Shears with teeth for cutting along zigzag lines

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This invention is an improvement in hand scissors or shears with teeth for severing cloth along zigzag lines to make a serrated instead of a straight edge.

The invention comprises a novel form of such shears that can be produced in a shorter time and with less work and labor and a smaller number of processing steps than have previously been required; and an important object of the invention is to provide shears of this kind of superior design at considerably reduced cost.

Previously in the manufacture of hand shears of this type, several metal strips or blanks were bunched and expensive series of steps; and an important object of the invention is to provide shears of this kind of superior design at considerably reduced cost.

On the drawings,

Figure 1 is a view partly in section showing the operation of cutting teeth for shears according to my invention.

Figure 2 is a front elevation of part of the mechanism shown in Figure 1.

Figure 3 is a section on line 3-3 of Figure 1. Figure 4 shows how the step of lapping and polishing is performed.

Figures 5 and 6 are diagrammatic views in section showing the result of the lapping process; the toothed blades looking as if in section along a line across the lower half of Figure 4, yiewed from above.

Figure 7 shows in part a pair of finished shears embodying this invention; and Figures 8, 9 and 10 are diagrammatic views showing details of the toothed blades for my improved shears.

The numeral 1 indicates a rotary disk or head adapted to be operated by a shaft 2, suitably supported in one or more bearings 3. This disk carries several strips or flat bars of metal or blanks 4, held in such position that they can be revolved past the triangular ends of a row of cutters 5, which are mounted on a support 6 and can be set close enough to the blanks to engage the edges thereof projecting out from the face of the disk 1 to form teeth, with lateral faces 7 and 8 intersecting in projecting edges 9. The disk and cutters 5 move relatively closer when the machine is in operation. The disk 1 has slots 10, in which the blanks 4 are made fast by locking bars 11, secured by screws 12. The slots are not radial, but so placed that if the center line were extended it would pass to one side of the axial center of the shaft 2, as indicated in Fig-
The blades are thus offset from the axis of the shaft 2, for cutting, to the same extent as they are offset from the pivot, joining the two halves or jaws of the finished shears when the blades are attached to said halves in their final positions. See Figure 7. Also the slots 10 are inclined somewhat to the front face of the disk, so that the triangular recesses are cut at a small angle to the wide opposite faces or flat sides of the blade, and the lateral faces 1 and 8 and the front edges 9 of the teeth are therefore inclined to said sides for about ten degrees. The teeth 7 and 9 will not be flat but are small elements of conical surfaces described with reference to the center of the shaft 2 as a common axis by the diagonal sides of the point ends of the cutters 5. A machine of such construction as to produce triangular teeth cut this way into the blades 4 is shown and described in my prior application Serial No. 651,257, filed July 3, 1946 now Patent Number 2,937,164 issued January 9, 1951; and its structural characteristics are set forth in the claims of said application. The cutters 5 are made fast on the support 6 by a band 13 and screws 14, or other suitable means. The head 1 and support 6 approach the blades 4 with a similar recess for another toothed blade. The blades are secured to the standard and the arm by screws 17 or other fastening means. The arm 18 is oscillated by a shaft 19; mounted in a bearing 20 at the top of the post 15. The lapping is accomplished by operating the arm 18 to swing the toothed blade it carries from side to side past and in rubbing or grinding contact with the toothed blade on the standard 18. The teeth on these two blades, which are of equal length, are so located that the teeth on one enter the recesses between the teeth on the other. Thus the lateral faces 7 and 8 of the teeth are carried repeatedly into and out of frictional engagement. The blades are mounted in the post 15 and arm 18 as shown in Figures 5 and 6, and the lateral faces of the teeth are adjacent the more acute or advanced edges thereof. These edges are made acute because of the inclination of the teeth to the flat opposite sides of the blades, making them sharper along one flat side of the blade than the other. As a result the blades wear away these lateral faces a bit along the advanced or acute leading edges and produce a narrow strip of surface indicated at 21, which extends across the lateral faces 7 and 8 from one end of the blade to the other at the acute or leading edges thereof. The surface of this strip makes a minute angle with the remainder of the lateral surfaces 7 and 8. When the blades are mounted in a pair of shears as indicated in Figure 7, the two blades present their leading edges towards each other, and these edges effect the cutting of a piece of cloth or other material which is to be severed or trimmed. These blades in question can be attached in any suitable manner to the two halves 22 indicated in part in Figure 7, these halves or jaws being joined together by a pivot 23 secured by a nut or cap 24, the handles being at the other ends not shown in the drawings, to make the shears complete.

