

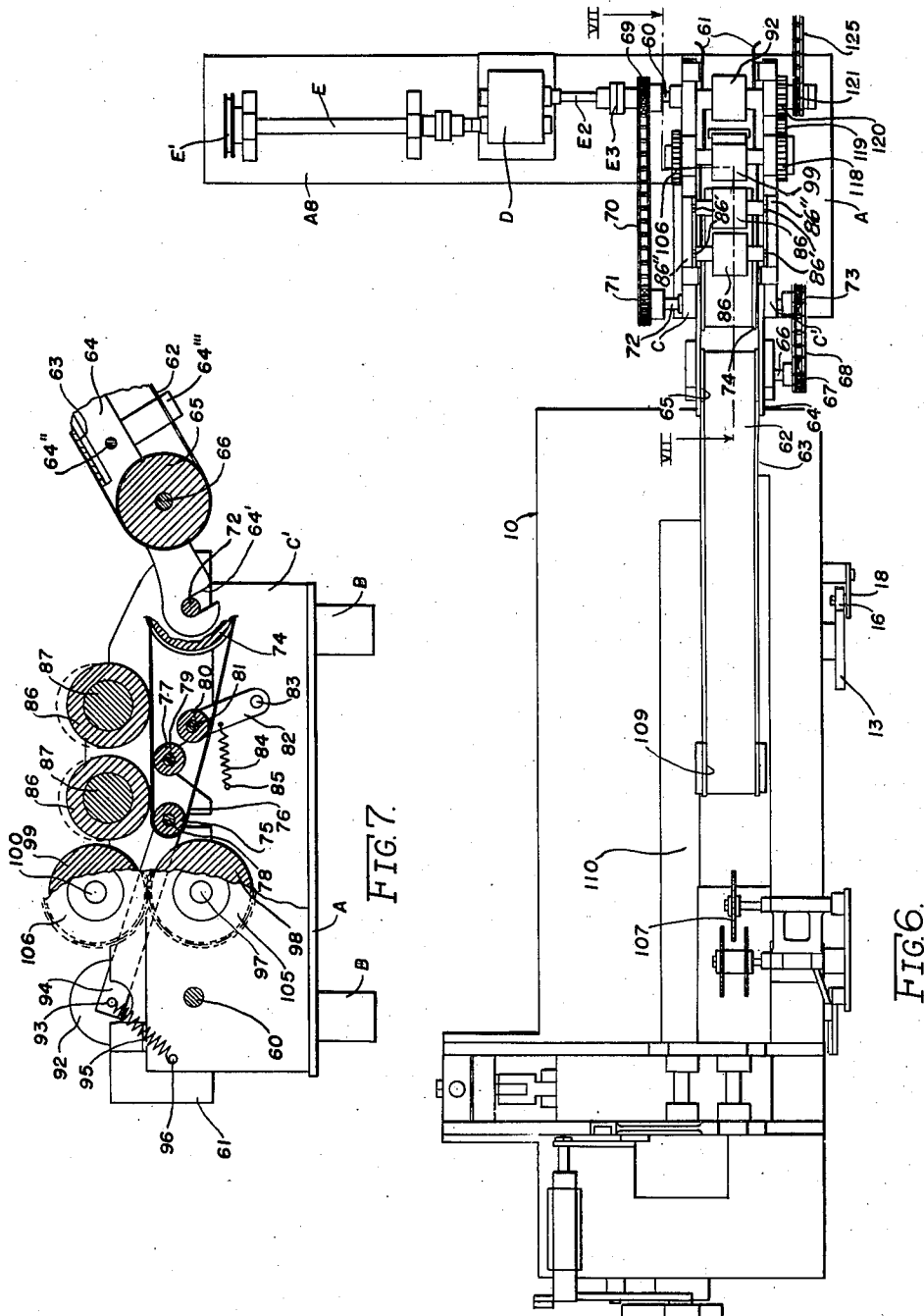
July 19, 1949.

