

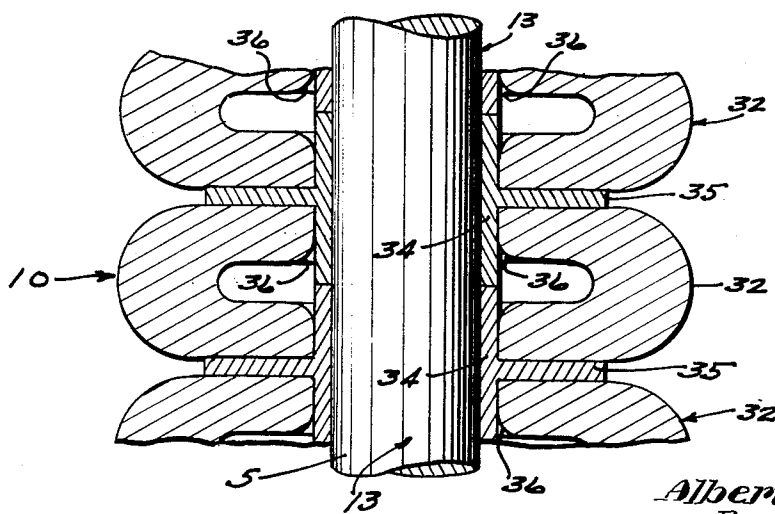
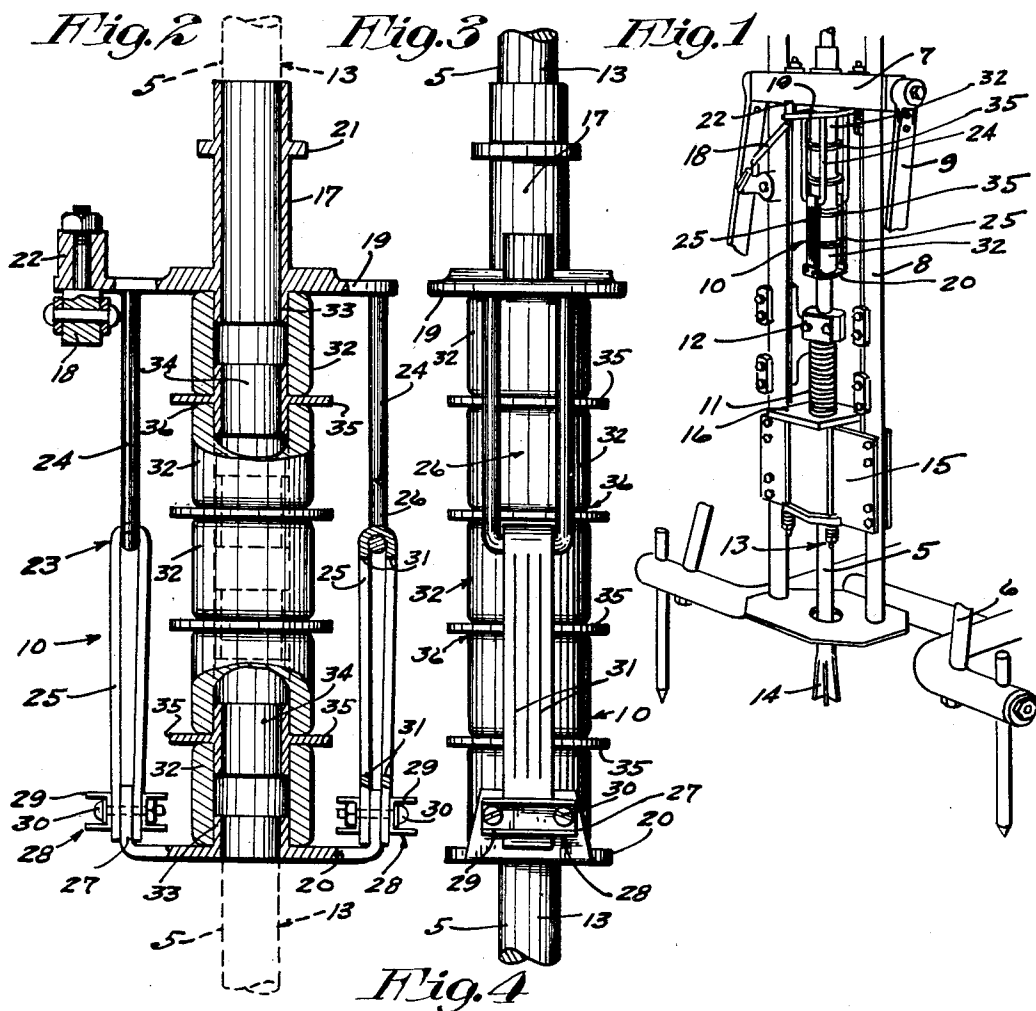
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SPRING DEVICE FOR DRILLING MACHINES

