Jan. 16, 1962 W. C. TROST 3,017,128

THREAD POSITIONING MECHANISM

Filed May 31, 1960 3 Sheets-Sheet 1

Fig. 1

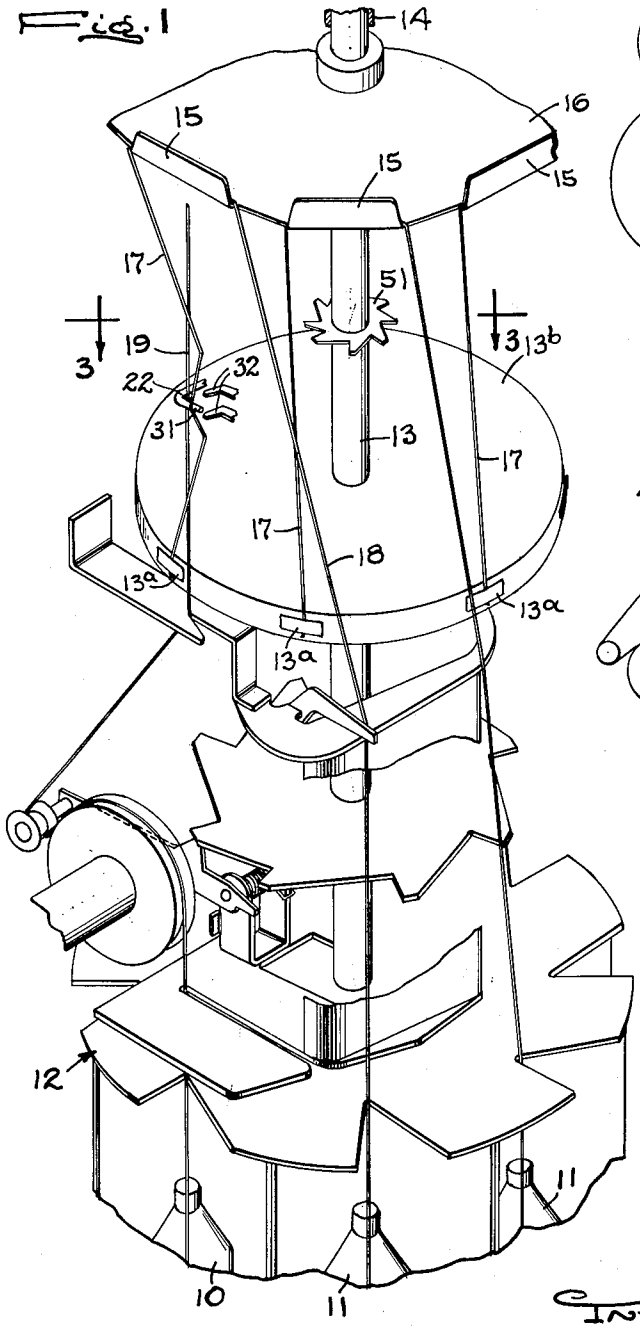
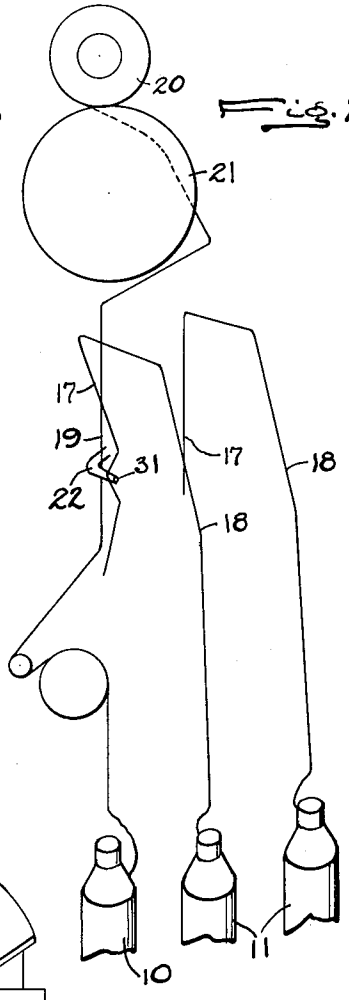


Fig. 2



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Jan. 16, 1962 W. C. TROST 3,017,128

