United States Patent [19]

German

[11] 3,869,997

[45] Mar. 11, 1975

[54] **WEB CUTTING SEWING MACHINE AND PROCESS**

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[22] Filed: **Feb. 9, 1970**

[21] Appl. No.: **9,104**

Related U.S. Application Data

[63] Continuation of Ser. No. 632,880, March 30, 1967, abandoned.

[52] **U.S. Cl.** **112/121.12,** 83/408, 83/428, 112/130, 112/122

[51] **Int. Cl.** **D05b 21/00**

[58] **Field of Search** 112/121.14, 121.11, 121.12, 112/121.15, 121.29, 2, 203, 205, 262, 122, 124, 129, 130, 10, 11, 102, 214; 83/428, 83/408, 302; 156/251, 259, 264, 510, 156/515, 518

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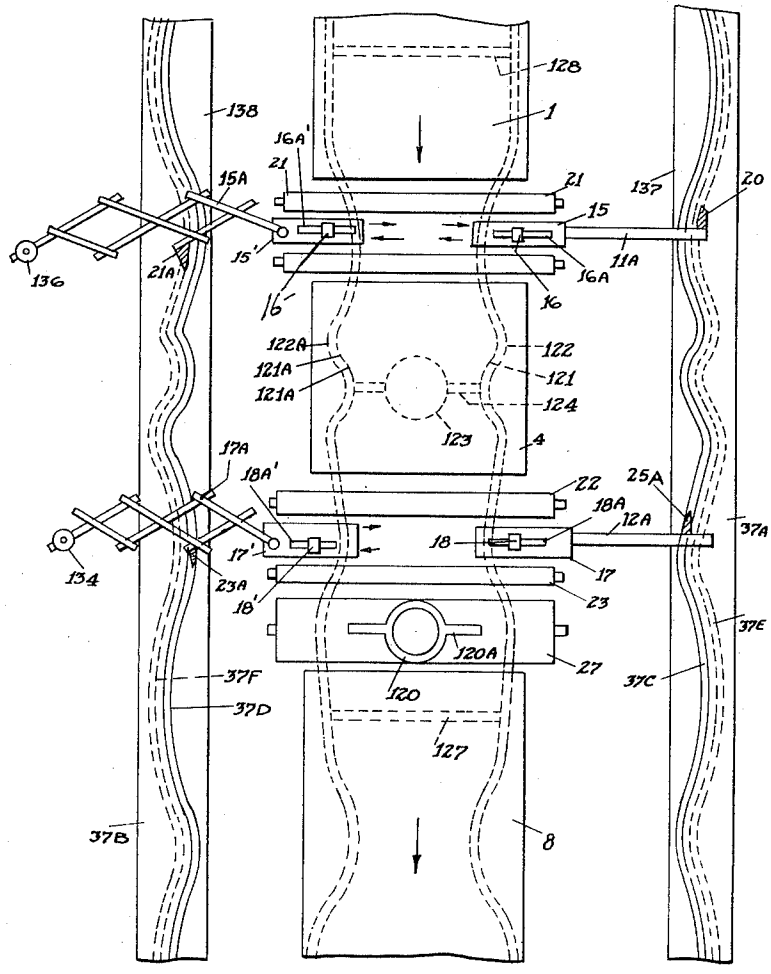
Primary Examiner—James R. Boler

[57] **ABSTRACT**

A sewing apparatus comprises first and second cutting stations, a sewing station and means for feeding a pair of superimposed flexible mated webs through said first cutting station comprising guided cutting devices and said sewing station which comprises guided sewing devices to form a central strip of interconnected articles having non-linear profiled edges sewn together and waste border strips. The sewing apparatus provides means for transporting said central strip of articles from said first cutting station and said sewing station through said second cutting station for cutting the central strip into separate articles and also provides means for collecting the sewn articles and the unsewn border strips.

32 Claims, 27 Drawing Figures



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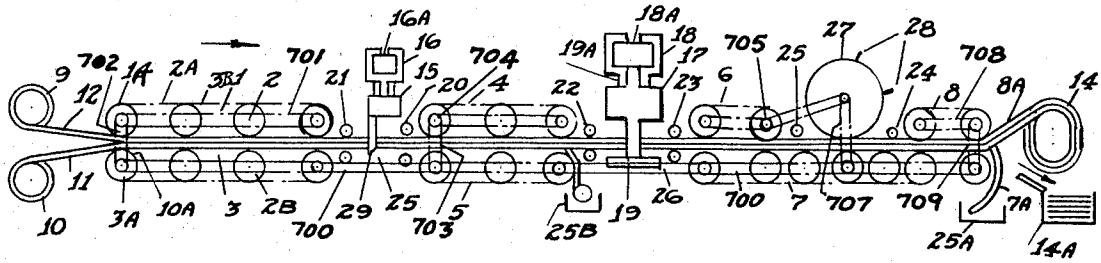
SHEET 1 OF 8

Fig. 1.



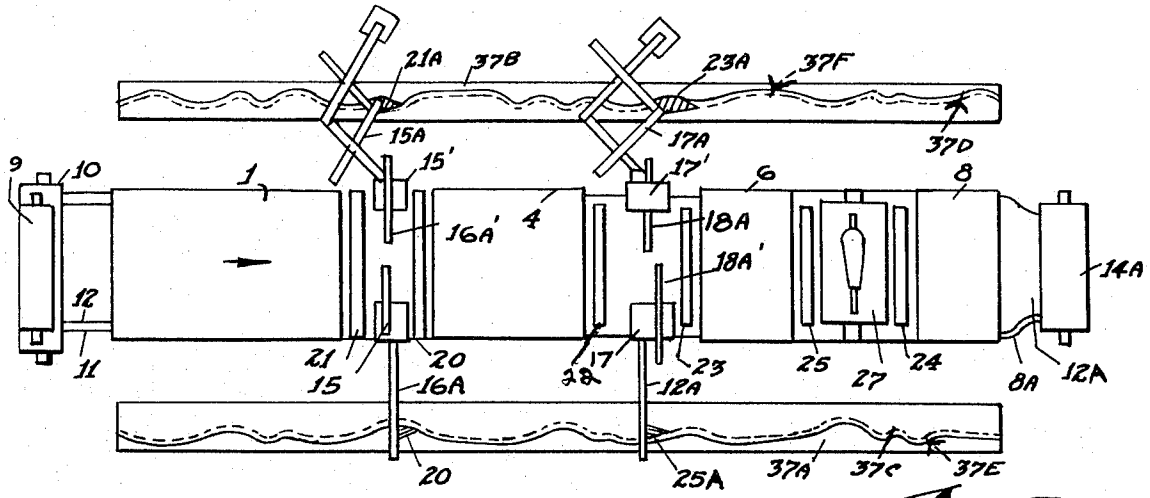


Fig. 2.

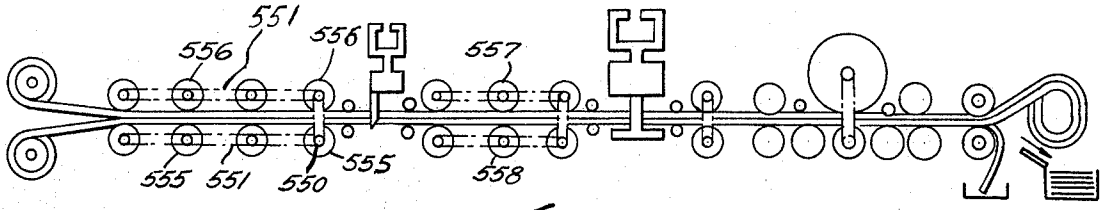


Fig. 7.

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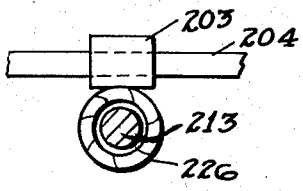

Fig. 8B.

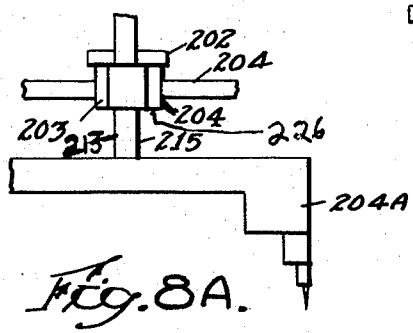

Fig. 8A.

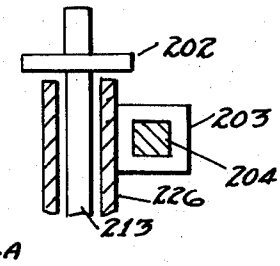

Fig. 8.

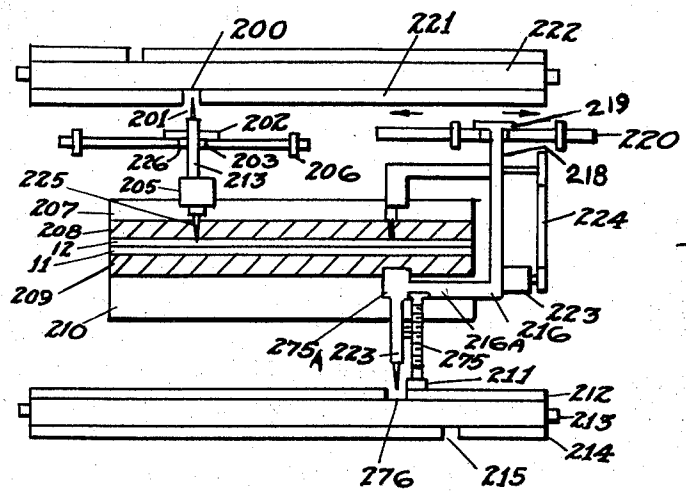

Fig. 3.

