Dec. 8, 1942. J. F. LEHMAN 2,304,647

LICKER GRINDER

Filed April 12, 1941 2 Sheets-Sheet 1

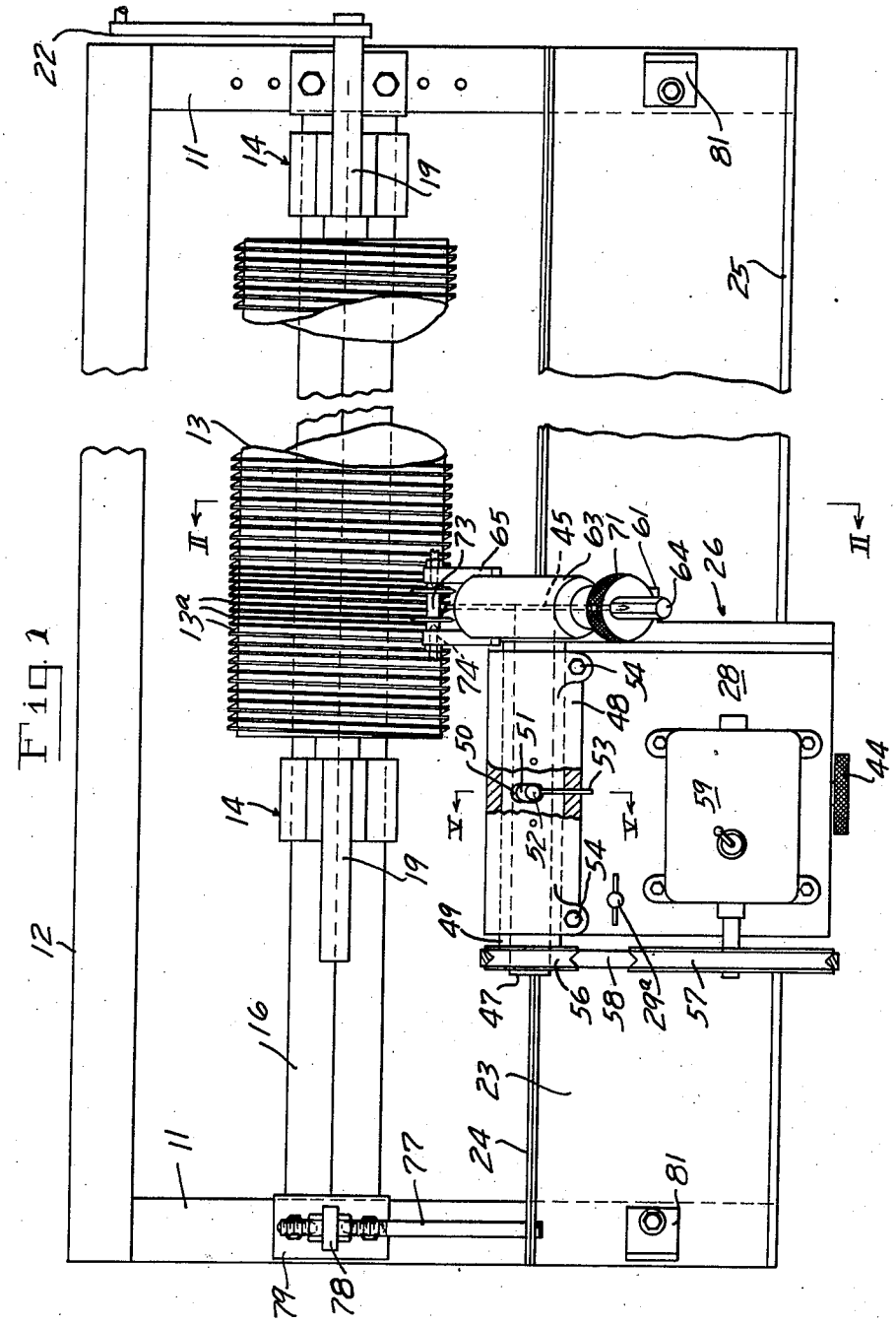


FIG. 1

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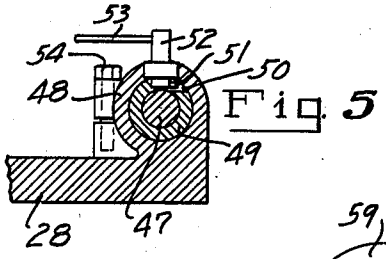