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AUTOMATIC STRING SEWING MACHINE FEED
FOR TAMPONS AND THE LIKE

2,476,752

Filed Oct. 23, 1942

3 Sheets-Sheet 2



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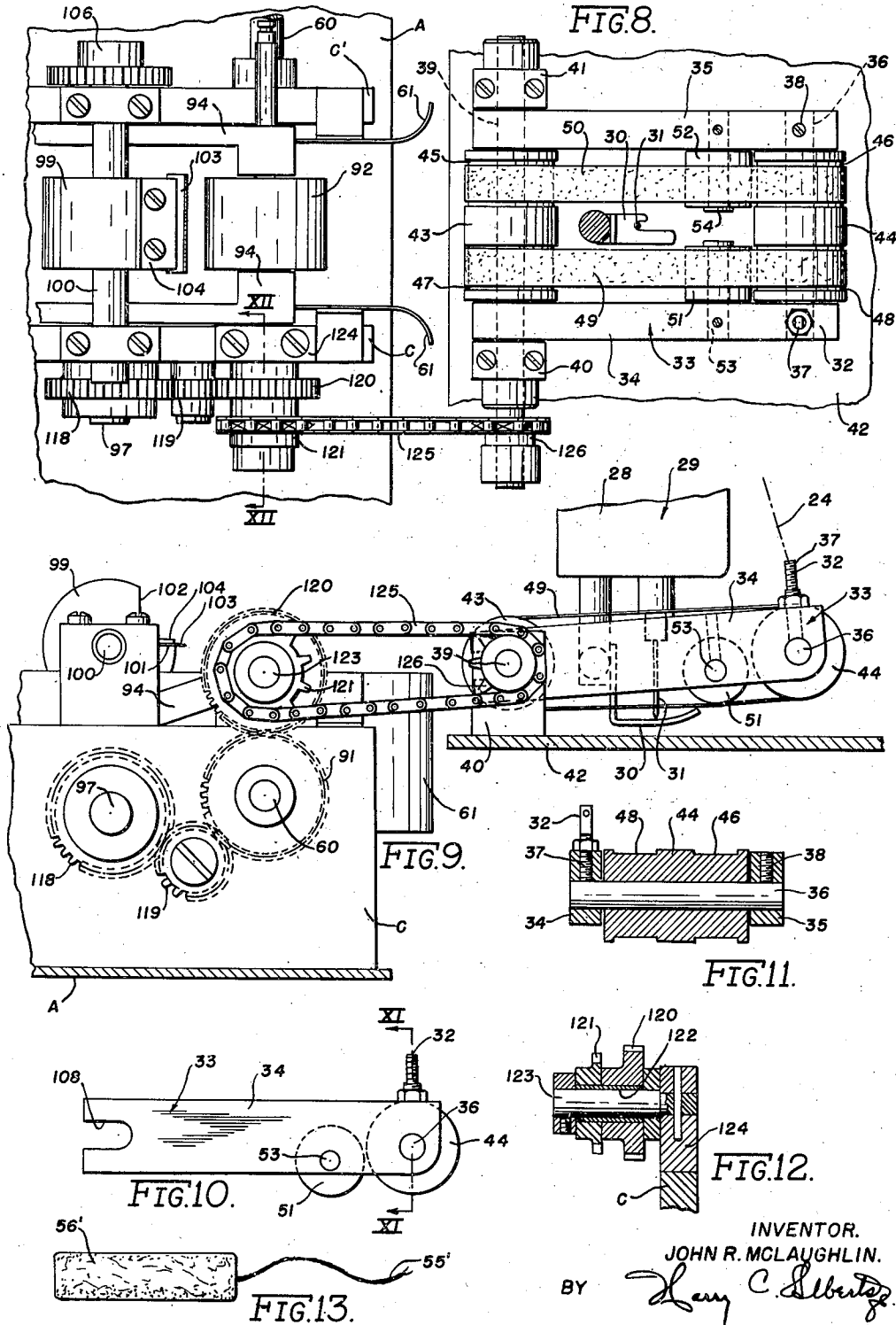
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AUTOMATIC STRING SEWING-MACHINE
FEED FOR TAMPONS AND THE LIKE

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Application October 23, 1942, Serial No. 463,096

12 Claims. (Cl. 112—203)

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This invention relates to feeding devices and more particularly to automatic string sewing machine feeds for absorbent cotton pads or the like, preferably though not essentially, used in the production of catamenial devices, although it may be employed with equal advantage for other purposes.