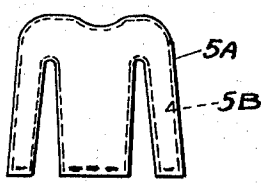

Fig. 9A.

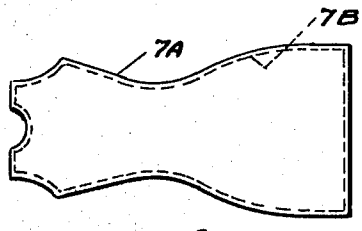

Fig. 9.

Fig. 9B.

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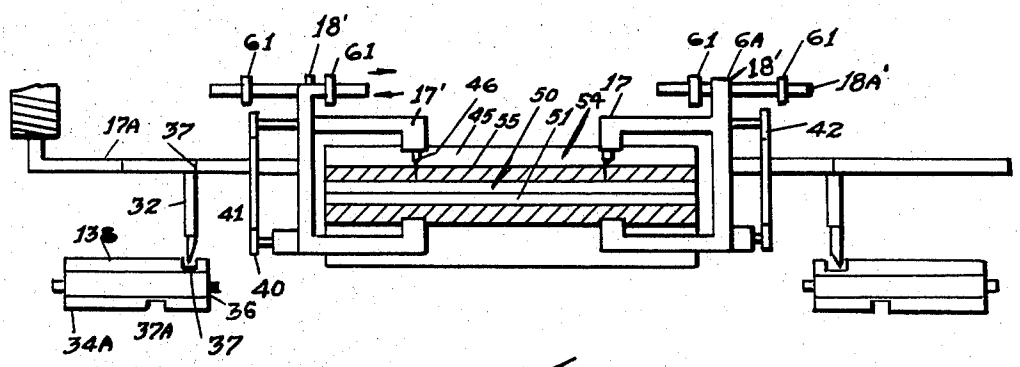

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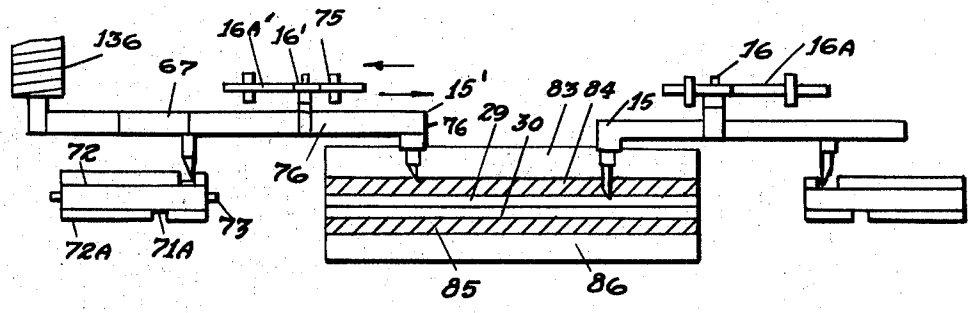

Fig. 5.

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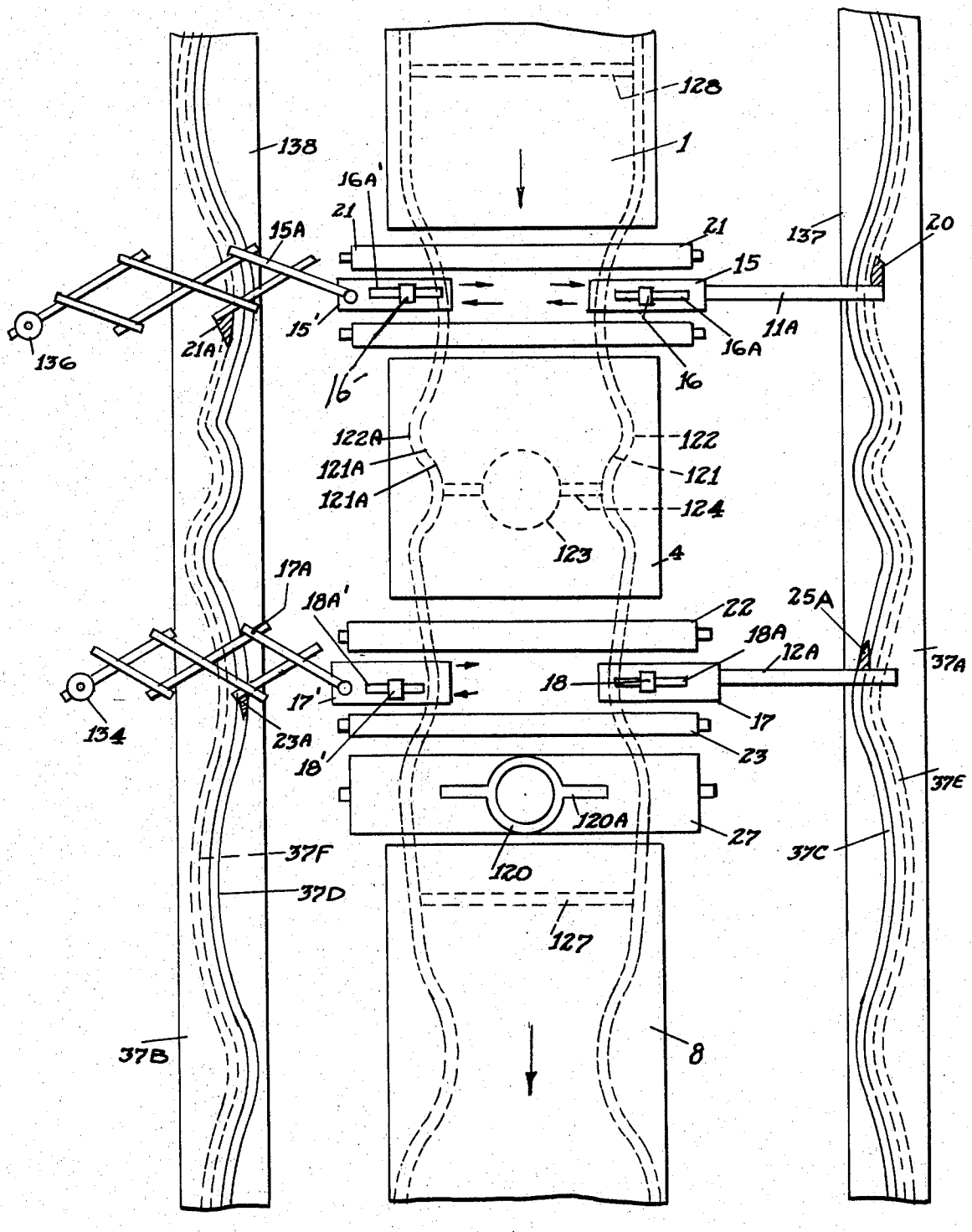

Fig. 6.

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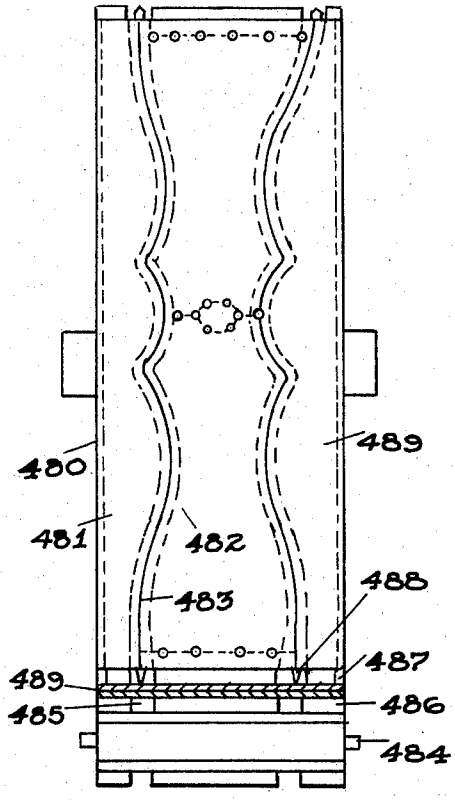

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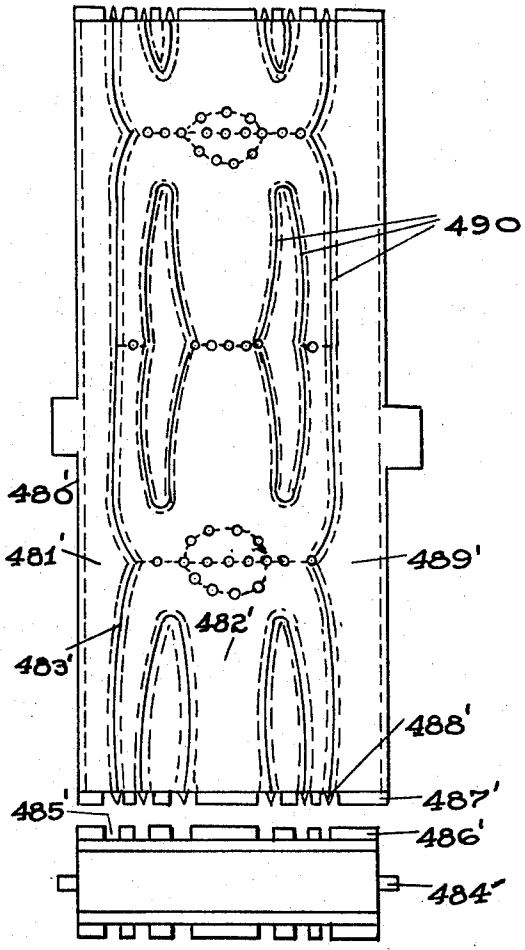

Fig. 11.

