Feb. 15, 1966 L. F. MULNO 3,235,154

PISTON TOOL

Filed June 28, 1963 2 Sheets-Sheet 1

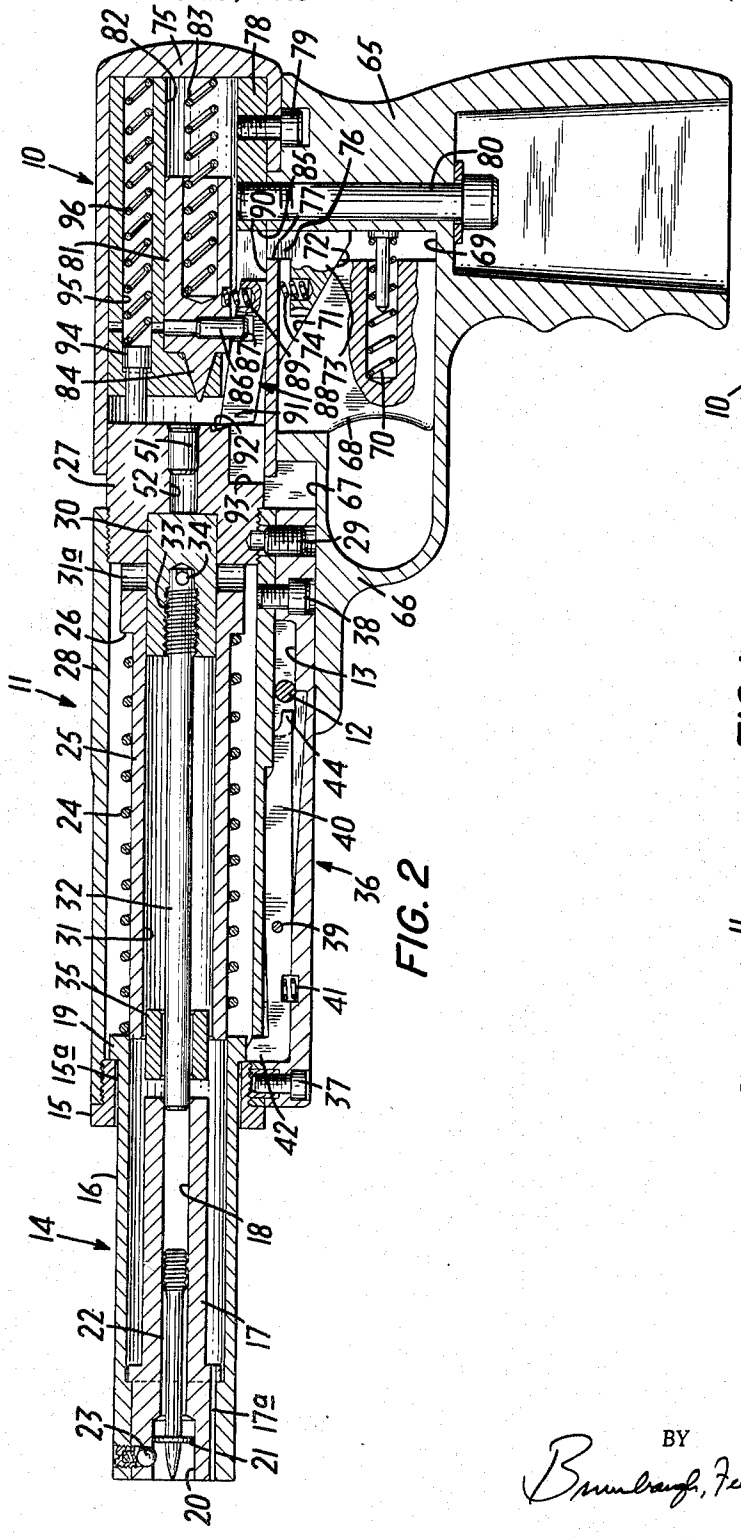


FIG. 2