THREAD POSITIONING MECHANISM

Filed May 31, 1960 3 Sheets-Sheet 2

Fig. 3

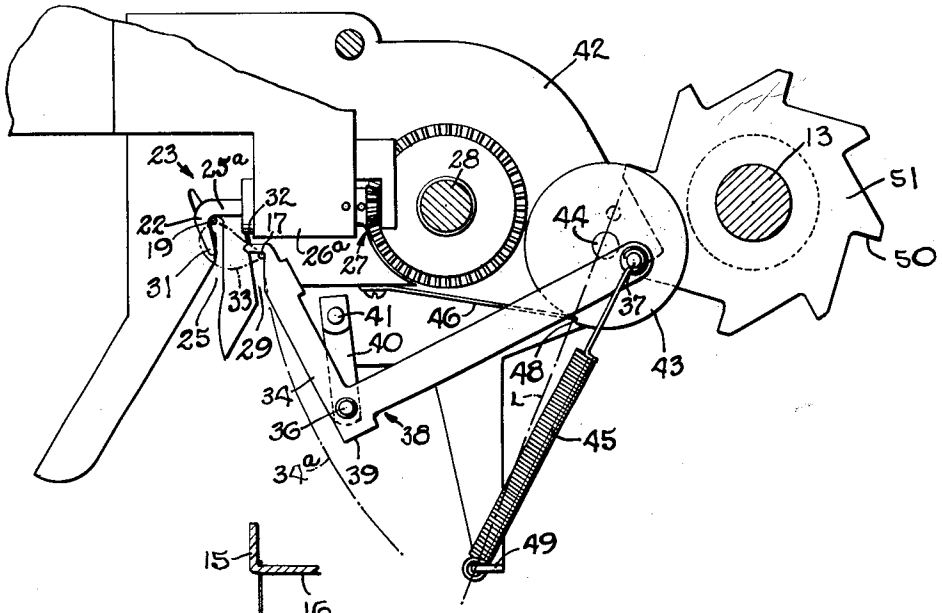
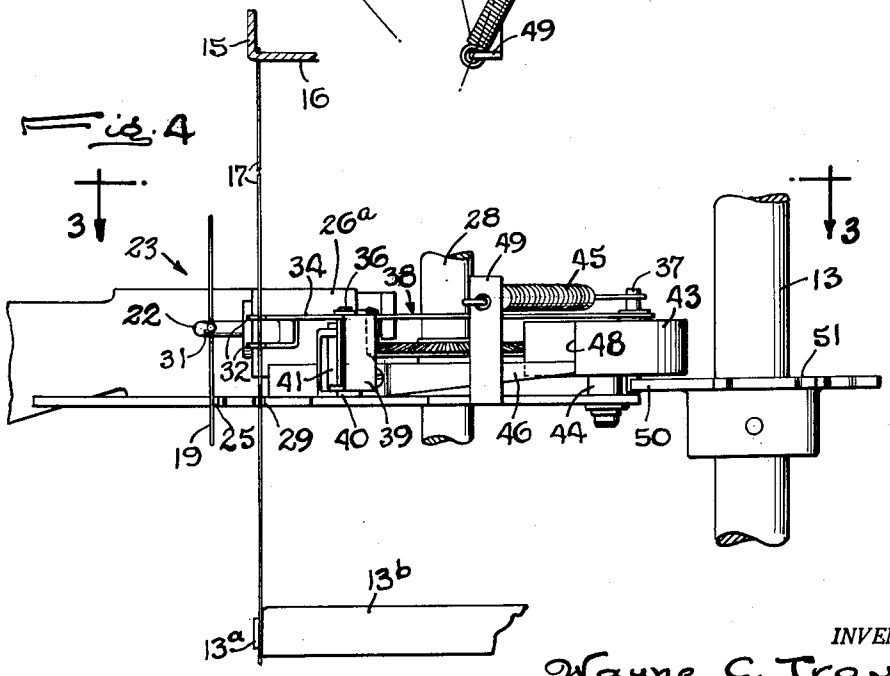


Fig. 4



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THREAD POSITIONING MECHANISM