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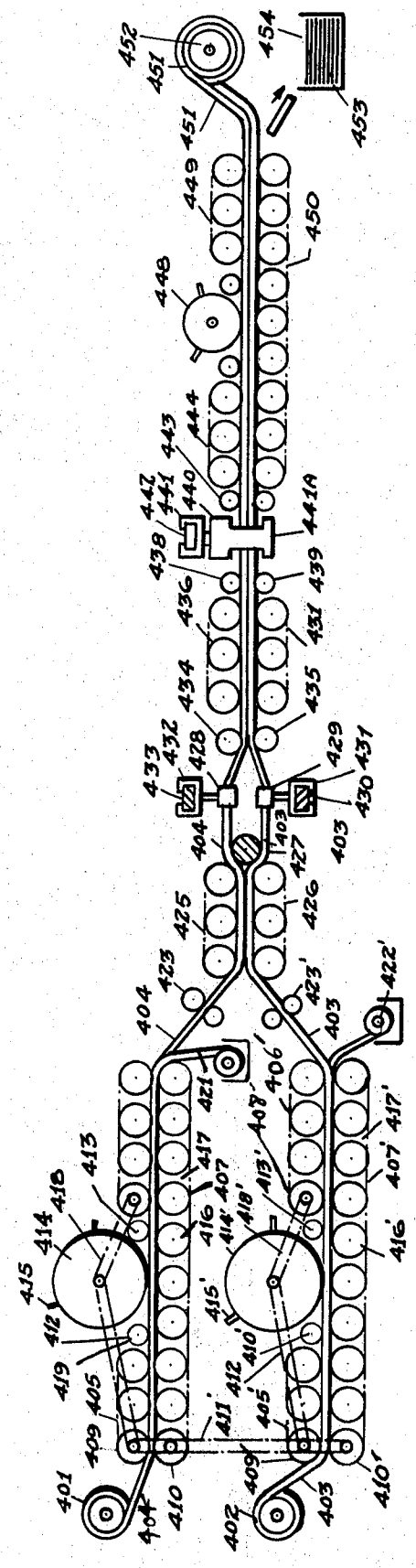

Fig. 12.

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Fig. 13.

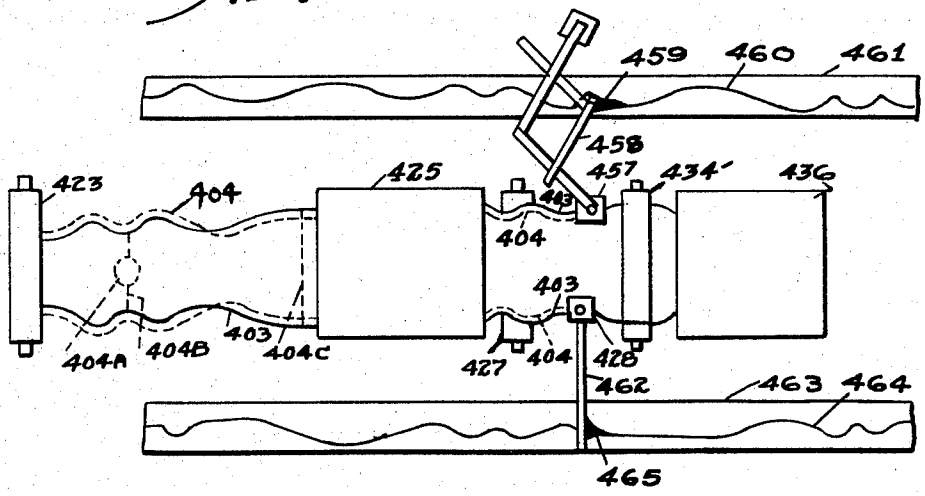
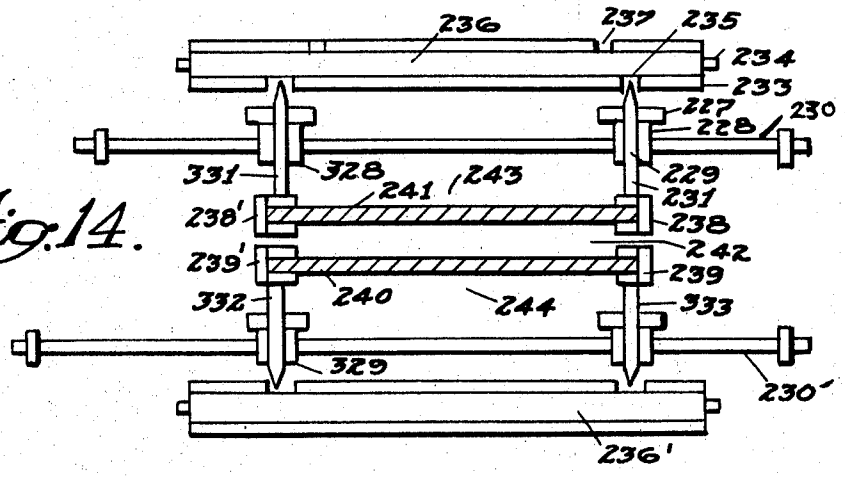


Fig. 14.



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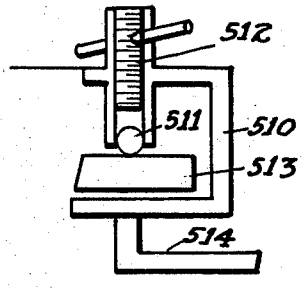
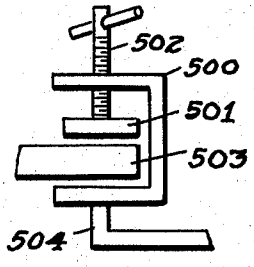


Fig. 15.



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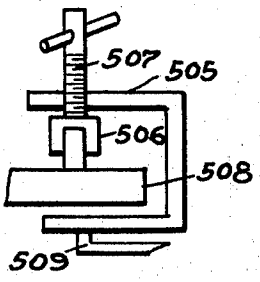

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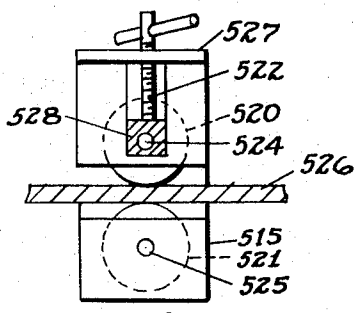

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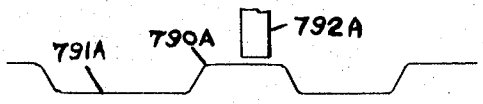
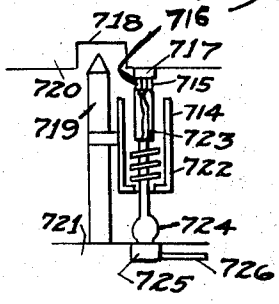


Fig. 21.



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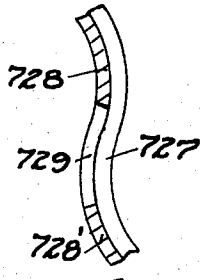

Fig. 23.

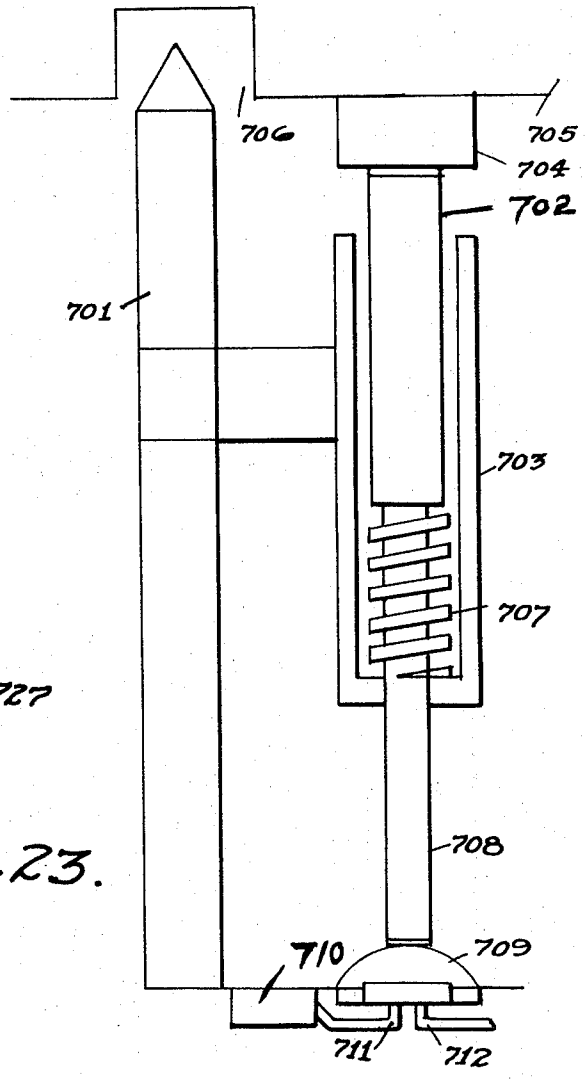

Fig. 20.

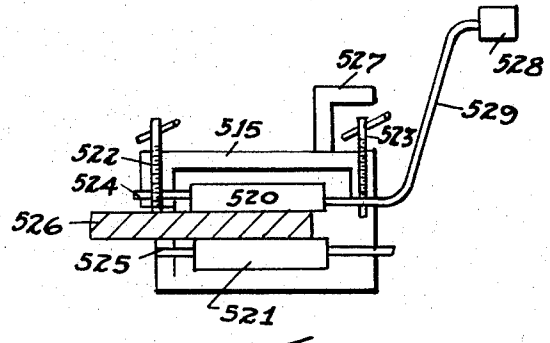

Fig. 18.

