

[54] **CARTRIDGE-ACTUATED FASTENER-DRIVING TOOLS**

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[22] Filed: **May 17, 1971**

[21] Appl. No.: **143,823**

[30] **Foreign Application Priority Data**

May 30, 1970 Germany.....P 20 26 570.7

[52] U.S. Cl.....**227/10**

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

[58] Field of Search.....227/9, 10, 11

[56]

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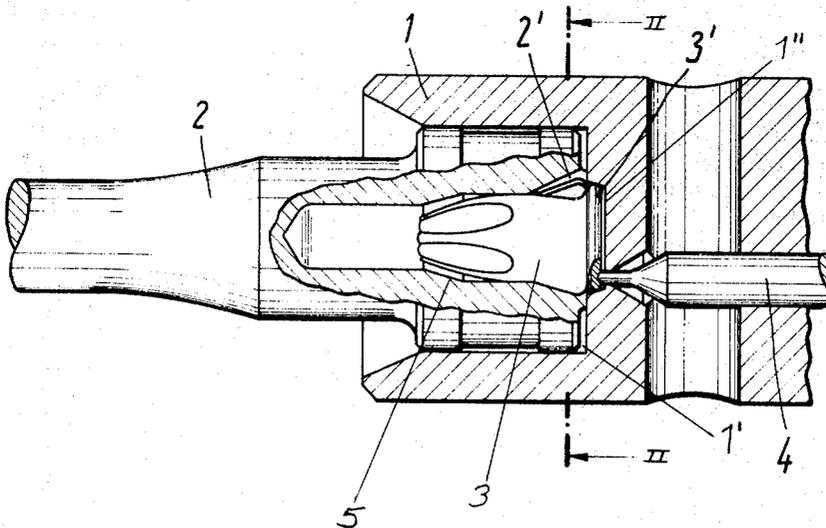
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ABSTRACT

A cartridge-actuated tool adapted to explosively drive fasteners is provided which ejects the actuating cartridge into a propulsion chamber while controlling cartridge rupture so as to avoid tool damage.

