This invention relates to shot type impact tools and more specifically to a mechanical safety device therefor. An object of this invention is to provide a positive lock-out arrangement for shot type impact tools to prevent inadvertent firing thereof.

Another object of this invention is to provide the aforementioned lock-out arrangement which is released when the tool is brought into contact with a work piece.

This invention contemplates a tool having a barrel, and a handle secured to the barrel. A pair of hollow members with resilient means therebetween are disposed in the barrel, one member being fixed against movement and the other being movable and biased by the resilient means toward the front end of the barrel. A plunger is slidably disposed in the barrel, and means engaging the two hollow members is provided to engage and prevent forward movement of the plunger. The plunger is permitted to move forwardly in the barrel displacing the engaging means by its forward movement when the tool is brought into a work piece moving the biased hollow member rearwardly against the resilient means to release the engaging means.

These and other objects will become apparent by referring to the following specification and the accompanying drawings which depict a preferred embodiment of the invention.

FIGURE 1 is an elevational view of a typical impact tool incorporating a safety device in accordance with the invention.

FIGURE 2 is a sectional elevational view of the forward end of the tool of FIG. 1 including the safety device.

FIGURES 3 and 4 are sectional views taken on lines 3—3 and 4—4 of FIG. 2 in the direction of the arrows.

While the invention is illustrated and described as being embodied in a portable power tool, the subject invention also finds utility in a press type machine such as a punch type rivet machine or a punch press.

Referring now to the drawings, the outer casing of a power tool 5 is comprised of a grip portion 7 and a barrel 13. The grip or handle 7 houses a trigger actuated valve 9 for controlling accumulated pressure stored in the enlarged upper chamber portion 11.

The barrel 13 is a stepped tubular member having the largest portion defining a cylinder chamber 15 at the rearward end thereof adjacent to the pressure storage chamber 11. The chamber 15 encloses a piston 47, the rod 49 of which is the working tool and extends into the next forward portion 23 of the barrel 13 which forms a mechanical lock chamber as will be further discussed.

The forward portion or nozzle 27 is the smallest part of the barrel 13 and forms a housing for a tubular release member 29. The tubular release member 29 normally extends outwardly from the front edge of the barrel 13 and has an enlarged rear portion 31 forming an annular shoulder 33 adapted to engage a matching shoulder 25 which defines the front end of the lock chamber 23.

There are a pair of holes or detent receivers 35 in the walls of the enlarged portion 31 and a pair of axially extending internal slots 37, in the inner surface, extending from the holes 35 to the back edge of the enlarged portion 31.

A resilient means or spring 39 engages the back surface of the release member 29 and urges or biases it forwardly in the housing such that the shoulders 25 and 33 abut one another. The spring 39 engages a shoulder on a tubular spring seat member 41 which also forms a detent retainer. The member 41 is locked in the chamber 23 by drive pins, rivets, lock wire or any of the well known methods (not shown). The rear surface of the member 41 is flush with an internal shoulder 17 which defines the front end of the cylinder chamber 15. Forwardly of the shoulder on the member 41 is a reduced portion 43 which is encircled by the spring 39 and extends into the enlarged portion 31 of the release member 29. Adjacent to the front end of the reduced portion 43 are a pair of holes 45 which receive and retain detent balls 53 and are in alignment with an annular groove 51 in the forward end of the piston rod 49 when the piston 47 is in its rearmost position.

When the tool is ready for firing, the chamber 11 is fully charged and the piston 47 is in its rearmost position. The detent balls 53 are carried within the openings 45 in the reduced portion 43 of the spring seat 41 and are seated in the annular groove 51 of the piston rod 49. As may be seen, the balls are prevented from leaving the groove 51 by their engagement with grooves 27 in the rearmost portion of the release member 29.

Accidental operation of the valve 9 which would release the charge in the chamber 11 and normally drive the piston 47 rearwardly is negated by the mechanical detent lock members 53.

