

[54] **DRY SHAVER**
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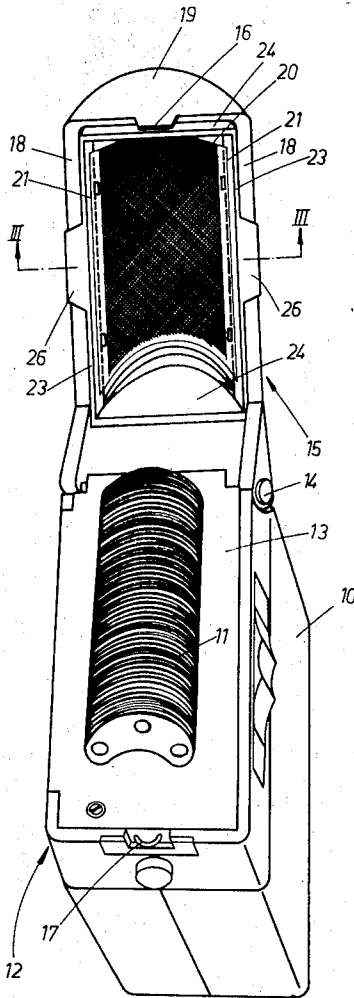
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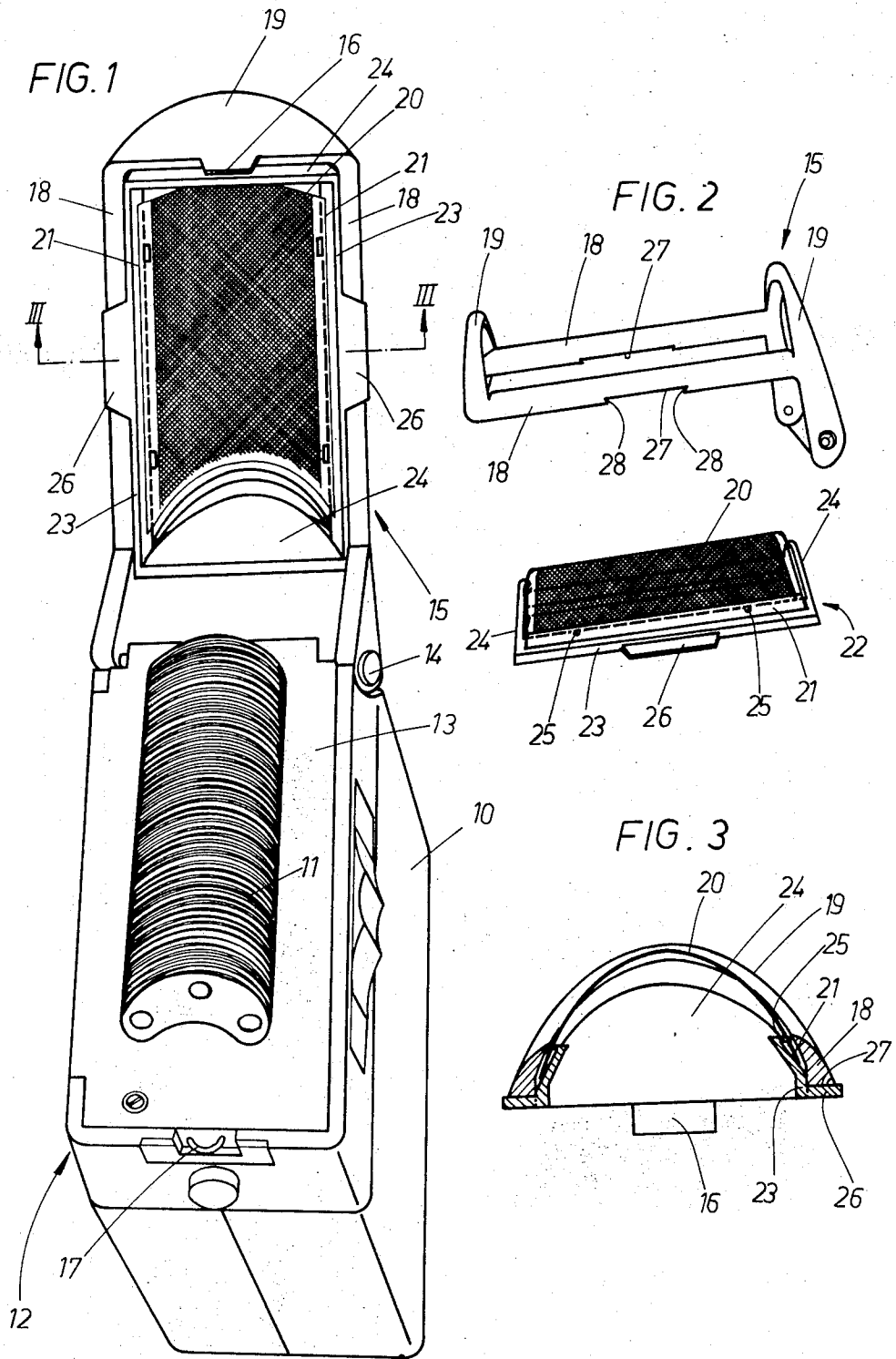