It contemplates more especially the feeding of preformed wads or pads of absorbent cotton or other material cut into elongated units, to a sewing machine for stitching longitudinally therealong and in successive spaced relation with continuous series of string connected sheets of like size and construction, for thereafter automatically segregating a continuous strip into individual strips having a stringtail attached thereto preparatory to the formation of highly compressed, self-sustaining and form-retaining wads of absorbent cotton serving as internal catamenial devices.

Prior to being compressed, and when leaving the sewing machine the cotton or other material has been cut into elongated pieces with the fibers disposed transversely, and these pieces have been stitched longitudinally in spaced relation to each other with a connecting string between them. Upon leaving the sewing machine, and prior to being operated upon by a compressing and forming apparatus, the attached pieces in the form of a continuous strip are passed through devices which are adapted to sever the string close to and end of each piece, thus leaving a "tail" attached to each piece. The present apparatus is designed for the purpose of accurately and effectively performing this severing operation.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is to provide improved feeding means having a successive series of sheets of material that are sewed together in uniformly spaced relation for severance into combined strips having connected strings extending therefrom.

Still another object is to provide improved feeding and cutting means in conjunction with a sewing device for automatically forming individual strips of material having a manipulating string connected thereto.

A further object is to provide improved feeding, cutting, and discharging means operating in automatic timed relation in the production of highly compressed self-sustaining and form-retaining catamenial devices of the tampon type.

A still further object is to provide improved feeding, cutting and discharging instrumentalities

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operated in conjunction with a sewing machine for feeding wads of string connected units to a processing machine in timed relation with the operating instrumentalities thereof.

Still a further object is to provide combined feeding, sewing, cutting and compressing instrumentalities to convert strips of material such as cotton into highly compressed, self-sustaining, form-retaining tampons.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

In the drawings:

Figure 1 is a side view in elevation of instrumentalities embodying features of the present invention.

Figure 2 is a fragmentary sectional view of the sewing machine feeder element.

Figure 3 is a fragmentary side view in elevation of the compressor actuator cam that controls the operation and feeding instrumentalities.

Figure 4 is a fragmentary sectional view taken substantially along line IV—IV of Figure 3.

Figure 5 is a diagrammatical plan view showing successive strips of cotton having stitched connecting strings therebetween after leaving the sewing and severing instrumentalities.

Figure 6 is a top plan view of the cutting and discharging instrumentalities shown in Figure 1 together with the feeding and compressing elements coordinated therewith.

Figure 7 is a side view in elevation partly in section substantially on line VII—VII of Figure 6.

Figure 8 is a fragmentary plan view of the feeding and cutting instrumentalities viewed substantially along line VIII—VIII of Figure 1.

Figure 9 is a fragmentary side view in elevation of the instrumentalities shown in Figure 8.

Figure 10 is a side view in elevation of the frame plate for the feeding mechanism shown in Figures 8 and 9.

Figure 11 is a sectional view taken substantially along line XI—XI of Figure 10.

Figure 12 is a sectional view taken substantially along line XII—XII of Figure 8.

Figure 13 is a plan view of a completed tampon with its attached string.

The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the present invention, but is merely illustrative thereof. There may be considerable variations and adaptations of all or part of the teachings depending upon the dictates of commercial practice. The present embodiment comprises instrumentalities for feeding, convoluting,

and compressing the cotton strips into a tampon or plug that is self-sustaining and form-retaining of the type more specifically described and illustrated in applicant's copending application, serially numbered 68,975, filed January 3, 1949, now abandoned, which, in this instance, constitutes the finishing instrumentalities for the strips that are fed thereto.

Generally, the compressing instrumentalities comprise a frame 10 mounted on the standard 11 (Figure 1) that supports a main shaft 12 which in turn supports a plurality of actuators including a cam 13 that rotates therewith. The cam 13, in this instance, has low and high sides 14—15 which form an irregular camming periphery that coacts with a circular cam follower 16. The circular cam follower 16 is rotatively mounted on a pin 17 carried by a lever 18. A ball bearing 19 is interposed between the cam follower 16 and the pin 17 to insure the rotation thereof with minimum friction. The lever 18 is pivoted at the lower extremity thereof to a pintle 20 fixed to the frame standard 11 somewhat below and laterally offset from the main shaft 12. The cam 13 continuously rotates to oscillate the lever 18 against a spring 21 that has one extremity anchored to the frame 10 as at 22 while the other extremity is attached to the lever 18 as at 23 proximate to the upper extremity thereof.

