July 7, 1953 C. S. RUDEEN 2,644,703

TWINE KNOTTER

Filed Jan. 16, 1951 2 Sheets-Sheet 1

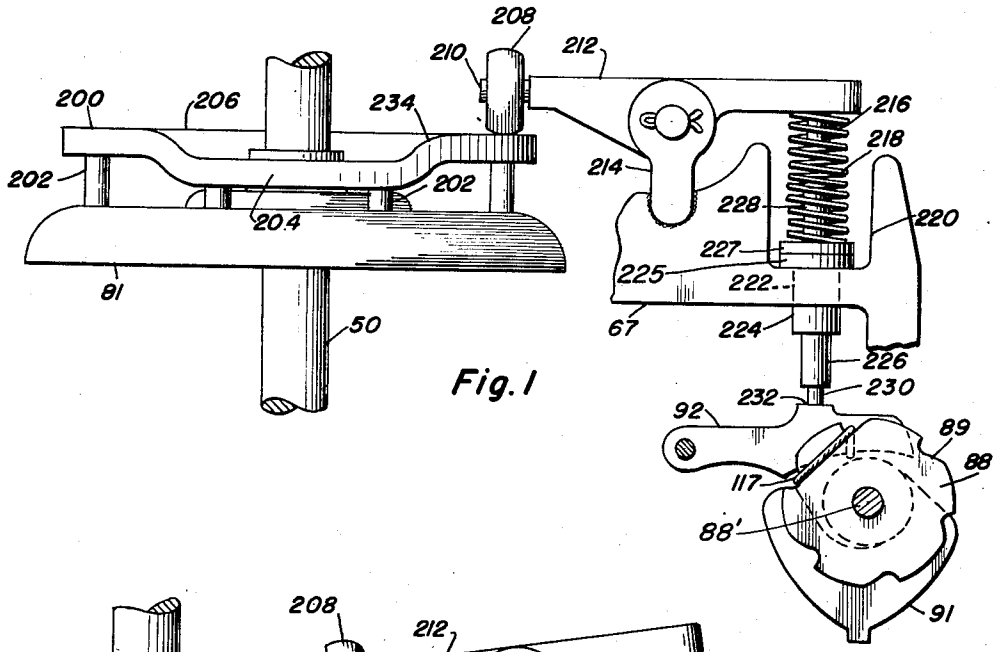


Fig. 1

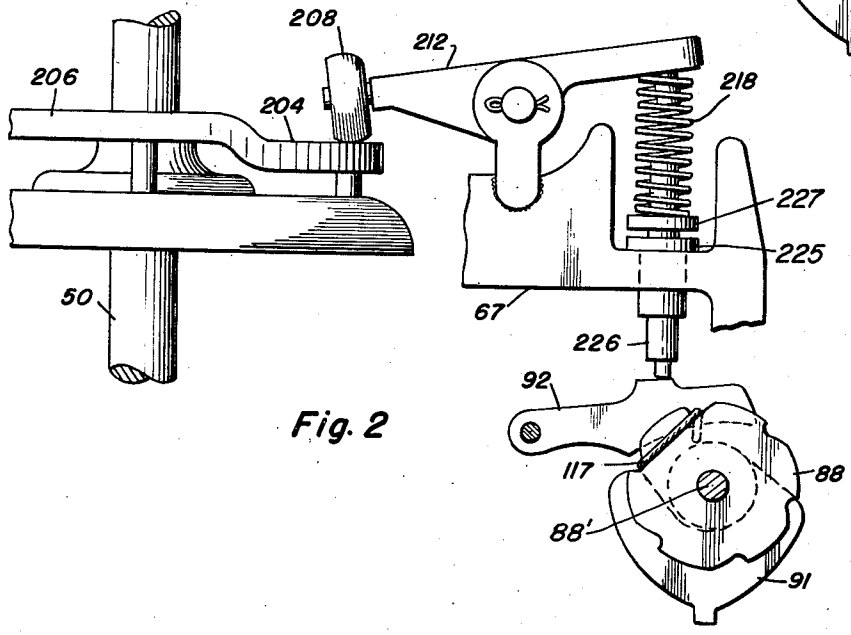


Fig. 2

Carl S. Rudeen
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

July 7, 1953 C. S. RUDEEN 2,644,703

TWINE KNOTTER

Filed Jan. 16, 1951 2 Sheets-Sheet 2

Fig. 3

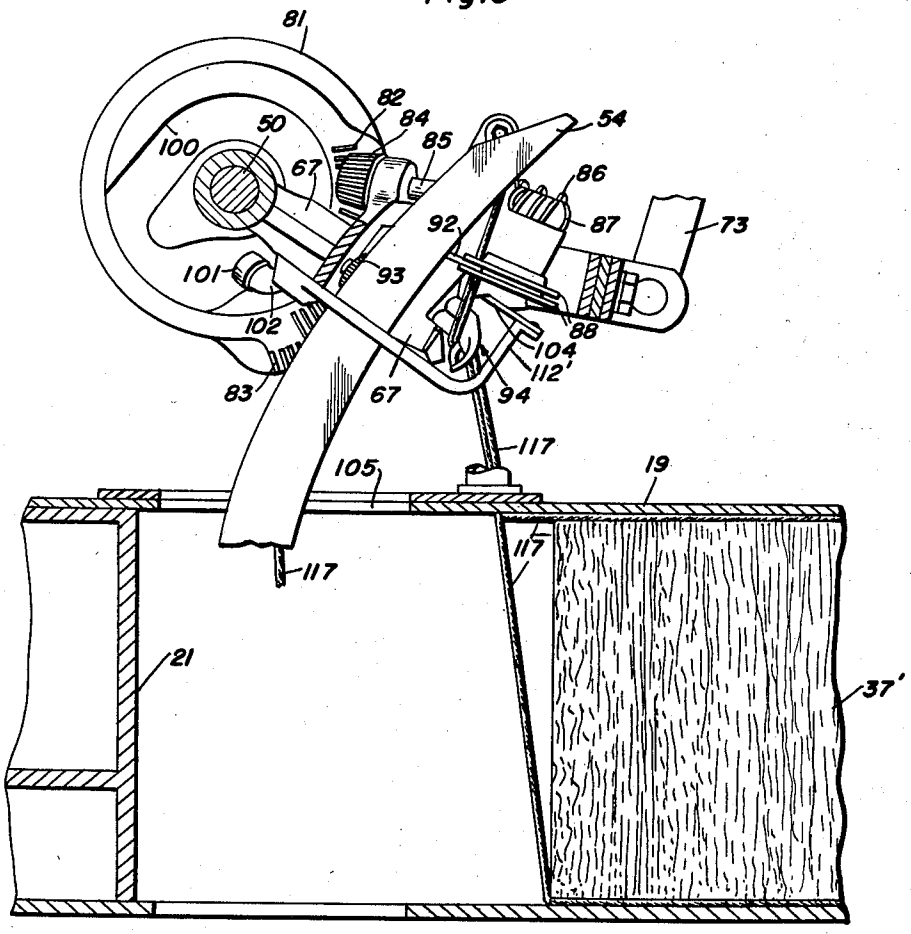
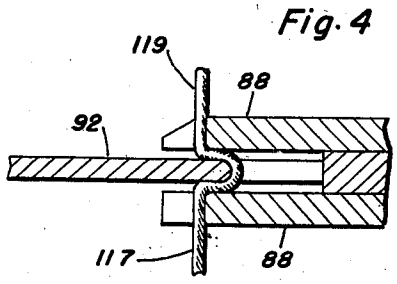


Fig. 4



Carl S. Rudeen

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Patented July 7, 1953

2,644,703

UNITED STATES PATENT OFFICE

2,644,703

TWINE KNOTTER

Carl S. Rudeen, Pocatello, Idaho

Application January 16, 1951, Serial No. 206,161

9 Claims. (Cl. 289—10)

1

This invention comprises new and useful improvements in a twine knotter or tier for use on baling machines or the like and more specifically pertains to a means for controlling the pressure applied to the twine, string, bands, wire, or generically stated, the strand, during the various operations of the tier.

