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TENSIONING DEVICE

Original Filed Feb. 25, 1946

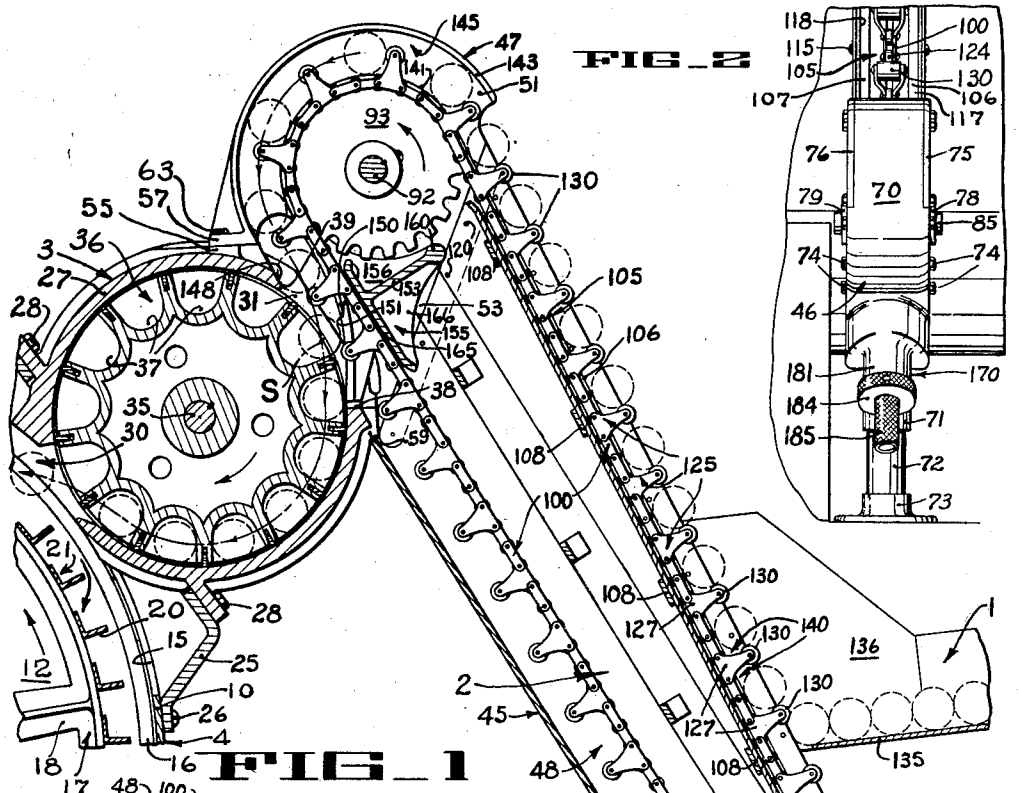


FIG_1

FIG_2

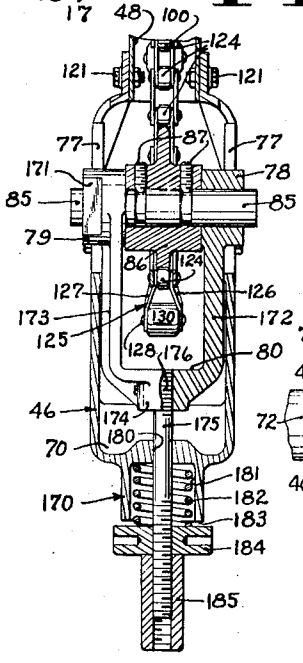


FIG_4

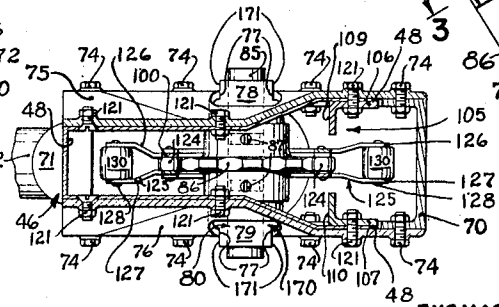


FIG_3

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TENSIONING DEVICE

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9 Claims. (Cl. 198—208)

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This invention relates to conveyors and more particularly to a tensioning device for conveyors of the endless chain or the belt type.