To operate the tool 5, the release member 29 is pressed against a work piece (not shown) and urged rearwardly into the tool housing 13. The trigger valve 9 is actuated with the release member 29 in the depressed position, and the holes 35 of the enlarged portion 31 aligned with the holes 45 in the spring retainer. The force of the piston 47 will now drive the balls 53 out of the annular groove 51 and into the openings 35 thus releasing the piston which is driven forwardly. As the piston 47 moves forward, the air in the front end of the chamber 15 is vented through a passage 21 and at the end of the stroke, the front of the piston 47 engages a cushion pad 19 provided to absorb shock.

To return the piston 47 to its original position, release of the valve 9 causes pressure fluid to enter the forward end of the chamber 15 and move the piston 47 rearwardly. At the same time, by removing the tool 5 from the work piece, the spring 39 urges the release member 29 forwardly. When the piston 47 reaches its most rearward cocked position, the balls 53 will be forced back into engagement with the annular groove 51. As the balls 53 enter the groove 51 and leave the openings 35, the spring 39 drives the release member 29 forwardly until the shoulder 33 again engages the shoulder 25 of the housing. Pressure fluid is again delivered to the chamber 11 and the tool is now cocked and ready for subsequent operation.

Having thus described my invention, I claim:

1. An impact tool comprising a barrel, a handle secured to the barrel, a plunger slidably mounted in the barrel, a first hollow member fixedly secured in the barrel, a second hollow member slidably mounted in the barrel, resilient means urging the second hollow member toward the front end of the barrel, and means engaging the plunger and the two hollow members to prevent movement of the plunger toward the front end of the barrel and upon the second hollow member being moved toward the rear end of the barrel by contact with means remote from said tool the engaging means being displaced by the plunger so that the plunger may move toward the front end of the barrel.

2. An impact tool comprising a barrel, a handle secured to the barrel, a piston having a piston rod slidably mounted in the barrel, a first hollow member fixedly se-
cured in the barrel and surrounding the piston rod, a second hollow member slidably mounted in the barrel and over the first hollow member, resilient means disposed in the barrel urging the second hollow member toward the front end of the barrel, and means engaging the piston rod and the two hollow members to prevent movement of the piston toward the front end of the barrel in one position and the second hollow member upon engaging a work piece and moving toward the rear end of the barrel the means being in a releaseable position for the piston to move toward the front end of the barrel displacing the means.

3. An impact tool comprising a barrel, a handle secured to the barrel, a piston having a piston rod slidably mounted in the barrel, the piston rod being provided with an annular groove adjacent the free end thereof, a first tubular member fixedly secured in the barrel and surrounding the piston rod, said first tubular member being provided with a plurality of holes therein, a second tubular member having a plurality of holes and being slidably mounted in the barrel with one end thereof projecting beyond the front end of the barrel when urged to its forwardmost position, resilient means disposed in the barrel engaging and urging the second tubular member toward the front end of the barrel to its forwardmost position, and balls disposed in the annular groove in the piston rod being disposed in the holes in the first tubular member to prevent movement of the piston toward the front end of the barrel, said balls being moved outwardly in the holes in the first tubular member from the groove and into the holes in the second tubular member by firing the piston when the second tubular member is pressed against a workpiece and moved rearwardly registering the holes in the two tubular members with each other.

4. The combination with a tool having a barrel and a piston having a piston rod with an annular groove adjacent the free end thereof and being reciprocal relative to the barrel, of a first tubular member fixedly secured in the barrel and surrounding the piston rod, said first tubular member being provided with a plurality of holes therein, a second tubular member slidably mounted in the barrel and having one end projecting beyond the front end of the barrel when in its forwardmost position, said second tubular member being provided with a plurality of spaced slots extending from the other end thereof and a plurality of holes at the ends of the slots, resilient means surrounding the first tubular member engaging and urging the second tubular member toward the front end of the barrel to its forwardmost position, and balls disposed in the annular groove in the piston rod being disposed in the holes in the first tubular member and in the slots in the second tubular member to prevent movement of the piston toward the front end of the barrel, said balls being moved outwardly in the holes in the first tubular member from the groove and into the holes in the second tubular member by firing the piston when the second tubular member is pressed against a workpiece and moved rearwardly in the barrel registering the holes in the two tubular members with each other.

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