March 2, 1954 C. S. RUDEEN 2,670,978

TWINE KNOTTER

Filed Oct. 11, 1951 2 Sheets-Sheet 1

Fig. 1

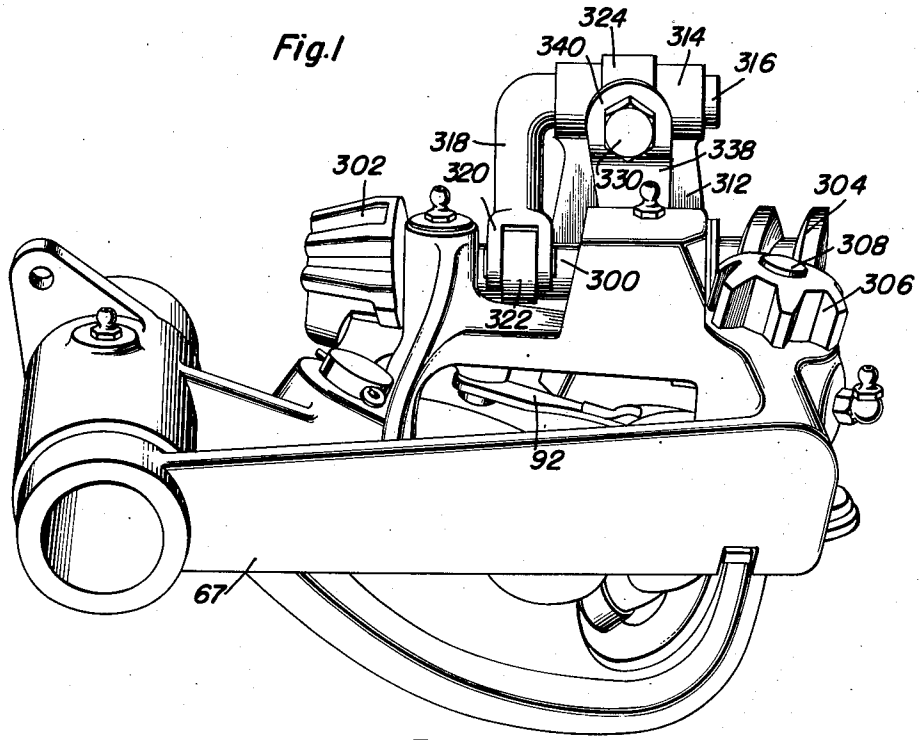
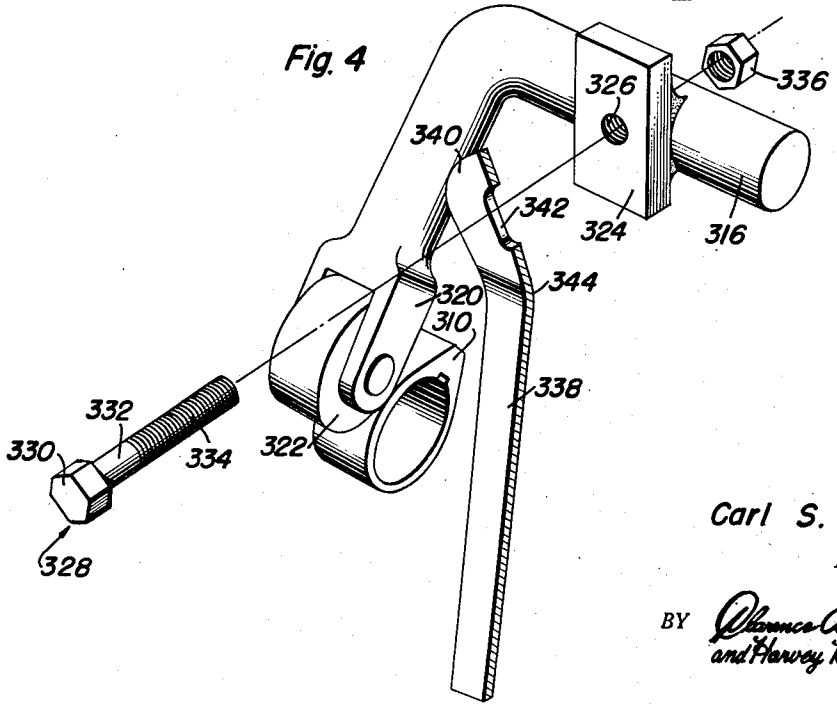


