Oct. 8, 1940. LE ROY F. DENSMORE 2,216,878

METHOD OF FORMING DETENTS

Filed April 4, 1938

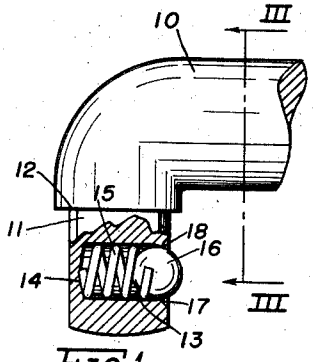


FIG. 1.

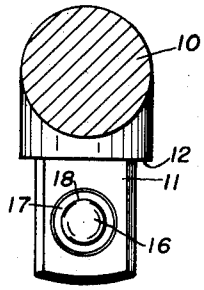


FIG. 2.

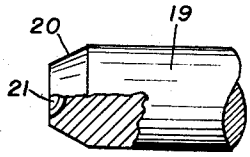


FIG. 3.

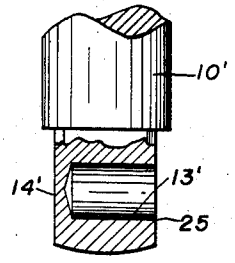


FIG. 4.

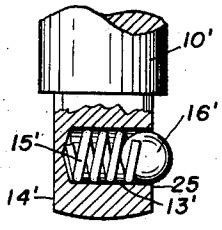


FIG. 5.

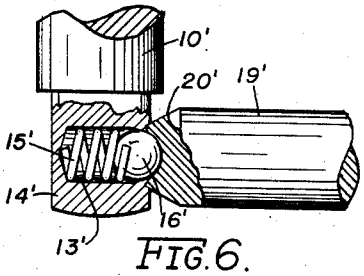


FIG. 6.

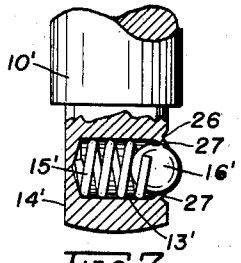


FIG. 7.

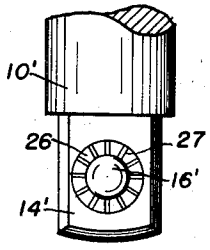


FIG. 8.

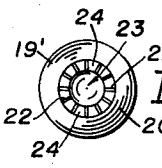


FIG. 10.

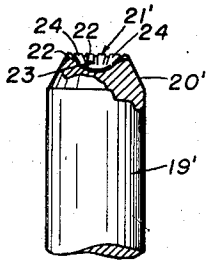


FIG. 9.

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METHOD OF FORMING DETENTS

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Application April 4, 1938, Serial No. 199,804

6 Claims. (Cl. 29—148)

This invention relates to spring impelled detents and their method of confinement, although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially the provision of novel means for more effectively swaging the periphery of a recess to confine instrumentalities therein such as spring impelled detents.

The usual swaging operation commands the use of a die or punch that has a smooth peripheral cutting outline to uniformly displace the metal around the open orifice of a recess so as to retain the detent or other instrumentality therein. It has been found through long usage that such swaging operations and methods of forming indentures do not effectively retain the detent in position in that the metal defining the orifice is compressed down into the recess rather than extended radially inward near the surface of the hole to render the swaging effective. By so doing, the usual swaging die presses the material around the recess downwardly and in a direction parallel to the axis of the recess so as to effect only slight inward extension in the material in partially closing the opening.

With the teachings of the present invention, the swaging effect is produced so as to cause the material to flow radially inward near the surface of the metal to effectively provide a substantial enclosure for the recess opening to retain a spring impelled detent or other instrumentalities therein.

One object of the present invention is to provide an improved method of swaging the material surrounding the opening of a recess so as to effectively retain instrumentalities such as a spring impelled detent therein.

Another object is to provide a detent confining recess by resort to an improved swaging operation.

Still another object is to irregularly swage the region of an open end recess by applying alternately varying degrees of cold metal flowing force to partially enclose said opening against removal of the detent.

A further object is to impart a serrated swaging effect to the open end region of a recess to effectively retain an instrumentality such as a detent therein.

A still further object is to partially close the open end of a recess by irregularly swaging the region thereof along radially converging lines to partially enclose the detent.

