United States Patent

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[54] AUTOMATIC FEEDING OF FASTENERS

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[52] **U.S. Cl.** **227/10**, 227/118, 227/136

[51] **Int. Cl.** **B25c 1/14**

[58] **Field of Search** 227/9, 10, 117, 118, 136, 137, 227/138

[56] **References Cited**

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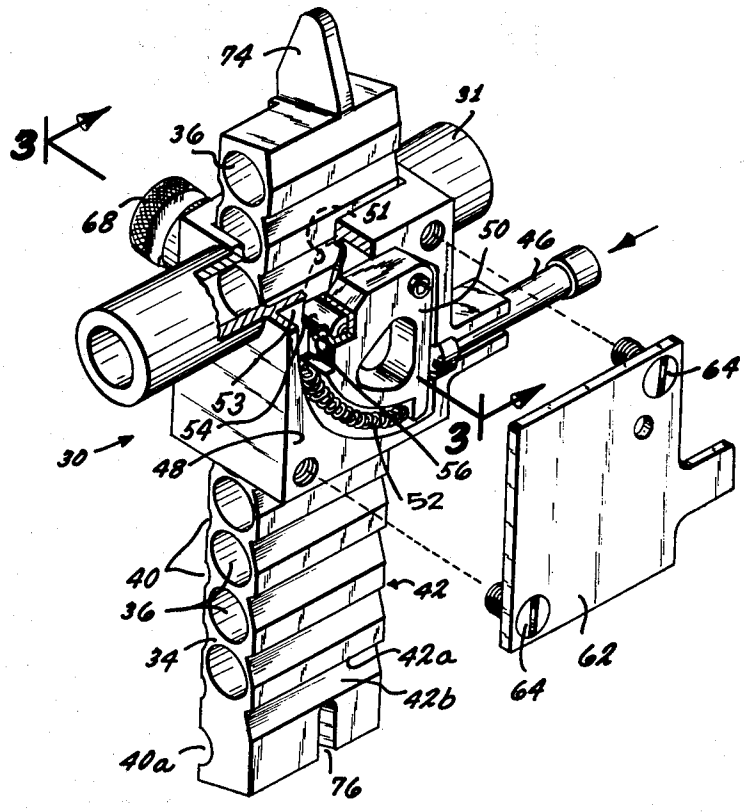
[57] **ABSTRACT**

A feeding clip having relief portions enabling the clip to be gripped and moved forward in response to an actuating device of the fastening tool, and further including indexing means for registering a fastener held in the clip with the driving ram of the fastening tool. The indexing means operates as the tool is cocked in readiness for firing. The clip is advanced forward to move a fastener into position. Upon firing, a driving ram in the tool drives the fastener through the clip and into the work surface. Release of the tool followed by further cocking in readiness for a second firing advances the clip through the tool to align the next successive fastener with the driving ram.

