

Candidate's Answer Paper

Claims:-

1. A dry shaver comprising a cutter (23) arranged for reciprocating movement, a rotary motor (2), and drive means (9, 11) arranged to convert rotary movement of the rotary motor (2) into reciprocating movement of the cutter (23), characterised in that the drive means (9, 11) comprises a cam (9) having at least one lobe (27), the cam (9) being carried on the rotary motor (2) and at least one cam follower (11) arranged to contact the surface (10) of the cam (9) such that rotation of the cam (9) causes reciprocating movement of the cam follower (11) which is transmitted to the cutter (23).
2. A dry shaver as claimed in claim 1 characterised in that the cam (9) has a plurality of lobes (27)
3. A dry shaver as claimed in claim 2 characterised in that the cam (9) has two lobes (27)
4. A dry shaver as claimed in claim 2 characterised in that the cam (9) has three lobes (61)
5. A dry shaver as claimed in claim 2 characterised in that the cam (9) has four lobes (71)
6. A dry shaver as claimed in any of claims 1 to 5 characterised in that the cam follower (11) is pivotally mounted about a pivot (16), the cam follower (11) comprises a first arm (14), a second arm (15) rigidly connected to the first arm (14) and a wheel (12) rotatably mounted on the first arm (14), the wheel (12) is arranged in contact with the surface (10) of the cam (9).
7. A dry shaver as claimed in claim 6 characterised in that biasing means (17) are arranged to exert a force on the cam follower (11) to maintain the wheel (12) in contact with the surface (10) of the cam (9).
8. A dry shaver as claimed in claim 7 characterised in that the biasing means (17) has means (18) to adjust the force exerted on the cam follower (11).
9. A dry shaver as claimed in claim 7 or claim 8 characterised in that the biasing means (17) comprises a compression spring.
10. A dry shaver as claimed in any of claims 1 to 5 characterised in that the cam follower (41) is pivotally mounted about a pivot (16), the cam follower (41) comprises a first arm (42), a second arm (43) and a third arm (44) rigidly connected to each other, a first wheel (45) rotatably mounted on the first arm (42) and a second wheel (46) rotatably mounted on the third arm (44), the wheels (45, 46) are arranged in contact with the surface (10) of the cam (9).
11. A dry shaver as claimed in claim 10 characterised in that at least one of the first and third arms (42, 44) is elastic.
12. A dry shaver as claimed in claim 10 or claim 11 characterised in that at least one of the bearings of the first and second wheels (45, 46) is elastically mounted on the respective arm (42, 44).
13. A dry shaver as claimed in any of claims 6 to 12 characterised in that each wheel (12) has an elastic ring (26) in contact with the surface (10) of the cam (9).

14. A dry shaver as claimed in any of claims 1 to 13 characterised in that the motor (2) is phase synchronous motor.

Introduction

Title A dry shaver

Field of the Invention The present invention relates to dry shavers, particularly those having a cutter arranged for reciprocating movement and driven by a rotary single phase synchronous motor.

The cutter has a plurality of cutter blades which reciprocate immediately behind a shear foil having openings therethrough, through which hairs to be shaved off extend so as to be cut by the cutter blades.

Background of the Invention

Single phase synchronous motors are widely used in such domestic appliances owing to their low cost and practically frictionless operation, owing to the absence of brushes in contact with the rotor of the motor. These motors rotate at a constant speed which corresponds to the ac mains frequency. In order to achieve a satisfactory cutting action with the above defined dry shaver, it is necessary that the reciprocating cutter has a sufficiently high speed of movement with respect to the openings in the shear foil. In view of the size of the appliance, a high movement speed of the reciprocating cutter can only be obtained by means of high frequency movement of the cutter. The speed of rotation of single phase synchronous motors is too low to achieve the necessary cutting action with high frequency movement of the cutter when the rotation of the motor is directly converted into a reciprocating movement by means of a simple crank. Higher speed motors are too bulky and expensive for use in such appliances and it is therefore necessary to ensure that the frequency of movement of the cutter is higher than the frequency of rotation of the single phase synchronous motor.

Prior Art

One known dry shaver described in Document I comprises a cutter arranged for reciprocating movement, a rotary synchronous motor and drive means arranged to convert rotary movement of the rotary motor into reciprocating movement of the cutter. The drive means comprises a first gear wheel carried by the rotary motor and a second gear wheel which meshes with the first gear wheel. The second gear wheel is rotatably mounted on the housing of the dry shaver. A first lever is pivotally connected to the second gear wheel by means of a pin eccentrically mounted on the second gear wheel. A second lever is connected to the first lever by means of a hinge and is pivotally mounted to the housing by means of a bearing. The free end of the second lever is connected to the cutter.

