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IMPROVEMENTS IN EXPLOSIVELY ACTUATED FASTENER DRIVING TOOLS

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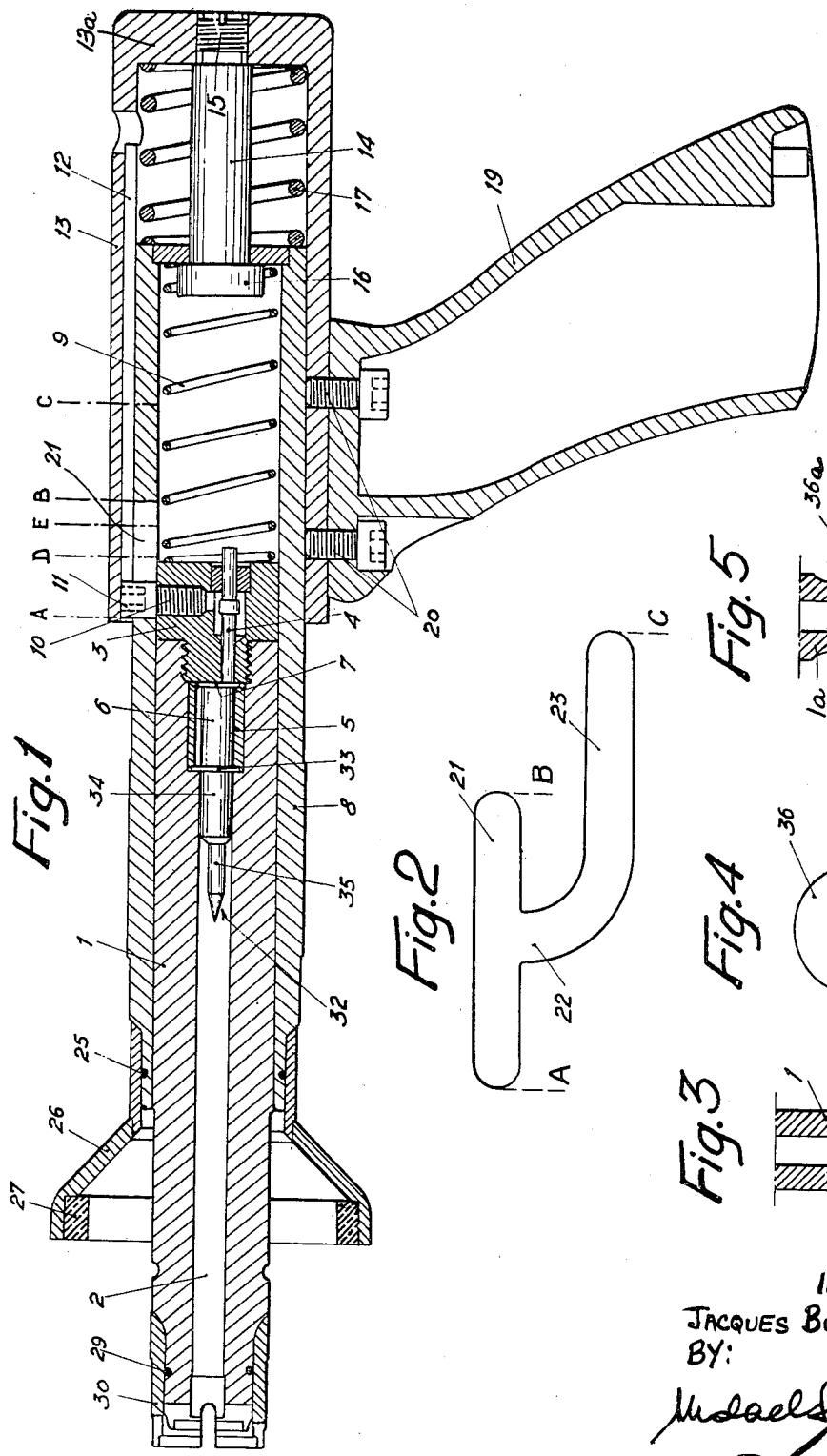