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WEB CUTTING SEWING MACHINE AND PROCESS

This application is a continuation of application Ser. No. 632,880, filed Mar. 30, 1967, now abandoned.

This invention pertains to an automatic garment making machine and automatic garment making process for the handling of limp fabrics and their conversion to garments and expecially pertains to novel machines and processes for automatically cutting out continuous front and back garment sections, automatically sewing the outer edges of said sections to form side seams and performing other necessary additional cutting procedures in order to produce partially sewn garments.

In producing specific garments such as dresses, as an example, which are made from a two piece pattern, high stacks of fabric material of various types are cut with various cloth cutting tools along marked lines to produce two separate garment sections, a back and front garment section and a manual procedure is employed whereby the front and back sections are assembled in a manner consisting of a worker picking up the front and back sections, orienting the surfaces of the front and back sections so that the outside surfaces (as for example in dresses many printed cotton fabrics are used and these fabrics should face outward) face outward in the completed garment, the worker then combines the front and back sections and within the same time period aligns the side edges of these sections and then uses a sewing machine to fasten the side edges to form seams. The assembled garments are then transported to benches where other garment working procedures are carried out. The amount of work entailed in the production of garments by manual procedures is relatively costly and an automatic garment making machine and process could help reduce some of the labor costs in the manufacture of these garments. This invention describes certain novel mechanized processes and mechanized devices which are an important part of the apparatus and work together in a continuous and efficient manner to perform the various garment making procedures.

In producing garments such as dresses, a cutting procedure is followed whereby a long length of the textile material is folded over many times to produce a high multi-layered stack of printed textile fabric and this is then cut with appropriate cloth cutting tools to form garment sections and it has been found that one garment section with an outer printed surface facing upwardly is followed by another garment section with an inner nonprinted surface facing upward which is then followed by an outer printed surface, etc. and these garment sections alternate in this manner all the way through the stack of cut sections.

It therefore requires the additional effort and labor of the worker to maneuver these sections so outward printed surfaces face outward in the completed garment.

It is an object of my invention to provide a garment making process and machine which automatically cuts out continuous interconnecting identical front and back garment sections simultaneously and automatically sews the outer edges of said garment sections simultaneously to form side seams and performs the other necessary additional cutting procedures in order to produce partially sewn garments.

It is a further object of my invention to provide a garment making process and machine which can automatically cut continuous front and back garment sections of identical dimensions, automatically handle and assemble the limp knit, woven or non-woven fabrics of said cut contoured garment sections, automatically orient and position said sections, automatically align and mate the outer edges of said garment sections for multi-ply fastening procedures in order to form good quality side seams in a continuous, rapid and efficient manner.

Another object of my invention is to provide a modified garment making process and machine which can automatically and separately cut continuous separate front garment sections and automatically and separately cut continuous separate back garment sections, said sections being of different dimensions and having unaligned outer side edges and automatically position said unlike continuous garment front and back sections in separate paths and mate these sections so that they have partially aligned edges and then provide novel edge guide means devices which efficiently guide the unaligned outer side edges of the continuous front and back garment sections into alignment so they can be mated and sewn by a fastening device to form seams of relatively good quality, said seaming process being efficient and rapid.

Yet another object of this invention is to provide specific and unique edge guide means devices to align the dissimilar outer side edges of the front and back garment sections in order to form aligned and coinciding edges which can be efficiently sewn into good seams and said novel edge guide means devices are guided by novel guide means devices and novel guide track means devices.

A further object is to provide a novel process for the assembling and handling and seaming of garment sections by a continuous cutting process to form continuous front and back garment sections instead of a discontinuous cutting process employing larger stacks of separate garment sections which are more difficult and time consuming to handle.

FIG. 1 is a side plan view of one form of the garment making machine containing the various devices and working elements of the invention for automatically and continuously orienting, cutting, assembling positioning, mating and seaming or sewing of garments such as sleeveless dresses or sweaters.

FIG. 2 is a top plan view of the garment making machine in FIG. 1.

FIG. 3 is a crossectional plan view of a modified version of the garment making machine in FIG. 1.

FIG. 4 is a crossectional plan view of FIG. 2 and shows the fastening devices or sewing machines and their movable carriage devices and their guide means devices and their guide means track devices.

FIG. 5 is a crosssectional plan view of FIG. 2 and shows the cutting and trimming devices or reciprocating sabre knife devices and their guide means devices and their guide track means devices.

FIG. 6 is an enlarged top plan view of FIG. 2 and shows the sewing machine fastening devices and reciprocating sabre knife cutting devices and also shows in more detail the grooved or molded lines or patterns of the guide track means for both the sewing machines and the reciprocating cutting knives which are close to each other and follow each other and also this diagram shows by dotted lines the outlines of the continuous

garment sections and as will be noted the lines and patterns on the right hand side guide track means correspond to the lines and pattern of the right hand such outer side edges of the continuous garment sections and the lines and pattern on the left hand side guide track means corresponds to the lines and pattern of the left hand side outer side edges of the continuous garment sections.

FIG. 7 is a side plan view of the garment making machine in FIG. 1 which has been modified by utilizing a series of sets of nip rolls (rubber coated steel or steel or other suitable rollers) to replace the primary and secondary conveyor belts of FIG. 1.

FIG. 8 is a crossectional side plan view of the movable carriage means devices which may or may not rotate on their flange and which serve to hold and support the fastening machine or sewing machine and the cutting and trimming devices or the reciprocating knife blade devices.

FIG. 8A is a side plan view of FIG. 8.

FIG. 8B is a top plan view of FIG. 8.

FIG. 9 is a top plan view of the identical back and front garment sections of a sleeveless dress.

FIG. 9A is a top plan view of the identical front and back garment sections of a long sleeve knitted sweater.

FIG. 9B indicates in a side plan view how the identical front garment section will be placed on the identical back garment section by manual methods.

FIG. 10 is a side plan view of a die cutting roller or roll and a crossectional view of a conveyor belt in contact with said die cutting roller which has a continuous sleeveless dress cutting pattern on it.

FIG. 11 is a side plan view of a die cutting roller or roll and a crossectional view of a conveyor belt in contact with said die cutting roll which has a continuous long sleeve sweater cutting pattern on it.

FIG. 12 is a side plan view of a modified version of the garment making machine of FIG. 1.

FIG. 13 is a top plan view of a part of the modified garment making machine in FIG. 12 showing mainly the edge guide means devices and their guidance means devices and their guide track means devices.

FIG. 14 is a crossectional side plan view of modified versions of the guide track means devices and guidance means devices of the edge guide means devices shown in FIG. 13.

FIG. 15, FIG. 16, FIG. 17, FIG. 18, FIG. 19 and FIG. 20 are different views of various types of edge guide means devices.

FIG. 21 is a crossectional side plan view of an electrical switch means device for stopping and starting the sewing machine motor automatically in accordance with a given pattern on a patterning means device.

FIG. 22 is a side plan view showing the hill-like and valley-like nature of the molded patterning means device in FIG. 21.

FIG. 23 is a plan view of a photoelectric switch means device and parts thereof similar to the device shown in FIG. 21.

Referring to the drawings FIG. 9 and FIG. 9A the numbers 5A, 7A and 5B, 7B represent regular front and back garment sections of identical dimensions or size such as are utilized in the manufacture of sleeveless dresses or sweaters, as an example, in general the garments are composed mainly of a front garment section and a back garment section and the width measurements of the front section and the back section are the same.

In most cases, in the primary procedure employed in making a garment the side edges of the front and back section are brought into alignment and seams are formed and sewn along the side edges thereof. This is one of the beginning assembly procedures and the garment is then conveyed to other garment making processes which are known to the art.

The present invention will be described and refer generally to the primary garment making procedures of handling and assembling the limp garment sections and forming the side seams. In order to illustrate this invention properly it is necessary to describe and refer to the primary procedures in the manufacturing and assembling of garments such as sleeveless dresses and sweaters since this pertains to one of the important processes of the invention.

Furthermore it should be understood that this invention is not limited to the specific described primary assembly procedure, but makes use of principles having considerably wider applications.

As described before in the manufacture of a garment such as sleeveless dresses or knitted sweaters, a large length of fabric in continuous form is laid up on a table by being passed back and forth in successive layers on the table. A lay-up may contain as many as 75 layers of fabric. Following the lay-up procedure, the whole stack of the fabrics is cut simultaneously to form specific garment sections and it is known that garment sections in a cut stack will be arranged so that one section with the outer printed surface face up will be followed by the next section with the inside non-printed surface face up and this condition will exist all the way through the stack. Therefore, in the manual assembly procedure which follows the cutting of the fabrics, the two limp garment sections must be handled so that the outside printed surface of both the front and back garment sections will face outward.

In accordance with this invention an automatic machine for the cutting, assembling and seaming of garment sections is provided, said garment making machine is supplied with two single plys of fabric, one which will represent the continuous front garment sections or top garment sections and one which will represent the continuous back garment sections or bottom garment sections and by manipulating these fabric rolls on the feed means device or unwind roll stand so that the outside printed surface of the fabrics face inward, assembled and sewn garments are produced with the outside printed surface facing outward and this is an important feature of this invention.

Referring to FIG. 1, the numbers 9 and 10 represent feed means or feeding devices for the purpose of feeding or passing preferably two single plys of fabrics of continuous length or a dual ply tubular fabric (not shown) of continuous length preferably in a horizontal plane of a transporting means, the primary conveyor belts 1,3. Said feeding devices may consist of two adjustable speed unwind feed rolls for the two separate single ply fabrics 11,12 or one adjustable speed unwind roll for a dual ply tubular fabric and variable speed drive means is utilized for said fabric feeding devices for the purpose of synchronizing their speed with the other devices of said garment making machine.

