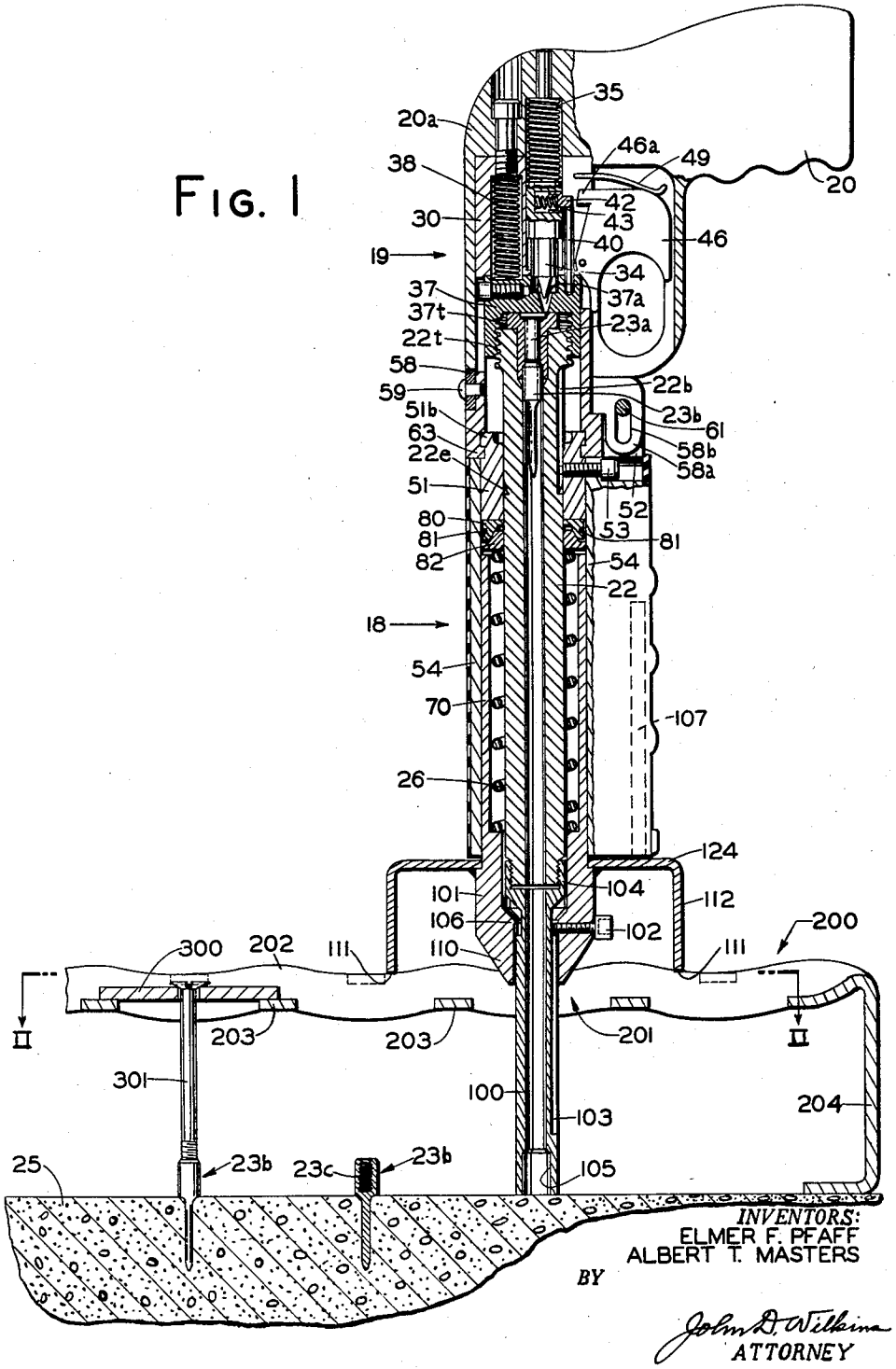
Feb. 23, 1960 E. F. PFAFF ET AL 2,925,603