3 Claims, 7 Drawing Figures



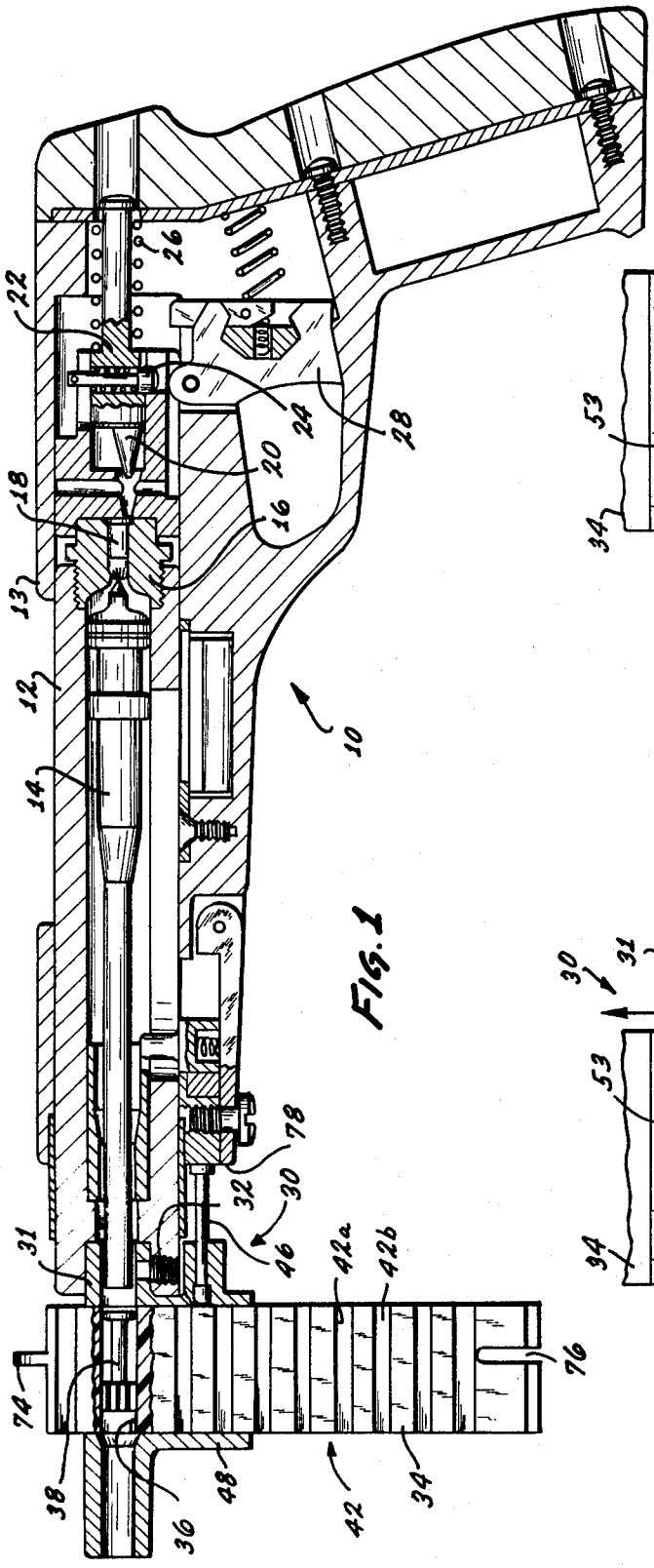


FIG. 1

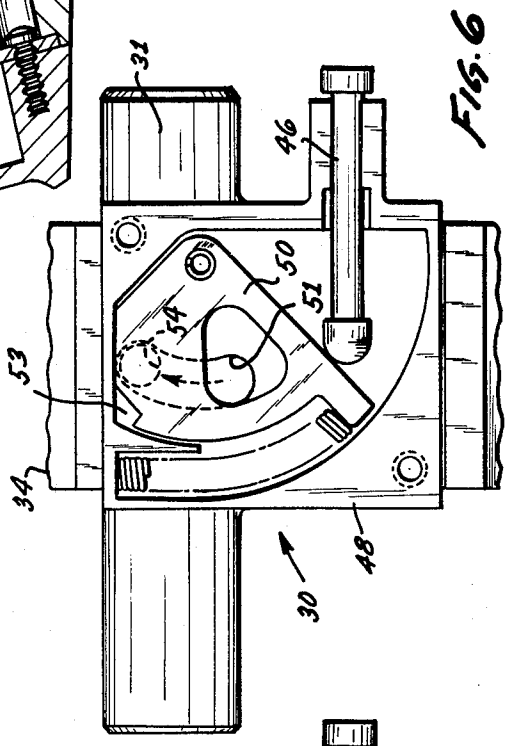


FIG. 6

