Dec. 1, 1942. K. A. S. KARLSTRÖM 2,303,475

DEVICE FOR THE PARALLEL GUIDANCE OF TOOLS IN PERFORMING DENTAL WORK

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Fig. 1.

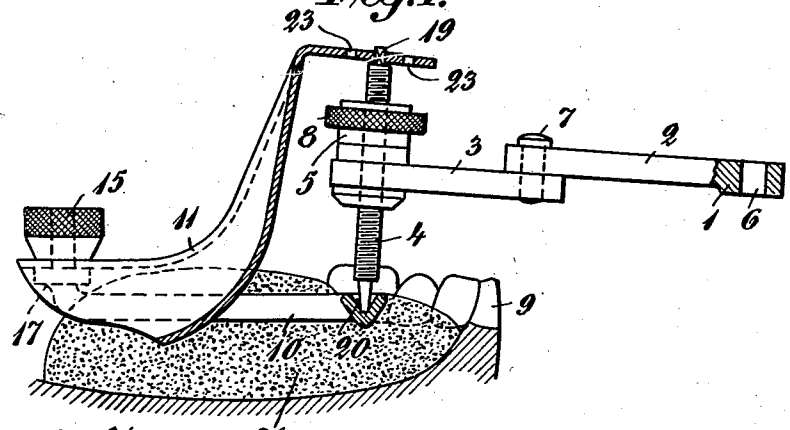


Fig. 2.

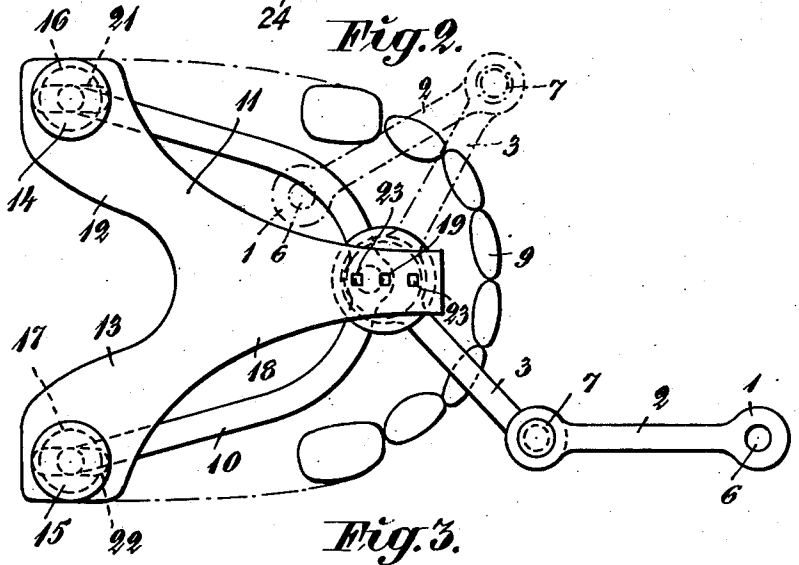
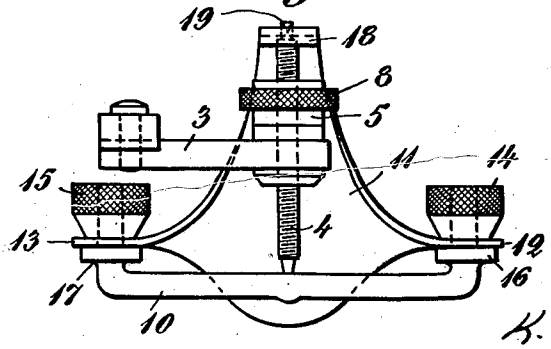


Fig. 3.



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Fig. 4.

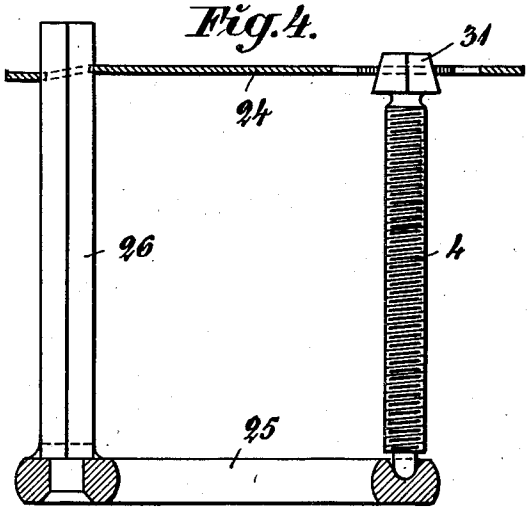


Fig. 5.

