

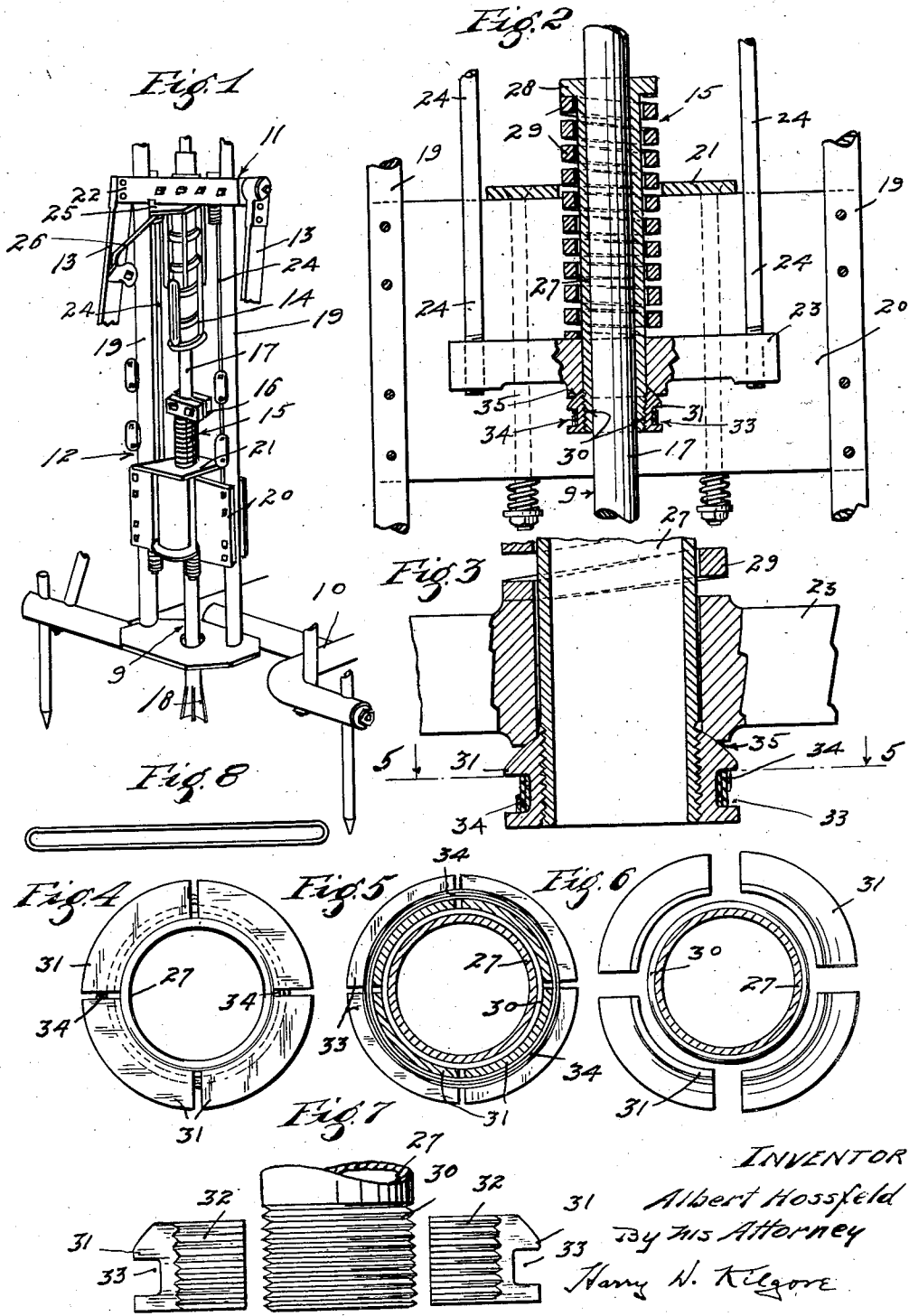
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BUFFER SPRING DEVICE FOR DRILLING MACHINES

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BUFFER SPRING DEVICE FOR DRILLING MACHINES

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My present invention relates to improvements in buffer spring devices for use in drilling machines of the type disclosed and broadly claimed in my United States Letters Patent No. 1,888,668, issued November 22, 1932.

