Oct. 31, 1961 E. F. GLASS ET AL 3,006,124

HAY CONDITIONER

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Fig. 1

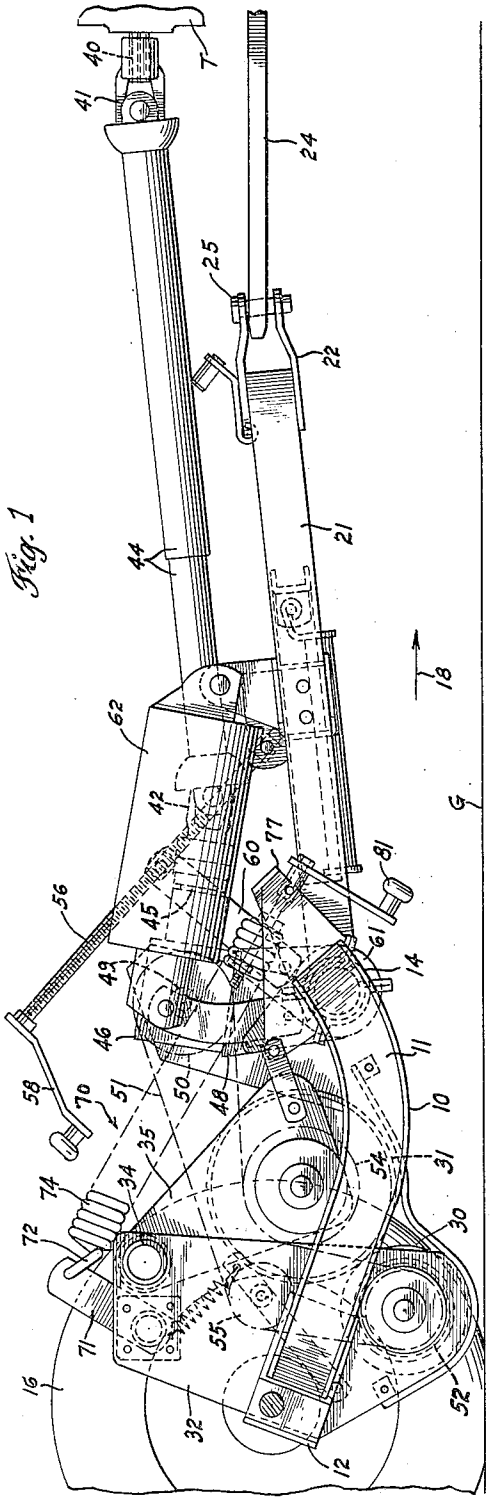
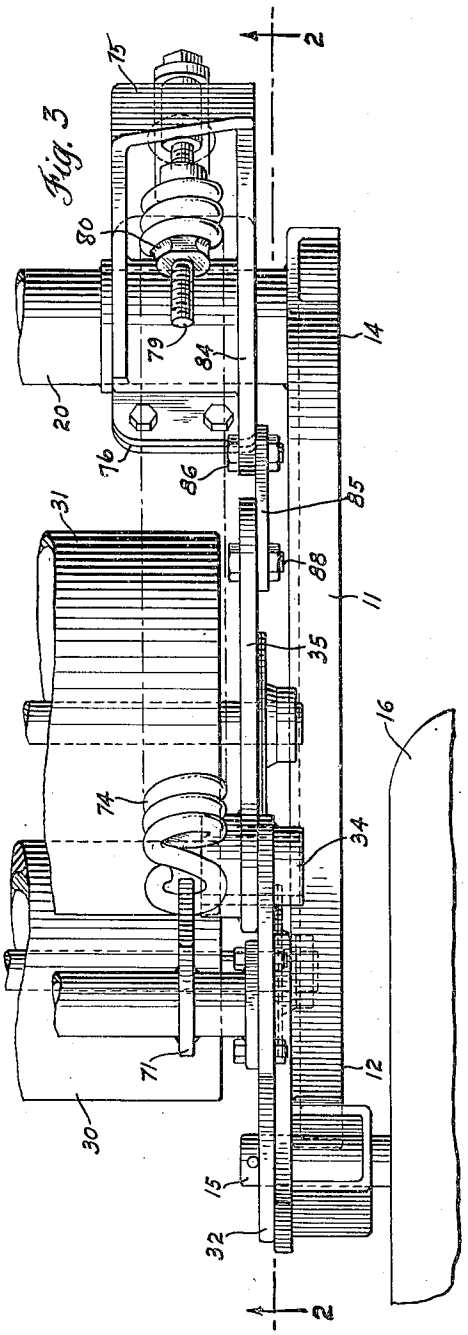