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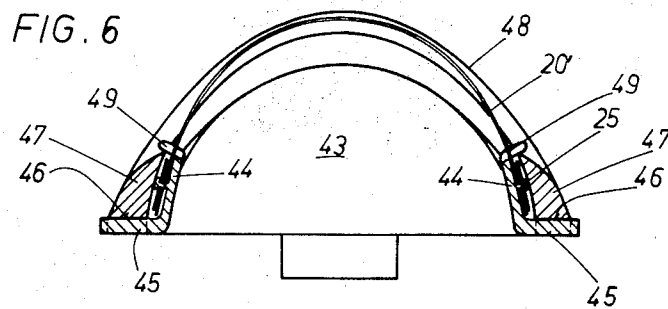
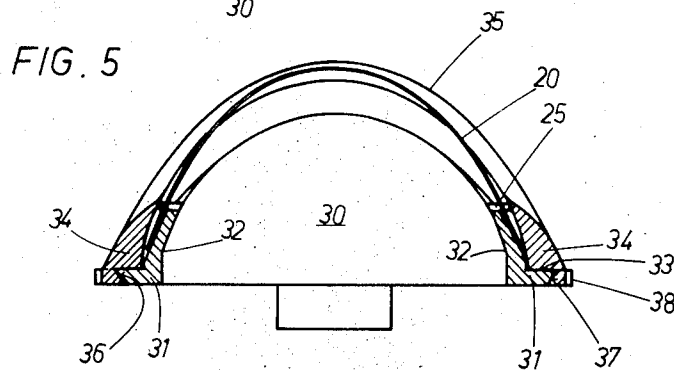
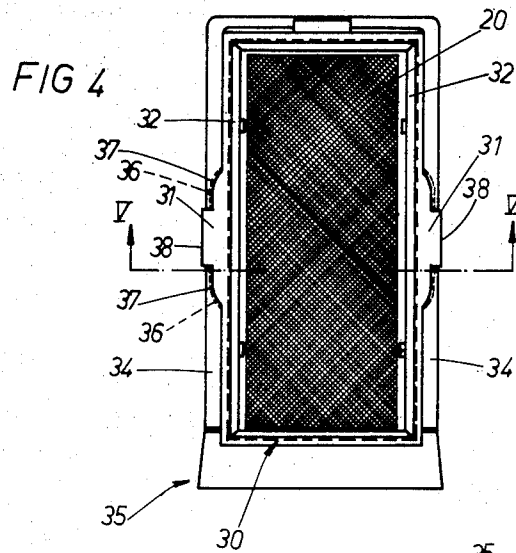
[57] **ABSTRACT**

