United States Patent [19]

Hallock, Jr.

[11] **3,854,536**

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[54] **ADAPTER FOR FLUID OPERATED DRIVING TOOL**

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[52] **U.S. Cl.** **173/15,** 173/131, 227/7, 227/113

[51] **Int. Cl.** **B25c 1/00,** B25c 3/00

[58] **Field of Search** 173/15, 16, 17; 227/113, 227/6, 7, 8

[56] **References Cited**

UNITED STATES PATENTS

2,632,890	3/1953	Tietig	227/113
3,194,324	7/1965	Langas	173/2
3,438,449	4/1969	Smith	173/17

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[57] **ABSTRACT**

An adapter for mounting on a fluid operated driving tool which prevents operation of the tool until a predetermined condition has been attained, the condition being that the workpiece being driven must encounter substantial resistance to penetration of the base material.

7 Claims, 5 Drawing Figures

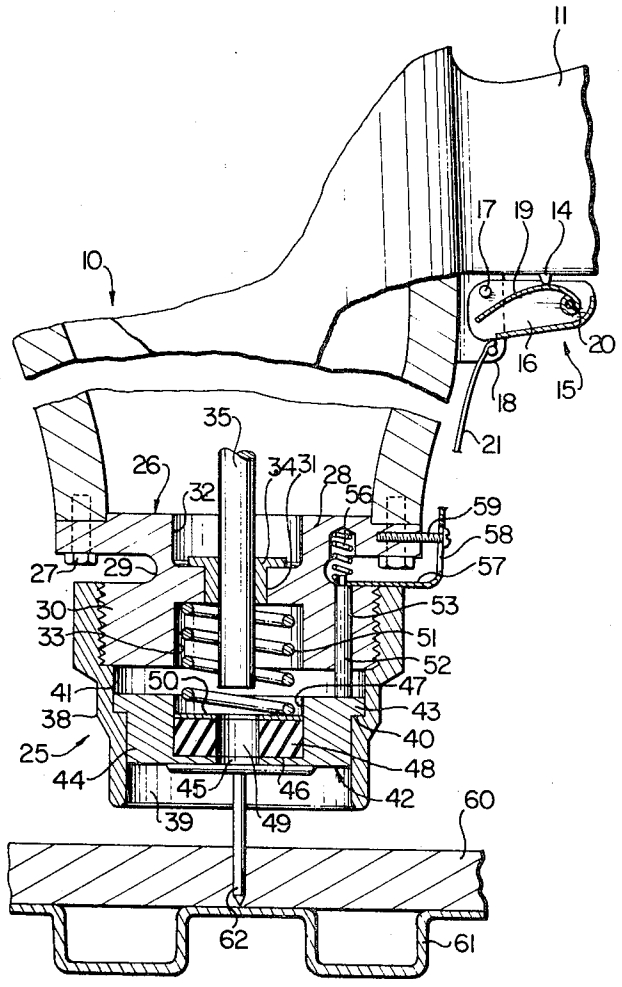

FIG. 1

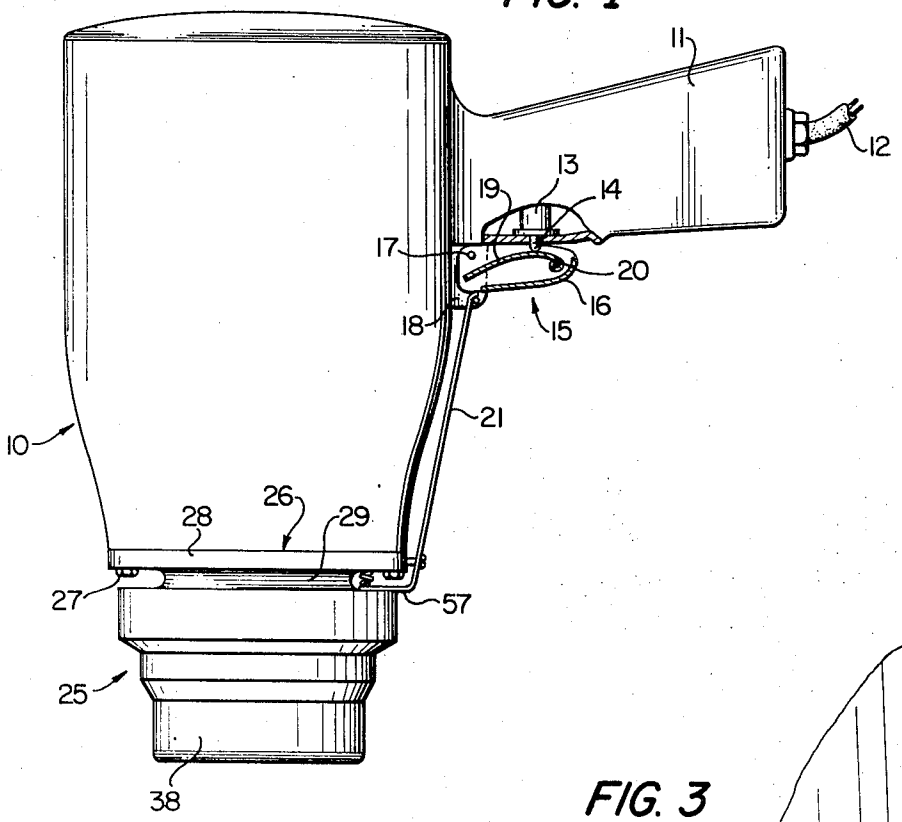

FIG. 2

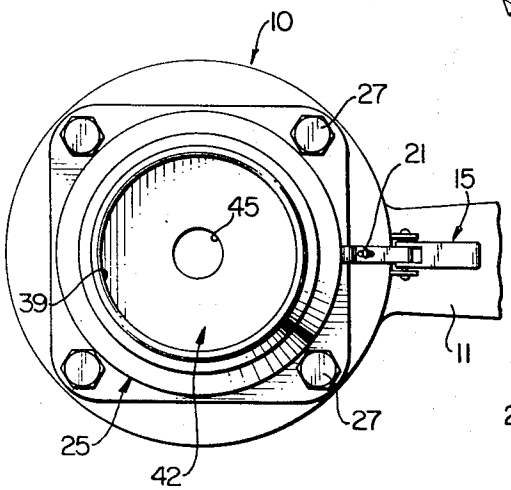

FIG. 3

