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Kuehn et al.

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[54] **LOOP FASTENER GUN ASSEMBLY**

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[52] **U.S. Cl.** **227/130**

[51] **Int. Cl.** **B25c 1/04**

[58] **Field of Search** 227/130, 149

[56] **References Cited**

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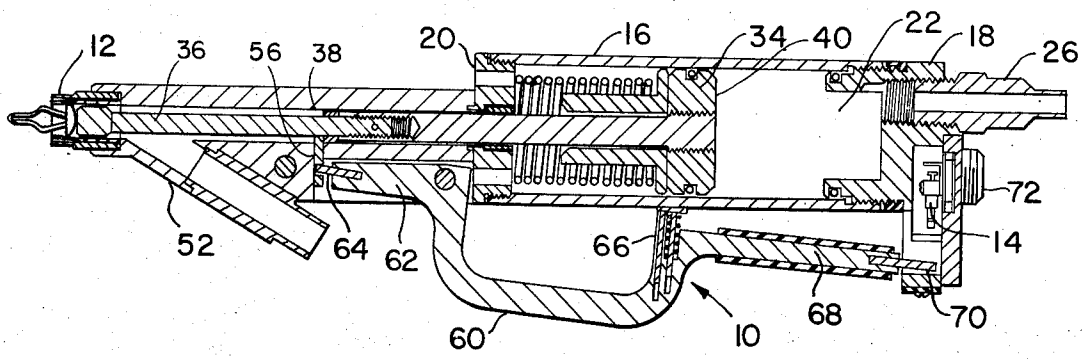
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[57] **ABSTRACT**

A loop type fastening mechanism which utilizes an air operated plunger which pushes the fastener into engagement with the support.