A shear head is provided on a housing of a dry shaver and a replaceable unit can be releasably connected with the shear head so that it can be replaced in toto. The unit comprises a frame and an apertured shear foil which is mounted in the frame in curved operating condition and can be inserted into and removed from the shear head together with the frame.

16 Claims, 6 Drawing Figures







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DRY SHAVER

BACKGROUND OF THE INVENTION

The present invention relates generally to a dry shaver and more particularly to a dry shaver of the type having a driven cutter unit over which there is mounted an apertured shear foil in curved condition.

Dry shavers of the type in question are already known. Usually they have a shear head which can be completely removed from the housing, or which can be pivoted on a hinge with reference to the housing. In either case the removal of the shear head exposes a cutter element which carries a plurality of cutter blades. This cutter element is moved by the drive of the dry shaver. The shear head itself is provided with an apertured very thin shear foil of metallic material which is curved so as to follow the also-curved contour (usually semi-cylindrical) of the cutter element. When the shear head is in place, the shear foil closely surrounds the cutter element, so that the latter reciprocates or otherwise moves and beard stubble extends through the holes in the shear foil and will be cut off by the reciprocating cutter element.

In the known constructions the shear foil is provided on its longitudinal edges with reinforcements which are provided with connecting means by means of which the shear foil is mounted in the shear head. The shear foil is supplied in planar condition and, when it is to be mounted in the shear head, it must first be curved to its operating condition and then must be so held that its longitudinal edges extend in parallelism with one another whereupon these longitudinal edges are connected with their connecting elements to the shear head. Another approach known from the prior art is to provide the reinforcements along the longitudinal edges of the shear foil of substantially U-shaped configuration and to give them open ends into which transverse brackets are inserted the length of which corresponds approximately to the distance at which the longitudinal edges are to be spaced when the shear foil is moved to curved condition. The brackets are then connected with the shear head.

All of this would be acceptable if a shear foil were required to be supplied only once, namely at the time the dry shaver is purchased. Evidently, during the assembly of the dry shaver a shear foil is installed so that the dry shaver is sold ready for use. The installation of the shear foil at this time is carried out by persons who are skilled in the field and have the necessary technical expertise and manual skill. However, shear foils sometimes wear out and very frequently are damaged, for instance if the dry shaver is dropped or is accidentally hit against something or for other reasons, and in this connection it must be remembered that the shear foils are very thin and thus highly susceptible to such damage. Moreover, a dry shaver can only be supplied with a shear foil the arrangement and size of whose apertures is intended for the comfort of the average skin and the average growth of beard. If the purchaser has a particularly sensitive skin, or for instance if a purchaser has a particularly heavy beard, it is quite often necessary to remove the shear foil and replace it with another one more particularly adapted to the specific circumstance. In fact, many dry shavers are sold with two or three different shear foils which are then installed by the purchaser in dependence upon the partic-

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ular requirements. Other dry shavers are sold with the understanding that such shear foils may be purchased separately.

Under these circumstances, however, problems occur because now the installation of the new shear foil is carried out by the user, that is the person who in most instances will have little if any technical skill and may be to a greater or lesser degree devoid of manipulative ability. On the other hand it is essential that the shear foil be installed in precisely the correct position, because otherwise, the dry shaver will not operate properly and will not afford proper shaving efficiency. In fact in many instances, improper installation of the shear foil may lead to very premature destruction of the same. Evidently, the more difficult the installation of the shear foil, the more chances there will be for the shear foil to be improperly installed with the disadvantages which have just been outlined.

SUMMARY OF THE INVENTION

It is, accordingly, a general object of the invention to overcome the disadvantages of the prior art.

More particularly, it is an object of the invention to provide an improved dry shaver which is not possessed of these disadvantages.

Still more particularly, it is an object of the invention to provide an improved dry shaver in which the installation of a shear foil in precisely the proper position and relationship to the other components of the dry shaver, is assured and can be reliably carried out even by persons without any technical knowledge or skill whatsoever, and without any difficulties of any type.

