

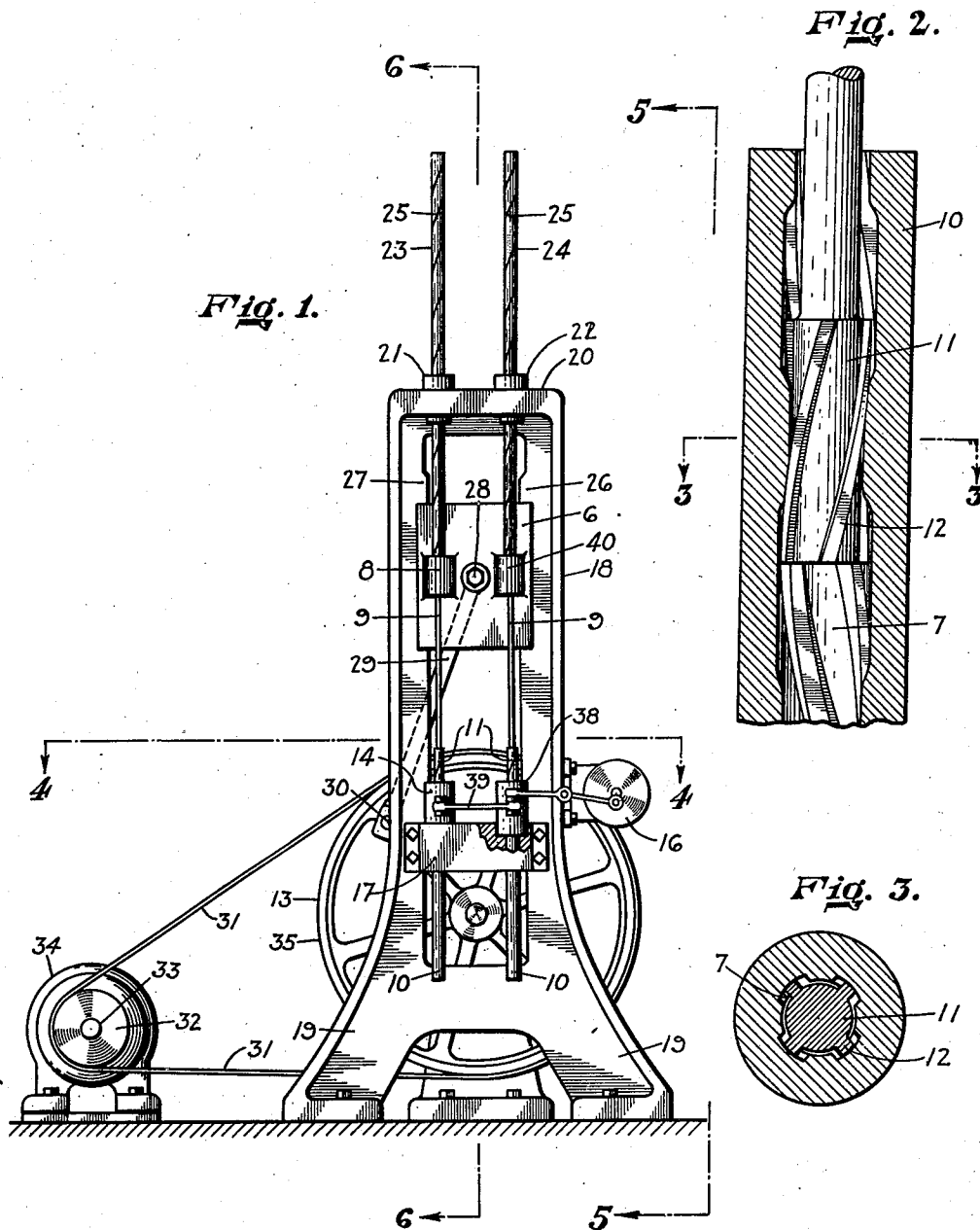
Aug. 15, 1939.

F. HÖLLSTIN  
POLISHING MEANS

2,169,841

Filed Dec. 3, 1937

2 Sheets-Sheet 1



INVENTOR  
FRANZ HÖLLSTIN  
BY *Richard & Seier*  
ATTORNEYS



## UNITED STATES PATENT OFFICE

2,169,841

## POLISHING MEANS

Franz Höllstin, Berlin, Germany, assignor to  
Rheinmetall-Borsig Aktiengesellschaft Werk  
Borsig Berlin-Tegel, Berlin-Tegel, Germany

Application December 3, 1937, Serial No. 177,881  
In Germany September 29, 1936

4 Claims. (Cl. 51—31)

This invention relates to polishing means, and refers more particularly to a device for polishing spiral elongated grooves situated upon the inner walls of a hollow body.