5 Claims, 5 Drawing Figures



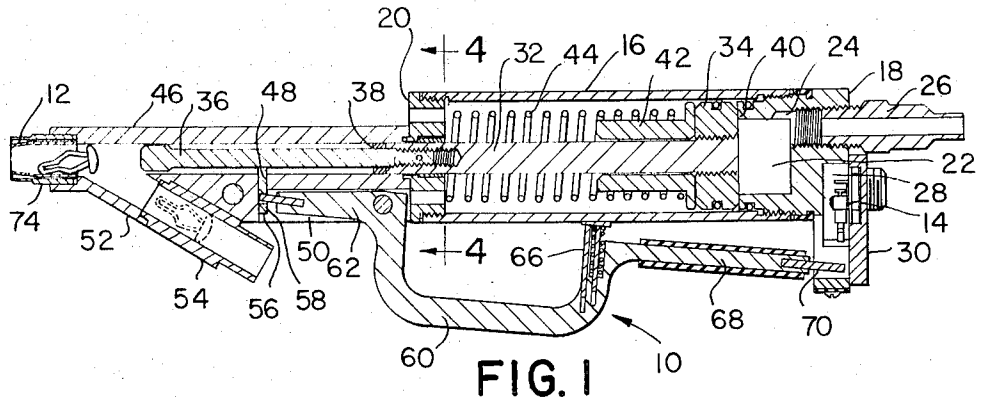


FIG. 1

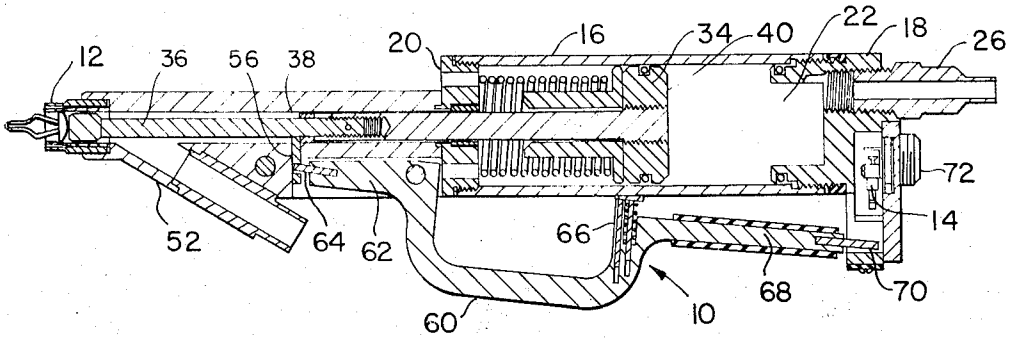


FIG. 2

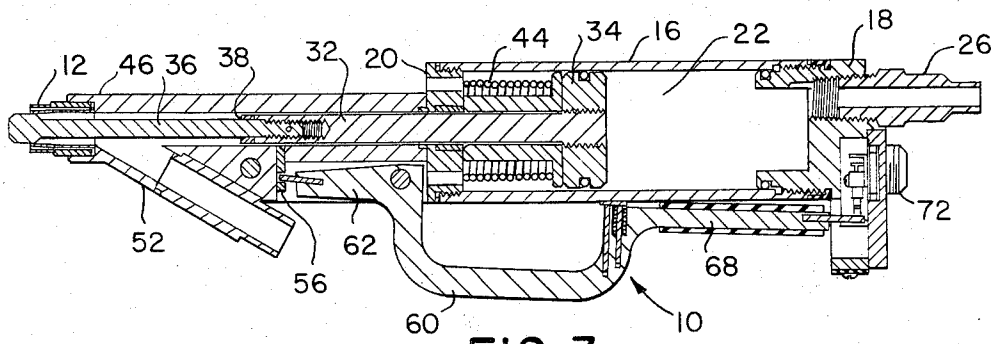


FIG. 3

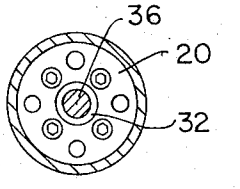


FIG. 4

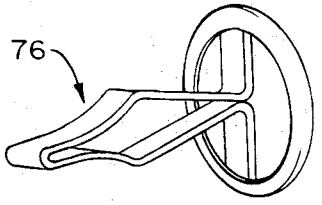


FIG. 5

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LOOP FASTENER GUN ASSEMBLY

BACKGROUND OF THE INVENTION

In the past the gasket liner and cover of refrigerators have been fastened together by using screws. More recent, the use of loop type panel fasteners have become popular and these have been attached through the use of hand tools such as a hammer. This method of engagement is extremely inefficient causing damage to either the liner or the cover and also creating irregularity in the engaement of the different parts. The gun or tool disclosed herein, due to the use of stored energy, pushes the fastener into engagement with the liner, gasket and cover. The gun is extremely safe to handle since the push type of operation will not drive a fastener into the free hand of an operator.

SUMMARY OF THE INVENTION

This is a loop type fastening system utilizing an air gun which stores the energy created by the air and then releases it in a pushing type of operation rather than in an impact type of operation. The gun automatically inserts and reloads itself at a rate of approximately 40 per minute with continuous operation of up to 2,000 or 3,000 pieces depending on the type of external reservoir.

An object of the present invention is to provide an efficient automatic fastening system for loop type fasteners.

A further object of the present invention is to provide an automatic fastening tool which does not utilize an impact type engagement.

A still further object of the present invention is to provide a loop fastener gun assembly which utilizes a sear type trigger mechanism for releasing the piston and also for deactivating an electrical circuit.

A still further object of the present invention is to provide a trigger mechanism which releases the piston and simultaneously engages the plunger of an electrical switch.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a section of the gun assembly showing the position of the different parts prior to the injection of air into the system;

FIG. 2 is a section of the gun shown in FIG. 1 after air has been injected into the system and prior to the actuation of the trigger mechanism;

FIG. 3 is a section of the gun shown in FIGS. 1 and 2 showing the gun after the trigger mechansim has been activated;

FIG. 4 is a section taken on line 4—4 of FIG. 1; and

FIG. 5 is a side perspective view of the fastener.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing there is shown a pneumatic gun or tool assembly comprising broadly, a single cavity air cylinder or fluid chamber, a sear type trigger mechanism **10**, a chuck **12**, and a limit switch **14**.