In keeping with these objects, and with others which will become apparent hereafter, one feature of the invention resides, in a dry shaver, in a combination which comprises a housing, a shear head on the housing, and a replaceable unit comprising a frame and a shear foil mounted in the frame in curved operating position. Connecting means is provided for releasably connecting the unit with the shear head when inserted into the latter.

In other words, the shear foil is supplied not in flat condition as is invariably the case in the prior art, but in curved operating condition so that it need merely be inserted with its associated frame which holds it in the curved position, into the shear head wherein it is then secured. This means that the proper positioning of the shear foil, and in particular its proper curvature, will be assured under all circumstances even if it is carried out by a person having no technical expertise at all and having little or no manipulative ability.

It is advantageous if the frame is provided with elastic longitudinal wall portions or strips with which the longitudinal edges of the shear foil are connected, while the opposite end walls of the same are stiff so that they will not bend and are preferably so configured that they are curved in accordance with the curvature of the shear foil itself. With such a construction the longitudinal strips of the frame together with the longitudinal edges of the shear foil connected to them can be readily deflected towards one another for insertion or removal from the shear head, but will always return to their proper position. This is particularly advantageous when the shear foil is to be installed because once the unit has been inserted into the shear head, it is merely necessary to release pressure on the longitudinal strip of the frame which will then return to their normal posi-

tion with the associated longitudinal edges of the shear foil, permitting engagement of the connecting portions with the shear head and mounting the unit in the latter.

It is advantageous if the connecting means or portions are provided on the longitudinal strip of the frame and on side walls of the shear head which are located opposite these longitudinal strips when the unit is inserted into the shear head. This means that when the pressure on the longitudinal strips is relaxed after the unit has been inserted into the frame, the return of the deflected strips to their normal position will result in automatic insertion of the connecting portions on the strips into appropriate recesses provided for this purpose on the side walls of the shear head. Of course, the provision of projections and recesses could be reversed.

It is advantageous if the projections, especially if they are formed on the longitudinal strips, are made of one piece with the strips and if they taper in outward direction of the shear head, the same also being true of the recesses provided in the latter. This results in a reliable engagement of the projections with the recesses, an engagement free from undesirable play, even if tolerance variations occur which cannot always be precluded in mass-production. Also, the insertion and removal of the projections into or from the recesses is facilitated in this manner.

The connection and disconnection of the unit from the shear head is also simplified if the recesses in the side walls of the shear head are open at the open side of the shear head itself, that is the side of the shear head which faces the housing of the dry shaver. The recesses may be provided with undercuts at the side where they are open in such a manner that the projections of the frame of the unit can snap into the recesses behind these undercuts. According to one advantageous embodiment of the invention the recesses will be conically tapered in transverse direction of the side walls of the shear head, in other words towards the outside of the shear head, and the continuously converging lateral edges bounding the open sides of the recesses are undercut. This provides for a particularly simple construction. Moreover, the longitudinal strips of the frame which are provided with the projections which extend into the recesses, need be deflected under pressure in inward direction only to an extent which corresponds to a portion of the length of the projections, in order to properly insert or remove the projections with respect to the recesses. In certain circumstances it may also be advantageous if the recesses are bounded by concavely curved edges and if the projections are provided with correspondingly concavely curved edges. It is further advantageous if the recesses extend in part to the outer side of the shear head in order to permit access to the projections from such outer side.

In some constructions it may not be possible to form undercut edges at the open sides of the recesses. In this case, the frame may be provided with retaining portions located above the projections at a distance coordinated with the dimensions of the side walls of the shear heads, which retaining portions extend through apertures provided for this purpose in the shear foil to retain the latter in place.