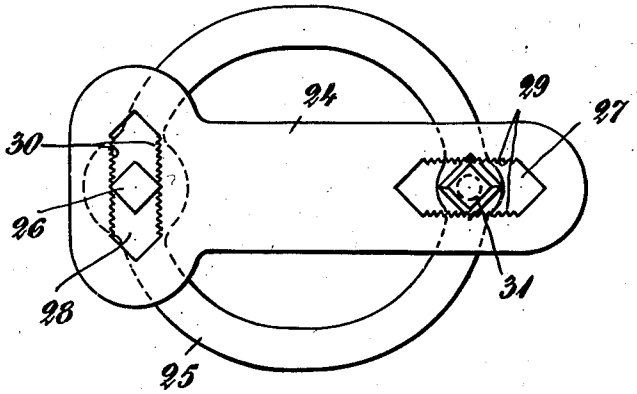
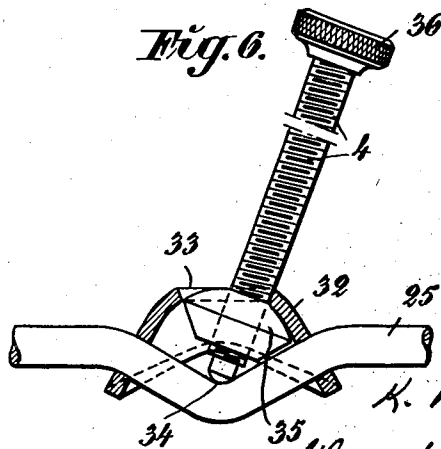


Fig. 6.



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Patented Dec. 1, 1942 2,303,475

UNITED STATES PATENT OFFICE

2,303,475

DEVICE FOR THE PARALLEL GUIDANCE OF TOOLS IN PERFORMING DENTAL WORK

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Application July 31, 1940, Serial No. 348,914
In Sweden April 24, 1940

17 Claims. (Cl. 32—67)

The present invention refers to such devices for the parallel guidance of tools in performing dental work in which a guiding sleeve for the tool is carried by an arm which is swingably mounted on a support adapted to be fixed relatively to the teeth. Such devices have particularly been brought into use for the drilling of mutually parallel pin holes in making tooth fixtures, but they may also be made use of for producing so-called pin-ledge attachments and the like fastening means for bridge works. The invention has for its object to bring about a greater degree of adjustability for the guiding sleeve in order thus to render possible a more convenient manipulation of the tool under varying working conditions. To this end the arm carrying the guiding sleeve is composed, according to the invention, of two or more links, which are pivotally connected to each other in such manner that the radial distance of the guiding sleeve from the swinging axis of the link arm can be varied while maintaining the parallelism between the guiding sleeve and the swinging axis. In addition, the invention comprises various means to make the guiding sleeve adjustable in a vertical direction and in different angular positions relatively to the teeth.

The invention will be described more closely with reference to the accompanying drawings which illustrate different embodiments of the invention. Figure 1 shows one embodiment in elevation, and partly in vertical section. Figure 2 is a plan view and Figure 3 a front view thereof. Figures 4 and 5 are an elevation partly in section and a plan view respectively of another embodiment. Figure 6 is an elevation partly in section of a third embodiment.