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SPRING DEVICE FOR DRILLING MACHINES

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8 Claims. (Cl. 267—1)

My present invention relates to drilling machines of the type disclosed and broadly claimed in my pending United States application for Letters Patent filed December 4, 1931 under Serial Number 578,883. In this type of drilling machine the drill is mounted on a reciprocatory carriage for endwise reciprocatory movement that is independent of the reciprocatory movement of the carriage and a pair of compression springs are provided for reciprocating the drill at a greater speed than that of the carriage. One of these springs acts as a propelling spring for a drill during its operative stroke and the other of said spring acts as a buffer spring for said drill. The propelling spring is placed under tension by the drill during its return stroke and drives said drill at a high velocity during its operative stroke and the buffer spring is placed under tension during the operative stroke of the drill and returns or retracts the drill at a high velocity.

Due to the high velocity at which the drill is operated the lives of the propelling and buffer springs are relatively short and particularly the propelling spring.

The object of this invention is to provide a simple and highly efficient compression spring device intended for general use but especially designed to take the place of either the propelling spring or the buffer spring, or both, in a drilling machine.

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

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 improved spring device embodied therein as a propelling spring for the drill;

Fig. 2 is a fragmentary view of the compression spring device and drill, some parts being broken away and other parts being sectioned, on an enlarged scale;

Fig. 3 is a side elevation of the parts shown in Fig. 2; and

Fig. 4 is a fragmentary view principally in section showing the spring device compressed to its limit.

The drilling machine fragmentarily illustrated in the drawing is fully shown, described and broadly claimed in the application heretofore identified.

Of the parts of the drilling machine shown, it is

important to note the drill 5, the main frame 6, the carriage 7, the tilting frame 8, the connecting rods 9, for reciprocating the carriage 7 on the tilting frame 8, the compression spring device 10, which is the subject matter of the present invention, the compression buffer spring 11 and the friction grip 12 on the drill 5. The drill 5 includes a body 13, in the form of a long round steel rod, and a cutter 14 on one end of said body. This drill 5 is mounted on the carriage 7 for compound reciprocatory and rotary movements.

A pair of laterally spaced cross-tie plates 15, which form a part of the tilting frame 8, support a striker plate 16 for the grip 12. The drill 5 extends axially through the spring device 10 and the compression spring 11 and the outer end of the carriage 7 affords a base of resistance for the spring device 10 and the inner end of said carriage affords a like base for the buffer spring 11. The friction grip 12 is mounted on the drill body 13 between the spring device 10 and the spring 11, normally rests on said spring 11, and supports the drill 5 therefrom with the grip 12 above the striker plate 16 and normally out of contact therewith. The spring device 10 is secured to a rotatable bearing 17 on the carriage 7 which is oscillated, during the reciprocatory movement of said carriage, by connections 18 from said bearing to the tilting frame 8.