It is advantageous to make the projections longer than the thickness of the shear head side walls, so that the free ends of the projections can be engaged from

the outer side of the shear head and can be inwardly displaced upon such engagement. To the extent possible it is advantageous if the frame with its projections and, if such are provided, with its retaining portions, is of one piece.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view illustrating one embodiment of the invention, with the shear head moved to a position in which it is spaced from the cutter element of the dry shaver;

FIG. 2 is an exploded view showing the shear head and the unit associated therewith, of the embodiment of FIG. 1;

FIG. 3 is a section taken on line III—III of FIG. 1;

FIG. 4 is a bottom view of a shear head and associated unit according to another embodiment of the invention;

FIG. 5 is a section taken on line V—V of FIG. 4; and

FIG. 6 is a view similar to FIG. 5 but illustrating a further embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail, and firstly the embodiment in FIGS. 1-3, it will be seen that a dry shaver has been illustrated (FIG. 1) in somewhat diagrammatic form. Only those components of the dry shaver have been shown which are important for an understanding of the invention. The dry shaver has a housing 10 in which there is provided a drive, for instance an oscillatory armature drive known in the art, which imparts oscillatory movements to a cutter element 11 provided with a plurality of cutter blades which are mounted on a carrier. Such elements 11 are too well known to require detailed discussion.

The element 11 is normally (that is in operative condition of the dry shaver) located in a shear head 12 which, in the embodiment of FIGS. 1-3 utilizes a bottom plate 13 connected with the housing 10 and a shear head frame 15 which is connected with the plate via a pivot axis 14. The shear head is shown in opened or removed condition in FIG. 1, and the frame 15 is pivoted about the axis 14 with reference to the plate 13 as illustrated. In operative condition, however, the frame 15 is in contact with the plate 13 and in this position it is held by an element 17 which extends behind the projection 16, so that the shear head surrounds the element 11 with its end walls 19 and its side walls 18.

A shear foil 20 is so mounted in the shear head frame 15 that in the operative condition it will be curved above and around the element 11 and cooperate with the same in the manner discussed earlier. The longitudinal edges 21 of the shear foil 20 are mounted in a frame 22, that is the shear foil is supplied in this manner in which it is already in curved condition. FIGS. 2 and 3 show that the frame 22 fits into the frame 15 and has side walls or strips 23 and end walls 24 which extend

upwardly beyond the side walls and are curved in conformance with the curvature of the shear foil. The dimension of the frame 22 is so selected that its side walls or longitudinal walls and its end walls will move in contact with the inner surfaces of the side walls 18 and the end walls 19 of the frame 15 when so inserted. The frame 22 is of one piece and may for instance be of synthetic plastic material; its side walls 23 are elastically deflectable in inward direction towards one another, whereas the end walls 24 are rigid or substantially rigid in order to provide necessary stability to the frame.

The shear foil 20 is provided with cut-outs or apertures in its longitudinal edges 21 (not separately designated) in which projections 25 of the walls 23 of the frame 22 are received, so that the shear foil is mounted on the frame 22. The disconnection of the shear foil from the frame 22 is prevented in appropriate manner, for instance by forming rivet-like heads on the projections 25. The curved transverse edges of the shear foil are not connected with the end walls to assure that in operative condition the shear foil can yield when pressure is applied upon it by moving the dry shaver against the skin of a user.

The shear foil 20 with the frame 22 together constitutes a unit which is to be releasably connectable with the shear head frame 15 of the shear head. For this purpose the side walls 23 of the frame 22 are provided with projections 26 which extend laterally from their lower edges and which are receivable in recesses 27 of the side walls 18 of the frame 15. In the embodiment of FIGS. 1-3 the recesses 27 are provided in the lower region of the side walls 18 and are open towards the open side of the frame 15 as well as towards the inner and outer side of the frame 15 (i.e., of the shear head).

Edges 28 bounding the recesses 27 are undercut (see particularly FIG. 2) in such a manner that the projections 26 can be pressed behind these undercuts and will be engaged by the underside thereof. FIG. 1 shows that the projections 26 as well as the recesses 27 conically taper in direction towards the outer side of the shear head to permit an insertion of the projections into the undercut regions of the edges 28 even after the side walls 23 have been deflected inwardly only a small amount. When the deflection is thereupon removed by removing pressure on the side walls 23, the latter will elastically return to their starting position and will press the projections 26 outwardly so that they engage into the undercuts of the edges 28.

