Oct. 2, 1962 B. H. BUNN 3,056,345

TWINE ARM AND CONTROL THEREFOR

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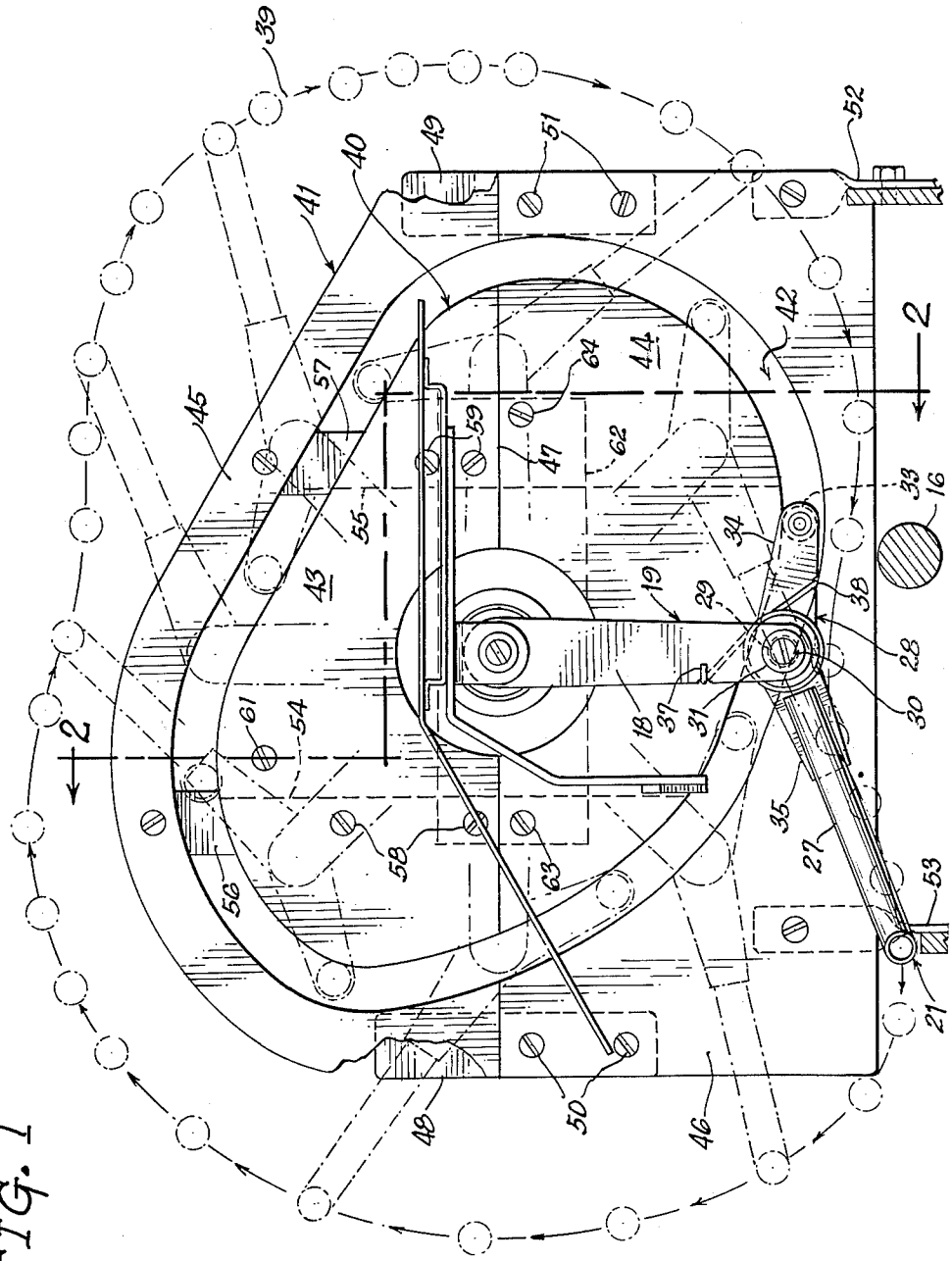


