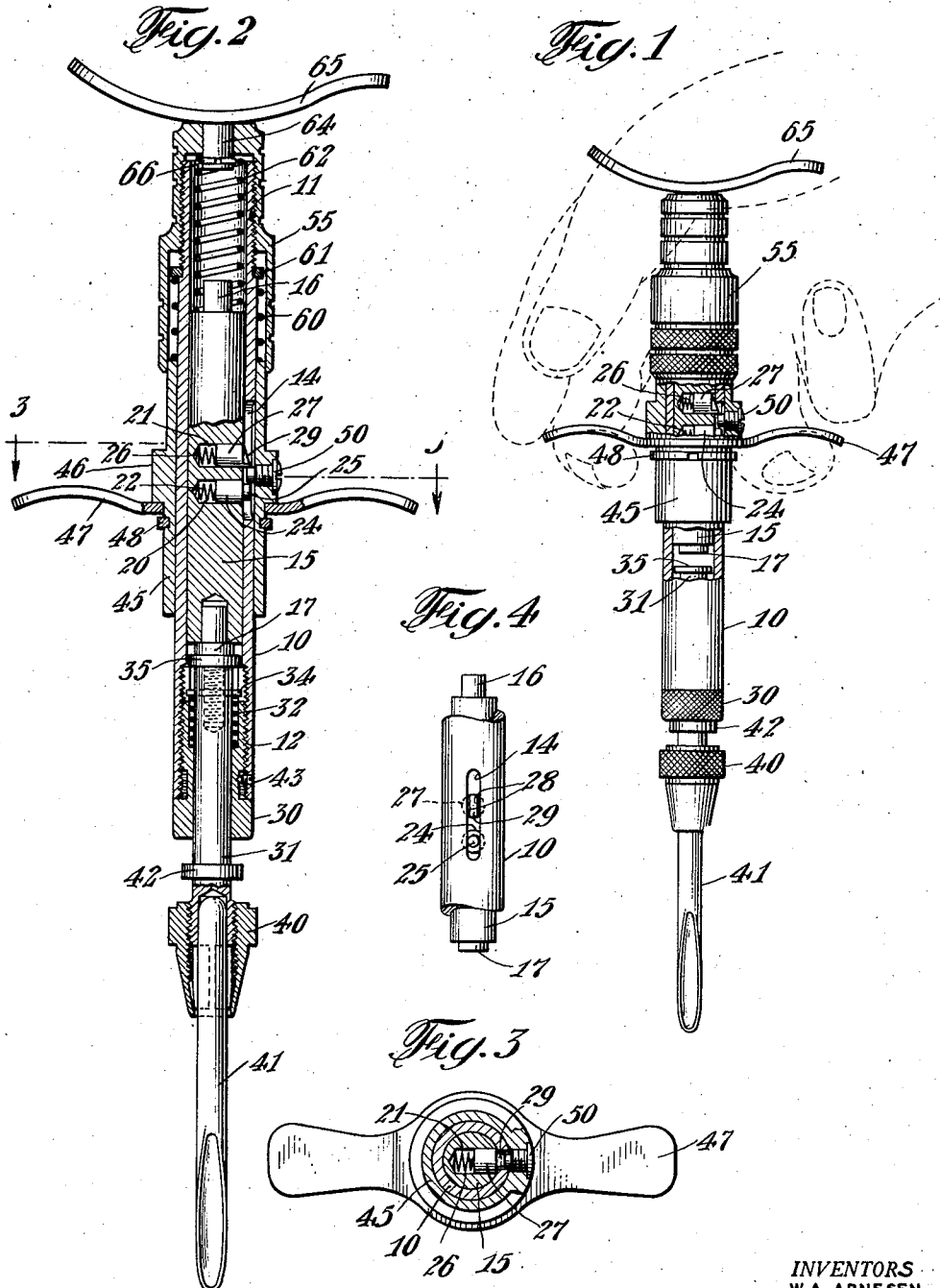


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DENTAL AND SURGICAL HAMMER

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## DENTAL AND SURGICAL HAMMER

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This invention relates to improvements in dental and surgical hammers, and more particularly to improvements in such hammers embodying self-contained mechanism for applying a percussive blow to a tool carried thereby.

The present invention constitutes an improvement over the instrument shown and described in Reiter, Patent No. 1,837,067, issued December 15, 1931, for "Automatic surgical mallet."