Fig. 3



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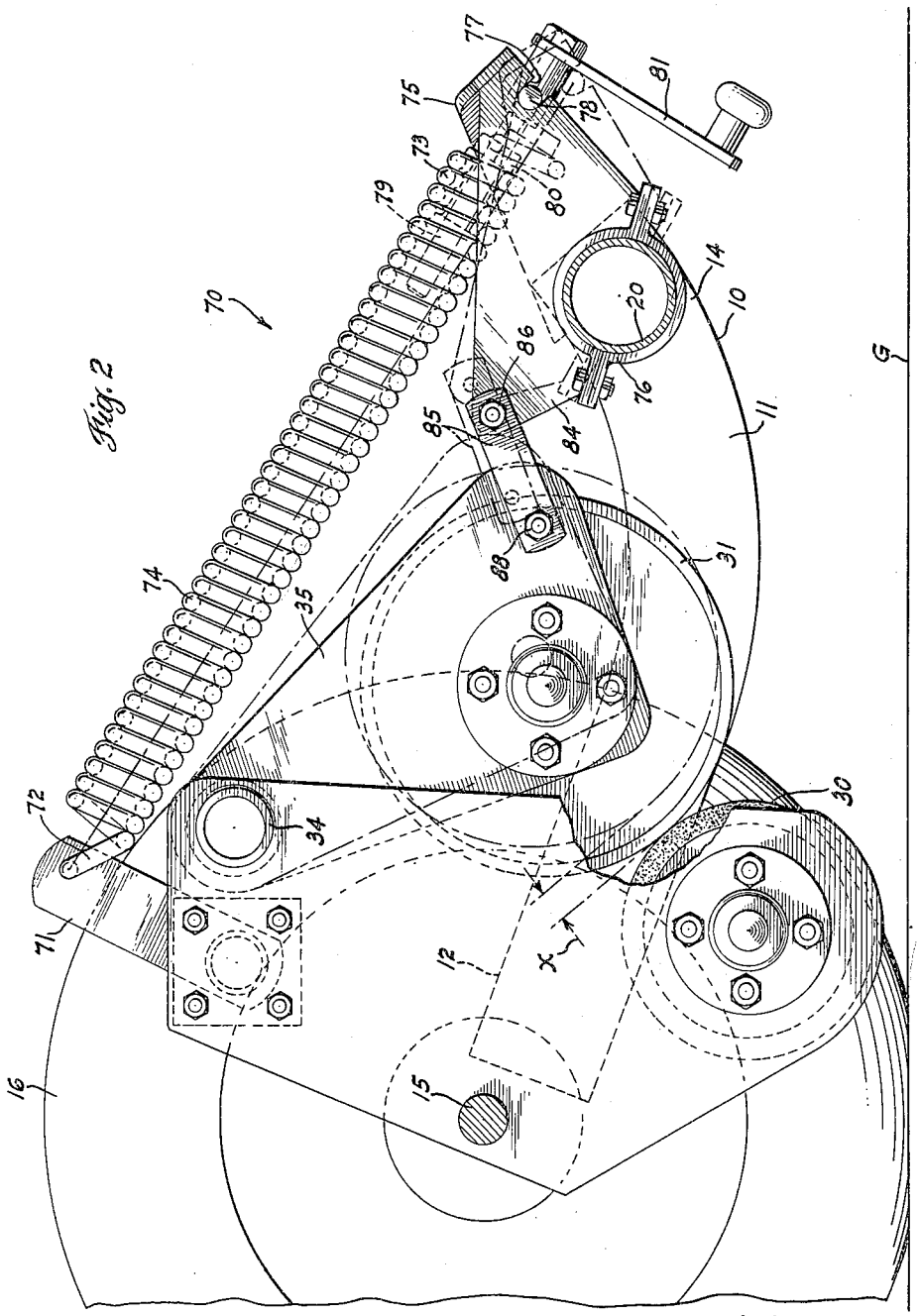
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Fig. 2