Fig. 1

Fig. 2

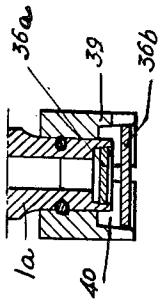


Fig. 5

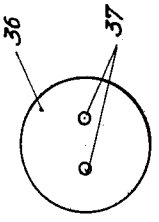


Fig. 4

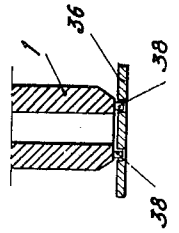


Fig. 3

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IMPROVEMENTS IN EXPLOSIVELY ACTUATED FASTENER DRIVING TOOLS

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3 Claims. (Cl. 1—44.5)

This invention relates to explosively actuated fastener driving tools for driving dowel pin shaped fasteners into hard and compact materials, particularly to tools having a barrel in which is housed the fastener to be propelled by the explosion of a charge placed in the tool and fired by a firing device comprising a firing pin actuated by a striker.

In order to protect users, some of said tools do not comprise any trigger device, but are so made that the striker carried by an actuating member is displaced simultaneously with said member, against a recoil spring, under the effect of a blow or shock at the rear end of the tool, for instance a sudden push with the hand, which, in practice, makes it necessary to press the other end (front end) of the tool against the surface of the material into which the fastener is to be driven.

In some embodiments of the above mentioned known tools, the latter comprise a barrel removably assembled with a breech block and firing pin carrier slidingly located in an elongated housing partly surrounded by a slidable firing pin actuating sleeve, the relative movement of the said sleeve, which carries a firing pin striker, with respect to the breech block being controlled by means of a safety device comprising a system of longitudinal grooves and a pawl carried respectively by the elongated housing and the breech block.

The system of grooves comprises a first longitudinal groove and a second longitudinal groove having a section at right angles and intersecting the first groove, the arrangement being such that the pawl can be engaged in the second groove by imparting, by hand, a rotary movement to the elongated housing with respect to the breech block and the barrel, the length of the second groove enabling the said housing to assume, in relation to the barrel, a longitudinal position such that the striker can hit against the firing pin.

The present invention has for its object to improve the tools of the above mentioned kind in order to simplify their manufacture and their handling.

According to the invention, the slidable firing pin actuating sleeve comprises a bottom and surround completely the rear part of the housing, the firing pin striker being secured to said bottom.

In order to permit a better handling of the tool, a grip is secured to said sleeve.

According to another improvement, the pawl integral with the breech block and firing pin carrier on which is removably mounted the barrel of the tool, the pawl cooperating with the safety groove system, is slidingly engaged with a longitudinal groove provided on the firing pin actuating sleeve, so that the barrel and the sleeve are both rotatable with respect to the elongated housing.

Other features and characteristics of an improved tool will be gathered from the description hereunder, which relates to a preferred embodiment of the tool, given solely by way of illustration and shown diagrammatically on the accompanying drawing, on which:

Fig. 1 is a longitudinal radial cross-section of a projection device according to the invention;

Fig. 2 is a larger scale view of the groove system of the safety device;

Figs. 3 and 5 are two radial, longitudinal cross-sections showing two modifications of the barrel front end for the fixing of special washers to the mouth of the tool barrel;

Fig. 4 is a plane view of the washer shown in Fig. 3.

In the specimen embodiment shown in Figs. 1 and 2, the tool comprises a barrel **1** of which the end opposite the projection orifice is provided with a tapped hole of larger diameter than that of the bore **2** of the barrel. In this tapped hole is screwed the end of a breech block and firing pin-carrier **3** in which a rod **4**, forming the firing pin, can slide freely. The firing pin is not in the axis of the bore **2**, but is slightly displaced towards one side. Between this tapped hole and the bore **2** of the barrel is a cylindrical housing which is co-axial with the bore and has a diameter which is intermediate between that of the bore and that of the tapped hole. This cylindrical housing takes a cylindrical cartridge carrier **5** through which the barrel is locked on the breech block **3**. The cartridge **6** is placed inside the cartridge carrier, the collar **7** of the cartridge resting on a shoulder inside the carrier at the end of the carrier which is in contact with the breech block **3**.

An outside elongated housing **8** is fitted over the barrel so as to be able to rotate and slide longitudinally. The length of this housing is such that it can enclose the barrel **1** from one end to the other. A spring **9** is inserted between the breech block **3** and the rear end of this housing so as to make the barrel project partially beyond the housing when the tool is not in use, as shown in the figure.

The housing is guided over the barrel by means of a lug constituted, in this particular case, by a screw **10** with guiding head **11**, screwed radially into the breech block **3**. This head **11** projects slightly outside the housing **8** through the grooves shown in Fig. 2.

