May 27, 1969 R. H. MARKS ETAL 3,446,041

FABRIC FORMING APPARATUS

Filed Feb. 10, 1966

Sheet 1 of 4

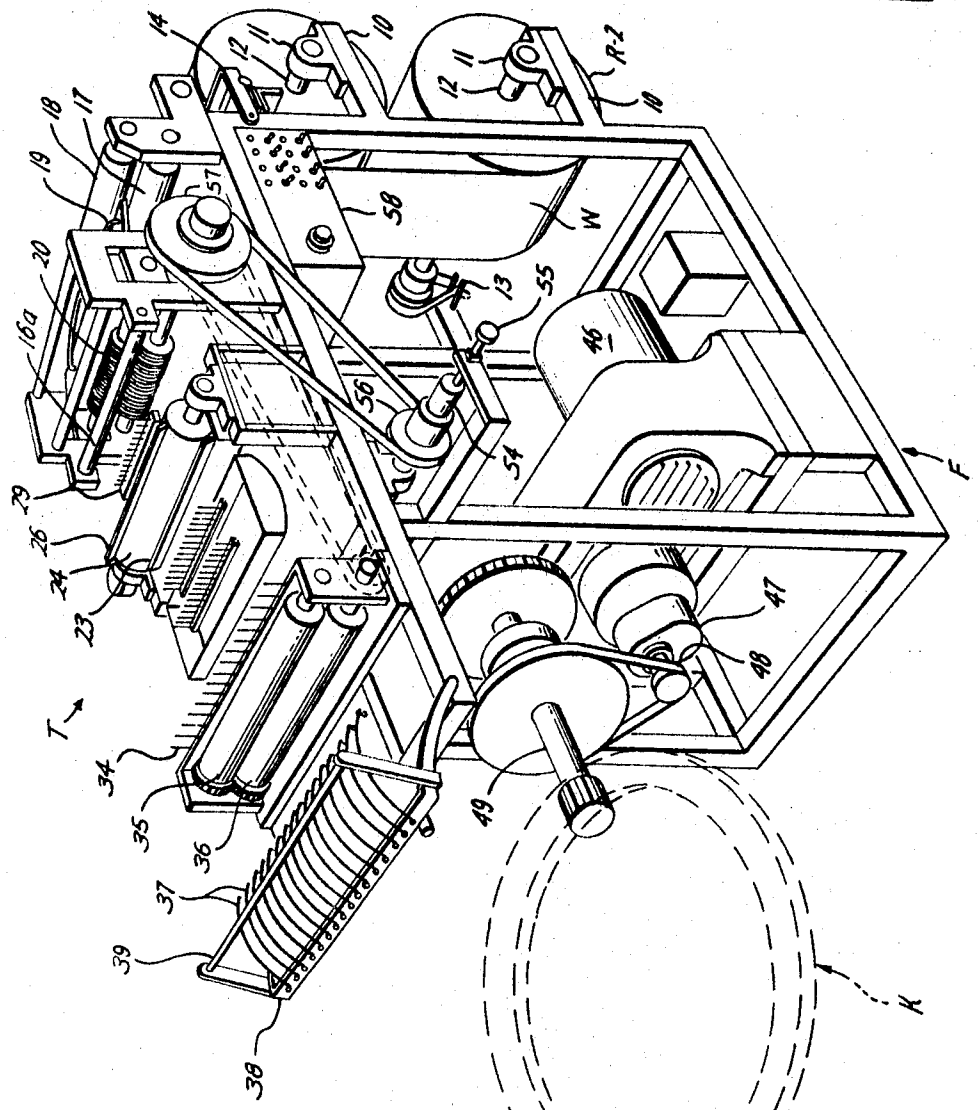


Fig. 1

Ronald H. Marks
Lawrence R. Goodman
Luther E. Stokes
Roy H. Millard
INVENTORS

BY J. Vincent Martin
Joe E. Edwards
Gilbert E. Springgate
ATTORNEYS

May 27, 1969 R. H. MARKS ETAL 3,446,041

FABRIC FORMING APPARATUS

Filed Feb. 10, 1966

