April 11, 1944. O. HORRER 2,346,489

METHOD OF MAKING COMB MEMBERS FOR DRY SHAVERS

Filed May 8, 1941

Fig. 1

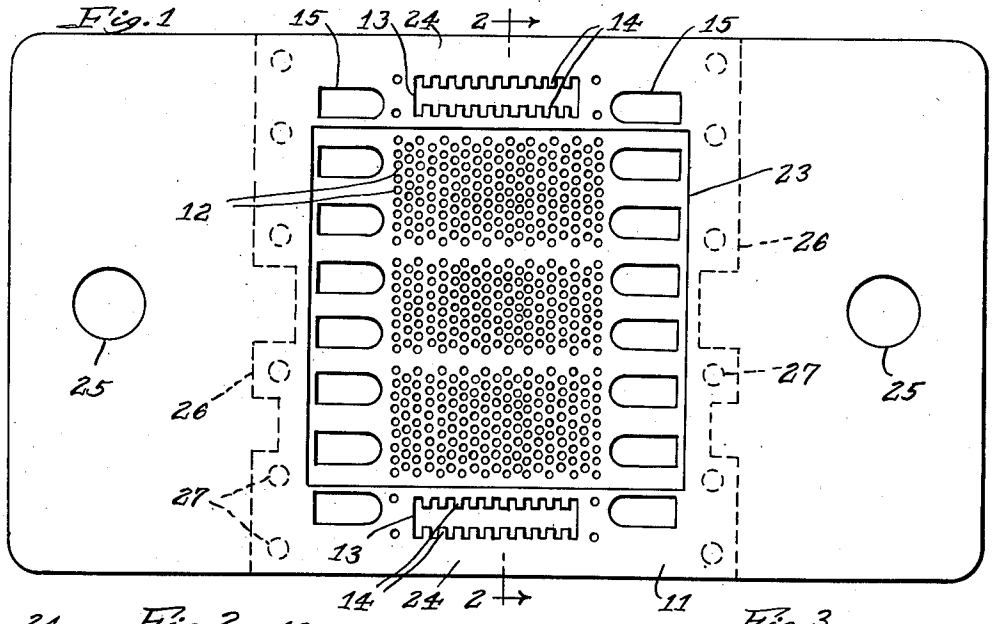


Fig. 2

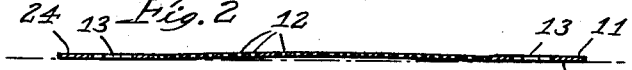


Fig. 3



Fig. 9

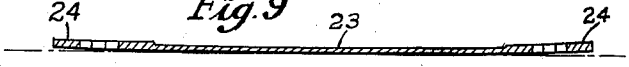
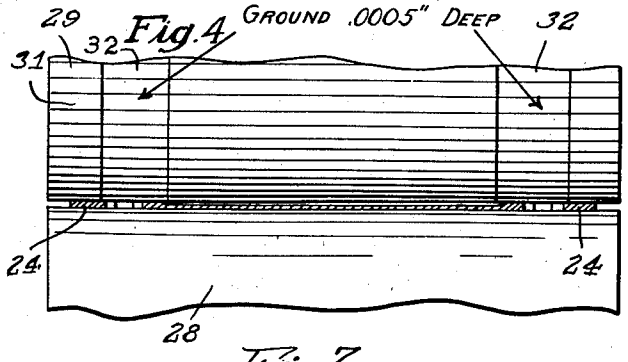