The drill in the type of drilling machine above referred to is mounted on a reciprocating carriage for endwise reciprocating movement that is independent of the reciprocating movement of the carriage. A pair of compression springs is provided for reciprocating the drill at a greater speed than that of the carriage. One of these springs acts as a propelling spring for the drill to produce its operative stroke and the other of said springs acts as a buffer spring for starting the comparatively heavy drill on its upward stroke and accelerate its movement. The propelling spring is placed under tension by the drill during its return stroke and drives said drill by its expanding movement at high velocity during its operative stroke. The buffer spring is placed under tension during the first part of the return stroke and its expanding movement during the latter part of the stroke retracts the drill at high velocity. Due to the high velocity at which the drill is operated, the life of ordinary propelling and buffer springs is relatively short.

The objection to the ordinary propelling spring was overcome by substituting therefor a novel spring device disclosed and broadly claimed in my United States Letters Patent No. 1,930,098, issued October 10, 1933, and entitled "Spring device for drilling machines."

It is well known that it is not the normal compression and expansion of a compression spring that shortens its life, but the stretch thereof that takes place beyond the normal expansion of a spring expanding at high velocity.

The objects of this invention are: first, to provide positive means for preventing a buffer spring from stretching beyond its normal expanding limit; second, to provide a buffer spring assembly that will not loosen up or come apart under the terrific strain placed thereon by the high velocity of the drill and its reciprocatory travel; third, to provide a buffer spring assembly that can be quickly and easily placed in its operative position in a drilling machine while in the field; and fourth, to provide a buffer spring assembly in which the several parts thereof can be put together without the use of tools.

To the above end, generally stated, the invention consists of the novel devices and combination of devices hereinafter described and defined in the claims.

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In the accompanying drawing which illustrates the invention, like characters indicate like parts throughout the several views.

Referring to the drawing:

Fig. 1 is a fragmentary perspective view of a drilling machine having the present invention embodied therein;

Fig. 2 is an enlarged view of the buffer spring assembly in central longitudinal section and also showing, fragmentarily, associated parts of the drilling machine;

Fig. 3 is a view corresponding to Fig. 2, but showing only the lower portion of the buffer spring assembly and the lower cross-head of the drilling machine;

Fig. 4 is a bottom plan view of the buffer spring assembly, as shown in Fig. 3;

Fig. 5 is a view in horizontal section taken on the line 5—5 of Fig. 3;

Fig. 6 is a view corresponding to Fig. 5, with the exception that the collar quadrants are separated from the sleeve member;

Fig. 7 is a view partly in elevation with the sleeve member and the collar quadrants separated, as shown in Fig. 6; and

Fig. 8 is a view showing one of the rubber bands used in holding the collar quadrants applied to the sleeve.

Of the parts of the drilling machine shown, it is important to note the drill 9, the main frame 10, the carriage 11, the tilting frame 12, the connecting rods 13 for reciprocating the carriage 11 on the frame 10, the drill propelling spring device 14, the buffer spring assembly 15, which is the subject matter of the present invention, and the friction grip 16. The drill 9 includes a body 17 in the form of a long round steel rod and a cutter 18 on one end of said body. This drill 9 is mounted on the carriage 11 for compound reciprocating and rotary movements.

The tilting frame 12 includes a pair of laterally spaced guide posts 19 and a pair of cross-tie plates 20 rigidly secured thereto and held laterally spaced thereby, the one from the other. A striker plate 21 for the grip 16 rests on the cross-tie plates 20 and is secured thereto.

The carriage 11 includes an upper cross-head 22 slidably mounted on the posts 19, a lower cross-head 23 that affords a spring base and a pair of rods 24 which hold said lower cross-head suspended from the upper cross-head 22 between the cross-tie plates 20. The drill 9 extends axially through the spring device 14 and the buffer spring device 15. Said spring device 14, at its outer end, is attached to a rotatable bear-

ing 25 on the cross-head 22 and is oscillated during reciprocatory movement of the carriage 11 by connections 26 from said bearing to the tilting frame 12.