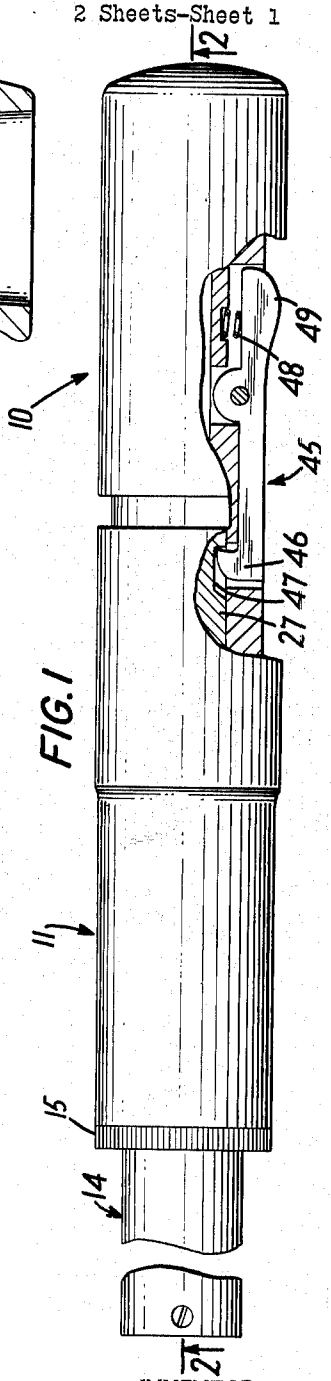


FIG. 1

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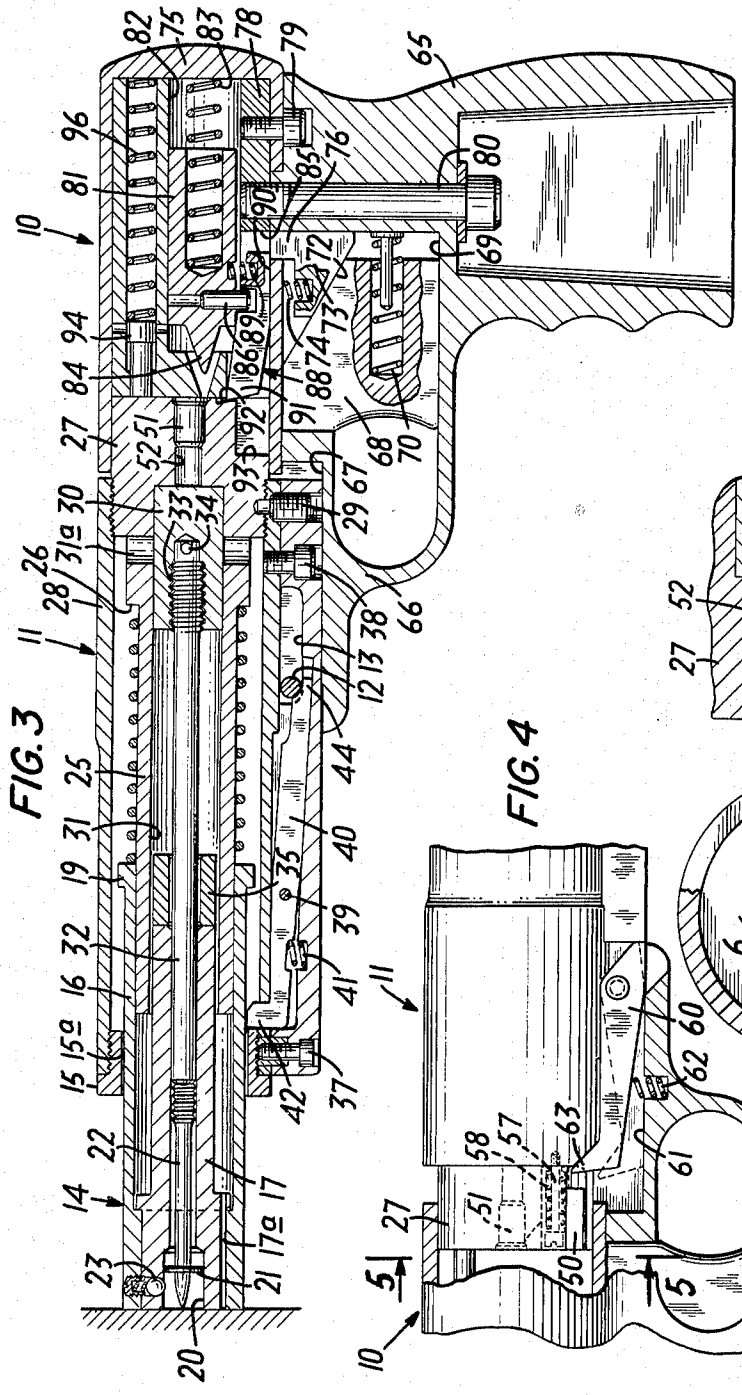