When the grooves of this type are bored, for example in the manufacture of rifles and machine-guns, the cutter making these grooves often leaves an uneven surface, due to shifting in the course of the manufacture. Small cracks or depressions are formed in the grooves, which must be removed later by polishing means, as otherwise the article cannot be used; grooves of this type should be extremely smooth, clean, and regular, particularly if the articles manufactured are the barrels of firearms, such as rifles or machine guns.

Attempts to satisfy these requirements through the use of polishing bodies movable within the hollow article and consisting of silicon carbide or the like have been unsuccessful, since the polishing medium is collected in the small crevices and cracks, and due to the movements of the silicon carbide body forms additional grooves or unevennesses which often extend along the entire work piece.

An object of the present invention is the provision of means through the use of which it is possible to produce grooves situated in a hollow body which are extremely smooth, uniform, and well polished.

Another object is the provision of means which are simple in construction and which can be used without increasing the usual time required for polishing, for eliminating the crevices and cracks formed by the cutter while cutting inner spiral grooves within a hollow body.

A further object is the provision of means for permanently and satisfactorily removing unevennesses in inner grooves within a comparatively short time.

The above and other objects of the present invention may be realized by moving the polishing tool longitudinally in the direction of the grooves and at the same time causing the work piece to carry out an oscillating or turning movement, both these movements taking place simultaneously in the course of the polishing process.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing by way of example a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 is a side elevation of a polishing machine constructed in accordance with the principles of the present invention;

Figure 2 is a detailed section showing the position of the polishing tool within the article to be polished;

Figure 3 is a cross-section along the line 3—3 of Figure 2;

Figure 4 is a horizontal section along the line 4—4 of Figure 1;

Figure 5 shows the machine in side elevation, looking in the direction of the arrow 5 in Figure 1; and

Figure 6 is a section along the line 6—6 of Figure 1.

The machine illustrated in the drawings comprises a vertical machine frame 18, which is carried by the legs 19. The frame 18 comprises an upper plate 20 carrying two guides 21 and 22. The guides 21 and 22, which are similar to each other in form, are provided with openings through which the two spindles 23 and 24 extend.

The spindles 23 and 24 are also similar to each other and are provided with elongated spiral outer grooves 25, which correspond to the grooves formed in the work pieces 10. The guides 21 and 22 are provided with projections (not shown) which are situated within the bore-holes of these guides and which engage the grooves 25 of the spindles 23 and 24.

The inner walls of the machine frame 18 are provided with guides 26 and 27 engaging a carriage 6, which is vertically reciprocated along the guides 26 and 27 and which carries the supports 8 and 40 for the spindles 23 and 24, respectively.

The carriage 6 carries a pivot 28, upon which is mounted one end of a rod 29. The lower end of the rod 29 is mounted upon a pin 30 carried by a wheel 13. An endless belt 31 passes over the wheel 13 and also over a pulley 32, which is rotatable along with the shaft 33 of a motor 34. Due to this arrangement, the carriage 6 along with the spindles 23 and 24 is vertically reciprocated when the motor 34 is running.

The tools used for polishing the manufactured work pieces consist of elongated rods 9 carrying cylinders 11, provided with spiral projections the curvature of which corresponds to the curvature of the grooves 7 within the work pieces 10. The tools 9 are inserted into the heads 8 carried by the carriage 6 in such manner that they not only reciprocate vertically along with the carriage 6, and the spindles 23 and 24, but also rotate along with these spindles 23 and 24. This device is of standard construction and is not shown further in the drawings.

As already state, the curvature of the spiral grooves 7 in the work pieces 10 corresponds to the curvature of the grooves 25 in the spindles 23 and 24. The projections 12 of the polishing cylinders 11 move, therefore, within the grooves 7 in the course of the combined reciprocatory and rotary movement of the spindles 23 and 24 and the tools 9.

The polishing cylinder 11 of a polishing tool 9 is shown in detail in Figures 2 and 3 of the drawings. The curvature of the spiral projections 12 of this cylinder corresponds to that of the grooves 7 of the work piece 10, but the width of these projections 12 is equal to only about one third of the width of the grooves 7.

As is customary in the art, the polishing cylinder 11 may be formed by a lead casting corresponding to the interior of the work piece 10 and carried by a rod 9.

If barrels of firearms are to be manufactured in this manner, it is necessary to provide different cylinders for barrels of different sizes and forms.

Figures 2 and 3 show the position of the polishing cylinder 11 within the work piece 10 when the machine is ready to be started. The polishing tools 9 are mounted within the supports 8 and 40 in such manner that the ribs 12 of the cylinders 11 extend substantially in the middle of the grooves 7 of the work pieces 10 (Figure 3).