In the example shown, the guiding sleeve 1 is arranged on the end of an arm composed of two links 2 and 3, said arm being swingably mounted on a pivot pin 4 through the agency of a nut 5 which is threaded onto the pin. The guiding sleeve 1 is provided with a bore hole 6 intended to receive the tool, such as a bore, or the part of the bore shank into which the bore bit is secured. The center line of the guiding sleeve parallels the pin 4. In adjusting the bore bit into different operating positions the bore bit will thus always maintain the same angular position relatively to the teeth as the pivot pin 4, thus rendering possible the boring or drilling of mutually parallel pin holes in the teeth. The two links 2, 3 are pivotally connected to each other by means of a pin 7 which also parallels the pivot pin 4. Thanks to this linkage device the guiding sleeve 1 may be conveniently brought into any desired operating position relatively to the teeth, as will be seen from Figure 2, where the arm 2, 3 is shown in different positions. The inner link 3 is pivotally mounted on the nut 5 which, in turn, is adjustable into different vertical positions on the pin 4, the friction between the nut and the threads of the pivot pin being sufficient to retain the nut in any position of adjustment. To facilitate turning of the nut the latter is provided with a knurled boss 8. The nut may be provided with one or more division lines or marks, by means of which the magnitude of the turning movement of the nut may be ascertained. The corresponding raising or lowering of the arm can be established by calculation when the pitch of the thread is known, the same being 0.5 millimeter, for example. The arm carrying the guiding sleeve may be composed, if desired, of two or more pairs of links arranged in a similar manner as in so-called lazy tongs, whereby greater rigidness is imparted to the arm, so that the individual links may be made more slender.

Figures 1 and 2 illustrate the position of the device relatively to the row of teeth 9 in the upper jaw and the lower jaw respectively. The arm 2, 3 is secured by means of the pivot pin 4 in a support consisting of a strap-shaped supporting member 10, which may be fixed relatively to the teeth by means of a plastic mass 24 or in some other way, and a clamping member 11 consisting in the example shown of a fork-shaped sheet-metal piece from resilient material, preferably steel. The two rear arms 12, 13 of this member are secured to the respective ends of the strap 10 by means of nuts 14, 15 which are threaded onto the upwardly bent end portions of the strap 10, the arms 12, 13 being then secured between the respective nuts and a boss 16 and 17 respectively on the strap. The front arm or stem 18 of the clamping member 11 serves as an attachment for the upper end of the pivot pin 4, which to this end is provided with a square pin 19 entering a square hole in the outer end of the stem 18 which is substantially parallel to the strap 10. The clamping member 11 is constituted so as to bear with a certain spring power on the end of the pivot pin 4. The lower end of the pivot pin 4 bears on the bottom of a recess 20 in the middle front portion of the strap, said recess being conical so that the pivot pin 4 may be adjusted to different angular positions relatively to the strap 10.

To facilitate adjustment of the pivot pin into different angular positions relatively to the teeth

and the strap 10 respectively, the arms 12, 13 are provided with slit 21, 22 which upon loosening of the nuts 14, 15 make possible an adjustment of the stem 18 in all directions forwardly, rearwardly, and laterally. The pivot pin 4 having thus been brought into the desired position, the same is fixed in this position by the nuts 14, 15 being tightened up. To facilitate coarse adjustment of the pin 4 without the nuts 14, 15 having to be loosened, the arm 18 is provided with a number of square holes 23 into which the pin 19 may be fitted after the stem 18 having been raised. In the example shown, three such holes are shown as being arranged in a row along the plane of symmetry of the device. Such holes, however, may also be arranged in rows at right angles to the plane of symmetry, or in some other way, so that the pivot pin may also be adjusted by means of these holes in different lateral directions.

The embodiment illustrated in Figures 4 and 5 differs from the embodiment above described only in respect of the construction of the support, the clamping member 24 being in this case connected with the supporting member 25 only at one point located behind the pivot pin 4. The connection between the clamping member 24 and the supporting member 25 is established by means of an upright 26 riveted to the supporting member 25 in a position substantially perpendicular to the plane of the supporting member 25, which in this case has the form of a ring. The clamping member 24 consists of a band-shaped piece of resilient sheet metal and is connected to the top end of the pivot pin and to the upright 26 by means of slit-and-pin connections. It is provided with two slits 27 and 28 extending perpendicularly to each other, as shown in Figure 5. The opposite longitudinal edges of said slits are provided with toothings 29 and 30 respectively adapted to engage the opposite edges of the square ends of the pivot pin 4 and the upright 26. The upright 26 has a square cross section all over its length, whereas the pivot pin 4 has a square head 31 of a pyramidal shape.

