MOVABLE CLIPPER BLADE AND DRIVE TRANSMISSION FOR SAME

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This invention relates to a movable clipper blade and drive transmission for same which constitute a significant improvement over the blade and transmission shown in Leo J. Wahl Patent No. 2,564,920.

The present drive transmission and that of the aforesaid patent are shown embodied in an electric hair clipper which is powered by a vibratory type motor. The movable blade of the hair clipper bears on a fixed or comb blade, and is driven back and forth across the fixed blade by means of a drive transmission which connects the movable blade to the armature element of the motor. The transmission includes a finger element which is seated in a recess provided in the movable blade. The bearing plane between the two blades lies at an angle of about 30 degrees to the vibratory plane of the armature, a condition which imposes special operating requirements on the transmission structure.

In order for the two blades to cut properly, a certain minimum amount of pressure must be provided between them. This pressure often is referred to as blade bias or tension. The minimum pressure required for proper cutting may be referred to as optimum cutting bias. Pressures in excess of optimum cutting bias are objectionable in that they introduce friction problems of heat, wear, lubrication, etc., and contribute to a general decrease in clipper efficiency, both electrical and mechanical.

The construction of the drive transmission shown in the aforesaid patent of Leo J. Wahl is such that the transmission finger element tends to seat itself from the movable clipper blade when the latter encounters substantial resistance in performing its cutting function, particularly when it is attempted to employ optimum cutting bias. Therefore, the patented construction the unseating tendency is materially reduced by substantially increasing the bias between the blades. This expedience, however, introduces the aforesaid friction problems of heat, wear, lubrication, etc., and, accordingly, the net result is little, if any, improvement.

One object of this invention, therefore, is to provide a finger-driven clipper blade and associated finger of such construction that the pressure or bias applied to the blade by the finger does not exceed appreciably, if at all, the minimum or optimum amount required to establish a proper cutting relationship between the two blades. The present construction, as will be seen, eliminates the need for bias or pressure beyond the optimum amount inasmuch as the drive finger, even under heavy loads, does not have a tendency to become unseated. Thus, the invention provides a construction wherein the clipper blade is entirely free of excessive friction and its attendant problems (heat, wear, lubrication, etc.) in brief, a construction which operates at maximum mechanical and electrical efficiency up to the point of stalling.

Another object of the invention is to provide a drive transmission construction which is subject to simplified and economical manufacture, that is, a construction which does not require close manufacturing tolerances.

In brief, the invention contemplates the provision of certain critical bearing surfaces between the movable blade and the drive finger, these bearing surfaces being oriented and spaced apart in such manner that the aforesaid objects of the invention are achieved.

Other objects, advantages and details of the invention will be apparent as the description proceeds, reference being had to the accompanying drawing wherein one form of the invention is shown. It is to be understood that the description and drawing are illustrative only and that the scope of the invention is to be measured by the appended claims.

In the drawing:

Fig. 1 is a longitudinal sectional view of a portion of an electric hair clipper embodying the drive transmission of the invention;

Fig. 2 is a plan view of one form of transmission element employed in the invention;

Fig. 3 is an elevational view of the transmission element shown in Fig. 2;

Fig. 4 is a fragmentary view of the transmission element taken on line 4—4 of Fig. 3;

Fig. 5 is a fragmentary elevational view taken on line 5—5 of Fig. 4;

Fig. 6 is a top plan view of a movable clipper blade showing a recess and bearing surfaces designed to receive the drive finger of the transmission element shown in Figs. 2—7;

Fig. 7 is a sectional view on line 7—7 of Fig. 6, and

Fig. 8 is a fragmentary sectional view on line 8—8 of Fig. 6.

Referring now to the drawing, an electric clipper 10 embodying the invention is shown in part in Fig. 1. A clipper housing 11 carries a fixed or comb blade 12, the blade being shown secured to housing 11 by screw means 13, although it is understood that in some instances blade 12 is related to housing 11 by means which permits longitudinal adjustment of blade 12 so that length of cut may be varied.

Blade 12 is disposed at an angle, approximately 30 degrees, to the axis of the clipper. The upper surface of blade 12 is ground flat to provide suitable bearing for the cooperating movable blade, and forward blade end 14 is provided with cutting teeth.

A vibratory motor 15, disposed within housing 11, includes an electromagnet 16 and a vibrating armature 17. Forward end 18 of the armature terminates in proximity with fixed blade 12. A movable clipper blade 20 having a ground undersurface bears on the upper surface of fixed blade 12. A transmission element 21 interconnects forward end 18 of armature 17 with movable blade 20, the element 21 having a specially shaped finger which is received within a specially shaped recess in the upper surface of movable blade 20.

Transmission element 21 is shown in detail in Figs. 2—5. As here shown and in Fig. 6, flat spring member 22 has one leg 23 secured to armature 17 by suitable means such as rivets 24 (Fig. 1) which hold the armature laminations together. Apertures 25 are provided in leg 23 to receive the securing means. Other leg 26 of the spring member carries a finger member 30 which engages movable blade 20.

Finger member 30 may be made of any suitable material, metal or plastic, but in preferred form it is a plastic material such as nylon. The advantages of nylon material for a transmission of this character are set forth in the aforesaid prior patent.