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HAY CONDITIONER

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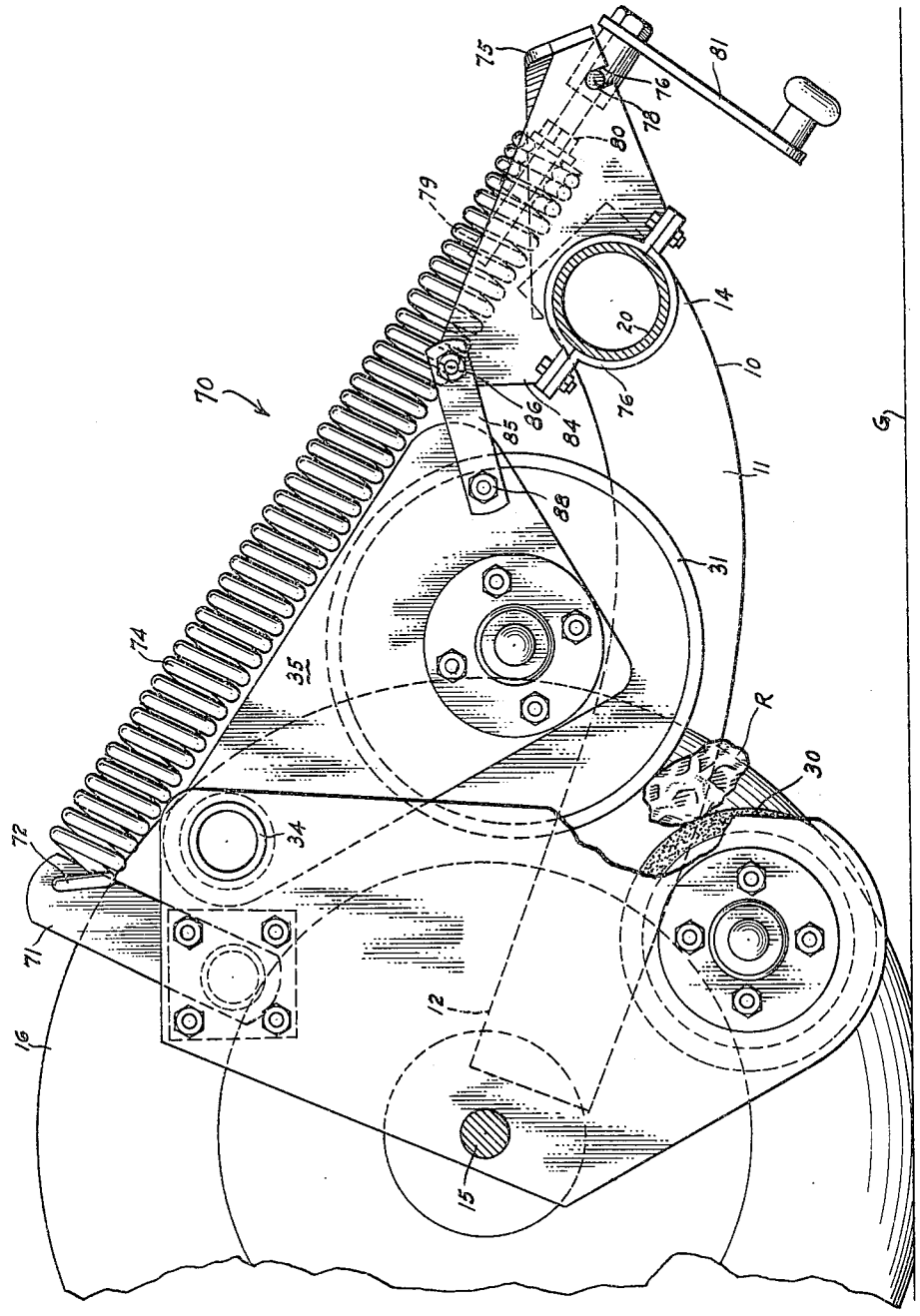


Fig. 4

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HAY CONDITIONER

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7 Claims. (Cl. 56—1)

This invention relates generally to hay conditioners of the type in which crop material is passed between a pair of horizontally extending cooperative rolls to crush or crack the stems and thereby facilitate drying. More specifically, the invention relates to resilient hold down means for the upper roll of a pair of conditioning rolls.