With this arrangement, the spring 21 normally maintains the cam follower 16 in frictional contact with the periphery 14—15 of the cam 13. The lever 18 has a flexible tension transmitting member such as a chain or string 24 connected to the upper extremity thereof as at 25 to engage a pulley 26 journaled on a stub shaft 27 that is fixed to the head 28 of a power sewing machine 29 of standard or suitable construction. The sewing machine 29 has the usual presser foot 30 with a reciprocally mounted needle 31 cooperating therewith for up and down movement responsive to the power source (not shown). The chain or string 24 has its other extremity fixed to the forward end 32 of the feeding frame 33 that comprises side plates 34—35 carrying a forward transverse stub shaft 36 therebetween. The stub shaft 36 is fixed between the forward ends of the confronting plates 34—35 by means of threaded fasteners 37—38 that project downwardly through the edge of the side plates 34—35 to engage the shaft 36.

Another shaft 39 is journaled in brackets 40—41 fixed to a bottom frame plate 42 proximate to the rearward edge thereof to carry a double grooved idler pulley 43 between the side plates 34—35 in confronting relation with a corresponding pulley 44 journaled on the stub shaft 36. Aligned spaced annular grooves 45—46 and 47—48 are provided in the pulleys 43—44 to carry endless belts 49—50 therebetween. The belts 49—50 are preferably though not essentially of rubber or other suitable material, and the tension thereof is suitably controlled through idler rollers 51—52 journaled on stub shafts 53—54 projecting inwardly from the confronting side plates 34—35 to carry the idler rollers 51—52 in the path of the belts 49—50 along their lower path of travel.

With this arrangement, the side plates 34—35 with their supporting pulleys 43—44 are pivoted relative to the shaft 39 for downward clockwise and upward counter-clockwise oscillatory movement (viewed from Figure 1) responsive to the chain or string 24 that is operated by the lever 18. The lever 18 is, in turn, operated by the cam

13 fixed to the prime shaft 12 of the compressor 10 that has its feeding, convoluting, and compressing instrumentalities operated in timed relation therewith. The raising or counter-clockwise movement of the side plates 34—35 will remove the continuously moving belts 49—50 from contact with preformed wads of cotton 56 placed on the frame plate 42 by an attendant or operator (Figure 1). In this position, there will be no feeding of the wads 56 beneath the presser foot 30 of the sewing machine 29 that continuously operates to form a twisted string 55 between the wads 56. The lowering of the frame plates 34—35 places the endless belts 49—50 in frictional contact with the wads 56 (Figure 2) placed in the path thereof by the attendant for feeding underneath the sewing machine shoe 30.

As a result, the twisted string 55 is sewed entirely through the absorbent cotton wads 56 to provide a twisted length 57 that is stitched to the transverse fibers 58 constituting the body thereof. The string 55 is produced by a lock stitch type of sewing machine 29 during the operation thereof between and while there are no cotton wads 56 in the machine 29 or under its needle 31. The cotton wads 56 are fed to the sewing machine 29 at substantially uniform intervals to provide a stitched portion 57 sewed through and along a longitudinal median line of the wads 56. The raising and lowering of the frame plates 34—35 is controlled by the cam 13 in timed relation with the feeding, convoluting, and compressing instrumentalities provided on the frame 10 so that the wads 56 are uniformly spaced with the corresponding lengths of thread 55 disposed therebetween and stitched length 57 extending entirely through the wads 56 as a continuous twisted string formed by the sewing machine 29.

These successive and uniformly spaced wads 56 with their connecting strings 55 are thus fed into cutting instrumentalities to be hereinafter described for the purpose of severing each string 55 at the point of juncture 59 with the successive wad 56.

The cutting instrumentalities comprise, in this instance, a horizontal base A, having feet B, and provided with spaced parallel plates C, C', arising vertically from said base to provide mountings and bearings for the instrumentalities of the apparatus. A lateral extension A3 projects to one side of the feed or front end of the base A, upon which extension a suitable speed-reducer D is mounted and driven by a shaft E receiving motion from a driving pulley E' that is actuated from any suitable source. A transmission shaft E2 is connected by a clutch device E3 to the main shaft 60 of the apparatus that is mounted in the vertical plates C, C'.