FIG. 1

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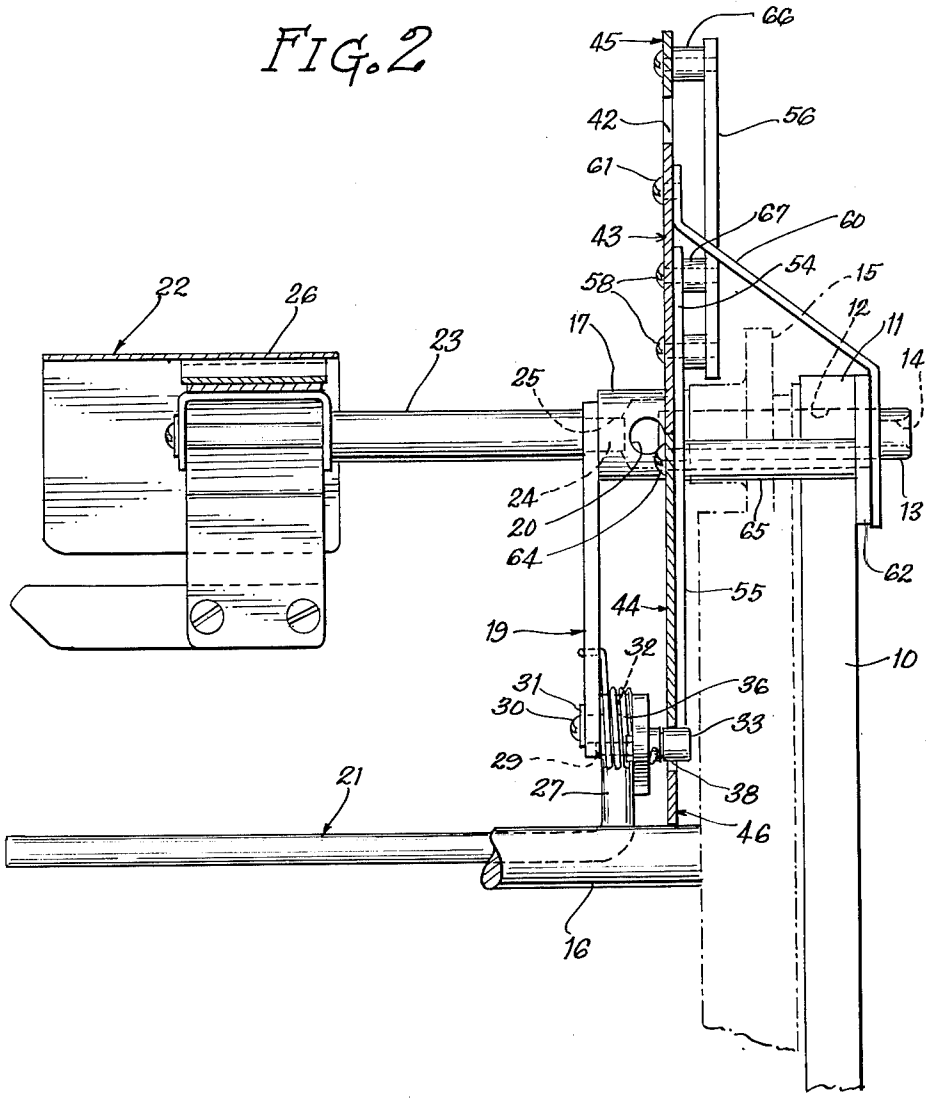
Horton, Davis, Brewer & Brugman
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FIG. 2



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TWINE ARM AND CONTROL THEREFOR

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3 Claims. (Cl. 100—27)

This invention relates to tying machines and particularly to the construction of the twine arm thereof and its control.