EXPLOSIVE ACTUATED DEVICE

Filed Sept. 6, 1955 3 Sheets-Sheet 1

FIG. 1



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EXPLOSIVE ACTUATED DEVICE

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FIG. 2

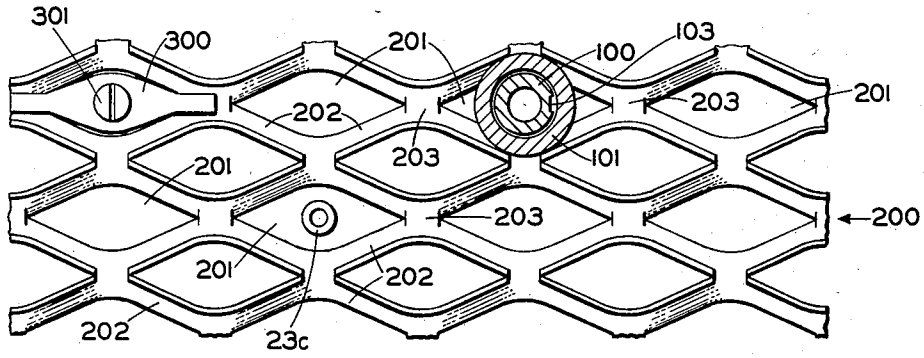
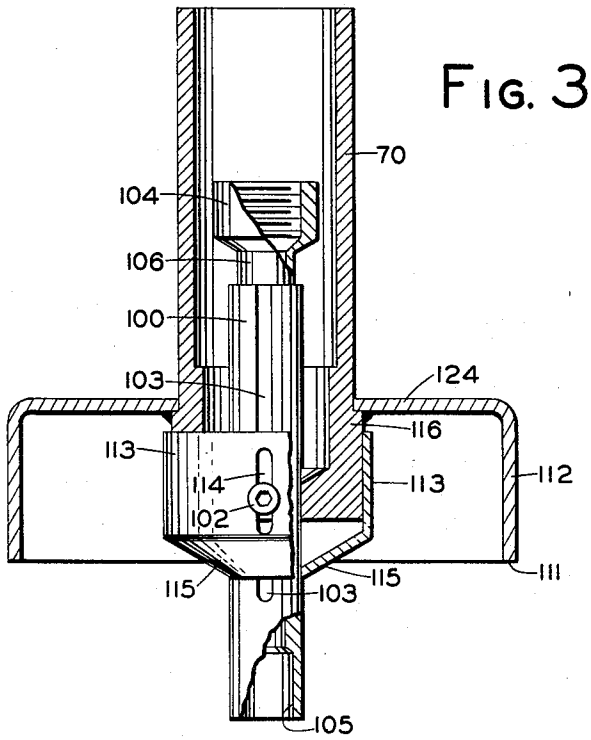


FIG. 3



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FIG. 5.

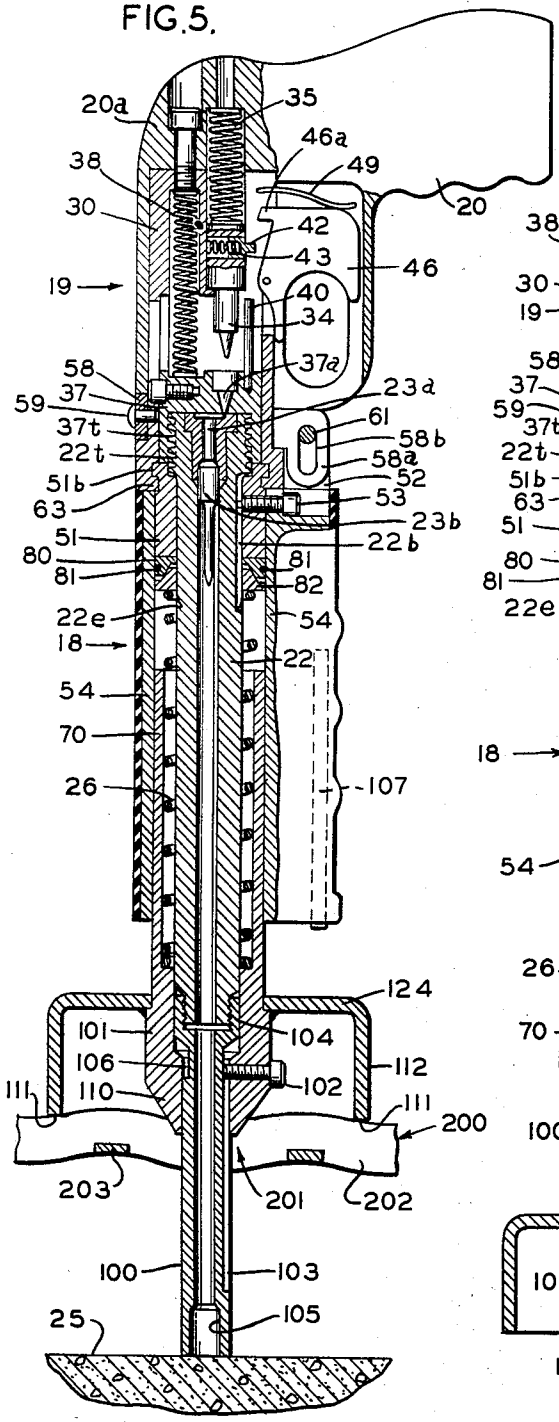
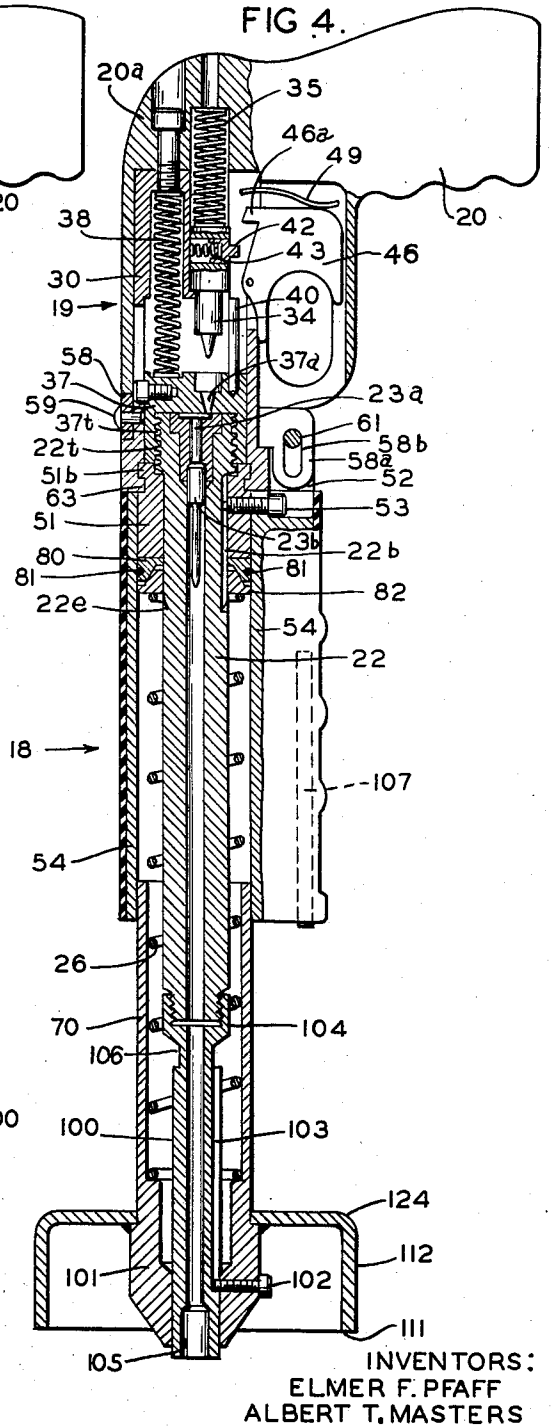


