

Dec. 7, 1948.

R. TEMPLE

2,455,826

EXPLOSIVELY ACTUATED TOOL

Filed Oct. 5, 1946

2 Sheets-Sheet 1

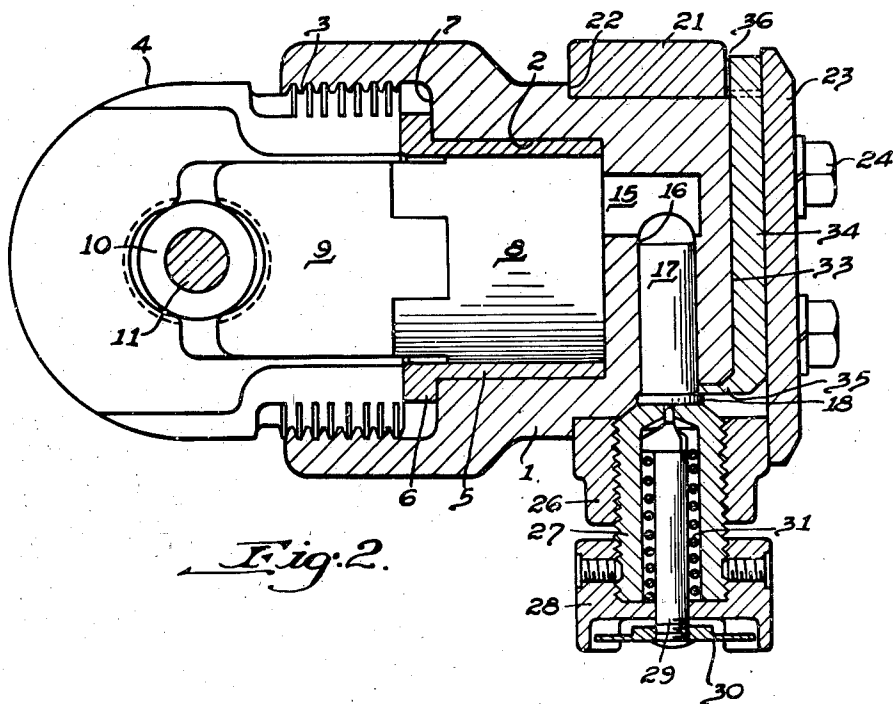
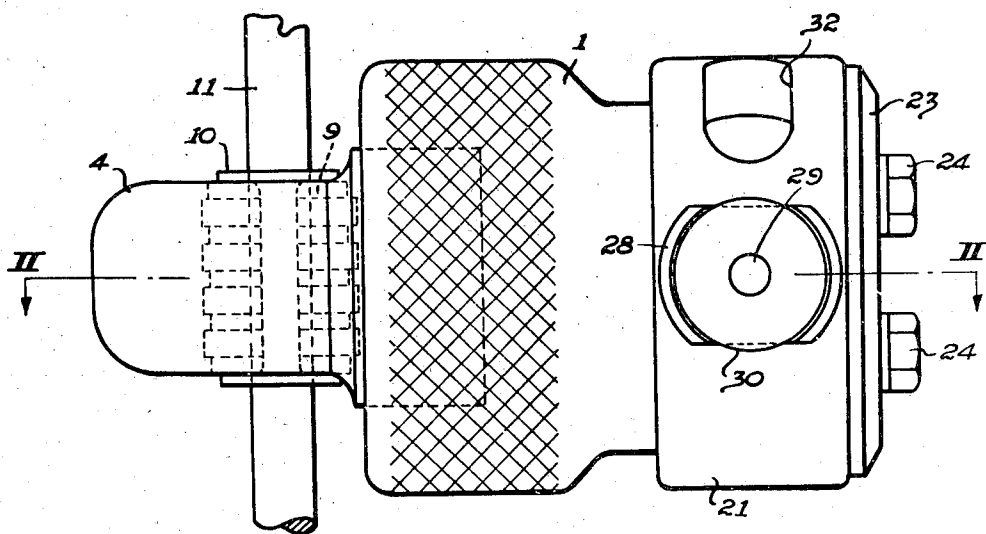


Fig. 1.