In practice, as set forth in my application, Patent Number 2,537,164 issued January 9, 1951; faces, which have the center of the shaft 2, for cutting, to the same extent on the apparatus and process for lapping toothed blades, the shaft 18, as it is rocked to swing the arm 18 from side to side with the two blades 4 in close proximity so that the faces 7 and 8 of the teeth on both come into rubbing contact, is also actuated so that this arm slides along the shaft 19 as the wearing away of the strip 21 proceeds. This axial feeding is stopped when the wearing away of the strip 21 is completed; but the swinging movement of the arm can continue a little further so as to polish and make perfectly smooth the narrow strips 21 along the teeth of the two blades which would always come closer to that, as the arm swings, the acute or leading edges of the teeth on the metal strip 4 which it carries, will describe arcs and this motion would form these strips 21 on each of the lateral faces 7 and 8 of the teeth on the two blades in such manner as to make them elements of conical surfaces, which have the center of the shaft 19 as a common axis. The strips 21 would therefore assume such shape, even if the faces 7 and 8 of the teeth were not previously cut so as to be small elements of concentric conical surfaces. By slowly durant operation in connection with the operation of the apparatus shown in Figures 1, 2 and 3; and by making the faces 7 and 8 conical in the first place before the lapping is done, the lapping is rendered much easier and more effective and can be completed in a much shorter time.

This mode of operation is very advantageous and saves time in practice. A complete lapping operation for a pair of blades can be carried out in not over thirty minutes.

In the old method of making toothed blades for shears of this type where the cutters as they form the teeth, revolve about an axis parallel to the blades 4, the faces 7 and 8 of the teeth were not conical but were plain or flat, and they then had to be put through a preliminary shearing operation to form the narrow strips such as 21. This mode of operation required to have the fewest few minutes of rubbing against one another adjacent the more acute or advanced edges thereof. These strips made by shearing were made conical, with respect to an axis transverse to the wide flat sides of the blade, and at the right distance from one end, as described. This shearing operation required at least two or three hours and a half, and even after lapping, the hard shears containing the toothed blades were hard to cut with and the teeth tended to rub, bind or grind against the cloth when severing it.

The lateral faces of the teeth were inclined to the wide flat sides of the blades because the teeth on one blade always have to clear and pass those on the other. If the lateral faces of the teeth between the pointed outer ends 3 and the inner ends or roots of the teeth were not inclined but perpendicular to the opposite, parallel flat sides of the blades, the teeth with the blades close enough together to cut with their advance edges, would then bind along the opposite or trailing edges; and the proper action of the shears could not be obtained at all. The outward inclination of the lateral faces enables the teeth to clear along the trailing edges; but with the blades set to pass as near as possible, the advance or leading edges of the teeth, which were sharper, would not always cut clearly because the leading edges of the teeth would always come closer at some points than others, especially if said edges
were straight along the sides of the teeth; i.e., if
the faces 7 and 8 are plane or flat.

The shearing of the teeth produce a strip
along the leading edges thereof like that shown
at 4 in Figures 8 and 6 improves the operation of
the shears, if the strips are all elements of conical
surfaces having the common axis above mentioned.
But if the remainder of the lateral faces 7 and 8 are
still flat, some of the teeth are liable to bind, and
are harder to work with, and will often cut imperfectly and roughly.

With the process described herein all of the
previous disadvantages are virtually eliminated,
because the teeth are cut on circular arcs about
the center of the shaft 2 as an axis and are formed
so that each is an element of a separate conical
surface as above stated. The inclination of the
teeth need not be more than 10° and the strip of
surface indicated at 21 does not have to be uni-
form in width; and yet the finished shears will
work more easily and cut perfectly cleanly and
smoothly in practice. The shears can also be
finished and assembled more rapidly.

The effect of processing toothed blades in this
manner is more clearly indicated in Figures 7, 8, 9
and 10. Each toothed blade has a rounded corner 23 which may be taken as the outer end in the cutting or lapping stages and in the finished unit. In Figure 7 the sides or faces of the teeth 7, presented towards the axis of the pivot 23, which corresponds to the position of one wide side of the blade to the other, and smoothly in practice. The
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tages enumerated above can be gained. But it is quite within the realm of possibility that this angle can be diminished; if mechanical apparatus capable of a greater approach to perfect uniformity in operation and result can be designed and built.

During the lapping operation as carried out with the apparatus including the structure shown in Figure 4, the distance between the axis of the shaft 19 and the adjacent ends of the two blades is the same as the distance from the axis of the shaft 2 to the inner ends of the blades in the operation of cutting the teeth, and this distance is also exactly the same as the distance between the inner ends of the blades and the axis of the pivot 23 in the finished shears carrying the blades.

Having described my invention, what I believe to be new is:

1. A shear blade of uniform width and thickness with teeth to sever sheet material along a serrated line, said blade having parallel opposite flat sides, said teeth extending through the blade from one side to the other and having ends lying in the planes of said sides, and lateral faces which are elements of concentric conical surfaces inclined at not more than ten degrees to said sides, the intersection of said faces with one of said sides forming relatively acute edges, and a narrow strip of surface on each of said faces extending along the acute edge thereof, said strip having a width of much less than half the thickness of said blade.

2. A shear blade of uniform width and thickness with teeth to sever sheet material along a serrated line, said blade having parallel opposite flat sides, said teeth extending through the blade from one side to the other and having ends lying in the planes of said sides, and lateral faces which are elements of concentric conical surfaces inclined at not more than ten degrees to said sides, the intersection of said faces with one of said sides forming relatively acute edges, and a narrow strip of surface on each of said faces extending along the acute edge thereof, said strip having a width of much less than half the thickness of said blade, said conical surfaces being alternately concave and convex over the lateral faces of the teeth.

SAVA I. SHERR.

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