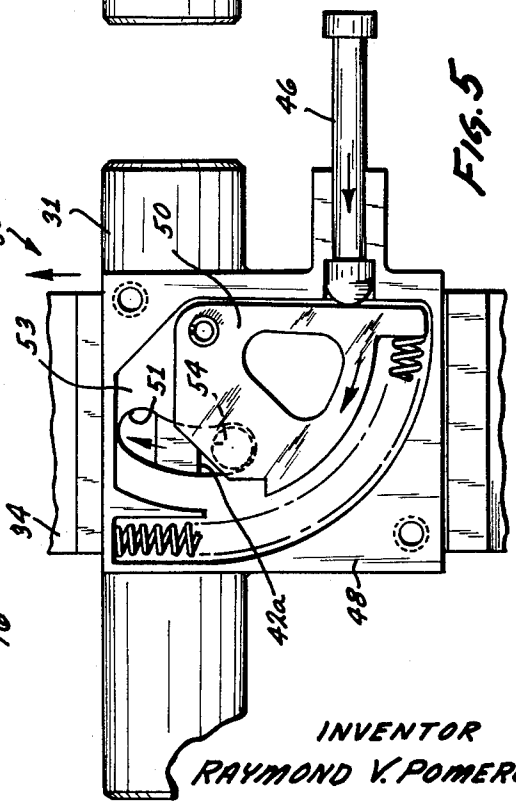


FIG. 5

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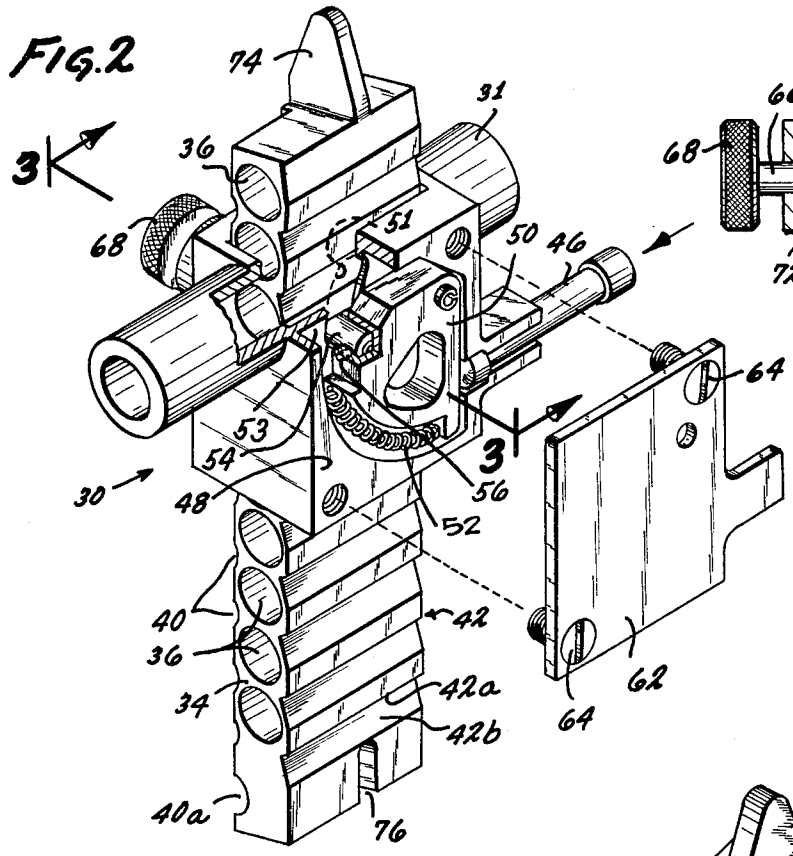
FIG. 2