This invention relates generally to an improvement in a portion of the device of Charles F. Crumb, as seen in his Patent No. 2,405,688. In the Crumb device, it has been found, through experience, that when hay or the like is being pressed into the baling chamber under the considerable force of the plunger, additional pressure is needed on the strand holder trigger to prevent the strand from slipping. This additional pressure was seen to be especially required when filling the chamber with a tight bale. Since the trigger element, as seen in Figure 16 of the Crumb patent, is freely pivoted to the knotter frame by a bolted connection, it is obvious that this manual adjustment permits only one desired setting for the entire cycle of operation for the machine. Accordingly, if as explained above, the trigger is tightened to the extent that it exerts enough pressure on the strand to prevent it from slipping when filling the chamber, it has been found that this pressure, necessarily still maintained on the strand during the knot tying operation, is effectual in breaking the strand before the knot is tied.

The above conditions are more clearly seen in Figure 5 of the Crumb patent, where the necessity for maintaining pressure on the strand 117 at the holder or upper end (immediately above the knife 104) of the same is seen while also in Figure 13 of the Crumb patent, the necessity for relieving the pressure exerted on the strand by the trigger 92 becomes evident. This latter may be understood more clearly when it is explained that the trigger 92 bears against the strand 117, holding it in the strand holder 88 while during the knot tying operation, the bill-hook 94 is pivoting downwardly, thereby creating a tension on the strand between the bill-hook and the strand holder. The pressure must be heavy in the first instance and light in the second and it is now believed to be evident that such results are impossible to attain with the present structure existing in the Crumb device. It is the broad object and intention of this invention, therefore, to alleviate this condition.

The primary object of this invention is to provide a tier for a baling machine which enables tying a much fuller or heavier bale than is presently possible in the unimproved system.

2

Another object of this invention is to provide a device embodying the foregoing objects which further provides a firmly tied band or strand around the bale without danger of breakage prior to tying.

Yet another object of this invention is to provide a means for increasing the pressure on the baling strand during the bale chamber pressing operation and sequentially decreasing the pressure during the knot tying operation.

Still another object of this invention is to provide a means for timing or synchronizing the pressure control means hereinabove referred to with the various operations of the baling machine.

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 top fragmentary horizontal view illustrating the structure of the instant invention and the manner in which it relates to the other elements of the baling machine;

Figure 2 is a top fragmentary horizontal view similar to Figure 1 but showing the position of the various parts of the instant invention at a different period of time in the cycle of operation of the baling machine;

Figure 3 is a vertical sectional fragmentary view illustrating the various parts of the baling machine that will be affected by the instant invention and being similar in many respects to Figure 13 of the Crumb Patent No. 2,405,688; and,

Figure 4 is an enlarged fragmentary sectional view showing the manner in which the strand is held in the strand holder by the holder trigger and also being similar to Figure 15 of the Crumb Patent 2,405,688.

Referring now more specifically to the accompanying drawings and also to the Crumb Patent 2,405,688, it will be noted that Figure 3 of the instant invention is similar in most respects to Figure 13 of the Crumb device. For purposes of clarity, the description of those features of the baler unrelated to the instant invention will be assumed to be essentially the same as the description in the Crumb patent, and further, numerals of like parts will be transferred to the instant invention. It should be noted that the novel features of the instant invention will be numbered beginning with the numeral 200.

At the outset, it is to be understood, however, that the features of this invention are not necessarily limited to the exact construction of the

Crumb device but may find utility in any baling machine adapted therefor.

Accordingly, the numeral 19 denotes the top of the baling chamber wherein is seen a mass of compressed material 37', as hay or the like, having a strand 117 extending therearound. At the left end of the chamber, there will be noted a plunger 21 for compressing the material 37'. Provided in the top 19 is an opening 105, through which the threading or strand feeding needle 54 may rise.

A suitable supporting frame, not shown, but identified in the Crumb patent by the numeral 48, has journaled therein a control shaft 50. Mounted on this shaft for rotation therewith is a cam member 81. Further, mounted on the shaft 50 for pivotal movement thereon is a knotter frame 67. Actually, the shaft 50 is driven or rotated at some fixed speed carrying the cam member 81 therewith, while the knotter frame 67 being journaled on the shaft 50, is made to move in a vertical arc during a predetermined interval of time by means of a cam, not shown, on a shaft, also not shown, positioned above the arrangement of the elements as seen in Figure 3. This vertical oscillatory movement of the knotter frame is effected through the tubular portion 73.