The present invention is a division of my copending application Serial No. 650,017, filed February 25, 1946, for a feed mechanism for feeding containers to a rotary cooker or the like. With such types of feed mechanisms it is customary to maintain the endless chain conveyor at a proper tension so as to prevent drooping of the chain and jamming thereof with other parts of the feed mechanism.

The present invention is particularly concerned with the provision of a tensioning device so constructed as to prevent drooping of the chain conveyor and to further prevent jamming of the chain with other parts of the conveyor mechanism in the event the tensioning device fails to operate properly.

Another object of this invention is to provide a safety unit for a spring tensioned chain conveyor for preventing drooping of the chain in the event of spring breakage.

Other objects and advantages of the present invention will become more apparent from the following description in connection with the drawings in which:

Fig. 1 is a section of a portion of a cooker showing the feed valve thereof associated with an elevator embodying the tensioning mechanism of the present invention.

Fig. 2 is a partial elevation of the present invnetion as seen from line 2—2 in Fig. 1.

Fig. 3 is a transverse section of the elevator and tensioning device taken along line 3—3 in Fig. 1.

Fig. 4 is a longitudinal section, partially in elevation taken along line 4—4 in Fig. 1.

The present invention has been illustrated in connection with a container feed mechanism for a continuous pressure cooker. Such container feed mechanism, in general, comprises a feed chute 1, an elevator 2, and a feed valve 3 associated with the pressure cooker 4.

The pressure cooker 4 which has been partially illustrated herein may be of any conventional construction such, for instance, as shown in U. S. Letters Patent No. Re. 15,334, dated April 11, 1922, to A. R. Thompson.

Continuous cookers of this type comprise a cylindrical shell 10 closed at its ends to provide a pressure treating chamber 12 and having an inlet opening 15 for admitting containers, presented thereto by the feed valve 3, into the chamber 12. A T-shaped track 16 is secured to the inner wall of the shell and extends helically therealong from

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the inlet to the discharge end thereof. The containers are advanced along the track 16 by a rotary reel 17 comprising a plurality of spider wheels 18 suitably secured to a drive shaft (not shown) journalled for rotation coaxially of the shell in a manner well known in the art. The spider wheels carry a plurality of pusher bars 20 on their periphery and longitudinally of the shell so as to form a series of pockets 21 for supporting containers along the track 16.

Secured to the shell 10 adjacent the inlet opening 15 by means of rivets 26 is a casting 25 to which the housing 27 of the rotary feed valve 3 is secured by bolts 28. The periphery of the housing 27 has a valve outlet opening 30 adjacent to and communicating with the inlet opening 15 of the treating chamber 12 and also has a valve inlet opening 31 spaced therefrom exteriorly of the chamber. The housing 27 is provided with pressure tight bearings (not shown) at its sides and rotatably mounted within the same is a shaft 35 disposed parallel to the drive shaft for the rotary reel. Within the housing 27 and keyed to the shaft 35 for rotation therewith is a rotary turret 36 having a plurality of peripheral pockets 37 sealed with respect to each other. Each pocket is adapted to receive an individual container for transferring the same from the valve inlet 31 to the valve outlet 30.

The shaft 35 extends beyond one end of the housing 27 and is drivingly connected to the drive shaft for the reel 17 in the manner as taught in the aforesaid Thompson patent, Re. 15,334, so that the turret 36 is driven in synchronism with the reel 17. As seen in Fig. 1, the reel 17 is rotated counterclockwise and the turret 36 clockwise whereby the reel pockets 21 are caused to register with the turret pockets 37 as they pass the communicating inlet and outlet openings 15 and 30 of the chamber and feed valve, respectively. The lower margin 38 of the valve inlet opening 31 is located horizontally opposite the axis of the turret. The upper margin 39 of the opening 31 is spaced peripherally from the lower margin 38 so as to permit containers to enter the feed valve from above, that is, along a path which is substantially vertically tangent to the path the containers will travel while in the turret pockets 37.