Sheet 2 of 4

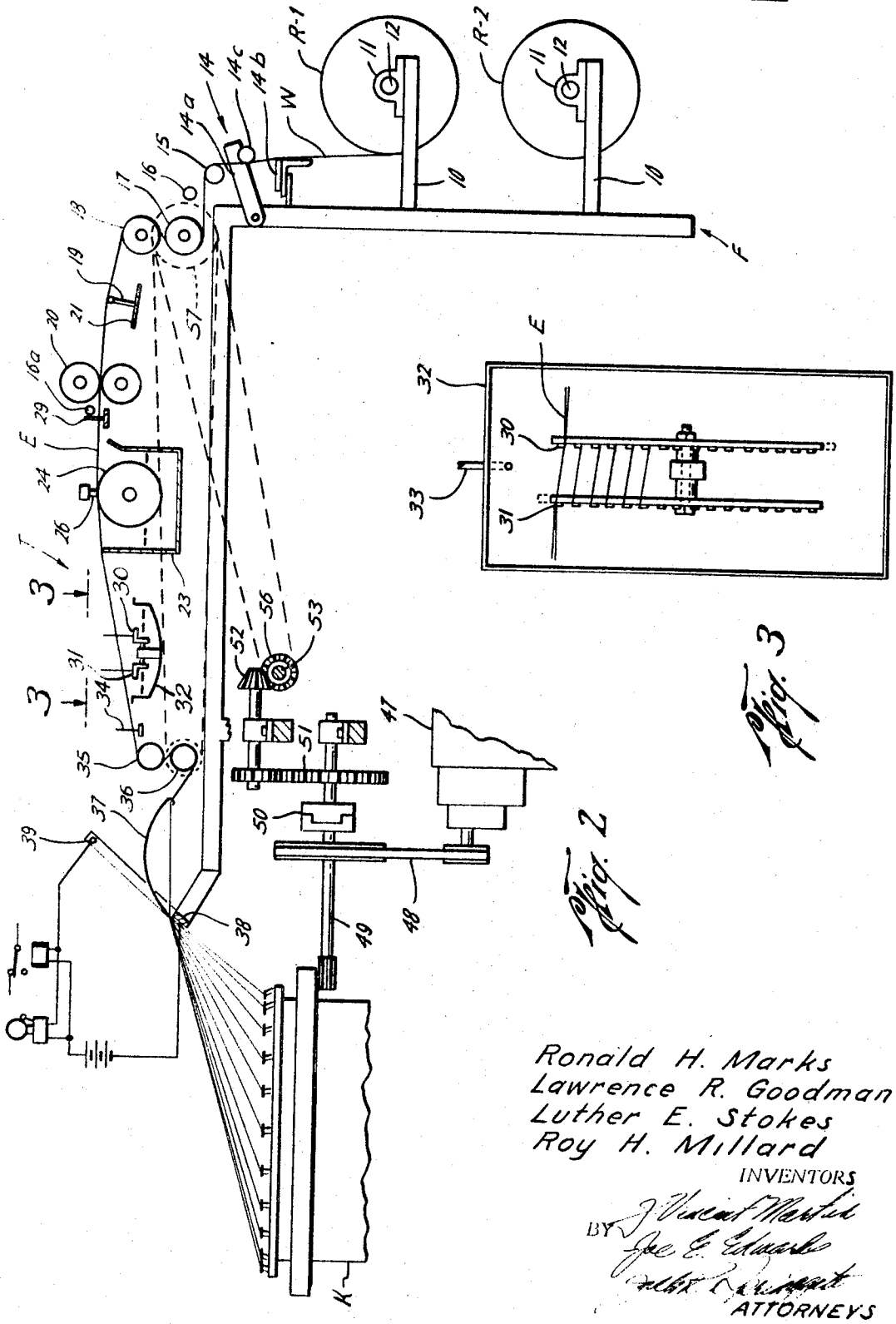


Fig. 2

Fig. 3

Ronald H. Marks
Lawrence R. Goodman
Luther E. Stokes
Roy H. Millard
INVENTORS

BY J. Vincent Martin
Joe E. Edwards
Robert L. Stewart
ATTORNEYS

May 27, 1969 R. H. MARKS ETAL 3,446,041

FABRIC FORMING APPARATUS

Filed Feb. 10, 1966 Sheet 3 of 4

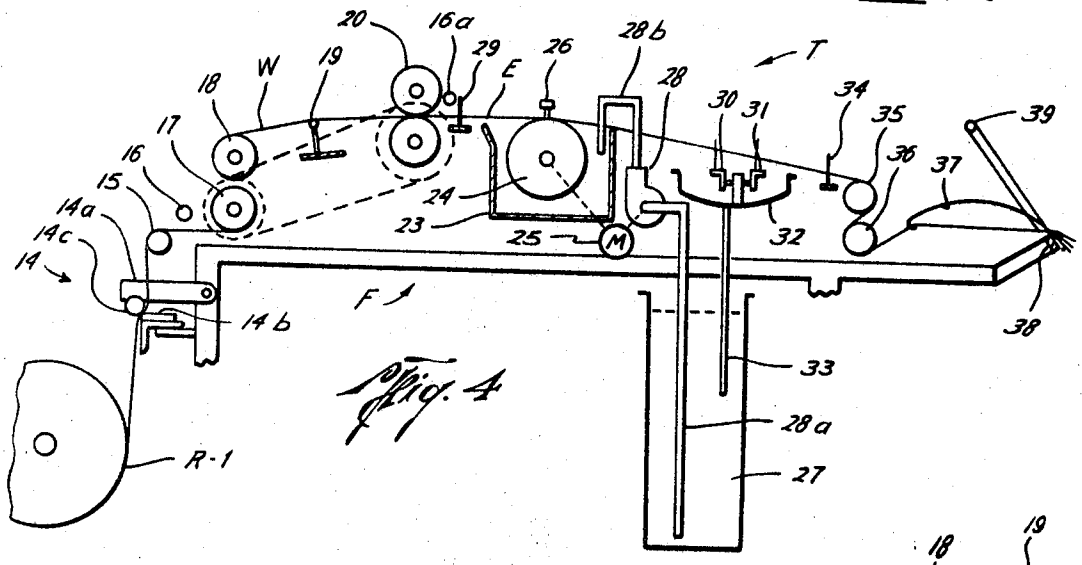
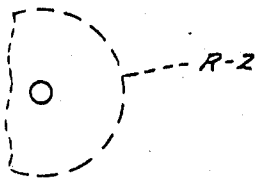