FIG. 3

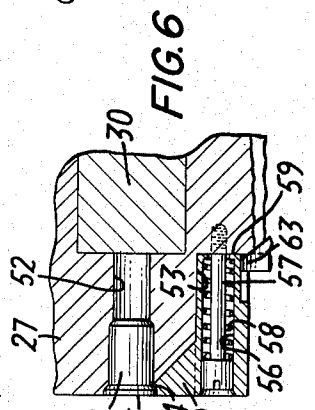


FIG. 6

FIG. 4

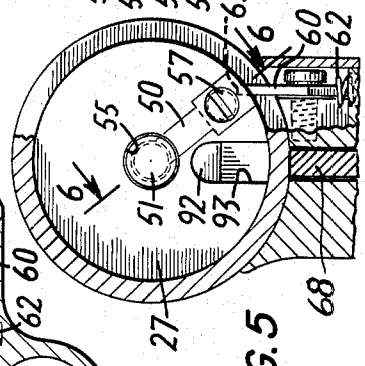


FIG. 5

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PISTON TOOL

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10 Claims. (Cl. 227—10)

This invention relates to explosively actuated piston-type tools for driving fasteners such as studs or bolts into construction materials such as masonry, for example, and, more particularly, to a new and improved piston tool arranged to drive fasteners of different lengths with maximum efficiency and safety and characterized by its simplicity of structure and operation.

In order to eliminate the danger associated with driving of fasteners at high velocity through the barrel of a powder actuated tool, various piston-type tools have been devised wherein the force of the explosion of a blank cartridge is imparted to the fastener through a driving piston which is held captive in the tool barrel. With this arrangement, a high driving force can be applied to the piston at relatively low velocity so that if the fastener escapes by passing through the material into which it is to be driven, for example, its velocity is not great enough to cause any damage.

Heretofore, however, piston-type fastener driving tools have not only been complex in structure and operation but have also been severely limited in the range of fastener lengths which can be accommodated without causing a deteriorating impact between the driving piston and the fastener.

Accordingly, it is an object of the present invention to provide a new and improved piston-type fastener driving tool which effectively overcomes the above-mentioned disadvantages of presently known tools.

Anther object of the invention is to provide a piston tool capable of driving fasteners having a wide range of lengths without permitting free flight of the piston or the fastener.

Another object of the invention is to provide a tool of the above character which is uncomplicated in structure and convenient in operation.

These and other objects of the invention are attained by providing a tool having a barrel with a breech end adapted to receive a cartridge, a fastener guide mounted at the forward end of the barrel for longitudinal motion with respect to the barrel and adapted to hold fasteners in position to be driven, and a piston slidable in the barrel and projecting forwardly therefrom to engage a fastener held in the fastener guide so as to transmit driving force thereto upon detonation of a cartridge without impact. Preferably, the fastener guide is urged forwardly with respect to the barrel and includes a rearwardly extending sleeve slidable into the barrel, the piston being formed with a forward extension which is received inside the sleeve.

The tool may also include a breech block member pivotally connected to the barrel having a forwardly urged firing pin slidable therein, along with a separate sear element slidably carried in a recess in the breech block. The sear element loosely receives a lateral projection from the firing pin so as to permit rocking motion of the sear element between a position engaging the breech end of the barrel and a position aligned with an opening in the barrel breech so as to permit forward motion of the sear element and the firing pin with respect to the barrel. Consequently, the tool can be cocked only when the fastener, piston, barrel breech and sear element are held in engagement by forward pressure applied to the breech block member regardless of the fastener length so that free flight of the piston and impact of the piston on the fastener is impossible.

Further objects and advantages of the invention will be apparent from a reading of the following description in conjunction with the accompanying drawings, in which:

FIG. 1 is a top view, partly broken away, showing a representative piston tool according to the invention;

FIG. 2 is a side view in longitudinal section, taken along the line 2—2 of FIG. 1 and looking in the direction of the arrows, illustrating the internal arrangement of the tool in its normal condition;

FIG. 3 is a sectional view similar to that of FIG. 2 showing the tool in the cocked condition;

FIG. 4 is a fragmentary view, partly broken away, illustrating the extractor actuator of the tool;

FIG. 5 is a view in transverse section, taken along the line 5—5 of FIG. 4 and looking in the direction of the arrows; and

FIG. 6 is a fragmentary sectional view, taken along the line 6—6 of FIG. 5 and looking in the direction of the arrows, showing the arrangement of the cartridge extractor of the tool.