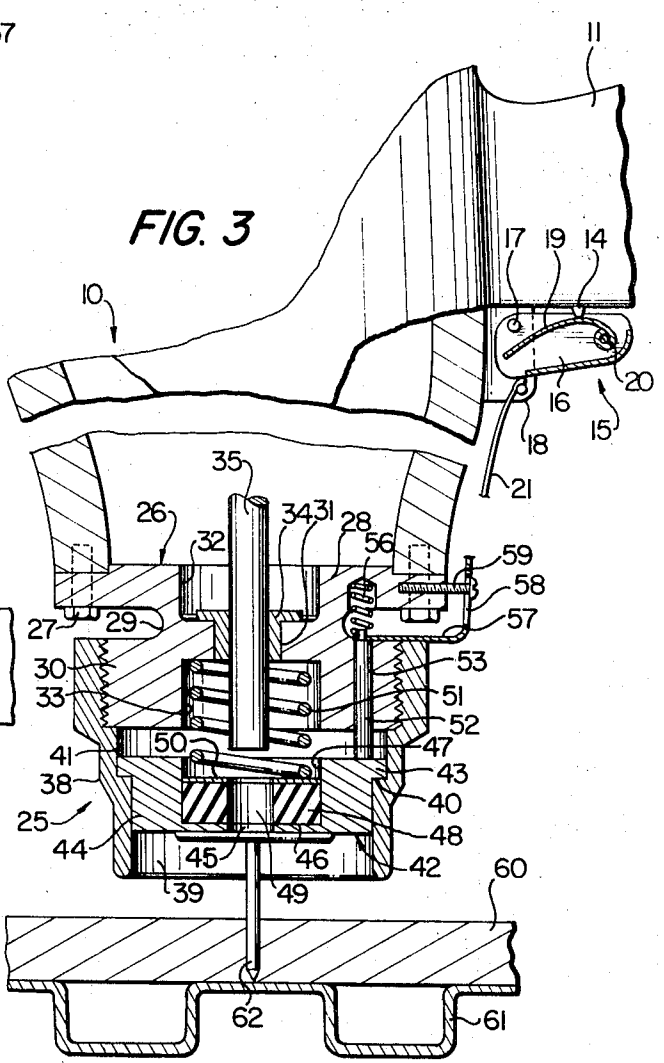

FIG. 4

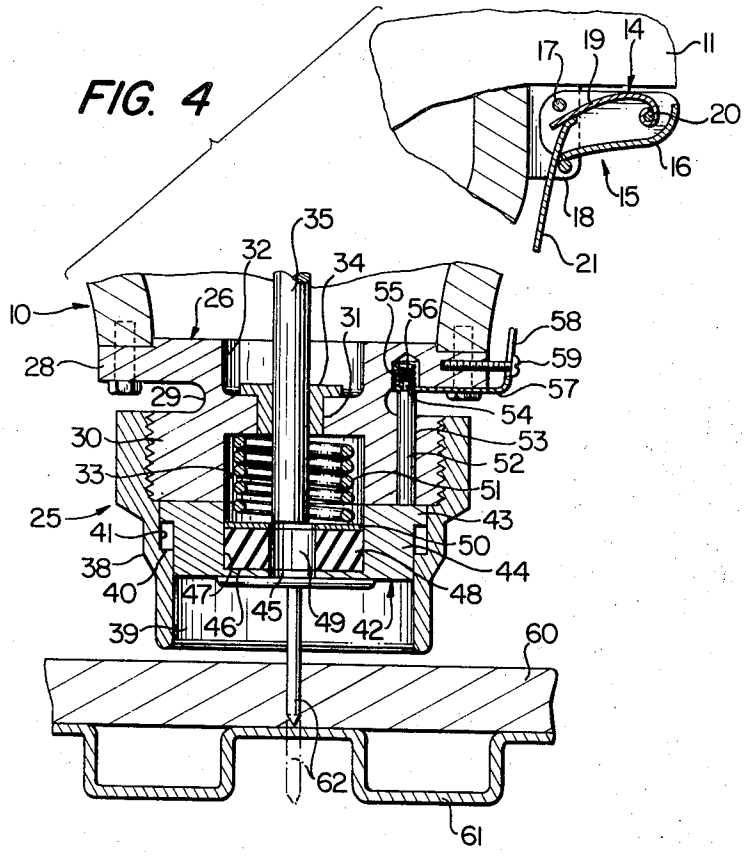
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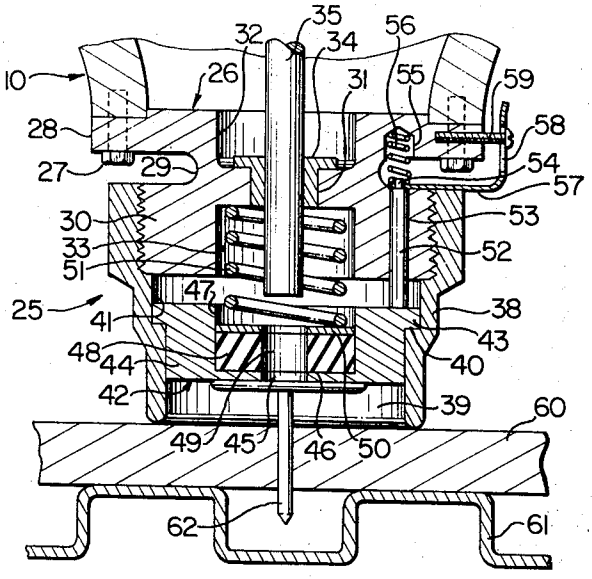
FIG. 5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ADAPTER FOR FLUID OPERATED DRIVING TOOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to fluid operated driving tools and relates particularly to tools having safety devices for preventing operation of the driving tool until the fastener being driven is in a correct position.

