

Oct. 13, 1953

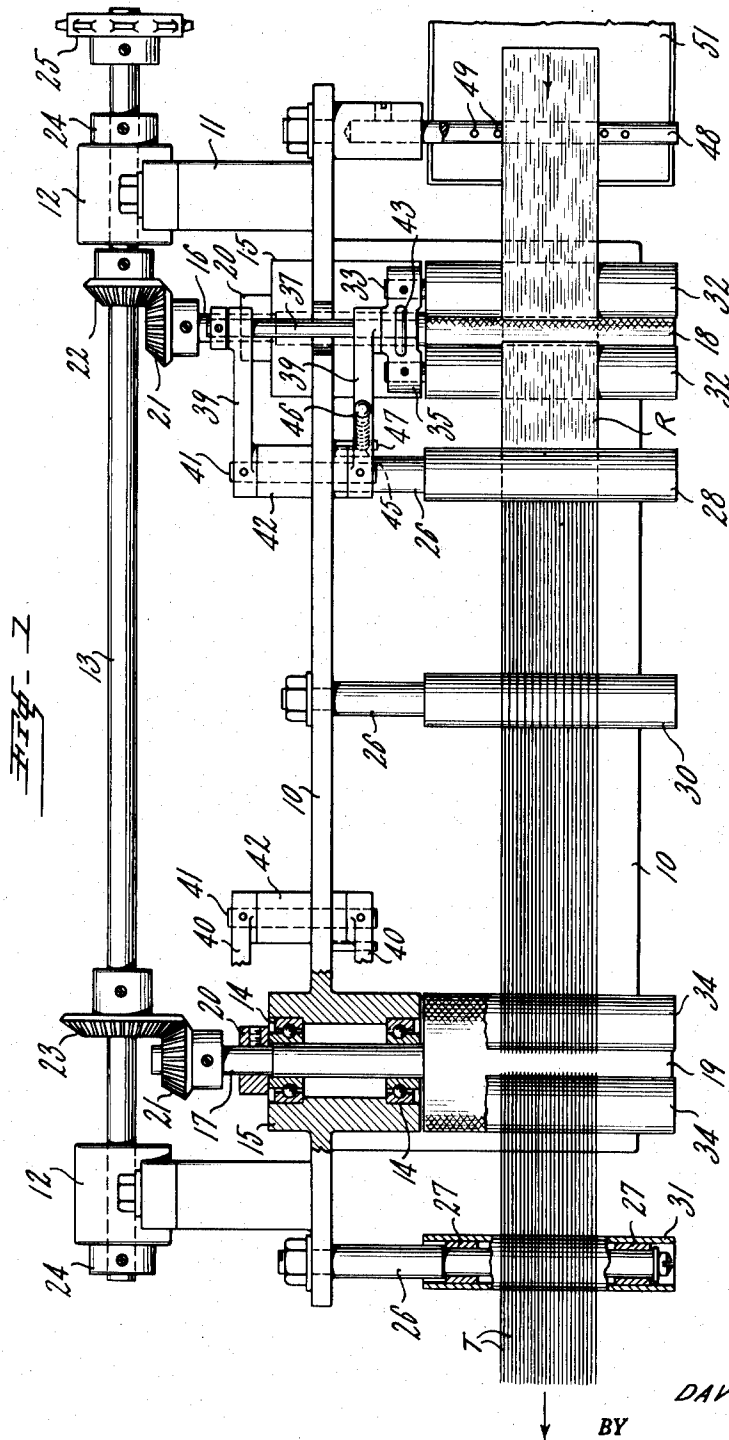
D. G. SLOVIN

2,654,936

RIBBON RUBBER THREAD SPLITTER

Filed April 22, 1952

2 Sheets-Sheet 1



INVENTOR.
DAVID G. SLOVIN
BY
Charles C. Millson
ATTORNEY

Oct. 13, 1953

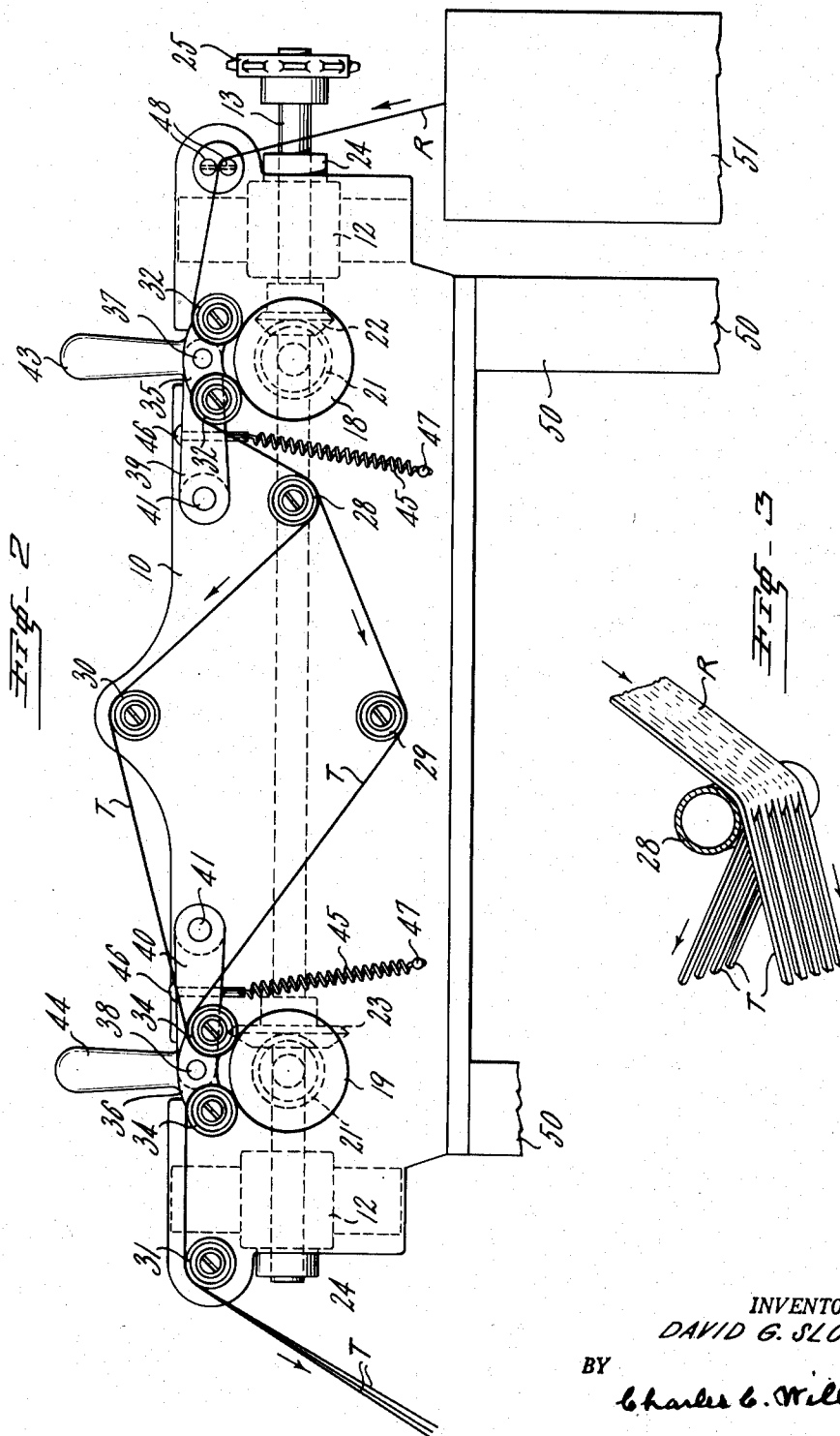
D. G. SLOVIN

2,654,936

RIBBON RUBBER THREAD SPLITTER

Filed April 22, 1952

2 Sheets-Sheet 2



INVENTOR.
DAVID G. SLOVIN
BY
Charles C. Willson
ATTORNEY

UNITED STATES PATENT OFFICE

2,654,936

RIBBON RUBBER THREAD SPLITTER

David G. Slovin, Providence, R. I., assignor to
United States Rubber Company, New York,
N. Y., a corporation of New Jersey

Application April 22, 1952, Serial No. 283,636

3 Claims. (Cl. 28—1)

1

This invention relates to an apparatus for splitting a ribbon or tape formed of elastic threads adhered to each other into its component threads.

In the textile industry large quantities of fine rubber threads are utilized to produce elastic textile products. Thus in one process a stretched rubber thread is covered with textile yarn to form an elastic yarn, and in another, tensioned rubber threads are braided with textile yarns to form an elastic webbing.

Normally these rubber threads are not made by the textile manufacturers, but are manufactured by producers of rubber goods who form ribbons or tapes composed of a number of individual threads which are adhered slightly to each other, so that the threads may be conveniently packaged and shipped to the textile manufacturers. These ribbons may be formed of cut rubber threads slightly bonded to each other by a process such as that disclosed in the patent to Hazell 2,323,132, or they may be formed of extruded latex threads slightly adhered to each other by a process such as that disclosed in my copending application Serial No. 235,541, filed July 6, 1951.