As illustrated in FIGS. 1 and 2, the typical tool arranged according to the invention comprises a breech block and handle assembly 10 at the rear of the tool, a barrel assembly 11 slidably and pivotally connected to the breech block and handle assembly by a transverse pin 12 which passes through a longitudinal extending slot 13 in the barrel assembly, and a fastener guide assembly 14 slidably received in the forward end of the barrel assembly. As shown in FIG. 2, the fastener guide assembly comprises an outer housing member 16 and an internal guide member 17 having an axial bore 18 rigidly joined together, the housing member being formed with an outwardly projecting annular shoulder 19 inside the barrel assembly so as to be retained therein by the collar 15. A counter-bore 20, at the forward end of the fastener guide, has a diameter large enough to receive a disc 21 mounted on the forward end of a fastener 22 to be driven and a spring-biased ball detent 23 projects into the counter-bore to releasably retain the fastener in the guide.

To urge the fastener guide forwardly against the collar 15, a spring 24 in the barrel assembly 11 surrounds a barrel member 25 therein and extends from the rear surface of the guide housing 16 to a forwardly facing shoulder 26 on the outside of the barrel member. The barrel member 25 is enlarged at its breech end to form a barrel block 27 and a barrel housing 28 attached to the barrel block by a threaded connection and locked thereto by a set screw 29 supports the collar 15 by screw threads at its forward end.

A piston 30 closely fitting but freely slidable in the bore 31 of the barrel 25 is provided with a forwardly extending rod 32 which is just received in the rear end of the fastener guide bore 18 when the guide is extended and the piston 30 is in its rearmost position in the bore 31, as shown in FIG. 2, and to permit a close sliding fit of the piston 30 in the bore 31 and the piston rod 32 in the guide bore 18 without requiring excessively close manufacturing tolerances, the piston rod 32 and the piston 30 are joined by a loose threaded connection 33 and locked against relative rotation by a transverse pin 34. Also, to prevent damage to the pin guide 17 and the piston if no resistance is encountered in driving a fastener, a buffer collar 35, made of a relatively deformable material such as aluminum and loosely fitting on the rod 32, is slidable on the rod between the piston and the fastener guide.

Forwardly of the rear end of the bore 31, a distance approximately equal to the length of the shortest fastener to be driven, the barrel is formed with radial exhaust ports 31*a* providing communication between the bore 31 and the interior of the barrel housing 28 so as to permit explosion gases to be exhausted after the piston 30 has

traveled a corresponding distance. The collar 15, moreover, is also formed with gas escape passages 15*a* extending longitudinally adjacent to the fastener guide 16 and similar longitudinal passages 17*a* are provided in the fastener guide 17 to permit escape of air displaced by the piston 30 upon forward motion in the bore 31.

On the outside of the barrel housing 28, an interlock housing member 36 is mounted by two screws 37 and 38, the transverse slot 13 being formed in this member to receive the pin 12. Within the interlock housing, a pivot 39 supports a longitudinally extending interlock lever 40 for pivotal motion about an axis transverse to the barrel axis and a compression spring 41 urges the forward end 42 of this lever toward the axis of the barrel 25. In the normal position shown in FIG. 2, however, the forward end of the lever, which projects inwardly through an opening in the housing 28 toward the barrel axis, is held outwardly away from the barrel 25 by engagement with the annular shoulder 19 of the fastener guide assembly. Consequently, the rear end 44 of the lever 40 is normally positioned in blocking relation to the pin 12, thereby preventing complete forward motion of the handle and breech block assembly 10 with respect to the barrel assembly 11. As will be explained in greater detail hereinafter, this blocking condition prevents the tool from being cocked. When the shoulder 19 moves away from the inwardly projecting end 42 upon relative motion of the barrel assembly and the fastener guide assembly, however, inward motion of the end 42 is permitted, removing the other end 44 of the lever from its blocking relation in the manner shown in FIG. 3.

As illustrated in FIG. 1, a lever 45 pivotally mounted in the handle and breech block assembly is formed with a latch 46 at its forward end which is received in a corresponding recess 47 in the barrel block 27 and is releasably retained therein by a spring 48 when the tool is in the condition shown in FIGS. 1 and 2. To open the tool, pressure is applied to a projecting portion 49 at the rear of the lever 45 to release the latch, and the breech block and handle assembly 10 is then free to slide rearwardly with respect to the barrel assembly until the pin 12 reaches the rear end of the slot 13, at which position the barrel block is free from the forward end of the breech block assembly and relative pivotal motion about the pin 12 to expose the breech end of the barrel is possible.