By selecting the gear ratio between the first and second gear wheels, the speed of rotation of the second gear wheel, and hence the rate of reciprocation of the cutter can be varied.

Problem

However, the dry shaver described in Document I is considered to be somewhat noisy, which can be irritating to both the user and members of his family when shaving in the early morning. This noise originates from the meshing gear wheels (numbered 7 and 9 on the enclosed drawings) which are

required to achieve the necessary speed of movement of the cutter.

Accordingly the present invention seeks to provide a dry shaver having a cutter arranged for reciprocating movement and driven by a rotary motor which at least reduces the above problems.

Accordingly the present invention provides a dry shaver as claimed in claim 1.

The advantage of this dry shaver is that drive is transmitted to the cutter from the rotary motor without the use of gear wheels and hence the dry shaver is quieter and less irritating to the user and members of his family.

In order to increase the frequency of oscillation of the cutter to an acceptable level for 50Hz and 60Hz AC supplies the cam has a plurality of lobes. By selecting cams with various numbers of lobes the frequency of oscillation of the cutter is selected, for example two lobes causes the cutter to oscillate at twice the frequency of rotation of the motor. Three lobes causes the cutter to oscillate at three times the frequency of rotation of the motor. Similarly for four lobes. Thus selection of frequency of oscillation of the cutter is by selection of a cam with an appropriate number of lobes. The lobes are generally equally spaced on the cam, to give elliptical, triangular and square cams.

A cam follower as described in claim 6 is a preferred arrangement. However, it is preferred that a biasing means described in claim 7 is used to maintain contact between the wheel and the cam surface. It is preferred that the biasing means is adjustable to allow adjustment in the factory for different frequencies of AC mains supply.

A cam follower as described in claim 10 is another preferred arrangement because it is not necessary to have biasing means to bias the wheels into contact with the cam surface.

It is preferred that the wheels have elastic rings to contact the cam surface to further reduce noise and to minimise wear of the cam and cam follower.

It is also possible to provide one of the first and third arms in an elastic material or provide the bearings for one or both of the wheels with an elastic mounting on the respective arm.

