

Aug. 16, 1949.

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2,479,431

SAFETY MECHANISM FOR EXPLOSIVELY ACTUATED TOOLS

Filed June 22, 1948

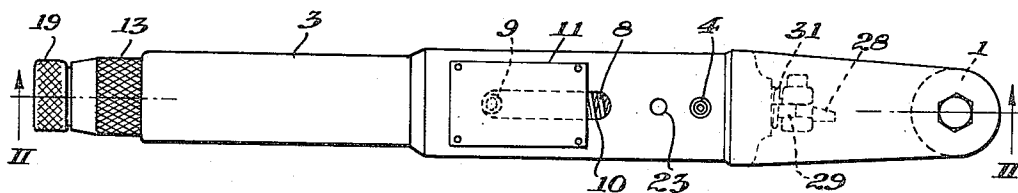


Fig. 1.

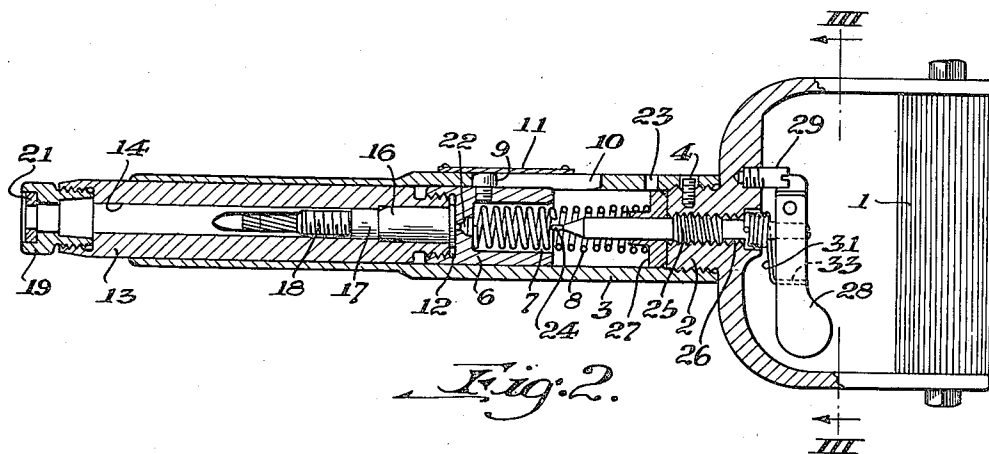


Fig. 2.

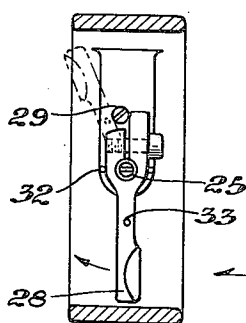


Fig. 3.

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UNITED STATES PATENT OFFICE

2,479,431

SAFETY MECHANISM FOR EXPLOSIVELY
ACTUATED TOOLS

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Application June 22, 1948, Serial No. 34,542

7 Claims. (Cl. 1—47)

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This invention relates to safety mechanism for explosively actuated tools that may be used for driving studs and the like, and more particularly to such tools which can not be discharged accidentally.

In one type of driving tool the explosive cartridge that furnishes the driving power is detonated by pushing the barrel back into the tool to press the cartridge against a stationary firing pin. If the barrel should be pushed back accidentally, as might happen if the tool were dropped and landed on either end, the cartridge would strike the firing pin and the stud or other projectile would be driven out of the barrel. That would endanger any nearby persons.

It is among the objects of this invention to provide a sliding barrel type of explosively actuated driving tool which can not be discharged accidentally, which requires a special manipulation by the operator before the tool is in condition to be fired, and which automatically returns to a non-firable condition when the tool is released.

In accordance with this invention a breechblock is slidably mounted in a barrel guard in the form of a sleeve projecting from the front of a stock that can be held in the hand. The breechblock, which has an axial passage through it, is urged forward in the sleeve by a spring. Detachably connected with the front end of the breechblock is a barrel which projects from the guard. The stud is provided with a threaded opening in line with the breechblock passage, and a firing pin is threaded in that opening. The pin normally is retracted far enough to keep its front end from projecting through the breechblock passage and into engagement with a cartridge, pressed against the front of the breechblock, in case the barrel accidentally pushes the breechblock rearward in the sleeve to firing position. In order to permit the tool to be discharged, there is a turning member for the pin which is adapted to be turned manually in one direction for screwing the pin forward in the threaded opening of the stock far enough that the pin will project through the breechblock passage when the block is pushed back to firing position. When the turning member is released, it is automatically turned in the opposite direction to return the pin to its retracted position. This preferably is done by means of a spring. It also is desirable to provide a stop for limiting the distance that the turning member can be turned in either direction. To prevent the tool from being used as a weapon with a stud serving as a bullet, the bar-

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rel normally projects from the sleeve a distance not materially greater than the distance between the forward and rearward positions of the breechblock in the sleeve. This prevents a person from holding the stock in one hand and pulling the barrel back in the guard with the other hand, as he will not be able to hold onto the barrel and pull it back far enough into the guard to cause the cartridge to strike the firing pin.

