

[54] **ROTARY SHAVER WITH INTERLOCKING MEANS TO PREVENT SHEAR PLATE ROTATION**

3,081,541 3/1963 Vaes 30/43.6
3,694,915 6/1970 Beusink 30/43.5 X
3,715,803 2/1973 Tyler 30/43.5

[75] Inventor: **Robert A. Yonkers**, Grandville, Mich.

Primary Examiner—Al Lawrence Smith
Assistant Examiner—Gary L. Smith
Attorney, Agent, or Firm—Andrus, Scales, Starke & Sawall

[73] Assignee: **Bissell Inc.**, Grand Rapids, Mich.

[22] Filed: **Nov. 17, 1972**

[21] Appl. No.: **307,418**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 271,798, July 14, 1972.

[52] U.S. Cl. 30/43.5, 30/346.51

[51] Int. Cl. B26b 19/14, B26b 19/04

[58] Field of Search 30/43.4, 43.5, 43.6, 346.5

References Cited

UNITED STATES PATENTS

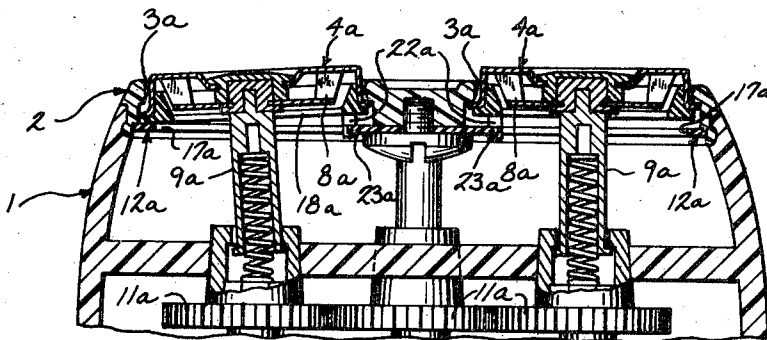
2,900,720 8/1959 Starre 30/43.5

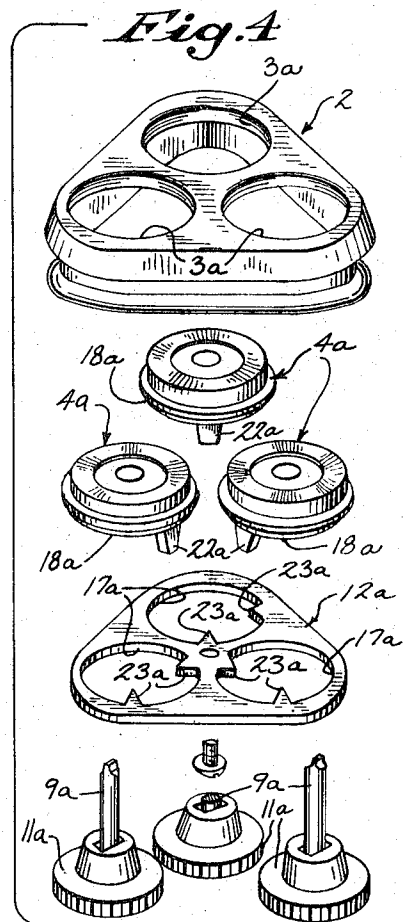
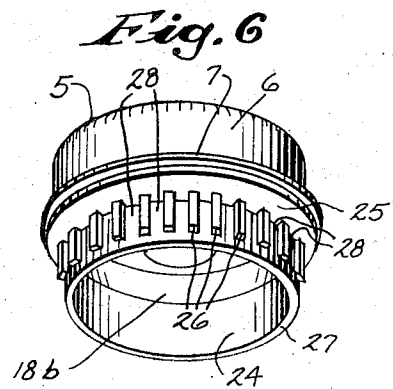
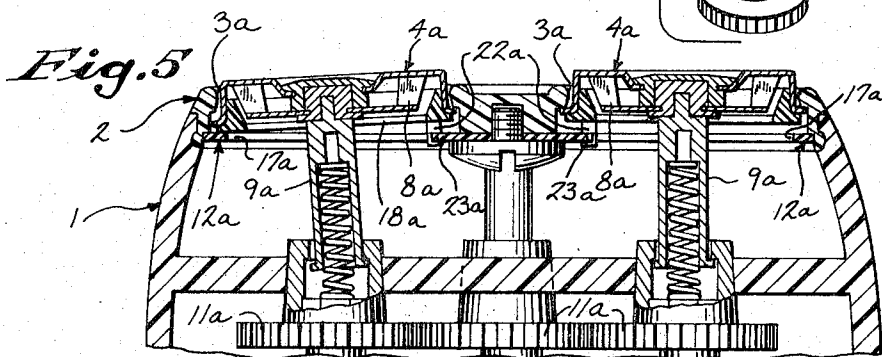
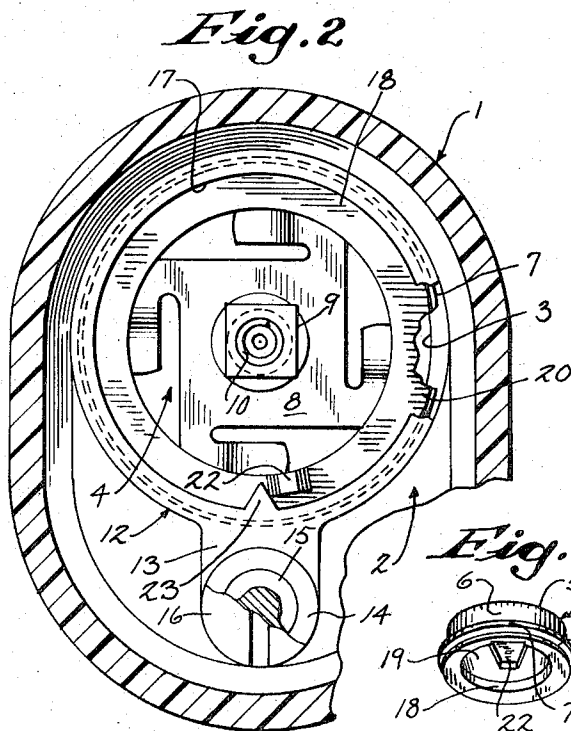
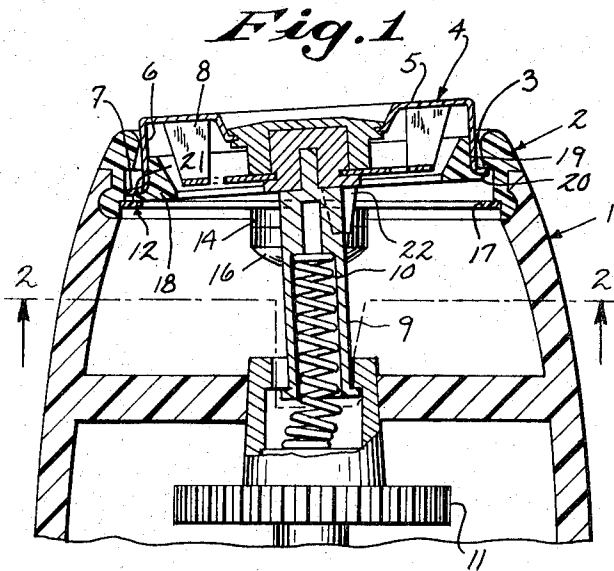
[57]

ABSTRACT

A dry rotary shaver has a floating shear plate disposed within a head opening which provides an outer stop, and a rigid stop member which limits inward shear plate movement. The shear plate is provided with a projection which extends longitudinally into an opening in the stop member. The inner stop member opening is provided with a radially inwardly extending projection which cooperatively engages with the longitudinal projection to hold the shear plate against rotation.

6 Claims, 6 Drawing Figures





ROTARY SHAVER WITH INTERLOCKING MEANS TO PREVENT SHEAR PLATE ROTATION