In hay conditioners of the type recited, it is conventional to have a lower roll rotatable about a fixed horizontal axis and a rotatable upper roll mounted for movement radially outwardly relative to the lower roll responsive to the thickness of crop material passing between the rolls. Compressing springs are usually employed to resist movement of the upper roll away from the lower roll. The hold-down pressure provided is usually proportionate to the spacing of the upper roll relative to the lower roll, the greater the spacing the greater the pressure. An increase in roll pressure is desirable up to a certain amount of roll spacing. However, thereafter, a very substantial hold-down pressure on the upper roll is undesirable because it tends to produce jamming by refusing to allow excessive charges of material or foreign objects to pass between the rolls.

It has been proposed heretofore to provide structure which will decrease the hold-down force on the upper roll as such upper roll moves away from the lower roll. This greatly reduces the chances of plugging. However, the quality of the crushing action depends upon the pressure exerted on the material passed between the rolls and if the pressure decreases right from the start of outward movement of the upper roll, decreased crushing efficiency will take place. It is preferable to have an increase in roll pressure up to a certain amount of roll spacing and then to decrease such pressure when a substantial overload situation and roll spacing is approached.

A main object of this invention is to provide a roll pressure system in a hay conditioner of the character described, wherein the hold-down force on an upper roll increases, or at least remains generally constant, up to a given movement of the upper roll away from the lower roll and thereafter the hold-down force progressively decreases.

Another object of this invention is to provide a roll pressure system of the character described wherein the operating characteristics and the hold-down pressure exerted by the system can be adjusted.

Another object of this invention is to provide a roll pressure system of the character described which achieves its desired objectives within a small space, utilizing relatively short spring means enabling the machine to have a low silhouette.

A further object of this invention is to provide a roll pressure system of the character described which is relatively simple in design whereby it can be manufactured at low cost and is easy to repair.

Other objects of this invention will be apparent hereinafter from the specification and from the recital in the appended claims.

In the drawings:

FIG. 1 is a side elevation of a hay conditioner having a roll pressure system thereon constructed according to this invention; the right hand ground wheel of the machine is removed;

FIG. 2 is an enlarged fragmentary view of the conditioning rolls and the system shown in FIG. 1 for holding down the upper roll. Such view is taken generally on the line 2—2 of FIG. 3 looking in the direction of the arrows;

FIG. 3 is a fragmentary plan view of FIG. 2; and

FIG. 4 is a view similar to FIG. 2 but showing the upper roll substantially removed from the lower roll by an object passing between the rolls.

Referring now to the drawings by numerals of reference and particularly to FIG. 1, 10 denotes a support frame which includes fore-and-aft extending laterally spaced frame members 11. Each frame member 11 has a rearward end 12 and a forward end 14. The rearward ends 12 support spindles 15 of ground wheels 16. Thus, the rearward end of frame 10 is supported on the ground G for travel forwardly as indicated by the arrow 18 in FIG. 1.

The forward ends 14 of frame members 11 support a cross member 20 to which a tongue assembly 21 is connected. The tongue assembly has a hitch 22 at its forward end connected to the drawbar 24 of a tractor T. The connection of the hitch 22 and drawbar 24 is by means of a hitch pin 25. Thus, the frame, including assembly 21, is supported rearwardly by the ground wheels 16 and forwardly by the drawbar 24.

Mounted on frame 10 and extending transversely relative to the direction of travel of the machine are cooperative crop conditioning rolls, namely lower roll 30 and upper roll 31. These rolls are rotatable about horizontal axes and extend parallel to one another. The lower roll 30 is journalled for rotation in the lower portions of vertically extending side plates 32 rigidly connected to the frame members 11. As shown in FIGS. 1, 2 and 4, the plates 32 extend above and below the frame members 11. The upper portions of these plates carry pivot members 34 which swingably support downwardly and forwardly extending members 35 in which the upper roll 31 is journalled. Normally, upper roll 31 is disposed in peripheral engagement with the lower roll 30 as shown in FIGS. 1 and 2. However, it is swingable radially outwardly relative to the lower roll about the axis of the pivot members 34 from the position shown in solid lines in FIG. 2 to the dotted line position of FIG. 2. Such outward swinging movement of the upper roll will normally be responsive to the crop material passing between the rolls. When an excessively large charge of crop material or a foreign object passes between the rolls the upper roll will swing substantially outwardly relative to the lower roll as indicated in FIG. 4.