It is preferred that the rotary motor is a single phase synchronous motor

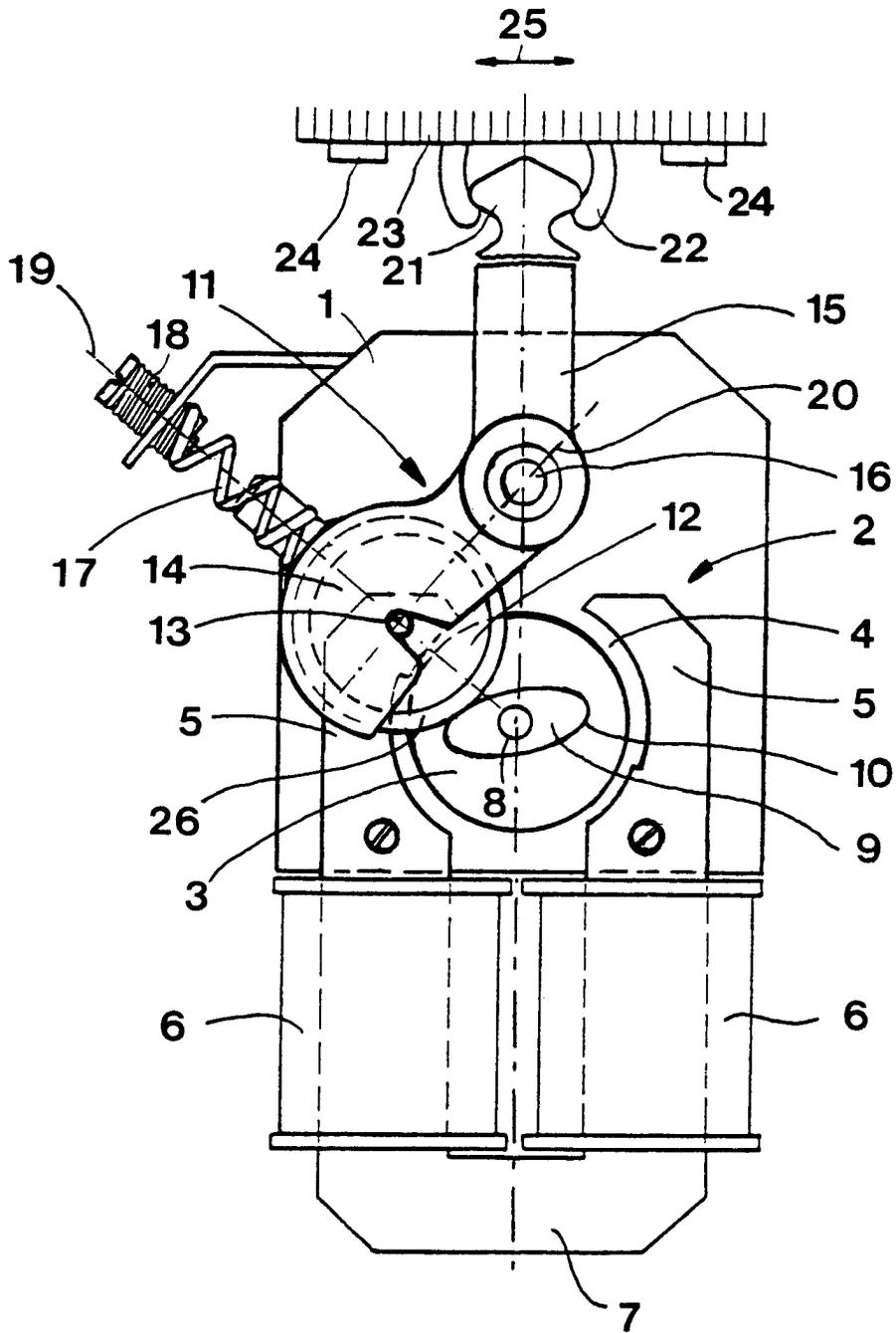


Fig. 1

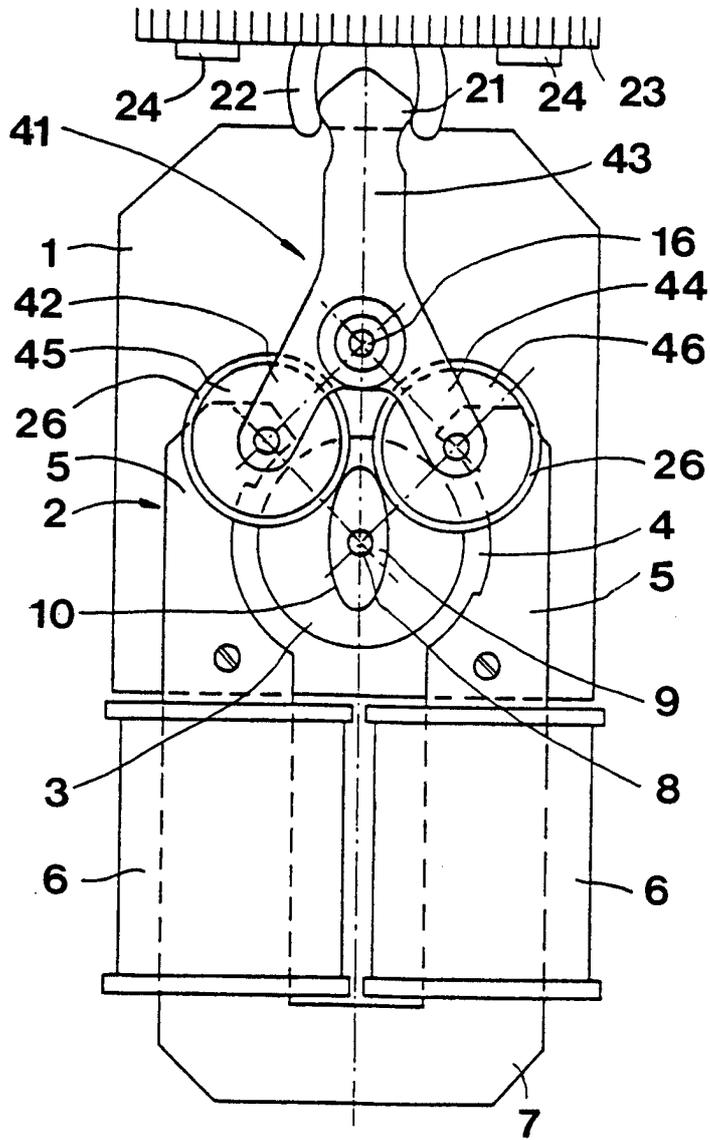


Fig. 2