For the purpose of securing the pivot pin 4 to the support, the clamping member 24 is first passed over the end of the upright 26 in such a manner that the opposite edges of the upright will enter the spaces between two adjacent teeth on the opposite edges of the slit 28 so that the clamping member will take up its middle position shown in Figure 5. The opposite end of the clamping member 4 is then passed similarly over the head 31 of the pivot pin so that opposite edges of the head will engage the toothings 29 of the slit 27. The rear end of the clamping member is then pushed down for a further small distance along the upright 26 so as to obtain a firm engagement between the upright and the clamping member. By the rear end of the clamping member being thus pressed down the opposite end will be caused to bear with a resilient pressure on the head of the pivot pin so as to firmly hold the pivot pin in position. By the arrangement described the end of the pivot pin may be adjusted in two directions perpendicular to each other in the following manner. For adjusting the pivot pin 4 laterally the rear end of the clamping member 24 is lifted up so as to disengage the upright 26 and then displaced laterally and parallelly in the longitudinal direction of the slit 28 to the wanted lateral position in which the clamping member is fixed by pushing its rear end down over the upright. In this position the upright engages another pair of tooth spaces on the toothings 30. For adjusting the pivot pin rearwardly or forwardly the fore end of the clamping member 24 is lifted off from the pyramidal head 31 against the spring action of the clamping member. After the pivot pin has been adjusted into the position wanted, the fore end of the clamping member is lowered into engagement with the head 31. In this position the head 31 will engage another pair of opposite tooth spaces of the toothings 29. The smallest amount of adjustment thus obtained corresponds to the pitch of the toothings. However, if wanted a still smaller adjustment rearwardly and forwardly may be obtained by maintaining one edge of the head piece 31 in its position relatively to the teeth 29 while moving only the opposite edge to the next tooth space. In this way an adjustment amounting to only half the pitch may be obtained. Similarly the clamping member 24 may be adjusted laterally by maintaining the rear edge of the upright 26 in its position relatively to the teeth 30 while turning the clamping member about said edge sideways and passing it into engagement with the next pair of teeth. Thus, in this case the clamping member 24 will be turned about the rear edge of the upright 26 instead of being displaced parallelly with itself as in the case first described.

Figure 6 shows another form of construction in which the upper end of the pivot pin 4 is freely movable, the adjustment into different angular positions being effected by means of a ball-and-socket joint connecting the pivot pin to the supporting member 25. Said joint consists of a calotte-shaped shell 32 soldered or welded to the member 25 and having a spherical inner surface. The pivot pin 4 is introduced through a circular opening 33 in said shell and arranged to bear with its lower end against a portion 34 of the supporting member located at the centre of the spherical surface. Threaded on to the pivot pin 4 is a nut 35 having an upper spherical surface adapted to engage the inner spherical surface of the shell 32. After the pivot pin has been adjusted into the angular position wanted, it is turned by means of the knurled boss 36 while the spherical surface of the nut 35 is kept into frictional engagement with the inner surface of the shell 32. The nut 35 will then be screwed on to the pivot pin and thereby firmly pressed against the shell so as to lock the pin in the adjusted position. In order to loosen the pivot pin for another adjustment, the pivot pin is turned in the opposite direction.

In order to allow a free movement of the link arm around the pivot pin 4 in the embodiments above described with reference to Figures 1 to 5 the radial distance between the pivot pin and the clamping member 11 or the upright 26 respectively should be larger than the radial length of the inner link 3 of the link arm.

The invention is primarily intended for boring or drilling work, but may also be used for grinding, the spindle of the grinding trundle being then guided in the same manner as the bore bit.

I claim:

1. A device for the parallel guidance of dental tools comprising a support consisting of a flat base portion adapted to be fixed to the teeth, and an elastic bracket projecting therefrom and the end of which extends substantially parallelly with said base portion, a pivot pin clamped between the outer end of the bracket and the base portion of the support, a tool guiding arm swing-

ably mounted on said pivot pin, and pin holes in the outer end of said bracket to hold the pivot pin in different angular positions.

2. A device as claimed in claim 1 in which a plurality of pin holes are provided in the bracket and arranged in parallel rows.

3. A device as claimed in claim 1 in which the pivot in pin has a square end and in which the pin holes in the bracket are square shaped to suit the square end of the pivot pin.

4. A device for the parallel guidance of dental tools comprising a support having a base portion adapted to be fixed to the teeth and a clamping member including an upright projecting from the base portion, a pivot pin clamped between the base portion and the clamping member, a tool guiding arm swingably mounted on said pivot pin and carrying a guiding sleeve for the tool, the lateral distance between the pivot pin and said upright being larger than the length of said arm.