Fig. 4



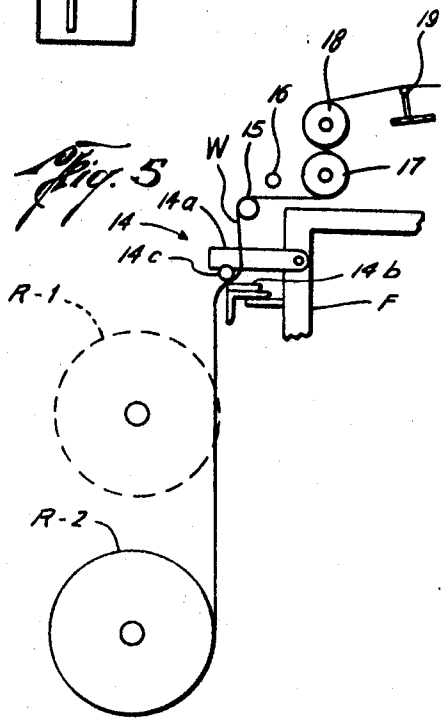


Fig. 5

Fig. 6

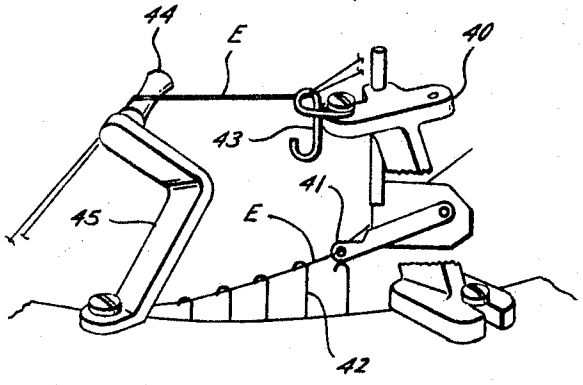
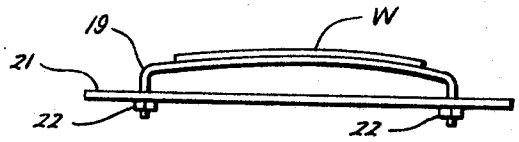