FIG 4.



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2,925,603

EXPLOSIVE ACTUATED DEVICE

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Application September 6, 1955, Serial No. 532,694

11 Claims. (Cl. 1—106)

This invention relates to tools and more particularly to tools for driving fasteners such as studs or pins into steel, concrete and the like by means of an explosive powered unit.

Stud driving tools of the type to which this invention relates include a barrel for projecting the fastener and a protective and aligning member telescopically mounted at the muzzle end of the barrel. It is desirable that such tools be adaptable to driving fasteners in certain types of covering installations among which is the installation of expanded metal members and other open grid work structural members used for flooring and the like wherein the cavities or openings in the grid work are quite small and wherein the grid is installed in such a way as to be spaced from the supporting surface. A typical grating of this type is shown in the drawings in which:

Figure 1 is an elevational view in cross section of one embodiment of a stud driving tool of this invention positioned for driving a fastener through a portion of the grating;

Figure 2 is a plan view taken on line II—II of Figure 1;

Figure 3 is a side elevational view of the barrel extension shown in Figure 1 with parts broken away and shown in partial cross section so as to illustrate still another embodiment of the invention;

Figure 4 is an elevational view in cross section of the embodiment of Figure 1 but with the parts shown in their free or extended position; and

Figure 5 is an elevational view in cross section of the tool in a position intermediate the positions illustrated in Figures 1 and 4.

In installing grating of this type which is used quite extensively as flooring, use of certain heretofore available explosive powered stud driving tools has necessitated the temporary setting of the grating on the support, the location and marking of points on the supporting surface into which the studs are to be driven in alignment with openings of the grid structure or grating. With these points located it is then necessary that the grid be removed in order that the tool might be brought up against the supporting surface for projecting the required number of studs therein. These studs are of a type which enable another fastener such as a bolt of suitable length to be coupled with the end of the explosive driven stud. The grating is then replaced in position and secured by means of threaded bolts or the like formed with an enlarged head or provided thereat with a suitable plate structure for abutting with the grating for the purpose of holding it against the supported surface to prevent any movement of the grating. It will be appreciated that this procedure includes quite a number of steps which if eliminated at least in part would make possible considerable economy in the installation procedure.

Therefore an object of this invention is to provide an explosive actuated stud driving tool adapted to project a fastener into place without need for removing the

cavitated covering or grating. Another object is to provide such a tool capable of projecting fasteners into a surface located on the opposite side of a grating or like foraminous structure having relatively small openings as compared to the diameter of the bore of the barrel of the tool. A still further object is to provide such a tool capable of driving fasteners into a surface which is located on the opposite side of a grating structure and displaced therefrom by an appreciable distance.

These and other objects which will become apparent from the following description of a preferred embodiment of the invention are accomplished in accordance with this invention by providing in an explosive actuated stud driving tool a barrel extension of reduced external size laterally, e.g. of smaller external diameter, and a shield and aligning member telescopically mounted about the barrel to permit relative movement between the fully extended position and the rear most position of said shield and aligning member relative to the barrel and its extension. The part of the barrel extension which is adapted to protrude ahead of the shield and aligning member is free from any enlargement which would interfere with insertion of the extension through the openings of the grating where such openings are smaller than the normal external diameter of the tool. In order to retain the forwardly biased shield and aligning member on the tool and prevent it from slipping off ahead of the muzzle end of the extension the shield and aligning member is provided with an internal projection which coacts with an external shoulder, groove, or slot on the barrel extension. This arrangement is preferred because it adapts the reduced barrel extension and the shield to assembly as a unit accessory in which all parts remain together whether attached to or detached from the tool. As an integral accessory the unit may then be readily interchanged with other accessory units which adapt the explosive actuated tool of the type described for handling all sorts of different specialized installations. A screw thread attachment is preferred.