Before the threads are utilized in a textile product, the individual threads are split from the ribbon, and they are tensioned a predetermined amount to control the elasticity of the final textile product. It has been proposed heretofore to place a splitting and tensioning apparatus, consisting of two pairs of spaced rolls and having means intermediate the rolls to split a tape into its component threads, before a textile machine which utilizes rubber threads, so that the threads may be split from the tape and tensioned by the same apparatus as they are supplied to the textile machine. Such a device which can both split and tension the split out threads is desirable, for the threads are supplied to the textile apparatus from the device in condition to be used by the textile apparatus. However, in order that the tensioned rubber threads may be combined in the textile product under the desired conditions, the splitting and tensioning device should be constructed in such a manner that it will supply the rubber threads at a controlled rate which may be coordinated with the needs of the textile apparatus.

A primary object of this invention is to provide an improved device for splitting ribbons such as those described above into their individual threads which is constructed in such a manner that it will supply the tensioned rubber threads at a constant controlled rate.

2

A further object of this invention is to provide an improved tape splitter and tensioning device that will supply the threads at a uniform rate to a textile apparatus and which is constructed so that the rate of thread delivery may be coordinated with the needs of the textile apparatus.

A more specific object is to provide a device of the type described in which the means for advancing the tape and threads through the apparatus are constructed to form a relatively large frictional area with which the tape and threads are held in contact and which therefore permits a sure control of the rate of thread advance from the apparatus. A further object of this invention is to provide a device of the type described which is so constructed that the threads and ribbon may be threaded into it easily when a new ribbon is started through the device.

These objects are achieved by providing two spaced driven drums about which the tape and threads are looped, and means intermediate the drums to split the ribbon into its component threads. To hold the ribbon and threads about the drums, a pair of rollers are mounted adjacent each drum, and these rollers are positioned relative to the drums so that the tape and threads are held in frictional contact with the drums throughout a large portion of the drums' peripheries. To increase the frictional force between the contacting areas of the drums and threads, the drums may have a roughened surface if desired. These drums are mounted on individual shafts which are rotated at different speeds from a common drive shaft through gear trains having different speed transmission ratios, and thereby the tension at the splitting point is maintained at the desired value regardless of the tension required for feeding the threads to the textile apparatus. The common drive shaft is driven from the textile apparatus, so the speeds of the drums are coordinated with the needs of the textile apparatus. Since the tape and threads are held in non-slipping engagement with the drums to be advanced as the drums are rotated, the threads will be supplied at a rate determined by the speed of the thread advancing drum; hence the thread delivery will be coordinated with the needs of the textile apparatus.

To provide easy threading of the tape splitter the rollers are supported near the drum by movable levers which are pivoted on the frame of the apparatus. By moving these levers, the rollers may be moved from the drums to facilitate threading of the apparatus. To prevent the movement of the rollers from the drums when the device is in operation, springs are anchored to

3

the frame to urge the levers in a direction to hold the drums and rollers in contact, so that vibrational forces caused by the neighboring textile machinery will not cause the rollers to vibrate against the drums.

For a better understanding of these and other characteristics and advantages of this invention, reference should be had to the following description when read in conjunction with the accompanying drawings, in which

Fig. 1 is a top plan view partly in section of one form of apparatus embodying this invention having a tape inserted therein which is to be split into its component threads;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1; and

Fig. 3 is a perspective view of a portion of the apparatus of Fig. 1 and of the tape showing the manner in which the tape is split into its component threads.

Referring now to the drawings and to Figs. 1 and 2 in particular, there is shown an apparatus according to this invention having a generally L-shaped frame 10 comprising a horizontal base and an upright wall, the latter of which carries the various rollers and elements of the tape splitting device, as well as the arms 11 that support the bearing housings 12 for the main drive shaft 13 of the apparatus. Projecting from the upright wall of the frame 10 are the shafts 16 and 17 which are journaled in bearings 14 carried by a housing 15 integral with the frame 10. On their outer ends the shafts 16 and 17 carry the tape advancing drum 18 and thread advancing drum 19 respectively. These drums may be steel drums having a knurled surface as shown in the drawings, or they may be covered with rubber or leather or other suitable covering to increase frictional contact with the threads. Collars 20 are fixed to the shafts 16 and 17 to maintain the shafts and drums in proper spaced relation to the common drive shaft 13 and to the rollers of the tape splitting apparatus.