Fig. 7



Ronald H. Marks
Lawrence R. Goodman
Luther E. Stokes
Roy H. Millard
INVENTORS

BY J. Vincent Martin
Joe E. Edwards
Jack R. Springgate
ATTORNEYS

May 27, 1969 R. H. MARKS ETAL 3,446,041

FABRIC FORMING APPARATUS

Filed Feb. 10, 1966

Sheet 4 of 4

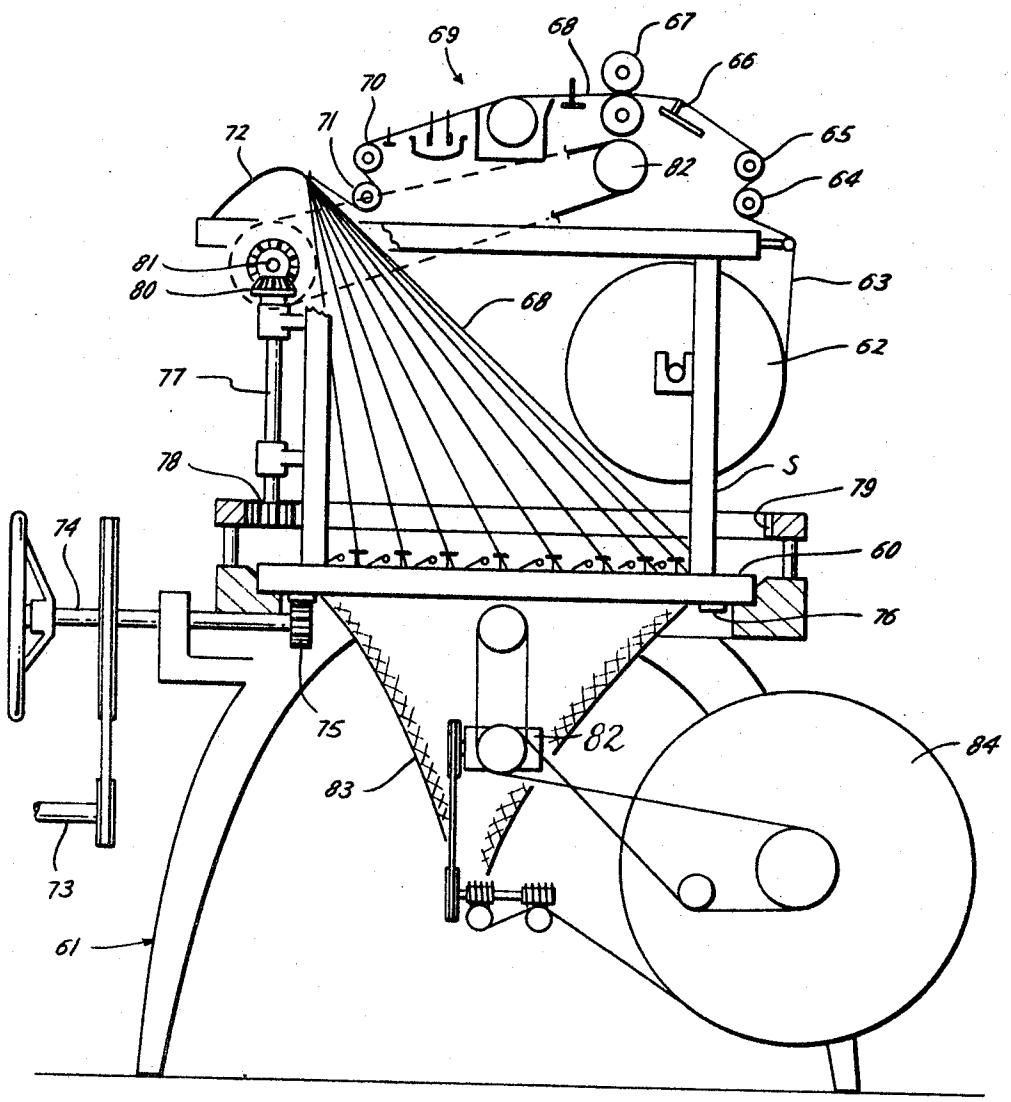


Fig. 8

Ronald H. Marks
Lawrence R. Goodman
Luther E. Stokes
Roy H. Millard
INVENTORS

BY Vincent Martin
Joe E. Edwards
ATTORNEYS

United States Patent Office 3,446,041
Patented May 27, 1969

3,446,041

FABRIC FORMING APPARATUS

Ronald H. Marks, Lawrence R. Goodman, Luther E. Stokes, and Roy H. Millard, Dallas, Tex., assignors, by direct and mesne assignments, to American Can Company, New York, N.Y., a corporation of New Jersey

Filed Feb. 10, 1966, Ser. No. 526,580
Int. Cl. D04b 15/48
U.S. Cl. 66—125
3 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for producing a knitted fabric including a knitting machine, and a frame for supporting a roll of web material, a cutter to divide the web material into a plurality of elements and means delivering the elements to the knitting machine for knitting into a fabric. This abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

The present invention relates to an improved apparatus for producing a fabric by supplying elements which are derived from a web material to a weft knitting machine and knitting such elements into a fabric.

Web material has previously been cut into pre-selected widths, treated and fed to a knitting machine to be knit into a knitted fabric. A typical example of apparatus used for this purpose is disclosed in the R. H. Marks Patent No. 3,214,943, issued Nov. 2, 1965.

It has been discovered that the web material may be handled more economically if suitable apparatus is provided to assure uniformity of treatment, the continuity of tension in the web material, the elimination of static electricity in the web material and elements cut therefrom and a continuity of supply of web material for substantially continuous operation. Also, it has been discovered that certain materials are more readily processed into a knitted fabric if they are subjected to a minimum of tension.

Therefore, an object of the present invention is to provide an economic, compact apparatus having the necessary components to perform the steps of cutting a web of material, treating such material and feeding elements of such material to a knitting machine.

A further object is to provide an apparatus which is readily combined with a circular knitting machine to cut, treat and feed elements to such knitting machine from a source of web material.

Another object is to provide an apparatus to cut, treat and feed elements from a web material to a knitting machine with the speed of such feeding being readily coordinated to the speed of the knitting machine.

Another object is to provide an apparatus for cutting, treating and feeding elements from a source of web material to a knitting machine including the application of a treating liquid and the removal of excess treating liquid prior to the feeding of the elements to the knitting machine.

Still a further object is to provide an apparatus for cutting, treating and feeding elements of a web material to a knitting machine including apparatus to assist in the maintenance of a uniform tension in the strips and for stopping the apparatus and knitting machine in the event one of the elements breaks.

Another object is to provide an apparatus for cutting, treating and feeding elements to a knitting machine which feeds such elements to each knitting station with a minimum of friction.

A still further object is to provide a compact unitary assembly having improved arrangement for cutting, treating and feeding elements from a source of web material to a knitting machine which straightens the web material to eliminate wrinkles and eliminates static electricity in the web material before cutting.

The construction design to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

FIGURE 1 is a perspective view of one form of the conversion apparatus of the present invention and schematically illustrates the position of the rotating cylinder knitting machine which it is to feed in dashed lines;

FIGURE 2 is a partial side elevation of the apparatus illustrated in FIGURE 1;

FIGURE 3 is a partial plan view of the apparatus as shown by line 3—3 in FIGURE 2 and illustrates the adjustable means for wiping excess treating liquid from the elements;

FIGURE 4 is a partial side elevation of the opposite side of the apparatus from the side down in FIGURE 2 and particularly illustrating the treating system;

FIGURE 5 is a partial side elevation of the apparatus illustrating the use of the splicing means;

FIGURE 6 is a perspective view of the feeding guides at one station on the knitting machine;

FIGURE 7 is an end view of the means used to align and remove wrinkles from the web material; and

FIGURE 8 is an elevation view of another form of apparatus of the present invention installed on a rotating plate knitting machine.

