April 18, 1944. C. W. CHENEY 2,346,906

MANUFACTURE OF BAND CLIPS HAVING CLOSING WORM GEAR

Filed May 8, 1943

FIG. 1.

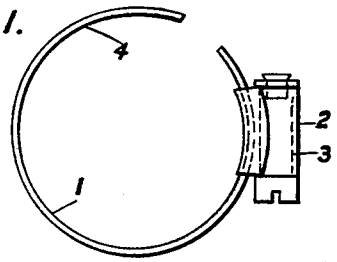


FIG. 3.

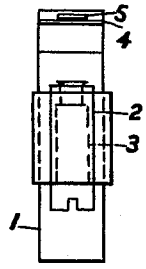


FIG. 2.

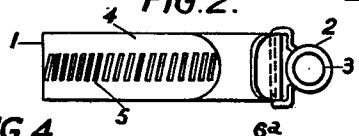


FIG. 4.

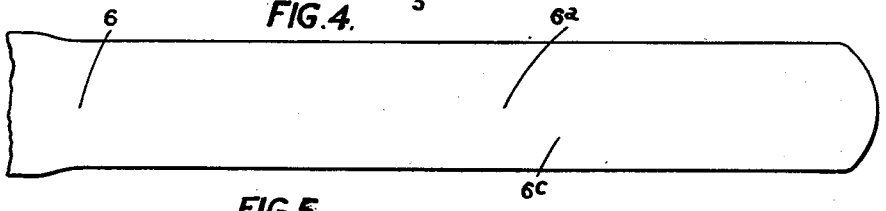


FIG. 5.

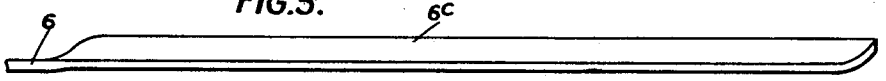


FIG. 6.

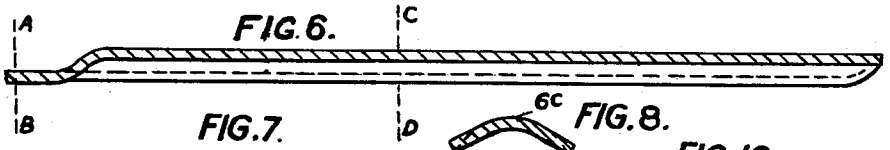


FIG. 7.

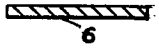


FIG. 8.

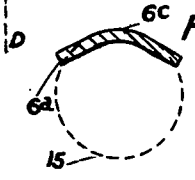


FIG. 10.

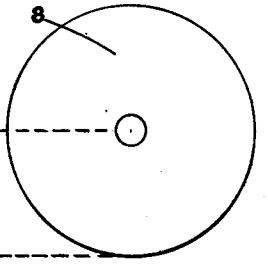


FIG. 11.

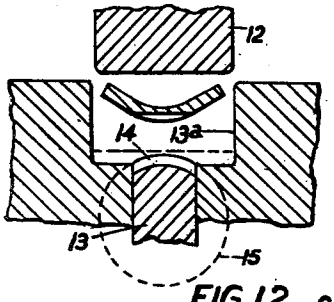


FIG. 9.

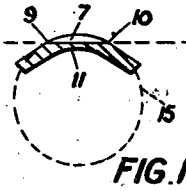


FIG. 12.

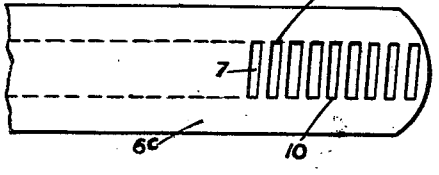


FIG. 13.

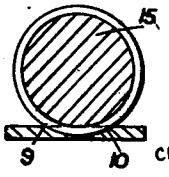
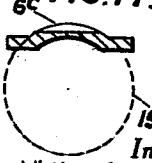


FIG. 14.



