Sept. 13, 1955 H. L. RAPP 2,717,527

WATCHMAKING TOOL FOR ASSEMBLING THE MAINSPRING ASSEMBLY OF A SELF-WINDING WATCH

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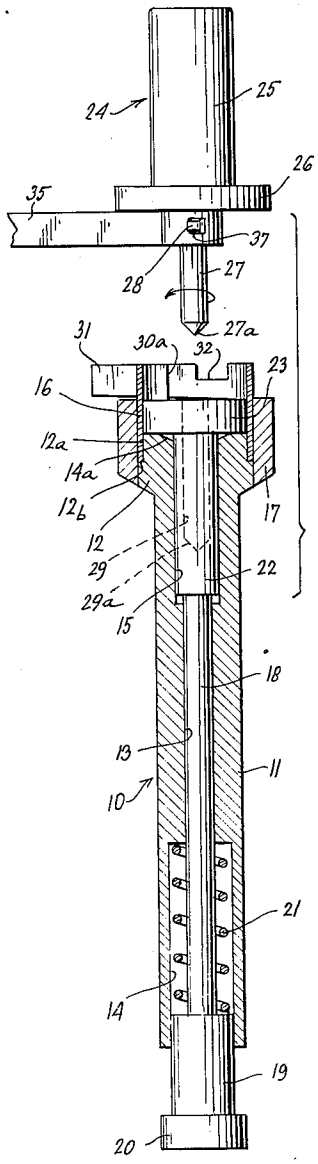
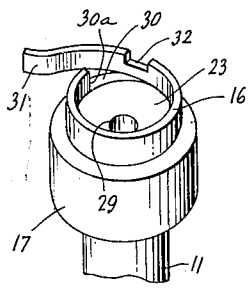


FIG. 1.

FIG. 2.



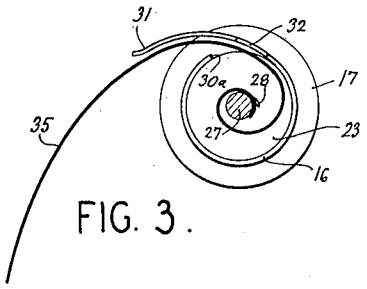


FIG. 3.

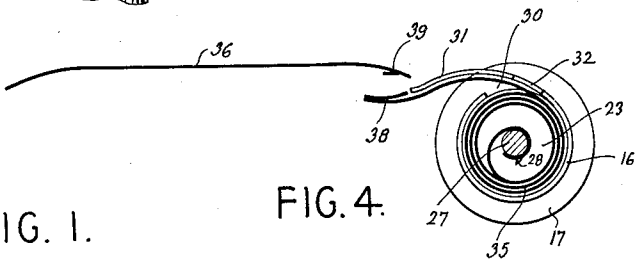
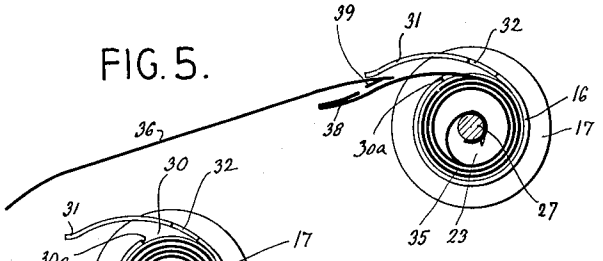


FIG. 4.

FIG. 5.



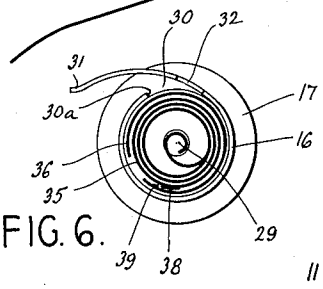


FIG. 6.