This application is a continuation-in-part of co-pending U.S. application Ser. No. 271,798, filed Jul. 14, 1972 by the present inventor and Wallace D. Herrick, entitled DRY SHAVER WITH FLOATING PERIPHERALLY SUPPORTED SHEAR PLATE, and assigned to a common assignee.

The application is also a companion to and discloses an improvement over the structure disclosed in co-pending U.S. application Ser. No. 307,517 filed on even date herewith by Wallace D. Herrick entitled ROTARY SHAVER WITH SHEAR PLATE ROTATION PREVENTING MEANS, and assigned to a common assignee.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a rotary dry shaver of floating shear plate design, and wherein a rotary cutting member is disposed beneath the shear plate for removing hairs extending through the plate.

The device of the present invention is a further modification of certain concepts disclosed in the first-identified above-mentioned joint co-pending application. In that application, a support is fixed within the shaver head and acts as a retaining means to hold the shear plate and rotary cutting element in place when the shaver head is removed from the shaver housing. In the embodiments shown therein, the support includes a resilient spring which engages the shear plate periphery, and in several embodiments shown the support includes a stop to limit the inward floating movement of the shear plate. Furthermore, there is disclosed therein the concept of an interlock between the retaining means and the shear plate to prevent rotation of the latter without interfering with its tilting action. In the specific embodiments shown there, the interlock comprises a lug on the spring which cooperatively engages a notch in the shear plate periphery.

