Aug. 31, 1943. H. D. GREENBERG 2,328,270

OSCILLATORY HAMMER

Filed June 1, 1942

Fig. 1.

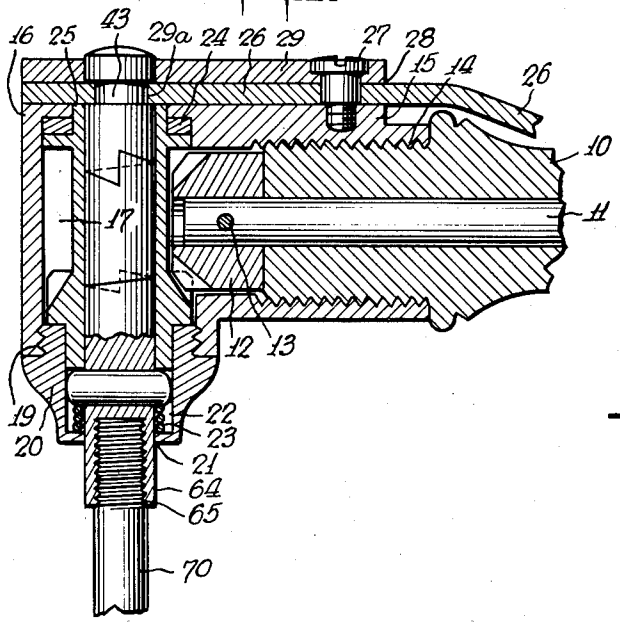


Fig. 2.

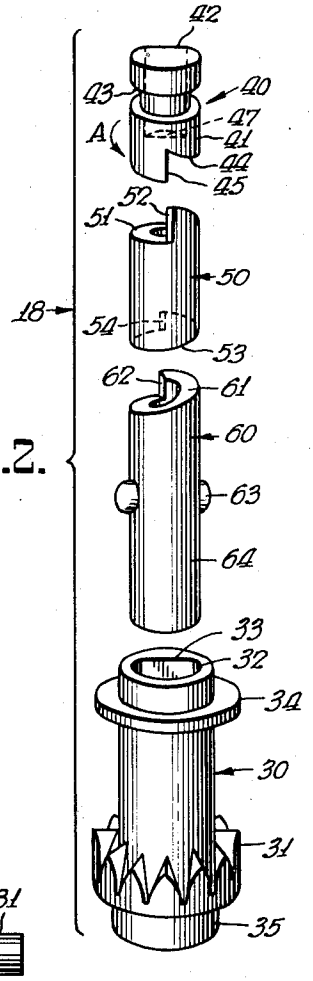


Fig. 3.

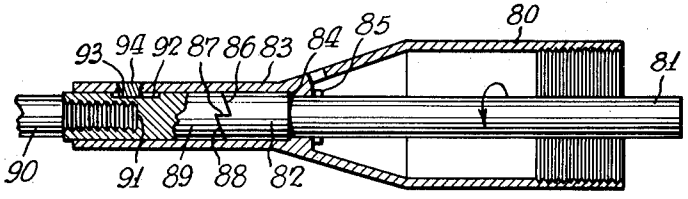
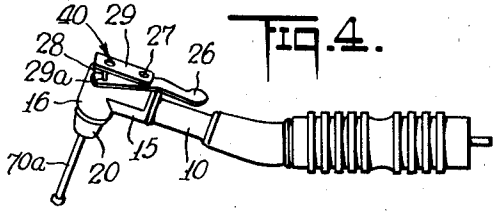


Fig. 4.



INVENTOR
Harry Daniel Greenberg
BY
Harry Ernest Rubens
ATTORNEY

42-70

Patented Aug. 31, 1943

2,328,270

UNITED STATES PATENT OFFICE

2,328,270

OSCILLATORY HAMMER

Harry Daniel Greenberg, New York, N. Y.

Application June 1, 1942, Serial No. 445,526

3 Claims. (Cl. 74—56)

My invention relates to improvements in oscillatory devices and hammers, the motive power being provided for by a rotating shaft.

The primary object of my invention is to provide such a device with a differential stroke travel to permit blows of different intensities.

Another object is to provide a different stroke travel by a reversal of the rotation of the driving shaft.

Still another obect is to provide such a device in which the line of the hammer travel and the direction of the blow is in the same axis and parallel to the axis of the motive drive with a view to minimizing lateral and centrifugal vibration usually found in devices of this character employing eccentric drives and other unbalanced means.

Other objects of my invention are to provide a device of the foregoing character that may be readily attached to dental-engine handpieces or contra-angles for various types of dental uses; to provide a device which is simple in construction and assembly, and which may be inexpensively manufactured.

I accomplish these and other objects and obtain my new results as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing, in which:

Fig. 1 is a partially sectional view of my device wherein the hammer travel is in a direction normal to the axis of rotation of the main drive shaft.

Fig. 2 is an exploded view of the elements of my device that produce the oscillatory effect.