The elevator 2 comprises a housing 45 having its lower end supported by a pedestal 46 and its upper end formed as a head casting 47 supported by the housing 27 of the rotary feed valve 3. The elevator housing 45 is provided with a trough-like closure 48 intermediate the pedestal and head

casting which forms a guard for moving parts of the elevator as will later become apparent.

The head casting 47 is formed by two circular shaped side plates 51, each having a downwardly extending section 53. Adjacent the upper margin of the inlet opening 31 each side of the valve housing 27 is provided with a boss 55, Fig. 1. Flanges 57 extend horizontally from the respective side plates 51 and rest upon the bosses 55. Each adjacent side of the valve housing 27 at the lower margin of the inlet opening 31 is likewise provided with a boss 59. The flange 57 of each side plate 51 is secured by a bolt 63, Fig. 3, to the respective bosses 55 on the valve housing and the lower ends of the plates 51 are similarly secured to the bosses 59 adjacent the lower margin of the inlet opening 31. In this manner, the plates 51 are disposed with their inner faces flush with the end walls of the turret pockets 37 so as to permit passage of containers lengthwise therebetween.

The pedestal 46 comprises a substantially U-shaped casting 70 having a downwardly extending sleeve 71 which fits over a standard 72 having a foot portion 73. Bolted, as shown at 74 (Figs. 1, 2, and 3), to the sides of the casting 70 are a pair of side plates 75 and 76, each having a guide slot 77 formed therein. Arranged in these slots for sliding movement therealong are floating bearings 78 and 79 formed as a part of a yoke 80, later to be more fully described. A shaft 35 is supported for rotation in the floating bearings 78 and 79 and has a sprocket 86 secured thereto by set screws 87, as shown in Figs. 3 and 4.

The circular section of each side plate 51 is provided with a laterally projecting bearing (not shown) and an elevator drive shaft 92 is supported in these bearings for rotation about an axis parallel to the shaft 35. A drive sprocket 93 is keyed to the shaft 92 for rotation therewith between the side plates 51 and one end of the shaft extends beyond the head casting for driving connection, in a conventional manner, to the shaft 35, for example, in the same manner as the latter is connected to the drive shaft of the rotary reel.

Trained around the sprockets 93 and 86 is an endless elevator chain 100. The lower reach of chain 100 extends substantially parallel to a chord line struck across the periphery of the housing 27 from upper to lower margins 39 and 38, respectively, of the inlet opening 31. As best seen in Fig. 1, the lower reach of the chain 100 is spaced from the inlet opening 31 to permit passage of containers between the chain and the turret housing 27. The upper reach of the elevator chain 100 is also inclined and is supported parallel to an elevator track 105, as shown in Fig. 1. The elevator track 105 comprises two angle irons 106 and 107, Fig. 3, spaced from each other by U straps 108, Fig. 1. The straps 108 are welded to the lower faces of inwardly extending flanges 109 and 110 of the angle irons and have a chain supporting channel 111 welded to their recessed portion.

The trough-like closure 48, mentioned above, has its open upper edges secured by bolts 115, Fig. 2, to the outer faces of vertical flanges 117 and 118 of the angle irons 106 and 107, respectively. The upper end of the closure 48 fits between the side plates 51 and each side of the closure, as well as the upper ends of the angles 106 and 107, is secured to the respective side plates 51 by machine bolts 120, Fig. 1. The lower

end of the closure 48 fits between the side plates 75 and 76 which are secured to the casting 70 of the pedestal 46. Each side of the closure 48, as well as the lower ends of the angles 106 and 107, is secured to the respective side plates 75 and 76 by machine bolts 121, Fig. 3. The elevator track 105 is thereby fixed between the pedestal and head casting and the closure 48 provides a chain guard therebetween.