Fig. 5

Fig. 2

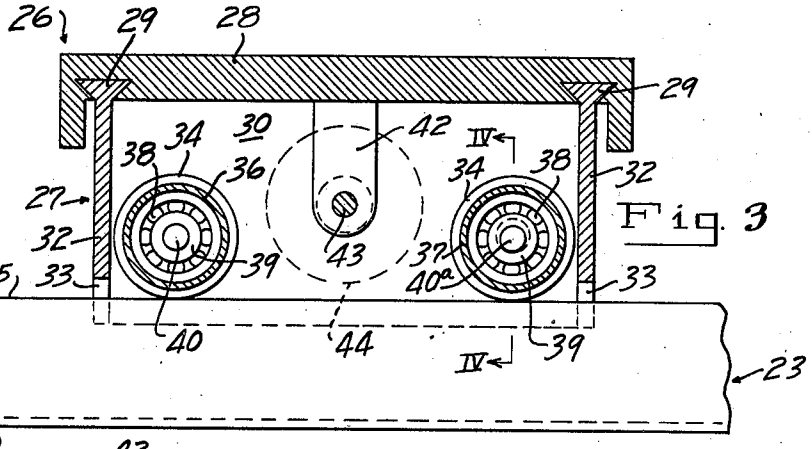


Fig. 3

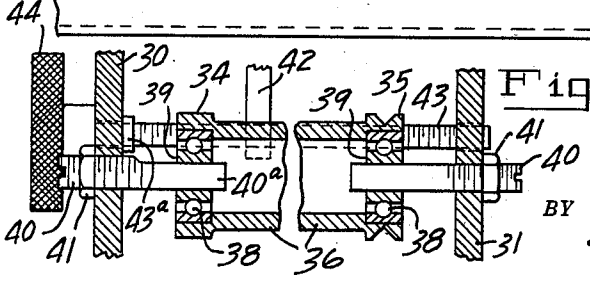


Fig. 4

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UNITED STATES PATENT OFFICE

2,304,647

LICKER GRINDER

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Application April 12, 1941, Serial No. 388,259

9 Claims. (Cl. 51—56)

My invention relates to a machine for grinding the spirally wound rolls of wire on a licker cylinder, and has for an object the provision of a machine of the character designated which shall be capable of accurate and efficient grinding of the wire while still in place on the licker cylinder.

As is well known in this art, a licker cylinder has cut therein a number of series of helical grooves for receiving continuously extending toothed wires. These wires are inserted in the grooves after they are cut, by placing the smooth side in the bottom thereof, and, while the cylinder is rotating in a lathe, a calking tool is forced into engagement with the sides of the grooves to crush the same inwardly, thus to secure the wire in place. This calking operation leaves the surface of the cylinder between the rows of wire somewhat rough. This roughness is increased due to the fact that the cylinder is generally made of cast iron and may have blow holes or other defects therein into which the calking tool sinks during the calking operation.

Another object of my invention, therefore, is the provision of a machine of the character designated which embodies a bevelled grinding wheel adapted to enter between the adjacent rows of wire for the purpose of grinding the sides thereof, in combination with spring pressed guide rollers mounted independently of the grinding wheel and free for movement toward and from the licker, which rollers likewise fit between rows of wire and against the sides thereof to cause the grinding wheel to traverse the cylinder as the latter is rotated.

Another object of my invention is to provide a licker grinding machine which embodies a track set parallel to the longitudinal axis of a rotatable licker cylinder, and having thereon a carriage carrying a motor driven grinding wheel and the spring pressed guide rollers, so that upon rotation of the licker the rollers follow the convolutions of the spirally wound wire and feed the carriage and grinding wheel across the licker.

A further object of my invention is to provide improved means for levelling the carriage on the track.

My invention also contemplates certain improvements in licker grinders of the general type disclosed in my copending application, Serial No. 347,114, filed July 23, 1940, which application disclosed a grinder supported on rollers from the surface of the licker cylinder itself. While I have found this grounder to be quite satisfactory in operation, the apparatus of the present application is capable of more accurate grinding than the device disclosed therein.