The shafts 16 and 17 carry at their inner ends the bevel-gears 21 which mesh with bevel-gears 22 and 23 fixed to the main drive shaft 13 of the tape splitter. It will be noted that the bevel-gear 23 driving the shaft 17 which supports the thread advancing drum is larger than the gear 22 driving the shaft 16 which supports the tape advancing drum, so that the drum 19 is rotated at a greater peripheral speed than the drum 18 for a purpose which will be stated hereinafter. Collars 24 are fixed to the main drive shaft 13 at the outer ends of the bearing housings 12 to maintain the gears 22 and 23 in proper spaced relation to the shafts 16 and 17. A drive sprocket 25 is fixed to the shaft 13 and is driven by a chain and drive sprocket (not shown) from the apparatus which is to use the threads, so that the delivery of the threads may be coordinated with the needs of this apparatus.

The upright wall of the frame 10 also carries the fixed shafts 26 which have the rollers 28, 29, 30 and 31 journaled thereon through the porous metal bearings 27. These rollers, although they serve different purposes in the apparatus, are identical in construction. Two similar bodily movable rollers 32 are supported adjacent the tape drum 18 on the shafts 33, and another pair of these rollers 34 are supported adjacent the thread drum 19 on similar shafts. The two shafts 33 are secured to a yoke 35 which is rockingly supported by a shaft 37, and the other two shafts which carry the rollers 34 are simi-

4

larly secured to a second yoke 36 that is rockingly supported by a shaft 38. The shaft 37 is swingingly supported by a pair of spaced arms 39 that are pivotally supported by a shaft 41 journaled in a boss 42 formed on the frame 10. The shaft 38 is likewise supported by the spaced arms 40 pivotally supported by the shaft 41 journaled in the boss 42. The arrangement is such that the pair of rollers 32 that cooperates with the drum 18 are supported above such drum for movement toward and from the same, and the pair of rollers 32 that cooperate with the drum 19 are similarly supported. Each pair of rollers is urged towards its drum by a spring 45 having one end attached to a swinging arm at 46 and the other end anchored at 47. However, the levers 39 and 40 may be pivoted against the force of the springs 45 to raise the rollers 32 and 34 when the thickness of the threads vary and when the apparatus is threaded with a new tape. To facilitate threading of the apparatus, the yokes 35 and 36 are provided with handles 43 and 44 respectively.

At the tape supply end of the apparatus the frame 10 carries the two tape guides 48 having the aligned holes 49 bored therethrough to receive pins which constrain the tape to follow a predetermined path laterally of the frame as it enters the apparatus. The entire splitter is supported on the legs 50 which may be bolted to the apparatus that is to utilize the threads.

To prepare the apparatus for splitting the threads from a ribbon, a ribbon R composed of rubber threads adhered to each other is led from a supply 51, which may be a shipping container, to a pre-tensioning device such as a plurality of pins (not shown) about which the ribbon is led on a tortuous path. From the pre-tensioning device the ribbon R is threaded through the tape guides 48 and placed over the top of the rollers 32. These rollers are then raised from the tape advancing drum 13 by the handle 43, and a loop of the ribbon is pulled downwardly between the rollers and is slipped over the outer end of the drum. The ribbon R is led under the roller 28, and the individual threads T which have been split out manually are placed over the roller 30 or under the roller 29, so that adjacent threads in the tape are constrained to follow the diverging paths about the rollers 29 and 30. The split out threads T are looped about the drum 19 in substantially the same manner as the tape R is threaded about the drum 18. Preferably, care is taken to assure that the threads occupy the same lateral positions relative to each other over the rollers 29, 30 and 34 and about the drum 19 that they occupy in the tape R. From the rollers 34 the threads are led over the roller 31 and thence to the positions in the textile apparatus where they are to be used.

When the textile apparatus is started, the drums 18 and 19 will be driven by means of the sprocket 25, the shaft 13, the gears 22, 23 and the gears 21. Since the ribbon R, and the threads T, are held looped substantially about the drums 18 and 19 and in non-slipping engagement therewith by the rollers 32 and 34, the ribbon and threads will be advanced with the drums. As the drum 18 rotates it pulls the ribbon R about the pins of the pre-tensioner and feeds the tensioned ribbon to the roller 28. Since adjacent threads in the ribbon are constrained to follow the diverging paths about the rollers 29 and 30, they will be split out from the ribbon as they

leave the roller 28 as best shown in Fig. 3. The individual threads T are tensioned further between the drums 18 and 19, because the latter drum is rotating at a greater peripheral speed than the former. From the drum 19 the threads T are led in their tensioned condition to the textile apparatus.