Still a further object is to provide a radially serrated orifice defining the open end of a recess to effectively retain a detent or other instrumentality therein.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawing:

Figure 1 is a fragmentary side view of a wrench socket handle showing the usual and customary swaged recess therein, this forming no part of the invention and merely being illustrated to show the known swaging operation.

Figure 2 is a sectional view taken substantially along line II—II of Figure 1.

Figure 3 is a fragmentary side view of the usual swaging tool that is used in producing a swaging effect as shown in Figures 1 and 2, parts thereof being broken away to clarify the showing.

Figure 4 is a side view in elevation of a socket shank showing the initial step of drilling or otherwise forming a recess in the polygonal extension thereof, parts thereof being broken away to clarify the showing.

Figure 5 is a view similar to Figure 4 showing the next step of inserting a spring and detent on the recess.

Figure 6 is a view similar to Figure 5 showing the next sequential step of impacting the orifice defining region of a recess in a manner embodying features of the present invention.

Figure 7 is a view similar to Figure 6 showing the resultant effect produced with the tool shown in Figure 6 as a result of the impact produced therein.

Figure 8 is a fragmentary end view in elevation of the device shown in Figure 7.

Figure 9 is a fragmentary side view of an improved swaging tool embodying features of the present invention, the swaging head being partially broken away to clarify the showing.

Figure 10 is a plan or end view of a swaging tool head embodying features of the present invention.

The structure selected for illustration in Figures 1 to 3 show the usual type of swaging tool and effect produced therewith. This illustrated embodiment comprises a handle shank 10 which terminates in any suitable type of extension which, in this instance, has a polygonal socket receiving portion 11 of reduced dimensional extent so as to define a shoulder 12 against which the socket will rest. A recess 13 is drilled or otherwise formed transversely in the socket receiving portion 11 so as to extend transversely therethrough for substantially the entire extent

thereof so as to define an open end recess having a closed bottom 14. The recess 13 serves to confine any suitable form of instrumentality which, in this instance, comprises the usual coil spring 15 having a diameter somewhat smaller than the recess 13 so as to serve as a resilient support for a detent 16. The detent 16 is, in this instance, of spherical configuration and serves to frictionally engage the polygonal aperture provided in a wrench socket so as to serve as a complement of the shank extension 11, thereby effecting engagement therebetween owing to the resilient urge of the spring 15 on the detent 16.

It is necessary, or at least highly desirable, that the spring impelled detent 16 should be retained within the recess 13 against accidental displacement therefrom and this is usually accomplished by smoothly swaging the periphery around the open end of the recess 13 so as to provide depressed countersunk formation 17 which tends to slightly diminish the extent of the recess opening so as to preclude the detent 16 from being displaced therefrom. To this end, the diameter of the detent 16 conforms very closely to the interior of the recess 13 so that the slight diminishment in the size of the recess opening created by the smooth peripheral swage 17 will be effective to preclude the removal of the detent 16. It should be observed that the smooth peripheral swage 17 (Figures 1 to 3) is formed depressing the material downward and in axial alignment with the diameter of the recess 13 to the end that only a very slight portion thereof is displaced inwardly in a radial direction to define a slight peripheral abutment 18.

In consequence thereof, the spring 15 will normally urge the detent 16 against a slight peripheral abutment 18 created by the swaged countersunk peripheral depression 17. This is accomplished by resort to a die having a cylindrical shank 19 that terminates in an inwardly tapered end 20 having a recess 21 in the end thereof that serves as a cutting die to depress the metal downwardly into the recess 13 and simultaneously causing a slight inward peripheral abutment 18 serving as a retainer for the detent 16. This type of swaging or embossing tool is used on hardened metal so that the body around the drilled hole is compressed considerably. As a result of this action a comparatively small portion of the metal which is moved or displaced radially toward the center of the hole is quite brittle. After use for confinement of a spring impelled detent this brittle peripheral retainer edge breaks off in the form of a small ring with the result that the spring impelled detent drops out of the enclosure. This type of swaging has been resorted to for many years and was thought practical in the absence of an improved structure that the art sought, and was used in the absence of a more effective expedient.

It has been found, however, that this type of structure can be rendered more effective by providing the usual recess 13' in a polygonal shank 14' that serves as an extension of a shank 10'. The recess 13' is of the usual construction, and a spring 15' is confined therein to impart an outward urge to the detent 16'. To this extent, the steps of forming an effective swage are similar to those described in the previous embodiment, but the swaging effect is far more pronounced and of increased effectiveness by resorting to a die 19' having its tapered extreme region 20' provided with an improved cutting extremity 21'. The cutting extremity 21' of the cutting die is, in this instance, provided with radially disposed grooves 22 that provide a serrated concave surface 23.