Suitably vertically disposed guide plate 61, that are flared away from each other at their outer ends, extend longitudinally between the vertical plates C, C' from the front towards the rear of the structure for the purpose of guiding and preventing lateral displacement of the articles or strip of material that moves through the machine, and a conveyor belt 62 receives the articles after they have been operated upon between the guides 61 and conveys the separated articles away from the apparatus. The conveyor belt 62 travels upon an inclined bed 63 secured to upwardly extending arms 64 that are preferably removably connected to the discharge end of the apparatus, and said conveyor belt 62 passes around a pulley 65 at the lower end of the bed 63, that has its

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spindle 66, which is journaled in said arms 64, provided with an extended end carrying a sprocket 67 that is driven by a chain 68.

The main shaft 60 is provided with a sprocket 69 that is engaged with a chain 70 extending towards the discharge or rear end of the apparatus where said chain 70 engages another sprocket 71 on the adjacent end of a jack-shaft 72 journaled in the vertical plates C, C' through the medium of a sprocket 73 upon the other end of said jack-shaft 72 and is also engaged with the chain 68, whereby the apron-engaged pulley 65 is actuated at substantially the same speed as the pulley 74 that is secured to the jack-shaft 72 between the vertical plates C, C'.

The apron bed 63 and supporting arms 64 may be an independent structure that is detachably connected to the delivery or rear end of the apparatus as detailed in Figure 1. The lower ends of said arms 64 are provided with downwardly opening slots 64' that embrace adjacent portions of the pulley spindle 72 which permits the structure being lifted off the machine. The intermediate portions of the arms 64 have supports 64'' movably connected to them by pivot members 64'''.

About midway the length of the vertical plates C, C' there is a small pulley 75 about which a conveyor belt 76 is engaged and which is driven by the pulley 74 on a spindle 72 that extends between the vertical plates C, C' and is journaled therein for rotation. Said conveyor belt 76 is disposed with its upper reach in a substantially horizontal plane as shown in Figure 7, and there is a small idler pulley 77 engaged with the under surface of the conveyor belt 76 intermediate the pulleys 74 and 75 the purpose of which will be later explained. Pulleys 75 and 77 have their respective spindles, 78 and 79, suitably journaled in adjacent portions of the vertical plates C, C', the pulley 75 being freely rotatable on its spindle 78.

A tension pulley 80, with its spindle 81 journaled in swinging arms 82, is adapted to maintain the apron 76 taut and take up any slack therein. The arms 82 are pivotally mounted at their lower ends on studs 83 projecting from the vertical plates C, C', and they are pulled in the desired direction by coiled springs 84, 84, that have their ends suitably connected to said arms and to lateral pins 85, 85 projecting from the inner faces of the vertical plates C, C', as shown in Figure 7. Presser rollers 86, 86, are mounted above and in contact with the top reach or run of the conveyor belt 76 so that they will normally bear down upon the conveyor belt 76. The trunnions 87, 87 of these presser rollers 86, 86, rotate freely in upwardly open vertical slots 86', 86' provided in angle plates 86'', 86'' secured to the upper edges of the vertical plates C, C', and said rollers 86, 86, are preferably of solid construction of sufficient weight to firmly contact the pieces or wads of cotton 56 as the latter successively pass beneath said rollers 86, 86 on the conveyor belt 76 while moving through the machine. When the wads of cotton 56 engage the presser rollers 86, 86, the latter will be lifted as shown in dotted lines in Figure 7, and frictionally press down on said wads until the latter have passed said rollers 86 after which the rollers 86, 86, will each return to their apron-contacting positions as shown in the full lines in said figure.

The wads of cotton 56 are elongated and are provided with longitudinal stitching 57, and said wads are spaced apart suitable distances and are,

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when being fed into the machine, joined by a string 55 which is a continuation of the stitching 57 that is adapted to be severed as shown in Figure 5 during transit through the machine. The wads 56 and the strings 55 provide a continuous strip of material when fed into the apparatus.