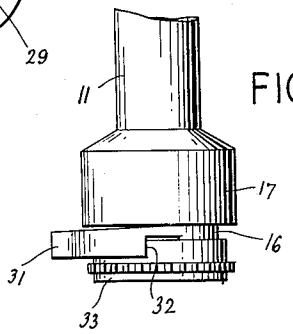


FIG. 8.

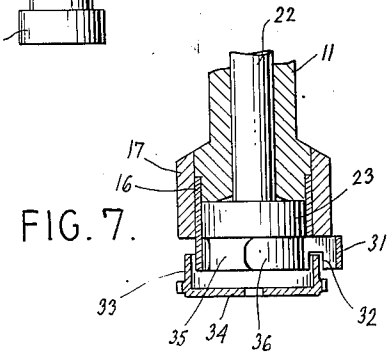


FIG. 7.

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WATCHMAKING TOOL FOR ASSEMBLING THE MAINSPRING ASSEMBLY OF A SELF-WINDING WATCH

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2 Claims. (Cl. 81—7.5)

This invention relates to an improved tool for assembling the mainspring assembly of a self-winding watch.

The invention will be described in particular application to the mainspring assembly of a self-winding watch, but it will be understood that the tool may also be used in assembling other types of watches.

A conventional self-winding mainspring assembly includes a barrel having a cylindrical inner peripheral wall in which the coiled mainspring is received. In addition, a separate relatively short length of spring metal, commonly known as a bridle, is hooked to one end of the mainspring and rests against the peripheral barrel wall. While the mainspring is being wound, the bridle exerts a tension against the peripheral barrel wall, so as to resist turning of the mainspring end to which it is hooked. When the mainspring is sufficiently wound, this tension is overcome; and the bridle slips along the peripheral barrel wall, preventing overwinding.

As a result of the above function of the bridle, it is important that it be assembled in the barrel without being deformed.

A tool, commonly known as a mainspring winder, has been heretofore developed for inserting the mainspring, but not the bridle, in the barrel. This tool comprises a hollow head having a cylindrical peripheral wall and having a plunger at the inner end thereof and normally spaced from the outer end thereof. A winding spindle may be inserted into the outer end of the head and manipulated to wind a mainspring into said head. The head may then be placed within an open end of a barrel and the plunger pushed outwardly to force the mainspring into the barrel.

In the use of a tool of the above type, it has been necessary to insert the bridle into the barrel by hand. This task has been difficult for a number of reasons, such as the smallness of the parts and the care required to avoid deformation of the bridle.

An important object of my invention is to provide an improved tool for inserting both the mainspring and the bridle into the barrel simultaneously.

My improved tool resembles the previously described tool in certain respects and varies in other respects. The wall of the head is provided with a slot at the upper end thereof, and an extension member is attached to or integral with a side edge of said slot. The extension is shaped relative to the slot to serve as a guide-way to permit drawing the mainspring through the slot into coiled position within the head, and to permit hooking the bridle onto the end of the mainspring so that the bridle may also be drawn into the head. This extension is also shaped to permit the head to be placed within an open end of a barrel to permit manipulation of the plunger to transfer the mainspring and the bridle to the barrel.

Other objects, advantages and features of the invention will become apparent from the following description, in conjunction with the annexed drawings. The drawings show a working model of a preferred embodiment of the invention and are substantially to scale.

In the drawings,

Fig. 1 is an exploded side elevation, partly in longitudinal section, of my improved tool and of the spindle for winding the mainspring into the tool.

Fig. 2 is a perspective view of a detail of the tool.

Fig. 3 is a top plan view of the tool, and showing the spindle in section and inserted into the tool, and showing a mainspring partly wound into the tool.

Fig. 4 is a view similar to Fig. 3, showing the mainspring almost entirely wound into the tool and also showing a bridle being brought into position for engaging the end of the mainspring.

Fig. 5 is a view similar to Fig. 4, showing the bridle inserted between the mainspring and the tool wall for engagement with the mainspring.

Fig. 6 is a view similar to Fig. 5, showing the mainspring and the bridle completely wound into the tool, with the spindle removed.