Briefly, my invention comprises a framework having mounted thereon bearings for rotatably supporting a licker. A track is mounted on the framework and means is provided for bringing the longitudinal axis of the licker into parallelism with the track. A carriage is supported on the track by ball bearing rollers, and on the carriage is a motor driven grinding wheel adjustable axially with respect to the carriage and longitudinally of the licker. A bearing member is positioned above the grinding wheel and carries therein a slide, on one end of which is mounted a parallel pair of guide rollers. These rollers are preferably mounted on a common shaft and are so spaced and shaped as to fit between and bear against the sides of adjacent parallel rows of spirally wound wire. A spring biases the slide toward the licker so that during the grinding operation the rollers are pressed firmly but yieldably between and against the rows of wire.

The rollers have bevelled peripheries which fit between the rows of wire, but they are thick enough to prevent them from coming into direct contact with the surface of the cylinder, thus to avoid striking the rough places on the cylinder which are formed by the calking operation referred to above. The rollers are preferably spaced on opposite sides of the grinding wheel so that when a complete traverse of the cylinder has been made by the grinding wheel, one of the rollers is still in engagement with the wire. The rollers are free for movement toward and from the licker, but while making a given cut the grinding wheel remains always at a constant distance from the axis of the cylinder. The track may be formed similarly to a lathe bed from an upturned channel with the flange adjacent the licker bevelled, the other flange being machined smooth and flat. Complemental ball bearing rollers carried by the carriage engage the track. This construction assures correct alignment between the grinding wheel and the licker, and the bevelled track and rollers also hold the carriage on the track.

Apparatus embodying features of my invention is illustrated in the accompanying drawings forming a part of this application, in which

Fig. 1 is a fragmental plan view with certain parts in section;

Fig. 2 is a sectional view taken on line II—II of Fig. 1;

Fig. 3 is an enlarged sectional view taken on line III—III of Fig. 2;

Fig. 4 is a fragmental sectional view taken on line IV—IV of Fig. 3 and illustrating a means for levelling the carriage on the track by raising or lowering one of the ball bearing rollers; and

Fig. 5 is a detail sectional view taken on line V—V of Fig. 1, and showing one means for effecting axial movement of the grinding wheel on the carriage.

Referring to the drawings for a better understanding of my invention, I show the same as embodying a framework having end members 11 and side members 12. The licker cylinder 13 is rotatably mounted in upstanding bearing members 14, one of which is adjustably clamped on an inverted angle member 15 secured to the end frame members 11. As seen in Fig. 2, the clamp comprises a set screw 17 threaded into a wedge block 18 which is adapted to fit into the underside of the channel 16, thus to clamp its associated bearing member 14 in place. When it is desired to grind lickers of different lengths, the adjustable bearing member 14 may be shifted along the member 16. The end shafts 19 of the licker cylinder fit in forked bearings 20 in the upper ends of the bearing member 14 which terminate at the bottom in a V-shape 21, thus providing a wear compensating bearing and for accommodating shafts of varying diameter. A handle 22 is secured to one shaft 19 of the licker, whereby the same may be rotated manually. It is preferable to rotate the cylinder manually to provide for necessary grinding of teeth which may be more dull than others.

On top of the frame I mount a channel shaped track 23, which has one flange thereof bevelled to an edge, as at 24, the other side 25 being machined flat and smooth.

A carriage 26 is mounted on the track 23, and as shown in the drawings it comprises a lower frame member 27 and a top member 28 which is slidable with respect to the member 27 on guides 29. A locking pin 29a is secrewed into the plate 28 and engages the top of one of the guides 29 to lock the plates together when desired. The lower frame 27 has depending front and rear flanges 30 and 31 respectively, and depending side flanges 32, notched as at 33 to fit over the flanges of the track 23.