At the front end of the machine there is a corrugated feed roller 90 that is fast on the horizontal main shaft 60 that has its ends opposite the sprocket 69 provided with a gear 91. Coacting with this feed roller 90 is an opposing presser-roller 92 that has its spindle 93 carried in the free or swinging ends of elongated lever-arms 94 (see Figure 9) that incline downward towards the opposite end of the machine where their rear ends are secured to the spindle 78 upon which the conveyor-pulley 75 is loosely mounted for rotation. Said spindle 78 performs the function of a rock-shaft for actuating certain portions of the machine that control the timed operation of the cutter, as later explained. The presser-roller 92 is yieldably urged towards the corrugated feed roller 90 by means of coiled springs 95, 95, that are connected at their upper ends to the projecting portions of a spindle 93 and at their lower end are engaged with lateral pins 96, 96 on the vertical plates C, C'.

A horizontal shaft 97 is journaled in bearings in the vertical plates C, C', with its end portions projected beyond said plates in the manner shown in Figure 7, and the intermediate portion of said shaft 97 has a roller 98 anchored to it for rotation therewith. This roller 98 is located between the corrugated feed roller 90 and the conveyor pulley 75 so that the upper surface of said roller 98 is disposed in substantially the horizontal plane of the upper reach or run of the conveyor 76. Above and in vertical alignment with the axis of the roller 98, there is a rotatable severing or cutting device which embodies a mutilated cylinder 99 secured to a rotatable shaft 100 that is journaled in the vertical plates C, C'. This cylindrical member 99 has a flattened portion 101 and it is also provided with an angular groove or notch 102 which provides a seat in which a blade 103 is secured by an adjustable clamping plate 104 so that the sharpened edge of said blade projects beyond the circumferential surface of said cylindrical member 99 in the manner shown in Figure 7 so that it will come into contactive engagement with the roller 98 when these portions of the machine are in operation.

The movement of the cutting cylinder 99 is timed so that the blade 103 will contact and sever the connecting string 55 between the wads of cotton 56 at a location close to the trailing edge of each wad as shown in Figure 5. The shafts 97 and 100 have gears 105 and 105 respectively that are secured to their extended ends and which are in mesh with each other so that they will be rotated in opposite directions and at the same speed. The roller 98 and the cutter member 99 are preferably adapted to be intermittently rotated for each severing or cutting operation performed by the blade 103, and when the wad 56 is between the roller 98 and the curved surface of cutter member 99 said wad 56 will be in a compressed condition due to the fact that the space between the surfaces of these elements is preferably less than the thickness of a wad 56.

Although the advancing or feed rollers 90—92 and the cutter devices 97—99, when operating,

travel at the same number of revolutions per minute, the larger diameters of the cutter rollers 97—99 give them a higher peripheral speed than the feed rollers 90—92. This has the effect that when the cutting action takes place the part being cut is given tension by the higher surface speed of said cutter rollers. The drive of the conveyor 76 is so arranged that the lineal speed thereof is greater than the surface speed of the cutter-rollers 97—99. As the material passes beneath the roller 86, the friction of the material against the conveyor 76 will keep the material under tension, while the cutting action is taking place, to enable the blade 103 to sever the string 57 completely and cleanly.

It should be noted that the operation of the compressor 10, responsive to the rotation of the main shaft 12, gives positive and timed rotation to the cam 13 that uniformly spaces the sewed wads 56 that are connected by the intervening twisted string 55. This relieves the attendant or operator of all manual feeding or guiding action on the wads 56, since the positive lowering and raising of the feeding belts 49—50 automatically spaces the wads or cotton strips 56 and gives uniform string lengths 57 as well as straight sewing. Additionally, it allows the sewing machine 29 to be mechanically tied in with the tampon compressor so as to operate as a coordinated unit.

The cam 13 is so set on the compressor 10 that the cotton strips or wads 56 after going through the sewing machine 29 arrives at the feeding wheels 107 when these are up or in their inoperative position. The compressor is more fully illustrated and described in my copending application, serially numbered 463,092, filed October 23, 1942. So that the needle 31 of the sewing machine 29 can be readily threaded, the carriage sides 34—35 are slotted at the rearward edges as at 108 so that by removing the rubber belts 49—50 the whole carriage can be removed.