The preferred embodiment of this invention is illustrated in the accompanying drawings in which Fig. 1 is a plan view of the tool; Fig. 2 is a central longitudinal section thereof taken on the line II—II of Fig. 1; and Fig. 3 is a transverse section taken on the line III—III of Fig. 2.

Referring to Figs. 1 and 2 of the drawings, the stock is in the form of a D-handle provided with a hand grip 1. Opposite the grip the stock has a forwardly projecting portion 2 extending into the rear end of a sleeve 3 that is held in place by a screw 4 and forms a barrel guard. Slidably mounted in the rear end of the sleeve is a breechblock 5 that has a deep recess 7 in its rear end for receiving a coil spring 8 that urges the block away from the stock. Forward movement of the breechblock is limited by a cap screw 9 projecting from the top of the block into a slot 10 extending lengthwise of the sleeve. This slot may be covered by a nameplate 11 or the like.

The front end of the breechblock is provided with a short threaded recess 12 in which the rear end of a barrel 13 is screwed. The rear end of the axial bore 14 through the barrel is adapted to receive a cartridge 16, the rim of which is clamped between the rear end of the barrel and the breechblock. Preferably, the front end of the cartridge is crimped over a forwardly tapered rear portion of a piston member 17 that is frictionally connected to the rear end of a stud 18 for supporting it centrally in the barrel. The stud is shaped for the purpose for which it is intended, the one shown having a threaded rear end and a knurled central portion of smaller diameter to hold it in the material into which the stud is driven by the tool. The front end of the barrel is formed by a muzzle cap 19 provided with a recess for holding a metal washer 21 that is carried out of the cap by the stud. The bore through the cap is slightly smaller than the one through the rest of the barrel so that piston 17 will be stopped by the cap as the stud leaves the barrel. Barrels with different size bores for receiving studs of different diameters are interchangeable with the one shown. When a barrel is being screwed into or out of the breechblock,

the latter is prevented by cap screw 9 from rotating.

The breechblock is provided with an axial passage 22 through which a firing device can be projected for detonating cartridge 16. The firing device is in the form of a firing pin mounted in the stock, and discharges the cartridge when the barrel is pushed back a predetermined distance in barrel guard 3. The guard has a vent 23 to permit air to escape from behind the breechblock as the latter moves rearward in the guard. It is a feature of this invention, however, that simply pushing the barrel back in the guard will not detonate the cartridge, whereby accidental discharge of the tool is avoided. With this invention it is first necessary to move the firing pin forward from an inoperative to an operative position. Accordingly, the firing pin has a point member 24 integral with the front end of a threaded shank 25 that registers with threads formed in the wall of an opening 26 extending through the stock portion 2 in line with breechblock passage 22. The pin projects from both ends of the stock opening; the front portion of the pin being slidably mounted in a guide member 27 engaging the rear end of spring 8. Its inoperative position is one in which the pin is retracted far enough so that even if the barrel is pushed back in the guard sleeve as far as it will go, the point 24 will not project through the breechblock passage. In order to move the firing pin forward into firing position, a lever or arm 28 is rigidly mounted on its projecting rear end so that by swinging the arm to turn the pin, the pin is screwed forward through the stock far enough to be engaged by the cartridge when the barrel is pushed back. The position to which the arm is swung manually is shown in broken lines in Fig. 3. A stop member 29 is screwed into the stock in the path of both ends of the arm to limit the distance that the arm can be turned in either direction to only that necessary for moving the pin into and out of firing position. Although a single thread may be used to connect the shank of the firing pin to the stock, a multiple lead thread is preferred because it permits a greater forward movement of the firing pin to be obtained for a given rotation of the pin.

An important part of the invention is that the moment the operator releases arm 28, the pin automatically is returned to its retracted inoperative position. This is accomplished by a spring 31 coiled around the rear end of the firing pin shank in front of the arm. One end of the spring is anchored in a slot 32 in the stock, while the other end projects into a hold 33 in the arm. This torsional spring is put under such tension when the arm is swung manually to firing position that it will automatically swing the arm back to its original position, shown in full lines in Fig. 3, when released.