3 Claims, 2 Drawing Figures



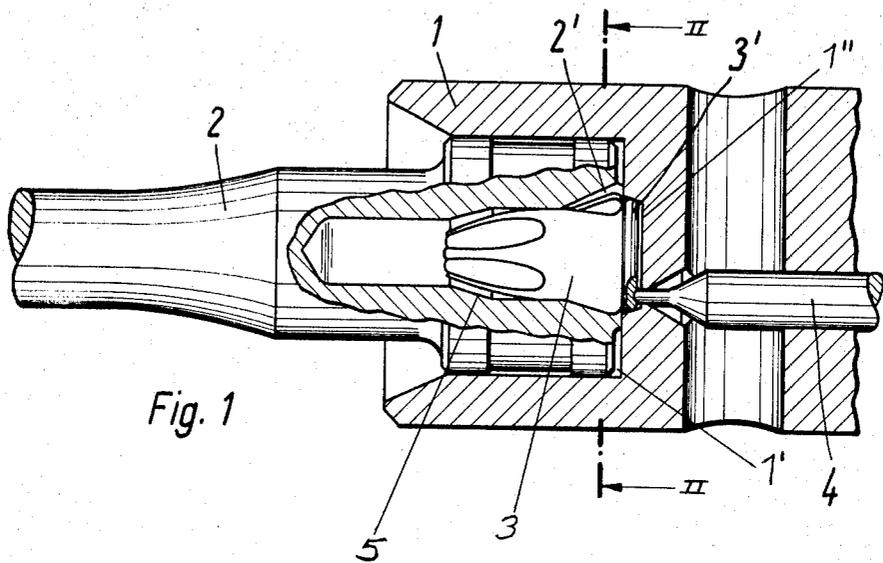


Fig. 1

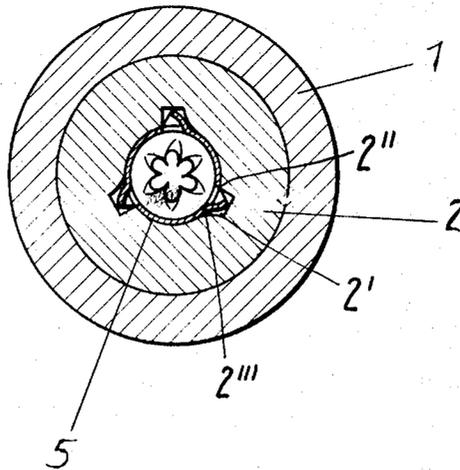


Fig. 2

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CARTRIDGE-ACTUATED FASTENER-DRIVING TOOLS

This invention relates to cartridge-actuated fastener-driving tools for explosively inserting bolts, pins, studs or other like fasteners.

The invention is concerned with cartridge-actuated fastener-driving tools comprising a thrust plunger displaceable by the combustion gases from a detonated cartridge, the thrust plunger having its rearward end arranged to be received in a propulsion chamber, and a cartridge chamber being provided to issue into the propulsion chamber and to receive a cartridge in such manner that the base of the cartridge faces towards the propulsion chamber, whereby the cartridge case is ejected into the propulsion chamber after detonation by the pressure generated by the combustion gases.

Known cartridge-actuated fastener-driving tools of the above-mentioned type in which the cartridge chamber is located either in the rearward end of the thrust plunger or alternatively in a barrel having a portion encircling the thrust plunger are characterized in that the cartridge case is designed to be withdrawn or ejected automatically from the cartridge chamber upon the forward movement of the thrust plunger under the pressure of the burning gases, and thus no special mechanical withdrawal elements are necessary. However, in these known tools there is a danger of disintegration or splitting of the cartridge case frequently occurring due to the considerable difference in gas pressure between the interior and exterior of the cartridge case, with the result that functional damage to the tool may arise and the operation of the tool may in consequence be considerably impaired. In order to meet this problem attempts have already been made to reduce the pressure difference between the interior and exterior of the cartridge case by providing channels for the gases in the rearward end of the thrust plunger which defines the cartridge chamber, these channels extending rearwardly towards the propulsion chamber and at an angle to the base of the cartridge chamber. However, even with this modification, splitting of the cartridge case is not avoided. Moreover, due to the provision of the special channels for the gases the cartridge chamber itself is weakened. In addition, it is known in firearms to provide small longitudinal grooves either in the cartridge case or in the cartridge chamber for the purpose of equalizing the gas pressure and thus reducing the bursting pressure in the cartridge case. The combustion gases from the cartridge case can escape along these small longitudinal grooves and can pass rearwards between the case and the cartridge chamber wall so that in this way the pressure on the walls is reduced and the cartridge case can be withdrawn more easily. However, the above-mentioned measures are not satisfactory for cartridge-actuated fastener-driving tools which include a thrust plunger.

It is an object of the present invention to provide a cartridge-actuated fastener-driving tool having a thrust plunger and which is operative in such a way that ejection of the spent cartridge case occurs automatically by the action of the gas pressure, and more particularly so that the cartridge case is ejected without being split or broken up.

This is achieved in accordance with the present invention by the provision of a cartridge-actuated

fastener-driving tool comprising a thrust plunger displaceable by the combustion gases from a detonated cartridge, the thrust plunger having its rearward end arranged to be received in a propulsion chamber, a cartridge chamber issuing into the propulsion chamber and arranged to receive a cartridge in such manner that the base of the cartridge faces towards the propulsion chamber, whereby the cartridge case is ejected into the propulsion chamber by gas pressure after detonation, characterized in that desired rupture areas for the cartridge case are provided in the wall of the cartridge chamber adjacent to the propulsion chamber in the form of axially extending recesses.

In this way the cartridge case breaks open without splitting after detonation of the charge at predetermined areas which are positioned as far as possible close to the base of the cartridge so that the high internal pressure generated in the cartridge case by the detonation can be vented swiftly out into the propulsion chamber and with the result that the cartridge case is ejected without splitting and without impairment of the driving force generated by the combustion gases.