When viewed as shown in FIG. 1, the lower roll 30 rotates counterclockwise while the upper roll 31 rotates clockwise. The rolls are driven from the splined output shaft 40 of the tractor T. Shaft 40 has connected to it a conventional quick-coupling universal 41 connected to a universal 42 through shaft means not shown extending through telescopic tubular power-take-off cover members 44. Universal 42 transmits power to the input shaft 45 of a gear box 46 supported on a pedestal 48 mounted on and extending upwardly from the cross member 20. Gear box 46 has an output shaft 49 which extends to the lefthand side of the machine facing forwardly and is connected to a drive sprocket 50 for driving an endless chain 51. Chain 51 extends around a drive sprocket 52 connected to the lower roll 30 and around a portion of a sprocket 54 connected to upper roll 31. A chain tightener 55 is provided to hold the chain 51 under tension.

For adjusting the height of the lower roll 30 relative to the ground a crank rod 56 is provided adapted to be rotated by means of a handle 58. Rod 56 is operable to pivot an arm 60 connected to a control plate 61 to adjust the frame 10 relative to the tongue 21. Such adjustment may also be obtained through hydraulic means including

cylinder 62. Such structure is not described in detail here since it plays no part in the present invention.

In order that the stems of the crop material passing between rolls 30 and 31 are properly crushed and cracked so that when they are discharged on the ground they will dry faster, means is provided for exerting a hold-down pressure on the upper roll to thereby effect a greater pressure or squeezing action on the crop material than would be provided merely by the weight of the upper roll. Such hold-down means generally denoted 70, comprises two identical structures one at each side of the machine. Since such structures are the same only one will be described and it will be understood that the other is similarly constituted.

Fastened to the upper end of the adjacent support plate 32 is a rigid arm 71 to which one end 72 of a tension spring 74 is connected. Spring 74 extends downwardly and forwardly from element 71 and is connected at its lower end 73 to a lever arm 75 pivotally supported by means of members 76 on cross member 20. Lever 75 extends radially relative to the cross member 20 and has a notch 77 adjacent its outer end in which a cross-pin 78 seats. Pin 78 extends transversely through a threaded member 79 extending into the end 73 of spring 74. The threaded member 79 threads into a cast plug 80 which threads into the spring coils to provide a connection between member 79 and the spring. A crank handle 81 is provided whereby the tension load on the spring 74 can be adjusted.

Lever arm 75 is generally U-shaped when viewed in plan as shown in FIG. 3. One leg 84 of the U extends radially from the cross member 20. Leg 84 is connected to member 35 by lost-motion means in the form of a link 85 having one end pivotally connected to leg 84 by bolt nut means 86 and an opposite end pivotally connected to the adjacent member 35 by bolt nut means 88. As shown in the drawings, member 35 and link 85 comprise a toggle arrangement whereby radial pivotal movement of the upper roll 31 relative to lower roll 30 causes the member 35 to swing and such swinging action of the member 35 produces a longitudinal movement of the link 85. Such longitudinal movement is considerable at first, but approaches zero as pivotal connection means 88 approaches dead center on a line between the pivot member 34 and bolt nut means 86.

In operation, the machine travels to the right of FIG. 1, as indicated by the arrow 18. The previously cut crop material resting on the ground G is engaged by the counterclockwise rotating lower roll 30 which is preferably made of rubber or some other resilient material. Also, it is preferable that the periphery of the lower roll have some roughness to it whereby it will aggressively engage the crop material and lift it. The lower roll 30 elevates the crop material and directs it toward the upper roll 31 which is rotatable on an axis spaced forwardly of the rotatable axis of the lower roll. The overlying surface of the upper roll engages the material after it has been lifted by the roll 30 and such material is swept rearwardly in a continuous mat between the rolls and crushed. When the material leaves the rolls on the discharge side thereof it drops to the ground where it may dry. The amount of material passing between the rolls will vary with different crop conditions.