Fig. 5

Fig. 4



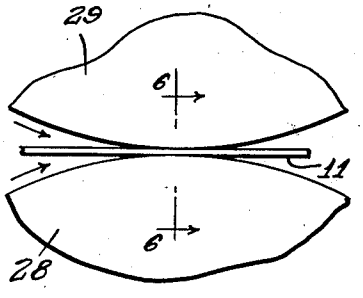


Fig. 7

Fig. 6

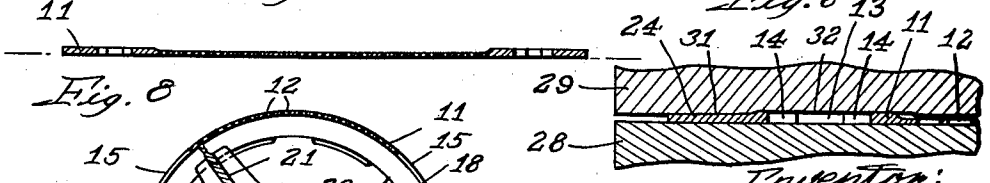
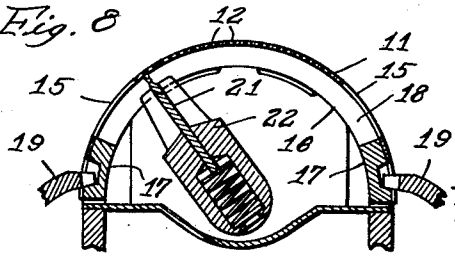


Fig. 8



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Atts.

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UNITED STATES PATENT OFFICE

2,346,489

METHOD OF MAKING COMB MEMBERS FOR DRY SHAVERS

Otto Horrer, Chicago, Ill., assignor to Chicago Flexible Shaft Company, Chicago, Ill., a corporation of Illinois

Application May 8, 1941, Serial No. 392,417

5 Claims. (Cl. 76—104)

This invention relates to the manufacture of a comb member for a dry shaver, particularly the thin perforated plate or comb member of the type shown in Patent No. 2,234,891.

In the commercial manufacture of comb structures of the kind disclosed in said patent certain structural irregularities occurred in the finished comb member, the observance of which was not readily apparent and the presence of which impaired the cutting efficiency. Furthermore, this condition necessitated a grinding operation requiring the removal of a relatively large amount of stock, considering the nature of the operation, which not only added to the cost but tended to make for other variables in shape characteristics of the comb member. This presented a serious problem, particularly in view of the small and somewhat delicate structure of the perforated comb body, the hardness of the metal and the high degree of precision desired in the finished product.

The main object of the present invention is to provide a simple and practicable solution of this problem.

Another object of the invention is to provide an improved method of making a comb member of the character described with a view to reducing the cost of manufacture thereof.

Other objects and attendant advantages will be appreciated by those skilled in this art as the invention becomes better understood by reference to the following description when considered in connection with the accompanying drawing, in which—

Figure 1 is a plan view partly diagrammatic of a comb member at a certain stage of the manufacture in accordance with the present invention, on a scale approximately four times full size;

Fig. 2 is a cross section taken on the section line 2—2 of Fig. 1;

Fig. 3 shows the strip flexed to a curved form, as a diagrammatic illustration;

Fig. 4 shows the step of passing the strip between opposed rollers with the strip in section;

Fig. 5 is a fragmentary view looking at one end of the parts shown in Fig. 4:

Fig. 6 is a fragmentary section illustrating the roller action approximately ten times full size and being diagrammatic insofar as concerns deformation of the comb member between the bite of the rollers;

Fig. 7 is a section through the comb member similar to Fig. 2 after the rolling operation;

Fig. 8 is a cross section through a shaving implement showing an application of the comb member, with the parts approximately four times full size; and

Fig. 9 is a cross-section through a comb member showing diagrammatically the effect after the rolling operation and before flexing the comb, as described hereinatfer.

The comb member to which my invention applies is of the type and manufacture shown in Patents Nos. 2,234,891 and 2,182,067. The comb member here designated generally by 11 constitutes the skin-engaging member of a shaving implement which member is provided with hair-receiving openings and constitutes the stationary cutting member, the cutting edges being at the inner side, that is, the side opposite from the skin-engaging side. This comb member is preferably of thin spring steel in the nature of razor blade steel and in the preferred manufacture the hair-receiving openings are formed by a punching operation, although they may be otherwise formed in keeping with the present invention. The said openings or perforations may be of any suitable or preferred shape and arrangement and in the present embodiment I have shown, for purpose of illustration, a relatively large number of small round openings 12 closely positioned in a given medial area. This embodiment may also include elongated openings 13 shaped to provide opposed rows of teeth 14. The small openings 12 are adapted for close shaving and the teeth 14 for clipping long hairs. The openings 15 are relief openings for egress of the cut hair. This or any other combination of openings may be employed in keeping with the present invention.