Conversely, to release the frame 22 with the shear foil 20 from the frame 15, it is merely necessary to inwardly deflect the side walls 23 until the projections 26 are withdrawn from the recesses 27. The projections 26 are configured longer than the thickness of the side walls 18 so that, as shown in FIGS. 1 and 3, the ends of the projections extend outwardly beyond the outer side of the frame 15 and, when the shear head is moved to the open position of FIG. 1, can be engaged and can be inwardly depressed. The projections 26 extend far enough beyond the outer side of the side walls 18 so that they can be depressed inwardly to the extent necessary to disengage them from the shoulders 28 with a concomitant inward deflection of the side walls 23.

The embodiment of the invention in FIGS. 4 and 5 is somewhat different from that of FIGS. 1-3. Here, the shear foil 20 is connected in the same manner as described above to a frame 30 which replaces the frame 22. The frame 30 is also provided with projections 31

on its side walls, and these projections are receivable in recesses 33 of the side walls 34 of the shear head frame 35 which replaces the frame 15. In this embodiment also the recesses 33 are open to the open side of the frame 35. However, here the configuration is such that in the outer regions there are formed concavely curved shoulders 36 which are opposed by correspondingly convexly curved marginal zones 37 of the projections 31. The shoulders 36 are so undercut that the curved marginal zones 37 can be received in these undercuts. The center regions 38 of the projections 31 are so extended that they extend through outwardly extending portions of the recesses 33 which are open to the outside and that they project outwardly beyond the walls 34. The center regions 38 constitute contact or engaging portions which can be engaged and depressed from the outside and permit inward deflection of the projections 31 under simultaneous inward deflection of the side walls for insertion or removal of the unit with the shear foil without interference by the frame 35. Regions 38 extend sufficiently outwardly so that the curved zone 37 can be pressed out of the undercut of the shoulders 36.

Coming, finally, to the embodiment illustrated in FIG. 6, it will be seen that here the shear foil is designated with reference numeral 20' being connected in the same manner as described before to a frame 43 which replaces the frame 22 in FIGS. 1-3. The frame 43 is provided with projections 45 in its longitudinally extending side walls 44, and the side walls 47 of the shear head frame 48 are provided with recesses 46 which are open to the open side of the frame 48 and are arranged to accommodate the projections 45. The recesses 46 are not provided with undercut shoulders, contrary to the previous embodiments.

In this embodiment, the side walls 44 of the frame 43 are provided at their upper edge with a spacing from the projections 45 which corresponds to the height of the side walls 47, with additional retaining portions 49 which engage the upper side of the side walls 47 of the frame 48 and which thus prevent the frame 43 from undesired or unintentional removal out of the frame 48. The portions 49 are sufficiently long so that when the projections 45 are inwardly depressed, resulting in a similar inward deflection of the side walls 44, the projections 49 will become disengaged from the side walls 47 of the frame 48. This means that a connection or removal of the frame 43 can be carried out by an elastic inward deformation of the side walls 44, together with the projections 45. The shear foil 20' is connected with its longitudinal edges on the outer side of the side walls of the frame 43, and the projections 49 extend through appropriate cut-outs provided for this purpose in the shear foil.