Generally, the upper roll 31 moves toward and away from lower roll 30 throughout a range indicaed by the arrows X in FIG. 2, from the solid line position to the dotted line position. In the actual machine, such roll spacing falls in the range of from zero to one and one-half inches. The relative arrangement of the member 35, lost-motion link 85 and lever arm 75, and the connection of the spring 74 between the lever arm and its support 71, is such that the hold-down force exerted by the spring 74 on the upper roll 31 increases proportionately or at least remains constant for movement of the upper roll throughout the range indicated by the arrows X. However, occasionally an extra heavy accumulation of material has to be passed between the rolls, or a rock R, illustrated in FIG. 4, may be picked up and passed between the rolls. When such occurs, the movement of the upper roll away from the lower roll exceeds one and one-half inches, or thereabouts, and when this point has been exceeded, it is preferable that the spring force on the upper roll does not increase because such would tend to plug the machine. The leverage employed is such that when a one and one-half inch roll spacing is achieved, any further outward movement of the upper roll is subjected to a gradually decreasing hold-down force. Thus, the overloaded condition is quickly corrected and is able to be eliminated without jamming the machine. The provision of the third link 85 or equivalent is important to achieving this end.

While the roll pressure structure described provides the desired hold-down action, it does not interfere with any desired adjustment of the spring 74. The handle 81 can be used to preset the tension of the spring 74 as desired by the operator.

While this invention has been described in connection with a particular embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses or adaptations of the invention following in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention, what we claim is:

1. A hay conditioner comprising a frame, a first and a second roll mounted on said frame for rotation about horizontal, parallel axes, said rolls having peripheries normally in generally abutting relationship, said second roll being movable radially away from said first roll responsive to material passing between the rolls, means supporting said second roll on said frame for such movement including a member swingable relative to the frame, a lever pivotally mounted on said frame, a hold-down spring interconnected between said frame and said lever and operable to resist pivotal movement of the lever in one direction, lost-motion means pivotally connecting said member and said lever whereby when said second roll moves away from said first roll force is transmitted through said lost-motion means to said lever to pivot the lever in said one direction, the geometric relationship of said member, lever and lost-motion means being such that the hold-down force on said second roll materially decreases only after a given roll spacing has been achieved.

2. A hay conditioner comprising a frame, a first and a second roll mounted on said frame for rotation about horizontal, parallel axes, said rolls having peripheries normally in generally abutting relationship, said second roll being movable radially away from said first roll responsive to material passing between the rolls, means supporting said second roll on said frame for such movement including a member swingable relative to the frame, a lever pivotally mounted on said frame, a hold-down spring interconnected between said frame and said lever and operable to resist pivotal movement of the lever in one direction, a link pivotally connected to said member and forming a toggle therewith, and means pivotally connecting said link to said lever whereby when said second roll moves away from said first roll said member swings and force is transmitted through said link to pivot said lever in said one direction, the geometric relationship of said member, lever and link being such that the hold-down force on said second roll materially decreases only after a given roll spacing has been achieved.

3. A hay conditioner as recited in claim 2 wherein said spring is a tension spring.

4. A hay conditioner as recited in claim 3 wherein

the connection of said spring and said lever arms is adjustable whereby the spring can be preloaded.

5. A hay conditioner as recited in claim 4 wherein said adjustable means comprises a rotatable threaded member, an internally threaded sleeve fixed to said lever arm and threaded onto said rotatable member, and a crank means connected to said rotatable member.

6. A hay conditioner comprising a frame supported for ground travel forwardly, a first roll mounted on said frame for rotation about a fixed horizontal axis and close to the ground, a second roll positioned above and forwardly of said first roll and rotatable about an axis parallel to said first roll, said rolls extending transverse to said ground travel, a pair of support members extending downwardly and forwardly relative to said frame, means pivotally supporting an upper end of each support member on said frame, each support member having a lower end in which one end of said second roll is journalled, a cross-member on said frame forwardly of said second roll, a lever arm pivotally supported

on said cross-member, a tension spring having one end connected to said frame adjacent the pivotal supporting means for one of said supporting members and an opposite end connected to said lever arm whereby when said lever arm is pivoted in one direction said spring is extended, a link having one end pivotally connected to said one supporting member and forming a toggle therewith, said link having an opposite end connected to said lever in a position such that when said member swings force is transmitted through said link to pivot the lever.

7. A hay conditioner as recited in claim 6 wherein means is provided for placing such spring under initial tension.

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