Fig. 4



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March 2, 1954 C. S. RUDEEN 2,670,978

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Filed Oct. 11, 1951 2 Sheets-Sheet 2

Fig. 2

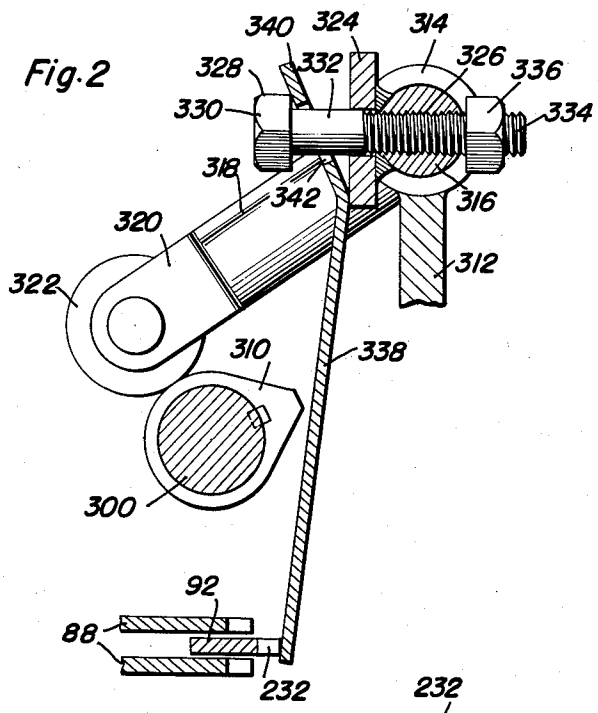
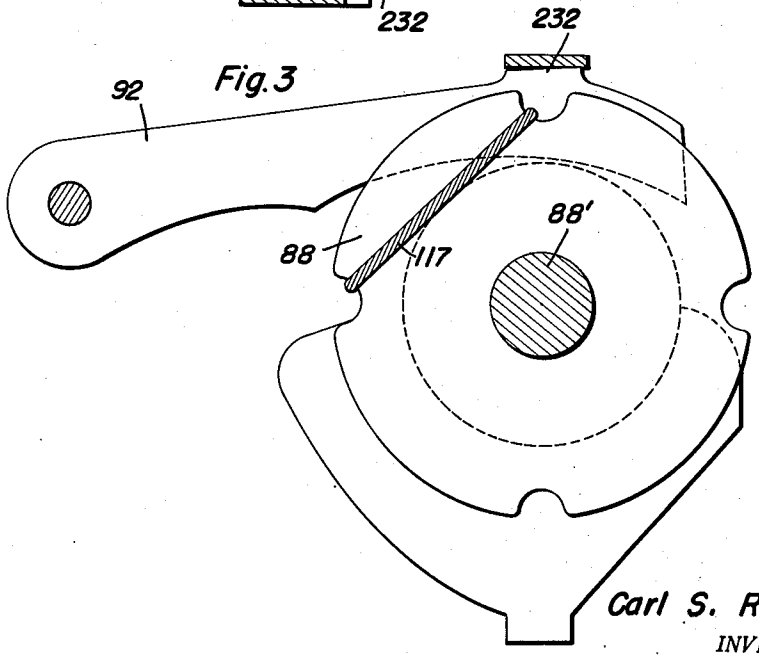


Fig. 3



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TWINE KNOTTER

Carl S. Rudeen, Pocatello, Idaho

Application October 11, 1951, Serial No. 250,824

11 Claims. (Cl. 289—14)

1

This invention comprises novel and useful improvements in a twine knotter or tyer and is a continuation-in-part of my copending application Serial No. 206,161, filed January 16, 1951, now Patent No. 2,644,703, issued July 7, 1953, and is an improvement of the construction of a twine knotter.

The primary object of this invention is to simplify the construction of a mechanism for increasing the pressure on the baling strand during the bale chamber pressing operation and for sequentially decreasing the pressure during the knot tying operation.