An object of the invention is to provide an instrument of the foregoing type in which a piston, spring-actuated for imparting a sharp blow to a cutting instrument, has associated therewith improved means for so moving the piston as to compress the spring and for releasing the spring to exert its pent-up pressure at a predetermined time.

Another object of the invention is to provide piston-operating means composed of a pin movable radially of the piston and having its upper surface tapered or cammed to engage a part of an enclosing cylinder under the impetus of a moving device whereby such engagement of the cam surface releases the pin from the engaging device, simultaneously releasing the piston for movement under the impetus of an internal spring.

Another object of the invention is to provide in an instrument as above described special impact surfaces on the ends of parts thereof which are brought into percussive contact.

A further object of the invention is to provide, in addition to the radially movable pin before described, a second radially movable pin cooperating with a formation in a wall of the cylinder for limiting movement of the piston carrying such pins.

A still further object of the invention is to provide simplified means whereby parts of the instrument can be held in assembly.

In carrying out the foregoing and other objects of the invention, use is made of a cylinder member within which is slideably mounted a piston. One end of the cylinder is closed by a cap member which retains a spring in position between one end of the piston and the cap. The other end of the cylinder is closed by a housing for a chuck carrying rod, such chuck carrying rod being movable relative to the housing. The outer end of this rod is provided with a chuck for holding a chisel, bit, or other type of cutting device to be used with this instrument. Surrounding the cylinder is an actuating member composed in part of a sleeve to which is loosely attached a member having wings for engagement with the fingers of an operator and having

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a screw member passing through the wall of the sleeve with a part of the end of the screw extending into a slot in the cylinder. The cylinder is provided with spaced radial bores which are normally aligned substantially with the slot in the cylinder. In each of these radial bores is mounted a spring compressed by a pin somewhat of the order of a lock tumbler pin. The outer end of one pin is of substantially cylindrical form with the end rounded, the cylindrical form being of a diameter to fit closely in the slot in the cylinder with the shoulder surrounding this cylindrical part engaging the inner wall of the cylinder on each side of the slot. The other pin is of similar diameter in its major portion but has diametrically opposite flats of such size as to provide an intermediate portion fitting closely between the walls of the slot, and the end of this portion is cammed to slope inwardly from the chuck end of the instrument toward the opposite end thereof. The actuating screw carried by the sleeve before mentioned engages the high end of this cammed surface and is positioned between the two pins. The result of such engagement and of the construction is that movement of the actuating member away from the chuck causes movement simultaneously of the piston in the same direction. When the cammed surface contacts one end of the slot in the cylinder, continued movement forces the pin carrying this surface inwardly of the piston until the high part of the cammed surface is depressed sufficiently to clear the end of the actuating screw, at which time the piston is released to move in the opposite direction under the impetus of the spring interposed between the upper end of the piston and the cap before mentioned, and to impart a percussive blow to the chuck carrying rod.

Other features, objects and advantages of the invention will become apparent by reference to the following detailed description of the accompanying drawings illustrating the same, wherein:

Fig. 1 is a side elevation partially in vertical section of an instrument embodying the invention and in position immediately prior to release of the piston affording a percussive blow;

Fig. 2 is an enlarged vertical section through an instrument embodying the invention;

Fig. 3 is a section taken substantially on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary view showing the manner in which the pins previously mentioned cooperate with the slot in the cylinder wall.

Referring now to the drawings, and particular-

ly to Fig. 2, 10 indicates generally a cylinder made of some suitable material such as brass or any other desired metal, preferably of a type that may be plated to withstand the effects of sterilization. The upper end of this cylinder 10 is externally threaded as at 11, while the lower end thereof is internally threaded as at 12. Intermediate the ends of the cylinder the wall thereof is provided with a slot 14, shown both in Figs. 2 and 3, the latter view indicating clearly the width and relative length of the slot. Slideably mounted within limits within the cylinder 12 is a piston 15, preferably made of the same metal as the cylinder 10. The upper end of piston 15 has a neck portion 16, while the lower end thereof is hollowed out to receive a hammer element 17 press-fitted into the end of the piston. This hammer element 17 is preferably made of hardened stainless steel or any other material suitable for imparting and absorbing percussive shocks.