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2 Sheets-Sheet 2

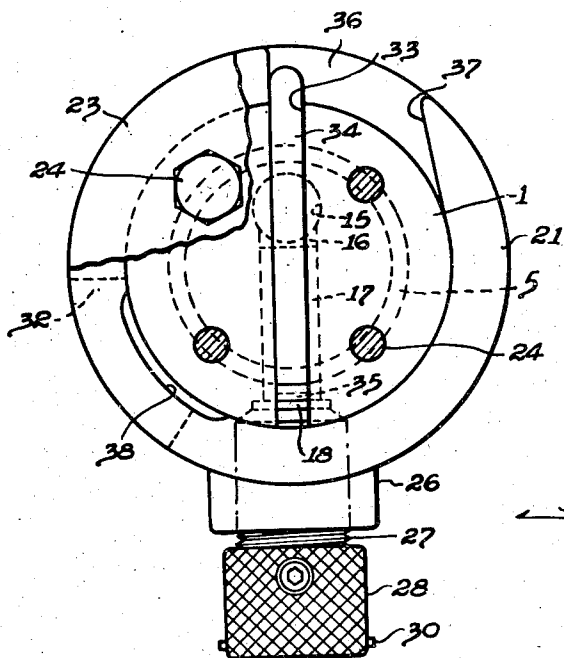


Fig. 3.

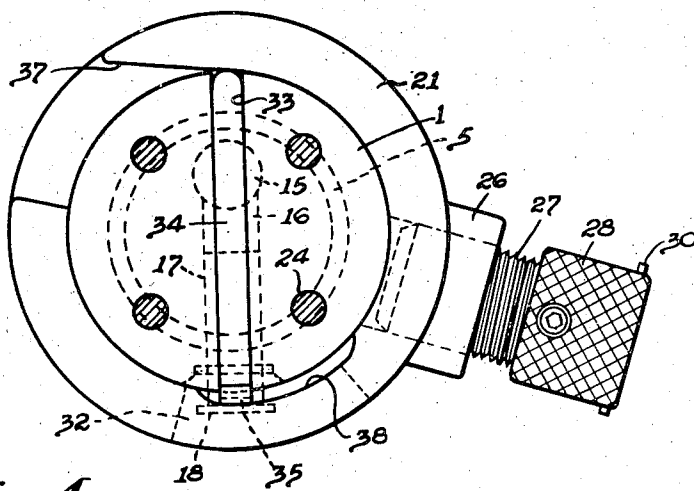


Fig. 4.

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UNITED STATES PATENT OFFICE

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EXPLOSIVELY ACTUATED TOOL

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8 Claims. (Cl. 140--113)

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This invention relates to explosively actuated tools, and more particularly to powerful small tools and the ejection of cartridge shells therefrom.

It is among the objects of this invention to provide such a tool which is small but very powerful, which can quickly be disconnected from the work, and from which a cartridge shell is automatically ejected when the tool is prepared for reloading.

In accordance with this invention the body of the tool is provided with a bore extending inwardly from one end. A piston is slidably mounted in the bore for driving a movable die against articles on which the tool operates. Opposite sides of the piston are engaged by the arms of a U-shape stationary die which are detachably connected to the tool body by inserting them in the bore and giving them a quarter turn. Communicating with the inner end of the bore is a passage that extends radially of the bore to the periphery of the body. Removably mounted in this passage is an explosive cartridge which has the usual rim at its outer end. Rotatably mounted on the body is an encircling ring which is provided with a radial opening through which a firing pin extends for detonating the cartridge. Preferably, the pin is slidably mounted in a breech block that is threaded in the ring opening so that the inner end of the block can be screwed against the outer end of the cartridge. After the cartridge has been fired the breech block is retracted far enough to permit the ring to be rotated on the body in order to remove the breech block from behind the empty shell and to bring another radial opening through the ring into line with the shell. At the same time a cam surface, with which the ring is provided, moves into contact with one end of an ejector that extends slidably across the tool body with its opposite end engaging the inner surface of the rim of the cartridge shell. The pressure of the cam against the ejector moves it and causes it to push the cartridge shell out of the passage so that it can drop or be pulled through the adjoining ring opening. A new cartridge then is inserted in the passage, and the ring is turned back to bring the breech block into line with the cartridge against which the block then is screwed.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a bottom view of the tool; Fig. 2 is a longitudinal section taken on the line II--II of Fig. 1; Fig. 3 is a rear end view of the tool with the end plate broken away; and Fig. 4 is a similar

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view, but showing the ring rotated into cartridge ejecting position.

Referring to the drawings, a cylindrical metal tool body 1 is provided with a cylindrical bore 2 extending inwardly from one end. The outer end portion of the bore has a larger diameter than the inner portion and is provided with interrupted screw threads 3 to receive a U-shape member 4 which forms a stationary die. In assembling the die and body, the parallel arms of the die are inserted in bore 2 between the two sets of screw threads, and then the die is turned 90° to engage its threads with those of the body. Mounted in the inner end of the bore is a cylindrical bushing 5 which is encircled at its outer end by a flange 6 that is clamped between the inner end of the stationary die and the shoulder 7 connecting the two parts of the bore. Slidably mounted in this bushing is a piston 8 which is integrally connected to a movable die 9 that cooperates with the stationary die. The movable die is rectangular in cross section so that it has flat surfaces that slide along the flat inner surfaces of the arms of the stationary die. The movable die also serves as a brace or block that prevents the arms of the other die from bending toward each other and becoming disengaged from threads 3. The work-engaging portions of these dies are shaped in accordance with the purpose for which they are to be used. Those shown are intended for compressing sleeves 10 on the adjoining ends of cables or bus bars 11 to connect them together.

