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MEANS TO CONTROL THE EFFECTIVE FORCE OF THE EXPANDING GASES ON A FASTENER, IN EXPLOSIVELY ACTUATED FASTENER DRIVING IMPLEMENTS

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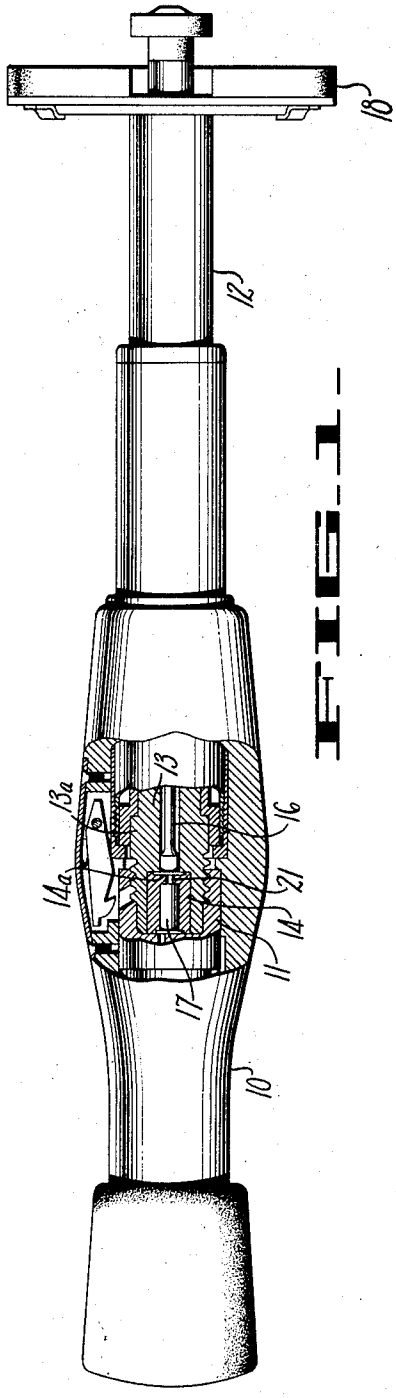


FIG. 1

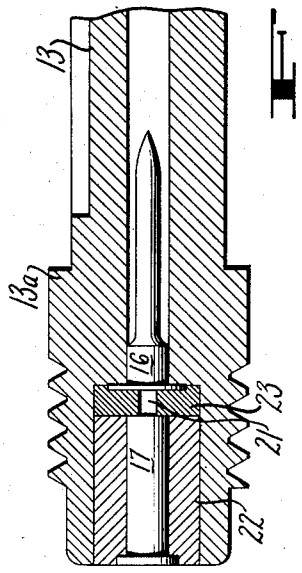


FIG. 2

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MEANS TO CONTROL THE EFFECTIVE FORCE OF THE EXPANDING GASES ON A FASTENER, IN EXPLOSIVELY ACTUATED FASTENER DRIVING IMPLEMENTS

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4 Claims. (Cl. 1—44.5)

The present invention relates to stud driving tools of the type employed for installing studs by explosive action in various types of wall surfaces including concrete walls and steel structures, and is concerned more particularly with methods and apparatus for controlling the effective power or force applied to the stud from a standard explosive charge so that the effective force is controlled in accordance with the characteristic of the stud being driven and the characteristic of the surface into which it is to be installed. The present invention provides a variation of the power control methods disclosed and claimed in the co-pending application of Roy Magnuson, Ser. No. 135,114, filed December 17, 1949, and later forfeited, for Stud Driving Tool and Method of Power Control.

In accordance with the instant invention, a standard explosive charge or cartridge is employed but the rate at which the explosive force is applied to the cartridge is controlled to determine the effective force applied to the stud in driving it home into the surface. By selecting the rate of application of the force to a particular stud, in accordance with its characteristics and the characteristics of the surface, a desired effective driving force is obtained.

The above and other objects of the invention are attained in connection with a preferred embodiment of a stud driving tool as illustrated in the accompanying drawings, in which:

Figure 1 is an elevational view of a stud driving tool which is broken away in part to show the combustion chamber in cross section.

Figure 2 is an enlarged sectional view showing a modified structure for carrying out the invention.

