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R. T. CATLIN ET AL
CURVED BARREL EXTENSION FOR CARTRIDGE-POWERED
STUD DRIVING TOOLS

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2 Sheets-Sheet 1

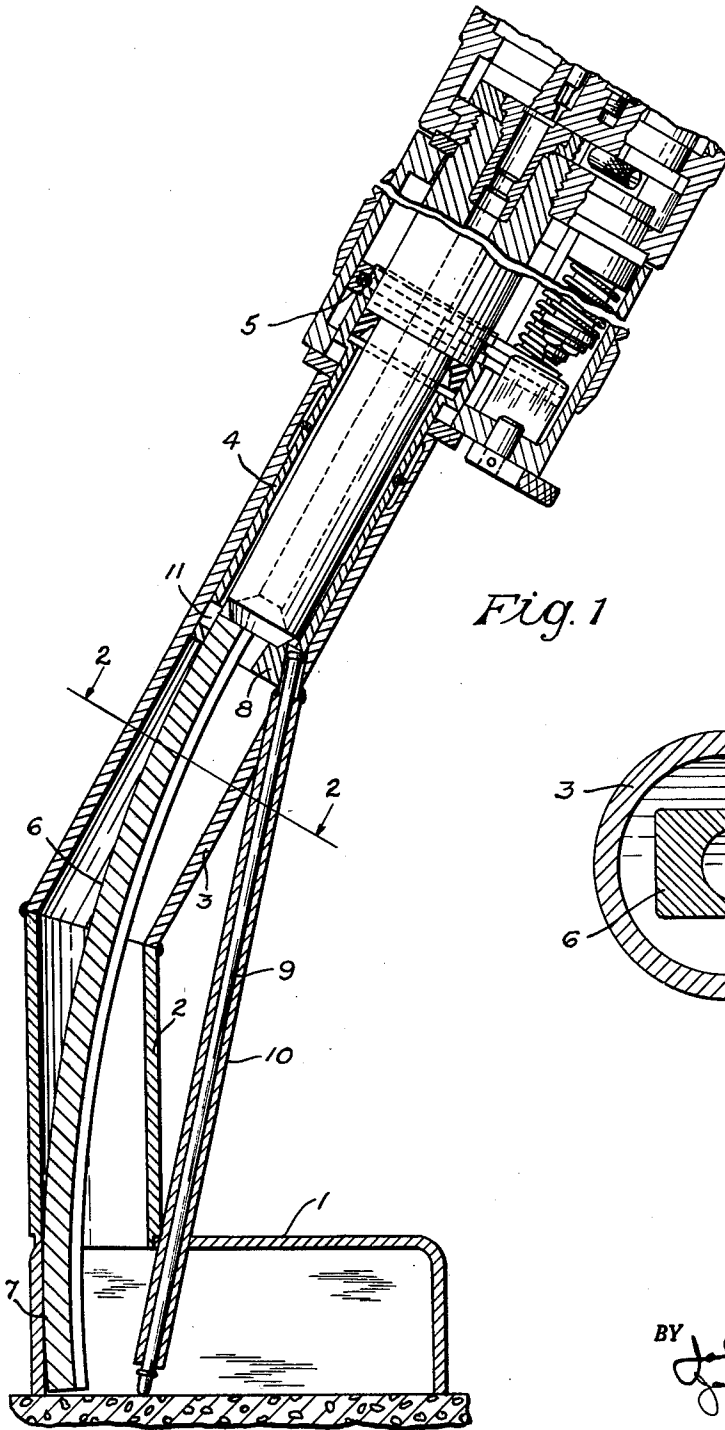


Fig. 1

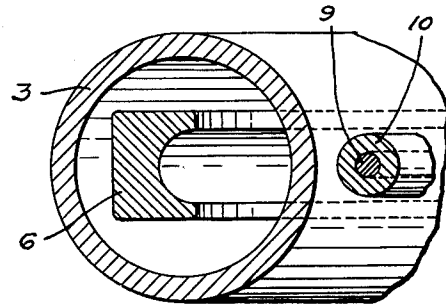


Fig. 2

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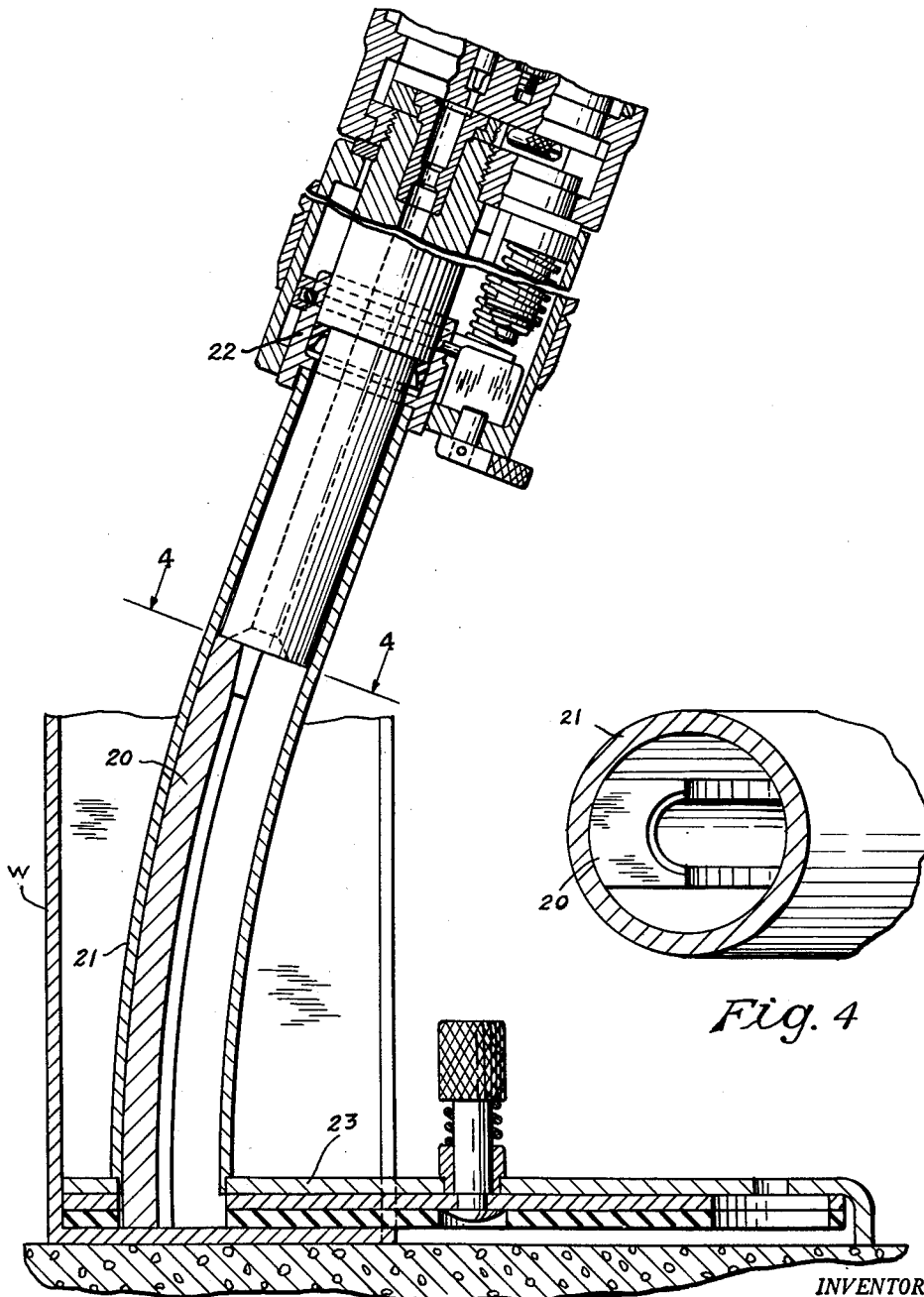


Fig. 4

Fig. 3

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CURVED BARREL EXTENSION FOR CARTRIDGE-POWERED STUD DRIVING TOOLS

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Application March 8, 1956, Serial No. 570,244

1 Claim. (Cl. 1—106)

This invention relates to an accessory for cartridge-powered stud driving tools and has particular application to facilitating the use of such tools in locations not accessible to the use of a conventional stud driver.

There are a number of applications for cartridge-powered stud drivers which require driving a stud beneath an obstruction or in a base of a narrow recess in a vertical surface. Under these conditions, the physical dimensions of most stud drivers make it impossible to properly position the tool normal to the work surface, and a serious safety hazard exists if the studs are driven with the conventional stud driver held at an angle to a work surface. Examples of some of these applications are: fastening church and theatre seats; fastening steel door bucks; and fastening overhead door brackets.