As will be understood in column 4, line 17 et seq. of the Crumb patent, the cam member 81 has toothed segments 82 and 83 and when the cam member reaches the proper angular position, segment 82 will engage the beveled gear 94 which is secured to a shaft 85 journaled in the knotter frame. At the opposite end of the shaft 85 is a worm gear 86 engaging and driving a worm wheel 87 which, in turn, is secured to a pair of notched plates 88 by a shaft 88', which is journaled in the knotter frame 67. Therefore, rotation of the beveled gear 84 causes rotation of the notched plates 88. As also seen in Figure 16 of Crumb, a member 92, termed the holder trigger, is pivotally mounted to the frame 67 by means of a bolt connection. As more clearly illustrated in Figures 1, 2 and 4 of the instant invention, it will be noted that the trigger 92 extends between the spaced notched plates 88 and is capable of holding and compression therebetween the end 119 of the strand 117. Furthermore, a conventional stripper element 91 is provided, as illustrated.

When the member 81 has rotated sufficiently, toothed segment 83 will engage the beveled gear 93 which has secured thereto, by means of a shaft, not shown, a bill-hook 94. Since the details of the bill-hook do not materially affect the instant invention, it will not be discussed herein. It is only necessary to note that the bill-hook rotates downwardly upon engagement of the segment 83 with the gear 93.

Further, the member 81 has a cam track 100, along which rides a follower 101, for controlling an L-shaped arm 102 pivoted on the knotter frame 67. The outer end 102' of the lever 102 is provided with a knife blade 104 and such is disposed to move upwardly to cutting engagement with the strand 117 when the follower 101 reaches the proper portion of the cam track 100.

Referring now to Figures 1 and 2 and accordingly, more specifically to the instant invention, it will be noted that the numeral 200 denotes a cam track or ring. This ring is secured on one side of the member 81 by means of the spacer elements 202. The required camming action is effected by providing a dipped portion 204 in the cam track 200. The dip 204 is of the correct

angular measurement and in the proper location relative to the main flat section 206 of the track to provide proper synchronism with the cam member 81 and the remaining operation of the machine.

Riding on the cam track or ring is a roller 208 freely rotatable on the pintle 210 which extends outwardly of the rocker arm 212. The rocker arm 212 is pivoted intermediate its ends by means of a bifurcated element or rocker holder 214 which, in turn, is secured in some convenient manner to the knotter frame 67. At the opposite end of the rocker arm 212 and depending downwardly therefrom is a stub element 216 which acts as a positioner for the spring or resilient element 218.

The knotter frame 67 is provided with a recess 220 located substantially beneath the stub element 216 and therefore provides an opening for the spring 218. This recess, at its lower end, is provided with a bore 222, into which is snugly fitted a sleeve 224 which, as will subsequently be described, acts as a bearing element. The sleeve 224 is provided at its upper end with a peripheral flange 225 which acts as an abutting surface to prevent the sleeve from moving beyond a certain limiting position. A plunger 226 is slidably received within the sleeve 224 and has a gradation of diametrical dimensions throughout its length. Accordingly, intermediate its ends, the plunger 226 is provided with a peripheral flange 227 which in cooperation with the flange on the sleeve acts as a downward limiting abutment. Extending upwardly from the flange 227 is a stub shaft 228 for guiding and positioning the spring 218 therearound. The lower end of the plunger 226 has a reduced tip 230 for abutment with the back surface 232 of the trigger plate 92.

In operation, the initial position of the various elements of the entire baling device will be similar to that shown in the Figure 5 of the Crumb patent and at this time the cam roller 208 will be riding on the upper flat surface 206 of the cam track. In this way the rocker arm 212 will be exerting a downward pressure by means of the plunger 226 on the back surface 232 of the element 92, thereby tightly compressing the strand 117 in the holder plates 88. Therefore, the plunger 21 may exert a considerably greater force on the mass of material 37' in the baling chamber without causing the strand 117 to slip loose of the connection in the holder plates 88.