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UNITED STATES PATENT OFFICE

2,346,906

MANUFACTURE OF BAND CLIPS HAVING CLOSING WORM GEARS

Charles William Cheney, Soho, Birmingham, England

Application May 8, 1943, Serial No. 486,262
In Great Britain February 24, 1942

3 Claims. (Cl. 29—159.2)

The invention relates to a band clip of the kind having closing worm gear and embodying a band-member of flat and flexible strip metal having at its head end a fixed housing for the close mounting therein of a worm and for the close threading therethrough of the free end of the band-member to lie between the worm and the opposed bottom and sides of the housing, said free end of the band-member from its extremity being formed with a longitudinal and central line of worm-teeth extending crosswise for the worm to engage so that its rotation will close and open the band, as required.

Such a worm-geared band clip is well-known and extensively used, and a feature of it is that the teeth of the band-member are machined in the outer face thereof so as to be within the thickness of the band-member and without breaking through to the inner surface of said band-member.

A clip of this kind is at present desired for purposes demanding that it shall not fail in its gripping efficiency, the present difficulty in its manufacture being the formation of the worm-teeth and the manner of producing them and which according to present production is not only very expensive but exceedingly slow, and unreliable inasmuch as said worm-teeth are incorrectly formed in relation to the screw-threads of the worm they have to engage; in other words, the worm-teeth have not the combined correct pitch, depth and curvature for proper and complete engagement with the screw-threads of the worm.

The object of the invention is to provide a method of making a worm-geared band clip of the kind in which the worm-teeth are correctly formed to the combined pitch, depth and curvature of the screw-threads of the worm, and by a manufacture which is inexpensive and suitable for quick production, and which prevents, by maximum engagement of the worm-teeth with the screw-threads of the worm, any transverse displacement between said teeth and the worm, and any possibility of slip between same in the operation of clip.

A worm-geared band clip according to the invention has its worm-teeth formed accurately as to pitch, depth, and curvature while the band or body-member is in the form of a straight strip, said worm-teeth being roughly machined by a traversing cut while the band-member is transversely curved to the arc of the worm at that portion to be machined, said teeth being afterwards finished as to correct pitch, depth, and curvature by pressure between tools while said band-member is still in the form of a straight strip.

One manufacture according to the invention flattens out the machined cross curving and finishes the worm-teeth at one operation by pressure between two tools, one of which is flat and the other of which is formed with worm-teeth corresponding accurately with the screw-threads of the worm.

It is an essential feature of the invention that the worm-teeth are roughly machined while the band-member is straight longitudinally, and transversely curved to the arc of a sector of the worm and by a straight traverse, and this machining can be performed in any convenient manner and quite easily by the use of a hob or cutter of a much larger diameter than the diameter of the worm so long as the thickness of the strip is properly calculated and the correct transverse curvature aforesaid is provided, the correct curvature of the worm-teeth being left to the finishing operation.

In all forms of the invention the worm-teeth are wholly in close engagement with the screw-threads of the worm, so that there can be no transverse displacement between the strip and the worm.

The invention aforesaid will be hereinafter particularly described with reference to the accompanying drawing in which:

Fig. 1 is an end view of the kind of clip to which the invention relates.

Fig. 2 is a plan of Fig. 1.

Fig. 3 is a side view of Fig. 1.

Fig. 4 is a plan of a portion of the band-member longitudinally straight but transversely curved where the worm-teeth are to be provided.

Fig. 5 is a side view of Fig. 4.

Fig. 6 is a longitudinal section of Fig. 4.

Fig. 7 is a cross-section of Fig. 6 on the dotted line AB.

Fig. 8 is a cross-section of Fig. 6 on the dotted line CD.

Fig. 9 is a cross-section of the strip after being roughly machined.

Fig. 10 represents a hob by which the strip of Fig. 9 is machined by a straight traverse.

Fig. 11 shows in section a pair of finishing tools with the straight strip, Fig. 9 placed between them before the finishing operation takes place.

Fig. 12 is a plan of a portion of the strip Fig. 9.

Fig. 13 shows the worm-teeth and the worm in relative close engagement, essential to a reliable grip of the clip.