Obviously, the bearing 25 and hence the upper cross-head 22 afford a base of resistance for the spring device 14 and the spring of the buffer spring device 15 rests on the lower cross-head 23 which affords a base of resistance therefor. The friction grip 16 is mounted on the drill body 17 between the spring device 14 and the buffer spring assembly 15. Normally the cutter 18 of the drill 9 rests on the material being drilled, the friction grip 16 just contacting the striker plate 21 and the fully expanded buffer spring assembly 15 just contacting the friction grip 16.

Operation of the drilling machine thus far described may be briefly described as follows, to wit:

As the carriage 11 starts on its upward travel, the buffer spring assembly 15 is compressed against the friction grip 16 and absorbs the shock of starting the comparatively heavy drill 9 on its upward stroke. As the carriage gradually slows down and comes to a stop at the upper end of its travel the compressed buffer spring assembly 15 expands thus retracting the drill 9 to a much higher speed than that attained by the carriage 11 at any point of its travel. During this upward travel of the drill 9, the grip 16 engages the propelling spring device 14, compresses the same under powerful tension and at which time the propelling spring device 14 absorbs the shock of the drill 9 and brings the same to a stop at the limit of the upward travel of the carriage 11. Downward movement of the carriage 11 gives the drill 9 a powerful downward throw which is accelerated by the expansion of the compressed propelling spring device 14 and causes the drill 9 to attain a high velocity as it travels to its work. At or practically at the end of the downward stroke of the drill 9, the grip 16 is brought to a stop by its engagement with the striker plate 20 and as the drill 9 advances into the work, it drives itself through the grip 16 by the force of its momentum. The feeding of the drill 9 through the grip 16 takes place at a series of almost imperceptible steps of movement.

For the purpose of this case, it is not thought necessary to describe in detail the rotary movement imparted to the drill 9 except to state that during the downward travel of the carriage 11, and while the grip 16 is in engagement with the spring device 14, said spring device is given a turning movement about its longitudinal axis by the connections 26 which imparts a like movement to said drill by frictional engagement between the spring device 14 and the grip 16.

Referring now to the buffer spring assembly 15, in detail, the same includes a long sleeve 27 through which the drill 9 loosely extends. This sleeve 27 has on its upper end a spring seat 28 in the form of an annular shoulder that surrounds said sleeve. Encircling the sleeve 27 is a coiled spring 29. The lower end portion of the sleeve 27 has formed thereon a multiplicity of independent serrations 30. These serrations 30 lie in parallel planes and each thereof is endless. A serrated collar 31 is applied to the serrated end portion of the sleeve 27 and comprises separate quadrants. This collar 31 is internally serrated at 32 to match the serrations 30. An annular external channel 33 is formed in the collar 31. The collar 31 is yieldingly held on the sleeve 27 with its serrations 32 interlocked with the serra-

tions 30 of said sleeve by a plurality of rubber bands 34, one of which is shown in Fig. 8. Each rubber band 34 is applied around the collar 31 in its channel 33 and stretched so that it is under strain to draw the collar quadrants onto the sleeve 27. It is important to note that the ends of the collar quadrants are spaced apart so as not to interfere with the clamping of said quadrants onto the sleeve 27.

The sleeve 27 extends axially through a hole in the lower cross-head 23 with the spring 29 between the lower cross-head 23 and the spring seat 28 and the collar 31 is under the lower cross-head 23. In the under side of the cross-head 23 is a seat 35 for the collar 31. This seat 35 and the upper end portion of the collar 31 have beveled or ball and socket engagement, the one with the other. The adjustment of the collar 31 on the sleeve 27 is such that when pressure is removed from the buffer spring assembly 15, the spring 29 is held under slight compression. At the time the buffer spring assembly 15 engages the grip 16, which is during the upward travel of the carriage 11, the spring 29 is compressed by the force of this engagement. The compression of the spring 29 moves the sleeve 27 endwise downwardly through the cross-head 23 and the collar 31 out of the seat 35. When pressure is removed from the buffer spring assembly 15, the compressed spring 29 expands and returns the sleeve 27 and the collar 31 to their original positions. At the time the collar 31 enters the seat 35, the beveled or ball and socket surfaces thereof center the collar 31 in the seat 35 and the sleeve 27 in the hole in the cross-head 23.

