70 and guide pin 71 in limiting forward movement of the firing pin housing 69 relative to the back breech member 53. A spring 85 is positioned in the bore 57 of the back breech member 53 between the back wall 58 and the firing pin housing 69 to bias the latter toward the breech portion 30 of the barrel assembly 28 when the tool is cocked.

As shown in FIGS. 1, 4 and 5, the present tool 10 has a side opening breech for loading the chamber 33, the front and back breech members 18 and 53 having mating faces 90 and 91 and being hinged on pin 92 for relative pivotal movement. Friction locking means 93 are provided for maintaining the breech members 18 and 53 in closed position, the locking means comprising spring loaded balls 94 mounted in the hinge portion 54 of the back breech member 53 and seated in mating depressions 95 formed in the face 91 of the hinge portion 19 of the front breech member 18. The hinge pin 92 is located in a lower projecting portion of the front and back breech member hinge portions 19 and 54 so that the breech end of the barrel assembly 28 will be fully exposed when the tool 10 is opened. Diametrally opposite to the hinge pin 92, the hinge portions are provided with interfitting means to prevent axial separation of the breech members 18 and 53 during firing of the tool. The front breech member has an arcuate groove 96 milled substantially on a radius from the hinge pin 92 and the back breech member 53 is provided with a hook member 97 substantially complementary to the groove wall and preferably having a slight frictional fit therewith.

The breech portion 30 of the barrel assembly 28 and the firing pin housing 69 of the firing pin assembly 59 also have an interfitting relationship. The breech portion 30 includes a neck 100 and head 101 through which the cartridge and fastening means chamber 33 extends, an annular depression 102 being formed at the rearward face 103 of the head 101 for seating the rims of powder cartridges (not shown). The neck 100 is reduced in size relative to the breech portion 30 and head 101 to form radially extending limit surfaces 104 and 105, as will be described. However, a portion of the neck and head project radially outwardly, as at 106, in an elliptical-like pattern, FIG. 4. The firing pin housing 69 has an end face 108 in opposed relation with the surface 104 of the breech portion 30, and this housing 69 is machined to form a yoke 109 to receive the neck 100 of the barrel assembly 28 and to form a recess 110 to receive the head 101. The recess 110 has opposed surfaces 111 and 112 and the firing pin bore 72 opens into the recess through the surface 112. As shown in FIGS. 4 and 5, the yoke 109 and recess 110 have a side opening, at 113, for relative pivotal action of the housing members to expose the barrel assembly 28 for loading the chamber 33. It will be noted that the axial distance of the neck 100 between the opposed surfaces 104 and 105 is the same as the axial distance of the recess 110 between the surfaces 111 and 112, and that the yoke 109 and head 101 are adapted for relative axial movement. Still referring to FIGS. 4 and 5, the hinge portion 54 of the back breech member 53 has a side open section 114 to permit clearance of the neck 100 and head 101 of the barrel assembly 28, and the firing pin housing 69 is beveled, at 115, to prevent jamming the head 101 thereagainst when the tool is being closed after loading the chamber 33. The breech portion 30 of the barrel assembly 28 has a longitudinal or axially extending slot 116 formed in its side in which a guide pin 117 is positioned for providing rectilinear non-rotational movement of the barrel assembly 28 in the housings 11 and 14.

Referring now to FIGS. 1, 4, 5 and 7, an ejector mechanism 120 is provided for discharging spent cartridge shells from the chamber 33, the ejector 120 including an ejector lug 121 positioned in a recess 122 in the face 103 of the head 101 and being substantially flush therewith. The lug 121 extends radially from the cartridge shell chamber 33 toward the elliptical portion 106 of the head, and has a lip 123 forming a portion of the continuous cartridge rim engaging depression 102. The lug 121 is secured on a rod 124 slidably mounted in an axially extending bore 125 through the ellipse portion 106 of the head 101 and neck 100 and through the breech portion 30 of the barrel assembly 28. The rod 124 has its other end secured to a collar 126 circumscribing the barrel 29 inside of the spring 47. The collar 126 includes spaced lugs 127 which receive and seat a turn of the spring 47 thereby biasing the collar in a forward direction (toward the muzzle end of the tool 10) to normally maintain the lug 121 in a retracted position seated in the recess 122. An elongated opening 128, FIG. 7, is formed in the wall of the housing 14 and liner 16, and a handle 129 extends outwardly of the housing and is threaded in one lug 127.