Filed May 31, 1960 3 Sheets-Sheet 3

Fig. 5

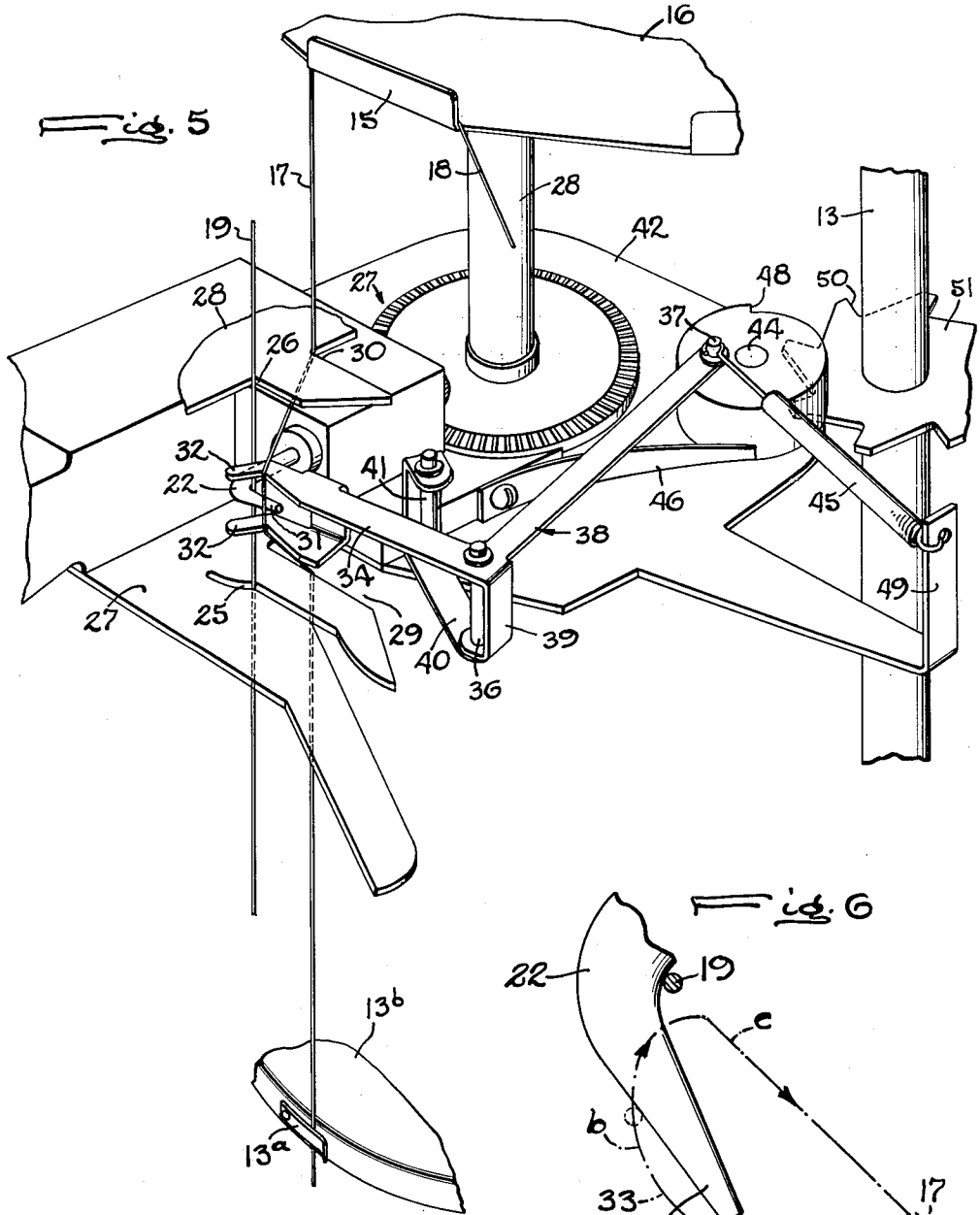


Fig. 6

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3,017,128

THREAD POSITIONING MECHANISM

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Filed May 31, 1960, Ser. No. 32,991
6 Claims. (Cl. 242—35.6)

This invention relates to a mechanism for positioning a thread in relation to a part for operating on the thread such as the bill of a knotter. For example, in the winding machine disclosed in my copending application, Serial No. 669,234, filed July 1, 1957, a plurality of threads unwound from bobbins on an indexable magazine and supported in generally parallel relation and advanced successively into operative association with the bill of a knotter by which the thread is tied instantaneously to another thread upon exhaustion of the latter and without interrupting the winding operation. In approaching the knotter, an intermediate portion of the thread is intercepted and bent laterally and then positioned properly with respect to the knotter bill and the associated running thread.

The general object is to provide a mechanism of the above general character which will position successive threads quickly and more reliably than has been possible heretofore.

A more detailed object is to effect the thread positioning by the overcenter action of a spring exerted on a crank which is brought to rest in an accurately defined position for receiving a succeeding thread.