5. A device as claimed in claim 17, in which the clamping member is connected with the upright by means of a slit-and-pin connection, the slit of which is provided with teeth along two opposite edges adapted to be engaged by edges on the upright.

6. A device as claimed in claim 17, in which the clamping member is connected with the pivot pin by means of a slit-and-pin connection the slit on the clamping member being provided with teeth along two opposite edges adapted to be engaged by edges on the top of the pivot pin.

7. A device for the parallel guidance of dental tool comprising a support having means for fixing the support relatively to the teeth, a pivot pin secured to said support by means of a ball-and socket joint, a tool guiding arm swingably mounted on said pivot pin, and means associated with said ball-and-socket joint for fixing the pivot pin in different angular positions relatively to the support.

8. A device as claimed in claim 7 in which the ball-and-socket joint is adapted to be locked and unlocked by a turning movement of the pivot pin.

9. A device as claimed in claim 7 in which the ball is threaded on the pivot pin and in which the end of the pivot pin bears against the central portion of the ball-and-socket joint.

10. A device for the parallel guidance of dental tools comprising a support having means for fixing the support in the mouth relatively to the teeth, a pivot pin having one end in abutment with said support whereby the pivot pin may swivel bodily about the point of abutment into different angular positions relatively to the support, a tool guiding arm swingably mounted on said pivot pin, and clamping means for fixing the pivot pin to the support in any selected angular position.

11. A device for the parallel guidance of dental tools comprising a support having means for fixing the support in the mouth relatively to the teeth, a pivot bearing in said support, a pivot pin swivelly engaged at one end in said bearing and movable bodily into different angular positions, a tool guiding arm swingable on said pivot pin, and means for fixing the pivot pin to the support in different angular positions.

12. A device for the parallel guidance of dental tools comprising a support having means for fixing the support in the mouth relatively to the teeth, a pivot bearing in said support, a detachable pivot pin swivelly engaged at one end in said bearing and movable bodily into different angular positions, a tool guiding arm swingable on said pivot pin, means for holding the pivot pin in articulative engagement with said bearing, and means for fixing the pivot pin to the support in different angular positions.

13. In a device for the parallel guidance of dental tools the combination of a support having means for fixing the support in the mouth relatively to the teeth and comprising a base portion and a clamping member, a pivot pin swivelly movable angularly with respect to said base portion and clamped in the selected angular position between the base portion and the clamping member, a tool guiding arm swingably mounted on said pivot pin.

14. In a device for the parallel guidance of dental tools the combination of a support having means for fixing the support in the mouth relatively to the teeth and comprising a base portion and an elastic clamping member, a detachable pivot pin clamped longitudinally between the base portion and the elastic clamping member, a tool guiding arm swingable on said pivot pin, and means associated with the elastic clamping member for shifting the position of the end of the pivot pin engaged therewith to alter the angular position of said pin with respect to said base portion.

15. In a device for the parallel guidance of dental tools the combination of a support having means for fixing the support in the mouth relatively to the teeth and comprising a base portion and a clamping member, a pivot bearing in the base portion of said support, a detachable pivot pin clamped between said bearing and the clamping member, a tool guiding arm swingably mounted on said pivot pin, and means for relatively adjusting the base portion and clamping member to vary the angular position of the pin with respect to the base member.

16. In a device for the parallel guidance of dental tools the combination of a support having means for fixing the support in the mouth relatively to the teeth and comprising a base portion and an elastic clamping member, a detachable pivot pin clamped between the base portion and the elastic clamping member, a tool guiding arm swingably mounted on said pivot pin, means for adjusting the clamping member in one direction with respect to the base portion and means for adjusting the pivot pin in another direction with respect to the clamping member to vary the angular position of the pin with respect to the base portion.

17. A device for the parallel guidance of dental tools, comprising a support consisting of a flat base portion adapted to be fixed to the teeth, an upright projecting from the rear part of the base portion, an elastic arm carried by and adjustable in one direction transversely of said upright, a detachable pivot pin clamped between the base portion and the elastic arm, a bearing in the base portion for one end of the pivot pin, means associated with the elastic arm for adjusting the opposite end of the pivot pin relatively to the elastic arm in the opposite direction, and a tool guiding arm swingably mounted on the pivot pin.

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