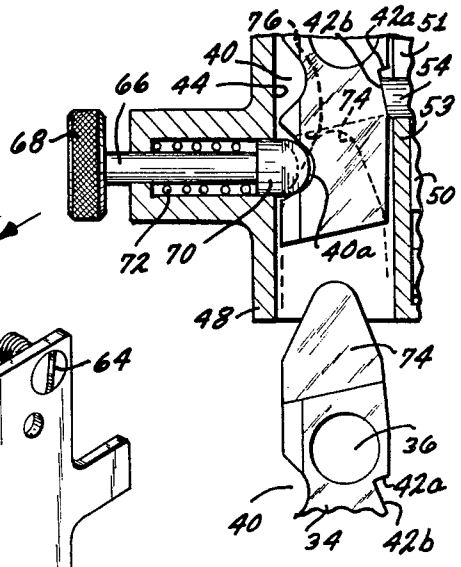


FIG. 7

FIG. 3

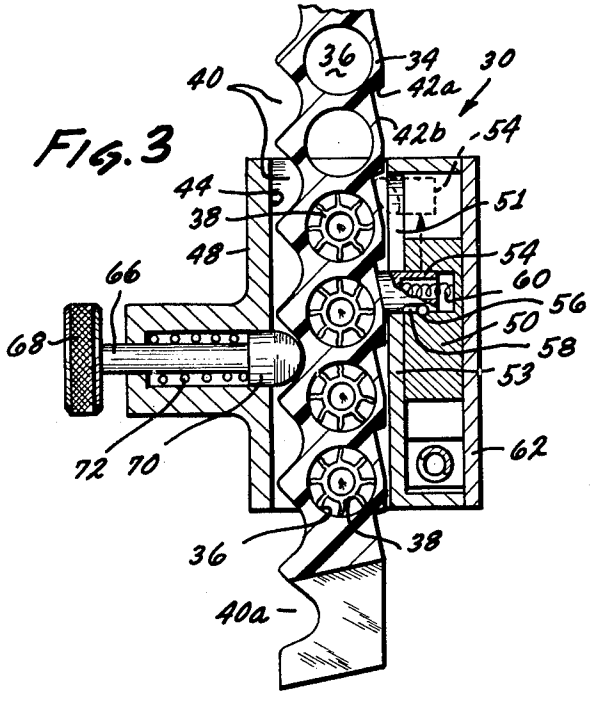
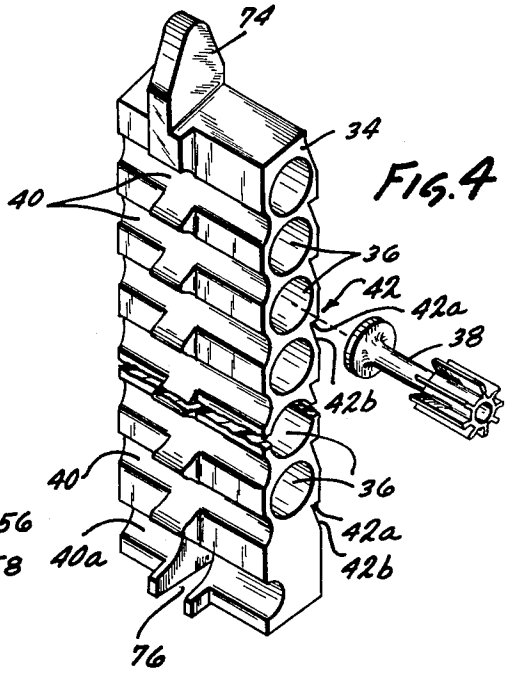


FIG. 4



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AUTOMATIC FEEDING OF FASTENERS

HISTORY

This invention relates to an automatic fastener feeding mechanism for a powder actuated tool. Powder actuated tools are commonly used in the construction industry for driving fasteners, etc. into hard work surfaces such as concrete. The driving is accomplished by an explosive force that drives a piston through a barrel against a fastener positioned in the end of the barrel.

Powder actuated tools have numerous safety requirements. These requirements include for example loading of the power load for driving the piston such that it is entirely enclosed inside the tool, and also requires a two step action for firing the tool. A commonly used firing pin mechanism ignites the power load but only after the firing pin is cocked by forcing the nose of the tool against the work surface. A powder actuated tool must accomplish the automatic loading while maintaining the required two step firing, preferably in the manner described above.