In my prior Patent No. 1,606,290, for "Tying Machine," granted November 9, 1926, there is disclosed a tying machine having a twine arm constructed of two parts, one of which is slidable upon the other so that the length of the arm can be varied. Sliding motion is imparted to the said one part by a plate cam surmounted on the tying machine adjacent the arm and cooperating with a cam follower secured to the said one part.

The purpose of the two-part arm disclosed in the aforesaid prior patent is to enable the tying machine to accommodate larger bundles than it could otherwise handle. With the fixed-dimension arm, the bundle must always be small enough to allow the arm, while travelling in a circular path, to pass around it. Thus, although the arm might clear a large bundle at the top of its swing, the arm would strike the bundle at the corner regions of the latter. By making an extensible arm, the movement of which is controlled by a specially designed cam, the end of the arm that passes over the bundle can be made to describe a somewhat rectangular path, thereby clearing corners of large bundles which would otherwise interfere with its movement.

The extensible arm disclosed in the aforesaid patent necessarily created appreciable transverse forces in the slidable part because of the tangential component of force developed therein by the circular movement of the arm. These transverse forces occasionally resulted in a cocking of the slidable part in the guide provided therefor in the hub portion of the arm, which in turn resulted in increased friction, greater power requirements and greater wear.

The principal object of this invention is the provision of an extensible twine arm made of two parts, wherein tangential forces created therein by the circular movement of the arm are converted into rotary movements, or into forces acting normally to the axis of a bearing thereby reducing frictional forces between the two parts of the arm to a minimum.

As a more specific object, this invention has within its purview the provision of a twine arm comprised of two parts, one of which is pivoted upon the end of the other so that the two parts can bend or fold readily and thus effect a variation in the radial distance between the outermost end of the arm and the axis about which the arm rotates.

As a further specific object, this invention seeks to provide a folding twine arm controlled by a cam and follower, wherein the follower trails the arm and therefore is subjected only to a minimum of compressive forces tending to cause the follower to bind in its cam groove.

Yet another specific object of this invention is to provide a novel construction of a cam, whereby the cam can be assembled around and disassembled from a shaft without threading the cam over the shaft.

These and other objects of this invention will become clear from the following detailed description of a preferred embodiment of the invention in which:

FIG. 1 is a front elevational view of a fragment of a tying machine showing the folding twine arm of this invention and the cam by which its effective radial dimension is controlled; and

FIG. 2 is a side elevational view in section of the fragment of a tying machine shown in FIG. 1, the section being taken along the line 2—2 of FIG. 1 and in the direction of the arrows at the ends of said line.

It may be stated preliminarily that the twine arm and controlling cam and follower of this invention may be substituted for the two-part twine arm and cam and follower disclosed in my aforesaid Patent No. 1,606,290 and hence the details of construction of the remainder of the tying machine will not be detailed here. It is understood that the description of so much of the tying machine as is necessary to make a complete operative bundle-tying machine contained in such prior patent is incorporated herein by reference.

Referring now to the drawings for a detailed description of the invention, there is shown in FIG. 2 a portion of the frame 10 of the tying machine which extends upwardly at the rear of the machine and terminates in a support 11 having a horizontal opening 12 in which is fixed a tube 13 having a central passageway 14 through which twine is passed from right to left as viewed in FIG. 2 from a suitable source of supply (not shown) associated with, or carried on, frame 10. Rotatably mounted on tube 13 is a sprocket 15 driven by a chain and drive sprocket (not shown) from a horizontally disposed shaft 16. Sprocket 15 is appropriately secured to a hub 17 to drive the latter, said hub 17 being in turn secured to the radially inner part 18 of a twine arm designated in its entirety by the reference character 19. Thus part 18 is constrained to rotate with sprocket 15, the rotation of the latter being synchronized with the knotter of the machine as shown in the aforesaid Patent No. 1,606,290.