The front end of the unit is preferably provided with a self-centering barrel positioner for extending into part of an aperture or surface cavity of the grid work of the grating so as to position the barrel desirably in the opening of the grating. This positioner has a leading surface protruding ahead of the edge of the shield and shaped so as to fit the marginal or surface configuration of the grating adjacent the opening. These openings may include apertures of various irregular or elongated shapes such as the diamond shape of an expanded metal structure. In such elongated openings the barrel may be shifted along the length of the opening and emplace the stud at different points. But the positioner in such cases serves to prevent driving a stud or fastener at any point other than a point properly aligned with the aperture of the grating.

In the specific embodiment shown in Figures 1, 4 and 5, the tool utilized is generally of the type shown and disclosed in the copending patent application of Rowland J. Kopf et al., Serial No. 355,034, filed May 14, 1953, but modified in accordance with one embodiment of this invention. A tool of this type comprises a barrel **22** adapted to carry an explosive charge **23***a* at its breech and a firing pin **34** for setting off the explosive charge in order to project the fastener **23***b* into the work surface of the supporting structure **25**.

The tool can be divided into two major parts namely, the barrel assembly **18**, which carries the barrel **22** movably mounted therein, and the breech assembly **19**, which includes the piston grip or handle **20** and a firing means including trigger **46**.

These two major parts of the tool are pivotally connected about a hinge pin or screw **61** carried in a bifur-

cated hinge bracket 52 mounted on the outer surface of the outer barrel housing tube 54 by any suitable means such as screw 53 which also serves to secure a collar 51, through which the barrel 22 telescopes, within the outer tube 54 in such a way that the end of the screw 53 projects into a slot 22*b* in the outer surface of the barrel 22. This connection also includes a hinge ring 58 positioned between a shoulder on the front of the rear housing 20*a* and a shoulder on a breech block receiver and firing mechanism housing or receiver 30 to extend circumferentially about the breech assembly 19 with limited rotational movement permitted by register pin 59 which is secured in hinge ring 58 with the point of pin 59 projecting inwardly from the ring to extend into an arcuate slot extending circumferentially over an angle of about 45° in the receiver and housing 30. The ends of hinge ring 58 take the form of longitudinally extending ears 58*a* in abutment with each other and each longitudinally slotted at 58*b*. Ears 58*a* are adapted to be positioned in the bifurcation of the hinge bracket 52 with the hinge pin 61 extending through the slot 58*b*. This arrangement permits the barrel assembly 18 and the breech assembly 19 to be moved axially with respect to each other and also pivoted about each other so as to permit engagement of the assemblies preparatory to firing of the tool and to also permit disengagement of the assemblies preparatory to loading the tool.

The pivoted connection of barrel assembly 18 and the breech assembly 19 holds these captive but enables engagement and disengagement of the assemblies as necessary. Engagement of these assemblies occurs between the breech end of the barrel 22, which is formed with an interrupted external thread 22*t*, and the breech block 37 at its internal interrupted thread 37*t*. Engagement also occurs at the bayonet fitting between collar 51, which has the male lugs 51*b*, and the receiver 30, the front end of which is formed with the female bayonet lugs 63. This arrangement of interrupted threads and bayonet connection lugs together with sliding hinge pin connection at the pin 61 provides limited axial and rotational movement between the assemblies which not only secures them with proper alignment but also permits limited separation.

The receiver 30 carries a firing pin 34 biased forwardly by means of firing pin spring 35. Slidably mounted in the receiver 30 is a breech block 37 which is adapted to fit over the breech of barrel 22 at the interrupted internal threads 37*t* of block 37 orificed at 37*a* to permit the point of the firing pin 34 when released to project through block 37 to strike the cartridge 23*a*. Projecting from the block 37 is a cocking rod 40 adapted to abut with firing pin pawl 42 which is carried by pin 34 and is biased by pawl spring 43 to project laterally from pin 34 into the path of cocking rod 40. Trigger 46, mounted on rear housing 20*a* pivotally and acted upon by trigger return spring 49, also mounted on housing 20*a*, has a sear 46*a* which is adapted to be moved to depress the pawl 42 into pin 34 against spring 43 so as to enable the firing pin 34 under the bias of spring 35 to be thrust forwardly through the firing pin hole 37*a* to strike the cartridge 23*a*. Also carried in receiver 30 is a breech block spring 38 which biases the block 37 forwardly.

The barrel assembly 18 includes in addition to the barrel 22, collar 51 and outer housing tube 54, a shield and alignment tube 70 telescopically mounted over the barrel 22 between it and the outer housing tube 54, an outwardly extending and surrounding shield 124 carried by tube 70 outside of the housing tube 54, and a helical shield spring 26. This is a compression spring telescopically mounted between the barrel 22 and the tube 70 for the purpose of biasing shield 124 forwardly over the barrel 22 to urge the shield 124 against the surface of the grids 202 of the grating through which the fastener is to be driven. Unless the tube and shield assembly is held back by substantial square abutment with the work surface of the grating in abutment with some part of housing 54, the spring 26 will additionally bias the barrel 22 and also breech block 37, when attached thereto, forwardly to the safety position.