The invention also resides in the novel manner of weighting the crank to insure proper association thereof with a locating pawl.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary perspective view of part of a winder embodying the novel feature of the present invention.

FIG. 2 is a diagrammatic view of showing the relationship of several threads in the winder.

FIG. 3 is a fragmentary section taken along the line 3—3 of FIGS. 1 and 4.

FIG. 4 is an elevational view of the mechanism shown in FIG. 3.

FIG. 5 is a fragmentary view of the improved thread positioning mechanism and associated parts.

FIG. 6 is a diagrammatic view of the orbit traversed by the thread positioning fingers.

The improved thread positioning mechanism is shown in the drawings incorporated in a winding machine of the type disclosed in the aforesaid application to which reference may be made for details of certain of the parts described below. In this machine, an active bobbin **10** and a plurality of reserve bobbins **11** are mounted in pockets spaced around a magazine **12** fast on an upright shaft **13** which is journaled in spaced bearings **14** and indexable through steps of lengths determined by the angular spacing of bobbins. Lengths of the threads unwound from the reserve bobbins **11** are hung up in inverted J-shape around flanges **15** on a disk **16** fast on the shaft, the short leg **17** of each J being spaced ahead of the long leg **18** and held at its lower end in a spring clamp **13a** on the outer periphery of a disk **13b** fast on the shaft **13**.

During the winding operation the magazine is stationary and the thread **19** of the bobbin **10** is unwound and drawn upwardly through suitable guides illustrated schematically in FIG. 2 and to a package such as a cheese **20** which rests on and is driven by a rotating

winding drum **21**. In running past the bill **22** of a knotter **23**, the thread **19** is disposed within the heel of the bill and alongside the short leg **17** of the first reserve thread which is bent laterally and outwardly so as to lie against the outer side of the bill and cross the running thread above and below this bill as shown in FIGS. 1, 2 and 5. This is accomplished by disposing the running thread in notches **25** and **26** vertically alined with the inside of the knotter heel as shown in FIG. 5 and formed in stationary plates **27** and **28** below and above the bill. The leading end **17** of the reserve thread is disposed in lower and upper notches **29** and **30** formed in the plates **27** and **28** and spaced inwardly from the notches **25** and **26** and like the latter opening along the path of advance of the threads to the knotter but in a direction opposite to the indexing motion.

The bill **22** projects laterally from a shaft **25a** journaled on the machine frame at **26a** and coupled through gears **27** (FIG. 3) with a shaft **28** which is spring actuated. Upon breaking of the thread, the bill is turned clockwise as viewed in FIG. 6 through at least a revolution and operates instantaneously as described in the aforesaid application to tie the trailing portion of the broken thread to the leg **17** of the first reserve thread and thus continue the winding.

At the same time, an indexing step of the magazine **12** and shaft **13** is initiated during which the leading portion **17** of the second reserve thread is shifted sidewise along a path **34a** into proper association above described with the knotter bill. This necessitates intercepting the thread as it approaches the tip **31** of the bill, bending the intervening length of thread outwardly, holding this position of the bend until the thread passes beyond the bill tip, and then releasing the bend to leave the thread crossing the running thread above and below the knotter. Interception of the advancing reserve thread is effected by at least one finger **32** which normally projects transversely of the path of indexing of the thread, there being two such fingers in the present instance, respectively spaced above and below the tip **31** of the knotter bill. After such interception, the fingers are shifted outwardly and along the indexing path and then inwardly to describe an orbit **33** which, as shown in FIGS. 3 and 6, lies tangent to the path of advance of the thread and extends outwardly from the latter beyond the knotter bill.

To effect the orbital movement, the fingers **32** are formed on and project laterally from the outer end of one leg **34** of a bell crank **38** which is L-shaped in the present intsance and fulcrumed to swing about a floating axis defined by a pivot pin **36**, the other end portion of the bell crank being journaled on the pin **37** of a crank which is turned counterclockwise through one revolution from a well-defined position (FIGS. 3 and 4) corresponding to the retracted position of the fingers **32**. The pivot pin **36** is mounted in a yoke **39** (FIG. 5) and projects upwardly from the free end of an arm **40** fulcrumed at its inner end on a pin **41** upstanding from and fixed to a stationary plate **42** in which the thread guide notches **25** and **29** are formed. The arm **40** is spaced inwardly from the path of the thread and projects along this path opposite to the travel of the thread. The arm which is somewhat shorter than the leg **34** of the bell crank **38** thus supports the latter for bodily shifting back and forth about an axis paralleling the crank pin **37**. The latter projects through and is fixed on a wheel **43** journaled on a stud **44** on the frame plate **42**.