Fig. 14 shows a cross-section of a strip curved in a modified form to Fig. 9.

The band clip Figs. 1 to 3 embodies a band-member 1 of flat and flexible strip metal, a hous-

ing 2 fixed to the one end of said band-member, and a worm 3 mounted within the housing 2, the free end 4 of the band-member 1 being formed with a longitudinal line of worm-teeth 5 extending crosswise and adapted for engagement of the worm, rotation of the worm 3 to open and close the band.

The invention relates solely to the worm-teeth 5, and provides a manufacture which is inexpensive suitable for quick production and particularly accurate for engaging the screw-threads of the worm.

A straight strip length 6 Figs. 4 to 8, is transversely curved at 6a to an arc 6c of the worm used in the clip, for the length of worm-teeth to be formed, this curving 6c being in a metal strip of a properly calculated thickness so that the worm-teeth shall not break through said thickness to the inner surface of the band-member. Said curving 6c is now machined across by a traverse cutting the pitched grooves 7 as clearly shown in Fig. 9, and conveniently by a revoluble hob or cutter 8 Fig. 10, which revolves between centres while the transversely shaped strip 6, suitably held at an angle to the axis of the cutter, is traversed in relation thereto.

Thus is roughly machined in the free end 4 of the band-member 1 a longitudinal line of unfinished worm-teeth having pitch, depth and length to an arc of the worm, the latter from the point 9 to the point 10, leaving an intact part 11 of the strip below the machining.

The machined strip Fig. 9 is now inverted, as in Fig. 11, and its teeth finished by pressure between a top tool 12 and a bottom tool 13, the former having a flat underside, and the latter having a tooth-shaping surface 14 corresponding exactly with the screw-threads of the worm, and when these two tools 12 and 13 operate upon the strip, which is accurately guided in the cavity 13a of the holder of the bottom tool said strip is flattened out and its worm-teeth accurately finished as to curvature, and also as to correct pitch and depth; so that when said teeth are put into engagement with the screw-threads of the worm 15 they accurately and wholly engage same for the full width of the line of worm-teeth, as clearly shown at 9 and 10 in Fig. 13.

With the aforesaid manufacture there can be no slip between the screw-threads of the worm 15 and the worm-teeth of the band, there being no tendency of the strip to roll sideways because of the accurate and centralizing engagement of the teeth with the screw-threads.

In known forms of clips the worm-teeth are cut and finished while the band is circled, and by a hob or cutter of much larger diameter than the diameter of the worm to be used, so that the teeth in the line have a larger arc than the screw-threads of the worm, and therefore the objectional feature of transverse relative rolling between the strip and the worm, and great possibility of slip in the pull-up. The cutting of the worm-teeth while the band is circled and by a hob or cutter of the same diameter as the worm is an impractical proposition for commercial production quite apart from the fact that a small diameter cutter would quickly become useless.

The invention is distinctive inasmuch as it roughs and correctly finishes the teeth while the strip is in a straight condition.

I claim:

1. A process for providing a metal strip with worm teeth formed accurately to the pitch, depth and curvature of a given worm, comprising the steps of curving the portion of the flat strip to be provided with the teeth transversely to the arc of a sector of the given worm, forming the teeth in the convex surface of the curved strip portion by a rough machining across at the proper pitch angle, and, subsequently, accurately finishing the teeth and flattening out the curved strip portion by pressure between appropriately shaped dies.

2. A process, as claimed in claim 1, wherein the flattening out of the machined curving and the finishing of the worm teeth are performed in one operation by pressure between two dies one of which is flat and the other of which is formed with worm teeth corresponding accurately with the screw-threads of the worm.

3. A process for providing a metal strip with worm teeth formed accurately to the pitch, depth and curvature of a worm, comprising the steps of arching the portion of the flat strip to be provided with the teeth transversely of the longitudinal axis of the strip, forming the teeth in the convex surface of the arched strip portion by a rough machining, and, subsequently, accurately finishing the teeth and flattening out the arched strip portion by pressure between appropriately shaped dies.

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