While the front end of shield spring 26 acts on the assembled tube 70 and its shield 124, the rear end of shield spring 26 acts on barrel lock release ring 82, which has a rearwardly extending male frusto-conical surface designed to mate with and cooperate with the female frusto-conical surface made up of the semi-circular frusto-conical surfaces of the pair of C-shaped arcuate gripper members 80. These are separated on a diameter to form the halves of a split ring held together by the circular spring 81 and serve as a lock adapted to engage within the circumferential groove 22*e* of the barrel under the radially inward bias of the split circular spring 81 in the absence of the axial pressure exerted by the normally compressed shield spring 26. Should the safety and aligning shield 124 be removed for any reason, spring 26 no longer exerts any pressure and the grippers 80 close in on groove 22*e* preventing operation. But with all parts in place spring 26 causes ring 82 to wedge members 80 out of groove 22*e* to permit tool operation. The force exerted by the rear end of shield spring 26 acts through release ring 82 and gripper members 80 when these are out of engagement with the barrel groove 22*e* against barrel collar 51 fixed within outer housing tube 54.

In accordance with this invention the muzzle of the barrel 22 is provided with a shield and aligning assembly together with a barrel extension 100 of reduced diameter adapted to be projected through an opening 201 of a foraminous structural member such as the grating 200 having edge spanning grid members 202 and flanged edges 204 for spacing the foraminous surface of grating 200 from the work surface 25. The assembly is provided with an inner shield extension 101 extending around the barrel extension 100 within the shield 124. Mounted on shield extension 101 is an inwardly projecting retainer pin or screw 102. Barrel extension 100 is provided in turn with the longitudinally extending slot 103 on its exterior surface for coaction with the end of the retainer pin 102 which is shown screw threadedly carried on the shield extension 101. The rear end 104 of barrel extension 100 is of a diameter corresponding to that of the barrel 22 and has a female thread for engagement with the male thread at the muzzle of the barrel. The front end of barrel extension 100 is preferably provided with an enlarged bore 105 so as to enable the tool to be easily extricated from the enlarged rear end or threaded head portion 23*c* of the driven fastener 23*b*.

The shield extension 101 not only carries an inwardly projecting retainer pin 102 but also is preferably formed at the front end with a conical surface 110 projecting somewhat ahead of the marginal edge 111 of the extended sidewall 112 of the shield 124. Conical surface 110 serves as a positioner for centering the barrel extension in openings 201 of a grating which are somewhat longer than the external diameter of the barrel extension 100. The desired resulting centered relationship between extension 100 and the grate openings 201 is shown in Figure 2. In the absence of the conical positioner 110 the fastener 23*b* may be driven unsymmetrically and make it impossible to secure the grating 200 with the usual anchoring plate 300 and anchoring screw 301 or the like.

The front end 110 of shield extension 101 acts not only as a barrel extension guide but also as a barrel positioner, the extent of projection of which is designed to suit the type of grating being installed. If the opening of the foraminous structural member 200 is a circular perforation of a diameter corresponding to that of the barrel extension, the front surface 110 has no projection ahead of margin 111. With larger and irregular

openings of various sorts the front end **110** is designed to project forwardly to a greater degree but not so far as to interfere with the action of the slidable shield **124** which aligns the tool squarely with respect to the surface of the grid structure **202** of the grating **200** and thereby with the work surface **25**.

In the embodiment of Figure 3 the degree of projection of the positioner is adjustable to suit different shapes and sizes of openings or countersinks in the surface of the grid structure **202** of the grating. The inner shield extension **116** in this embodiment carries a front end portion **113** which serves as an adjustable positioner slidably mounted on the extension **116**. This adjustable positioner **113** is of hollow construction the front end of which is formed with a male conical surface **115** surrounding an opening for passage of the barrel extension **100**. The cylindrical side wall of positioner **113** has a longitudinal slot **114** for receiving the retainer and locking pin or screw **102** the end of which is adapted to project into the longitudinal groove **103** of barrel extension **100**. In this embodiment the locking screw **102** may be released sufficiently to permit the positioner **113** to be adjusted to suit the grating being installed. Then by means of locking screw **102** the positioner is secured in place with a desired degree of projection ahead of the margin **111** of the extended side wall **112** of the shield **124**. It is to be noted that the shield **124** together with its tube **70** and its inner extension **116** and positioner **113** is movably assembled on the reduced barrel extension **100** in such a way as to provide in this embodiment a single unit. This unit can be put on the tool or removed as needed with a minimum number of steps by the tool operator who need merely attach the unit at the female threaded end **104** of the extension **100** to the muzzle of the regular barrel of the tool.