Intermediate the ends of the cylinder 15 are provided two bores 20 and 21 extending radially a considerable distance through the piston. Positioned in the bottom of the bore 20 is a small spring 22 held in place by a pin 24, the outer end of which has a cylindrical neck 25, the end of which is rounded. The other bore 21 likewise has a spring 26 therein held captive by a pin 27, the outer end of which is provided with opposite flats 28, while the end thereof is provided with a flat cammed surface 29 extending inwardly of the device from bottom to top, as viewed in Fig. 2. The neck part 25 has a diameter of such size as to fit closely but slideably within the slot 14, while the two flats 28 are so spaced as likewise to fit closely but slideably in the same slot. The respective shoulders on the pins 24 and 27 formed by the projection of the neck 25 and the flats 28 are of such configuration as to engage the inner surface of the cylinder 12 on each side of the slot 14, as shown in both Figs. 2 and 3.

Threaded into the outer end of the cylinder 10 is a housing 30 for a chuck carrying rod 31. The housing 30 has a portion thereof externally threaded to engage the internal threads 12; has a hollow bore for the passage of the rod 31 with the upper end of the bore enlarged to receive a coiled spring 32 surrounding rod 31 and held compressed by a through pin 34, the ends of which are free to move in diametrically opposite longitudinally extending slots in the upper part of the housing 30. Thearedly secured to the upper end of the rod 31 is an anvil member 35 of diameter larger than the hammer member 17 but preferably made of the same material as the hammer member 17. The anvil member 35 is of sufficient diameter to overlie the upper end of the housing 30.

The lower end of the rod 31 is hollowed out with its extremities split to form chuck fingers which can be constricted by a rotatable member 40 threaded onto the end of the rod and having a suitable formation to constrict the chuck fingers. This chuck is adapted to hold a chisel, gouge or other instrument, as indicated at 41, against withdrawal or against relative rotation. The rod 31 is provided intermediate its ends with an external annular shoulder 42, the purpose of which will be explained later. A set screw 43 threaded through the cylinder and engaging the housing 30 prevents movement of the housing and also rod 31, due to through pin 34.

Surrounding a part of cylinder 10 is a sleeve member 45 which has an enlargement 46, against the lower edge of which is retained a freely ro-

tatable double wing-like member 47, the wings of which are shaped to be engaged by fingers of an operator. This member 47 is retained in place by its engagement with the enlargement 46 and also by a spring ring 48 fitting in a shallow groove cut in the outer surface of sleeve 45. The enlargement 46 has a through aperture internally threaded for the reception of a screw 50, the end of which is provided with a smooth neck of diameter to fit in the slot 14 between the neck 25 and the high end of the tapered or cammed surface 29.

Secured to the upper end of the cylinder 10 is a cap member which has a portion of internal diameter to be internally threaded into engagement with threads 11, and another portion of larger internal diameter to encompass a coiled spring 60 surrounding the cylinder 10 and held captive between the upper end of the sleeve 45 and a spring split ring 61 seated in a shallow groove in the wall of cylinder 10. This latter part of the cap extends down far enough to normally overlie the upper end of the sleeve 45 and is of such dimensions as to permit the sleeve to be retracted into the cap against tension of spring 60. Another spring 62 is entrapped in the space between the top of piston 15 and the top of cap 55, the neck 16 of the piston fitting within the spring. The top of cap 55 has a through aperture to loosely receive a stud 64 on the underside of a hand fitting member 65, such stud being loosely retained in place by a spring ring 66 fitting in a shallow groove in the stud.

When the device is assembled, the piston 15 can be interposed into the cylinder 10 at the threaded end thereof and pressed upwardly. The cam surface 29, upon engaging the lower edge of the wall of the cylinder, will be moved inwardly of the piston, permitting the piston to slide upwardly in the cylinder, while the pin 24 can be depressed until the neck 25 will engage under the wall of the cylinder, at which time the piston can be moved upwardly with the parts 29 and 25 in substantial alignment with slot 14 until this slot is reached, at which time the ends of the respective pins will protrude into the slot and thereby restrain the piston from undesired movement in either direction.