The carriage is mounted on the track 23 by means of rollers 34 and 35, the peripheries of rollers 34 being flat to fit the machined side 25 of the track, and the rollers 35 being bevelled to fit the side 24. I preferably form the rollers 34 and 35 by machining them on the opposite ends of a pair of cylinders 36 and 37. Into the ends of each of these cylinders I press a set of ball bearings 38, and into the inner races 39 of each set of bearings I press a pin 40 which has its outer end threaded through the adjacent flange 30 or 31 of the frame member 27. I place a jam nut 41 on the outer threaded end of each pin 40 so as to prevent it from rotating and to hold the rollers in place.

In order that all four of the rollers rest on the track, I provide one of the pins 40 with an axle portion 40a which is offset from the threaded portion of the pin as seen in Figs. 3 and 4. By loosening the nut 41 and rotating the pin 40, its offset axle 40a moves up or down with respect to the track and thus causes its associated roller 34 to bear on the track equally with each of the other rollers.

Depending from the top member 28 of the carriage is a lug 42 having threaded therethrough a screw 43. The screw 43 passes loosely through the flanges 30 and 31 and is provided with a collar 43a inside the front flange 30. By rotating an adjusting knob 44 provided at the front, the top plate 28 is moved on the guides 29 toward or from the licker cylinder 13.

A grinding wheel 45 having its periphery bevelled on opposite sides to enter between the rows of wire 13a is supported for rotation on a shaft 47 in a housing 48 which is formed on the top plate 28. The shaft 47 passes through a sleeve 49 within the housing 48, and the sleeve 49 is provided with a recess 50 adapted to receive a small cam 51 on the lower end of a rotatable adjusting member 52. The member 52 is provided with a handle 53, and lock nuts 54 are adapted to clamp the housing around the sleeve 48 and hold the same against axial movement. By loosening the nuts 54 and swinging the handle 53, the sleeve 49, the shaft 47, and the grinding wheel 45 may be moved axially within the housing 48, and by means of this adjustment the grinding wheel may be set directly between the rows of wire 13a. The grinding wheel is driven by means of pulleys 56 and 57, connected by a belt 58 to a motor 59, which is likewise mounted on the plate 28. The grinding wheel 45 is provided with the usual guard 61, which is secured to the sides 32 of the lower plate 27 by means of bolts 62.

On top of the guard is mounted a sleeve 63 which carries therein a slide 64. A yoke 65, mounted on the forward end of the slide 64, is provided with a pair of bevelled guide rollers 66. These rollers are adapted to fit between the spirally wound rows of wire 13a with a wedge fit. A spring 67 surrounds the slide 64 and presses at one end against a collar 68 fast on the slide, and at the other end against a wall 69 of the sleeve. A stop member 71 on the slide 64 is provided with a set screw 72 which is adapted to engage the slide so as to prevent the spring from forcing the slide completely out of the sleeve 63 when the guide rollers are not in engagement with the wire. Also, by means of the member 71 the guide rollers may be completely withdrawn from the licker cylinder.

As seen in Fig. 1, the guide rollers are mounted on a common shaft 73, and are supported for rotation by means of pin point bearings 74, the pin members of which are screwed into the yoke 65 formed as a part of the slide. It will be noted that the rollers are spaced on either side of a vertical line through the grinding wheel. The purpose of this construction will be later described.

The operation of my device is as follows: The licker cylinder 13 to be ground is placed with its shafts 19 resting in the forked bearings 20, and the handle 22 is fastened to one of the shafts 19. The member 16 carrying the bearings 20 is adjusted so as to bring the longitudinal axis of the cylinder into parallelism with the track. This is accomplished by means of a bolt 77 which passes through an upstanding member 78 on a guide shoe 79 fast on the end of the support member 16, which shoe is slidable on the end frame member 11. The carriage is next pushed by hand on the tracks to a point where the rollers 66 may be engaged between the spirally wound rows of wire 13a, the stop member 71 being run out on the slide 64 far enough to permit the spring 67 to force the rollers into engagement with the wire. The grinding wheel is now run in to the correct cutting depth by rotating the feed screw 44 and at the same time it is also set directly between the rows of wire to be cut by loosening the clamp screws 54 and turning the

handle 53 of the cam adjustment 51. The licker is now rotated by means of the handle 22 and, the rollers 66 being engaged between the spirally wound rows of wire, cause the carriage to traverse the licker. When the grinding wheel reaches the end of the licker cylinder, one of the rollers 66 is still engaged with the wire, because of the fact that they are spaced on either side of the grinding wheel. This construction assures accurate grinding of the rows of wire immediately adjacent the ends of the licker. When the end of a cut is reached, the guide rollers are set into the next row and the licker is rotated in the opposite direction.