The projecting end of this head **11** is engaged in a longitudinal groove **12** of a firing pin actuating sleeve **13**, to the end of which a firing pin striker **14** is fixed coaxially. This striker comprises a threaded stem **15** screwed in the bottom **13***a* of the sleeve **13** and is accessible from outside. This axial striker passes through the end of the housing **8** and, inside this housing, has a wider part, or head, **16**. A spring **17**, stronger than the spring **9**, is mounted inside the sleeve **13** between the end of the housing **8** and the bottom of the said sleeve, and separates these two members from each other, the maximum space between them being limited by the head **16** of the striker which thrusts against the inside surface of the end of the housing **8**. A butt or handle **19** is fixed on the sleeve **13** by means of two screws **20**.

The system of grooves in the housing **8** is shown on a larger scale in Fig. 2. It has a longitudinal groove **21** of which the ends are shown by the lines A and B in Fig. 1. The distance between these lines, or the length of the groove increased by the maximum possible advance of the sleeve **13** in relation to the housing **8**, is less than the distance between the end of the firing pin **4** and the head **16** of the striker **14**. It will therefore be seen that if the housing **8** slides forwardly over the barrel **1**, compressing the spring **9** (for instance, owing to a blow on the projecting end of the barrel), the head **11** of the screw **10** strikes against the end B of the groove **21**, so that the firing pin cannot get into contact with the striker **14** and it follows that there can be no accidental firing of the cartridge **6**. In the same way, if there is an impact against the end of the sleeve **13**, the latter is pushed forward longitudinally and, through the spring **17**, the housing **8** is pushed back on the barrel **1**, and this movement is stopped

by the end B of the groove 21. In this position of the housing in relation to the barrel, the maximum pressure of the sleeve 13 against the spring 17, which it compresses completely, does not suffice to cause the striker 14 to hit the firing pin 4.

In order to ensure that firing will take place when it is desired to fire the tool, a transversal groove 22 has been made in the wall of the housing 8 at a point half way along the groove 21. This transversal groove curves round into a longitudinal part 23, the end of which is shown by C in Fig. 1.

When the head 11 of the screw 10 is opposite the opening in the groove 21 leading into groove 22, that is to say, between the lines D and E on Fig. 1, or A—B, Fig. 2, it suffices to rotate the housing 8 relative to the barrel 1 by hand, and this head 11 penetrates into the groove 22, then into the groove 23, thus enabling the housing 8 to advance in sliding over the barrel 1, by compressing only the spring 9, until the head 11 of the screw 10 comes to a stop against the end C of the groove 23. In this position the striker 14 travels far enough to hit the firing pin 4.

A flared mouthpiece 26, intended to act as silencer and splinter screen, is slipped over the opposite end of the housing 8 and held in place by a keeper ring 25. A rubber ring 27 is placed inside this mouthpiece 26.

Instead of this flared mouthpiece, a cylindrical mouthpiece, which prolongs only the housing 8, can be mounted. A device 30, with a space for a washer inside, is slipped over the mouth of the barrel 1 and fixed detachably, also by a keeper ring, 29.

This tool is operated as follows: the barrel 1 is unscrewed to separate it from the breech block 3 and is withdrawn from the housing 8. A dowel pin shaped fastener 32 comprising a pointed shank 35, a guiding head 34 and a shearable disk 33 integral with the head 34 (or removably secured to said head) and then a cartridge 6 are placed respectively in the barrel and in the cartridge chamber 6, and the barrel is replaced and fixed on the breech block 3. It is locked on the latter by means of the carrier 5 which clamps the disk 33 in the barrel and thus maintains the fastener 32. The outer end of the barrel 1 is then pressed against the surface of the material into which the fastener 32 is to penetrate, the workman holding the tool by the butt in his left hand and keeping it strictly at right angles to the said surface. By pressing on this butt, the workman causes the elongated housing 8 to slide along over the barrel 1 until the head 11 of the screw 10 is opposite the groove 22. With his right hand he thereupon rotates the housing 8 relative to the barrel 1, at the same time maintaining his pressure on the butt 19 to push the head 11 in the groove 22 and then in the groove 23 the sleeve further along the barrel. The head 11 of the screw 10 having been brought back into the groove 23 by this rotating movement, the housing continues to travel forward with respect to the barrel and the spring 9 is more and more compressed until the splinter screen 26 also presses against the surface of the material into which the fastener is to be driven, the length of the groove 23 being especially designed for this purpose. All the workman then has to do is to give the rear end of the sleeve 13 a fairly sharp blow with his right hand, in order to advance the sleeve 13 with respect to the housing 8 by compressing the strong spring 17 and cause the striker 14 to hit the firing pin 4, the butt 19 held in the workman's left hand accompanying the sleeve in this movement. The explosion of the cartridge 6 forces the fastener 32 out of the barrel 1 and into the material, where it becomes firmly anchored, the disk 33 or an annular portion thereof remaining in the cartridge chamber from which it is removed when the barrel is unscrewed.