A more specific object of this invention is to provide a device for accomplishing the foregoing object in a more positive manner than by methods heretofore known.

A specific improvement over my copending applications, hereinbefore cited, is the replacement of the tensioning means for the trigger plate by a leaf spring tensioning means.

These, together with various ancillary features and objects of the invention, which will later become apparent as the following description proceeds, are attained by the present invention, a preferred embodiment of which has been illustrated, by way of example only, in the accompanying drawings, wherein:

Figure 1 is a perspective view showing a knot tensioning device for balers incorporating therein the novel tensioning means of this invention;

Figure 2 is a vertical transverse sectional detail view taken upon an enlarged scale of a portion of the spring and its tensioning member of Figure 1;

Figure 3 is a horizontal sectional view illustrating the particular portion of the strand tying mechanism on which the controlling elements of the present invention are applied; and,

Figure 4 is a group perspective view of the elements for varying the tension of the trigger spring and associated mechanism of Figure 2.

Reference is now made more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views, those portions of the present invention which are of conventional design or are identical with those disclosed in my above identified copending applications are indicated herein by the same numerals applied in said copending applications, for simplicity and clarity of explanation of the functioning of the improved construction of this application with respect to those of my copending applications.

As shown in the accompanying drawings, the numeral 67 designates generally the knotter supporting frame, mounted in the usual manner upon

2

a baler, this frame journaling a shaft 88' upon which is fixed a pair of holder disks or plates 88 having notched peripheries for receiving a portion of a strand 117 for tying a knot therein. Pivotally mounted upon the support frame 67 is a lever 92 constituting a twine holder trigger, and disposed between the pair of plates 88 as shown in Figures 2 and 3 for frictionally pressing the strand 117 of twine in the notches of the holder plates 18. The trigger 92 is provided with a lug or raised portion 232 for receiving a tensioning means in accordance with this invention, whereby a controllable and variable pressure is applied to the trigger and thence to the strand 117 for varying the tension to which the strand is subjected during the tying and baling operation.

Journaled in the knotter support 67 is a driving shaft 300 having a gear 302 whereby the shaft is driven from the customary driving means for the knotter assembly. At its other end, the driving shaft 300 is provided with a worm gear 304 which is enmeshed with a pinion 306 carried by a shaft 308 having at its other extremity the customary knotter bill hook for tying a knot in the strand 117. The shaft 308 is, in turn, connected to a conventional gearing mechanism (not shown) with the shaft 88' whereby the holding or tensioning plates 88 are operated in timed relation to motion of the knotter hook, the foregoing construction representing a well known arrangement which, in itself, forms no part of the present invention, although it is to the structure that the improvement of this invention claimed hereinafter, is applied.

In accordance with the present invention, mechanism is provided for automatically, and in properly timed relation to operation to the other parts of the strand knotting device, varying the tension of the strand during various cycles of the knotting operation.

In the present invention, however, the above mentioned driving or actuating shaft 300 is provided with an actuating cam 310 thereon which cam varies the tension or force applied to the trigger plate 92 in synchronized relation with operation of the knotting mechanism.

Mounted upon a suitable standard 312 carried by the knotter support frame 67, is a cylindrical bushing 314 in which is journaled a crank shaft 316 having a crank arm 318 depending from one end of the same. This arm, at its lower end, is provided with a bifurcated extremity 320 in which is rotatably journaled a cam follower roller 322 engaging the cam 310 for rocking motion thereby.

As will be best apparent from Figures 1 and 2, the bearing 34 and the upper end of the standard

312 is bifurcated, and between these bifurcated portions a shaft 316 has welded or otherwise fixedly secured thereto a tangentially positioned spring adjusting plate 324. An internally threaded diametrically disposed bore 326 extends through the shaft 316 and through the plate 324, and an adjusting bolt 328 is provided having an actuating head 330, a shank portion 332 and a screw-threaded extremity 334 received in the screw-threaded bore 326, and provided with a lock nut 336.

It will thus be apparent that the bolt 328 may be adjusted radially or diametrically of the shaft 316 and locked in adjusted position.