Finger member 30 is suitably secured to leg 26 of spring member 22 as by screws 31. The forward end 32 of finger member 30 is laterally elongated and downwardly extended as best shown in Figs. 2 and 3. The down-
wardly extending axis of the end 32 makes an angle of approximately 60 degrees with the plane of spring member 22, and end plane 33 of finger member 30 is normal to this axis.

Fig. 4 is a bottom view of the forward end of finger member 30, end plane 33 of the member being in the plane of the drawing as indicated by line 4—4 in Fig. 3. The bottom corners of finger member 30 are beveled to prevent bearing surfaces. These surfaces are designated 35, 36, 37 and 38 in Fig. 4, and similarly, where appropriate, in Figs. 2, 3 and 5.

As shown in Fig. 4, each of the corner surfaces 35—38 is inclined at an angle of substantially 30 degrees to the transverse axis 39 of finger end 32. Each corner surface also is inclined at an angle of substantially 20 degrees to the longitudinal axis of the finger end as shown in Fig. 5. Thus, each bearing surface, for example, surface 35, is inclined at substantially 30 degrees to the transverse axis of the finger end and also inclined at an angle of substantially 20 degrees to the longitudinal axis of the finger end. The 20 degree inclination is the critical one from the standpoint of the driving relationship between the finger member and its associated blade.

The aforesaid finger member 30 of the drive transmission engages and cooperates with movable clipper blade 20 which is illustrated in Figs. 6—8 and which now will be described.

Movable blade 20 is generally rectangular in shape and it has a row of cutting teeth 40 along one of its sides.

The upper surface of blade 20 has an elongated, generally central recess 43. This recess is shaped to conform to the shape of finger end 32. Thus, the upper surface corners of recess 43 are shaped, respectively, to provide bearing surfaces 45, 46, 47 and 48. These surfaces, respectively, receive the surfaces 35—38 of finger end 32 and establish a wedging relationship between the finger member and the blade.

As shown in Figs. 6 and 8, each bearing surface in recess 43 has an inclination of substantially 30 degrees to the longitudinal axis of the recess (Fig. 6) and an inclination of substantially 20 degrees to a plane normal to the blade (Fig. 8).

One important structural feature of the invention is that one adjacent pair of the bearing surfaces, for example surfaces 45 and 46, is spaced from the other adjacent pair, namely, surfaces 47 and 48, by an effective distance which is approximately half the thickness of blade 20 measured along the row of teeth 40. Thus, the dimension C shown in Fig. 6 must be approximately one-half the aforesaid blade width.

Another important structural feature of the invention is that dimension C must be approximately twice the length of dimension A, the latter being the distance from the forward teeth ends to the longitudinal axis of recess 43. Since dimension B (Fig. 6) is one-half dimension C, it will be seen that dimension A is approximately equal to dimension B.

In operation, blade 20 reciprocates back and forth in response to movement of finger member 30 which is carried and driven by vibrating armature 17. As previously mentioned, finger member 30 aided by spring member 22 exerts a bias or pressure on blade 20, this bias or pressure being of optimum cutting value.

Assuming blade 20 is moving to the left as viewed in Fig. 6, teeth 40 and consequently the blade encounter a resistance indicated by R. This resistance R is applied to blade 20 on an arm indicated by dimension A. The resultant moment which is represented by the product R times A reacts on finger member 30 as a torque which under certain circumstances tends to unseat the finger member. This torque (R times A) or twisting leverage is resisted by a moment represented by the product of a force F applied by the finger member and the arm indicated by the dimension B.

When the product of F and B exceeds or equals the product of R and A, finger member 30 retains its proper seated relationship with recess 43, i.e. no unseating occurs. This is true under conditions of optimum bias.

Thus, the unseating tendency is substantially eliminated when the dimension B is greater than or at least not smaller than the dimension A, and this relationship is one of the main features of the invention. When the dimension B is less than dimension A it is necessary to increase the cutting bias and thus increase the value of F in order to resist the tendency toward unseating and this expedient, as previously mentioned, is objectionable because it results in excess friction between blades.

Another main feature of this invention which cooperates with the dimensioning described above is the previously mentioned shape of the bearing surfaces 35—38 and 45—48. The described shape or inclinations of these bearing surfaces are such that close manufacturing tolerances are not required. Thus, relatively inexpensive manufacturing processes may be followed in shaping the surfaces 35—38 on the finger and the surfaces 45—48 on blade 20. Minor deviation from the desired shapes in manufacture do not result in failure of bearing engagement as would be the case, for example, if an inclination of substantially less than 20 degrees were used in place of the substantially 20 degrees specified.

To summarize, it has been found that the substantially 20 degree angle is as steep as practical for efficient, substantially 30 degree recess extending with its upper surface thereof, the extremities of said recess each having a pair of double-inclined bearing surfaces, each bearing surface inclined at an angle of about 30 degrees with the longitudinal axis of the recess and at an angle of about 20 degrees with a plane normal to the blade, the said pairs of bearing surfaces spaced from each other by approximately twice the distance from said teeth to the longitudinal axis of said recess, said spacing corresponding approximately to one-half the width of the blade, a drive finger having bearing surfaces disposed and shaped to be seated on the bearing surfaces of said recess, and vibrating means secured to said drive finger and biasing same against said blade with optimum cutting pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

431,965 Cook et al. July 8, 1980
1,708,315 Lutes Apr. 9, 1929
2,306,039 Chromonic Dec. 22, 1942
2,640,261 Wahl June 2, 1953