The safety mechanism 48 against which one end of the barrel spring 47 is seated, is provided to assure that the tool 10 will not be operative in the event the spring 47 and shield device 37 are removed. As shown in FIGS. 1, 2, 5 and 6, the safety mechanism 48 includes a yoke member or latch plate 132 positioned above an annular groove 133 in the barrel 29, FIG. 1, and having downwardly extending sides 134 with arcuate slots 135 through which bolts 136 extend and are secured to the cylindrical portion 21 of the front breech member 14. Spacers are provided to maintain the bolts 136 in a loose fitting relationship in the slots 135 whereby the latch plate 132 is freely slidable. The sides 134 of the plate clear the barrel groove 133 and barrel 29 and the lower margin of the plate 132 is biased toward the barrel groove 133 by a leaf spring 137. An upper beveled guide block 138 is secured to the center of the latch plate 132 and a similar block 139 is secured to the end of the cylindrical portion 21 of the front breech member diametrally opposite to the upper block 138. When the spring 47 is assembled in the barrel bore 17 under compression, its end seats against the fixed lower block 139 and movable upper block 138 moving the blocks apart to raise the latch

plate 132 against the biasing action of the leaf spring 137 and clear the barrel 29 for axial movement.

Referring now to FIGS. 1, 8 and 9, it will be seen that the barrel extension 35 may be threaded on the muzzle end of the barrel 29 in place of the muzzle cap 44 and the muzzle cap 44 is then threaded on the outer end 144 of the barrel extension 35 to retain the guard or shield device 37 thereon. The length of the sleeve 38 is predetermined so that the free end 50 is positioned within the bore 17 of the housing 14 adjacent to the muzzle end 39 thereof. A longer barrel spring 47 must be substituted to provide the compressive force necessary to maintain a normally expanded or inoperative condition of the tool parts. The barrel extension 35 is utilized in placing fasteners in recessed openings and the like where the shield would be moved relative to the barrel, and it is necessary that extra barrel length be provided to assure movement of the barrel and firing pin assemblies 28 and 59 to ready-to-fire position, as will be described.

Inasmuch as the tool can be conditioned for firing when the barrel means 35 extend beyond the shield 40 a substantial distance under the foregoing circumstances, a safety device 145 is provided so that the operator cannot accidentally discharge the tool and must manually release the shield for relative recessing movement into the housing bore 17.

The safety device 145 comprises a laterally moveable member 146 received in a bore 147 and counterbore 148, the counterbore intersecting the housing bore 17 and having its outer end closed by a plug 149. The member 146 includes a rod portion 150 slidable in the bore 147 and extending outwardly of the housing 14, and an enlarged head or stop portion 151 slidable in the counterbore between a retracted, inoperative position in the counterbore 148 and a normally extended position in which the stop 151 projects into the barrel bore 17. Spring means 152 are provided for biasing the stop portion 151 of the member 146 toward its normally extended position in the bore 17. In normal operation of the tool 10 (when no extension 35 is needed) the shield sleeve 38 extends past the member 146 and acts against the shoulder 153 between the rod and stop portions 150 and 151 overcoming the force of the spring 152 to maintain the stop portion in retracted inoperative position in the counterbore 148. However, when the barrel extension 35 is attached to the barrel portion 29, the shield 40 is positioned outwardly of the muzzle end 39 of the housing 14 with the free end 50 of the sleeve 38 adjacent to the housing muzzle and outwardly of the safety device 145. Accordingly, the member 146 is unrestrained and is moved laterally to its extended operative position in the bore 17 by the spring 152 thereby forming a positive stop in the bore 17 with respect to relative sliding movement of the sleeve 38 therein. In order to condition the tool for operation the member 146 is moved laterally by manual pressure on the free end of the rod 150.

Referring again to FIG. 1 it will be seen that in the inoperative position of the tool 10 the barrel spring 47 exerts a force on the muzzle end of the barrel assembly 28 (acting against the shield sleeve 42 and muzzle cap 44) to maintain the barrel assembly in an expanded position relative to the front housing 14 and front breech block 18. The shoulder 31 of the barrel assembly 28 is in abutment with the shoulder 25 of the front breech block to position the rear surface 104 of the enlarged breech portion 30 forwardly of the mating faces 90 and 91 of the front and rear breech members 18 and 53, respectively. The spring 85 of the firing pin assembly 59 positions the assembly in an inoperative forward position with the front end face 108 of the yoke member 109 spaced apart a predetermined distance from the surface 104 of the barrel breech portion 30 and rearwardly of the mating surfaces 90 and 91 of the breech members 18 and 53. The forward position of the firing pin assembly 59 is determined by the guide pin 71 forming an abutment with the end of the slot 70 and the detent 87 of the sear 74 abutting the forward end of the slot 84. The clearance between the surfaces 104 and 108 is provided so that the neck 100 of the barrel and the yoke 109 of the firing pin assembly are aligned relative to the hinge faces 90 and 91 of the housing members for opening and closing the tool for loading purposes.