Hub 17 has a radially disposed opening 20, tube 13 terminating short of opening 20 so that twine may be passed from the left hand end of tube 13 as viewed in FIG. 2, through opening 20 to the exterior of hub 17.

Twine arm 19 has a second part 21 which is hollow and through which the twine passes after it leaves opening 20, said twine ultimately emerging from second part 21 at the left hand end thereof as viewed in FIG. 2 to pass around the bundle or article to be tied.

A table 22 is supported from a rod 23 having a reduced end 24 piloted in an opening 25 in hub 17 in which it is freely rotatable. Table 22 is so formed and weighted that its center of gravity lies below the axis of opening 25 and hence it retains a generally horizontally disposed top surface 26 upon which a portion of the bundle to be tied may be supported while said tying operation is in progress. The specific form of the table is not material to this invention and may be selected for adoption to a particular article to be tied.

The second part 21 of twine arm 19 is shown in FIG. 1. As stated above, second part 21 is hollow and may be a tube the free end of which is horizontally disposed and the opposite end 27 of which is bent radially inwardly toward the axis of hub 17. Said end 27 is brazed or otherwise secured to a rocker arm 28, having a pin 29 (FIG. 2) pivoted on the radially outer end of inner part 18 of arm 19. A machine screw 30 and a washer 31 on the end of pin 29 on one side of inner part 18, and a bushing 32 on the opposite side of said inner part serve to prevent axial movement of pin 29 in its opening in the inner part 18. Rocker arm 28 has a cam follower roller 33 mounted on the end 34 thereof opposite the end 35 on which the part 21 is secured, said roller extending rearwardly toward the portion of the machine frame shown at 10. A torsion spring 36 has one end 37 thereof hooked around inner part 18 and the other end 38 hooked around rocker arm 28 at end 38, the direction of torque developed by spring 36 being counterclockwise as viewed in FIG. 1 for a purpose hereinafter made clear.

It may be apparent from the description thus far given that the second part 21 of twine arm 19 can rotate about the axis of pin 29 and thereby "fold" relative to inner part 18. This rotation of second part 21 results in a change in the distance from the axis of rotation of hub 17 to the horizontally disposed second part 21. By providing an appropriately contoured cam to cooperate with roller follower 33, any desired movement of part 21 can be attained. It will be assumed for purposes of illustration that the desired path for the horizontally disposed second part 21 to describe is that shown by the arrows at 39 in FIG. 1. This path is non-circular and, in fact, is expanded in a horizontal direction to embrace a larger rectangular bundle than would be possible with a circular path the diameter of which would be limited by obstructions such as shaft 16 or overhead clamps. This movement can be produced by the plate cam now to be described.

In radial alignment with roller follower 33 is a plate cam formed by an inner plate 40 and a coplanar outer plate 41, the confronting edges of the plates 40 and 41 being uniformly spaced and defining a slot 42 into which roller 33 extends. Said confronting edges are so shaped that as inner part 18 of arm 19 is rotated in a clockwise direction as viewed in FIG. 1 the horizontal portion of part 21 will be compelled to describe path 39 by the roller 33 and rocker arm 28. The cam contour can be developed by the application of the usual cam design practice.

Slot 42 is made slightly wider than the diameter of roller follower 33 to avoid any binding of the follower therein. It may now be noted that spring 36 constantly holds roller follower 33 against the edge of plate 40 and thereby prevents any chattering of the arm as its direction of movement is reversed by the cam or by the action of gravity upon the eccentrically supported part 21.

Cam plate 40 is made of two parts, one upper part 43 and a lower part 44. Similarly, cam plate 41 is made of an upper part 45 and a lower part 46. The upper and lower parts of both cam plates 40 and 41 meet on a straight line 47 which passes through the axis of rotation of arm 19. Thus the cams may be assembled on the machine without disassembling the arm 19 or its drive. The upper and lower parts 45, 46 of cam plate 41 are secured together by a pair of straps 48, 49 which are secured by spot welding or the like to the opposite ends of upper part 45 and extend downwardly to overlie the back of the lower plate 46. Suitable screw fasteners 50, 51 removably secure the lower ends of straps 48, 49 to the lower part 46. Said lower part 46 is removably secured to the machine frame by straps 52 and 53.