We believe that the best solution to this problem is to effectively extend the barrel of the tool around a curve so that tilting the tool to obtain the necessary mechanical clearance still will result in driving a stud vertically into the work surface. With such a design, we have found that within reasonable limits the stud in the course of projection will conform to the curvature of the barrel as it passes through the curved portion due to centrifugal force and will recover elastically from that deformation after being driven into a work surface. We have found also that since centrifugal force holds the stud against the outer curved surface of the barrel during its projection around the curve, the inner portion of such a barrel would serve no useful purpose and may therefore be eliminated with substantial improvement in ease and economy of manufacture. The barrel extension which we prefer is therefore actually only half a barrel and is most readily formed by routing a semi-circular groove in the surface of a steel bar which is thereafter bent to provide the desired curve. We have provided this barrel extension with mounting means which permit it to be attached to a conventional stud driver—for example, that shown in the patent to M. H. Walker, No. 2,645,772, issued July 21, 1953, or the stud driver shown in the copending application to M. H. Walker et al., Serial No. 517,192, filed June 22, 1955. We have also included with this barrel extension in the preferred embodiment safety means to prevent a tool from being fired if the barrel extension is not positioned substantially vertically with relation to the work surface. These safety means are arranged to cooperate with safety devices present on the conventional tools referred to in the patent or patent application mentioned above.

The object of our invention is to provide for the driving of studs in those locations which could not be reached safely with the use of conventional stud driving equipment.

The exact nature of our invention as well as other objects and advantages thereof will become more readily apparent from consideration of the following specification referring to the attached drawing in which Fig. 1 is a partial side elevational view of a conventional stud driver

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to which the preferred embodiment of our invention has been applied. The elements which constitute our invention are shown in a longitudinal sectional view.

Fig. 2 is a cross-sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a similar view showing a modified form eliminating certain refinements and safety features.

Fig. 4 is a cross-sectional view on the line 4—4 of Fig. 3.

Referring to the drawings by characters of reference, the preferred embodiment of our invention includes a hollow box guard or shield 1 to prevent the escape of ricocheting studs or particles of material displaced from the work surface into which a stud is driven. The shield box 1 may be of the common 4" square hollow box type but obviously may be altered in plan form as is customary with special and custom-fitted guard designs. Secured to the guard box 1 by welding or other conventional means and secured to each other by a suitable joint are a pair of sleeves 2 and 3 which, together, constitute a housing for the curved barrel extension and a means of attaching the assembly to a conventional stud driver as by a barrel sleeve 4 having a quick detachable joint 5 with the stud driver proper. A joint of this type is shown in the copending application of Robert T. Catlin and Arthur J. Landa, Serial No. 553,475, filed December 16, 1955, now Patent No. 2,873,446, granted on February 17, 1959. Supported within the sleeves 2 and 3 is the curved barrel extension 6 which may be fastened therein by a welded joint in the region 7 and by welding to a centering ring 8, welded or otherwise mounted in the sleeve 3. The curved barrel extension 6 is formed on a uniform and moderate curvature—for example, it may be bent to follow a curvature of about 12" radius and still permit even relatively long studs to be driven therethrough and still recover elastically from the deformation incurred as they pass along the curved surface.

A radius of curvature of about 12 inches and proportions as shown in the drawing permit the barrel of the tool to depart by an angle of 30 degrees from a line normal to the base of the guide box. This appears to be a sufficient displacement of the body of the tool to offer adequate clearance when positioning for driving the studs beneath an obstruction or into a recess. However, a larger or smaller angle may be desirable for some specific applications. A 12" radius of curvature is sufficiently large to accommodate any conventional stud which there may be occasion to drive with a tool of this kind. Should it become desirable to utilize this principle with studs longer than the present conventional studs, it would be desirable to use a larger radius of curvature and, similarly, in those applications such as fastening into structural steel where comparatively short studs may be used it would be entirely practicable to use a smaller radius of curvature and to deflect the stud through a total angle of more than 30 degrees, if substantial advantage resulted therefrom in adapting the tool to reaching some particularly difficult locations.