Proper alignment or positioning of the neck and head 100, 101 relative to yoke and recess 109, 110 is also assured by the bevel surface 115 of the firing pin assembly 59, FIG. 5. This surface 115 also assures that a cartridge inserted into the cartridge chamber 33 is properly seated with its rim in the annular depression 102 and not projecting out of the chamber at an angle. In other words, a wiping or camming action is provided between the shell and breech faces when the tool is closed to slide the cartridge shell into place.

Referring to FIGS. 4, 5 and 7, the ejector mechanism 120 is adapted to be moved between a normally retracted position in which the ejector lug 121 is flush with the surface 103 of the barrel head 101 and an extended or operative position in which the lug 121 is moved axially rearwardly so that the lip 123 will eject a spent shell from the annular depression 102. The barrel spring 47 exerts a return force on the collar 126 of the ejector mechanism against which a manual ejection force is applied and which return force maintains the normally inoperative position of the lug 121.

The firing pin assembly 59 includes the sear 74 having an operative position relative to the trigger surface 80 at all times except when the tool has been discharged and before the parts of the tool are returned to inoperative positions for re-loading. Inasmuch as the trigger has a large leverage because of the lever 78 and remote pivot point 79 thereof, a stronger sear spring 75 may be provided to prevent accidental movement of the sear 74 while still providing a relatively light trigger action.

The travel distance of the firing pin 62 from its ready-to-fire or cocked position is predetermined relative to the length of the bore 72 of the firing pin assembly 59 between the head or pin element 68 and the cartridge rim position in the recess 102, and the required indent of the firing pin to discharge a cartridge shell is precise. The force of the firing pin spring 65 is also predetermined, and the relative movement of the housings 11 and 14 relative to the barrel and firing pin assemblies 28 and 59 to provide a substantially full compression of the springs 47 and 85 is required to position the firing pin assembly in substantially firm abutment with the end wall 58 and barrel assembly 28 so that the firing pin will be cocked and operative to discharge a cartridge when the trigger 77 is actuated. An insert plug 141 is provided in a recess 142 in the muzzle end 39 of the front housing 14 to function as an abutment for the shield member 40 and predetermine the axial movement of the shield and barrel assembly 28 relative to the housing 14. Accordingly, the relative axial movement of the barrel assembly and firing pin assembly toward cocked position in the tool housings 11 and 14 can be precisely set in a simple manner.

It will be noted that a manually applied pressure pushing the tool housings 11 and 14 toward a work surface 143 in which a fastener is to be placed will press the shield 40 and muzzle cap 44 against the work surface to telescopically move the tool housings over the barrel assembly 28 and effect endwise or axial movement of the barrel 29 and shield sleeve 38 in and relative to the housing 14. The barrel assembly takes up the lost-motion connection with the firing pin assembly 59, which then moves in concert with the barrel assembly toward the ready-to-fire postion in which the firing pin housing 69 is in abutment with the end wall 58 of the back breech housing 55. During this movement toward ready-to-fire position a lost-motion connection is provided between the sear 74 and firing pin abutment 63', the sear sliding

upwardly in its bore 73 to receive the forward reduced shank portion whereby substantial movement of the parts toward ready-to-fire postion must occur before the firing pin is engaged and moved to load the firing pin spring 65. It will also be noted that the discharge or forward travel distance of the firing pin before the stop 64 contacts the shoulder 67 of the chamber 61 is preselected so that the fiiring pin head 13 will precisely contact a cartridge in the chamber 33. However, in the event the firing pin housing 69 is not substantially fully moved to ready-to-fire position to cock the firing pin 62 the distance between the stop member 64 and the shoulder 67 will be shortened whereas the travel distance between the firing pin head 68 and the cartridge is fixed. Accordingly, unless the barrel and firing pin assemblies are moved to a fully retracted postion, the firing pin stop member 64 will prevent discharge of the cartridge even if the trigger 77 is moved to actuate the sear 74, in which case the firing pin shank 63 is released into the sear bore 83 and will require the tool to be returned to inoperative position in order that the firing pin 62 may be engaged by the sear and conditioned for operation. It will be readily apparent that if the tool 10 is tilted at an angle to the surface 142, the shield will not form a closed chamber 41 with the surface so that dust and particles may escape around the shield when the tool is fired and create a hazardous work condition. It is also apparent that even though the shield 40 may be moved relative to the housing 14 to compress the spring 47, the barrel assembly 28 will be biased toward an extended position by the firing pin assembly 59 and its relatively weaker spring 85 so that movement of the barrel and firing pin assemblies toward cocked position is independent of the movement of the shield and requires that the muzzle cap 44 be contacted and moved in concert with the shield for operation of the tool. Therefore, at an angular postion the muzzle cap 44 will contact the work surface 143 after partial relative movement of the shield 40 has taken place whereby movement of the tool parts to fully operative position with the firing pin housing 69 in abutment with the end wall 58 will not occur if the angle of the shield is above a predetermined maximum, such as 5° to 7°.