A lead spring 338 of a flat strip of resilient material such as steel or the like, is provided, having an angularly disposed flat upper end 340 provided with a longitudinally elongated slot 342, through which the shank 332 of the bolt 330 loosely extends as shown in Figure 2. It will be noted that the junction 344 of the angulated portion 340 with the spring shank 338 provides an abutment surface, which, as shown in Figure 2, bears against the surface of the plate or block 324. At the same time, the head 330 engages the angulated portion 340, thus supporting and retaining the spring 338 in position, and actuating the same in the following manner.

As the cam 310 which is fixed to the shaft 300 rotates, it will periodically engage the roller 322, and thus cause a vertical pivoting or oscillatory movement of the lever 318 in a vertical plane. This oscillatory movement of the lever or crank arm will impart a rocking motion to the shaft 316 and by virtue of engagement of the head 330 with the angulated portion 340 of the spring and of the fulcrum 344 with the block 324, will in turn impart a clockwise rotation to the spring, causing the lower end of the latter, where it rests upon the lug 232 of the trigger plate 92, to depress the trigger plate between the holder plates 88 and thereby increase the frictional grip upon the strand 117, and increase the tension on that strand.

The mechanism is so timed with respect to the other elements of the baler that the tension upon the spring 338 is increased as the material is compressed in the bale, thereby increasing the tension of the strand, but this increased tension is gradually reduced by virtue of the nose of the cam 310, leaving the roller 322 as the knotting hooks begin their operation through the drive means 304, 306.

The present invention permits easy adjustment of the range of the variation of tensioning through the screw threaded engagement of the bolt 328 with the shaft 316. The elongated slot 342 permits the necessary angular movement of the bent lever of the spring with respect to its support means and during pivoting movement of this bent lever.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a leaf spring resiliently engaging said holding means.

2. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said tensioning means including a leaf spring resiliently engaging said holding means.

3. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand when held by said holding means, means for applying a variable pressure to said holding means, said last means including a spring resiliently engaging said holding means, combined supporting and stressing means for said spring.

4. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand when held by said holding means, means for applying a variable pressure to said holding means, said last means including a spring resiliently engaging said holding means, combined supporting and stressing means for said spring, said spring having an angularly disposed portion with an elongated slot therein, said supporting and stressing means comprising a crank shaft having a plate thereon, a bolt extending through said slot and said plate, said spring abutting said plate.

5. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means.

said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft.

6. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on said surface.

7. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on said surface, said leaf spring having an elongated slot receiving said bolt.

8. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on said surface, said leaf spring having an elongated slot receiving said bolt, said leaf spring having an angulated portion containing said elongated slot, a fulcrum portion on said spring engaging said surface.

9. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on

said surface, said leaf spring having an elongated slot receiving said bolt, said leaf spring having an angulated portion containing said elongated slot, a fulcrum portion on said spring engaging said surface.

10. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on said surface, said rock shaft having a plate fixedly secured tangentially thereto, said abutment surface being positioned on said plate.

11. A pressure controlling device comprising means for holding a strand, means spaced from said holding means for applying tension to a strand and means for applying a variable pressure to said holding means, synchronizing means

operatively connecting said pressure applying means with said tensioning means, said tensioning and pressure applying means each having a cyclic operation, said pressure applying means respectively increasing and decreasing the pressure on said holding means during predetermined periods of the cycle of operation of said tensioning means, said synchronizing means including a control shaft, said shaft having cam means for actuating said pressure applying means and gearing means for actuating said tensioning means, said tensioning means including a bale press chamber and a plunger for pressing a bale in said chamber, means for threading said strand around the bale, said pressure applying means increasing the pressure on said holding means during operation of said plunger, said tensioning means also including a knot-forming means rotatably actuated by said gearing means, said last means engaging said strand, said pressure applying means decreasing the pressure on said holding means during the operation of said knot-forming means, said pressure applying means including a rock shaft having a crank arm engaging said cam, a leaf spring engaging said holding means, an actuating means operatively connecting said leaf spring to said rock shaft, said actuating means including an abutment surface on said rock shaft, a bolt supporting said leaf spring on said surface, said rock shaft having a plate fixedly secured tangentially thereto, said abutment surface being positioned on said plate, a bifurcated journal supporting said control shaft, said plate being disposed between the furcations of said journal.

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