Assurance that the base of the guard box is in engagement with the work surface during firing is provided by the use of a thrust rod 9 guided in a tubular member 10 secured to the guard box 1 and passing through the upper sleeve member 3 and the edge of the centering ring 8 into a position to oppose and intercept the barrel sleeve 4. This thrust rod 9 is, within limits, free to reciprocate in the tubular member 10 and normally projects below the base of the guard box. When, however, the guard box is placed in secure engagement with a work surface the lower end of the thrust rod also engages that surface and the thrust rod is caused to project further into the path of the barrel sleeve 4. If

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the guard box is tilted or lifted from the work surface, the thrust rod is free to project below the plane of the base of the guard box and is to that extent withdrawn from the path of the barrel sleeve.

Referring to the patent application first mentioned above, it will be seen that the advance of the barrel of the tool toward a work surface relative to a barrel sleeve which is in engagement with that surface is instrumental in cocking the firing mechanism. Similarly, in the patent above mentioned, the advance of the barrel toward a work surface relative to a barrel sleeve, (in the patent called an action tube extension) is instrumental in withdrawing a safety member which blocks the firing of the tool. Since in either case it is movement of the barrel relative to the sleeve which conditions the tool for firing, we have in the claim identified the sleeve as a fire control member.

The present invention is with suitable modifications in mounting adapted to either of the prior tools but for convenience in illustration is here shown applied to the tool of the patent application by a quick detachable connection shown in the second application above referred to.

In this arrangement with our guard box in engagement with a work surface, the barrel of the tool proper may be advanced toward the curved barrel extension and the work surface coming to rest substantially in engagement with the centering ring 8. During this advance movement of the barrel, the barrel sleeve tends to advance with the barrel but upon encountering the end of the thrust rod 9 the movement of the barrel sleeve 4 is interrupted and the further advance movement of the barrel relative thereto cocks the tool firing mechanism.

If, however, the guard box has been tilted or lifted away from the work surface, the thrust rod will not be forced to project into the path of the barrel sleeve 4 and the sleeve may continue to advance with the barrel into the clearance recess 11 provided in the centering ring 8. Lacking relative movement between barrel and sleeve, the firing mechanism of the tool will not be cocked and it may not be fired.

The simplified form of the tool shown in Fig. 2 eliminates the refinements of the safety device described immediately above and consists of a curved barrel extension 20 brazed or otherwise secured in a curved sleeve 21. This sleeve 21 is provided at its upper end with a fitting 22 adapted to make the quick release connection to a stud driver referred to in the above-identified application. A plate-like guard 23 is provided in this instance. For a detailed explanation of the way this guard operates in locating studs with reference to a workpiece W, such as a steel door buck, reference may be made to the copending application of Catlin and Turton, Serial No. 530,252, filed August 24, 1955, now Patent No. 2,831,192, granted April 22, 1958. Except for the elimination of the non-tilt safety feature, this modification functions in the same way as that described above and the tool is

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cocked by the advance movement of the barrel thereof toward the end of the curved barrel extension.

In either form of our invention the stud driver is operated in the normal manner. When the stud contacts the curved barrel extension, it is forced by centrifugal force to substantially conform to that curve which was selected as a curvature to which the straight stud could be forced to conform without exceeding the elastic limit. The stud, therefore, follows around the curve and is delivered tangentially from the end of the curved section. Since the elastic limit was not exceeded, the driven stud recovers from the curve and stands normal to the work surface.

Although we have here shown only two modifications of our invention, it should be apparent that other variations are possible without departing from the spirit of our invention. For a definition of the limits applicable to the scope of our invention, reference may be had to the appended claim.

We claim:

A safety extension attachment for an explosive operated tool of the type which projects elongated fastener devices at high velocities to fasten one object to another and which comprises a casing, a barrel and a breech mechanism mounted in said casing, a firing mechanism cooperating with said breech mechanism, said firing mechanism comprising a projecting safety means relatively movable with respect to the barrel to permit operation of the tool when the safety means and barrel are relatively displaced by movement of the tool into operative position by pressure against a work surface; said attachment comprising in combination, a housing, an open curved guide member positioned in said housing to cooperate with the tool barrel to engage projected fastener devices as they are projected from the barrel and guide said projected fastener devices through a curved path to a line of direction at an angle to the axis of the barrel, said housing provided with a passageway therethrough for passage of projected fastener devices and with means for securing said attachment in operative relationship to the tool; and a movable means mounted in said housing constructed and arranged to engage the work surface and the projecting safety means of the tool to cause relative displacement between the projecting safety means and barrel when the tool and attachment are moved into operative position against a work surface to render the tool firing mechanism operative.

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