Fig. 7 is a longitudinal section, partly broken away, of a barrel and of the tool inserted into the barrel for transferring the mainspring and bridle thereto.

Fig. 8 is a side elevation similar to Fig. 7, but showing the tool turned about its longitudinal axis relative to its position in Fig. 7.

Upon reference to the drawings in detail, it will be seen that they show a tool **10** having a cylindrical main body **11**. Said body **11** has a cylindrical head **12** of slightly greater diameter. Said body **11** has a cylindrical axial bore **13** in the central portion thereof and cylindrical axial bores **14** and **15** of greater diameter in the respective end portions thereof. Bore **14** extends to the lower end of body **11**, as taken in Fig. 1, and bore **15** extends through head **12** and to the upper end thereof. The upper end of bore **14** is optionally flared outwardly at **14***a*.

The upper portion **12***a* of head **12** is of reduced diameter, and accordingly a transverse shoulder **12***b* is provided at the junction between said upper portion **12***a* and the lower portion of head **12**. A relatively thin, generally cylindrical collar **16** is mounted upon head portion **12***a* and in abutment with shoulder **12***b*. The external diameter of collar **16** is substantially the same as that of the lower portion of head **12**. Collar **16** extends above the upper end of head portion **12***a*.

A retaining and reinforcing collar **17** is mounted upon collar **16** and the lower portion of head **12**. Preferably, collar **17** extends above head portion **12***a* but below the upper end of collar **16**. The assembly of head **12** and collars **16** and **17** may be held together frictionally or by any other suitable means.

Plunger rod **18** extends slidably through bore **13** and into bores **14** and **15**. A plunger piston **19** is mounted upon the lower end of rod **18** and is slidably located within bore **14**. Piston **19** extends below bore **14** and has an enlarged stop head **20**. A compression spring **21** is located in bore **14** with rod **18** extending therethrough and with its ends respectively abutting the upper end of bore **14** and piston **19**.

A further plunger piston **22** is mounted upon the upper end of rod **18** and is slidably located within bore **15**. A pusher head **23** is mounted upon the upper end of piston **22** and is slidably located within collar **16**.

The normal position of the parts thus far described is clearly shown in Fig. 1. In this position, spring **21** urges piston **19** downwardly, so that pusher head **22** is seated upon the top of head portion **12***a*. Piston **22** is optionally spaced slightly above the lower end of bore **15**. Stop head **20** is spaced below the lower end of body **11**. The top of pusher head **23** is spaced below the top of collar

16, to permit insertion of a mainspring and bridle within collar 16 and above pusher head 23.

It will be apparent, without illustration, that stop head 20 may be pushed upwardly, against the action of spring 21, until it abuts body 11. In this movement, pusher head 23 is moved upwardly to eject any inserted elements from collar 16. Preferably, when stop head 20 abuts body 11, the upper face of pusher head 23 is at least on a level with the upper end edge of collar 16.

Fig. 1 shows a winding spindle 24 which has a cylindrical handle 25 formed with an enlarged shoulder member 26 at the lower end thereof. A cylindrical rod 27 depends from handle 25 below shoulder member 26. Rod 27 has a radial projection 28 located slightly below shoulder member 26. Rod 27 has a tapered point portion 27*a*.

Piston 22 has an axial bore 29 which extends upwardly into pusher head 23 and to the top thereof. The lower end of bore 29 is tapered at 29*a*.

Spindle rod 27 is insertable within bore 29 until shoulder member 26 abuts the top of collar 16 and is turnable within said bore 29.

The structure of the portion of collar 16 which projects above collar 17, and which forms an important part of the invention, will now be described in detail.

The wall of collar 16 has a slot 30 formed therein and preferably extending downwardly from the upper edge of the wall to at least the level of the upper face of pusher head 23 in the normal position thereof. At one edge of slot 30, the collar wall has an extension 31 which diverges outwardly relative to the circumference of the collar wall and also extends beyond the other edge 30*a* of slot 30. Collar extension 31 is spaced from slot edge 30*a*.