The elevator of the present invention employs but a single endless chain and the spacers between the respective links thereof are rollers 124 which ride upon the channel 111 as they travel along the same. Every third link of the chain 100 is provided with a flight 125 comprising outwardly extending brackets 126 and 127, each flared laterally with respect to the center of the chain. A pin 128 extends between the upper ends of each pair of brackets 126 and 127 and supports a roller 130 adapted to engage a container for pushing the latter upwardly and over the drive sprocket 93.

The containers are fed onto the upper reach of the elevator chain 100 by the gravity chute 1, hereinbefore mentioned, as seen in Fig. 1. The gravity chute 1 has a lower wall 135 terminating adjacent the elevator chain and also has side walls 136 secured to the sides of the closure 48 to support the discharge end of the gravity chute adjacent the elevator chain.

The containers gravitate along chute 1 in a steady stream toward the elevator and fall one after another into successive pockets 140 formed between the pusher rollers 130 of the chain 100. The containers fall into the respective pockets 140 and are supported on the inwardly extending flanges 109 and 110 of the elevator track 105. The upper reach of the chain is disposed at such an angle as to assure that each container will be supported in its respective pocket 140 as the containers are elevated.

The pusher rollers 130 are so disposed relative to the longitudinal axes of the respective containers engaged thereby that the periphery of each roller engages the periphery of a container, i. e., the rollers have single line contact with the respective containers. Therefore, while the containers are pushed up the inclined track 105 they are free to roll upon the inwardly extending flanges 109 and 110 thereof and also are free to rotate with respect to the pusher rollers 130. Accordingly, scraping of the containers along the track 105 and against the pusher rollers 130 is minimized and the containers are elevated with the least possible resistance to the drive mechanism for the chain 100.

The circular sections 51 of the head casting 47 are each provided with inwardly extending flanges 141 which are tangent with respect to the flanges 109 and 110 of the track 105 to form a continuation thereof. The circular sections 51 are also provided, adjacent their peripheries, with inwardly extending flanges 143 and the spaces between the flanges 141 and 143 provide a track 145 around the sprocket 93. Therefore, as the containers leave the upper end of the track 105 they pass into the track 145 and are maintained within their respective pockets 140 as the chain 100 travels around the sprocket 93.

As the chain 100 begins its descending reach, the pockets 140 are inverted so that the containers will normally gravitate toward the feed valve 3. The valve housing 27 is provided with inclined surfaces 148 above the upper margin 39 of the inlet 31. These surfaces 148 are tangent

to the ends of the flanges 143 at the periphery of the circular sections 51 and are parallel to the normal pitch line of the descending reach of the chain 100. Consequently, the containers are maintained within the pockets 140 until they pass the upper margin 39 of the inlet 31 and thereafter are free to gravitate toward the turret pockets 37 as the chain moves past the inlet 31.

The present apparatus is adapted to be operated at a high speed in which case the containers conveyed over the drive sprocket 93 are substantially pushed in a steady stream by the respective pusher rollers 130. While the containers are thus pushed, they are guided by the arcuate track 145 and subsequently descend toward the inlet opening 31 of the valve housing. In order to assure that containers fed at such speed will transfer from the chain pockets 140 to the turret pockets 37 a stripper guide 150 is provided.

The stripper guide comprises a pair of stripper rails 151 spaced apart and in alignment with the respective inside flanges 141 on the inner faces of the side plates 51. The rails 151 are formed as an integral part of a casting 155 and each of them is reinforced by a triangular shaped web 156 extending rearwardly from the rails. The webs 156 are joined by a web 159 extending normal to the chain 100 and rearwardly therefrom to the apex of the triangular webs where the latter are joined by a transverse portion 160.

The casting 155 is mounted between the side plates 51 and is suitably secured in place opposite the inlet 31 by bolts (not shown). The upper end of each rail 151 abuts against the lower end of the inside flanges 141 and the descending reach of the chain 100 passes between the rails 151. The rails 151 are curved to guide the containers out of the chain pockets 140 and into a substantially vertical path which is tangent to the path the containers will travel while in the turret 36. The lower ends of the stripper rails 151 terminate adjacent the lower margin 38 of the inlet 31.