Inner cam plate 40 has a pair of back plates 54 and 55 which are spot welded or otherwise secured to the lower part 44 of inner cam plate 40 on the opposite ends thereof, said back plates extending upwardly to overlie the back of upper part 43. Upper part 43 is secured to the back plates 54 and 55 and to vertically extending straps 56, 57 by machine screws 58 and 59, respectively. Straps 56, 57 serves to align the inner cam 40 with the outer cam 41 and to brace the relatively thin upper part 45 of the outer cam 41 from the relatively rigid inner cam 40. To avoid interference between straps 56, 57 and follower roller 33 the said straps are displaced rearwardly by spacers 66, 67 disposed between the cams and the straps.

Inner cam plate 40 is fixed to machine frame 10 by a brace 60 secured at its upper end to upper part 43 by a suitable fastener 61 and to a transverse rectangular plate 62 at its lower part by spot welding or the like. Said plate is appropriately secured to machine frame 10 by any known means. The lower part of inner cam 40 is also secured to plate 62, the means used comprising long screws 63, 64 which pass through spacers 65 and are threaded in said plate 62.

To assemble the complete plate cam, it is desirable first to assemble lower part of outer plate 41 upon its straps 52, 53 and the said straps upon the appropriate frame members. The lower part 44 of the inner plate 40 is next secured to plate 62 by the screws 63, 64. The upper part of the outer plate is then secured to straps 56 and 57, and the upper part 43 of the inner cam is assembled, together with the straps 56, 57 to the plates 54 and 55 extending upwardly from the lower part 44. Straps 48 and 49 may then be fastened to lower part 46 and finally the brace 60 may be secured to the upper part of the inner plate and to the rear plate 62.

It may be apparent that the above-described twine arm provides a means for varying the path of travel of the twine feeding end thereof to conform generally to the shape of bundles to be tied and also to avoid interference with other parts of the tying machine which cannot readily be moved to another location. The plate cam by which the movements of the twine arm are controlled is conveniently made of separable parts which may be readily assembled around a shaft without removing the shaft and the mechanisms associated therewith.

It is understood that the foregoing description is merely illustrative of a preferred embodiment of the invention and that the scope of this invention is not to be limited thereto, but is to be determined by the appended claims.

What is claimed is:

1. In a tying machine, a twine feeding arm and a rotatable support for the arm, said twine feeding arm having a first part secured to and extending radially from said rotatable support, and a second part having a twine-feeding radially outer region, means pivotally mounting the second part on the first part about an axis spaced from and substantially parallel to the axis of the rotatable support, a plate cam fixedly mounted on the machine adjacent said twine feeding arm, a roller follower mounted on the said second part and cooperating with the plate cam, said plate cam comprising a radially inner plate, a radially outer plate substantially coplanar with the inner plate, said inner and outer plates having confronting edges defining a slot for guiding the roller follower, said inner plate being comprised of two parts which are separable along a line passing through the axis of the rotatable support whereby said inner plate can be assembled around said rotatable support, said plate cam causing the roller to vary its radial distance from the said rotatable support for the twine arm as said arm is rotated thereabout, thereby oscillating the said second part about its pivoted mounting and altering the radial dimension between the rotatable support and the twine feeding outer end of the second part as the arm is rotated about the axis of said rotatable support.

2. In a tying machine, the combination described in claim 1, said radially outer plate being comprised of two separable parts.

3. In a tying machine, the combination described in claim 1, and means supporting the outer plate from the inner plate, said means comprising straps disposed to bridge the space between the inner and outer plates, and means securing the straps to said plates.

References Cited in the file of this patent

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