2. Description of the Prior Art

Heretofore the attaching of covering material such as relatively soft insulation boards or shingles, siding or the like to a foundation such as wood or sheet metal has been done by a carpenter holding a nail on the covering material and driving the nail with a hammer. In order to speed up the operation and thereby reduce the time and labor involved, fluid operated driving tools have been provided for driving nails, staples and other penetrating fasteners when the trigger of the tool is operated. Although driving tools have increased production while reducing the manual labor involved, they have been hazardous since an operator could intentionally or accidentally activate the trigger in some position other than the driving position of a tool causing a fastener to be expelled from the tool at substantial velocity which could cause personal injury to any workman the fastener might strike, or could cause damage to a structure which the fastener hits.

Some efforts have been made to improve the driving tools by placing an adapter on the driving end of the tool and connecting such adapter to the trigger so that the adapter had to be placed in engagement with the material into which the fastener was to be driven and a downward force applied thereto before the trigger could be operated. An example of this type of structure is the patent to Langas U.S. Pat. No. 3,194,324. Other efforts, such as the patents to Hansen U.S. Pat. No. 1,846,804 and Smith U.S. Pat. No. 3,438,449, have been provided in which the fastener or the workpiece being driven was adapted to engage the driving member of the gun to cock such member before the gun could be operated.

In the construction of industry, it is frequently desirable to attach relatively easily penetrable insulation board to sheet metal siding, roofing and the like and in order to do this nails or other fasteners such as disclosed in the R. L. Hallock U.S. Pat. No. 2,967,448 have been provided which will penetrate and grip sheet metal to hold the insulating material in position. Sheet metal siding and roofing decks have included generally rectangular corrugations for extra strength so that portions of the insulating board engaged the hills of the corrugated sheet metal while a space occurred between the insulating board and the valleys of the corrugated sheet metal. Since the insulating board has not been transparent, the nails were driven blindly and the workman who used a power operated driving tool did not know whether the nail had penetrated the sheet metal or whether the nail was driven into a void so that it had no holding capacity.

SUMMARY OF THE INVENTION

The present invention is an adapter for a fluid operated driving tool which is used for blind driving a fastener to attach relatively soft insulation board to a corrugated sheet metal substructure. The adapter prevents

operation of the driving tool until the fastener is pushed through the insulation board and is aligned with one of the hills of the corrugated substructure so that a fastener, which is aligned with a void and does not engage the substructure, cannot be driven by the tool.

It is an object of the invention to provide a safety adapter for a fluid operated driving tool which not only prevents inadvertent operation of the tool, but also prevents operation of the tool until such time as the fastener being driven is located in a position to penetrate the substructure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a fluid operated driving tool with the adapter attached thereto.

FIG. 2 is a bottom plan thereof.

FIG. 3 is an enlarged vertical section illustrating the initial step in driving the fastener.

FIG. 4 is a section similar to FIG. 3 illustrating the adapter in a position such that the trigger of the tool can be energized for driving the fastener.

FIG. 5 is a section similar to FIG. 3 illustrating the fastener in alignment with a void in which position the tool is inoperative.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With continued reference to the drawing, a fluid operated driving tool **10** is provided having a handle **11** connected to one end of a pressure hose **12** the opposite end of which is connected to a source of fluid under pressure (not shown). The handle **11** includes a control valve **13** having a plunger (not shown) which controls the flow of air under pressure from the hose **12** to the conventional pressure operated driving mechanism within the tool **10.** The valve **13** includes a stem **14** which extends outwardly of the handle **11** in a position to be engaged by a portion of a trigger **15** for operating the valve. The trigger **15** includes a generally U-shaped housing **16** swingably connected by a pivot **17** to a pair of lugs **18** extending outwardly from the driving tool **10.** The open side of the U-shaped housing **16** faces the handle **11** substantially in alignment with the outer end of the stem **14.** A trigger lever **19** is swingably mounted on a pivot **20** at the outer end of the U-shaped housing **16** while the inner end of such lever is freely movable.