Clamplike transporting means or devices 1,3 and 4,5 are employed for the purpose of conveying or passing

the fabrics 11,12 along a predetermined course or path toward and in contact with a movable carriage device 16 consisting of a movable cutting and trimming device 15 and movable carriage guide means and a movable carriage device 18 consisting of a movable fastening device such as a sewing machine 17 and a movable carriage guide means and for the additional purpose of clamping said fabrics (in contact with one another along their width) in a predetermined position in relation to the other elements of this garment making machine in order to automatically orient in direction and plane the top fabric ply or cut front garment sections in continuous form and the bottom fabric ply or cut back garment sections in continuous form and to automatically position and automatically align the outer edges of the front and back garment sections in continuous form and to automatically mate the continuous front and back garment sections prior to sewing and forming of the seams. The clamplike transporting means or devices 1, 2, 3, 4 and 5, 6, 7 and 8 in certain instances also act to prevent wrinkling of the fabrics by applying the proper amount of tension to said fabrics, said wrinkling if it occurred might result in inaccurate cutting and sewing and might make the appearance of the finished garment undesirable. The transporting means may consist of two primary conveyor belts 1, 3 one mounted above the other and each in definite contact with one another and variable speed drive means for driving the lower primary conveyor belt 3 and a sprocket chain 10A connects the lower conveyor drive roller 3A with a pair of reversing gears attached to the shaft of the upper conveyor drive roller 1A in order to insure synchronization of speed of both conveyor belts. The reversing gears of the upper 1A conveyor belt act to maintain the proper counterclockwise rotation of the upper conveyor belt although the sprocket chain is being turned clockwise. The primary function of the primary conveyor belts 1,3 is to feed the two fabric plys which are in contact with each other in the particular case illustrated in the drawings, to the cutting device 15 for cutting the continuous front and back garment sections simultaneously and then these continuous cut front and back sections in an oriented, properly positioned, aligned, mated condition with their outer side edges in an aligned and coinciding state are conveyed by the secondary conveyor belts 4 and 5 to the fastening device or regular sewing or overedge sewing machine 17, for the purpose of sewing the outer side edges to form seams. When the movable carriage device 18 containing the fastening device as sewing machine 17 and a movable carriage guide means device precedes the movable carriage device 16 containing the cutting device 15 and its movable carriage guide means in the garment making machine, the sewing machine is employed for the purpose of sewing a line of stitches simultaneously in the top and bottom plys of the fabrics (while said plys are in definite contact with each other along a predetermined course or path to effect and form the contour and shape of) the side seams of a garment and said stitching or fastening means will correspond to the contour of the eventual finished garment seams the sewn fabrics are then transported by secondary conveyor belts 4 and 5 to a cutting device and then the cutting device such as a die cutting roller or reciprocating sabre knife 15 cuts and trims along a predetermined course or pattern which is similar to the sewing stitch pattern except that it is ¼ to ½ inch away from it to continuously form the front and back garment sections and the cut and trimmed seam around these sections. Thus one of the advantageous features of this invention is the fact that when the front and back garment sections are of identical dimensions it is possible to first sew the fabrics and then cut them to form the garments with the sewn seams automatically formed and this is advantageous when the fabric materials being used are such that the edges of said materials tend to unravel or curl up or are difficult to sew for any reason. In certain instances, instead of a reciprocating cloth cutting sabre blade device, a die cutting roller can cut out automatically the unwanted portions of the pattern in the sewn cloth and a partially finished garment with sewn side seams remains.

However in the case where the cutting device 15 precedes the sewing machine 17 as shown in the drawings, then the cutting devices simultaneously cut the top and bottom ply of fabrics along a predetermined course or path to effect and form the aligned edges of the unfinished side seams of a garment, and thus forms the continuous front and back sections which are automatically oriented, positioned, aligned, and mated and then these mated sections are carried by the secondary conveyor belts 4 and 5 to the sewing machine 17 which then sew the coinciding and aligned edges of the identical noted front and back garment sections to form finished seams in the assembled garments.

As shown in FIG. 2 and FIG. 6, suitable movable guide means devices are utilized for the purpose of accurately guiding movable carriage devices consisting of said fastening devices or sewing machine devices 17 or the cutting and trimming devices 15, the guide means device may consist of a pantograph device 15A and 17A with attached guide rod or guide blade or a line reproducing device 23A and 15A or a straight steel bar or rod 11A and 12A which has a guide rod or a guide blade at its end 25A and 20, said guide rod or guide blade acting as a line tracing device. The guide means device guides the movable carriage devices containing either the fastening device or sewing machine or the cutting device along a predetermined course or path to effect and form the contoured side seams of a garment and said path or course corresponds to the contour of said garment seams. Again referring to FIG. 2 and FIG. 6 one or more guide track means conveyor belts 37A and 37B which are moving at the same speed as the primary secondary and tertiary conveyor belts is utilized as a patterning device and these guide track means conveyor belts are preferably located in a parallel state to either side of the garment making machine or under the garment making machine below the fabrics or above the garment making machine above the fabrics and said guide track means contains a flexible abrasion resistant polymeric strip of material such as flexible nylon, or abrasion, resistant polyurethane or elastomeric materials such as abrasion resistant rubber and this strip is attached to a rubber conveyor belt by means of nylon bolts and nuts which are set into ground holes in the belt and are flush with the inner surface of the belt so they will not scar the steel rollers. One of the advantageous features of these patterning strips is that they can easily be removed and the pattern of the garment and its seams easily changed. In certain instances the pattern may be cut into or molded upon the surface of the guide track means conveyor belt itself as illustrated in the drawing FIG. 2, FIG. 3, FIG. 4, FIG. 5 and FIG. 6

by the numerals 37c, and 37D and 37E and 37F. The flexible abrasion resistant strip or ribbon has a molded or grooved teflon coated guide track into which the movable tracing styles, guide rod or guide blade of the pantograph guide means device or straight steel rod or bar guide means device projects downwardly and the movable guide rod or guide blade or movable tracing stylas 23A, 21A, 20 and 25A of said guide means devices which are an important part of the movable carriage devices which also contain the sewing machine 17, and 17' or fastening devices or the cutting and trimming devices 15 and 15' serves to guide said movable carriage devices in a predetermined course or path or pattern or line along and through the fabrics involved corresponding to the course or path or pattern or line of said molded or grooved guide track means. The pattern or course or path or line of the guide track means corresponds to the predetermined proposed desired seams of the garment as illustrated in FIG. 6, which shows dotted lines transposed over the surface of the garment making machine in order to illustrate the predetermined desired and proposed pattern of the continuous garment sections which will be formed by the machine, in this particular instance, for example, continuous garment sections of sleeveless dresses will be formed. The dotted inside lines 121 and 121A represent the lines of stitching and the dotted outside lines 122 and 122A represent the cutting pattern line. The moving guide track means conveyor belt is connected by a sprocket chain from its drive wheel to the lower drive wheel of the primary conveyor belt 3 which is turning clockwise so that its speed is synchronized with the primary conveyor belts. Since the primary 2, 3 secondary 4, 5 and tertiary 6, 7, 8 conveyor belts FIG. 1 are interconnected and synchronized by a series of sprocket chains 700, 701, 702, 703, 704, 705, 705', 708, 709, 707 from the lower drive wheels of each of these sets of conveyor belts therefore the speed of the guide means track conveyor belt is the same and is synchronized with the speed of these clamplike transporting means in order to facilitate the accurate reproduction of the contoured pattern path or line of the molded or grooved guide track means. Said suitable movable fastening device or cutting device can move back and forth across the path of movement of the fabrics.

It is advantageous to use a variable speed drive for the sewing machine or fastening device so that said sewing machine can be synchronized with the conveyor belt movement in order to control stitch length and for adjustment for the various types of fabrics and in certain instances the sewing machine or fastening device attached to the movable carriage device can pivot or rotate and in other instances it may remain fixed or non rotational. Also in certain instances the movable carriage means can pivot or rotate and in other instances it may remain fixed or non rotational.

Furthermore in certain instances a compressed air edge straightening device may be utilized to flatten and smooth out the edges of the contoured seam, said edge straightening device being employed prior to the fastening and sewing procedure. Following the cutting assembling and sewing of these continuous garment sections, the mated garment sections are transported by the tertiary conveyor belts 6, 7, 8 to one or more die cutting rollers 27 which are employed for the purpose of cutting out the neck portions of the continuous garment sections and other unwanted portions in a continuous manner and in some cases for the purpose of trimming the garment sections in a continuous manner and in other cases to disconnect the assembled and sewn continuous garment sections into separate disconnected garments, as for example, as illustrated in FIG. 6, in sleeveless dresses by cutting the neck portions 123 of the garment sections and also the shoulder portions 124 and the hem portions 127 and 128 of the dresses in a continuous manner. One of the previous disadvantages of a regular die cutting roller is the fact that it cut a groove in the rubber part of the conveyor belt supporting the material to be cut after a certain length of time and in such a manner that the die roller lost its cutting power and also the cost of attaching molded dies to the steel die roller were expensive.