The operation of the improved drilling machine may be briefly described as follows, to wit: Upward movement of the carriage 7 gives the drill 5 a powerful throw upward through the medium of the buffer spring 11 acting on the grip 12 and the force of this upward throw, which causes the drill 5 to travel at a greater speed than that of the carriage 7, is caught and absorbed by the spring device 10 which is compressed and placed under tension by the grip 12 under the action of the drill 5.

Downward movement of the carriage 7 gives the drill 5 a powerful downward throw which is accelerated by the expansion of the compressed spring device 10 and causes the drill 5 to attain a high velocity. At or practically at the end of the downward stroke of the drill 5 the grip 12 is brought to a stop by its engagement with the striker plate 16 and as the drill 5 advances into the rock it drives itself through the grip 12 by the force of its momentum. The feeding of the drill 5 through the grip 12 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 move-

ment imparted to the drill 5 by the action of the spring device 10 on the grip 12.

Referring now in detail to the improved compression spring device, the same, in addition to the hub 17, includes an outer cross-head 19 and an inner cross-head 20. The cross-head 19 is integral with the inner end of the hub 17 and cooperates with a flange 21 on the outer end portion of the hub 17 to hold said hub against axial movement in the carriage 7 with freedom for rotary movement.

Formed with one of the arms of the cross-head 19, on the outer end thereof, is a boss 22 to which the connections 18 are attached. The inner cross-head 20 is attached to the outer cross-head 19 by two connections 23 one on each side of the spring device 10 and spaced equi-distant from the axis thereof. Each connection 23 includes a U-shaped rod 24, the ends of which are rigidly secured to the outer cross-head 19 and a flexible strap 25 of leather or other suitable material. The rods 24 extend substantially midway between the cross-heads 19 and 20 and afford elongated eyes 26 and the straps 25 are folded upon themselves and extend through said eyes with their transverse portions normally held by the transverse portions of said rods. Formed with the inner crosshead 20, at the ends of its arms, is a pair of apertured ears 27 which extend between the end portions of the straps 25.

Clamps 28 connect the straps 25 to the ears 27 and each thereof includes a pair of transverse channel members 29, the backs of which bear on the outer faces of the respective strap 25 and a pair of nut-equipped bolts 30 which extend through holes in said backs and the apertured ears 27. The nuts on the bolts 30 are held from turning by certain of the sides of said channel members 28. Each end portion of each strap 25 is longitudinally slit at a plurality of transversely spaced points, as indicated at 31, for a purpose that will presently appear.

The improved spring device further includes a cylindrical body member 32 of elastic rubber and comprises a plurality of axially spaced sections, as shown five. Formed with each cross-head 19 and 20 on the inner face thereof is a sleeve 33 which is axially aligned with the hub 17 and of the same internal diameter.

Interposed between the two sleeves 33 are a plurality of floating sleeves 34, as shown four, which have the same external and internal diameters as the sleeves 33. The end portions of the sections of the body member 32 are telescoped onto the sleeves 33 and 34. Normally the sleeves 34 are axially spaced from each other and the sleeves 33 to permit compression of the spring device 10 and said sleeves also act as stops when in engagement with each other to limit the compression of said spring device.

Formed with each sleeve 34, at the longitudinal center thereof, is an external annular flange 35 that extends materially outward of the body member 32. These flanges 35 afford bases for the sections of the body member 32 and also act as fins for the radiation of heat produced by the movement of the drill 5 through the sleeves 33 and 34 and the expansion and contraction of the body member 32. The cross-heads 19 and 20 also assist in the radiation of heat.

During the compression of the spring device 10 the sections of the body member 32 are outwardly displaced or buckled, as shown in Fig. 4. To facilitate the buckling and straightening of the sections of the body member 32, the outer edges

thereof are rounded at 36 so that said sections will roll on the cross-heads 19 and 20 and the flanges 35. The internal diameter of the body member 32 is slightly less than the internal diameter of the sleeves 33 and 34 so that the sections of said body are stretched over the sleeves 33 and 34 and thereby frictionally held in place. The adjustment of the connections 23 is such that the body member 32 is normally held under slight compression and thereby holds the straps 25 taut. During the retracting movement of the drill 5 under the expanding action of the buffer spring 11 the grip 12 engages the inner cross-head 20 and compresses the spring device 10 by buckling the sections of the body member 32 and places said device under tension. The carriage 7, during the compression of the spring device 10, acts as a base of resistance therefore.