Upon forward motion of the barrel assembly in this manner, moreover, a cartridge extractor 50, shown in FIGS. 4 to 6, automatically removes a cartridge 51 from the cartridge chamber 52 in the barrel block 27. As best seen in FIGS. 5 and 6, the extractor 50 comprises a triangular shaped block slidably mounted in a corresponding recess 53 in the barrel block 27 and having an inner corner 54 normally positioned beneath the rim 55 of a cartridge inserted in the chamber 52 and shaped to receive the rim. Within the base of the triangle, a longitudinal bore 56 receives the head of a screw 57 which is affixed to the barrel block 27 and a spring 58 extending between the head of the screw and a shoulder 59 in the bore normally urges the extractor to its innermost position illustrated in FIG. 6.

To operate the extractor 50 when the tool is opened, a cartridge extractor actuator 60 pivotally mounted in a slot 61 in the handle and breech block assembly 10 is pressed toward the barrel assembly 11 by a compression spring 62 and has a lateral projection 63 which is normally positioned in the recess 53 beyond the inner end of the extractor 50, as shown in FIGS. 4 and 6. Accordingly, as the barrel assembly moves forwardly with respect to the handle assembly, the tip 63 engages the inner end of the extractor block 50 holding it in fixed position with respect to the handle assembly as the barrel moves away from the handle, thereby causing the corner 54 to withdraw the cartridge 51 from the chamber 52. Furthermore, the extractor bore 56 is made slightly larger than the head of the screw 57 so that the extractor is somewhat loose and as a result of the unbalanced pressure applied by the point 63, the extractor tilts inwardly toward the axis of the barrel to a slight degree as the barrel moves away from it. This loose fit of the extractor on the head of the screw 57 permits the extractor to move laterally so as to be restored to its normal position if a cartridge is inserted in the chamber with the extractor extended. Upon closing of the tool, the extractor actuator 60 is displaced laterally to the dotted line position shown in FIG. 4 as the barrel assembly moves toward the handle and breech block assembly until the tip 63 can again move into the recess 53 under the influence of the spring 62.

In the handle and breech block assembly 10, a handle 65 has a forward trigger guard extension 66 in which the transverse pin 12 is mounted and a longitudinal slot 67 in this extension receives the interlock housing 36 for longitudinal sliding motion during relative motion of the handle and barrel assemblies. In addition, a trigger 68 mounted in a slot 69 in the handle 65 for sliding motion parallel to the axis of the tool is urged toward a forward position in the slot by a compression spring 70. An inclined cam surface 71 at the top of the trigger 68 engages a corresponding inclined surface 72 on a sear actuator 73 which is supported in the slot 69 for sliding motion perpendicular to the axis of the tool and is pressed downwardly against the surface 71 by a compression spring 74 extending between the sear actuator and a cylindrical breech block housing 75. As a result, a projection 76 on the sear actuator is forced inwardly toward the axis of the tool through an opening 77 in the breech block housing so as to project inside the housing upon rearward motion of the trigger 68, the spring 74 restoring the actuator and the trigger when the trigger is released.

Inside the breech block housing 75 which projects forwardly far enough to enclose the rear end of the barrel block in the normal position shown in FIG. 2, a breech block 78 is held in fixed position by a screw 79, the breech block and housing also being affixed to the handle 65 by a screw 80. A firing pin 81 slidably mounted in a bore 82 in the breech block and urged forwardly therein by a firing pin spring 83 has a forward conical extension 84 which normally fits into a corresponding opening in the front wall of the breech block so that the tip projects through the opening in line with the rim of the cartridge 51 when the firing pin is in its forward position in the bore 82, as shown in FIG. 2. Projecting laterally from one side of the firing pin 81 and extending part way into a longitudinal slot 85 in the breech block is a pin 86 fitting loosely in and normally extending part way into a recess 87 at one side of a sear element 88 which is longitudinally slidable in the slot 85. The loose connection between the pin 86 and the sear element 88 permits a rocking motion of the sear element in the slot 85 about the adjacent forward edge of the firing pin in a plane extending through the axis of the tool and a spring 89 extending between the sear element and the firing pin normally presses a beveled surface 90 at the rear end of the sear against the housing 75 so as to deflect the forward end 91 of the sear toward the axis of the tool.