It may sometimes happen that containers rebound from the outside flanges 143 toward the chain pockets as the containers approach the inlet opening 31. Consequently, without the stripper guide 150 such containers would be carried beyond the desired path and might become jammed between the lower margin of the inlet opening 31 and the pusher roller 130 and would, therefore, be crushed or damaged due to shock so that they would not withstand the cooking pressure to which they are subsequently subjected. However, containers that rebound as aforesaid are positively deflected from the chain pockets into the turret pockets by the stripper 150 and damage to the containers is, therefore, avoided.

The lower reach of the chain 100 will normally hang in a slight catenary curve or in other words, will droop and when operating will vibrate relative to the normal pitch line between sprockets 93 and 86. As seen in Fig. 1, the stripper guide casting 155 is provided with a stabilizer shoe 165 which extends parallel to the lower reach of the chain 100 and opposite the inlet 31 of the valve. This shoe 165 is so positioned that the spacer rollers 124 of the chain 100 will normally engage the same when the chain is on its pitch line. Consequently, as the links of the elevator chain 100 leave the drive sprocket 93 their spacer rollers 124 engage the shoe 165 and the normal vibratory action of the chain is, accordingly, minimized.

The maintenance of the chain on the normal pitch line thereof as the containers flow into the turret pocket is very important. It is apparent that movement of the chain outwardly from the inlet opening is limited by the shoe 165. The chain, however, tends to droop toward the opening 31 and, therefore, the chain must be maintained at a proper tenseness between the two sprockets 93 and 86. This is essential, otherwise the pusher rollers 130 are likely to extend into the opening 31 and are liable to become caught on the turret or on the lower margin 38 of the inlet 31.

In order to maintain the elevator chain under tension the floating sprocket 86 is associated with a tension carriage 170 (Figs. 3 and 4). As hereinbefore explained, the sprocket 86 is secured to a shaft 85 having its ends rotatably mounted in bearings 78 and 79 formed as a part of the yoke 80. These bearings have parallel faces 171 and fit into the respective guide slots 77 for sliding movement longitudinally with respect to the elevator housing 45. The yoke 80 has legs 172 and 173 extending downwardly along the longitudinal axis of the housing 45 and has a threaded boss 174 at its bight. A rod 175 has one end threaded into the threaded boss 174 of the yoke and is secured thereto by a tapered pin 176 (Fig. 4). The rod 175 also extends downwardly along the longitudinal axis of the elevator housing and fits through an aperture 180 in the bottom of the casting 70 adjacent the standard 72.

A cylindrical cup 181 is formed concentric to the aperture 180 on the underside of the casting 70 and a compression spring 182 is arranged in this cup 181 and around the shank of the rod 175. The spring 182 normally extends beyond the rim 183 of the cup 181 and is compressed by an adjusting nut 184 which is threaded onto the rod 175. The spring 182 in the present instance is of a construction calculated to exert approximately 340 pounds pressure when compressed by the adjusting nut 184 to a length disposing the outer end of the spring approximately ⅛ of an inch from the rim 183 of the cup 181. The nut 184 is secured in its position of adjustment by a locking sleeve 185 threaded onto the end of the rod 175 to tightly engage and lock the nut 184 on the threads of the rod.

By the foregoing arrangement, the elevator chain 100 is properly tightened and any manufacturing tolerances, i. e., variations in link length or the like, are taken up by the spring 182. Consequently, as the chain travels around the sprockets 93 and 86, a pulsation of the floating sprocket is permitted. In other words, the bearings 78 and 79 slide in the slots 77 and the yoke 80 is constantly urged downwardly by the compression spring 182 to keep the sprocket 86 tightly against the endless chain 100.