Evidently, other embodiments can be provided, and various changes can be made in the illustrated embodiments without departing from the intent and concept of the invention. The shear head could be configured differently from what has been shown, and it need not be hinged to the housing but can be completely separable therefrom. The basic configuration of the shear foil and for the frame therefor could also be different from what has been illustrated, and the manner in which the shear foil is connected with the frame and the frame with the shear head or shear head frame, could also be different, just as the location of the projections and re-

cesses could be reversed from what has been illustrated and described.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a dry shaver, it is not intended to be limited to the details shown, since various modifications and structural changes can be made without departing in any way from the spirit and concept of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a dryshaver, a combination comprising a housing; a shear head on said housing; a replaceable unit comprising a frame and a shear foil mounted in said frame in curved operating position, said frame having a pair of flexible longitudinal wall portions and a pair of end wall portions connecting said longitudinal wall portions at opposite ends thereof; and connecting means for releasably connecting said unit with said shear head when inserted into the latter, said connecting means comprising cooperating connecting portions provided on said longitudinal wall portions of said frame and on portions of said shear head which are adjacent to said longitudinal wall portions when said unit is inserted in said shear head, said cooperating connecting portions comprising outwardly extending projections on said longitudinal wall portions and recesses for said projections on said shear head wherein said projections and said recesses taper in direction outwardly of said shear head.

2. A combination as defined in claim 1, wherein said end wall portions of said frame are rigid.

3. In a dryshaver, a combination comprising a housing; a shear head on said housing; a replaceable unit comprising a frame and a shear foil mounted in said frame in curved operating position, said frame having a pair of flexible longitudinal wall portions and a pair of end wall portions connecting said longitudinal wall portions at opposite ends thereof; and connecting means for releasably connecting said unit with said shear head when inserted into the latter, said connecting means comprising cooperating connecting portions provided on said longitudinal wall portions of said frame and on portions of said shear head which are adjacent to said longitudinal wall portions when said unit is inserted in said shear head, said cooperating connecting portions comprising outwardly extending projections on said longitudinal wall portions and recesses for said projections on said shear head, said portions of said shear head being side wall portions bounding an open side of said shear head, and said recesses being open at said open side.

4. A combination as defined in claim 3, wherein said end wall portions of said frame are rigid.

5. In a dryshaver, a combination comprising a housing; a shear head on said housing, said shear head having side walls; a replaceable unit comprising a frame and a shear foil mounted in said frame in curved operating position, said frame having a pair of flexible longitudinal wall portions and a pair of end wall portions connecting said longitudinal wall portions at opposite ends thereof; and connecting means for releasably connecting said unit with said shear head when inserted into the latter, said connecting means comprising cooperating connecting portions provided on said longitudinal wall portions of said frame and on portions of said shear head which are adjacent to said longitudinal wall portions when said unit is inserted in said shear head, said cooperating connecting portions comprising outwardly extending projections on said longitudinal wall portions and recesses for said projections on said side walls of said shear head the length of said projections being greater than the thickness of said side walls of said shear head.

6. A combination as defined in claim 5, wherein said end wall portions have lower regions connected with said longitudinal wall portions, and edge faces extending upwardly from said lower regions and curved in accordance with a curvature of said shear foil.

7. A combination as defined in claim 5, wherein said projections and said recesses taper in direction outwardly of said shear head.

8. A combination as defined in claim 5, wherein said projections and said frame are of one piece.

9. A combination as defined in claim 5, wherein said end wall portions of said frame are rigid.

10. A combination as defined in claim 5, wherein said side walls of said shear head have bottom portions facing said housing, and wherein said recesses are provided at said bottom portions of said side walls of said shear head, said side wall portions of said shear head bounding an open side of said shear head, and said recesses being open at said open side.

11. A combination as defined in claim 10; and further comprising undercut shoulders bounding said recesses at said open side.

12. A combination as defined in claim 11, wherein said recesses taper conically in direction outwardly of said shear head, and wherein said shoulders converge continuously in said direction.

13. A combination as defined in claim 11, wherein said shoulders are concavely curved, and wherein said projections have cooperating convexly curved marginal zones.

14. A combination as defined in claim 13, wherein said recesses extend in part to the outer side of said shear head.

15. A combination as defined in claim 10; further comprising retaining portions provided on said longitudinal wall portions upwardly of said projections and extending through apertures in said shear foil into retaining engagement with said shear head.

16. A combination as defined in claim 15, wherein said projections, said retaining portions and said frame are of one piece.

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