As shown in FIG. 2, the forward tip 91 of the sear element normally projects forwardly from the breech block and, in the tilted position of the sear, this tip is aligned with a surface portion 92 of the rear wall of the barrel block 27, the surface 92 being angled inwardly so as to retain the tip 91 in place when longitudinal pressure is applied by the barrel block to the sear element. Immediately adjacent to the surface portion 92 and in line with the breech block slot 85 is a recess 93 into which the forward end of the sear may be received when the sear is rocked about the adjacent forward edge of the firing pin to tilt the rear end away from the housing.

The breech block also includes a plunger 94 slidable in a bore 95 and pressed forwardly therein by a spring 96 so as to project from the breech block against the rear surface of the barrel block and, in the normal posi-

tion of the tool shown in FIGS. 1 and 2, this holds the barrel block away from the front end of the breech block and against the catch **46** to prevent free sliding motion of the barrel assembly with respect to the handle and breech block assembly. Moreover, by changing the strength of the spring **96**, the pressure necessary to cock the tool can be adjusted without requiring any change in the strength of the firing pin spring **83**.

In operation, to load the tool, the catch **46** is released be pressing on the projection **49** so that the barrel assembly may be moved forwardly to disengage the barrel block **27** from the forward end of the breech block housing **75** and then pivoted about the pin **12** to expose the breech end of the barrel. During this operation, any cartridge remaining in the chamber is withdrawn by the extractor **50** in the manner previously described. After a cartridge **51** has been inserted in the chamber **52**, the barrel assembly is pivoted back to aligned position and moved rearwardly into the breech block housing until the latch **46** engages in the recess **47**. Also, a fastener **22** to be driven is inserted into the fastener guide **17** so as to be releasably retained therein by the detent **23**. As pointed out above, the fastener may have any length over a wide range of values being restricted only by the lengths of the pin guide **17**, the barrel **25** and the piston rod **32** and, in a typical embodiment, these lengths were selected to permit driving of fasteners having any dimension from one-half inch to three inches.

The forward end of the tool is then placed against a workpiece at the location of fastener insertion in the manner shown in FIG. 2 and the handle and breech block assembly **10** is pressed toward the workpiece. This motion forces the barrel assembly **11** forwardly until the piston **30** abuts the rear end of the bore **31** in the barrel block **27** and the piston rod **32** engages the rear end of the fastener **22**, the forward end thereof being pressed against the workpiece, as shown in FIG. 2. During this motion, the barrel **25** slides forwardly inside the fastener guide housing **16** and around the fastener guide **17** against the pressure of the spring **24** to an extent dependent upon the length of the fastener **22**. At the same time, the forward end **42** of the interlock lever **40** moves off the shoulder **19**, permitting the interlock lever to pivot under the influence of the spring **41** so that the end **44** of the lever is moved out of blocking relation to the transverse pin **12**.

With the interlock thus rendered inactive, the handle and breech block assembly **10** can be moved forwardly with respect to the barrel assembly **11** but the sear element **88**, held in engagement with the surface portion **92** by the spring **89**, acting through the pin **86**, retains the firing pin **81** in fixed position with respect to the barrel assembly as the breech block moves forwardly, thereby cocking the firing pin spring **83**. Likewise, the plunger **94** is held in position against the barrel block **27** so that the plunger spring **96** is compressed, adding to the force required to move the breech block to the cocked position. At the same time, the projection **76** of the sear actuator **73** is moved forwardly to a location beneath the rear end of the sear element **88**.

To fire the cartridge, the trigger **68** is moved rearwardly, raising the sear actuator **73** so that the projection **76** rocks the sear element about the adjacent forward edge of the firing pin **81** and the forward tip **91** of the sear is disengaged from the surface **92** of the barrel block **27**. This permits the firing pin spring **83** to drive the firing pin **81** forwardly to fire the cartridge **51** and, at the same time, the sear element **88**, being aligned with the recess **93** in the barrel block, is moved forwardly into that recess by the pin **86**. Upon detonation of the cartridge **51**, the piston **30** and the piston rod **32** are driven forwardly to drive the fastener **22** into the workpiece, firm contact being maintained between the piston rod and the fastener at all times during driving so as to prevent damaging impact between those components.