The present invention is believed to provide automatic feeding which also meets the safety requirements and is additionally inexpensive to produce and easily operated. Furthermore, the automatic loading is easily adapted to present driving tools. Very briefly the automatic loader is a nose piece which accepts a feeding clip filled with fasteners. The clip is advanced through the nose piece by the action of cocking the firing pin. Means are provided to align the fasteners with the driving ram and also to lock the cocking action when the last fastener of the cartridge is driven through the barrel.

The invention will be more clearly understood by referring to the following detailed description and drawings wherein:

FIG. 1 is a sectioned view of a powder actuated tool employing a fastener feeding device in accordance with the present invention;

FIG. 2 is a perspective view with portions sectioned and removed to illustrate the operation of the fastener feeding device shown in FIG. 1;

FIG. 3 is a section view taken on lines 3—3 of FIG. 2;

FIG. 4 illustrates the fastener containing clip used in the fastener feeding device;

FIGS. 5 and 6 illustrate mechanisms of the fastener feeding devices in the two extreme positions of before and after advancing the clip to the next successive fastener;

FIG. 7 illustrates the operation of ejecting an emptied clip.

Referring to FIG. 1 a powder actuated tool **10** includes a barrel **12** slidably mounted in a tool housing **13** and a driving ram **14** slidable within the barrel. A breach plug **16** receives a power load **18**. A firing pin **20** carried by a carrier **22** is prevented from contacting the power load **18** because of sear **24**. As the barrel **12** is moved rearwardly into the housing (e.g., by forcing the end of the barrel against a work surface), the firing pin is moved with it and compresses spring **26**. The trigger **28** is engaged to release the sear **24** and spring **26** propels the firing pin toward the power load.

The fastener feeding mechanism **30** forms an extension **31** on the front of the barrel **12** and is locked to the barrel by means of lock screw **32**. The fastener holding clip **34** that is fed through the feeding mechanism **30** is best shown in FIGS. **3** and **4**. As shown the fastener clip has a row of circular openings **36** adapted to contain fasteners **38**. One side of the clip is formed with wave-like valleys **40** while the other side is formed with ridges **42**. A slot **44** through the barrel extension **31** permits passage of the clip whereby openings **36** can be aligned with the barrel **12**.

The mechanism for advancing the clip automatically through the slot **44** is illustrated in FIGS. **2**, **3**, **5** and **6**. A plunger **46** is slidably mounted in the casing **48**. A triangular shaped lever **50** is pivotally mounted within the casing. A spring **52** urges the lever **50** to the position shown in FIG. **2** and **5** with plunger **46** urged to its fully retracted position. A gripping stem **54** is carried by the lever **50**. The gripping stem is mounted to the lever **50** by a pin **56** fixed to the lever which

rides in slot **58** in the stem to permit limited lateral sliding movement through a slot **51** in a mounting plate **53**. A spring **60** urges the stem into its extended position and into engagement with ridges **42** in the clip **34**. The mechanism described in confined in the housing by a cover plate **62** fixed to the housing by screws **64**. It will thus be seen that forcing the plunger **46** into the casing **48** as shown in FIG. **6** causes pivoting of lever **50**. The stem is thus pivoted upwardly as viewed in the figures and because of its engagement with a ridge **42** of the clip, urges the clip upwardly. The ridges have square upper edge surfaces **42*a*** and slanted lower edges **42*b*** thus providing firm gripping of the stem when moved upwardly but providing a camming action when the stem and lever move downwardly causing the stem to be retracted against the bias of spring **60**.

