An ultrasonic toothbrush is known from US 2012/0291212 A1, which has two parallel channels running transverse to the longitudinal axis of the brush to increase the resonant frequency. The frequency is increased in the forward-backward direction if the two channels are positioned at the front. If the channels are provided on the left and right of the brush neck, the frequency is increased in the lateral direction.

Disadvantages:
There is still a lack of sufficient understanding of the cleaning behavior of sonic toothbrushes. The knowledge we have today about the cleaning effect of manual toothbrushes cannot be transferred to the highly dynamic situation of a sonic toothbrush. In EP 1,713,413 (Church & Dwight) it is pointed out that a bristle stiffness of 0.2 - 0.8 is advantageous for the effectiveness of cleaning. EP 3'291'700 (Braun) describes a buckling force in the range of 0.01 N to 2 N as advantageous.

Disclosure of the invention
Embodiments of the invention seek to create a toothbrush for sonic toothbrushes which belongs to the technical field mentioned at the beginning and which has a better cleaning effect, in particular one which is gentle on the gums. In particular, a defined and controlled two-dimensional movement of the bristles is to be generated.

According to a first aspect of the invention there is provided a brush for a sonic toothbrush with longitudinal axis vibration, having an elongate base body which forms an adapter on a base portion for rotationally fixed coupling to a sonic toothbrush drive in order to vibrate the brush about a base portion longitudinal axis, and which forms a bristle support on a head portion, in which a plurality of bristles are anchored, a neck portion being formed between the base portion and the head portion, and wherein the the base body forms a kink angle in such a way that the base portion longitudinal axis and a head portion alignment axis include an angle γ in the range from 7° to 17°, the bristle support has a deflection in the range of 5% - 20% in relation to a length (L) of the base body, the plurality of bristles are substantially perpendicular to the head portion alignment axis, wherein the essential part of the bristles have a buckling stress σ_k in the range from 0.1 to 10 MPa, wherein

$$\sigma_k = \frac{\pi^3}{L^2} \cdot E \cdot r^2$$

π = number Pi (= 3.14), E = Young's modulus of the bristles, r = half the diameter of the bristle

L = length of the bristle

According to the above aspect of the invention, the essential part of the bristles has a buckling stress σ_k in a range from 0.1 MPa to 10 MPa, wherein

$$\sigma_k = \frac{\pi^3}{L^2} \cdot E \cdot r^2$$

π = number Pi (= 3.14)

E = Young's modulus of the bristles,

r = half the diameter of the bristle

L = length of the bristle

It was found that the desired two-dimensional movement of the bristle tips is a combination effect of the geometry of the brush according to the invention and the specified buckling tension of the bristles. In particular, the two-dimensional movement can be described as a kind of "8"

field is surrounded by the outer bristle field. The bristles in the inner bristle field may have a different length than the bristles in the outer bristle field. Within the scope of the invention, it is possible that only the bristles in the outer bristle field have the defined kink tension.

However, it also generally corresponds to a particular embodiment that at least two different bristle lengths are provided on the brush head. However, it is advantageous if bristles of different lengths belong to different bristle tufts. In other words, the bristle lengths within a bristle tuft are preferably essentially the same size.

According to a preferred embodiment of the invention, the adapter for rotationally fixed coupling to the sonic toothbrush drive has a channel running parallel to the longitudinal axis of the base portion for positively engaging a pin of the sonic toothbrush drive. The brush can therefore be plugged onto a pin of a sonic toothbrush drive using the adapter. Preferably, a latching element is provided so that the brush engages on the sonic toothbrush drive. The pin is pivoted back and forth around its longitudinal axis and the brush as a whole performs this longitudinal axis oscillating movement.

In a preferred embodiment of the invention, the base body comprises a load-bearing material with a Young's modulus of not more than 6000 MPa and not less than 2000 MPa. The bristle support is formed integrally with the base portion, in particular the adapter. Within the scope of the invention, the one-piece base body can also be formed from several elements bonded by a material bond (base portion, neck portion, head portion). The main part of the brush can, for example, be a synthetic material injection-molded part. The bristle support, brush neck and base portion are then formed on this injection-molded part. If required, a local or total coating with a soft plastic sheath can be provided.

According to a second aspect of the invention, there is provided a set comprising the brush according to the first aspect and a sonic brush drive. The sonic brush drive has the form of a hand apparatus onto which the brush can be attached. The sonic brush drive is designed to oscillate the brush back and forth about the longitudinal axis of the base portion. The operating frequency should be in the range of 150 - 400 Hz, in particular in the range of 150 Hz to 300 Hz.

In this range, the bristles according to the invention are best able to perform the desired two-dimensional "8" movement.