It is an advantageous aspect of this invention to provide a die cutting roller device which does not cut up and destroy the rubber surface of the conveyor belt and an inexpensive device for the attachment of the molded dies to the surface of the die cutting roller. Referring to FIG. 10 and FIG. 11, the die cutting roller consists of a hollow steel roll 480 to which has been attached an inexpensive steel die 483 which is continuous and goes all the way around the circumference of the roller so that a continuous cutting pattern may be produced in the fabrics upon contact with said die cutting roller. According to the process involved in making this die cutting roll device, the die cutting roller with attached continuous steel cutting die which is at least 1/16 to ¼ inch high is allowed to come in contact under pressure with a suitable rubber conveyor belt which is at least as long as the circumference of the die cutting roller. Then the die cutting rollers cuts a 1/16 to ¼ inch deep groove 485 in the thick hard rubber belt 486 with limited and little compression properties of the conveyor belt 484 which corresponds to the continuous pattern of the molded steel cutting dies 483 attached to the roller. The steel die cutting roller with steel cutting dies attached is allowed to come in contact under pressure with a rubber sheet of material which has high compression or compressive properties or can easily be compressed such as soft plain latex rubber or relatively hard sponge rubber of low porosity and then the die cutting roller cuts a pattern in the material which corresponds to the continuous pattern of the molded steel cutting dies 483 attached to the roller. The cut and patterned pieces 481, 482 and 489 of soft compressive rubber are then attached with flat head nylon or steel bolts in the countersunk holes drilled in the rubber and the tops of the holes are ground down so that the flat heads of the bolts are half way down in the holes and said rubber cut and patterned pieces are attached to the surface of the die cutting roller so that they completely surround the cutting die on all sides and are approximately in contact with or very close to the sides of said attached cutting dies.

Thus when the fabrics are conveyed on the patterned grooved conveyor belt under the die cutting roller which is in synchronization with and in correct position in relation to the conveyor belt, the compressible soft rubber 487 next to the die cutting surface is compressed against the surface of the fabrics so as to clamp and hold the fabrics 489 and keep said fabrics from slipping or moving as the die cutting surface 488 is exposed and is forced through the fabrics and into the groove of the rubber conveyor belt below, to cut the fabrics with a shearing type of force on action. Since

the rubber surface on the conveyor belt has little compressive qualities and is difficult to compress, it remains firm to also better grip and clamp the fabrics from the other side and this cutting shearing type force is very effective in cutting these fabrics.

The molded cutting die itself is continuous and completely circular, and slips or passes over the circumference of the roller and has a lip through which it is bolted to the steel (die cutting) roller. By moving the two continuous and circular cutting dies towards the edges of the steel roller or away from its edges it is possible to change the size of the garments to make a size 10 or size 12 or size 14, etc. dress. FIG. **11** shows a cutting pattern of long sleeve interconnected sweaters on a steel cutting die roller and numeral **490** represents the continuous cutting die and **491** represents the rubber conveyor belt.

Some of the objects of a modified version of this invention or apparatus are accomplished in general by the following steps:

Referring to FIG. **12** and FIG. **13** and FIG. **14**, two single plys of fabrics **404** and **403** are fed from synchronized unwind stands **401** and **402** to the synchronized 4th set of clamplike transporting means conveyor belts **405, 406, 407** and to the synchronized 5th set of clamplike transporting means conveyor belts **405'**; **406'**; **407'**; each set of which accurately orients in direction and plane and accurately positions these single fabric plys and then convey them in a horizontal plane to the die cutting rollers **415, 415'** which are each synchronized with each other and with the 4th and 5th conveyor belts by interconnecting sprocket chains. These die cutting rolls **415** and **415'** are so synchronized and positioned that the die cutting roller of the 4th set of conveyor belts is continuously cutting out the specific areas or parts of the continuous unidentical front garment sections while the die cutting roller of the 5th set is cutting out simultaneously specific areas or parts of the continuous unidentical back garment sections which correspond to and will be mated at a later time with the specific areas or parts of the continuous unidentical front garment sections being cut out directly opposite and above them by the 4th set of conveyor belts, so that these specific areas of the continuous garment sections which will be mated at a later time are being cut out by both rollers at exactly the same time and because of this accurate positioning and cutting, there will be no difficulty in mating them. Then these continuous dissimilar front and back garment sections are transported by the 4th and 5th clamplike transporting means conveyor belts to positioning rolls **423,** and **423'** and to the synchronized primary clamplike transporting means, the primary conveyor belts **425** and **426,** while at the same time the continuous cutting waste is being rolled up in the waste receptacle **422** and **422'**. The continuous non identical front garment sections and the continuous non identical back garment sections are then automatically oriented in direction and plane, positioned, and aligned so that they have partially aligned edges and mated and then these continuous unaligned mated garment sections are transported to a separating roll **427** which separates the front unidentical garment section from the back unidentical garment section. The continuous back garment section and the continuous front garment section are transported to edge guide means devices **428** and **429, 457, 238, 239, 239'** and **238'** so that their outer unaligned edges are movably clamped in these edge guide means devices which are supported on tracks, **230, 230', 430** and **433** and are supported by movable carriage devices, **431, 432** and in FIG. **14,** numeral **228, 328, 329, 330** and are guided by guidance means devices **231, 331, 332, 333** and guide track means devices on guide track means conveyor belts **236** and **236', 461** and **463.** Said edge guide means devices movably clamp and guide the unaligned outer side edges of the continuous unidentical front garment sections **404** and back garment sections **403** in FIG. **13** along a predetermined path course, line or pattern in order to align their outer side edges and bring them into a coinciding condition, and the path, course, line or pattern of movement of these edge guide means devices corresponds to the path, course, line or pattern of the marked, ground or molded, groove of the guide track means devices of the guide track means conveyor belts **461** and **463** in FIG. **13** and **236** and **236'** in FIG. **14.** Then the continuous front and back sections with aligned and coinciding outer side edges are transported to the mating rolls, **434** and **435,** which mate these garment sections and they are then transported by the clamplike transporting means, the synchronized secondary conveyor belts **436** and **437,** to the fastening devices or sewing machines **441A** and **441A'** which sew a pattern along the aligned and mated outer side edges of these continuous mated unidentical back and front garment sections to form the side seams of these garments. The outer side seams and the line of stitches of these continuous front and back garment sections correspond to the sewing pattern **37C** and **37D** marked ground or molded into the guide track means devices **37R** shown in FIG. **2A** on the guide track means conveyor belts **37A** and **37B** or in FIG. **3** numerals **222** and **213.** Then the continuous cut and sewn garment sections are conveyed in the same oriented aligned and mated condition by the synchronized tertiary conveyor belts in FIG. **12** numerals **444, 449** and **450** to a die cutting roller **448** which can cut out the unwanted portions of the continuous front and back garment sections such as the neck portions **404A** of these garment sections and also can cut if desired the proposed and predetermined hem lines **404C** and shoulder lines **404B** of these garment sections in FIG. **13** to produce separate cut and sewn garments **454** which can be automatically stacked by devices **453** known to the art or the continuous garment sections **451** may be left uncut and be rolled up on a synchronized windup roll **452** for further garment making processing. In some cases it being understood that most of the devices and especially the clamplike transporting means devices are synchronized with each other by suitable synchronizing means such as sprocket chains and variable speed drive means. Furthermore the guidance means devices may consist of a pantograph guidance means device **458** in FIG. **13** or a straight steel bar or rod guidance means device.

Referring to FIG. **15,** FIG. **16,** FIG. **17,** FIG. **18** and FIG. **19,** drawings (detailed) of edge guide means devices are shown and referring again to FIG. **15,** FIG. **16,** and FIG. **17,** numerals **500, 505, 510** are the steel casings of the edge guide devices and numerals **503, 508** and **513** indicate a ply of fabric which is movably clamped or held in FIG. **15** by the clamping action between the steel plate **501** and the steel casing **500** and in FIG. **16** by the clamping action between the nonpivoting roller caster **506** and the steel casing **510.** Nu-

merals **504, 509, 514** indicate the steel connecting link between the guidance means devices and the edge guide means devices, numerals **502, 507, 512** indicate a screw adjustment device to exert greater or less clamping force on the fabrics. Referring to the cross-sectional plan view of FIG. **18** and the side plan view of FIG. **19** of a modified edge guide means device in which two rotatable rollers **520** and **521** are so situated as to move by clamping the fabric ply **526** between said rollers. Said rollers are attached to shafts **525** and **524** which are mounted on the steel casing **515** and numerals **522** and **523** indicate screw adjustment devices to exact greater or less clamping force on the fabrics and numeral **528** designates a stationary electric motor device means for the roller **520** and numeral **529** indicates a flexible drive shaft from said electric motor so that in certain instances if the rollers have to be driven, this can be accomplished. Also in certain instances it may be possible to mount a small electric motor directly on the edge guide means device so as to give greater flexibility of movement.