At the inner end of bore 2 the tool body is provided with a small chamber 15 located at one side of the axis of the bore into which it opens. Extending from the side of this chamber radially through the body to the far side thereof is a cylindrical passage 16 of a size adapted to receive a cartridge 17 containing a charge of explosive. The outer end of this passage flares outwardly and receives the usual rim 18 on the outer end of the cartridge.

Encircling the end portion of the body that contains chamber 15 and passage 16 is a metal ring 21 that is rotatable around the body. The ring is held in position lengthwise of the body by an annular shoulder 22 on the body and by a circular plate 23 connected to the end of the body by screws 24.

The ring has a thickened portion 26 normally located at the outer end of the cartridge, and is provided with a threaded radial opening in axial alignment with passage 16. Screwed into this opening is a breech block 27, the inner end of which is tapered to seat in the flared outer end

of the passage against the cartridge to hold it in place when it is fired. The outer end of the breech block projects from the ring and carries a knurled and recessed head 28 by which the block can be turned in the ring. The block is provided with an axial passage in which a firing pin 29 is slidably mounted. The outer end of the pin projects into the head and supports a disc 30, while a coil spring 31 encircles the pin to keep it from slipping outwardly in the breech block. When the disc is struck by a hammer, the pin is driven inwardly against the cartridge to detonate it. The explosion builds up pressure in the chamber and thereby drives piston 8 and the movable die toward the stationary die.

In order to reload the tool, the breech block 27 is unscrewed from ring 21 far enough to draw the inner end of the block out into the ring. The ring then can be rotated around the body 1, using the head 28 of the breech block as a handle, until a radial opening 32 through the ring arrives below the empty cartridge shell. When this occurs, the shell automatically is ejected, partially or completely, from passage 16. This is accomplished by providing the end wall of the body with a slot 33 that extends diametrically across it. As shown in Fig. 2, the lower end of the slot extends laterally into the flared outer end of the cartridge passage. Slidably mounted in this slot is a bar 34 which forms a cartridge ejector. One end of the bar is provided with a lateral projection or finger 35 which, before the cartridge is discharged, projects between the cartridge rim and body 1 and engages the inner surface of the rim. At the same time the opposite end of the bar projects radially from the slot into an opening 36 through the ring.

When the ring is rotated around the body to bring opening 32 into line with the empty shell, a cam surface 37, which forms one end wall of opening 36, as shown in Fig. 3, moves into engagement with the projecting end of the ejector bar and pushes it downwardly as disclosed in Fig. 4. The inner surface of the ring opposite the cam surface is provided with a cut-away area 38 to permit the adjacent end of the bar to move down the necessary distance without escaping from the body. At the same time finger 35 on the bar pushes down on the cartridge rim and thereby starts the shell moving out of the passage. If the shell then is sufficiently loose in the passage, it will drop out through ring opening 32 or be blown out by compressed gas remaining in chamber 15. If the shell is not loose enough to fall out of its own accord, the rim 18 can be grasped by the fingers to pull it out. The ring then is turned back just far enough to remove cam 37 from above the ejector, and a new cartridge is inserted in passage 16. The rim of the cartridge engages ejector finger 35 and pushes the bar back up to its original position. Then the ring is turned the rest of the way back to its original position, and breech block 27 is screwed into the flared outer end of the passage to hold the new cartridge firmly in place in line with the firing pin.

This tool is designed especially for work in close quarters such as when cables are to be connected to other cables projecting from a board in closely spaced relation. The tool is short because the firing mechanism projects from one side and the stationary die does not take up much room. The stationary die can be quickly disconnected from the tool body after a pair of cables have been joined by merely giving the body a quarter turn

to disengage the threads. Although the tool is small, being shown full size in the original drawings, it produces a pressure between the dies of forty tons or more.

According to the provisions of the patent statutes, I have explained the principle and construction 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. A tool comprising a body provided with a bore extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, an ejector extending slidably across the body and having one end adapted to engage the inner surface of the cartridge rim, the opposite end of the ejector being located adjacent the opposite side of the body, a ring encircling the body and rotatably mounted thereon, and a firing pin extended radially through the ring and normally located in line with said passage, said ring being provided with a radial opening and with a cam surface opposite said opening for pushing said opposite end of the ejector transversely of said body when the ring is rotated, whereby to eject a cartridge shell from said passage so that it can pass out through said ring opening.