Inasmuch as the shield **124** and its tube **70** are preferably mounted in the outer housing tube **54** of the barrel assembly **18** in such a way as to permit telescopic movement of the outer housing tube **54** relative to the shield and tube, but not rotational movement, the barrel extension **100** is also provided with a circumferential groove or slot **106** preferably adjacent the end **104** and intersecting with the longitudinal groove or slot **103** as shown in Figures 1 and 3. Groove **106** is adapted to receive the end of locking screw **102** to enable the barrel extension **100** to be engaged at the threaded end **104** with the muzzle of the barrel by rotational movement. In accordance with this feature the unit accessory of this invention can be attached to the tool by merely inserting the shield tube **70** into the outer housing **54** and, with the barrel extension **100** extending ahead of the shield margin **111** sufficiently to align circumferential groove **106** with the retainer pin **102**, by twisting the barrel extension **100** to threadedly engage it with the barrel **22**. The obvious reverse procedure is employed to detach the unit from the tool.

The completely assembled and loaded tool with its parts in the safety position assumed prior to placement of the tool in readiness to perform is shown in Figure 4. In this position the tool is inactive with both the barrel extension **100** and the shield **124** fully extended ahead of housing **54** under the impetus of spring **26**. Here the entire barrel structure including the associated breech block **37** and rod **40** are displaced together away from the firing pin **34** and its pawl **42**. The displacement from pin **34** and its pawl **42** puts the tool in safe inoperative condition with trigger sear **46***a* misaligned with respect to pawl **42**.

All the while the barrel extension **100** and the hole entering and guiding surface **110** extend somewhat ahead of the edge **111** of shield **124**. The protrusion of entering and guiding surface **110** of shield extension **101** conditions the tool for proper alignment with the openings **201** of the grating **200** as shown in Fig. 5. In this intermediate position the barrel extension **100** passes in

desired spatial relationship through a hole of grating **200** when the operator, by holding the tool handle **20**, presses the housing parts of the tool forwardly until the front end of extension **100** is put into abutment with the work surface **25** with desired squareness with the benefit of safety aligning shield **124**. In this position spring **26** is partially compressed and grippers **80** have been spread apart to permit full sliding movement of the housing relative to the barrel.

Further thrust by the tool operator on the handle **20** brings the tool parts into full operative relationship as shown in Fig. 1 where the barrel **22**, its block **37** and rod **40** are in close proximity with firing pin **34**, in which position rod **40** contacts and holds back pawl **42** thereby cocking the firing pin spring **34** while placing pawl **42** in alignment with sear **46***a* of trigger **46**. At this stage of tool operation, the tool operator need only pull trigger **46** to set off cartridge **23***a* and eject the fastener **23***b* into the work surface **25**. Shield **124** in the position shown in Fig. 1 abuts with the front of rod **107**, which extends adjustably as a part of housing **54**, thereby securing control of the squareness with which fastener **23***b* is projected into the work surface **25**. In the event the bore of the barrel and its extension **100** is not square with respect to surface **25**, the tool will not operate.

The shield **124** and its tube **70**, operating as a unit serve to prevent operation of the tool unless the marginal edge **111** of the side wall **112** is pressed against the grid work **202** of the grating **200**. Margin **111** defines a plane perpendicular to the axis of the bore of the barrel **22**. As set forth in the aforementioned patent application, Serial No. 355,034, when the tool is pressed forwardly against the work so as to advance it on the barrel **22** and the shield tube **70**, the front end of the housing tube **54** or an extendable appendage, such as rod **107**, is put into abutment with the rear surface or plate of the shield **124** and the firing pin pawl **42** is brought into abutment with the cocking rod **40** to permit the sear **46***a* of the trigger **46** to be brought into alignment with the firing pin pawl. In this condition of the tool it is at the ready-to-fire position and can be operated by pulling on the trigger **46**. But, if the marginal edge **111** of the side wall **112** of the blast confining shield **124** is not pressed against grid **202** because the barrel **22** is not aligned squarely to the work surface **25**, the barrel is free to advance from the ready-to-fire position and the pawl **42** is misaligned with respect to the sear **46***a*. In this condition the tool is inoperative and prevents projection of a fastener at an angle to the work surface **25** which may cause a dangerous ricochet.

In operation, with a grating **200** in place on the supporting surface **25**, the tool is brought up to the grating in such a way so as to put the barrel extension **100** through one of the diamond shaped openings **201** formed between the main grids **202** of the grating and the interconnecting webbing **203**. The tool is pressed toward the work (Figure 5) so that the muzzle of the barrel extension **100** is pressed against the supporting surface **25** while the peripheral edge or margin **111** of the forwardly biased shield **124** is in engagement with the tops of the grids **202** of grating **200** which are spaced from the supporting surface **25** by means of the edge flange **204** of various heights in different sizes of the grating.

Since the grating **200** is obtainable in various displacements from a supporting surface, the barrel extension **100** is of a length adequate for projection against a supporting surface even with a grating of maximum spacing which is to say with grating having an edge flange **204** of greatest height as shown in Figure 1. It will be noted that tube **70** in this embodiment is of such length compared to the length of recess in housing **54** that even at full tool extension (Figure 4) part of tube **70** remains telescoped in housing **54** and together with extension guide

101, which in effect is part of tube 70, keeps the desired angular relationship of shield 124 with respect to barrel 22 and particularly its extension 100 in operative positions adjacent the full tool extension. The shield 124 and its tube 70 under the bias of spring 26 will adjust itself into abutment with the grid 202 of other sizes of grating which is spaced more closely to the supporting surface 25. The conical nose 110 of the extension guide 101, Figures 1 and 2, or the nose 115 of positioner 113 of extension 116, Figure 3, enters the diamond shaped aperture in the grating so as to center the axis of the tool barrel extension 100 with respect to the opening 201, Figure 2. For a given size of grating when the tool is pressed against the work so that the muzzle of the barrel extension 100 is against the supporting surface 25, the shield 124 is in abutment not only with the grid 202 but also in abutment either with the front end of the housing 54 as in Figure 1 or with the housing appendage 107 for sizes of grating the grid of which is spaced more closely to the supporting surface 25 than the grating shown in Figure 1.