Normally the crank wheel is urged counterclockwise by a spring **45** and held in an angular position corresponding to the retracted position of the fingers **32** and defined by a leaf spring pawl **46** fixed cantilever fashion to the frame at **47** for engagement at its free end with an abutment in the form of a radially disposed shoulder

48 on the wheel periphery. The spring is of the contractile type and stretched between the crank pin 37 and the outer end of a fixed arm 49.

The eccentrically disposed crank pin projects through and below the wheel 43 into the path of the teeth 50 angularly spaced around the periphery of a disk 51 fixed to the indexable shaft 13. The leading faces of the teeth are disposed substantially radial and face in the clockwise direction of the shaft indexing. At the proper time in each step of the latter, one tooth picks up the pin 37 and turns the crank wheel 43 counterclockwise thus further stretching the spring 45. The line of action of the latter is thus moved laterally toward and finally over-center or across the line L (FIG. 3) whereupon the spring force becomes effective to turn the wheel on ahead of the cam tooth 50, this force continuing to be applied a full half revolution between the two dead center positions of the crank during which the bell crank 38 is, by rocking of its supporting arm 40, first shifted outwardly and then drawn inwardly.

After the crank pin passes the second dead center position, the spring begins to act in the opposite direction and turns the crank clockwise after the momentum of the parts has been overcome. To insure that the crank will always be stopped with the pawl engaging the shoulder 48 under the force of the spring and the fingers properly positioned, the invention contemplates construction of the crank and the connected parts with sufficient inertia to insure that the momentum acquired under the action of the spring after the crank has been moved over-center by the cam tooth will be sufficient to swing the crank far enough beyond the opposite over-center position to carry the shoulder 48 past the tip of the pawl 46. Then, as the turning of the crank under the action of the spring is reversed, the shoulder will come against the pawl end and stop the crank with the fingers 32 in the desired retracted position shown in FIG. 3.

As a result of the crank motion above described and the mounting of the bell crank 38 on the floating arm 40, it will be apparent that in the initial counterclockwise movement of the crank pin by a cam tooth 50 and up to the over-center position of the crank, the fingers 32 are shifted outwardly and transversely of the path of advance of the thread 17 and along the initial quarter revolution after the crank passes over-center. Then, in the remainder of the revolution of the crank, the fingers are retracted back along the straight part of the orbit 33 and the crank comes to rest against the stop pawl.

The teeth 50 of the cam are positioned around the shaft so as to come into engagement with the pin 37 and initiate turning of the crank at the time in the indexing cycle when the advancing thread 17 reaches and is intercepted by the finger 32 which, as shown in full in FIGS. 4 and 6, straddle the knotter bill 22 and project outwardly across the path 34^a of advance of the thread to the knotter. In the initial turning of the crank up to the over-center position the fingers are shifted transversely of the thread path 34^a to bend the intervening length of the thread outwardly relative to its stationary guide notches 29 and 30 and along the initial part *a* (FIG. 6) of the orbit.

Such bending continues in the next quarter revolution of the crank during which the bend in the thread is carried across and beyond the tip 31 of the knotter bill along part *b* of the orbit. By the simultaneous swinging of the arm 40, the final portion of this motion is along the bill 22 thus carrying the thread to the outer side of the bill as shown in FIG. 5 and in phantom in FIG. 6. The motions of the bill crank 38 and its supporting arm 40 are reversed in the next quarter revolution of the crank during which the fingers 32 are retracted along the straight part *c* of the orbit and across and away from the thread which is left deposited on the outer side of the knotter bill.

During the final retraction of the fingers 32 and as

the line of action of the spring is carried across the center line L (FIG. 3), the spring force becomes effective to resist continued turning of the crank. Owing, however, to its substantial inertia, the crank wheel has by this time gained enough momentum to overcome the spring and carry the crank pin counterclockwise beyond its normal rest position thus insuring that the shoulder 48 will always move past the tip of the pawl 46. Then when the fly-wheel effect is dissipated, the spring reverses the turning of the wheel until the shoulder comes against the stop pawl to arrest the motion with all of the parts disposed in the normal rest position and ready for the next thread positioning cycle.

The orbital motion of the positioning fingers 32 occupies only a fraction of the indexing motion of the shaft 13 and is completed well before the next tooth 50 of the cam disk approaches the normal position of the crank pin 37. When the indexing is complete the next tooth 50 to actuate the crank will be disposed behind and adjacent the crank pin as shown in FIG. 3.