Normally movement of the trigger **15** toward the valve stem **14** will not actuate the valve since the trigger lever **19** is free to rotate. Before the movement of the trigger **15** can actuate the valve **13,** a trigger arm **21** must be moved upwardly to bear against the inner end of the lever **19** so that when the trigger is moved the lever **19** is no longer free to rotate and therefore moves the stem **14** inwardly to actuate the valve **13.**

In order to move the trigger arm upwardly, an adapter **25** is mounted on the end of the driving tool **10** and such adapter includes a body **26** which is fixed to the driving tool in any desired manner, as by screws or other fasteners **27.** The inner portion **28** of the body **26** is of a configuration corresponding generally to the configuration of the end of the driving tool **10** and is connected by a reduced neck **29** to a generally cylindrical externally threaded outer portion **30.** The body **26** has a bore **31** extending generally along the vertical axis which communicates with a concentric counterbore **32** extending inwardly from the inner portion **28,**

and a concentric counterbore 33 extending inwardly from the outer portion 30. A guide bearing 34 is mounted within the bore 31 for guiding the driving member 35 of the driving tool 10.

A head or cap 38 threadedly engages the outer portion 30 of the body 26 and such head includes a relatively large axial bore 39 connected by a shoulder 40 to a concentric counterbore 41 adjacent to the body 26. A generally cylindrical holder 42 has an upper portion 43 slidably received within the counterbore 41 of the head and a reduced lower portion 44 slidably received within the bore 39. The upper portion 43 of the holder normally rests on the shoulder 40 of the head, as illustrated in FIGS. 3 and 5.

The holder 42 has a bore 45 along the vertical axis which is slightly larger than the diameter of the driving member 35 and such bore is connected by a shoulder 46 to a concentric counterbore 47. The counterbore 47 extends most of the way through the holder 42 and is adapted to receive a cylindrical magnet 48 which rests against the shoulder 46. The magnet 48 is provided with a central opening 49 substantially in alignment with and of a size corresponding to the bore 45 of the holder so that the driving member 35 can pass through the magnet. Preferably a shim or flat washer 50 is mounted on the upper surface of the magnet 48.

A relatively strong spring or other resilient member 51 surrounds the lower end of the driving member 35 and has its lower end disposed within the counterbore 47 of the holder 42 and bearing against the shim 50, while the upper end of such spring is received within the counterbore 33 of the body 26. The spring 51 normally maintains the holder 42 in spaced relationship with the body 26.

An upwardly extending post 52 is fixed to the holder 42 and such post is slidably mounted in an opening 53 in the outer portion 30 of the body 26. The post 52 is provided with a reduced upper end 54 which extends into the opening between the upper and lower portions of the body and adjacent to the neck 29 thereof. The inner portion 28 of the body 26 has an upwardly extending cylindrical recess 55 in alignment with the post 52 and such recess is adapted to receive a spring or other resilient member 56. The lower end of the trigger arm 21 is provided with an angularly disposed inwardly extending flange 57 the inner end of which is provided with an opening which receives the reduced end 54 of the post and is held in position by the spring 56. If desired the lower portion of the arm 21 may have a guide slot 58 in which a guide pin 59 is slidably received and such pin is connected to the inner portion 28 of the body 26.

In the operation of the device, when an insulation board 60 is to be mounted on a corrugated substructure 61, it is desirable to drive a roofing nail or other fastener 62 through the hills only of the substructure to make certain that the insulation is firmly connected to the substructure. In order to do this, the head of the nail 62 is placed in engagement with the lower end of the holder 42 where it is attracted by the magnet 48 and held in position. The driving tool 10 then is moved toward the insulation 60 and a downward force is applied thereto to cause the stem of the nail to penetrate the relatively soft insulation without substantially compressing the spring 51. If the penetrating point of the nail engages one of the hills of the substructure 61, as illustrated in FIG. 3, further downward movement of the driving tool overcomes the tension of the spring 51 so that the holder 42 moves upwardly from the outer stop or shoulder 40 into engagement with the outer portion 30 of the body 26 which provides an inner stop. Upward movement of the holder causes the post 52 to move upwardly and move the arm 21 upwardly so that the upper end of the arm abuts the free end of the trigger lever 19 so that when the trigger 15 is depressed the stem 14 of the valve 13 is moved and the valve is actuated so that air under pressure causes the driving member 35 to be extended to drive the nail 62 through the substructure 61, as illustrated in phantom in FIG. 4. As soon as the nail is driven, the spring 51 returns the holder 42 to its lower position and deactivates the valve 13.