It will be apparent that the spring pressed slide 64 will, due to the spring 67 in the housing, move toward and from the licker whenever the rollers 66 engage a portion of the rows of wire which are either too far apart or too close together, respectively. However, the grinding wheel remains at a constant distance from the center of the licker cylinder, and therefore cuts the high side off of any wires that might be projecting too far from the longitudinal axis of the cylinder. I have found that it is just as important to make the outside diameter of all the rows of teeth equal over the entire length of the cylinder as it is to sharpen the teeth. This is due to the fact that the licker is set very close to the mote knives, the main cylinder, and feed plate of the carding engine, this clearance being generally about seven to twelve thousandths of an inch.

In order to prevent the carriage from running off the ends of the track, I provide spring stop members 81 which the sides of the carriage strike when it approaches the ends of the tracks.

It will be seen that the guide rollers 66 are held against twisting because the yoke member 65 of the slide 64 fits into slots 82 on each side of the housing 63. It will likewise be apparent that the rollers are axially fixed with respect to the carriage, so that as they follow the spirally disposed wire the carriage is moved across the licker without lost motion.

I have found my improved machine to be very accurate and efficient in operation. Because of the fact that the guide rollers 66 are yieldably mounted with respect to the grinding wheel, the cutting action of the wheel is not affected by the variations in distance between the rows of wire, for as the rollers strike wide or narrow places they move slightly in or out of the grooves between the wire with the result that the grinding wheel remains a constant distance from the center of the cylinder and cuts all of the wire to a common overall diameter and to a common degree of sharpness. It will be noted that the guide rollers do not bear on the licker roller itself, but instead they rest against the sides of the wire. The roughness of the licker roller, therefore, does not affect the guiding action of the guide rollers, and my machine is capable of grinding to the extremely close tolerances required for the work to which it is adapted.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. A machine for grinding the spirally wound wire on a licker cylinder comprising a grinding wheel adapted to grind the sides of the rows of wire, a track parallel to the longitudinal axis of the licker cylinder, a carriage mounted free to move on the track and on which the grinding wheel is rotatably mounted, guide means carried by the carriage and adapted to fit between the spiral rows of wire, means adapted to hold said guide means firmly but yieldably against the sides of the rows of wire, means to move the grinding wheel into cutting engagement with the wire, and means for rotating the cylinder to cause the carriage and grinding wheel to traverse the cylinder responsive to the feeding action of the guide means and spirally wound wire.

2. A machine for grinding the spirally wound wire on a licker cylinder comprising a motor driven grinding wheel having a bevelled periphery adapted to fit between and grind the sides of adjacent rows of wire, adjusting means associated with the grinding wheel for positioning it between adjacent rows of wire, a carriage on which the grinding wheel is mounted, a track on which the carriage is free to move extending parallel to the longitudinal axis of the cylinder, a pair of rollers supported by the carriage and adapted to fit between parallel rows of wire, a slide member on which said rollers are mounted for movement toward and from the cylinder, a spring associated with the slide member and adapted to hold said rollers firmly but yieldably between the rows of wire, and means for rotating the cylinder to cause the carriage and grinding wheel to traverse the cylinder responsive to the feeding action of said rollers.

3. A machine for grinding the spirally wound rows of wire of licker cylinders comprising a motor driven grinding wheel adapted to enter between and grind the sides of adjacent rows of wire, means to support said grinding wheel for movement parallel with the longitudinal axis of the cylinder, a pair of guide rollers carried by the supporting means and adapted to fit between the rows of wire and cause the grinding wheel to traverse the cylinder upon rotation of the latter, means to move the grinding wheel into grinding contact with the wire, means to rotate the cylinder, means for supporting the guide rollers free for movement toward and away from the cylinder responsive to irregularities in the spacing of the rows of wire thereon, and a spring associated with the rollers and adapted to hold them in yieldable engagement with the wire.