In this condition the cartridge 23*a* at the breech of the tool barrel 22 is in operative relationship with the firing pin 34 which in turn has been held back by the cocking rod 40 acting on the pawl 42 so as to compress the firing pin spring 35. In the meantime while the shield and aligning assembly has been held against forward movement by the grating the breech of the barrel is movable forwardly so as to compress the spring 26 sufficiently to unlock the gripper members 80. In this condition of the tool the shield and aligning assembly serves to align the barrel extension both with respect to the aperture 201 in the grating 200 and with respect to the supporting surface 25 with sufficient squareness to minimize the likelihood of a ricochet. It will be noted that the spacing between the front end of the connection 104 of the barrel extension and the back side of the counter bore in either the extension guide 101 or 116 is such that the tool will not fire even though the shield 124 is withdrawn rearwardly as far as possible unless the muzzle of the barrel extension 100 is also pressed into engagement with the supporting surface 25 to put the barrel and its extension into a ready-to-fire position. If the tool is not held squarely to the work the barrel extension 100 and the barrel 22 will move forwardly from the ready-to-fire position and permit the firing pin pawl 42 also to move forwardly out of operative alignment with the sear 46*a* of the trigger 46. Likewise, if the tool is not completely compressed against the work, the tool will not fire because the barrel again moves forwardly from the ready-to-fire position.

With the tool properly positioned, the operator merely pulls the trigger 46 and discharge of the cartridge 23*a* drives the fastener 23*b* into the surface of the supporting body 25 leaving the enlarged rear end 23*c* of the fastener protruding above the surface for connection with the anchoring screw 301. As shown in Figures 1 and 2, fastening of the grating 200 is completed by applying the screw 301 and the anchoring plate 300 threaded on the shank of screw 301 in abutment with the head of the screw.

It is to be understood that while only a few specific embodiments have been described and illustrated those skilled in the art may make further modifications, changes and embodiments without departing from the spirit and scope of the invention as set forth in the appended claims. For example, the contour of the peripheral edge of the shield may in some installations advantageously be complementary to the surface configuration of the covering piece and aid in the centering function.

What we claim is:

1. An explosive actuated tool for driving studs into a supporting surface to affix a cavitated covering piece in substantially parallel overlying relationship to said surface comprising a tool housing having an adjustable extension, a forwardly biased barrel extendable forwardly from said housing and slidably mounted therein from a fully extended normal safety position to an operative ready-to-fire position at which the housing is advanced completely with respect to said barrel, said barrel having means at its breech for carrying a driving explosive cartridge, means mounted on said housing for firing said carried cartridge and thereby operating said tool only when the housing is substantially completely advanced as the tool is thrust toward said surface, said barrel terminating adjacent its muzzle end in a barrel extension characterized by at least one external transverse dimension less than the diameter of the barrel and the corresponding dimension of a cavity of said piece and none greater so as to adapt said barrel extension to be inserted through said cavity into abutment with said surface, and a shield and aligning assembly including an outwardly extending covering piece engaging member having a periphery defining a plane substantially perpendicular to the axis of said barrel and a tube carrying said member telescopically mounted with respect to said housing for movement of said housing from a rearward fully extended position to a forward position at which said assembly is in abutment with said housing, said barrel extension having limited movement with respect to said assembly and a longitudinally extending slot opening onto the external surface of said extension, said shield and aligning assembly including detent means extending inwardly into said slot, one end of said slot being abuttable with said detent means for limiting the forward position of said assembly back of the muzzle end of said extension and means adjacent the other end of said slot being axially abuttable with said detent means and spaced from said first slot end sufficiently for permitting said assembly to be positioned rearwardly into any one of an infinite number of positions at which said assembly is abuttable with both said extension of said housing and said covering piece without relative movement between said barrel and said firing means into said operative relationship independently of said barrel extension abutment and housing advance and in addition permitting said barrel and explosive cartridge to move forwardly out of said operative relationship unless the periphery of said member is engaged in substantial parallelism with said covering piece.