The reciprocating sabre knife cannot be used to cut a continuous pattern of continuous long sleeve sweaters because the pattern is too complicated and intricate. Therefore a die cutting roller such as described in FIG. **11** with a continuous die cutting pattern of sweaters molded on it is employed in conjunction with a conveyor belt. The nature of the conveyor belt and surface area of the die cutting roller is similar to that used for the continuous sleeveless dress identical front and back garment sections in FIG. **10.** Said continuous long sleeve sweater garment sections would be fastened or sewn by several different sewing machines, one sewing machine to form the seams on the outer side of the sleeve, a second sewing machine to form the seams on the other side of the same sleeve and a third sewing machine to form seams on the outer side edges of the main part of the sweater in FIG. **11.** The second and third sewing machines have electrical switch means FIG. **20** for turning the electric motor of the sewing machine off and on according to a specific pattern in order not to sew over and fasten the sleeve openings, said pattern is ground on an auxiliary patterning means device **704** which consists of a series of hill-like **790A**, FIG. **21** and valley-like or depressed areas **791A**, FIG. **21** in the thick plastic molded strip **704** FIG. **20** (nylon) ¼ to 1 inch high which follows the contour or lines of the regular groove **706** FIG. **20** in the guide track means on the guide track means conveyor belts **705** for guiding the sewing machine. A switch element which has an extension rod extending from it and rides on this strip of plastic material **704** or auxiliary patterning means stip device and as the extension rod **702** comes in contact with a hill-like area it forces the extension rod downward if the guide track means is above the sewing machine and causes a touch switch **709** on the top of the sewing machine to be actuated and this stops the electric motor on the sewing machine. Then the extension rod rides down a valley like area and when it rides up again on a hill-like area the extension rod again activates the switch and starts the sewing machine motor again and this touch switch is similar to the type used for electric lights and thus by this auxiliary pattern means device, it is possible to cause the sewing machine to sew for a predetermined distance and then stop and start again according to a set pattern. This is especially advantageous to prevent the sewing over of certain areas such as the arm openings in the side of a sleeveless dress and over the openings of the long sleeves in sweaters, FIG. **3** shows such an electric switch means device **275** in which a spring **707** FIG. **20** pushes the extension rod **275A** FIG. **3** against the auxiliary patterning means device **211** at all times to insure accuracy of results. In addition, a latching relay may be actuated by another type of switch and said relay in turn can energize or deenergize the variable speed electric motor of the sewing machine. In an alternate apparatus and process FIG. **22** an electric switch means device can consist of an auxiliary patterning means device such as a strip of electrically conductive polymeric or elastomeric paint **717** which is applied as a relatively thin ribbon of paint **717** next to the groove **718** of the sewing machine guide track means device **720** and an extension rod **723** of the electrical switch means device has a negative and positive contact point **715, 716,** with lead wires **724** connected from these points to a relay **725** and said extension rod with positive and negative contact points is pressed by a spring **722** against the broken and non-continuous patterning means strip device **717.** When the extension rod with said negative and positive points at its end comes in contact with the conductive polymeric ribbon, **717,** it trips the switch and closes the circuit to the relay and the relay energizes the motor and when it rides off the conductive strip, the circuit is broken and the relay is inactivated and the sewing machine motor is thus deenergized. In a further alternate method and apparatus, a photoelectric switch is employed to activate a relay which energizes and de-energizes the electric motor of the sewing machine and also a patterning means device is employed consisting of a painted strip of alternating black **728** and white **729** portions FIG. **23,** with the black areas corresponding to those areas which trip the switch and start the motor and the white areas corresponding to those areas that do not trip the switch and thus stop the electric motor when a beam of light from a light source is directed against the patterning means strip and reflects upward to hit the photoelectric switch.

Referring to FIG. **7,** a series of sets of nip rollers may be utilized to replace the primary and secondary conveyor belts (FIG. **7**), each set of nip rollers consisting of two plain steel or rubber covered steel rollers, e.g. **555-556** and **557-558,** in direct and firm contact with each other so as to form a nip between the rollers and the number and the positioning of the sets of nip rollers can in some cases correspond to and be the same as the number and positioning of the single steel rollers in either the top or bottom set of conveyor belts in the garment making machine. All of the top rolls of the nip roll sets are connected with each other by sprockets **550** and sprocket chains **551,** FIG. **7** so that they will be synchronized and all of the bottom rolls of the nip roll sets are connected with each other **551** so that they will be synchronized. Then the bottom drive wheel of the first nip roll set is connected by sprockets and a sprocket chain to the top drive wheel of the first nip roll set and said bottom drive nip roll is driven by an electric motor and said sprocket chain from the bottom drive nip roll connects and drives a set of reversing gears which is attached to the top nip drive roll shaft and these reversing gears change the clockwise rotation of the sprocket chain to the correct counter clockwise rotation for the top drive nip roll and then all of the

rolls in one series of nip roll sets, both bottom and top rolls are synchronized and move at the same speed with no slippage. One series of nip roll sets replaces one set of conveyor belts and serves the same purpose as the set of conveyor belts which is to act as a clamplike transporting means and to automatically orient in direction and plane the continuous top and bottom fabric plys or continuous front and back garment sections and to automatically position, align and mate the continuous garment sections and the top and bottom fabric plys and also to automatically align the outer side edges of the identical continuous front and back garment sections and automatically mate their aligned and coinciding outer side edges. As in the case of the primary and secondary conveyor belts, the primary series of sets of nip rollers **555, 556** is synchronized with the secondary series of sets of nip rollers **557, 558,** FIG. **7** by sprockets and a sprocket chain or by the use of variable speed drives for each of the primary and secondary series of nip roll sets.

Referring to FIG. **1,** said die cutting roller consists of a molded cast iron or cast steel die **120, 120A** on a roller surface of sufficient circumference so that the neck portions of the garments and the other unwanted portions of the garments are continuously cut out in the correct position in the fabrics in a repetitive manner after each revolution of the die roller which is in close contact with the top of the fabrics. The position of the cut out portions in the fabrics corresponds to the position and location of the steel die on the surface of the die roller having a straight die cutting surface across its width if preferred on another section of said die roller so as to cut in a repetitive manner as for example in the case of sleeveless dresses, the hem **127** and **128** and the top shoulder portions **124** of said garments so as to produce separate sewn garments and in long sleeve sweaters to cut in a repetitive manner the proposed shoulder lines, sweater bottom sweater sleeve bottoms and the neck portions of said long sleeve sweaters so as to produce separate sewn garments. The die cutting roller is connected by a sprocket chain and sprocket to a drive wheel on the lower tertiary conveyor belt and a pair of reversing gears are attached to its shaft so that it may retain its proper counter clockwise rotation or in certain instances a variable speed drive may be employed in order to insure its synchronization in speed with the tertiary conveyor belts as well as all the other conveyor belts which are synchronized with the tertiary conveyor belt. Referring to FIG. **3** in which a modified arrangement and version of the regular guide track means conveyor belt and the regular movable carriage device is shown. For the purpose of illustration a cutting device and a sewing machine device are displayed opposite each other in this drawing, however this arrangement does not exist in the regular garment making machine and returning to this drawing again, the top fabric ply **12** and the bottom fabric ply **11** are in an oriented properly positioned aligned and mated condition as they are transported toward the cutting device or reciprocating sabre knife by the upper conveyor belt **207** and the lower conveyor belt **210** and by the driven nip rolls **200** and **208** and these nip rolls are similar to the nip rolls illustrated in FIG. **1,** FIG. **2,** and FIG. **6** such as numerals **21, 22, 23, 24,** and **25** which are also driver rolls and which are connected by sprocket chains to the conveyor belts so that they are synchronized with the conveyor belts and are driven by the power from said conveyor belts. The sewing machine **216** is supported by the movable carriage device **219** and pivots at **218** and the movable carriage device slides back and forth on wheels on a square track **220** so that the sewing machine does not tilt to either side and is always perpendicular to the surface of the fabrics. The numeral **216A** designates an extension of the movable carriage leading to the pointed guide rod **224** of the guide means device **223** which is directly under the needle of the sewing machine to insure accurate pattern reproduction and extends and projects into the groove **211** of the guide track means conveyor belt (lower) **212** which is an integral part of the conveyor belt, which is supported by rollers **213.** The bottom of the conveyor belt **214** shows another groove to indicate the continuity of the groove in said belt. The numeral **223** represents a variable speed drive motor attached to the sewing machine which delivers power by a belt **224** from one pulley to another above it to run the sewing machine. The reciprocating cloth sabre knife indicated by the numeral **205** has its blade facing directly forward and parallel to the direction or path of the moving fabrics.

What is claimed is:

1. A sewing apparatus comprising first and second cutting stations, a sewing station and means for feeding a pair of superimposed flexible webs through said first cutting station and said sewing station to form a central strip having profiled edges sewn together and border strips adjacent said central strip having free edges congruent to said sewn profiled edges, means transporting said strips from said first cutting station and said sewing station through said second cutting station for cutting the central strip into separate articles, and means for collecting the sewn articles and the unsewn borders.

2. An apparatus as defined in claim **1** wherein said first cutting station comprises a pair of cutting tools and guide means for guiding the tools toward and away from each other to form said edges.

3. An apparatus as defined in claim **2** wherein the guide means comprises a pair of travelling belts, cam means on the surface of the belts having a contour identical to said profiled edges, and means operated by said cam means for moving said cutting tools.

4. An apparatus as defined in claim **3** wherein said sewing station comprises a pair of sewing heads and guide means for guiding the heads toward and away from each other to join the edges of the central strip along lines parallel to said profiled edges.

5. An apparatus as defined in claim **4** wherein the guide means comprises said belts and cam means, and means operated by said cam means for moving said sewing heads.

6. An apparatus as defined in claim **5** wherein the means for feeding the webs comprises a pair of opposed conveyor belts having a width substantially equal to the width of the webs for clamping together and transporting the webs to the first mentioned cutting and sewing stations, opposed conveyor belts for clamping together and transporting the webs between the said first mentioned cutting and sewing stations, opposed conveyor belts for clamping together and transporting the webs between the said first mentioned cutting and sewing stations and the second cutting station opposed conveyor belts for clamping together and transporting the webs to the collecting means, and means for driving said conveyor belts and the belts of the guide means at the same surface speed.

7. A device as defined in claim 5 wherein said sewing heads are operated by electric motors, switch means for controlling said motors, and switch operating means carried by the belts of the guide means for operating said switch means.

8. A sewing apparatus comprising first and second cutting stations;

a sewing station;

means for feeding a pair of superimposed flexible webs through said first cutting station and said sewing station to continuously form a central strip, the central strip being of mated interconnected garment parts having profiled, shaped, aligned coinciding edges sewn together and border strips adjacent said central strip having free edges congruent to said sewn profiled shaped edges;

said first cutting station means for cutting said mated interconnected garment parts in a predetermined position;

means for transporting said strips from said first cutting station and said sewing station, in said predetermined position, through said second cutting station for cutting the central strip of mated interconnected garment parts into separate partially sewn garments; and

means for collecting the partially sewn garments and the unsewn borders.