The application of the process of converting different kinds of web material, such as paper, vinyls, polyethylene and other similar plastic materials, to a knitted product, has required that specal considerations be given to the apparatus which converts the web material into elements suitable for feeding to a knitting machine. In the conversion of some plastics, a very accurate control of tension, particularly in feeding to the knitting machine, to maintain a minimum tension is desirable to prevent a slight stretching of the individual elements. Some materials have a static charge of electricity when unwound from a roll. Such static electrical charge may interfere with the successful conversion of the materials to a knitted product and should be eliminated. The treatment of the elements which are to be fed to a knitting machine should be carefully controlled so that the elements are amenable to the knitting and, when knit, form the desired fabric.

In the preferred form of the present invention the apparatus includes a frame structure F, which is designed to support both the feed stock and the components of the apparatus which perform the conversion of the web material from the feed stock, and is also designed to be compact and to deliver the elements produced to the knitting machine at the proper height. The feed stock, which would include at least two rolls designated R–1 and R–2, is supported by means on the frame F, such as the two pairs of arms **10** and suitable bearings **11** secured to the arms **10** to receive the shafts **12** of the two rolls. Thus, the rolls are mounted on the frame and are free to turn as the web material is withdrawn from the rolls. A braking mechanism **13**, seen in FIGURE 1, is positioned on each of the shafts **12** to retard the withdrawal of the web material from the roll and thereby provide a resisting force which develops the proper tension in the web material. The direction of travel of the web material as seen in FIGURES 1 and 2 is generally

through the conversion apparatus supported on frame F from the right to the left toward the knitting machine K.

The apparatus is designed to draw web material from either of the two rolls R–1 and R–2 in order to assure that a substantially continuous supply of web material W is available for the operation of the apparatus. The web material W withdrawn from the roll R–1, as seen in FIGURE 2, is threaded through the splicing means **14**. The splicing means **14** illustrated in the figures is suitable for splicing thermoplastic materials. The splicing means includes a pair of arms **14***a*, a base **14***b* and the heating element **14***c* supported by arms **14***a* which engages the web material on said base to form a bond between the last portion of web material from one roll and the initial portion of web material from the other roll. This splicing operation is hereinafter more clearly explained in relation to FIGURES 4 and 5.

From the splicing means the web material extends over the idler roller **15** and into proximity with the static eliminator **16**. The static eliminator may be any suitable type generally used in the industry by manufacturers of palstic films to eliminate static electricity. Generally, such equipment utilizes a power source and a converter to feed a direct current into a static bar which neutralizes the charge on the film by emitting positive charges. The static eliminator is generally placed within an inch or two of the surface of the film. The elimination of static from the web material will be such as to prevent any tendency of the elements into which the web material is cut from clinging to each other or to portions of the conversion apparatus. This elimination of static electricity, therefore, facilitates the separation of the elements and also assures uniform treating of the elements in the manner hereinafter explained.

The web material extends from the roller **15** to the power rollers **17** and **18** which provide the power necessary to overcome the resistance offered by the braking mechanism **13** and deliver the web material W over the bow bar **19** to the cutting means **20**.

The bow bar **19** functions to straighten the web material, to eliminate creases and folds and to assure that the web material is straight before cutting. The bow bar **19** is mounted on the base **21** which is secured between the side frames of the cutting means **20**. As best seen in FIGURE 7, the bow bar **19** is a slightly curved rod which is secured to the base **21** by any suitable means, such as the threaded end portions and the nuts **22**. The bow bar extends upwardly slightly above the direct line connection from the power roller **18** to the cutting means **20** to exert an upward force on the web material W which will eliminate creases from the web material and assure a uniform feeding of the web material to the cutting means **20**.

The web material W is cut into a plurality of elements having a predetermined width by the cutting means **20**. The cutting means **20** may be of any suitable type, such as a cutter as shown, in which spacers are positioned between the cutter blades, and the width of the strips cut may be preselected by preselecting the correct width of spacer. The cutter divides the web material W into elements E of the desired width. The determination of the width of elements E is based upon the end fabric which is to be produced and by the size of the needles needed to produce the desired fabric. If small needles are required to produce the desired fabric, then the width of the elements E is of necessity smaller than those used for the larger needles in order for the elements to be received in the hook of the needles and to be compressed or crushed by the hook and the pulling of the elements through the precedingly formed loop in the fabric.

While the elimination of the static electricity in the web material W before it is cut is helpful, with certain materials, such as thin plastic films, it is also advantageous to provide a second static eliminator **16***a* positioned in close spaced relationship to the elements E as they are discharged from the cutting means **20**. As shown, static eliminator **16***a* is supported from the frame of the cutting means **20**. This static eliminator **16***a* is similar to static eliminator **16**. Either static eliminator or a combination of both static eliminators **16** and **16***a* may be used to assure that the conversion of the web material W into elements E, the treating of elements E and the knitting of the elements E into a fabric are not hindered by static charges.

After the elements have been formed from the web material, they are next conducted to the treating means. The elements are treated normally by the application of a liquid which renders the elements more suitable for the knitting operation and also may include an additive which is desired in the final fabric produced. Generally, papers require the application of a liquid treating agent which renders them more pliable for the condensing step by the needles and also for the knitting operation itself. Some plastic materials require the application of a treated liquid which functions as a lubricant for the plastic to avoid introducing additional tension in the plastic elements during their passage from the cutter to the knitting machine.