2. In an explosive actuated stud driving tool having a housing, a barrel through which studs are projected and at the breech of which there is carried an explosive cartridge, said barrel being mounted in said housing so that its muzzle end extends forwardly therefrom, and cartridge firing means on said housing, said housing being movable with respect to said barrel for relative positioning of said barrel with respect to said housing from a fully extended normal safety position to a ready-to-fire position at which the barrel is received as far back in the housing as it will go, with said explosive cartridge and said firing means being respectively spaced apart in inoperative relationship and closely spaced in operative relationship in said respective positions, said barrel and housing being biased toward said extended position, the improvement adapting the tool for driving a stud into a supporting surface to affix a covering grating to said surface comprising a separate barrel extension mounted on the front end of said barrel, most of the length of said extension adjacent the muzzle end having an external diameter less than that of the barrel so as to adapt the extension to pass through an opening of said grating to abut with said surface, and a forwardly biasable shield and aligning assembly comprising a tube telescopically extending from said housing and an outwardly extending grating engaging member mounted on the front end of said tube and having a periphery around said barrel extension and defining a plane angularly related to the axis of said barrel extension in a manner adapted to align said axis squarely with respect to said plane, said as-

sembly being mounted coaxially on said barrel and extension, said barrel and extension being movabe forwardly with respect to said assembly unless said axis is squarely aligned with respect to said plane when said assembly engages said grating whereby said barrel is adapted to move out of said ready-to-fire relationship, and means for engagement of said assembly with said barrel extension for preventing said assembly from traveling ahead of the muzzle of said barrel extension, said last means consisting of an internally extending projection on the assembly engageable with a recessed part of said extension.

3. The tool of claim 2 wherein the internally extending projection on the aligning assembly engageable with a recessed part of said extension consists of a pin on said assembly extending inwardly into an axial slot on the exterior of said extension respectively.

4. The tool of claim 2 wherein the shield and aligning assembly together with said extension is a detachable accessory screw threadedly carried on the muzzle of the barrel and wherein the recessed part is an axial slot in said extension intersecting with a circumferentially extending slot on said extension alignable with the internally extending projection on said assembly, whereby said shield and aligning assembly together with said barrel extension may be either attached to or removed from said tool as a unit.

5. The tool of a claim 2 wherein the shield and aligning assembly includes a coaxial projection surrounding the barrel extension and having a male front surface protruding ahead of the outwardly extending grating engaging member for aligning said barrel extension with an opening of said grating.

6. In an explosive actuated stud driving tool having a barrel through which studs are projectable into a surface, the combination adapting said tool to projection of a stud through an opening of a grating covering said surface comprising a barrel extension detachably mountable on the muzzle, said extension barrel having a bore of substantially the same diameter as the bore of the barrel and having at least adjacent the muzzle end an external diameter less than that of the barrel and less than that of the minimum dimension of an opening of said grating, and an outwardly extending grating engaging member carried movably on said barrel extension and having forwardly extending side walls spaced from the barrel and forming a peripheral edge substantially perpendicular to the axis of the bore of said barrel, said grating engaging member having a guide for engagement with said barrel extension and said opening, and means projecting from said member into said extension for securing said grating engaging member on said barrel extension in a manner permitting axial movement of said member with respect to said extension.

7. The combination of claim 6 wherein said securing means consist of an axially extending groove in the exterior surface of said barrel extension and a locking screw on said guide projecting into said groove.

8. The combination of claim 6 wherein the guide has a male surface projecting ahead of said peripheral edge sufficiently to position said barrel extension with respect to the opening in the grating.

9. The combination of claim 8 wherein the projecting positioning surface is conical.

10. The combination of claim 8 wherein the barrel extension positioning surface is carried on a member adjustably mounted on said guide.

11. In an explosive actuated tool adapted to drive a stud into a work surface underlying a cover surface spaced from said work surface and having an access hole, a barrel adapted to be advanced towards said surfaces and having a bore through which studs are adapted to be projected and a breech at which a stud propelling explosive cartridge is adapted to be carried, a cartridge firing device with means for controlling said device, said means including a member mounted on said barrel for longitudinal movement with respect to said barrel from an extended normal safety position at which said firing device is inoperable to a ready-to-fire position at which said firing device is operable, said member being biased towards said extended position, a separate barrel extension detachably fixed on the front end of said barrel by movement including turning to place said extension and barrel into assembly, said extension having a reduced external diameter adapted to permit the extension to pass slidably through said cover structure hole into abutment with said work surface, a shield and aligning assembly comprising a tube telescopically mounted for limited movement longitudinally with respect to said barrel extension and member and having an outwardly extending portion mounted on said tube with a cover surface engaging periphery disposed around said barrel extension and defining a tool surface angularly related to the axis of said barrel and extension to align said axis squarely with respect to said work surface, said shield and aligning assembly being mounted coaxially with respect to said barrel and extension assembly and member and said assemblies having sufficient relative movement with respect to each other for permitting relative movement between said member and barrel to assume said safety position, unless said axis is squarely aligned and said extension in abutment with respect to said work surface when said shield and aligning assembly engages said cover surface and member whereupon said member and barrel are adapted for relative movement out of said ready-to-fire relationship, and motion limiting means for obtaining said limited movement consisting of an internally extending projection on said shield and aligning assembly and a recess on said extension for receiving said projection, said recess extending both circumferentially and longitudinally intermediate the ends of said extension, said member being adapted to permit actuation of said firing device only when said member and barrel are in said ready-to-fire relationship, said extension having at its muzzle end a longitudinally extending enlargement of its bore spaced from said recess, thereby substantially preventing binding of the end of a driven stud projecting from said surface into the bore of said extension after driving and while facilitating extrication of the tool from said stud end after driving and avoiding excessive stresses in said extension of least external diameter.

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