

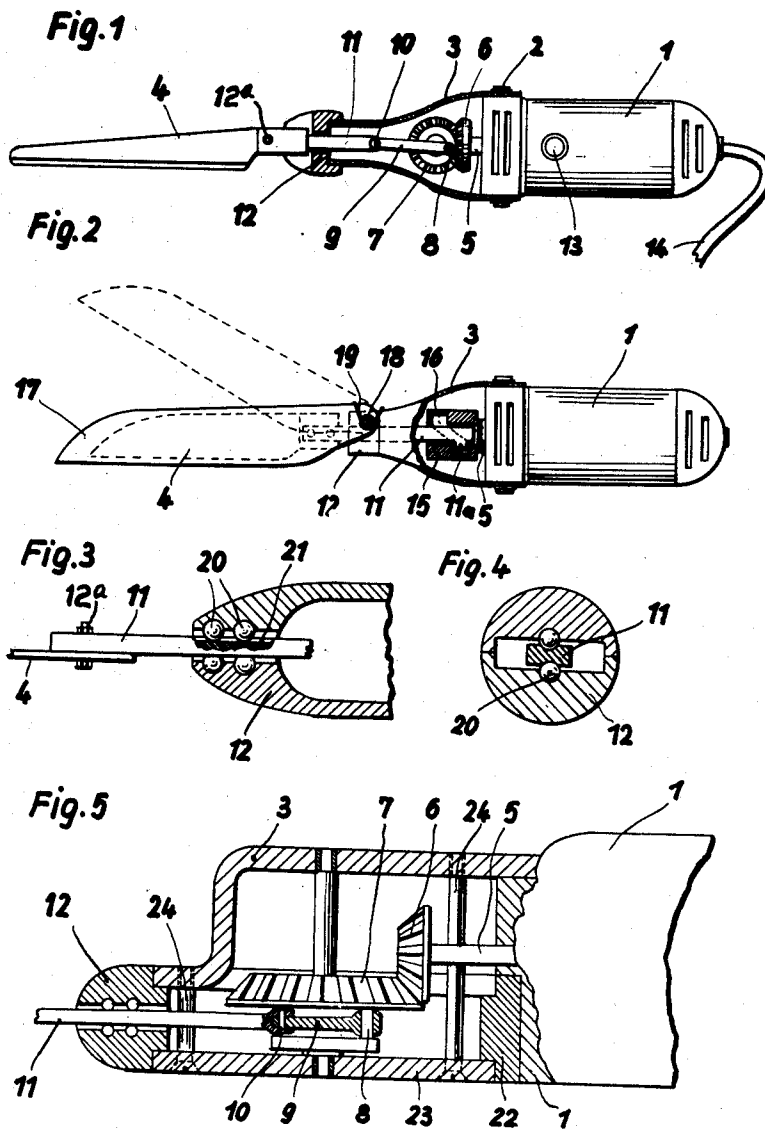
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POWER OPERATED CUTTING DEVICE

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POWER OPERATED CUTTING DEVICE

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The invention relates to a method for cutting objects of any kind by means of a hand apparatus possessing a blade which can perform a rectilinear oscillating movement.

Knives of this kind are commonly known and were developed for the purpose of facilitating and accelerating the cutting of objects. Such a commonly known device consists of an electro magnet arranged within the handle of the knife, by which electro magnet an oscillating movement of the blade is effected by way of contact changes. Such a drive, however, has the disadvantage that the speed of the oscillating movement is limited and that also the path of the knife during oscillation which corresponds to the stroke of the magnet is not sufficient to guarantee a good cutting.

According to another known performance of such a knife the drive for the oscillating movement of the blade is accomplished by an electro motor placed separately outside of the apparatus. The rotating movement of the motor is transmitted to a link motion by way of a flexible shaft. This link motion converts the rotating movement of the drive into an oscillating movement for the blade. This device, however, is primarily stationary as the flexible shaft can not be too long, so that the knife can only be used within the immediate neighborhood of the electro motor.

It is the object of the invention to overcome the disadvantages of the known cutting devices of this kind, and to create a practical hand cutting device for which there is an urgent need. This need could not be satisfied by the commonly known devices which were found to be unusable.