The applying means is part of the treating means illustrated and includes the applicator tank **23** in which liquid to be applied to the elements E is contained, the applicator roller **24** and the wiper **26**. The applicator roller **24** is mounted in the applicator tank **23** and is adapted to be rotated in either direction by the motor **25** (or any other drive source). The applicator roller **24** will pick up the treating liquid contained in the tank **23** and supply the elements E with the treating liquid. The wiper **26** is supported on the tank **23** and adapted to engage the upper side of the roller **24**. Generally, the material of wiper **26** which engages the elements is preferred to be a heavy felt which will at least partially absorb the treating liquid and wipe a portion of any excess liquid from the elements E while assuring that the upper side of each of the elements E is provided with the treating liquid. The treating liquid is supplied to the applicator tank **23** from the reservoir **27** by the pump **28** which is powered by the motor **25**. Suction line **28***a* connects pump **28** with the reservoir **27** and discharge line **28***b* connects from pump **28** to tank **23**. It is preferred that the level of liquid in the applicator tank **23** be maintained at approximately the same level at all times, and this may be accomplished by suitable controls (not shown) or manually as desired.

The comb **29** is provided to separate each of the elements E and to deliver them in slight spaced relationship to the treating means T. In this way, application of a uniform amount of treating liquid to each of the elements E is assured.

Also, as a portion of the treating means, suitable means is provided to remove the excess of treating liquid normally applied to the elements E by the applicator roller **24** to assure that the elements are adequately treated. The rotational speed and direction of rotation of the applicator roller **24** may be controlled to deliver more or less treating liquid as desired. The elements passing from the tank **23** are shown to engage the edge of the tank in order to remove some of the excess treating liquid therefrom. Additionally, the elements are further treated by the adjustable combs **30** and **31** to remove the additional excess treating liquid from the elements E. The adjustable scraper combs **30** and **31** are mounted for relative lateral movement immediately above the excess liquid trough **32** and are each suitably slotted to vary their relative position. As the combs are moved farther apart to the dashed positions illustrated in FIGURE 3, additional scraping action will be exerted on the elements E to remove more liquid than would be removed by the position of the combs shown in solid lines in FIGURE 3. This liquid removed by the combs **30** and **31** will drain down the combs into the trough **32** and be conducted back to the reservoir **27** by the drain **33**.

The treated elements, thereafter, pass through the spreader comb **34** to the power rollers **35** and **36**.

The power rollers **35** and **36** are driven, as hereinafter more fully explained, to provide additional control of the tension of the elements E during their passage from the cutter through the treating means. The flexible tension fingers **37** are secured at their base to the bar **38** which is, in turn, secured to the frame F. The flexible tension fingers **37** are provided with loops in their free end in which one of the elements is to be engaged for each finger.

In operation, the fingers **37** are sufficiently flexible to bend downward at their free end and provide an upward lift to the elements E to take up any slack in the elements and to assure that each of the elements is under substantially the same tension. The elements pass through the loop at the free end of the fingers **37** and over or through holes in the bar **38** to the individual feeding stations on the knitting machine K. The tension fingers **37** are also adapted to move up against the stop bar **39** whenever the element passing through its free end becomes sufficiently loose to allow the finger **37** to engage the stop bar **39**. By suitable circuitry, as shown in FIGURE 2 and in the copending application Ser. No. 413,261, filed Nov. 23, 1964, a circuit may be completed by the finger **37** whenever one of the elements becomes so loose as to allow it to engage the stop bar **39** to shut down the apparatus. This looseness normally only occurs when one of the elements has broken its connection back to the web W. With this stop circuit, the conversion and knitting operations are instantly stopped whenever one of the elements breaks or whenever it becomes sufficiently loose to allow the fingers **37** to engage the stop bar **39**.

The individual knitting stations of the knitting machine are provided with special feeding means. Such feeding means is utilized to provide additional control of the tension and feeding of the elements E to the knitting needles of the knitting machine K. This feeding means is illustrated in FIGURE 6. Each feeding station is provided with a standard **40** which supports the needle feed tab **41** at the proper position and level to allow the elements E passing through feed tab **41** to be engaged by the knitting needles **42** in the usual manner. A guide in the form of a wire loop **43** is secured to the standard **40**. The elements E extend from the flexible fingers **37** through the guide **43** on the standard **40** adjacent to the station at which they are to be engaged by the needles **42**. From the guides the elements extend over the roller **44**, which is held by the support **45** at a position between the individual standards **40**, and through the feed tab **41** to the needles. This method of feeding, particularly including the roller **44** between the guide **43** and the feed tab guide **41**, minimizes the tension in the elements E and will prevent unnecessary breakage and also any tendency of the elements E, when plastic, to elongate.

The power utilized to drive the knitting machine K is also utilized to drive the components of the conversion apparatus. With reference to FIGURES 1 and 2, the motor **46** is connected through the transmission **47** and a suitable belt or chain drive **48** to drive the shaft **49**. The shaft **49** is the drive shaft for the knitting machine K. Additionally, shaft **49** is connected through suitable clutch mechanism **50** and gearing **51** and **52** to rotate the shaft **53**. Shaft **53** is connected to the variable speed drive mechanism **54** which has a control knob **5** controlling the speed of the pulley **56**. This pulley **56** is connected to the drive pulley **57** of the cutter **20** to control the speed of rotation of the cutter **20**. Additionally, the power rollers **17**, **18** and power rollers **35**, **36** are interconnected with the cutter shaft, such connection shown in dotted lines in FIGURES 1 and 4, to synchronize the rotational speed of the power rollers **17**, **18**, **35** and **36** with the speed of rotation of the cutter **20**. The variable speed drive mechanism **54** will also allow the rate at which elements are fed to the knitting machine K to be synchronized with the speed at which such elements are utilized by the knitting machine and incorporated into the fabric being produced.