The operation and use of the instrument is substantially as follows. With all parts in the relative position shown in Fig. 2, and particularly with a cutting tool 41, such as a chisel, gouge or the like, engaged in the chuck on the end of rod 31, the instrument can be manipulated to apply repeated percussive blows to the upper end of rod 31 so that such blows can be transmitted to the cutting end of the tool 41. To accomplish such a percussive blow, the sleeve 45 is moved upwardly by a clenching of the operator's hand, the instrument being held with the member 45 against the heel of the hand and between the thumb and forefinger thereof and with two fingers engaged under the wings of the part 47. Movement of sleeve 45 upwardly carries piston 15 along with it, since the neck of screw 50 is in register with the groove 14 and lies between the neck 25 and the high edge of the cam surface 29. When the lower edge of cam surface 29 contacts the upper end wall of slot 14, continued movement of sleeve 45 upwardly causes the pin 27 to be moved inwardly radially of the piston, and such movement continues until the piston has been moved upwardly a distance sufficient to cause the pin 27 to be depressed an amount necessary to clear the inner

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end of the neck of the screw 50, at which time the higher edge of surface 29 is free to pass under the screw 50. At this time the spring 62 having been compressed by the upward movement of the piston forces the piston downwardly to cause the hammer member 17 to strike the anvil member 35. During the initial stages of upward movement of the piston the rod 31 follows such movement until the annular shoulder 42 engages the lower end of a housing member 30. Such following action is due to the spring 32 expanding and forcing the pin 34 upwardly, the ends of the pin riding in the slot in the housing 30. As soon as the collar 42 contacts the lower end of housing 30, further upward movement of rod 31 is arrested, and such arrest occurs well before the end of the upward movement of the piston. As will be seen by reference to Fig. 2, a gap is created between the hammer 17 and the anvil 35, which gap is widened until the pin 27 is released from duress by the screw 50. When this release occurs, as before mentioned, the piston 15 is immediately forced downwardly by expansion of spring 62 with the result that hammer 17 strikes anvil 35 a sharp blow, causing depression of hammer 35 and consequent downward movement of rod 31. This downward movement continues until the lower edge or surface of anvil 35 rests against the upper edge of the housing 30 within the cylinder 10.

Upward movement of sleeve 45 before described compresses the spring 60 surrounding the cylinder 10 with the result that, when finger pressure is released from the wings of member 47, spring 60 expands, carrying the sleeve downwardly and eventually causing the end of the neck of screw 50 to engage the cam surface 29 and ride thereover, momentarily depressing pin 27, the downward movement of the sleeve being continued until the neck of screw 50 contacts the neck 25 of pin 24. The parts are then in their normal position ready for a repeated operation of the instrument to cause the transmission of the force of a percussive blow from the hammer to the cutting edge of the tool 41.

The pin 24 with its neck part 25 fitting closely but slideably in the groove 14 prevents any possible rotation of piston 15 in the cylinder at such time as the pin 27 might be depressed to an extent sufficient to permit the piston to rotate were this neck 25 omitted. Also, the neck 25 serves as a stop limiting downward movement of the screw 50 and thereby determining the normal position of sleeve 45. This pin 24 and neck 25 also have the function of preventing the piston from being forced downwardly in the cylinder an undesired amount should the housing 30 be withdrawn for inspection or repairs or for any other purpose. As before mentioned, the various parts of the device, with the exception of the portions 17 and 35, can be made of any suitable material, such as brass, which can be plated to withstand the action of sterilizing fluids at high temperature, while the parts 17 and 35 are preferably made of such hardened material as to remain undamaged after repeated use of the instrument with attendant percussive blows of one on the other. The use of ring split members 43, 61 and 66 facilitates assembly or dismantling of the instrument and reduces the cost of machined parts materially.

From the foregoing it will be seen that the present invention provides an improved dental or surgical hammer of the utmost simplicity but of a ruggedness suitable for repeated use without material wear. The parts subject to most wear

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can be readily replaced with a minimum of expense and labor attendant thereto. It is to be understood that modifications beyond the illustrated embodiments can be made without departing from the spirit of the invention, and accordingly such limitations as to be imposed thereupon are only those set forth in the following claims.

What is claimed is:

1. An instrument of the type described comprising a cylinder, a piston slideable in said cylinder, a tool carrying rod slideably secured in one end of said cylinder, means for limiting sliding movement of said rod, said cylinder having a longitudinally extending slot in the wall thereof intermediate the ends of the cylinder, an outwardly biased pin movable radially in said piston and having a portion fitting in and extending partially through said slot, a spring captive at one end of said piston, and a member extending partially through said slot and engaging said portion to move it and said piston in a direction to compress said spring, said tool carrying rod being normally held by said piston at the outer end of its limit of movement and being biased to follow said piston to the inner end of its limit of movement as the piston compresses said spring, said portion being disengaged from said member by progressive engagement with the end wall of said slot whereby said piston is freed to impart a blow to said rod and drive it from one end of its limit of movement to the other end thereof.