The other safety features comprise the safety mechanism 48 and the safety device 145. The mechanism 48 is mounted in the housing bore 17 on the front face of the front breech member 18 for radial movement therein. The leaf spring 137 biases the latch plate 132 inwardly toward an abutment forming position in the groove 133 of the barrel 32 whereby axial movement of the latter will be prevented. However, the barrel spring 47 has one end seated on the canted blocks 138 and 139 to overcome the leaf spring force and normally maintain a retracted position of the latch plate 132. In the event the shield 40 and spring 47 are removed, the safety mechanism will be operative to prevent cocking action of the barrel assembly 28. The safety device 145 is provided to prevent shield movement into the housing 14 when a barrel extension 35 is used, unless a manual pressure is applied to move the stop portion 151 out of the bore 17 whereby the end 50 of the shield sleeve 38 can slide past the safety device 145.

From the foregoing it will be apparent that a simplified, but positive acting and efficient powder tool has been provided. Changes and modifications of the foregoing specification that will be readily apparent to all skilled in the art are contemplated as within the spirit and scope of the invention, which is limited only by the claims which follow.

What I claim is:

1. A powder actuated tool comprising front and rear housing members hinged together for side opening movement, a barrel assembly slidable in the housing members between forward inoperative and rearward operative positions and having a breech end for receiving a cartridge, a firing pin assembly slidable in the rear housing member between forward inoperative and rearward operative positions and including a firing pin and firing pin control means, said firing pin control means having a lost-motion connection with said barrel assembly for subsequent concert movement therewith to operative position and also having a lost-motion connection with the firing pin for moving it to a ready-to-fire position in the latter portion of barrel assembly and firing pin control means movement to operative postion, and means for limiting the travel distance of said firing pin toward the breech end of said barrel assembly whereby said firing pin will not discharge a cartridge unless said barrel assembly is substantially fully retracted to operative position.

2. The tool according to claim 1 wherein trigger means are provided in operative postion relative to said firing pin control means, and said firing pin control means normally slidably engage the firing pin for guiding the firing pin in its lost-motion movement relative to said firing pin control means.

3. The powder actuated tool according to claim 1 wherein said front and rear housing members have mating faces in sliding contact during side opening movement of said housing members, and the space defining the lost-motion connection between said barrel assembly and firing pin control means extending axially on each side of said mating faces of said housing members.

4. The powder actuated tool according to claim 1 wherein said firing pin control means includes a breech member slidable in said rear housing member and having a firing pin bore, a cross bore in said breech member, and a sear postioned in said cross bore and having a keyhole opening receiving at least a part of said firing pin at all times.

5. The powder actuated tool according to claim 4 wherein sear spring means are provided between one end of said sear and said breech member to normally maintain said sear in an inoperative postion, the other end of said sear projecting out of said rear housing member, and trigger means having a sear contacting surface in position to contact said other end of said sear.

6. The powder actuated tool according to claim 5 wherein said trigger means includes a lever pivoted at a point remote from said sear contacting surface whereby said sear is adapted to be maintained against accidental displacement by relatively strong sear spring means.

7. In a tool of the type described, a housing including first and second members releasably secured together and adapted for relative opening movement, a barrel slidably postioned in said first member, spring means between said barrel and said first member urging the barrel to a forward postion away from the second member, ejector means positioned within the first member for sliding movement relative to said barrel and first member, said ejector means being movable from a retracted postion toward said second member for ejecting spent cartridges when said members are in open position, said ejector means having an operative connection with said spring means and being normally maintained in said retracted position thereby.