The control panel **58** is secured to the frame, as shown, and combines switches and indicators for the motor **46**, for the motor **25**, for the static eliminator **16** and the splicing means **14**. If desired, when the applicator roller **24** is driven by a separate drive than the motor **25**, controls and indicators for such separate drive will be incorporated into the control panel **58**.

With particular reference to FIGURES 4 and 5, the splicing of the end of one roll onto the beginning of the other roll is illustrated. In FIGURE 4, the end of the roll R–2 (roll R–2 being shown in dashed lines) is positioned on the base **14***b* and the beginning of the other roll R–1 is positioned between the end of the roll R–2 and heating element **14***c*. With the equipment stopped and the respective ends of the rolls positioned in the splicing means **14** as described, the proper switch is actuated to cause the heating element **14***c* to heat and, thereby, bond the two ends together. Thereafter, the arm **14***a* will be raised and any excess material on either side of the bonded area trimmed off and the operation of knitting machine and conversion apparatus continued. In the illustration in FIGURE 5, the end of the roll R-1 is positioned within the splicing means **14**, together with the starting end of the roll R–2. The roll R–1, which has been exhausted in FIGURE 5, is illustrated in dashed lines. The splicing of the two ends together then proceeds as previously described in relation to FIGURE 4. In this manner, the splicing of one roll to another in plastic materials may be readily done with only a very short interruption in the continuous flow of web material and continuous operation of the knitting machine. When web materials which will not heat-bond to each other are used, a suitable quick-drying adhesive may be used for the splicing operation and the splicing means may be eliminated or used to accelerate the bonding by the adhesive means.

The form of the invention illustrated in FIGURE 8 involves a rotating type of knitting machine in which the feeding stations of the knitting machine rotate while the needles remain in a fixed position. With such a knitting machine the conversion apparatus is mounted on the knitting machine and connected to rotate therewith to preserve the relatioship between the individual elements and the feeding stations for each of such individual elements.

The converting apparatus illustrated in FIGURE 8 is generally the same apparatus as previously described. Such apparatus is schematically illustrated in FIGURE 8 and includes a frame structure S mounted on the rotating table **60** of the knitting machine **61**. The frame structure S provides support for the roll **62** to allow the web material **63** to be withdrawn therefrom. The power rollers **64** and **65** supply the power for the withdrawing of the web material from the roll **62** and deliver it over the bow bar **66** to the cutting means, cutter **67**. The cutter divided the web material into a plurality of elements **68** and the treating maens **69** applies a suitable treating liquid to the individual treating elements **68** before delivering the elements to their power rollers **70** and **71**. The tension fingers **72** receive the elements, one element to each tension finger, from power roller **71** to assure proper tension in the elements as they are delivered to the individual feeding stations of the knitting machine.

Power for the apparatus illustrated in FIGURE 8 is provided by the shaft **73** from a suitable source, not shown. The rotation of the shaft **73** will drive the shaft **74** to cause the table **60** to be rotated by the connection between the gear **75** and the rack **76** on the underside of the table **60**. The shaft **77** is supported by suitable bearings connected to the rotating table **60** and is provided with a lower pinion **78** which engages in the internal gearing **79** secured to the fixed portion of the knitting machine **61**. The shaft **77** is connected through the gearing **80** to the drive shaft **81** for the converting apparatus which is mounted on the frame structure S.

As the table **60** rotates, the entire converting apparatus, including the frame structure S, is rotated. This rotation

causes the shaft **77** to rotate because of the engagement of the pinion **78** in the internal gearing **79**. The shaft **81** is rotated at the desired speed whereby, through suitable belting, the cutter **67** and the power rollers **64, 65, 70** and **71** are driven at the desired speed. If desired, the connection from the drive shaft **81** to the cutter and power rollers may include a variable speed driven mechanism **82**, similar to variable speed drive mechanism **54**, to synchronize the speed of the converting apparatus so that the elements **68** are fed to the knitting stations on the knitting machine **61** at the speed with which the elements are converted into the fabric by the knitting machine **61**. The knitting machine **61** is provided with suitable apparatus to take up the knitted fabric **83** and wind it onto the roll **84**. Such apparatus is commonly used with knitting machines.

Such elements as the static eliminator, the treating means T, the adjustable combs for removing excess treating liquid and the improved guide means at the knitting stations, while not illustrated and described in relation to FIGURE 8, are contemplated to be used on such apparatus where applicable.

From the foregoing it can be seen that the apparatus of the present invention is compact and will economically convert a web material into strips, treat the strips and knit the strips into a fabric. This apparatus has provision for a substantially continuous supply of web material, removes creases and folds from the web material before cutting, eliminates static electricity from the web material or from the elements into which the web material is cut, maintains the desired tension in the web material and the elements to the point at which the elements are knit into a fabric and provides for a uniform treating of the elements.