The operation is repeated for each fastener to be put in.

When a washer is placed inside the washer-collar 30, the point of the fastener perforates this washer and is thus centered by it when it leaves the barrel, this ensuring that the fastener is better guided and penetrates better

into the material. In addition, that part of the washer which is carried along by the fastener forms a collaret on the latter, restricting its penetration into the material.

The tightness between the cartridge chamber and the bore of the barrel is ensured by the disk 33 of the fastener 32. The said disk rests against the wall of the said chamber and is placed beneath the cartridge carrier, so that it is held tightly by the cartridge carrier against the end of the cartridge chamber. When the cartridge explodes, the super-pressure which occurs at the rear end of the fastener 32 is such that the disk 33 is sheared and the fastener is forced through the bore of the barrel. In addition, the fastener 32 has a head 34, next to the disk and having an outside diameter equal to the diameter of the bore of the barrel, which guides it, and a portion 35, of a smaller diameter, ending in a point destined to penetrate completely into the material, the head 34 limiting the extent of penetration.

In order to limit the extent of penetration still further and also to ensure better guiding of the fastener, the following modification may be provided.

As shown in Figs. 3 and 4, a washer 36 can be placed on the mouth of the barrel 1, this washer being kept in place by projections 38 of the barrel which fit into holes 37. When it leaves the barrel, the portion 35 of the fastener perforates this washer 36, and the portion 34 comes on top of it and carries it along, the washer thus forming a collaret on the fastener, which presses firmly against the material into which the fastener is driven.

Obviously, the same result could be achieved by means other than those shown diagrammatically in Figs. 3 and 4.

Fig. 5 shows another modification in which a small washer 36*a* is placed in a lower recess of the barrel 1*a*. If it be desired to use a larger washer, a special head 39 can be applied to the mouth of the barrel instead of the device 30 shown in Fig. 1, this head being provided with a cavity 40 which serves to take a larger washer 36*b*.

It goes without saying that the subject-matter of the invention is in no way limited to the details of embodiments represented or described, which have been given merely by way of illustration.

What I claim is:

1. An explosively actuated fastener driving tool comprising: a breech block; a barrel removably secured to said breech block; a firing pin carried by said breech block; an elongated housing slidably guided over said barrel and said breech block and able to perform a limited longitudinal movement with respect thereto; spring means located between the rear end of the said breech block and the rear end of the said housing for normally pushing said housing opposite the front end of said barrel which normally projects from the front end of said housing; a striker having a front end in said housing for actuating said firing pin, said striker and said housing having limited longitudinal slidable movement relative to one another; a firing pin actuating sleeve slidably guided over the rear end portion of said housing and supporting said striker for movement therewith; and a spring, stronger than said first mentioned spring means and located between the rear end of said housing and the rear end of said sleeve, for normally urging back said sleeve and said striker with respect to said housing, said striker pin being normally separated from said firing pin a greater distance than the extent to which said housing can move longitudinally with respect to said barrel, and said housing being rotatable relative to said pin whereby after said rotatable movement the said striker may be moved to a position to actuate the firing pin.

2. A tool as claimed in claim 1, further comprising a butt, said butt being secured to the firing pin actuating sleeve.

3. A tool as claimed in claim 1, wherein said breech block is provided with a radial screw having a projecting head, and said housing has two non aligned longitudinal

slots, one in advance of the other and an intermediate curved slot joining said longitudinal slots and the firing pin actuating sleeve has a longitudinal inside groove, the screw head being received in said slots and entering in said groove, so that the groove in the sleeve and the slots in the housing move relative to the screw and the breech block.

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