When the piston has moved forwardly far enough to uncover the exhaust ports **31***a*, the explosion gases are vented to the atmosphere through the housing **28** and the exhaust passages **15***a*, but the momentum imparted to the piston, piston rod and fastener are great enough to assure that the fastener is driven into the workpiece until the enlarged head at the rearward end of the fastener comes up against the disc **21** and the workpiece. In this condition, the forward end of the piston is spaced from the rear end of the fastener guide **17** by a distance greater than the length of the buffer **35** so that there is normally no impact between the elements. If, however, there is insufficient resistance in the workpiece to stop the fastener when the enlarged head engages the disc **21** against the workpiece, the piston **30** will merely come into contact with the relatively malleable buffer **35** so that the driving energy of the piston is dissipated by deformation of the buffer without damage to the other components of the tool and without imparting additional driving energy to the fastener **22**.

Should the trigger **68** be pulled rearwardly prior to cocking of the tool, the projection **76** on the sear actuator **73** is moved inwardly into the recess **85** so as to block the rearward movement of the sear **88**, and cocking and firing of the tool are thereby prevented. The operator is thus forced to follow the proper sequence in using the tool, and cannot simply push to fire.

Although the invention has been described herein with reference to a specific embodiment, many modifications and variations therein will readily occur to those skilled in the art. Accordingly, all such variations and modifications are included within the intended scope of the invention as defined by the following claims.

I claim:

1. A fastener driving tool comprising barrel means having a bore and having a breech end and a forward end, fastener guide means for receiving a fastener to be driven and supported at the forward end of the barrel means for longitudinal motion with respect thereto, piston means slidably supported in the bore of the barrel means and extending forwardly into the fastener guide means for engagement with a fastener received in the guide means and held against a workpiece into which it is to be driven, the piston means comprising a member which has a length great enough to extend from the breech end of the barrel to the end of a fastener in the guide means when the guide means is moved rearwardly with respect to the barrel means, cartridge receiving means at the breech end of the barrel means communicating with the bore of the barrel means, breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, firing pin means slidably supported in the breech block means and urged forwardly therein toward a cartridge firing position, sear means normally interposed between the firing pin means and the barrel means to prevent forward motion of the firing pin means as the breech block means is moved toward its forward position, and trigger means arranged to displace the sear means from interposed relation when the breech block means is in its forward position, thereby permitting the firing pin to move forwardly to the cartridge firing position.

2. A fastener driving tool comprising barrel means having a bore and having a breech end and a forward end, fastener guide means for receiving a fastener to be driven and supported at the forward end of the barrel means for longitudinal motion with respect thereto, piston means slidably supported in the bore of the barrel means and extending forwardly into the fastener guide means for engagement with a fastener received in the guide means and held against a workpiece into which it

is to be driven, cartridge receiving means at the breech end of the barrel means communicating with the bore of the barrel means, breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, firing pin means slidably supported in the breech block means and urged forwardly therein toward a cartridge firing position, sear means normally interposed between the firing pin means and the barrel means to prevent forward motion of the firing pin means as the breech block means is moved toward its forward position, and trigger means arranged to displace the sear means from interposed relation when the breech block means is in its forward position, thereby permitting the firing pin to move forwardly to the cartridge firing position, wherein the sear means comprises a member supported for longitudinal sliding motion in the breech block means and rockable about a portion of the firing pin means between a first position in which the forward end of the member engages the breech end of the barrel means and a second position in which the forward end of the member is disengaged from the breech end of the barrel means.

3. A fastener driving tool according to claim 1 including trigger support means attached to the breech block means and wherein the trigger means comprises a first member slidable in the trigger support means in a direction generally parallel to the axis of the tool and having a surface inclined to its direction of motion, and a second member movable in the trigger support means in a direction generally perpendicular to the axis of the tool and having a surface inclined to its direction of motion and engaging the inclined surface of the first member, whereby motion of the first member in a direction generally parallel to the tool axis drives the second member in a direction generally perpendicular to the tool axis.

4. A fastener driving tool according to claim 1 including cartridge extractor means mounted in the breech end of the barrel means for limited longitudinal motion with respect thereto between a forward position within the barrel means and a rearward position projecting from the breech end of the barrel means and including an element engageable with a cartridge in the cartridge receiving means so as to move a cartridge rearwardly in the cartridge receiving means upon motion of the extractor means toward the rearward position, and extractor actuator means disposed laterally adjacent to the barrel means in longitudinally fixed position with respect to the breech block means and engageable with the extractor means to move the extractor means to its rearward position upon relative rearward motion of the breech block means with respect to the barrel means.