According to the invention the oscillating movement of the blade is effected by an electro motor arranged within the handle of the apparatus. The rotating movement of the motor is converted by eccentrics, crank drives, link motion or the like into the oscillating movement of the blade. It is absolutely essential that the blade travels a path of about 7 to 12 mm. per stroke at about 5,000 to 14,000 oscillating movements per minute. Only at these speeds and paths is it possible to make a good cutting without any pressure exerted on the body to be cut and making the cut in the shortest time, also in the case of objects, e.g. plastics, rubber or pliable materials which until now could be cut only with great difficulties or not at all.

A special and surprising advantage is the fact that at the hand cutting apparatus according to the invention a sharpening of the blade is not necessary but that a good cutting can be performed also with an edgeless blade. Such an apparatus which forms a unit in a handy form can be used at any place, e.g. in households, small shops or factories. It is only necessary to have a power source at disposal.

The blade of the hand apparatus is preferably arranged within the longitudinal direction of the handle. In special cases, for instance if space is limited, the blade

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can also be arranged at right angle to the longitudinal direction of the handle. Furthermore, handle and blade can be set at any desired angle.

To change the blade well known quick detachable means can be used.

If necessary the free end of the blade can be provided with a lateral guide so that also at abnormal length the blade travels the proper path and vibrations owing to the drive are prevented.

For protecting the blade against damage and to prevent injuries by the blade a protecting cover is provided which is pivoted to the handle and is drawn into protecting position by means of a spring. During cutting the cover is pushed back by the material being cut against the action of said spring.

Further objects and details of the invention will be apparent from the description given hereinafter and the accompanying drawing illustrating some embodiments thereof by way of example.

In the drawing

Fig. 1 shows the hand apparatus according to the invention in a partial longitudinal cross section,

Fig. 2 shows a modification of the invention, also in a partial longitudinal cross section,

Figs. 3 and 4 show the guidance for the blade carrier in two cross sections normal to each other.

Fig. 5 shows a further modification of the invention also in a partial longitudinal cross section.

The hand apparatus consists of the handle 1 which contains an electro motor (not shown), of a gear box 3 connected to said handle by means of screws 2, and of the blade 4. In the embodiment shown in Fig. 1 a level pinion 6 is arranged on the driving shaft 5 of the electro motor, which bevel pinion 6 is meshing with a bevel wheel 7 being pivotally mounted within the gear box 3. At the bevel wheel 7 there is, eccentrically to its rotation axis, arranged a crank pin 8 for a connecting rod 9 which at its other end is pivoted at 10 to the blade carrier 11. This blade carrier 11 is guided within the frontal part of the gear box 3, if needed within an end cap 12, such that it can perform only an oscillating movement. The blade 4 is fastened to the blade carrier 11 by means of screws 12a, rapid connectors or the like. 13 designates the switch for setting the electro motor in action, 14 is the electrical connection cable.

The operation of the apparatus is as follows. On rotation of the bevel pinion 6 by the electro motor the bevel wheel 7 is turned. The blade 4 is put into oscillating movement by way of the blade carrier 11 and the connecting rod 9. This movement is corresponding to the speed of the electro motor and the transmission ratio between the bevel wheels 6 and 7.

In Fig. 2 another embodiment of the invention is shown. The handle with the electro motor is again designated with 1, the gear box with 3, the blade with 4, the blade carrier with 11 and the driving shaft with 5. Upon the driving shaft 5 a sleeve 15 is situated which is provided with an inclined interior groove 16 in which grooves a projection 11a of the blade carrier 11 is camming. The blade carrier 11 is again, as in the embodiment shown in Fig. 1, guided laterally within the gear box 3 and thus cannot perform a rotating movement. At the gear box 3, there is fastened a protecting cover 17 of U-shaped cross section which can be turned about the pivot 18. A spring 19 supported with its one end at the gear box 3 and with its other end at the protecting cover 17 tends to keep the protecting cover 17 in its protective position. On cutting objects the protecting cover 17 is automatically pushed back by the material to be cut into a position which is shown in dashed lines in Fig. 2. Owing to the spring 19 the protecting cover 17

is automatically led back into its protective position when the cutting is finished.

The operation of this embodiment is such that the sleeve 15 is put in rotation by the electro motor. As the blade carrier 11 cannot be turned but its projection 11a cams in the inclined interior groove 16 of the sleeve 15 it has to perform an oscillating movement.

The Figures 3 and 4 show possibilities for the guidance and support of the blade carrier 11. For that purpose balls 20 are arranged within the end cap 12 of the gear box 3, which balls are engaging with corresponding grooves 21 in the blade carrier 11. The length of this groove 21 has to correspond with the way of the blade. This kind of guidance and support has practically no friction which fact is very essential with respect to the great number of oscillations per minute.

Fig. 5 shows another embodiment of the invention. This device permits to adjust the blade at any angle to the longitudinal direction of the handle. For this purpose the blade carrier 11 is guided and supported within a ring 22 which can be turned about the rotation axis of the crank drive. The drive of this device is similar to that one shown in Fig. 1. Within the handle 1 the electro motor drives by way of the driving shaft 5 a bevel pinion 6 which is driving the bevel wheel 7. At the bevel wheel 7 there is arranged a crank pin 8 for the connecting rod 9 which is provided, by means of a pivot 10, to the blade carrier 11. The fastening of the ring 22 is effected by a cover plate 23 by aid of which the ring 22 is pressed against the gear box 3 and the handle 1. On loosening the fixing screws 24 the ring 22 can be turned and can be kept in any angle position when the screws 24 are tightened. For securing the angle position there can be provided (not shown) notches within the cover plate 23 and the ring 22.

What I claim is:

1. A power operating cutting device comprising a casing, a motor having a rotating shaft both mounted within the casing, cutting means supported by the casing, and means connecting said motor with the cutting means to oscillate said cutting means at high frequency of at least 5,000 to 14,000 oscillations per minute and to give the cutting means a stroke from 7 to 12 mm.

2. A power operating cutting device as set forth in claim 1, including a carrier for said cutting means, and means for detachably and adjustably connecting the rear portion of the cutting means to the carrier.

3. A power operating cutting device as set forth in claim 1, including a carrier for said cutting means and anti-friction means between the carrier and the casing.

4. A power operated cutting device as set forth in claim 3, including a guard attached to the casing, and spring means engaging the guard and casing for resiliently urging the guard to cover the cutting means.

5. A power operated cutting apparatus comprising a handle, a rotary electrically operated motor mounted therein, a box attached to the forward portion of the handle, a cutter device having its rear portion reciprocally mounted in the forward part of the box, and means connecting the motor with the cutter device for oscillating said cutter device at high frequency of at least 5,000 to 14,000 oscillations per minute and to give the cutting means a stroke from 7 to 12 mm.

6. A power operating cutter as set forth in claim 5, including a carrier for said cutter device, and means for detachably and adjustably connecting the rear portion of the cutter device to the carrier.

7. A power operated cutting device comprising a casing, a motor within the casing, cutting means supported

by the casing, means connecting said motor with the cutting means to oscillate said cutting means at high frequency of the order of 5,000 to 14,000 oscillations per minute, a carrier for said cutting means, and means for adjustably setting both the cutting means and the carrier at any desired angle to the casing.

8. A power operated cutting apparatus comprising a handle, a rotary electrically operated motor mounted therein, a box attached to the forward portion of the handle, a cutter device having its rear portion reciprocally mounted in the forward part of the box, means connecting the motor with the cutter device for oscillating said cutter device at high frequency of the order of 5,000 to 14,000 oscillations per minute and to give a stroke from 7 to 12 mm., and quick detachable and adjusting means for connecting the rear portion of the cutter device at any desired angle with the handle.

9. A power operated cutter comprising a handle, an electrically operated motor mounted therein, a shaft rotatable by said motor, a housing having its rear portion attached to the forward portion of the handle, a cap closing the forward portion of the housing and provided with a slot, a blade carrier mounted for reciprocal movement in said slot, a blade connected to the outer portion of the carrier forwardly of the cap, anti-friction means in said cap engaging said blade carrier, means connecting the shaft with the blade carrier comprising bevel gears, a crank pin and a connecting rod whereby rotary motion of the shaft causes rectilinear oscillation of the blade, means whereby the blade may be set at any angle to the longitudinal direction of the handle comprising a ring rotatably mounted in the rear portion of the housing, said blade carrier being guided and supported within the cap and ring, and means for fastening said ring and cap to the housing in any desired position.

10. A power operated cutter as set forth in claim 9, said fastening means comprising a cover plate engaging a portion of the ring and cap, and screws attaching said plate to the side of the housing.

11. A power operated cutting apparatus comprising a casing, a motor within the casing, a cutting device having its rear portion reciprocally mounted in the forward part of the casing, a carrier for said cutting device, anti-friction means between the carrier and casing, means for detachably and adjustably connecting the rear portion of the cutting device to the carrier, means connecting said carrier with the motor for oscillating the cutting device, and means for setting the carrier and cutting device at any desired angle to the casing.

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