Since the rollers 32 and 34 which hold the ribbon and threads against the drums 18 and 19 are movably mounted, should any variations in thickness of the threads occur, the rollers 32 and 34 may move to accommodate this variation. The advantages of this arrangement will be apparent if one considers an apparatus having a pair of thread advancing rolls which are relatively immovable. When a thick portion of thread arrives between these rolls the threads are compressed with great force to conform to the fixed distance between the rolls. When these threads are compressed, they may be pressed against one another, and the rolls tend to press the threads into a ribbon which causes breakage when these adhered threads arrive at the textile apparatus. Similarly when a thick portion in the ribbon arrives at a pair of ribbon advancing rolls the threads in the ribbon are adhered more tightly together, and excessive breakage occurs when the individual threads are split from the ribbon.

In an apparatus according to this invention however, when a thickened portion occurs in the threads, the rollers 32 and 34 will be raised as this portion passes under these rollers, for the rollers are yieldingly held against the threads under the force of the springs 45. In the apparatus shown this force depends on the size of the springs, and is relatively independent of the thickness of the threads. Conversely, should a thin portion occur in the ribbon or threads, the rollers 32 and 34 will move toward the drums 18 and 19 to hold the ribbon and threads looped in positive driving engagement with the peripheries of the drums.

The tension at which the threads are advanced to the textile apparatus may be varied by changing the size of sprocket 25, and the tension at which the threads are split from the tape may be varied by varying the ratio between the gears 22 and 23. Preferably the tension at which the threads are split from the tape is kept as low as possible consonant with satisfactory splitting of the individual threads from the tape, for high tension at the splitting point tends to chafe and tear the threads. A splitter according to this invention is designed to accomplish splitting at a low tension, and preferably the ratio between the surface speeds of the drums 19 and 18 is 2 to 1. This may be reduced to 1½ to 1 for ribbons which are relatively easy to split apart, and it should not exceed 3 to 1. Since the splitter of this invention is driven directly from the textile apparatus which uses the rubber threads, the delivery of thread to the textile apparatus will be coordinated to its needs, so that the rubber threads are combined with the textile yarns at a tension controlled by the predetermined speed of the drum 18.

Although in the apparatus shown in the drawings the levers 39 and 40 have been provided with the springs 45, these springs may be dispensed

with where vibration is not a serious factor, for the weight of the rollers will tend to maintain them in contact with the drums, and in the disposition of the splitting rollers of the embodiment shown in the drawings, the tension applied to the ribbon and threads causes the ribbon and threads to urge the rollers against the drums.

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

1. Apparatus for splitting a tape composed of a plurality of rubber threads adhered to each other into its component threads, comprising a tape advancing drum having a roughened surface, a thread advancing drum having a roughened surface, means intermediate the drums for causing adjacent threads in the tape to follow divergent paths to thereby split the tape into its component threads, pivoted means adjacent each of said drums for maintaining said tape and said threads looped thereabout, a movable lever supporting said pivoted means whereby said pivoted means may be moved from said drums for easy threading of the apparatus, and means for driving said drums at different peripheral speeds, whereby said threads are delivered from said apparatus at a constant rate.

2. Apparatus for splitting a tape composed of bare rubber threads stuck together into its component threads, comprising a tape advancing drum, a thread advancing drum, means intermediate said drums for causing adjacent threads in said tape to follow divergent paths to thereby split said tape into its component threads, a pair of rollers adjacent each of said drums for maintaining said tape and said threads looped thereabout, a pivoted yoke supporting each pair of rollers, movable levers supporting said yokes, means yieldingly urging said levers to hold said rollers against said drums, and means for driving said drums at different speeds to thereby advance said threads from said apparatus under controlled tensions.

3. Apparatus for separating the individual threads from a ribbon formed of a number of rubber threads stuck together, comprising a pair of spaced drums, a pair of cylindrical rollers disposed adjacent a first of said drums to hold the ribbon looped substantially about the drum in frictional non-slipping engagement therewith, means intermediate the drums for directing the threads along divergent paths leading from the drum about which the ribbon is looped to thereby separate the ribbon into its component threads, a pair of cylindrical rollers adjacent the other of said drums for holding the threads looped substantially about this drum in non-slipping frictional engagement therewith, and means for driving said drums.

DAVID G. SLOVIN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
673,838	Kintzing	May 7, 1901
1,024,528	Sibley	Apr. 30, 1912
1,421,081	Hall	June 27, 1922
2,169,886	Shaw	Aug. 15, 1939
2,596,246	Johnson	May 13, 1952