8. In a tool of the type described, a housing including front and rear members releasably secured together and adapted for opening movement, said front housing member having a front bore and a rear counterbore, a barrel assembly including a breech portion slidably postioned in said rear counterbore and a barrel positioned in said front bore in spaced relation with the bore wall to define an annular chamber, said barrel having a muzzle end, said breech portion having a cartridge receiving opening including an annular recess for seating the cartridge rim, compression spring means in the front bore between the muzzle end of said barrel and front housing member normally maintaining the barrel assembly in a forward postion relative to the front housing member, and ejector means including a lug recessed in the breech portion of said barrel assembly and having a lip forming a portion

of said annular recess seating the cartridge rim, and control means extending between the front bore and the lug, said spring means being compressed between said control means and said front housing member to exert a force on said control means normally maintaining said lug in seated position in said breech portion of said barrel assembly, and means for actuating said control means to move said lug to a projected position for ejecting spent cartridges when said housing members are in open position.

9. The tool according to claim 8 wherein said control means of said ejector means comprises a collar circumscribing said barrel in said front bore and a rod connecting said collar and said lug.

10. In a tool of the type described, a housing having a bore, a barrel assembly mounted for sliding movement within said bore and including a muzzle end and a breech end, barrel spring means for normally maintaining said barrel assembly in an expanded position forwardly in said housing bore, safety means mounted on said housing within said housing bore for radial sliding movement relative to said housing and barrel assembly between a radially outer inoperative position and a radially inner position for limiting sliding movement of the barrel assembly relative to said housing, said barrel spring means being positioned between said muzzle end of said barrel and said safety means and normally urging said safety means to the inoperative postion thereof, and ejector means having a retracted inoperative postion and a projected position for ejecting spent cartridges from the breech end of said barrel assembly, said ejector means having a control end postioned within said housing bore in operative connection with said barrel spring means and normally being maintained in retracted position thereby.

11. In a tool of the type described, a housing having a bore with a muzzle end and an inner end, a barrel assembly mounted for axial movement relative to said housing between inoperative and operative positions, spring means in said bore having one end operatively connected to said barrel assembly and normally maintaining said barrel assembly in inoperative postion in said housing bore, and safety means including a latch plate movably mounted for limited radial movement on said housing at the inner end of said bore between said barrel assembly and the bore wall, an arcuate leaf spring secured to said latch plate and engaged against said bore wall biasing said latch plate radially inwardly toward said barrel assembly, said latch plate including first camming means having an inclined surface sloping inwardly toward the inner end of said bore, said safety means also including second camming means secured to said housing diametrally opposite to said first camming means and having an inclined surface sloping inwardly toward the inner end of said bore, said barrel assembly including a groove radially inwardly of said latch plate when said barrel assembly is in inoperative position, said leaf spring urging said latch plate toward an operative position within the groove for preventing axial movement of said barrel assembly toward its operative postion in said housing bore, and said spring means having its other end seated against the inclined surfaces of said first and second camming means and exerting a force greater than said leaf spring for normally maintaining said latch plate in a retracted postion radially outwardly of said barrel assembly groove.

12. A powder actuated tool comprising front and rear housing members having mating faces and being pivotally connected for side opening movement, co-axially aligned bores in said housing members forming a breech chamber, a barrel assembly having a breech portion slidably mounted in the bore of said front housing member, a firing pin assembly slidably mounted in the bore of said rear housing member, spring means normally maintaining an inoperative condition of said assemblies in said breech chamber, said assemblies having opposed surfaces normally spaced apart a predetermined distance to provide a relative lost-motion movement therebetween, said surfaces of said assemblies being recessed axially away from the radial plane of mating faces of housing members for side opening clearance thereof, and said assemblies being movable relative to housing members to ready-to-fire position.

13. A powder actuated tool comprising front and rear housing members pivoted for side opening movement, a barrel assembly slidable within and relative to the housing members between a forward inoperative position and a rearward ready-to-fire position, said barrel assembly having a breech end adapted to receive a cartridge, a firing pin assembly including a breech block member slidable in the rear housing member between a forward inoperative position and a rearward ready-to-fire position, said breech block member and breech end of said barrel assembly having a lost-motion connection during initial movement of the latter relative to said housing members toward ready-to-fire position, sear means movable in concert with said breech block member, a firing pin member in contact with said sear means and having a lost-motion abutment therewith for concert movement with said barrel assembly and breech block member during terminal movement thereof toward ready-to-fire position, said concert movement of said firing pin member moving it from an inoperative postion to a cocked position, and other means for rendering said firing pin member inoperative to discharge a cartridge in said breech end of said barrel assembly unless said barrel assembly and breech block member are substantially fully retracted to ready-to-fire position.

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