In some instances, it has been found desirable to eliminate the spring portion of the retainer-support, while still retaining the interlock between the latter and the floating shear plate, as well as retaining the inner stop.

Broadly in accordance with the invention disclosed in the second above-identified sole co-pending application, the shear plate and a rigid stop member is provided with non-yieldable projection means and recess means which cooperatively interlock to hold the floating shear plate against rotary movement. More specifically, and in the embodiments shown therein, the stop member is provided with one or more longitudinally outwardly extending rigid posts of fixed length which are received within complimentary notches in the wall of the shear plate. The posts are long enough to be disposed within the shear plate notches throughout the full range of floating positions of the shear plate.

The present invention is directed to a further modification of the concept of interlocking the floating shear plate and the fixed inner stop-retainer member. In accordance with the invention, the fixed inner stop is provided with an opening which has at least one projection extending radially inwardly from the edge thereof. In one embodiment, a tooth-like projection extends longitudinally from the shear plate into the stop member

opening and engages the radial projection to limit shear plate rotation. In a second embodiment, a plurality of circumferentially spaced longitudinal projections extend from the shear plate for engagement with the radial projection, with the longitudinal projections being supported by a skirt. In both instances, the shear plate and inner stop may be assembled without concern for rotational orientation therebetween.

DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates the best modes presently contemplated by the inventor for carrying out the invention.

In the drawing:

FIG. 1 is a vertical section of a portion of a single head dry rotary shaver constructed in accordance with the invention;

FIG. 2 is a transverse section taken on line 2-2 of FIG. 1;

FIG. 3 is a perspective view of the shear plate assembly;

FIG. 4 is an exploded perspective view of a three head shaver incorporating the invention;

FIG. 5 is a view similar to FIG. 1 of the three head shaver; and

FIG. 6 is a perspective view of another embodiment of shear plate assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The concepts of the invention may be utilized in a dry shaver having a single shear plate or any desirable number thereof.

FIGS. 1 and 2 illustrate one form of the invention as applied to a shaver with one shear plate. As shown therein, the shaver includes a housing 1 having a removable head 2 which is provided with a suitable circular opening 3 therein. Opening 3 is adapted to receive a floating annular relatively rigid thin-walled shear plate 4 having an outer shaving face 5 which merges into a cylindrical wall 6, which in turn terminates at its inner edge in a peripheral flange 7 of a larger diameter than the opening. Shear plate 4 is tiltably installed in opening 3 so that wall 6 loosely fits in the opening and so that flange 7 is disposed axially inwardly of the opening whereby the edge portion of the latter acts as an abutment or outer stop.

A rotary cutting member 8 is mounted on the end of a floating tiltable drive shaft 9 of any suitable well-known type and is biased into central supporting engagement with shear plate 4, as by a spring 10. Spring 10 biases both cutter 8 and shear plate 4 outwardly to a position where flange 7 engages the edge of head 2 around opening 3, which is the normal non-operating position of the parts. The inner end of shaft 9 is rotationally connected to drive gearing 11 which in turn is connected to the usual shaver motor, not shown.

In accordance with the invention, shear plate 4 cooperates with rigid inner stop means, without the need for a peripheral spring support for the shear plate, and in a manner so that the inner stop means limits or prevents shear plate rotation. For this purpose, a unitary relatively rigid flat stop member 12 is incorporated within the head. As shown, stop member 12 is preferably made from metal plate stock and is connected by a web 13 to a securement portion 14 which is mounted on a hub-like member 15 within head 2. A screw 16

threadably extends into hub 15, the head of which fixedly holds securement portion 14 and stop member 12 in place. Stop member 12 may be of any suitable construction, and in the embodiment shown comprises a transverse generally planular portion having a circular opening 17 therein which is aligned with head opening 3.

Stop member 12 has the additional function of retaining shear plate 4 and cutting member 8 in assembly within the head, even when the head is removed from housing 1.

The invention contemplates the utilization of cooperative projection means which interengage to hold the floating shear plate against rotation during shaver operation. For this purpose, and referring to the embodiment of FIGS. 1-3, a relatively rigid anti-turn ring 18 is fixedly disposed within the inner open end of shear plate 4. Ring 18 may be formed of molded plastic and includes a longitudinally extending cylindrical outer wall 19 having a radially outwardly extending annular flange 20 at its inner end and which forms a shoulder 21 with flange 7. In assembling ring 18 to shear plate 4, ring wall 19 is telescopingly press fit into shear plate wall 6 until shoulder 21 and shear plate flange 7 are abutting.