Fig. 3 is a sectional view of a modification of my device wherein the hammer travel is in the same direction as the axis of rotation of the main drive shaft.

Fig. 4 is a perspective outside view of my device employed in a contra-angle dental hand piece.

Referring more particularly to the drawing, reference numeral **10** designates, in Fig. 1, a casing wherein is journalled a drive shaft **11**. One end of the shaft **11** carries a bevel gear **12**, secured thereto by a pin **13**. The end of the casing **10** is threaded and engages at **14** the head **15**. The head terminates in a tubular transversely extending casing **16** provided with a recess **17** to receive the oscillatory producing mechanism **18**, illustrated in the exploded view in Fig. 2. The mouth of the recess **17** is threaded, as at **19**, to receive a cap **20** centrally apertured at **21** as hereinafter described.

The oscillatory producing mechanism **18** consists of the collar **30**, provided with the peripherally formed bevel gear **31** which engages the corresponding bevel gear **12** driven by shaft **11**. The collar **30** is hollow as at **32**, and provided with a flattened inner portion **33** at one end thereof, and a peripherally formed shoulder **34**. Into the hollow end of the collar **30** is inserted the driving cam **40**, which comprises a cylindrically shaped shaft **41**, longitudinally flattened at one end as at **42**, for engagement with the flattened inner portion **33** of the collar **30**, and thereby locked to the collar and forced to rotate with it. A groove **43** is peripherally formed around the cylindrical wall of the driving cam **40**, for the purpose of rotatably and removably locking it to the head **16** if desired, as will be hereinafter described. The driving cam **40** is provided with a spirally formed cam surface **44**, normal to the axis of rotation with a cam drop **45** in the spiral surface of predetermined height.

An intermediate cam shaft **50** is similarly provided with a cam surface **51**, in juxtaposition to cam surface **44**, and provided similarly with a cam drop **52** designed to interlock with cam drop **45**. At the remaining end of intermediate cam shaft **50**, an oppositely formed cam surface **53** is positioned with a cam drop **54** of predetermined height.

A final driven cam shaft **60** is provided with a cam surface **61** and a cam drop **62** in juxtaposition to cam surface **53** and cam drop **54** of the intermediate cam shaft **50**.

A pin **63** is driven through driven cam shaft **60**, which is designed to fit into the diametrically formed slots **22** in the inside of cap **20** with shaft **64** extending through aperture **21**. Thus the shaft **60** is prevented from rotating with respect to the cap **20**, but may longitudinally oscillate in the slots **22** thereof. The remaining end of driven cam shaft **60** may be threadedly recessed as at **65** to accommodate a suitably faced tool **70** which in this instance it is desired to be longitudinally oscillated.

A thrust bearing **24** may be inserted into the recess **17** of the head **16**, seating itself at the extreme end thereof, adjacent the shoulder **34** of collar **30**. The driving cam shaft **40** protrudes through aperture **25** in head **16**, and may be rotatably locked by the lever **26** mounted with a slot **28** in head **16**, which lever **26** is pivoted at set

screw 27, and is provided with a cut-out 29a, for engaging the slot 43 (see Fig. 4).

The oscillatory producing mechanism 18 is assembled as a unit into the recess 17 of head 16 through the threaded end 19, and comprises the collar 30, the driving cam 40 inserted into collar 30 from the lower end 35 thereof, the intermediate cam 50 next inserted into end 35, and the driven cam 60 following cam 50 into the collar. A spring 23 may be inserted into the recess of the cap 20 to keep the cam surfaces into interengagement.

The cap 20 is then threaded into the mouth of recess 17, and the casing 10 with shaft 11, and bevel gear 12 threaded at 14 to position at the end of head 15.

The lever 26 is then pivoted from the position indicated in Fig. 4 to the closed position of Fig. 1, rotatably locking the driving cam 40, and the device is ready for operation.

The shaft 11 and driving bevel gear 12 rotates the meshed bevel gear 31, causing collar 30 to rotate carrying driving cam 40 with it. If the cam 40 is rotated in the direction of arrow A of Fig. 2, it engages cam drop 52 of intermediate cam 50, causing the intermediate cam 50 to rotate with it. The cam surface 53 is oppositely positioned so that cam surface 53 propels cam shaft 60 the distance of cam drop 54, thereby causing the driven cam shaft 60 to oscillate or vibrate within collar 36, the pin 63 riding longitudinally in slots 22 of cap 20 preventing accidental rotation.

By reversing the rotation of shaft 11, the driving cam 40 is caused to reverse its direction of rotation. This causes the cam surface 44 thereof to ride cam surface 51 of the intermediate cam 50, which is propelled longitudinally the distance of cam drop 45, causing intermediate cam 50, now locked to driven cam 60 at cam drops 54 and 62, to vibrate therewith under action of applied pressure or the spring 23.