Collar extension 31 is optionally integral with the remainder of collar 16, but collar 16 may be formed in more than one piece if desired.

Preferably, collar extension 31 is connected to the edge of slot 30*a* shown in the drawings, so that when spindle rod 27 is inserted in bore 29 and turned in a clockwise direction, as taken in Figs. 3–6, to carry a mainspring through slot 30, in a manner to be described more fully below, the mainspring rides against the inner face of collar extension 31 and bears outwardly against same.

Reference is made to the drawings to complete the disclosure as to the preferred shape and size of collar 16 and of extension 31 and slot 30.

Another important feature of collar extension 31 is the provision of a notch or cut-out 32 therein. Said notch 32 extends downwardly from the top edge of extension 31 approximately half the distance to pusher head 23 in its normal position. The inner side edge of notch 32 is located approximately on the line of circumference of the main portion of collar 16, the outer other edge of notch 32 being thereby located radially outwardly of the main portion of collar 16.

Figs. 7 and 8 show a cylindrical barrel 33 which has a closed end 34. As is shown in Figs. 7 and 8, the outer diameter of collar 16 is slightly smaller than the inner diameter of barrel 33. Therefore, collar 16 may be inserted into barrel 33 for transfer of a mainspring and bridle from said collar 16 to said barrel 33. Extension 31 extends outwardly of barrel 33 when collar 16 is inserted therein, but slot 32 is located to receive a portion of barrel 33, so as to permit the insertion of collar 16 into barrel 33 sufficiently to permit the transfer operation.

The operation of tool 10 and spindle 24, with reference to a conventional mainspring 35 and a conventional bridle 36, is as follows:

Spindle rod projection 28 is extended through the opening 37 adjacent one end of mainspring 35. Spindle rod 27 is placed in bore 29 with shoulder member 26 abutting the top of collar 16, and with mainspring 35 extending through slot 30. Mainspring 35 is slidable between shoulder member 26 and pusher head 23.

Spindle 24 is turned in a clockwise direction, as taken in Figs. 3–6, whereby mainspring 35 is drawn through slot 30 and wound around spindle rod 27. Fig. 3 shows an intermediate stage in the winding of mainspring 35 upon spindle rod 27.

The coiled mainspring 35 exerts an outward tension against the inner wall of collar 16 in an effort to straighten itself. Therefore, at any instant, the portion of mainspring 35 just entering slot 30 bears against the inner face of collar extension 31, as shown in Figs. 3 and 4.

As is shown in Fig. 4, the trailing end portion of mainspring 35 has a piece of spring metal 38, which serves as a catch, mounted on the outer face thereof. The trailing end of catch 38 is fixed to mainspring 35. The leading end of catch 38 is free but tends to move against mainspring 35. Fig. 4 shows the stage of operation just before catch 38 strikes collar extension 31. In the position of Fig. 4, the leading end of catch 38 has just reached a position in which it is about to strike the end of collar extension 31.

Fig. 4 also shows bridle 36 placed in position to be engaged with mainspring 35. Bridle 36, of course, is much shorter than mainspring 35. In the position of Fig. 4, the leading end portion of bridle 36 has a piece of spring metal 39, which serves as a further catch, mounted on the inner face thereof. The leading end of catch 39 is fixed to bridle 36. The trailing end of catch 39 is free but tends to move against bridle 36.

The leading end of bridle 36 is pressed against the outer face of the trailing end portion of mainspring 35 so as to force mainspring 35 away from the inner face of collar extension 31 and is slid between mainspring 35 and collar extension 31 until catch 39 is located entirely ahead of catch 38. This position of bridle 36 is shown in Fig. 5.