The comb member 11 may be applied to a shaving implement in any suitable or preferred manner, the well known application being shown in the above mentioned patents and here illustrated briefly in Fig. 8. This shows the member supported by a rigid skeleton frame structure designated generally by 16 having longitudinal members 17 joined by a plurality of arched ribs 18, to which frame structure the finished comb member is secured, preferably in the manner disclosed in Patents Nos. 2,234,893 and 2,234,929. The comb structure comprising the member 11 and its supporting frame 16 as a unit is detachably held in working position by releasable members 19. A cutter 21 coacts with the inner side of the comb member 11 and is adapted to be rapidly oscillated in a cutting stroke by means of a holder 22 operated in a well known manner by an electric motor or any suitable source of power.

In actual practice the comb member is of

spring steel in sheet form approximately .004'' thick and having a Rockwell hardness of 50. In the particular embodiment shown the first step in the manufacture is to punch the perforations 15 and then grind the surface area defined by the borderline 23 to approximately .002'' thickness. This grinding is done with the strip supported on a suitable fixture, it being immaterial whether the area being ground is supported on a flat or a curved surface. The strip is then punched to form the perforations 12 and 13 above mentioned, thus leaving imperforate marginal areas 24. The openings 25 are incidental for the purpose of attaching the blank to a fixture (not shown) on which the blank is held during the above mentioned grinding operation. According to the prior practice the blank was then flexed, as shown in Fig. 3, approximately to the curvature it was intended to occupy in coaction with the cutter, as shown in Fig. 8, and while in this condition the inner surface of the comb was ground or lapped preferably by a cylindrical rotary abrasive member as covered by Patent No. 2,182,067. Following the grinding operation under the prior practice the end portions of the blank were cut off as indicated at 26 and openings 27 were punched for the reception of rivet heads for attaching the comb member to a supporting frame as disclosed in the above mentioned patents. In order to lap the entire inner surface of the comb member it was necessary, prior to my invention, to grind off a considerable amount of stock, particularly at the heavier end portions, frequently to the extent of removing as much as .0015'', this being a comparatively expensive operation considering the hardness of the stock, the area, and the high degree of precision desired.

My invention provides for a special forming operation prior to the grinding or lapping of the inner side of the blank, whereby the inner surfaces of the several perforated areas of the blank are brought approximately to a straight line along any line longitudinally when the comb member is flexed to the curvature it will occupy in the shaver, and as a consequence thereof the inner side may be ground or lapped quickly and satisfactorily by removal of not more than about .0003'' of material. Furthermore, this method tends to leave the perforated areas free from irregularities, distortions or any bulge effect in the extremely thin portion when the comb member is in the curved, operative condition, thus improving the cutting efficiency. In the preferred practice of my invention this special operation consists in effecting a small degree of uniform elongation of the heavier section of the blank along the ends thereof, the effect of which is to set up such compression stresses in these marginal areas as to cause them to assume a slightly upturned angle with relation to the blank proper when the blank is flat (as shown diagrammatically in Fig. 9), and a relation substantially in a straight line with the intermediate body of the comb member along any line longitudinally thereof when it is in the curved, operative condition (as shown in Fig. 7). This is effected preferably by passing the blank endwise between a pair of steel rollers 28 and 29 constructed and arranged to impose a high compression at the bite, sufficient to effect the slight uniform elongation of the metal contemplated by my invention. As shown in Fig. 4, the lower roller 28 has a truly cylindrical face while the upper roller 29 has a similar face which is ground to provide shallow grooves 32 of not more than .0005'' depth arranged opposite the perforated areas 13 so that the teeth 14 and the narrow imperforate strip at the inner side thereof will be relieved from the full roller pressure. As a result of this operation the reduction in thickness of the blank at the marginal edges is so slight as to be negligible, that is, hardly susceptible of measurement, but a new result is obtained in the form of the blank as a whole, in that because of the slight elongation of the marginal areas the several portions of the comb member are brought into a new shape relation in which the said marginal areas are slightly turned up with respect to the remainder of the blank. This latter effect is merely incidental to the compression stresses set up in the marginal areas as a result of the rolling operation. Thus, when the blank is curved in the opposite direction to the desired curvature the several areas assume a condition of stress wherein the entire under surface of the blank is in substantially a straight line longitudinally of the curved surface at every point, that is, the underside of the extremely thin section is in a straight line with the underside of the heavier marginal sections, as shown in Fig. 7. The rolling operation takes place after the blank has been perforated and before the grinding or lapping and preferably before trimming off the end portions at the lines 26. Figs. 2 and 3 show somewhat exaggerated the bulged or irregular condition of the extremely thin portion of the blank before the rolling operation, the dotted line in Fig. 3 indicating extension of the extremely thin section beyond the thicker end portions. In these views the extent of the bulge is exaggerated for the purpose of illustration. Likewise, in Fig. 6 the depth of the roller relief is exaggerated and the view is intended to be diagrammatic since in actual practice there is no resultant reduction in thickness of the stock so far as is noticeable to the eye or by ordinary measurement. By reason of the roller relief at 32 the narrow marginal portions of the comb member engaged thereby will be subjected to less pressure than the outer marginal portions 24 so that there will not be excessive elongation of the narrow marginal sections. This roller relief is also arranged so as not to impose the heavy pressure on the small teeth 14, thus protecting the small teeth from fracture and breakage.