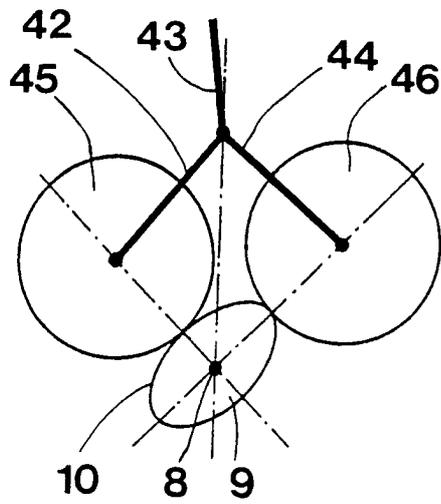


Fig. 2a

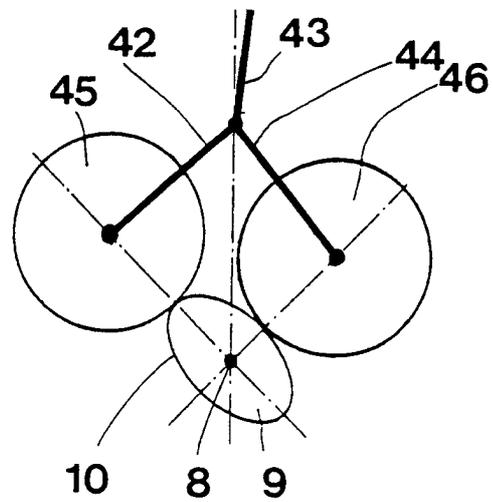


Fig. 2b

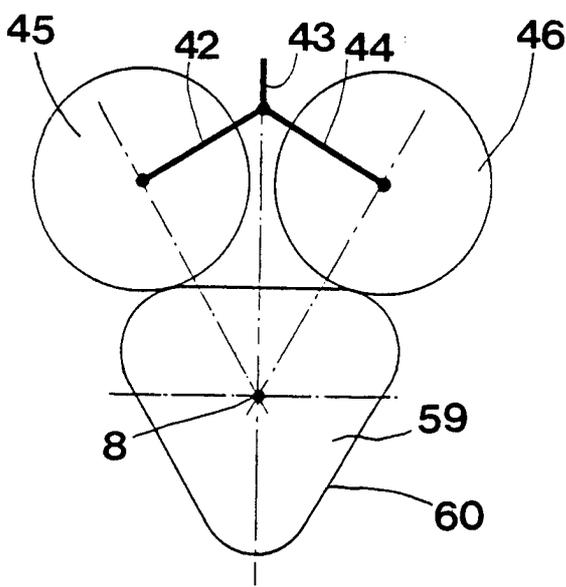


Fig. 3

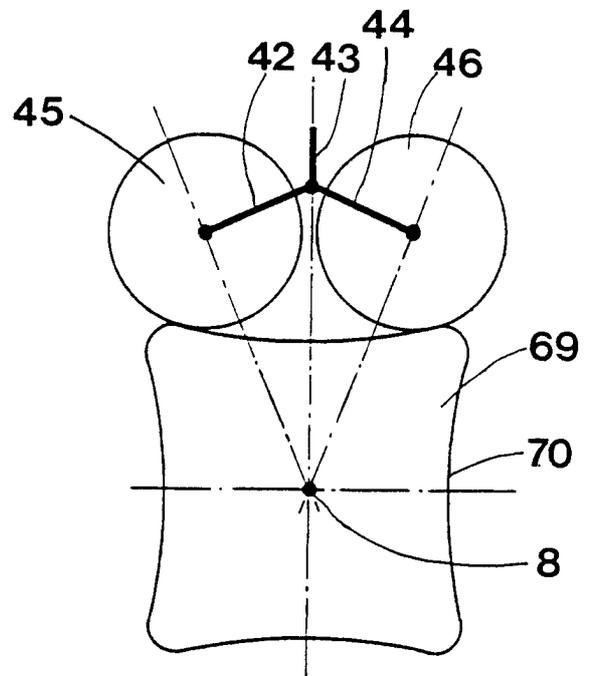


Fig. 4