5. A fastener driving tool comprising barrel means having a bore and having a breech end and a forward end, fastener guide means for receiving a fastener to be driven and supported at the forward end of the barrel means for longitudinal motion with respect thereto, piston means slidably supported in the bore of the barrel means and extending forwardly into the fastener guide means for engagement with a fastener received in the guide means and held against a workpiece into which it is to be driven, cartridge receiving means at the breech end of the barrel means communicating with the bore of the barrel means, breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, firing pin means slidably supported in the breech block means and urged forwardly therein toward a cartridge firing position, sear means normally interposed between the firing pin means and the barrel means to prevent forward motion of the firing pin means as the breech block means is moved toward its forward position, and trigger means arranged to displace the sear means from interposed relation when the breech block means is in its forward position, thereby permitting the firing pin to move forwardly to the cartridge firing position, including plunger means mounted in the breech block means for longitudinal sliding motion therein and projecting forwardly therefrom for engagement with the breech end of the barrel means, spring means urging the plunger means forwardly toward the barrel means, and latch means interconnecting the breech block means and the barrel means and adapted to retain the breech block means and the barrel means in predetermined spaced relationship against the urging of the plunger means and spring means.

6. A fastener driving tool according to claim 1 wherein the fastener guide means includes a fastener-receiving bore coaxial with and of smaller diameter than the bore of the barrel means and wherein the piston means comprises a large diameter rearward portion fitting closely into the bore of the barrel means and a smaller diameter forward portion extending into the bore of the fastener guide means and including means providing a loose connection between the rearward and forward portions of the piston means.

7. In a fastener driving tool including barrel means having a breech end, cartridge receiving means at the breech end of the barrel means, breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, and firing pin means slidably supported in the breech block means and urged forwardly therein toward a cartridge firing position, sear means normally interposed between the firing pin means and the barrel means to prevent forward motion of the firing pin means as the breech block means is moved toward its forward position, said sear means comprising a member supported for longitudinal sliding motion in the breech block means and rockable about a portion of the firing pin means between a first position in which the forward end of the member engages the breech end of the barrel means and a second position in which the forward end of the member is disengaged from the breech end of the barrel means.

8. In a fastener driving tool including barrel means having a breech end, cartridge receiving means in the breech end of the barrel means, and breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, cartridge extractor means mounted in the breech end of the barrel means for limited longitudinal motion with respect thereto between a forward position within the barrel means and a rearward position projecting from the breech end of the barrel means and including an element engageable with a cartridge in the cartridge receiving means so as to move a cartridge rearwardly in the cartridge receiving means upon motion of the extractor means toward the rearward position, and extractor actuator means disposed laterally adjacent to the barrel means in longitudinally fixed position with respect to the breech block means and engageable with the extractor means to move the extractor means to its rearward position upon relative rearward motion of the breech block means with respect to the barrel means.

9. In a fastener driving tool including barrel means having a breech end and breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, forwardly projecting means mounted in the breech block means for longitudinal sliding motion therein and projecting forwardly therefrom for engagement with the breech end of the barrel means,

spring means urging the forwardly projecting means forwardly toward the barrel means, and latch means interconnecting the breech block means and the barrel means and adapted to retain the breech block means and the barrel means in predetermined spaced relationship against the urging of the forwardly projecting means and the spring means.

10. In a fastener driving tool including barrel means having a breech end, cartridge receiving means at the breech end of the barrel means, breech block means longitudinally movable with respect to the barrel means between a position longitudinally spaced from the breech end of the barrel means and a forward position abutting the breech end of the barrel means, firing pin means slidably supported in the breech block means and urged forwardly therein toward a cartridge firing position, and sear means normally interposed between the firing pin means and the barrel means to prevent forward motion of the firing pin means as the breech block means is moved toward its forward position, said sear means comprising a member supported for longitudinal sliding motion in the breech block means and rockable about a portion of the firing pin means between a first position in which the forward end of the member engages the breech end of the barrel means and a second position in which the forward end of the member is disengaged from the breech end of the barrel means, trigger means connected to the breech block means and having a projection movable into engagement with the sear means when the breech block means is in the forward position to rock the sear means to cause said disengagement, said projection being movable into blocking relation to said sear means upon operation of the trigger means when the breech block means is in said longitudinally spaced position to prevent longitudinal motion of the breech block means to the forward position.

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