Referring to Figure 1, there is shown a stud driving tool of the character described and claimed in the co-pending applications of Smith and Daugherty, Serial No. 124,078, filed October 28, 1949, for Stud Driving Tool, and Erickson and Bullwinkle, Serial No. 130,818, filed December 2, 1949 for Stud Driving Tool. In general, stud driving tools of this character are adapted to be separated or broken in two halves for installation of a stud and a cartridge blank. The tool shown has a rear part **10** which contains the various firing control parts, including, for example, a firing pin carrier **11**, and a front or barrel part **12** of the tool including a barrel **13**. The barrel **13** is provided with an enlarged rear end **13***a* which has a threaded connection within the firing pin carrier **11** to connect the two halves of the tool. The barrel **13** is also provided with an enlarged bore in which a breech plug or insert **14** is removably seated. The stud **16** to be driven is mounted in the barrel with its flanged end accommodated in the recessed end wall **14***a* of the breech plug **14** in which the explosive cartridge **17** is mounted for impact by the firing pin of the firing mechanism.

With the parts disassembled, the breech plug **14** is removed and the selected stud **16** is installed in the barrel, the cartridge **17** is placed in the breech plug **14** and the parts are reassembled as shown in Figure 1 for a firing operation. Firing is accomplished by placing the end of the barrel **13** against the surface into which the stud is to be driven and pressing or telescoping the barrel assembly **12** and the firing pin carrier **11** back into the other part of the tool until a firing position is reached, as disclosed in said applications, and then effecting relative turning movement of the central housing and the end grip to fire the tool. At this time the deflector pad structure **18**, yieldably mounted about the barrel **13**, is engaged with the surface about the area of engagement of the end of the barrel so as to provide protection from flying particles of the wall surface upon explosive installation of the stud.

In accordance with the instant invention, the effective force of the standard cartridge is varied or adjusted to the desired characteristics for installation of a particular stud in a particular wall surface by controlling the rate at which the pressure developed by the gases of combustion are applied to the stud so that a selected effective force is applied to the stud. The terms "standard cartridge" or "standard explosive charge" are employed to denote the use of the same selected cartridge for all firing operations so that the same explosive force is available irrespective of type of body or wall surface in which a stud is to be installed, and irrespective of the particular stud being used. This enables a single inventory of cartridges. By varying the effective force of a selected standard cartridge, the tool can be adjusted to the requirements for installing a particular stud in a particular wall surface. As seen in Figure 1, the breech plug **14** is provided with an end wall **14***a* having a restricted orifice **21** therein. Combustion gases are metered through this orifice before becoming effective, so that by selecting a breech plug **14** with an orifice of a desired size, the rate of application of force to the stud is controlled. For maximum effective force the orifice **21** is enlarged to the full diameter of the cartridge. It will be understood that the breech plugs **14** are supplied in sets with orifice sizes related to the various types of studs to be installed and to the various types of surfaces encountered.

Figure 2 illustrates a modified construction in which the breech plug **22** is of standard construction while inserts or discs **23** are provided for interposition between the breech plug **22** and the barrel **13** with orifices **21** of selected sizes in the various discs **23** of a set.

The stud **16** as shown is of the flanged type, however, the invention is equally useful with other types of stud, for example, the type which is held frictionally in the barrel.

While we have shown and described certain preferred methods and apparatus for carrying out the invention it will be understood that the invention is capable of variation and modification from the form shown so that its scope should be limited only by the scope of the claims appended hereto.

We claim:

1. In a stud driving tool provided with a barrel having a bore open at the muzzle end and provided with means for mounting a stud, insert means carried by the barrel for free axial sliding movement for installation in and removal from the tool, said insert means having a passage for mounting a cartridge, and a wall included in said insert means disposed between said passage and said stud mounting means and having an orifice therein opening directly into the bore of the barrel for unobstructed communication therewith, and providing a passage for application of explosive gases from a cartridge to a stud.

2. The tool of claim 1 in which said insert means consists of an integral cup-like member having a transverse end wall in which said orifice is located.

3. The tool of claim 1 in which said insert means consists of a sleeve member and a separate disc providing an end wall in which said orifice is located.

4. In a stud driving tool provided with a barrel having a bore open at the muzzle end of the barrel and provided with means for mounting a stud, a cup-like insert for said barrel mounted therein for free axial sliding movement for installation in and removal from the tool, said insert having means for mounting a cartridge and having an orifice therein opening directly into the bore of the barrel for unobstructed communication therewith and having means for mounting a cartridge, said orifice being disposed between said cartridge and a stud in said barrel.

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