Through the bell crank and inertia type crank wheel it is possible to use a single spring and cam to execute reliably in accurately timed relation to the thread advance the somewhat complex orbital motion required to effect the desired positioning of the thread 17 in the precisely timed relation to the approach of the thread to the knotter bill. The parts involved are simple in construction and adapted for long service use.

I claim as my invention:

1. In a thread winder, the combination of, means for supporting a length of thread and advancing the same sidewise along a predetermined path, a finger normally disposed in said path to intercept said thread in its advance, an arm swingable about a fixed axis extending along and spaced laterally from said thread, an elongated lever supporting said finger at one end and fulcrumed intermediate its ends on the free end of said arm whereby to support said finger in said path for movement in an orbit extending transversely of said path, a crank rotatable about a second fixed axis normal to the plane of said orbit and parallel to said first mentioned fixed axis, an eccentric pin on said crank pivotally coupling the crank to the end of said lever opposite said finger, a spring normally urging said crank in one direction but acting to turn the crank in the opposite direction when the crank is moved over-center in the latter direction, a shoulder on said crank facing in said first direction, a retractable pawl normally engaging said shoulder under the action of said spring to hold said member in a predetermined position with said finger disposed in said path, and means operable in timed relation to the advance of said thread to turn said crank away from said position to and beyond an over-center position and thereby release the crank to the action of said spring, the inertia of said crank and the connected parts being sufficient to carry the crank beyond the opposite over-center position and thereby move said shoulder past said pawl before said spring becomes effective to reverse the direction of turning of the crank.

2. In a thread winder, the combination of, means for supporting a length of thread and advancing the same sidewise along a predetermined path, a finger normally disposed in said path to intercept said thread in its advance, a member supporting said finger for movement in an orbit disposed adjacent and extending transversely of said path, a crank rotatable about a fixed axis normal to the plane of said orbit and spaced laterally from said path, means pivotally coupling said member and said crank eccentrically of the latter, a spring normally urging said crank in one direction but acting to turn the crank in the opposite direction when the crank is moved over-center in the latter direction, a shoulder on said crank facing in said first direction, a retractable pawl nor-

mally engaging said shoulder under the action of said spring to position said member with said finger disposed in said path and at a predetermined point along said orbit, and means operable in timed relation to the advance of said thread to turn said crank away from said position and over-center and thereby permit the spring to continue the turning, the inertia of said crank and the connected parts being sufficient to carry the crank beyond the opposite over-center position and thereby move said shoulder past said pawl before reversal of the crank motion by said spring.

3. The combination of, means for supporting a length of thread and advancing the same sidewise along a predetermined path, a finger positioned to intercept said thread in its advance, a member supporting said finger for movement in an orbit disposed to one side of said path and extending transversely thereof, a crank rotatable about a fixed axis normal to the plane of said orbit, means pivotally coupling said member to said crank eccentrically of the latter, a spring normally urging said crank in one direction but acting to turn the crank in the opposite direction when the crank is moved over-center in the latter direction, an abutment on said crank facing in said first direction, a retractable pawl normally engaging said abutment under the action of said spring to hold said member with said fingers disposed in said path, and means operable in timed relation to the advance of said thread to turn said crank away from said position and over-center, the inertia of said crank and the connected parts being sufficient to carry the crank beyond the opposite over-center position and thereby move said abutment past said pawl.

4. Mechanism as defined by claim 1 in which said arm

projects from the fixed axis thereof along said path but reversely of the direction of travel of said thread.

5. Mechanism as defined by claim 1 in which said lever comprises an L-shaped bell crank.

6. The combination of, means for supporting a length of thread and advancing the same sidewise along a predetermined path, a finger normally disposed in said path to intercept said thread in its advance, a member supporting said finger for movement in an orbit extending transversely of said path, a crank rotatable about a fixed axis normal to the plane of said orbit, means pivotally coupling the lever and crank eccentrically of the axis of the latter, a spring normally urging said crank in one direction but acting to turn the crank in the opposite direction when the crank is moved over-center in the latter direction, an abutment on said crank facing in said first direction, a retractable pawl normally engaging said abutment under the action of said spring to hold said member in a predetermined position with said finger disposed in said path, and means operable in timed relation to the advance of said thread to turn said crank away from said position to an over-center position and release the crank to action of said spring whereby to turn the crank beyond the opposite over-center position and move said abutment past said pawl.

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