During the compression of the spring device 10 the straps 25 move freely in the eyes 26 and considerable torque is produced in the spring device 10. The purpose of the slits 31 in the straps 25 is to permit the several strips formed by said slits to slip upon each other and thereby prevent a tearing action on the straps 25 at the clamps 28.

The straps 25 perform another important function in that they will stretch at the limit of the expanding movement of the spring device 10 and thereby produce a cushioning action that will prevent the cross-head 20 from coming to a sudden stop which would be detrimental to the device.

The spring rubber body member 32 will not crystallize, and hence, has a much longer life than a coiled spring. This spring rubber body member 32 has another important advantage over a steel spring in that the tension thereof remains much the same during the entire compression thereof while in a steel spring the tension increases very fast during the compression thereof. By the use of a spring device that has a substantially constant tension it is possible to materially cut down the ballast weight for a drilling machine and the vibration of said machine is materially reduced.

Obviously, when the sections of the body member 32 are straight they offer great resistance but when once buckled comparatively little pressure is required to hold the same buckled.

What I claim is:

1. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, and a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, one of the cross-heads having a hub axially aligned with its passageway for connecting the device to a relatively fixed support with freedom to turn about its axis.

2. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, one of the cross-heads having a hub axially aligned with its passageway for connecting the device to a relatively fixed support with freedom to turn about its axis, said hub-equipped cross-heads also having means eccentric to the hub for attaching a connection thereto to turn the device about its axis.

3. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, and means having a pair

of flexible straps connecting the cross-heads to hold the parts of the device in assembled relation when the body is expanded, said straps being longitudinally slit.

5 4. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, and a pair of devices on
10 opposite sides of the body member, each of said devices comprising an eye on one of the cross-heads and a flexible strap folded upon itself with its end portions attached to the other cross-head and with its transverse portion extending
15 through said eye, said strap being longitudinally slit.

5. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, and a pair of devices on
20 opposite sides of the body member, each of said devices comprising an eye on one of the cross-heads and a flexible strap folded upon itself with its end portions attached to the other cross-head and with its transverse portion extending through
25 said eye, said straps being longitudinally slit at a multiplicity of transversely spaced points.

6. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, and a pair of devices on
30 opposite sides of the body, each of said devices comprising an eye on one of the cross-heads and a flexible strap folded upon itself with its end portions attached to the other cross-heads and with its transverse portion extending through
35 said eye, each end portion of the strap being longitudinally slit.
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7. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, a pair of spring devices on substantially opposite sides of the body member, one of said devices comprising a U-shaped rod, the ends of which are anchored to one of the cross-heads, and a flexible strap folded upon itself with its ends attached to the other cross-head and with its transverse portion extending toward the arms of said rod for engagement with the transverse portion thereof, the length of said arms being greater than the maximum movement of the device during compression thereof, whereby the strap will move between the arms without bending.
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8. A spring device comprising a pair of cross-heads having axially aligned passageways for a drill, and a cylindrical body member of elastic rubber between the cross-heads in axial alignment with said passageways, a pair of devices on substantially opposite sides of the body member, each of said devices comprising a U-shaped rod, the ends of which are anchored to one of the cross-heads, an ear on the other cross-head and a flexible strap folded upon itself with its ends positioned one on each side of said ear and with its transverse portion extending between the arms of the U-shaped rod for engagement with the transverse portion thereof, and a clamp for securing the two end portions of each strap to the respective ear, the length of said arms being greater than the maximum movement of the device during compression thereof, whereby the strap will move between the arms without bending.
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