4. A machine for grinding the spirally wound rows of wire on a licker cylinder comprising a rotatable grinding wheel having its axis of rotation substantially parallel to the longitudinal axis of the cylinder and adapted to enter between and grind the edges of adjacent rows of wire, a carriage to support said grinding wheel for movement parallel with the longitudinal axis of said cylinder, a pair of guide rollers on the carriage, one of said guide rollers being spaced on each side of said grinding wheel and both being adapted to fit between the rows of wire, means to hold said rollers spaced from each other and in fixed axial position on the carriage, means to move the grinding wheel with respect to the rollers and axially of the cylinder to position it directly between the rows of wire, and means for rotating the cylinder to cause the grinding wheel to traverse the cylinder responsive to the feeding action of the spirally wound wire on said rollers.

5. In a machine for grinding the spirally wound rows of wire on a licker including a grinding

wheel adapted to enter between and grind the edges of adjacent rows of wire, and a carriage supporting the grinding wheel for free movement parallel to the longitudinal axis of the cylinder, the combination of a pair of guide rollers mounted on a common shaft and disposed in spaced relation on opposite sides of the grinding wheel, bevelled peripheries on the rollers adapted to enter between adjacent rows of wire with a wedge fit, means to secure the rollers in fixed axial position on the carriage, a slide on which said rollers are mounted for movement toward and from said cylinder responsive to irregularities in the spacing of the wire, a spring on the slide to press the rollers into contact with the wire, means associated with the carriage and grinding wheel to adjust their positions axially with respect to the rollers to position the grinding wheel between the rows of wire, and means for rotating the licker to traverse the grinding wheel across the cylinder responsive to the rollers following the spirally wound wire.

6. In a machine of the character described, means for rotatably supporting a licker cylinder, a grinding wheel adapted to enter between and grind the sides of adjacent spirally wound rows of licker wire, a carriage supporting the grinding wheel for free movement parallel to the axis of rotation of the licker cylinder, a guide roller on the carriage adapted to engage the sides of adjacent rows of wire without contacting the cylinder itself, means for mounting the roller on the carriage free for movement toward and from the cylinder responsive to irregularities in the spacing of the rows of wire, a spring associated with the roller and adapted to hold the roller in contact with the side of the wire during the grinding operation, and means for rotating the licker cylinder to cause the grinding wheel to traverse the cylinder.

7. A machine for grinding the spirally wound wire on a licker cylinder comprising a motor driven grinding wheel having a bevelled periphery adapted to fit between and grind the sides of adjacent rows of wire, adjusting means associated with the grinding wheel for positioning it between adjacent rows of wire, a carriage on which the grinding wheel is mounted, a track on which the carriage is free to move extending parallel to the longitudinal axis of the cylinder, guide means supported by the carriage and adapted to enter between and bear against the sides of the rows of wire, said guide means being movable toward and from the cylinder responsive to irregularities in the rows of wire, means to hold the guide means in yieldable engagement with the rows of wire, and means to rotate the cylinder and cause the carriage and grinding wheel to traverse the cylinder responsive to the feeding action of the guide means.

8. A machine for grinding substantially parallel spiral rows of outwardly projecting teeth on a cylinder comprising a carriage, a track upon which the carriage is freely movable in a restrained path parallel to the cylinder, a grinding wheel rotatably mounted on and movable with the carriage and adapted to enter between and grind the sides of the rows of teeth, guide means carried by the carriage and adapted to bear against the sides of the rows of teeth for holding the grinding wheel to its work, means for holding the guide means in yieldable engagement with the rows of teeth, and means for rotating the cylinder to cause the guide means and grinding wheel to traverse the same.

9. A machine for grinding the spirally wound rows of wire of licker cylinders comprising a motor driven grinding wheel adapted to enter between and grind the sides of adjacent rows of wire, means to support said grinding wheel for movement parallel with the longitudinal axis of the cylinder, guides carried by the supporting means and adapted to fit between the rows of wire and cause the grinding wheel to traverse the cylinder upon rotation of the latter, means to move the grinding wheel into grinding contact with the wire, means to rotate the cylinder, means for supporting the guides free for movement toward and away from the cylinder responsive to irregularities in the spacing of the rows of wire thereon, and means associated with the guides and adapted to hold them in yieldable engagement with the wire.

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