The invention is particularly appropriate for use with cartridge-actuated fastener-driving tools which are provided with a barrel fitted with a firing pin and having a portion encircling the rearward end of the thrust plunger to define the propulsion chamber, with the cartridge chamber provided in the rear end of the thrust plunger. In such a case, and in accordance with a preferred feature of the invention, the desired rupture areas are defined by slots provided in the rearward section of the cartridge chamber wall in the form of inclined slots which increase in cross-sectional area towards the propulsion chamber and which are substantially trapezoidal in cross-section with one side wall of each slot meeting the cartridge chamber wall at a sharp angle and with the other side wall of each slot meeting the cartridge chamber wall in a smooth curve. By this means, breaking open of the cartridge case at the predetermined rupture areas in the cartridge chamber is favored and the danger of splitting of the cartridge case with its undesirable attendant effects is avoided in practice.

In order that the invention may be more fully understood a preferred embodiment in accordance with the invention will now be described by way of example and with reference to the accompanying drawing, in which:

FIG. 1 is a view, partly in section, of those parts of a cartridge-actuated fastener-driving tool incorporating a thrust plunger which are essential to the present invention; and,

FIG. 2 is a cross-section taken along the line II—II of FIG. 1.

It should be realized that only those parts of the fastener-driving tool which are relevant to the present invention are illustrated in the drawing and are described hereinafter. The fastener-driving tool comprises a barrel 1 which defines a propulsion chamber 1' formed as a recess in the forward end of the barrel 1. A thrust plunger 2 is displaceably held in the propulsion chamber 1', and in the ready-to-fire position shown in the drawing the rear end of the thrust plunger fits fully into the propulsion chamber 1'. A cartridge chamber 5 in the form of a multiple stepped bore is provided in the

rear end of the thrust plunger 2 and receives a cartridge 3 which has its base rim 3' facing towards the propulsion chamber 1' and projecting into a correspondingly shaped recess 1'' in the barrel wall forming the base of the propulsion chamber. A firing pin 4 is mounted in the barrel for axial movement relative thereto so as to cause detonation of the cartridge.

Inclined slots 2', three in number in this preferred embodiment, are provided in the wall of the rear section of the cartridge chamber. These slots 2' increase in cross-sectional area towards the propulsion chamber 1' and, as shown in FIG. 2, are each of substantially trapezoidal cross-section. One side wall 2'' of each slot 2' meets the cartridge chamber wall at a sharp angle, while on the other hand the other side wall 2''' of each slot 2' meets the cartridge chamber wall in a smooth curve. These slots 2' define desired rupture areas of the cartridge case which, under the influence of the internal pressure generated by the detonation, bursts open in the manner shown in FIG. 2, i.e., along the lines defined by the junction of the slot side walls 2'' with the cartridge chamber wall. This results in a swift pressure equalization between the interior of the cartridge case and the exterior of the cartridge case so that further splitting or even disintegration of the cartridge case is reliably prevented.

I claim:

1. A cartridge-actuated fastener-driving tool comprising a barrel fitted with a firing pin and having a propulsion chamber disposed therein; a thrust plunger having a rear portion disposed in said chamber; said thrust plunger having a cartridge chamber at least partially disposed in said rear portion; the cartridge chamber being adapted to receive a cartridge in such manner that the base of the cartridge faces the propulsion chamber whereby the cartridge case is ejected into the propulsion chamber by gas pressure after cartridge detonation; the wall portion of the cartridge chamber disposed adjacent to the propulsion chamber having axially extending rupture recesses for a cartridge disposed in the cartridge chamber.

2. The tool of claim 1 in which said rupture recesses increase in cross-sectional area in the direction of the propulsion chamber.

3. The tool of claim 1 in which said rupture recesses are substantially trapezoidal in cross-section with one side wall of each recess meeting the cartridge chamber wall at a sharp angle, and with the other side wall of each recess meeting the cartridge chamber wall in a smooth curve.

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