Another feature of this invention is that the barrel normally projects from its guard a distance substantially equal to, or not materially greater than, the distance that the breechblock travels in the sleeve. Consequently, very little of the barrel projects from the guard at the moment the tool is fired. This prevents a person from pushing the barrel back in the guard by hand and thereby using the tool as a weapon with the stud serving as a projectile.

It will be seen that the operation of this tool is as follows. After the barrel has been loaded with a stud and cartridge and has been screwed into the breechblock, the front end of the barrel

is placed against the object into which the stud is to be driven. One hand can grip the barrel guard while the other hand grips the hand grip 1. A thumb or finger of the latter hand then is used to swing arm 28 clockwise as far as it will go. This screws the firing pin ahead into operative position. While the arm is held in this position the handle is pushed forward to push the barrel and breechblock back into the guard sleeve as far as they will go. This causes the cartridge to strike the firing pin and be discharged, thus driving the piston and stud forward in the barrel. The piston is stopped by the muzzle cap 19, and the shock separates the piston from the stud which enters the object against which the barrel has been pushed. The arm then can be released, but torsion spring 31 will return it to its original position in which the firing pin will be retracted far enough so that it can not detonate the next cartridge until the arm again is swung by the operator clockwise against the stop 29. In this way a safety is provided for the tool which prevents it from being discharged accidentally.

If the tool is dropped and strikes on either end so that the barrel is impelled inward, the cartridge will not strike the firing pin because it is retracted. Likewise, the threaded connection between the firing pin and stock prevents the pin from being impelled forward to operative position by inertia or jarring.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing device threaded in said opening and having a point member projecting from its front end, said device normally being retracted in said opening to keep said point member from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, a turning member for the firing device adapted to be turned manually in one direction for screwing said device forward in said opening a predetermined distance so that said point member will project through said passage when the breechblock is in said firing position, and means operative automatically when the turning member is released for turning said device in the opposite direction to return it to its retracted position, whereby a safety is provided for the tool.

2. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening

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and normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, a turning member for the pin adapted to be turned manually in one direction for screwing the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, and a spring operative when the turning member is released for turning the pin in the opposite direction to return it to its retracted position, whereby a safety is provided for the tool.

3. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening and normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, a turning member for the pin adapted to be turned manually in one direction for screwing the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, and a spring connected to the turning member for turning it in the opposite direction to return the pin to its retracted position, whereby a safety is provided for the tool.

4. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening and normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, a turning member for the pin adapted to be turned manually in one direction for screwing the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, a stop limiting the distance that said member can be turned in said direction, and means operative automatically when the turning member is released for turning the pin in the opposite direction to return it to its retracted position, whereby a safety is provided for the tool.

5. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening and

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normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, the rear

5. end of the pin projecting from said opening, an arm rigidly mounted on said projecting rear end of the pin for turning it in one direction in order to screw the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, a spring connected to said arm for turning it in the opposite direction to return the pin to its retracted position, and a stop for limiting the distance that the arm can be turned in either direction.

6. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected with the front end of the breechblock and projecting from the sleeve, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening and normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, the barrel normally projecting from the sleeve a distance substantially equal to the distance between the forward and rearward positions of the breechblock in the sleeve, a turning member for the pin adapted to be turned manually in one direction for screwing the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, and means operative automatically when the turning member is released for turning the pin in the opposite direction to return it to its retracted position, whereby a safety is provided for the tool.

7. An explosively actuated driving tool comprising a stock, a sleeve projecting from the front of the stock, a breechblock slidably mounted in the sleeve and provided with an axial passage therethrough, a spring urging the breechblock forward in the sleeve, a barrel detachably connected to the front end of the breechblock and projecting from the sleeve, said barrel being adapted to receive an explosive cartridge and to clamp its rim between the adjoining ends of the barrel and breechblock, the stock being provided with a threaded opening in line with said passage, a firing pin threaded in said opening and normally retracted to keep its front end from projecting through said passage when the breechblock is accidentally pushed rearward in the sleeve by the barrel to firing position, a turning member for the pin adapted to be turned manually in one direction for screwing the pin forward in said opening a predetermined distance so that the pin will project through said passage when the breechblock is in said firing position, and means operative automatically when the turning member is released for turning the pin in the opposite direction to return it to its retracted position, whereby a safety is provided for the tool.

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No references cited.