As the chain 100 and sprockets 93 and 86 wear due to constant running, the floating sprocket 86 is free to move by the influence of the compression spring 182. The compression spring will urge the yoke, its floating bearings, and the sprocket 86 longitudinally away from the drive sprocket 93 and maintain the chain 100 under tension. However, when wear of the chain and sprockets is thus compensated for, the adjusting nut 184 becomes spaced further from the rim 183 of the cup 181 than it was in its original setting and the compression of the spring 182 will, accordingly, be reduced. Therefore, it becomes necessary to readjust the nut 184 back into the predetermined spaced relation with re-

spect to the rim 183 in order to obtain the desired tension of the elevator chain, as hereinbefore explained.

In addition to maintaining a proper tension on the elevator chain 100 the relationship of the adjusting nut 184 to the rim 183 of the cup 181 provides a safety feature. Should the spring 182 break or otherwise fail to bear against the nut 184 and thereby release the tension of the chain 100, the adjusting nut 184 will abut against the rim 183 of the cup. The floating bearings 78 and 79 and sprocket 86 are thereby prevented from sliding to the upper end of the slots 77. Therefore, the floating bearings can only move upwardly a limited distance dependent upon the distance of the adjusting nut from the rim 183 of the cup and, accordingly, excessive drooping of the chain is prevented. By thus preventing excessive drooping of the chain, the pusher rollers 130 are prevented from entering the inlet opening 31 of the feed valve. Therefore, the rollers 130 will not extend into the path of the turret pockets 37 and jamming of the rotary turret 36 as the latter rotates within the housing 27 is thereby prevented. Moreover, the rollers 130 are also thereby prevented from hooking onto the lower margin 38 of the inlet 31 and excessive damage to the apparatus avoided.

While I have described a particular embodiment of the present invention, it will be understood that various changes and modifications may be made without departing from the spirit of the invention. I, therefore, do not limit myself to the specific arrangement disclosed, but desire to avail myself of such modifications and alterations as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In an endless chain conveyor arranged to travel over a driven and a floating sprocket, a stationary support, means mounting said floating sprocket on said support for movement toward and from said chain, said mounting means having a threaded shank extending for axial sliding movement through said support in the direction of movement of said mounting means toward said chain, a spring encompassing the free end of said shank and engaging said support, an adjusting nut on said shank beyond said spring for compressing said spring whereby the latter exerts a predetermined spring load to said floating sprocket to maintain the latter in tensioning engagement with said chain, and means spaced from said adjusting nut and engageable by the same in the event of spring breakage for limiting movement of said floating sprocket away from said chain to thereby prevent excessive drooping of said chain.

2. A tension device for an endless web conveyor arranged to travel over spaced driven and floating wheels, comprising a stationary support having guideways formed therein, means for mounting said floating wheel for sliding movement with respect to said guideways, yieldable means for urging said mounting means in a direction away from said driven wheel, and adjustable means associated with said mounting means and said yieldable means for establishing a predetermined load against said floating wheel, said adjustable means being disposed to engage a portion of said stationary support in the event of failure of said yieldable means whereby to prevent excessive drooping of said endless web between said wheels.

3. A tension device for an endless web conveyor including spaced driven and floating wheels comprising a stationary support having guideways formed therein, means for mounting said floating wheel for sliding movement relative to said guideways, yieldable means operatively associated with said mounting means and bearing against said stationary support for urging said mounting means in a direction away from said driven wheel for maintaining said endless web at a predetermined tenseness, and means engaging said yieldable means and movable with said mounting means adapted to engage said stationary support incident to excessive relaxation of said yieldable means for limiting movement of said mounting means toward said driven wheel to thereby prevent drooping of said endless web.

4. A tension device for an endless chain trained around a driven and a floating sprocket comprising a stationary support having guideways in its side walls extending parallel to an axis extending from one to the other of said sprockets, means for mounting said floating sprocket for sliding movement relative to said guideways, yieldable means for urging said mounting means in a direction away from said driven sprocket for tensioning said endless chain, adjustable means operatively associated with said yieldable means for exerting a predetermined load to said floating sprocket for maintaining said endless chain under a predetermined tension, and means on said stationary support adapted to be engaged by said adjustable means upon undue yielding of said yieldable means for limiting movement of said mounting means toward said driven sprocket to thereby prevent excessive drooping of said endless chain.