A pulley 16 is in frictional engagement with a surface 35 of the wheel 13, so that the pulley is rotated by the wheel 13.

The work pieces 10 are mounted in cylindrical supports 14 and 38, which are rotatable around their vertical axis and which are carried by a bracket 17 integral with the frame 18 of the machine. The wheel 16 is connected with one end of a driving rod 36, which is pivotally connected at 37 with the cylinder 38. The cylinder 14 is connected with the cylinder 38 by a connecting rod 39.

The device operates as follows:

When the motor 34 is started, the endless belt 31 will rotate the wheel 13 which carries one end of the rod 29. The rod 29 will reciprocate the carriage 6 in the vertical direction along the guides 26 and 27. Since the spindles 23 and 24 are rotatably mounted in the supports 8 and 40 carried by the carriage 6, and since the grooves 25 of the spindles 23 and 24 are in engagement with corresponding projections formed within the guides 21 and 22, the spindles 23 and 24 will not only reciprocate along with the carriage 6 but will rotate around their longitudinal axis.

Since the tools 9 are firmly connected with the spindles 23 and 24, they will carry out the same movement as these spindles, namely, they will reciprocate vertically and also rotate.

At the same time, the pulley 16, which is in frictional engagement with the surface 35 of the wheel 13, will be rotated by the wheel 13. The rod 36, which is connected with the wheel 16 and the supports 14 and 38, will transform this rotation of the pulley 16 into an oscillatory movement of the work piece supports 14 and 38 around their vertical axis. Since the work pieces 10 are firmly mounted within their supports 14 and 38, they will oscillate along with them.

The position of the rod 36 relative to the pulley 16 may be so adjusted that the extent of the oscillatory movement of the work pieces 10 will be equal to the width of a groove 7 of the work piece minus the width of a projection 12 of the polishing cylinder 11.

Due to this oscillatory movement of the work pieces the dust formed by the polishing means is prevented from collecting in the small crevices and cracks of the work piece, so that these particles will not increase the uneven portions of the article, and the crevices and cracks will disappear very quickly.

This invention is of particular advantage in

the manufacture of barrels for firearms, since it makes it possible to eliminate unevennesses in an extremely short time and with exact precision.

Obviously, different means may be used for causing the movement of the work piece or the polishing tool in the course of the polishing process, for example, if necessary, the polishing tool 9 may carry out an oscillatory movement while the work piece 10 may be vertically reciprocated. It is also possible to cause the polishing tool 11 to carry out both movements. Moreover, many other changes may be made in the described construction without departing from the scope or intent of the invention, and all of such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. A device for polishing inner spiral grooves of a hollow body, said device comprising a polishing tool having projections extending in the direction of said grooves and adapted to be situated within said grooves, and means for causing a relative movement between said polishing tool and the hollow body in the direction of the longitudinal axis of said grooves, and for causing during said longitudinal movement a continuous relative oscillatory movement of substantially small amplitude between said polishing tool and the hollow body around said longitudinal axis.

2. A device for polishing inner spiral grooves of a hollow body, said device comprising a polishing tool having projections extending in the direction of said grooves and adapted to be situated within said grooves, reciprocating means connected with said polishing tool for moving said polishing tool relatively to said hollow body in the direction of the longitudinal axis of said grooves, a rotary wheel, means operatively connecting the first-mentioned means with said wheel, another wheel which is in frictional contact with the first-mentioned wheel, and means driven by the second-mentioned wheel and connected with said hollow body for simultaneously oscillating it with a substantially small amplitude around said longitudinal axis.

3. A device for polishing inner spiral grooves of a hollow body, said device comprising a polishing tool having projections the width of which is equal to about one third of the width of said grooves, said projections being adapted to be situated within said grooves, means for causing a relative movement between said polishing tool and the hollow body in the direction of the longitudinal axis of said grooves, and means for causing a continuous relative oscillatory movement of substantially small amplitude between said polishing tool and the hollow body around said longitudinal axis during said longitudinal movement.

4. A device for polishing inner spiral grooves of a hollow body, said device comprising a polishing tool having projections extending in the direction of said grooves and adapted to be situated within said grooves, means connected with said polishing tool for reciprocating said polishing tool relatively to said hollow body in the direction of the longitudinal axis of said grooves, means engaging said polishing tool for simultaneously oscillating it around its longitudinal axis, and means driven by the first-mentioned means for continuously oscillating said hollow body simultaneously with the reciprocating movement with a substantially small amplitude around the longitudinal axis of said grooves.