The gun proper comprises a tubular housing or body **16** open at both ends and having internal threads formed at each end. One of its ends is closed by a rear cap portion **18** and its other end is closed by a front cap **20**. The rear cap portion **18** includes an air well or chamber **22** which is fully open at one end and has an air channel **24** which opens into it. The air channel **24** extends through the rear cap portion **18** from the air well **22** through its rear surface as shown in FIG. **1**. The wall of the air channel **24** is threaded for part of its length. The rear cap portion **18** is externally threaded and includes an external annular groove within which an O-ring is placed to form an air tight joint with the body **16** with which it is threadingly engaged. A male plug **26** is threaded into engagement with the air channel **24** and has an axial passage formed therethrough. The lower rear portion of the rear cap portion **18** includes a cavity **28** which is closed off at its rear area by a plate **30**.

A cylindrical rod or connecting means **32** has a head or piston **34** engaged at one end and a plunger **36** engaged at the other. The plunger **36** is, at its engagement with the rod **32**, of less diameter than the rod **32** forming an external shoulder or engaging means **38** therewith. The head **34** has an external diameter slightly smaller than the internal diameter of the body **16** and has its rear surface **40** butted against the rear cap portion **18** closing off the air well **22**. An annular groove is provided on the external surface of the head **34** within which an O-ring is located forming an air tight engagement with the internal surface of the body **16**. The rod **32** and its head **34** are positioned axially within the body **16**. A spring stop sleeve **42** has a shank in circumscribing relation to the rod **32** and has a flange at one end which is butted against the front surface of the head **34**. The front cap **20** which closes off the formed opening of the body **16** includes air vents which open into the body chamber and a centrally located aperture through which the plunger **36** and the rod **32** extend. A compression spring **44** circumscribes the rod **32** and the shank of the spring stop sleeve **42**. The compression spring **44** is trapped between the rear surface of the front cap **20** and the flange of the spring stop sleeve **42**.

A tubular chuck adapter **46** is bolted to the front cap **20** extending axially and forwardly thereof circumscribing the plunger **36**. The underside of the chuck adapter **46** includes a trigger passage **48** that extends from the adapter innner passage or elongate cavity to a trigger slot **50** which lies in spaced parallel relation to the axis and on the underside of the adapter **46**. A tubular side port **52** opens into the inner passage of the chuck adapter **46** and is connected to a tubular feed tube adapter **54** which is engageable with a feed tube (not shown). A stop pin **56** has an arcuate terminal end and a hole **58** formed close to the other end which is fitted into the trigger passage **48**.

The trigger mechanism **10** includes an arcuate handle **60** having a forward extension **62** which has a trigger pin **64** extending therefrom. The back part of the handle **60** contains a spring and finger guide **66** which is spring loaded and adapted to move within channels formed in the handle **60**. A rearward arm **68** extends from the back part of the handle **60** and has an actuator member **70** extending therefrom. The trigger mechanism **10** is pinned by its handle **60** to the underside of the body **16** with the forward extension **62** lying in the trigger slot **50**, and the terminal end of the trigger pin **64** engaged within the hole **58** of the stop **56**. The spring and finger guide **66** is butted against the outer surface of the body **16** and the actuator member **70** of the rearward arm **66** lies in the cavity **28** of the rear cap portion **18**.

The limit switch **14** is attached to the rear cap portion **18** with its plunger directed toward and engagable with

the actuator member **70** of the trigger mechanism **10**. The limit switch **14** is electrically attached to a terminal socket **72** which in turn is attached to a source of electricity (not shown).

The necked down chuck **12**, slotted to allow efficient engagement with a fastener, is placed at the forward end of the chuck adapter **46** as shown in FIG. **1**. A chuck nut **74**, which is threadingly engaged with the chuck adapter **46**, circumscribes the chuck **12** and secures it in position.