5. A tension device for an endless chain arranged to travel over a driven and a floating sprocket, a stationary support having parallel guideways extending in the general direction from said driven to said floating sprocket, means supported in said guideways for mounting said floating sprocket for sliding movement relative thereto, said means having a portion thereof extending from said stationary support, yieldable means associated with said extended portion of said mounting means for engagement with said stationary support, adjustable means on said extended portion for urging said yieldable means toward said stationary support and for urging said mounting means away from said driven sprocket, and means on said stationary support for engaging said adjustable means upon excessive yielding of said yieldable means to thereby limit movement of said mounting means toward said driven sprocket.

6. A tension device for an endless chain trained around a driven and a floating sprocket comprising a stationary support, a yoke having parallel legs provided with bearings rotatably supporting said floating sprocket, means on said stationary support for receiving said bearings for supporting said floating sprocket for sliding movement toward and from said driven sprocket, a rod extending from said yoke, rearwardly of the legs thereof and through an opening provided in said stationary support, a compression spring encircling the extended end of said rod exteriorly of said support, means on said rod for compressing said spring and for drawing said yoke and floating sprocket in a direction away from said driven sprocket for exerting a predetermined spring load upon said endless chain, and means on said stationary support adapted to be spaced from said spring compressing means and for engaging the

latter in the event of excessive relaxation of said compression spring to thereby prevent excessive drooping of said chain.

7. A tension device for an endless chain trained around a driven and a floating sprocket comprising a stationary support having guide slots formed in opposite walls thereof substantially parallel to an axis extending from said driven sprocket through said floating sprocket and having an aperture aligned with said axis rearwardly of said floating sprocket, a yoke having parallel legs provided with bearings extending into said guide slots for supporting said floating sprocket for rotation and sliding movement relative to said support, a rod extending rearwardly from the bight of said yoke and through the aperture in said stationary support, a compression spring circumscribing the extended end of said rod, adjustable means on said rod for compressing said spring to exert a predetermined spring load upon said chain, and means on said stationary support for engaging said adjustable means in the event of failure of said compression spring for limiting movement of said floating sprocket away from said chain to thereby prevent drooping of said chain.

8. A tension device for an endless chain trained around a driven and a floating sprocket comprising a stationary support having guide slots formed in opposite walls thereof substantially parallel to an axis extending from said driven sprocket through said floating sprocket and having an aperture aligned with said axis rearwardly of said floating sprocket, a yoke having parallel legs provided with bearings extending into said guide slots for supporting said floating sprocket for rotation and sliding movement relative to said support, a rod extending rearwardly from the bight of said yoke and through the aperture in said stationary support, a compression spring circumscribing the extended end of said rod, adjustable means on said rod for compressing said spring to exert a predetermined spring load upon said chain, and means on said stationary support for maintaining said compression spring in alignment with said rod and for engaging said adjustable means in the event of failure of said compression spring for limiting movement of said floating sprocket away from said chain to thereby prevent drooping of said chain.

9. A tension device for an endless chain trained around a driven and a floating sprocket comprising a stationary support having guide slots formed in opposite walls thereof substantially parallel to an axis extending from said driven sprocket to said floating sprocket and having an aperture aligned with said axis, a yoke arranged within said stationary support having parallel legs provided with bearings extending into said guide slots for sliding movement, means for mounting said floating sprocket for rotation between said bearings, a threaded rod extending rearwardly from the bight of said yoke through the aperture in said stationary support, said stationary support having a cup shaped flange circumscribing the extended end of said threaded rod, a compression spring surrounding the threaded rod and seated within the cup shaped flange of said stationary support, and an adjusting nut threaded onto said threaded rod and against the free end of said compression spring for compressing the latter until its free end is disposed a predetermined distance outwardly from the rim of said cup shaped flange whereby in the event of excessive relaxation of said compression spring said adjusting nut will engage the rim of said cup shaped flange for limiting movement of said floating sprocket away from said chain to thereby prevent excessive drooping of said chain.

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