For purposes of the interlock, a tooth-like projection 22 extends longitudinally inwardly from shoulder 21 into stop member opening 17. Furthermore, a generally pointed radial projection 23 extends inwardly from the edge of stop opening 17. In assembling the head, projections 22 and 23 may be oriented so that they are not initially in engagement. However, when the shaver is actuated, the rotary forces will cause shear plate 4 to turn until projection 22 engages projection 23, to thereby lock the shear plate against further rotation.

While in the present embodiment, shear plate 4 and ring 18 form a two-piece assembly, it is within the contemplated scope of the invention that the structure be of unitary one-piece construction. In either event, the wall of the effective shear plate is formed to interlock within the inner stop opening by means of cooperative projection means.

When at least a portion of shear plate 4 engages inner stop member 12, the engagement is shown as being by flange 20. Shoulder 21 acts as an inner reinforcement which supportingly protects shear plate wall 6 and flange 7 against damage if shear plate 4 is subjected to extreme axial or radial forces, as when the shaver is dropped.

The longitudinally elongated shape of projection 22 permits floating action of shear plate 4 while assuring the interlock at all positions of the plate.

The various projections may be of any desired dimension without departing from the spirit of the invention.

FIGS. 4 and 5 illustrate an embodiment of the invention somewhat similar to the previously described embodiment, except that the shaver is adapted to have a multiplicity of floating shear plates, namely three. As shown, these three shear plates 4a are mounted in openings 3a, and each have a cutting member 8a mounted on suitably driven individual floating drive shafts 9a which are connected to suitable gearing 11a. In this embodiment, stop member 12a is provided with three openings 17a, each of which has a pair of radially inwardly extending projections 23a. An anti-turn ring 18a is assembled to each shear plate 4a, with tooth-like

projections 22a. In FIG. 5, one shear plate is shown in normal position, while another plate is shown in tilted position for illustrative purposes.

FIG. 6 illustrates a modification of shear plate 4 wherein the anti-turn ring 18b includes a longitudinally extending cylindrical outer wall 24 having a radially outwardly extending flange 25, which is similar to flange 20. In this case, a plurality of circumferentially and relatively closely spaced elongated projections 26 extend longitudinally inwardly from flange 25. For strengthening purposes, an annular skirt 27 extends from flange 25, is integral with and supports projections 26.

In the assembled head, radial projections 23 or 23a may be disposed in any one of the recesses 28 formed between projections 26 so that shear plate 4 is lockingly held against rotation. By utilizing a large plurality of closely and equally spaced projections 26, assembly of the entire unit is simplified because projections 23, 23a will automatically enter any one of the recesses 28 at any of a substantial number of circumferential shear plate positions, without the need for special orientation other than a possible very slight rotation of the shear plate.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A dry shaver comprising:

a. a shaver housing including a shaving head having at least one circular opening therein,

b. a shear plate which effectively comprises:

1. a thin-walled first member having an outer shaving face which merges into a cylindrical wall which loosely fits within said head opening for tilting relative thereto, and with said first member having a peripheral flange disposed beneath said head opening,

2. and a second member telescopingly assembled within said cylindrical wall,

c. a floating rotary cutting member disposed within said shear plate and tiltably supporting the latter,

d. a rigid fixed inner shear plate stop member having an opening with at least one radially extending projection, with said stop member opening being in alignment with said head,

e. and projection means extending longitudinally from said second member into said stop member opening and adapted to engage said radial projection to limit shear plate rotation during rotation of said cutting member.

2. The shaver of claim 1 in which:

a. said second member includes a radially outwardly extending flange,

b. and said projection means extends longitudinally inwardly from adjacent said radial flange.

3. The shaver of claim 2 in which said projection means comprises a plurality of closely spaced circumferentially disposed projection members forming recesses therebetween for receiving said radial projection.

4. In the shaver of claim 3: an annular skirt extending longitudinally from said radial flange and disposed inwardly of said projection members to support the latter.

5

6

5. The shaver of claim 8 which includes means on said second member for supporting the said peripheral flange of said first member against damage.

6. The shaver of claim 5 in which said supporting

means comprises a radially outwardly extending annular flange on said second member and forming a supporting shoulder therewith.

* * * * *

5

10

15

20

25

30

35

40

45

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,844,033 Dated October 29, 1974

Inventor(s) Robert A. Yonkers

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 49, after "member" delete "is" and substitute therefor ---are---

Column 5, line 1, delete the numeral "8" and substitute therefor ---1---

Signed and sealed this 14th day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents