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Specification

This invention relates to an oscillating bridge for converting the rotary motion of an eccentric driven by a motor shaft into a reciprocating motion of a drive member for a tool in small electrically powered appliances, comprising a bridge yoke which includes the drive member and is provided between two strip-like film hinges, and a connecting rod which is coupled to the eccentric outside the region intermediate the film hinges and extends parallel to the bridge yoke.

Oscillating bridges are known from DE-A-2,117,319 and DE-B-2,749,936 and are predominantly applied to dry shaving apparatus; however, they are also suitable for use in electrical massage devices, toothbrushes and files.

In designing oscillating bridges with regard to the required amplitude of oscillation, compliance with specific dimensioning rules is also required for the connecting rod in order to ensure the necessary rigidity in the direction of oscillation and the flexibility transversely thereto. However, in attempting to observe these rules, connecting rod dimensions result frequently which are only suitable with relatively wide spans of the oscillating bridge intermediate the film hinges serving as supporting members, or fold structures result (DE-B-2,749,936) which, in addition to their increased space requirements in terms of width, also tend to frequency-dependent instabilities which are only controllable at increased expenditure and close tolerances. In addition, the arrangement of the motor in the housing, which depends on the point at which its eccentric is coupled to the connecting rod end, may make it more difficult to mount and arrange the other necessary electrical components in the housing.

From Japanese Utility Patent No. JP-Y2-58-5585 an oscillating bridge of the type initially referred to is known, in which the bridge yoke is comprised of a plate provided with a drive member and strip-type film hinges formed thereon, as well as of a connecting rod formed on the plate. Due to the film hinges and the connecting rod being directly formed on the plate, the bridge yoke constructed in this manner is instable, tending to uncontrolled movements which are lost for the usable linear working movement.

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It is, therefore, an object of the present invention to provide an oscillating bridge of the type referred to which, in view of the demands stated in the foregoing, ensures greater freedom in the arrangement and the dimensions of all components identified and by means of which the conversion of the rotary motion of an eccentric driven by a motor shaft into a linearly reciprocating motion is accomplished in an optimum manner.

According to the invention, this requirement is satisfied in a surprisingly simple manner by the means identified in the characterizing part of the main claim.

To increase the rigidity of the oscillating bridge yoke, in an advantageous embodiment of the invention the two walls are connected by means of strips in the region of their free ends.

In accordance with the invention, this rigidity can be increased still further by connecting the bridge yoke with at least one of the strips by means of a web member which, if desired, may be provided with a further drive member on its outside. Conveniently, the oscillating bridge is held suspended by means of the fastening of the ends of the strip-like film hinges to the housing, whereby the pressure exerted on the drive member via tools connected thereto is advantageously taken up by the strip-like film hinges without causing their deformation.

An embodiment of the present invention will be described in the following with reference to the accompanying drawings. In the drawings,

FIG. 1 is a side view, in schematic representation, of an oscillating bridge with motor, mounted in the housing of a small electrical appliance;

FIG. 2 is a view of the oscillating bridge, as seen from the direction of arrow A in FIG. 1; and

FIG. 3 is a view of the oscillating bridge, as seen from the direction of arrow C in FIG. 1.

The oscillating bridge 1 according to the embodiment illustrated in FIG. 1 comprises essentially a bridge yoke 2 having formed thereon two walls 3 and 4 projecting at approximately right angles, and two strip-like film hinges 5 and 6 extending parallel to the walls 3 and 4. The film hinges 5 and 6 have their one ends 7 and 8, respectively, fastened inside the housing 9 of the small appliance, while the free ends 10 and 11 are integrally

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connected with the free ends 12 and 13 of the walls 3 and 4, respectively. Accordingly, the bridge yoke 2 of the oscillating bridge 1 oscillating in the direction of the double arrow B is held suspended in the housing 9.

On the upper side 14 of the bridge yoke 2 of the oscillating bridge 1, a drive member 15 is provided in the form of a pin which extends through an opening 16 in the housing 9 of the small electrical appliance in order to transmit the linear oscillation of the oscillating bridge to tools connected to the drive member 15 as, for example, the cutter assembly of a shaving apparatus.

In the housing 9 an electric motor 17 with a vertical shaft 18 is arranged adjacent to the side of the oscillating bridge 1, the motor having an eccentric 19 which is coupled to the end 20 of a connecting rod 21. As a result of the lateral arrangement of the motor 17 adjacent to the oscillating bridge 1, sufficient space is provided to accommodate electrical connecting elements as well as primary or secondary cells; these parts are schematically indicated by a rectangular fragment 22.

The oscillating bridge 1 may be an integral piece of plastics material as known in the art, with the bridge yoke 2 and the walls 3 and 4 then forming a rigid unit remaining largely free from deformations.

On the side of the bridge yoke 2 opposite the upper side 14, two strips 23 and 24 are provided which, extending in the direction of oscillation B, connect the free ends 12 and 13 of the walls 3 and 4 with one another. Accordingly, the bridge yoke 2 combines with the walls 3 and 4 and the strips 23 and 24 to provide an inherently rigid cage allowing no deformations under load.

Parallel to the walls 3 and 4, a web member 25 is provided which connects the strip 23 and/or the strip 24 with the bridge yoke 2. The web member 25 has a further drive member 26 formed thereon in the form of a pin which serves to drive a further tool of the small electrical appliance, for example, a long-hair trimmer of a shaving apparatus. The web member or web members 25 likewise add to the rigidity of the cage formed by the bridge yoke 2, the walls 3 and 4 and the strips 23 and 24.

To drive the oscillating bridge 1, the connecting rod 1 is used which is pivotally mounted on a rigid wall 3 in the area of the free end 12 of this wall and is passed through the opening 27 in the wall 4 as well as through the opening 28 in the film hinge 6, so that the

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end 20 of the connecting rod 21 projects out of the space 29 occupied by the oscillating bridge in the housing 9. The connecting rod end 20 is coupled to the eccentric 19 mounted on the shaft 18 of the motor 17. In the area of its connection 30 with the wall 3, the connecting rod 21 has a reduced cross section in order to ensure its elasticity transverse to the direction of oscillation indicated by arrow B.

FIG. 2 shows a side view of the oscillating bridge 1 as seen from the direction of arrow A in FIG. 1, with the wall of the film hinge 6 being partly broken away, as well as a partial section of the bridge yoke 2. The oscillating bridge 1 includes two strips 23 and 24. A web member 25 with a drive member 26 is formed on the strip 23. A rectangular opening 28 is provided in the wall of the film hinge 6 at the end of the film hinge opposite the end 8, through which opening the connecting rod 21 with its end 20 is passed.

FIG. 3 shows a view of the oscillating bridge as seen from the direction of arrow C in FIG. 1. In this embodiment, the oscillating bridge 1 is open in the area of the strips 23 and 24 and the walls 3 and 4, whereby the connecting rod 21 with its reduced cross section in the area of its connection 30 with the wall 3 becomes visible. In a modified embodiment of the oscillating bridge 1 not shown, the strips 23 and 24 and the walls 3 and 4 may be connected by means of a thin base plate.



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Patent Claims

1. An oscillating bridge (1) for converting the rotary motion of an eccentric (19) driven by a motor shaft (18) into a reciprocating motion of a drive member (15) for a tool in small electrically powered appliances, comprising a bridge yoke (2) which includes the drive member (15) and is provided between two strip-like film hinges (5, 6), and a connecting rod (21) which is coupled to the eccentric (19) outside the region intermediate the film hinges and extends parallel to the bridge yoke (2), characterized in that at the ends of the bridge yoke (2) two walls (3 and 4) are provided which project at approximately right angles and form a rigid unit with the bridge yoke, that the ends (12, 13) of the walls (3, 4) on the side remote from the bridge yoke are connected with the ends (10, 11) of the strip-like film hinges (5, 6) extending parallel to the walls (3, 4), that one of these walls (3 or 4) as well as the film hinge (5, 6) associated with this wall include each a respective opening (27, 28) provided on the respective center axis thereof, and that the connecting rod (21) is formed on the wall (3 or 4) opposite the respective opening (27, 28) in the region of its free end, extending centrally to the drive member 15, by means of a film hinge (30).

2. The oscillating bridge as claimed in claim 1, characterized in that the two walls (3, 4) are connected by means of strips (23, 24) in the region of their free ends (12, 13).

3. The oscillating bridge as claimed in claim 2, characterized in that the bridge yoke (2) is connected with at least one of the strips (23, 24) by means of a web member (25).

4. The oscillating bridge as claimed in claim 3, characterized in that a further drive member (26) is provided on the outside of the web member (25).

5. The oscillating bridge as claimed in any one of the preceding claims, characterized in that the oscillating bridge (1) is held suspended by means of the fastening of the ends (7, 8) of the strip-like film hinges (5, 6) to the housing (9).