The gun operates when air is passed through the male plug **26** into the air well **22** of the rear cap portion **18**. The air presses against the rear surface of the head **34** moving the rod **32** and plunger **36** forward until the external shoulder **38** butts against the stop pin **56** (FIG. **2**). The forward movement of the head **34** compresses the spring **44** and blocks the opening into the side portion **52** with the plunger **36**. The air pressure builds up in the air well **22** and the chamber behind the head **34** urging the external shoulder **38** more strongly against the stop pin **56**. Prior to the injection of air through the male plug **26**, the head **34** was held in the rear position by the spring **44**, with the plunger **36** in the rear position behind the port **52**, and a fastener **76** was fed through the side port **52**. This fastener **76** is then pushed by the terminal end of the plunger **36** further into engagement with the chuck **12** when the head **34** is moved forwardly to the position of FIG. **2** with the shoulder **38** against the stop **56**. If the trigger mechanism were now to be squeezed, compressing the spring of the spring and finger guide **66**, the trigger pin **64** would move withdrawing the stop pin **56** from its engagement with the shoulder **38** of the rod **32**. The plunger **36** would be pushed forward driving the fastener **76** into engagement with an apertured support. At the same time the actuator member **70** would engage the plunger of the limit switch **14**.

A simple valve system (not shown) operates when the trigger is released, allowing the switch **14** to reset initiating the air cycle by first exhausting the body **16** and the air well **22** of air which allows the compression spring **44** to return the rod **32** to its original position (FIG. **1**). Simultaneously with this action the valve, for an adjustable time period, allows air into the delivery system, pushing a fastener through an escapement (not shown) into the side port **52** and into the chuck assembly **12**. After the time period, the valve then directs the air into the male plug **26** to move the components to the position of FIG. **2**, starting the fastening cycle.

With reference to the foregoing description it is to be understood that what has been disclosed herein represents an embodiment of the invention and is to be construed as illustrative rather than restrictive in nature and that the invention is best described by the following claim;

We claim:

1. Apparatus for attaching a fastener to a support, said apparatus comprising housing means forming a fluid chamber and an inner passage having one end communicating with an end portion of said chamber, a chuck carried by said housing means at the opposite end of said passage, means behind said chuck and opening into said passage for directing a fastener into said passage and toward said chuck, a plunger in said passage behind said chuck and adapted to be moved within said passage, a rod connected with said plunger and extending rearwardly into said fluid chamber, a piston connected to said rod within said fluid chamber, said housing means having means to receive fluid under pressure into said fluid chamber on the side of said piston opposite said rod, stop means having a first position extending into said passage to engage a portion of said rod intermediate said piston and said plunger to position said plunger adjacent said chuck to engage a fastener held by said chuck with said piston being in an intermediate position in said fluid chamber spaced from said one end of said inner passage and spaced from said fluid receiving means, and having a second position clear of said passage, and trigger means adapted to move said stop means from said first position to said second position to enable said plunger to move from the position adjacent said chuck substantially through said chuck to push a fastener out of the chuck and into the support.

2. Apparatus according to claim **1** characterized by resilient means carried by said housing for urging said piston toward the end of said fluid chamber opposite said inner passage, with said plunger then being positioned on the side of said fastener directing means opposite said chuck.

3. Apparatus according to claim **1** characterized by said portion of said rod engaged by said stop means constituting a shoulder on said rod effective to be engaged by said stop means when said rod is moving toward said chuck but not effective to be engaged by said stop means when moving in the opposite direction.

4. A fastener attaching tool comprising a housing forming a fluid chamber and an inner passage having one end communicating with said chamber, a chuck carried by said housing means and communicating with the opposite end of said passage, means forming a side port communicating with said passage for directing a fastener into said passage toward said chuck, a plunger in said passage and adapted to reciprocate therein, a piston in said fluid chamber, means connecting said plunger and said piston, said housing means having means to receive fluid under pressure into said fluid chamber on the side of said piston opposite said plunger, said connecting means having engageable means, stop means having a first position extending into said passage and engageable with said engageable means to hold said plunger adjacent said chuck beyond said side port with said piston being in an intermediate position in said fluid chamber spaced from said one end of said inner passage and spaced from said fluid receiving means, and having a second position clear of said passage, and trigger means connected with said stop means and adapted to move said stop means from said first position to said second position and out of engagement with said engageable means, whereby said plunger can be moved into said chuck to push the fastener out of the chuck and into a workpiece.

5. Apparatus according to claim **4** characterized by resilient means in said fluid chamber engageable with said piston to urge said piston to a position in said chamber such that said plunger is to the side of said fastener port opposite said chuck.

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