2. A tool comprising a body provided with a bore extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, an ejector extending slidably across the body and having one end adapted to engage the inner surface of the cartridge rim, the opposite end of the ejector being located adjacent the opposite side of the body, a ring encircling the body and rotatably mounted thereon, and a firing pin supported by the ring normally in line with said passage but rotatable with the ring, said ring being provided with a radial opening and with a cam surface opposite said opening for pushing said opposite end of the ejector transversely of said body when the ring is rotated, whereby to eject a cartridge shell from said passage so that it can pass out through said ring opening.

3. A tool comprising a body provided with a bore extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, an ejector extending slidably across the body and having one end adapted to engage the inner surface of the cartridge rim, the opposite end of the ejector being located adjacent the opposite side of the body, a ring encircling the body and rotatably mounted thereon, said ring being provided with a threaded radial opening normally in axial alignment with said passage, a firing pin in the center of said opening, and a breech block threaded in said opening and slidably supporting the pin, said

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block being adapted to be screwed inwardly of the ring against the outer end of the cartridge, and said ring being provided with a second radial opening and with a cam surface opposite thereto for pushing said opposite end of the ejector transversely of said body when the ring is rotated after said block has been screwed outwardly in the ring, whereby said ejector will eject a cartridge shell from said passage so that it can pass out through said second ring opening.

4. A tool comprising a body provided with a bore extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a chamber opening into the inner end of said bore and with a passage extending radially from the side of said chamber to the periphery of said body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, an ejector extending slidably across the body and having a lateral projection at one end adapted to extend between said body and cartridge rim, the opposite end of the ejector normally projecting from the body, a ring encircling the body and rotatably mounted thereon, and a firing pin extending radially through the ring and normally located in line with said passage, said ring being provided with a radial opening and with a cam surface opposite said opening for pushing said projecting end of the ejector inwardly toward said body when the ring is rotated, whereby to eject a cartridge shell from said passage so that it can pass out through said ring opening.

5. A tool comprising a body provided with a bore, extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, an ejector extending slidably across the body and having one end adapted to engage the inner surface of the cartridge rim, the opposite end of the ejector being located adjacent the opposite side of the body, a ring encircling the body and rotatably mounted thereon, said ring being provided with a threaded radial opening normally in axial alignment with said passage, a breech block threaded in said opening and adapted to be screwed inwardly thereof to engage the outer end of a cartridge in said passage, said block extending outwardly from said ring to provide means for manually turning it in the ring, said block being provided with an axial passage with its outer end projecting therefrom and adapted to be struck by a hammer to fire said cartridge, and said ring being provided with a second radial opening and with a cam surface opposite thereto for pushing said opposite end of the ejector transversely of said body when the ring is rotated after said block has been screwed outwardly in the ring, whereby said ejector will push a cartridge shell from said passage so that it can pass out through said second ring opening.

6. A tool comprising a body provided with a

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bore extending inwardly from one end, a piston slidably mounted in said bore, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge having a rim at its outer end, the opposite end of said body being provided with a slot extending diametrically across it, an ejector slidably mounted in said slot and having a lateral projection at one end adapted to extend between said body and cartridge rim, the opposite end of the ejector normally projecting from the body, means secured to said opposite end of the body for holding the ejector in the slot, a ring encircling the body and rotatably mounted thereon, and a firing pin extending radially through the ring and normally located in line with said passage, said ring being provided with a radial opening and with a cam surface opposite said opening for pushing said projecting end of the ejector inwardly toward said body when the ring is rotated, whereby to eject a cartridge shell from said passage so that it can pass out through said ring opening.

7. A tool comprising a body provided with a bore extending inwardly from one end, a U-shape die having a pair of arms extending into said bore, means detachably connecting said arms to said body, a piston slidably mounted in said bore, a movable die joined to the front end of the piston and disposed between said arms in sliding engagement with their inner surfaces, said body at the opposite end of the bore being formed to receive an explosive cartridge, and a firing pin for detonating the cartridge.

8. A tool comprising a body provided with a bore extending inwardly from one end, the wall of the outer end portion of the bore being provided with interrupted screw threads, a U-shape die having a pair of parallel arms extending into said bore with their outer surfaces provided with screw threads registering with said first mentioned threads to detachably connect the die to the body, the inner surfaces of said arms being flat and parallel, a piston slidably mounted in the inner end portion of said bore, a movable die joined to the front end of said piston and disposed between said arms, said movable die having flat surfaces slidably engaging said flat surfaces of said arms, said body also being provided with a passage communicating with the inner end of the bore and extending radially thereof to the periphery of the body, said passage being adapted to receive an explosive cartridge, and a firing pin extending radially of the bore in line with said passage for detonating the cartridge.

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