With particular reference to FIG. 5, if the nail 62 should be aligned with one of the valleys of the substructure when the nail is pushed through the insulation, the lower end of the head 38 engages the upper surface of the insulation 60 before the nail encounters sufficient resistance to move the holder 42 and therefore the trigger 15 is still inoperative. When this condition occurs, the driving tool is raised after which the nail is pulled from the insulation and is again placed against the lower end of the holder 42 and the process is repeated until the nail engages one of the hills of the substructure. After two spaced nails have been driven through the same hill of the substructure, a line may be drawn between the two nails to assist the workman in locating a hill into which the nail may be driven.

I claim:

1. Apparatus for use with a tool having a power driven member for driving a fastener into a media which provides a predetermined resistance to the penetration of the fastener, said apparatus comprising holder means mounted for reciprocation coaxially of the power driven member and having a fastener engaging portion which is normally spaced outwardly of said power driven member, said holder means being constructed and arranged to permit said power driven member to contact the fastener without obstruction from said holder means, spaced inner and outer stop means limiting the movement of said holder means, resilient means normally urging said holder means toward said outer stop means, said holder means being movable toward said inner stop means upon engagement of the fastener with media of predetermined resistance prior to operation of said driving member, said resilient means not permitting movement of said holder means in media of less than said predetermined resistance, and linkage engaged by said holder means and conditioning said tool in non-driving state unless said holder means has moved to said inner stop means, whereby said fastener may be blind-nailed through an overlying media of less than said predetermined resistance into an underlying media having areas of greater and areas of less than said predetermined resistance and said power driven member will operate only when the fastener engages underlying media which is greater than said predetermined resistance.

2. Apparatus for use with a tool having a power driven member for driving a fastener into a media which provides a predetermined resistance to the penetration of the fastener, said apparatus comprising a body, means for mounting said body on said tool, a head carried by said body, holder means movably mounted within said head, resilient means normally

urging said holder means away from said body under a predetermined force, said holder means adapted to removably support a fastener having a stem extending outwardly of said head, and safety means actuated by said holder means to prevent operation of said tool until the fastener engages a media which provides sufficient resistance to overcome the force of said resilient means.

3. The structure of claim **2** in which said holder means includes an axial opening of a size to permit passage of the power driven member of the tool therethrough into engagement with the fastener.

4. The structure of claim **2** in which said holder means includes a magnet which releasably holds the fastener.

5. The structure of claim **2** in which said safety means includes a post fixed to said holder means and slidably mounted in said body, and linkage connected to said post and conditioning the operating mechanism of the tool to inoperative position until said holder means has overcome the force of said resilient means.

6. The structure of claim **2** including stop means spaced a predetermined distance apart to limit movement of said holder means.

7. Apparatus for use with a tool having a power driven member for blind driving a fastener into a relatively high density media and which is overlaid by a relatively low density media, said apparatus comprising a body, a head carried by said body, holding means movably mounted on said head, said holding means adapted to removably support a fastener having the stem extending outwardly of said head, resilient means normally positioning said holding means away from the body with a force greater than the force required for the fastener to penetrate the low density media, said holding means being movable toward said body upon engagement of the fastener with the relatively high density media but not upon engagement of the fastener with said relatively low density media, and safety means actuated by said holding means to prevent operation of said tool until the fastener engages the relatively high density media and said holding means is moved toward the body with a force sufficient to overcome said resilient means.

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