Spindle 24 is again turned to wind mainspring 35 still further upon spindle rod 27. In this movement, the leading end of catch 38 bears against the trailing end of catch 39, so that bridle 36 is also drawn through slot 30 into the inner space of collar 16.

After bridle 36 is completely located within the main portion of collar 16, projection 28 is detached from eye 37 and spindle rod 27 is withdrawn from bore 27, as shown in Fig. 6. As shown in Fig. 6, bridle 36 bears against the inner wall of collar 16 and is preferably slightly shorter than the circumference of said inner wall.

The open end of collar 16 is then inserted into the bore of barrel 33, as shown in Fig. 7, with the peripheral wall of barrel 33 located in notch 32. Plunger member 20 is manipulated, against the action of spring 21, to force pusher head 23 towards the open end of collar 16 and thereby force the mainspring and bridle out of collar 16 and into barrel 33. Tool 10 is then withdrawn from barrel 33.

It will be apparent from the above description that collar extension 31 is an extremely important part of this invention. Without extension 31, it would be extremely difficult, even with the use of an additional tool, to engage the catches 38 and 39 in the manner described above, without deforming bridle 36. At the point of junction of collar extension 31 with the respective side edge of slot 30, the wound coils of mainspring 35 exert a relatively great pressure against the inner face of collar 16, making it extremely difficult to force the delicate bridle between the outer coil and said inner face until catch 39 clears catch 38.

However, with the provision of collar extension 31, only the uncoiled trailing end portion of mainspring 35 bears against extension 31. Also the fulcrum of movement of said mainspring trailing end portion is substantially the junction point of collar extension 31 with the main portion of collar 16, so that by making extension 31 of sufficient length it is possible to obtain excellent mechanical advantage in moving mainspring 35 away

from extension 31 at the point of insertion of bridle 36.

It will be apparent that the inner face of collar extension 31 serves as a guide-way against which the trailing end portion of mainspring 31 bears to hold the small catches 38 and 39 in guided engagement with each other until they pass through slot 30.

While I have disclosed a preferred embodiment of my invention, and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made in the invention without departing from the scope and spirit thereof.

In the drawings, collar extension 31 is shown as integral with collar 16. However, it will be apparent that extension 31 may be a separate attachment. In that case, opening 30 will be somewhat wider, and extension 31 will have a portion located rearwardly of opening 32 with a depending extension which fits frictionally between collar 17 and head 12, in the same manner as collar 16.

A modified extension member of this type may be used as an adapter for previous mainspring winder tools.

I claim:

1. In a tool for inserting a mainspring into a watch barrel, the combination of a longitudinal hollow, cylindrical head, a pusher piston inserted in the lower end of said head and slidable therein and adapted to be spaced from the upper end thereof, the peripheral wall of said head having a longitudinal slot therein communicating with the portion of the interior space above said piston, and an extension member which is connected to said peripheral wall at one of the longitudinal edges of said slot, said extension member diverging outwardly from the periphery of said head and having an inner face which is substantially continuous with the inner face of the peripheral wall of said head, said extension member having a notch in the upper edge thereof, said notch being positioned whereby said head may be partly inserted within the bore of a barrel with the peripheral wall of said barrel extending into said notch.

2. In a tool for inserting a mainspring and bridle into a watch barrel, the combination of a longitudinal hollow, cylindrical head, a pusher piston inserted in the lower end of said head and slidable therein and adapted to be spaced from the upper end thereof, the peripheral wall of said head having a longitudinal slot therein communicating with the portion of the interior space above said piston, and an extension member which is connected to said peripheral wall at one of the longitudinal edges of said slot, said extension member diverging outwardly from the periphery of said head and having an inner face which is substantially continuous with the inner face of the peripheral wall of said head, said extension member being positioned to receive the radial outward thrust of a mainspring as it is being wound into said head through said slot, said extension member having a notch in the upper edge thereof, said notch being positioned whereby said head may be partly inserted within the bore of a barrel with the peripheral wall of said barrel extending into said notch.

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