As the shaft 50 continues turning and as seen in Figure 3 when the needle 54 has threaded the other end of the strand 117 into the notched plates 88 whereby the bill-hook will have engaged the strands 117 to begin its tying operation, the cam roller 208 will be nearing the transition area 234 on the cam track 200. It should be noted that as the bill-hook 94 begins to turn, a tension is created on that portion of the strand between the holder plates 88 and the bill-hook 94 and since the bill-hook turns in such a manner as to continually increase this tension, the strand 117 must be provided with slack, whereby the same may give or slip through the holder plates 88 to a slight degree. Accordingly, at the predetermined correct time, the cam roller 208 will have reached the lower level or dip 204 in the cam track 200, thereby, as seen in Figure 2, releasing the pressure applied to the trigger 92 by the plunger 226. In this way, the strand 117 may slip between the trigger 92 and the holder plate 88, allowing enough slack for the

bill-hook to effect a knot in the strand 117 without breaking the same.

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 after a consideration of the foregoing specification and accompanying drawings, it is not desired to limit the invention to the exact construction shown and described, but all suitable modification 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. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism.

2. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism, said resilient means including a plunger having a portion engaging said trigger, a spring engaging another portion of said plunger, said pressure increasing means engaging said spring and maintaining a predetermined minimum pressure upon said spring and trigger.

3. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism, said resilient means including a plunger having a portion engaging said trigger, a spring engaging another portion of said plunger, said pressure increasing means engaging said spring and maintaining a predetermined minimum pressure upon said spring and trigger, stop means limiting movement of said plunger towards said trigger.

4. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism, said resilient means including a plunger having a portion engaging said trigger, a spring engaging another portion of said plunger, said pressure increasing means engaging said spring and maintaining a predetermined minimum pressure upon said spring and trigger, said pressure increasing means including a rocker having a portion engaging said spring.

5. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism, said resilient means including a plunger having a portion engaging said trigger, a spring engaging another portion of said plunger, said pressure increasing means engaging said spring and maintaining a predetermined minimum pressure upon said spring and trigger, said pressure increasing means including a rocker having a portion engaging said spring.

6. In a knotting mechanism including a bill-hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for applying a strand to said holder plates and means for actuating said bill-hook, strand holder and strand feeding needle in timed relation, the improvement comprising; resilient means maintaining a yielding pressure urging said trigger between said holder plate for yieldingly clamping a strand in the peripheral notches, means for increasing the pressure of the resilient means upon the trigger during predetermined periods in the operation of the knotting mechanism, said resilient means including a plunger having a portion engaging said trigger, a spring engaging another portion of said plunger, said pressure increasing means engaging said spring and maintaining a predetermined minimum pressure upon said spring and trigger, stop means limiting movement of said plunger towards said trigger, said plunger having a stationary guide bushing, said stop means comprising complementary flanges on said plunger and guide bushing.

7. In a knotting mechanism including a rotatable bill hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said holder plates, a strand feeding needle for appling a strand to said holder plates and means for actuating said bill hook, strand holder and strand feeding needle in timed relation, the improvement comprising; a spring operatively associated with said trigger for

maintaining a yielding variable pressure upon said trigger urging the latter between said holder plates for yieldingly clamping a strand in the peripheral notches, a movable member operatively engaging said spring for temporarily increasing the spring pressure upon the trigger during predetermined periods in the operating of the knotting mechanism.

8. A knotting mechanism including a rotatable bill hook, a strand holder including peripherally notched holder plates, a pivoted holder trigger extending between said plates, a strand feeding needle for applying a strand to said holder plates, means for causing rotation of said bill hook, strand holder and strand feeding needle in timed relation, a spring operatively associated with said trigger for urging said trigger between said holder plates to thereby yieldingly clamp a strand in the peripheral notches and movable means operatively associated with said spring for temporarily increasing the force exerted by said spring upon the trigger during predetermined periods in the operation of the knotting mechanism.

9. In a knotting mechanism, a pair of substantially parallel, peripherally notched holder plates, a pivoted holder trigger extending between said plates, a spring operatively associated with said trigger and exerting a variable pressure thereon thereby urging said trigger between said holder plates for yieldingly clamping a strand in the peripheral notches, a movable member operatively associated with said spring for temporarily increasing the force exerted by said spring upon the trigger during predetermined periods in the operation of the knotting mechanism.

CARL S. RUDEEN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
257,837	Appleby	May 16, 1882
419,154	Miller	Jan. 7, 1890
1,257,465	Dudley	Feb. 26, 1918
2,405,688	Crumb	Aug. 13, 1946