2. An instrument of the type described comprising a cylinder, a piston slideable in said cylinder, a tool carrying rod slideably secured in one end of said cylinder, means for limiting sliding movement of said rod, said cylinder having a longitudinally extending slot in the wall thereof intermediate the ends of the cylinder, an outwardly biased pin movable radially in said piston and having a portion fitting in and extending partially through said slot, said pin having shoulders on each side of said portion engaging and slideable along the inner wall of said cylinder adjacent the edges of said slot, said shoulders limiting outward movement of said pin, the outer end of said portion having a cam surface, and having parallel side walls cooperating with the walls of said slot to prevent rotation of the pin relative to the cylinder, spring captive at one end of said piston, and a member extending partially through said seat and engaging said portion to move it and said piston in a direction to compress said spring, said tool carrying rod being normally held by said piston at the outer end of its limit of movement and being biased to following said piston to the inner end of its limit of movement as the piston compresses said spring, said portion being disengaged from said member by cam action of said cam surface against the end wall of said slot whereby said piston is freed to impart a blow to said rod and drive it from one end of its limit of movement to the other end thereof.

3. An instrument of the type described comprising a cylinder, a piston slideable in said cylinder, a tool carrying rod slideably secured in one end of said cylinder, means for limiting sliding movement of said rod, said cylinder having a longitudinally extending slot in the wall thereof intermediate the ends of the cylinder, an outwardly biased pin movable radially in said piston and having a portion fitting in said slot, the outer end of said portion having a cam surface and having parallel side walls cooperating with the walls of said slot to prevent rotation of the pin relative to the cylinder, a second outwardly

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biased pin movable radially in said piston and having a neck fitting in and extending partially through said slot to prevent rotation of said piston relative to said cylinder, a spring captive at one end of said piston, and a member fitting between said portion and said neck, said member engaging said portion to move it and said piston in a direction to compress said spring, said tool carrying rod being normally held by said piston at the outer end of its limit of movement and being biased to follow said piston to the inner end of its limit of movement as the piston compresses said spring, said portion being disengaged from said member by cam action of said cam surface against the end wall of said slot whereby said piston is freed to impart a blow to said rod and drive it from one end of its limit of movement to the other end thereof.

4. An instrument of the type described comprising a cylinder, a piston slideable in said cylinder, a tool carrying rod slideably secured in one end of said cylinder, means for limiting sliding movement of said rod, said cylinder having a longitudinally extending slot in the wall thereof intermediate the ends of the cylinder, a pin movable radially in said piston and having a portion fitting in and extending partially through said slot, the outer end of said portion having a cam surface and having parallel side walls cooperating with the walls of said slot to prevent rotation of the pin relative to the cylinder, a spring captive at one end of said piston, and a member extending partially through said slot and engaging said portion to move it and said piston in a direction to compress said spring, said tool carrying rod being normally held by said piston at the outer end of its limit of movement and being biased to follow said piston to the inner end of its limit of movement as the piston compresses said spring, said portion being disengaged from said member by cam action of said cam surface against the end wall of said slot whereby said piston is freed to impart a blow to said rod and drive it from one end of its limit

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of movement to the other end thereof, said piston and said rod having hardened inserts in the contacting ends thereof.

5. An instrument of the type described comprising a cylinder, a piston slideable in said cylinder, a tool carrying rod slideably secured in one end of said cylinder, means for limiting sliding movement of said rod, said cylinder having a longitudinally extending slot in the wall thereof intermediate the ends of the cylinder, a pin movable radially in said piston and having a portion fitting in and extending partially through said slot, a spring, a cap attached to said cylinder and holding said spring captive at one end of said piston, a sleeve carrying a member extending partially through said slot and engaging said portion to move it and said piston in a direction to compress said spring, said tool carrying rod being normally held by said piston at the outer end of its limit of movement and being biased to follow said piston to the inner end of its limit of movement as the piston compresses said spring, said portion being disengaged from said member by progressive engagement with the end wall of said slot whereby said piston is freed to impart a blow to said rod and drive it from one end of its limit of movement to the other end thereof, and a second spring surrounding said cylinder for restoring said sleeve to normal position, said cap having a skirt portion covering said second spring.

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