Referring to FIG. **3**, a centering post **66** is slidably mounted in the casing. The centering post extends through the casing and a knob **68** is provided on the end to allow manual retraction. A centering head **70** on the opposite end of the post is urged toward the clip **34** by spring **72**. The centering post is in registry with the valleys **40** on the clip so that when bottomed, the openings **36** are aligned with the barrel **12**. The valleys being tapered and the end of the centering head being matched thereto, an urging of the clip lengthwise will bias the post against spring **72** and as the peak of the valley is passed, the post is urged into the center of the next successive valley to align the next opening **36** with the barrel. The process is repeated until the last valley **40*a*** is reached. This valley is substantially deeper than the preceeding valley **40** and when the post is seated therein, the clip **34** is locked against further movement. The knob **68** can be manually moved to retract the post and unlock the clip **34**, or as seen in FIG. **7** another clip can be introduced into the feeding mechanism. The wedge **74** formed on the leading edge of the clip is pushed into the relief **76** at the rear end of the clip and wedges against the centering post to move it out of the valley **40*a***. The clip is then merely advanced manually through the feeding mechanism until the first valley **40** of the new clip is engaged by the centering post.

OPERATION

The specific feeding mechanism described is adapted to operate on a powder actuated tool wherein a cocking action takes place by forcing the barrel end into the tool housing. Thus an operator places the barrel end against a work surface and pushes on the handle to force the tool housing down over the barrel. The plunger **46** being limited in its rearward movement relative to the housing by engagement with shoulder **78**, is thus forced into the casing **48** of the feeding mechanism.

As seen in FIGS. **5** and **6**, the plunger forces pivoting of lever **50** with stem **54** moved upwardly in slot **51**. The stem engages a ridge **42** of a clip **34** and forces it upwardly against the holding force of centering post **66**. This upward movement moves the centering post to the next successive valley which aligns the next opening **36** holding a fastener **38** with the driving ram **14** of the tool. The trigger **28** is pulled to release the firing pin to fire the power load **18** which drives the driving ram against the fastener. The operator then releases the force against the handle of the tool, allowing the barrel end to move out of the housing and retraction of the plunger **46** from the casing **48**. The clip is held from returning movement by the centering post. Return movement of the stem without moving the clip is permitted by the camming action of the slanted edge **42*b*** forcing retraction of the stem against the spring **60**.

The process is repeated until the last of the fasteners contained on the clip are driven. The clip is then locked with the centering post **66** seated deeply in valley **40*a*** thereby preventing any further movement of the clip. With the clip prevented from movement the lever **50** cannot be pivoted and plunger **46** cannot be moved into the casing. It follows that the barrel cannot be moved into the tool housing and the firing pin cannot be locked, thus preventing further firing. This locked position thus prevents accidental firing until the knob **68** is manually retracted or until a new clip is placed in the feeding mechanism as described.

Variations of the feeding mechanism described above will be obvious to those skilled in the art while still employing the basic concepts of the invention. Therefore it is to be understood that the above embodiment illustrates one form only of the invention and is not intended to establish the scope of the invention.

What is claimed is:

1. An automatic self-contained fastener feeding mechanism adapted to be releasably locked to an explosively actuated fastener driving tool comprising: a barrel portion having a transverse opening therethrough, a casing supported by the barrel portion, a reciprocal advancing means carried by the casing for gripping and advancing a fastening holding clip a predetermined distance through the barrel opening, registering means carried by the casing to resist return movement of the clip and to align a fastener carried by the clip with the barrel, and releasable locking means to lock the feeding mechanism to the exit end of the barrel of the tool.

2. A feeding mechanism as defined in claim 1 wherein the exit end of the barrel of the tool is moveable relative to the breach end portion of the tool for cocking the tool's firing pin, said feeding mechanism including actuating means responsive to the relative movement for actuating the reciprocal advancing means.

3. A feeding mechanism as defined in claim 2 wherein said reciprocal advancing means includes a lever pivotally mounted in the casing, biasing means biasing the lever into one extreme pivotal position, and a stem carried by the lever adapted to engage a fastener holding clip provided in the opening of the barrel portion to advance the clip as the lever is pivoted, and said actuating means including a plunger that engages the lever to pivot the lever against the biasing means to a second extreme pivotal movement for advancing the fastener holding clip.

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