From the foregoing, it is evident that the spring 29 is positively stopped from expanding beyond a predetermined point and this point is determined by the distance the spring seat 28 is positioned from the cross-head 23 and the nut 31.

It has been found that by limiting the expanding movement of the spring 29 to prevent stretch thereof beyond its normal length, the life of said spring was materially increased.

The rubber bands 34 hold the collar 31 on the sleeve 27 so that there is no lateral movement of said collar relative to the sleeve and said collar will not work up or down on the sleeve 27 under the action of the jars produced on the buffer spring assembly 15 by its engagement with the grip 16 and the alternate engagement of the collar 31 with the cross-head 23.

To remove the collar 31 from the sleeve 27 it is only necessary to remove the rubber bands 34 from said collar and slightly compress the spring 29 to relieve the inward wedging action of the beveled or ball shaped seat 35 against the beveled or ball shaped end of said collar. In the absence of rubber bands, a piece of string or other slightly elastic material wrapped tightly around the collar 31 will serve as a tie and hold it securely to the sleeve 27.

It will be understood that the invention described is capable of various modifications within the scope of the invention herein disclosed and claimed.

What I claim is:

1. In a device of the class described, a structure having a spring base, means for reciprocating the structure at high speed, a sleeve extending through the spring base for relative endwise movement, said sleeve having at one end a spring seat and at its other end portion a plurality of parallel serrations, a sectional serrated collar applied to the serrated end portion of the sleeve

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and having serrations matching the serrations on the sleeve, the sections of the serrated collar being separable by relative lateral movement, means holding the sectional collar contracted onto the sleeve, a spring compressed between the spring base and the spring seat and yieldingly holding the collar in engagement with the spring base, and a tool extending through the sleeve for relative reciprocation and which is thrown to its work by the reciprocating structure, said tool during movement to its work engaging the sleeve, compressing the spring and moving the collar away from the spring base, the expansion of the spring returning the tool from its work.

2. The structure defined in claim 1 in which the means holding the sectional serrated collar contracted onto the sleeve is a yielding means.

3. The structure defined in claim 1 in which the means holding the sectional serrated collar contracted onto the sleeve is a stretched rubber band applied around the collar.

4. The structure defined in claim 1 in which the serrated collar has therein an annular channel, and in which the means holding the sectional serrated collar contracted onto the sleeve is a stretched rubber band in the channel.

5. In a spring device, a spring base, a sleeve extending through the spring base for endwise movement, said sleeve having at one end a spring seat and at its other end portion parallel serrations, a sectional serrated collar applied to the serrated end portion of the sleeve and having serrations that match the serrations on the sleeve, the sections of the serrated collar being separable by relative lateral movement, means holding the collar with its serrations interlocked with the serrations on the sleeve, and a spring compressed between the spring base and the spring seat, said spring base having a seat for the collar, the contacting surfaces between the collar and its seat converging toward the longitudinal axis of the sleeve.

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6. In a spring device, a spring base, a sleeve extending through the spring base for endwise movement, said sleeve having at one end a spring seat and at its other end portion parallel serrations, a sectional serrated collar applied to the serrated end portion of the sleeve and having serrations that match the serrations on the sleeve, the sections of the serrated collar being separable by relative lateral movement, means holding the collar with its serrations interlocked with the serrations on the sleeve, and a spring compressed between the spring base and the spring seat, said spring base and collar having ball and socket engagement.

7. The structure defined in claim 1 in which the sleeve extends through a hole in the spring base with working clearance, said spring base having a seat for the collar, said seat and collar having contacting surfaces that center the sleeve in the hole in the spring base each time the sleeve is moved by the expanding spring.

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