The results of my invention are particularly beneficial not only because of the saving in time and abrasive material in the grinding operation, but in obtaining a more uniform product in keeping with the high degree of precision desired for the respective parts. For example, by reducing the grinding or lapping to the small degree above noted the thickness of the end portions and consequently of the teeth 14 is kept uniform and the extremely thin area 23 is substantially relieved from objectionable compression stresses when in the curved operative condition. As a result of this method of manufacture more efficient coaction is obtained between the comb 11 and the cutter 22 and the cutting action is improved. My invention may be practiced either with or without perforations such as 13. My invention also contemplates broadly the step of effecting slight elongation of the marginal areas for the purpose described by the use of any equivalent means for this purpose.

While I have shown a particular embodiment of my invention, it will be understood that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such

modifications as fall within the true spirit and scope of my invention.

I claim:

1. The method of making a comb member for a dry shaver, from a strip of thin spring steel, including the step of reducing the thickness of the strip in a given central area by grinding, the step of providing hair-receiving openings in said area by perforating the same, and the step of uniformly elongating the marginal portions only of the strip which are located at opposite edges thereof beyond said reduced perforated area, said elongation being effected throughout the length of said marginal portions and being of sufficient degree to cause the said marginal portions to assume a slightly upturned angle with relation to the strip proper when the strip is flat.

2. The method set forth in claim 1, in which said elongation of said marginal portions is effected by passing the strip between opposed high pressure rollers, one of which has a central area of reduced diameter located opposite the reduced central area of the strip.

3. The method set forth in claim 1, in which said reduction by grinding is effected only at one side of the strip, and in which said elongation of said marginal portions is effected by passing the strip between opposed high pressure rollers, one of which has a cylindrical surface engaging the non-reduced side of the strip and the other has longitudinally spaced cylindrical surfaces engaging said marginal portions and also has a central area of reduced diameter located opposite the reduced area of the strip so as to relieve the reduced perforated area of the strip from direct pressure of the rollers.

4. The method of making a comb for a dry shaver, from a strip of thin spring steel, including the step of reducing the thickness of a central portion of the strip by grinding and leaving marginal portions of heavier section, punching hair-receiving openings in said central portion and a row of teeth in each marginal portion at opposite ends of said central portion, leaving imperforate the marginal edge portion of the strip at the outer side of each row of teeth, and passing the strip between rollers which subject only said marginal edge portions to high roller pressure to effect uniform elongation of said marginal edge portions throughout the length thereof.

5. The method of making a comb for a dry shaver, from a strip of thin spring steel of approximately .004'' thickness, including the step of reducing the thickness of a central portion of the strip by grinding to approximately .002'' and leaving marginal portions of heavier section, punching closely spaced hair-receiving openings in said central portion and a row of teeth in each marginal portion at opposite ends of said central portion, leaving imperforate the marginal edge portion of the strip at the outer side of each row of teeth, and passing the strip between rollers which subject only said marginal edge portions to high roller pressure to effect uniform elongation of said marginal edge portions throughout the length thereof.

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