9. An apparatus as defined in claim 8 wherein said first cutting station comprises:

a pair of cutting tools; and

guide means for guiding the tools toward and away from each other to form said edges.

10. An apparatus as defined in claim 9 wherein the guide means comprises:

a pair of travelling belts;

cam means on the surface of the belts having a contour identical to said profiled shaped edges; and

pantograph means, operably coupled to said cam means, for driving said cutting tools transversely across the path of the moving superimposed mated flexible webs.

11. An apparatus as defined in claim 8 wherein said sewing station comprises:

a pair of sewing heads; and

guide means for guiding the sewing heads toward and away from each other to join the continuous shaped aligned coinciding edges of the central strips of mated interconnected front and back garment parts along lines parallel to said profiled shaped edges.

12. An apparatus as defined in claim 11 wherein the guide means comprises:

a pair of travelling belts;

cam means on the surface of the belts having a contour identical to a pattern of stitches in the garment parts; and

pantograph means operably coupled to said cam means, for moving said sewing heads transversely across the path of the moving strips of continuous mated interconnected front and back garment parts.

13. An apparatus as defined in claim 8 wherein the means for feeding the webs comprises:

a first pair of opposed conveyor belts having a width substantially equal to the width of the webs for clamping together and transporting the webs to the first mentioned cutting and sewing stations;

a second pair of opposed conveyor belts for clamping together and transporting the webs of mated interconnected garment parts between said first mentioned cutting and sewing stations in a predetermined position;

a third pair of opposed conveyor belts for clamping together and transporting the webs between the first mentioned cutting and sewing stations and the second cutting station;

a fourth pair of opposed conveyor belts for clamping together and transporting the webs to the collecting means; and

drive means for synchronously driving all said conveyor belts, clamping belts, and guide means belts at the same surface speed.

14. A device as defined in claim 11 wherein:

said sewing heads are operated by electric motors;

switch means for controlling the operation of said motors; and

switch operating means mounted on the belts of the guide means to operate said switch means.

15. The garment working process which comprises the steps of: feeding a first pair of flexible superimposed webs to a primary pair of fixed, opposed clamplike contacting conveyor belt means; operating — said primary pair of conveyor belts to move the mated webs forward to, through and past a first cutting device in a continuous manner; operating and guiding said cutting means along a predetermined-path-to-cut out simultaneously central strips of continuous, non-linear, interconnected, front and back garment section parts which are oriented in direction and plane, properly positioned, aligned and mated with corresponding continuous, shaped, divergent, outer, side edges in an aligned coinciding state; moving said central strips of mated, shaped, interconnected, garment sections forward by means of a secondary pair of opposed, clamplike, contacting, driven, conveyor belt means to, through and past a guided sewing device in a continuous manner; guiding said means for joining and sewing along a predetermined path; joining and sewing, in a predetermined, discontinuous, intermittent pattern, the aligned edges to form seams and partially sewn garments; conveying said partially sewn garments to a second cutter device and cutting out a portion of each of said front and back section parts to form the neck portions of the garments; cutting transversely across the front and back garment section parts at spaced locations to form the hem and the shoulder lines and thereby separate a partially sewn garment from the strips of interconnected partially sewn garments; conveying the separate garments into a receptacle; and winding the unwanted outer side edges of the fabrics on a roll.

16. The garment working process of claim 15 including the steps of cutting out said central strips of continuous, interconnected, mated, front and back garment parts in a predetermined position; and moving said strips of mated, interconnected, garment parts forward in said predetermined position, by means of the secondary pair of clamplike, contacting, driven, conveyor belt means, to the sewing station to accurately join and sew the aligned coinciding edges and form seams.

17. The garment working process provided in claim 15 including the steps of cutting out said central strips of continuous, interconnected, garment parts in a predetermined position and accurately positioning said strips of mated interconnected garment parts on the

secondary pair of clamplike conveyor belts; and moving the interconnected garment parts to the guided sewing machine device to accurately sew the outer side edges of said mated interconnected garment parts to form seams.

18. The garment working process provided in claim **15** which comprises the steps of positioning the guided sewing device so that it precedes the guided cutting device to first sew a pattern of stitches in the two flexible, superimposed webs; conveying said sewn webs to the cutting device; and cutting out the strips of mated, shaped, interconnected, garment parts with sewn seams and sewn edges.

19. The process of claim **15** wherein; the first step of cutting comprises, cutting out said central strips of mated, interconnected, garment parts to form integrally cut sleeve portions extending downwardly, in a substantially vertical direction with a portion of said sleeves substantially parallel to the main portion of said interconnected garment parts; and said strips of mated, interconnected, garment parts have continuous, aligned, coinciding, shaped edges.

20. The process of claim **15** which comprises; arranging the uncut webs with printed surfaces of the fabrics facing inwardly whereby the printed surfaces will face outwardly in the finished partially sewn garments after said garments have been everted.

21. The process of claim **15** which comprises: positioning an inner pair of continuous lining fabric webs between said first pair of continuous fabric webs to form four plys of fabric webs; and cutting and sewing the four webs to form partially sewn garments which have a lining fabric.

22. The sewing apparatus of claim **9** further comprising; a die roll cutting device at each of said first and second cutting stations; each of said die roll cutter devices having a die roll cutter and an associated contacting conveyor belt; and coupling means for synchronizing said die roll cutters, in surface speed, with said associated conveyor belt and the other conveyor belts of said apparatus.

23. The sewing apparatus of claim **8** further comprising; a guided reciprocating sabre knife at said first cutting station.

24. The sewing apparatus of claim **10** wherein; the means operated by said cam means is a pantograph device.

25. The sewing apparatus provided in claim **12** wherein: the means operated by said cam means is a pantograph device.

26. The garment working process which comprises the steps of automatically and separately cutting a continuous, separate, strip of interconnected back garment parts at a first cutting station; automatically and separately cutting a continuous separate strip of interconnected front garment parts at a second cutting station; arranging the cutting stations one above the other to form a unitary cutting station; said front and back garment parts being of different dimensions and having unaligned outer edges; automatically positioning said continuous strips of unlike, interconnected, front and back garment parts for movement in a continuous manner along separate paths; arranging said interconnected, garment parts on their respective, separate, conveyor belts in a predetermined position; mating the edges of said strips of front and back garment parts by bringing them into partial alignment; separating said strips of front and back garment parts; guiding the edges of the separated strips of garment parts into alignment and mating said edges; guiding said means for joining and sewing along a predetermined path; joining and sewing the aligned mated edges of the front and back garment parts to form seams at a sewing station; in a predetermined discontinuous intermittent pattern; cutting the strip of mated interconnected garments into separate, partially sewn another at other cutting station; and collecting said partially sewn garments.

27. The sewing apparatus of claim **8** which comprises in combination in one machine, cutting means at said first cutting station including two die roll cutter device means which are exactly positioned one over the other and synchronized in surface speed with each other by coupling means of sprocket gears and sprocket chains, a pair of mating roll means, a primary pair of opposed conveyor belt means, garment part separator roll means, edge guide device means for guiding and aligning the dissimilar outer side edges of the front and back garment parts, a secondary pair of opposed conveyor belt means for mating and conveying said strips of shaped, interconnected, garment parts, guided means for joining and sewing at a sewing station, a tertiary pair of opposed conveyor belts for conveying the strips of mated, sewn, interconnected, garment parts to cutter means at said second cutter station which include a die roll cutter device means which cuts the strip of mated interconnected garments into separate partially sewn garments.

28. The sewing apparatus provided in claim **27** in which edge guide device means for guiding and aligning the dissimilar, outer, side edges of the front and back garment parts in order to form aligned and coinciding edges are guided by a cam means on a travelling belt and also provided are means operable by said cam means to guide said edge guide device means.

29. The sewing apparatus of claim **8** in which said means for feeding comprises pairs of clamplike, contacting, driven, roll means preceding and leading to said first cutting station and preceding and leading to said sewing station and coupling means for synchroniaing the surface speed of said pairs of contacting, opposed rollers comprises sprocket gears and sprocket chains.

30. The sewing apparatus of claim **8** in which a die roll cutter device is employed at said first cutter station and second cutter station and said die roll cutter device comprises a die roller and a conveyor belt on which are patterned pieces of hard, slightly compressible, rubber material which form patterned grooves between their outer side edges and said die roll cutter has attached to its surface patterned pieces of highly compressible, rubber material which surround and are closely adjacent to the cutting die blade on said die cutting roller and means for synchronizing the surface speed of said die cutting roller with its associated, conveyor belt comprise a pair of sprocket gears and a sprocket chain and said cutting die blade formed in a pattern projects into, engages and coincides with said patterned grooves on said conveyor belt.

31. The garment working process provided in claim **15** in which the cutting pattern of said first cutting means and the sewing pattern of said sewing means are substantially synchronized or made substantially alike

by synchronizing the cutting and sewing cam means of the common cam travelling belt.

32. The sewing apparatus of claim **7** wherein the switch operating means comprises a patterned strip of alternating, switch, actuating and switch, deactuating areas which works in cooperative relationship with an electric switch device for energizing and denergizing the drive motor of the sewing machine so it joins and sews in a predetermined intermittent discontinuous pattern, further comprising a patterned strip of electrically conductive, actuating, non-toxic, painted areas and non-conductive, deactuating, non-painted areas located adjacent said cam means on the common cam travelling belt which selectively actuate and deactuate a switch device means, comprising a springed extension rod having at one end positive and negative contact points which are in contact with said patterned strip.

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