It should be noted that the conveyor belt 62 moves over a roller 109 which is journaled at the extreme end of the upwardly extending arms 64 comprising a part of its frame to support the endless conveyor belt 62 for movement thereabove and therebelow to transfer the sewed tampon wads 56 to the feed table 110 of the compressor 10. The compressor 10 converts the sewed wads 56 into compressed tampons 56' of cylindrical configuration having an extending tail 55' projecting therefrom. A gear 118 is mounted on the shaft 97, and meshes through an idler gear 119 to gear 91 mounted on shaft 60. The gear 91 meshes with a gear 120 fixed to the sprocket 121 for journaled rotation in a bushing 122. The bushing 122 together with the two gears 120—121 are rotated in a fixed shaft 123 mounted in a bracket 124 fixed to the side C. A chain 125 extends between the sprocket 121 and a sprocket 126 fixed to shaft 39 which drives the feeder belts 49—50.

This completes the conversion of rectangular sheets of absorbent cotton or wads 56, its initial shape and configuration, to a completed tampon without manual intervention from the step of their placement under the feeding belts 49—50.

While I have described my invention in detail in its present embodiment or preferred form, it will be obvious to persons skilled in the art, after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope

thereof. I aim in the appended claims to cover all such changes and modifications.

I claim:

1. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path in uniformly spaced relation, and means in the path for receiving said strips in corresponding uniformly spaced and timed relation.

2. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of endless belt moving means pivotally confronting a predetermined stationary path of travel, means for pivotally raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path in substantially uniformly spaced relation, and means in the path for receiving said strips in corresponding uniformly spaced relation.

3. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined stationary path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path, and stitching means in the path for receiving said strips in uniformly spaced relation to form a continuous string interconnected strip.

4. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined stationary path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path, stitching means in the path for receiving said strips in uniformly spaced relation to form a continuous string interconnected strip, and severing means for segregating said stitched strips into separate articles with a stitched string length thereon.

5. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined stationary path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path, stitching means in the path for receiving said strips in uniformly spaced relation to form a continuous string interconnected strip, severing means for segregating said stitched strips into separate articles with a stitched string length thereon, and means for receiving said separate articles from said severing means.

6. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined stationary path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path, stitching means in the path for receiving said strips in uniformly spaced relation to form a continuous string interconnected strip, severing means for segregating said stitched strips into separate articles with a

stitched string length thereon, and compressing means for receiving said separate articles from said severing means.

7. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of moving means confronting said predetermined stationary path of travel, means for raising and lowering said moving means relative to said path of travel to advance flat strips of material along the predetermined path, stitching means in the path for receiving said strips in uniformly spaced relation to form a continuous string interconnected strip, severing means for segregating said stitched strips into separate articles with a stitched string length thereon, means for receiving said separate articles from said severing means, compressing means in said path, and conveying means interposed between said severing and compressing means.

8. In a feeding device, the combination with a frame, of fixed means on said frame for defining a predetermined stationary path, continuously moving surface means on said frame in confronting relation with said predetermined stationary path of travel, and means for periodically raising and lowering said surface means relative to said predetermined path of travel with articles disposed therebetween for feeding along said path of travel responsive to said continuously moving surface means in its lower operative position.

9. In a feeding device, the combination with a frame, of fixed means on said frame for defining a predetermined stationary path, continuously moving endless surface means on said frame in confronting relation with said predetermined stationary path of travel, a pivotal support for said frame, and means for pivotally raising and lowering said surface means relative to said predetermined path of travel with articles disposed therebetween for feeding along said path of travel responsive to said continuously moving surface means in its lower operative position.

10. In a feeding device, the combination with a frame, of fixed means on said frame for defining a predetermined stationary path, continuously moving pair of spaced endless belt surface means on said frame in confronting relation with said

predetermined stationary path of travel, a pivotal support for said frame, and means for pivotally raising and lowering said surface means relative to said predetermined path of travel with articles disposed therebetween for feeding along said path of travel responsive to said continuously moving surface means in its lower operative position.

11. In a feeding device, the combination with a frame, of fixed means on said frame for defining a predetermined stationary path, continuously moving spaced endless belt surface means on said frame in confronting relation with said predetermined stationary path of travel, and means for periodically raising and lowering said surface means relative to said predetermined path of travel with articles disposed therebetween for feeding along said path of travel responsive to said continuously moving surface means in its lower operative position.

12. In apparatus of the character described, the combination with fixed means defining a predetermined stationary path, of endless moving means including spaced belts confronting said predetermined stationary path of travel, means for raising and lowering said moving means at predetermined intervals relative to said path of travel to advance flat strips of material along the predetermined path in uniformly spaced relation, and means in the path for receiving said strips in corresponding uniformly spaced relation.

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