It will be therefore seen that the rotation of shaft 11 in one direction will cause an oscillation over a distance equal to the height of cam drop 54 or 62, and upon reversal of the shaft rotation, the cams 60 and 50 will oscillate as a unit over a distance equal to the height of cam drop 52 or 45. By proper design of the cam drops, the distance of oscillation may be selectively changed by a simple reversal of shaft rotation.

It should be noted that the lever 26 is shown because it is normally used in dental contra-angles to lock a dental burr 70a, shown in Fig. 4, into rotatable position. The contra-angle of Fig. 4 is adapted to receive the oscillatory producing mechanism of Fig. 2, without any change except for the recsss in the cap 20 for pin 63.

If a contra-angle device is desired with no need for accommodation to the present type of dental instrument, the head may be made closed at this point, eliminating lever 26, aperture 25, slot 43 and set screw 27.

In Fig. 3, a device is shown in which the hammer travel is in the same direction as the axis of rotation of the main driving shaft. While the three piece cam shaft arrangement may be used, shown as 40, 50 and 60 in Fig. 2, the parts may be further simplified by employing a single set of cam faces, where reversal of the drive shaft is undesirable, unnecessary or not available.

Thus the cutside casing 80 houses the main drive shaft 81, which terminates in the drive cam 82 integral therewith. This is journalled in the neck 83 of the casing 80, and is maintained in position by the inner casing shoulder 84, and by the ears or pin 85 on the shaft 81. A spirally formed cam face 86, provided with a cam drop 87, is juxtaposed to cam surface 88 with a corresponding cam drop, forming part of driven cam shaft 89. A suitably faced tool 90 threadedly engages the recess 91 in the driven cam 89, which is provided with a longitudinally formed slot 92 into which is keyed a threaded set screw 93 mounted in the threaded aperture 94 of the casing neck 83.

When the shaft is rotated in the direction of the arrow, the driving cam 82 will cause driven cam 89 to oscillate the distance of the cam drop 87. The return spring 23 of Fig. 1 may be omitted for the pressure of the tool on the hammered surface may be relied on to cause the driven cam to ride the cam surfaces. Furthermore, by manually controlling the degree of pressure, the amount of hammer travel can be controlled.

In the various modifications, the forward movement of the tool is at all times under the power of the main drive.

I have thus described my invention, but I desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of my invention, and, therefore, I claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of my invention are attained, and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to attain these objects and accomplish these results.

What I claim and desire to secure by Letters Patent, is as follows:

1. An oscillatory device comprising a supporting member; a rotating driving cam unit journalled therein, having a transversely faced, spirally formed cam surface with a circumferential cam drop of predetermined height; a driven cam journalled in said supporting member, provided with a cam surface operable by the cam surface of the driving cam unit, for propelling the driven cam and the driving cam unit away from each other a distance equal to the height of the driving cam drop; a tool actuated by said driven cam; locking means for preventing the rotation of said tool when the driving cam is rotating with respect to the driven cam; and means automatically operable for permitting the driven cam and the driving cam to rotate together as a unit when the direction of rotation of the driving cam is reversed; said driven cam normally pressed against said driven cam unit during the rotation of the driving cam unit.

2. An oscillatory device comprising a supporting member; a rotating driving cam unit journalled therein, having a transversely faced, spirally formed cam surface with a circumferential cam drop of predetermined height; a driven cam journalled in said supporting member, provided with a cam surface operable by the cam surface of the driving cam unit, for propelling the driven cam and the driving cam unit away from each other a distance equal to the height of the driving cam drop; a tool actuated by said driven cam; locking means for preventing the rotation of said tool when the driving cam is rotating with respect to the driven cam; said driving cam unit composed of two sections, each provided with spirally formed cam surfaces and corresponding cam

drops adjacent each other, whereby the two sections will interlock and operate as a unitary driving cam against the driven cam when the driving cam unit is rotated in one direction and when the direction of rotation is reversed, the section of the driving cam unit adjacent the driven cam will interlock with the driven cam and cause the two sections to be propelled away from each other a distance equal to the height of their respective cam drops; said driven cam normally pressed against said driving cam unit during the rotation of the driving cam unit.

3. In a hand piece having a driving shaft terminating in an integrally attached bevel gear, and a hollow collar provided with a peripherally formed bevel gear having its axis at right angles to the axis of the driving shaft and in engagement with the bevel gear at the end thereof; an oscillating mechanism comprising a three section shaft for insertion within the hollow collar, one end section of which is integrally connected to the collar, and having the adjacent faces of said pieces provided with oppositely formed spirally shaped cam surfaces and cam drops; a tool actuated by the remaining end of said pieces; locking means for preventing rotation of said tool; one set of adjacent cam surfaces interlocking and operating as a unitary unit causing the tool to be propelled a distance equal to the height of the cam drop of the remaining cam faces when the collar is rotated in one direction, and when the direction of rotation is reversed, the remaining set of adjacent cam faces will interlock and cause the tool to be propelled a distance equal to the height of the cam drops of the non-interlocking cam surfaces.

HARRY DANIEL GREENBERG.