The foregoing disclosure and discription of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. An apparatus for producing a knitted fabric from a supply of web material, comprising
- a rotating table weft knitting machine,
- a frame structure positioned on the rotating table of said knitting machine for rotation therewith,
- means on said frame structure supporting a supply of web material,
- cutting means on said frame structure to cut said web material into a plurality of elements having a preselected width,
- means delivering web material from said supply to said cutting means,
- treating means on said frame structure and including
  - means applying an excess of treating liquid to said plurality of elements, and
  - means removing the excess of treating liquid to said plurality of elements,
- means delivering said treated elements from said treating means to the knitting needles of said knitting machine, and
- drive means for said delivering means to deliver said elements to said knitting machine at the rate at which said elements are knitted into the fabric,
  - said drive means including
  - a toothed surface in the fixed portion of said knitting machine,
  - a drive shaft connected to drive the cutting means and both of said delivering means supported on said frame structure, and
  - a gear mounted on said drive shaft in engagement with said toothed surface whereby rotation of said frame structure rotates said drive shaft.

2. An apparatus for producing a knitted fabric from a web material, comprising
- a weft knitting machine,
- a frame structure associated with said knitting machine,
- means on said frame structure supporting two rolls of web material,
- cutting means on said frame structure to cut web material longitudinally into plurality of elements having a preselected width,
- means for delivering web material from said rolls to said cutting means,
- treating means supported on said frame structure for applying an excess of treating liquid to said plurality of elements and for removing the excess of treating liquid therefrom,
- means for delivering elements from said cutting means to said treating means,
- means for delivering said treated elements from said treating means to the knitting needles of said knitting machine, including
  - a plurality of standards,
  - each of said standards positioned on said knitting machine at a knitting station,
  - a plurality of feed tabs,
  - each of said feed tabs supported on a standard and adapted to deliver one of said elements to the knitting needles of the knitting machine,
  - a plurality of supports,
  - each of said supports positioned on said knitting machine between two of said standards,
  - a roller on each of said supports,
  - a guide on each of said standards,
  - each of said elements being delivered to the knitting needles through a guide on a standard, over the roller on the adjacent support and through the feed tab on the standard at the knitting station at which the element is to be fed to the knitting needles,
  - drive means for said delivering means and said cutting means to feed elements to the knitting stations of said knitting machine at the rate at which said elements are knitted into a fabric, and
  - a bow bar adapted to engage the web material before it enters said cutting means to eliminate creases and folds and to straighten the web material for delivery to said cutting means.

3. An apparatus for producing a knitted fabric from a web material, comprising
- a weft knitting machine,
- a frame structure associated with said knitting machine,
- means on said frame structure supporting two rolls of web material,
- cutting means on said frame structure to cut web material longitudinally into a plurality of elements having a preselected width,
- means for delivering web material from said rolls to said cutting means,
- treating means supported on said frame structure for applying an excess of treating liquid to said plurality of elements and for removing the excess of treating liquid therefrom,
- means for delivering elements from said cutting means to said treating means,
- means for delivering said treated elements from said treating means to the knitting needles of said knitting machine, including
  - a plurality of standards,
  - each of said standards positioned on said knitting machine at a knitting station,
  - a plurality of feed tabs,
  - each of said feed tabs supported on a standard and adapted to deliver one of said elemnts to the knitting needles of the knitting machine,
  - a plurality of supports,
  - each of said supports positioned on said knitting machine between two of said standards,
  - a roller on each of said supports,
  - a guide on each of said standards,

each of said elements being delivered to the knitting needles through a guide on a standard, over the roller on the adjacent support and through the feed tab on the standard at the knitting station at which the element is to be fed to the knitting needles,

drive means for said delivering means and said cutting means to feed elements to the knitting stations of said knitting machine at the rate at which said elements are knitted into a fabric, and

a base plate supported on said frame structures at a position between said rolls and said cutting means,

a heating element, and

means pivotally mounting said heating element to said frame structures at a position above said said base plate,

said web of material from said rolls being delivered to said cutting means by said delivering means between said base plate and said heating element whereby the trailing end of web material from one roll is bonded to the leading edge from the other roll by heating said heating element with overlapped portions of said web materials between said heating element and said base plate.

References Cited

UNITED STATES PATENTS

1,598,627	9/1926	Voegeli	26—54 X
1,843,078	1/1932	Berger	118—124
2,022,506	11/1935	Hejduk	118—124
2,059,873	11/1936	Jones et al.	242—58.5 X
2,162,403	6/1939	Howard	118—124 X
2,303,171	11/1942	Morrison.	
2,522,211	9/1950	Crawford.	
3,018,645	1/1962	Fried	66—125
3,131,527	5/1964	Gourley	57—32
3,214,943	11/1965	Marks	66—125
3,233,526	2/1966	Sherman	242—58.1 X
3,331,222	7/1967	Marks	66—125
3,307,378	3/1967	Warthen	66—125
3,336,645	8/1967	Mirsky	66—125 X

FOREIGN PATENTS

429,463	7/1911	France.
163,314	10/1964	USSR.

MERVIN STEIN, *Primary Examiner*

U.S. Cl. X.R.

28—1; 57—32; 118—124; 248; 242—58.1