The serrated concave surface 23 presents radially disposed and spaced interrupted swaging teeth 24 that present a serrated peripherally interrupted edge on the die 19' that serve to swage the region of an open end 25 of the recess 13'. It is to be noted that the extent of the concavity 23 in the end of the die 19' is such as to present a rather sharp peripheral serrated edge 24 along a diameter that is just slightly larger than the diameter of the recess 13' so as to effect an irregular indenture 26 for each tooth 24 on the die 19' to the end of causing the metal to flow inwardly toward the axis of the recess 13' to define spaced prongs 27 that present appreciably greater retaining influence on the detent 16' than the smooth peripheral swage 17 described supra.

This is effected by irregularly swaging the region of the open end of the recess 13' by applying slightly varying degrees of impacting force occasioned by the serrated peripheral edge 21'. The angular peripheral edge 21' effectively flow the material inwardly owing to the split wedging effect produced therewith (Figures 6 and 7) so that less impacting force is necessary and the resulting depression is less pronounced and in a position nearer the outer surface of the recess 13' (Figure 7) rather than pressing the metal down into the body surrounding the recess 13 (Figure 1). In other words, with the same impact and correspondingly sized dies 19 and 19', the former will tend to depress the metal downwardly into the body surrounding the recess 13 and along a path parallel to the axis of the recess 13 to the extent of giving only nominal inward radial material flow to partially enclose the open end of the recess 13 (Figure 1). With the teachings of the present invention, however, the die 19' only nominally presses the metal downwardly and causes appreciably greater inward flow to form a substantial peripheral retaining swage 27 (Figure 7) to more effectively limit the outer movement of the spring impelled detent 16'.

In the latter embodiment embodying teachings of the present invention, the inward wedge indenture or peripheral angular depression 26 of the metal around the opening is spaced somewhat beyond the diameter of the recess 13' so as to inwardly spread the body proximate to the recess end 25 or flow the mass inwardly and upwardly to define the substantial peripheral projection 27 that effectively retains the detent 16'. The sharp peripheral serrated edge 24 tends to move the material inwardly toward the center of the hole and always upwardly to define a substantially peripheral projecting body 27 which will not break loose from normal usage of the detent 16'. By resort to the usual swaging die 19, however, the material around the recess opening 17 is depressed substantially downwardly along the diameter of the recess 13 (Figure 1) rather than radially inward therebeyond so as to only form a comparatively slight peripheral brittle edge resulting from the inward flow of metal that is usually termed a swaging operation, this being readily seen from the comparative showings in Figures 1 to 3, on one hand, and in Figures 7 to 9 inclusive, on the other hand. As a result,

the method exemplified in Figures 4 to 10, inclusive, results in an improved retainer formed around the detent recess that is especially effective in retaining spring impelled detents against accidental displacement beyond their confines.

Various changes may be made in the embodiment of the invention herein specifically described without departing from or sacrificing any of the advantages of the invention or any features thereof, and nothing herein shall be construed as limitations upon the invention, its concept or structural embodiment as to the whole or any part thereof except as defined in the appended claims.

I claim:

1. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said open end by swaging indentations irregularly depressed axially toward the region of said open end to partially enclose said opening against removal of the detent.

2. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said open end by irregularly swaging axially toward the region of said open end to partially enclose said opening against removal of the detent.

3. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said open end by irregularly swaging said shank member in the region of said open end along radial converging lanes to partially enclose said opening against removal of the detent.

4. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said open end by irregularly swaging indentations in said shank member adjacent the region of said open end by applying alternately varying degrees of cold metal flowing force to partially enclose said opening against removal of the detent.

5. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said open end by circumferentially indenting and swaging the material of said shank member adjacent the open end therein along diametrical lines slightly beyond the wall of said recess to radially tend to close the open end thereof.

6. A method of forming a metal detent retaining recess which consists in recessing a shank member to define an open end, then inserting a loosely fitting detent through said open end for lodgement in the recess, and then partially closing said shank member adjacent in the region of the open end by circumferentially and alternately indenting the material along a diameter slightly beyond the wall of said recess to radially tend to close the open end thereof.

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