

April 4, 1950

K. S. EWER
APPARATUS FOR LAMINATING STRANDS
TO FORM A CIRCULAR FABRIC

2,502,514

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6 Sheets-Sheet 1

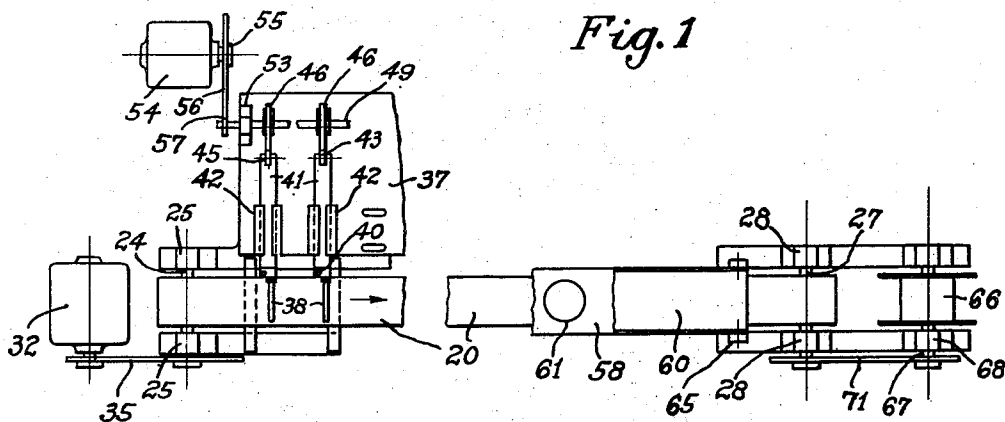


Fig. 1

Fig. 2

Fig. 3

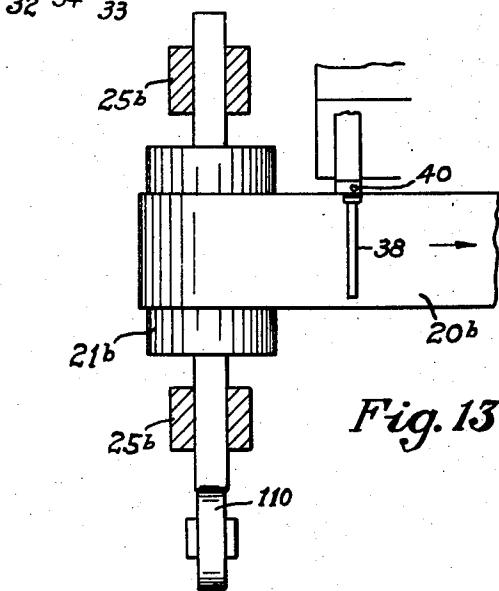
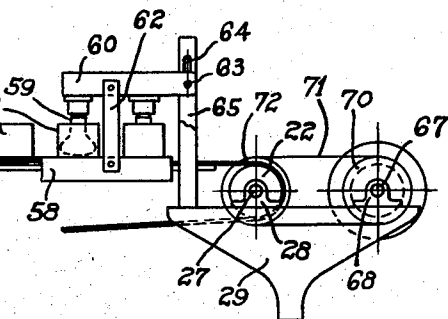
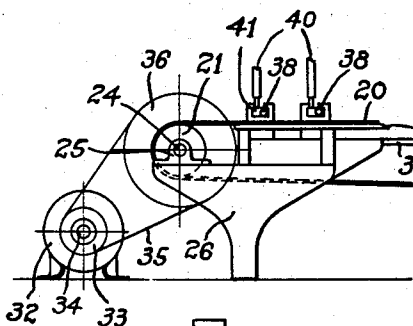


Fig. 13

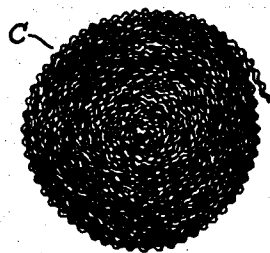


Fig. 17

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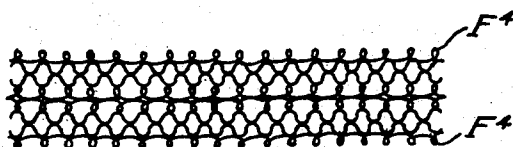
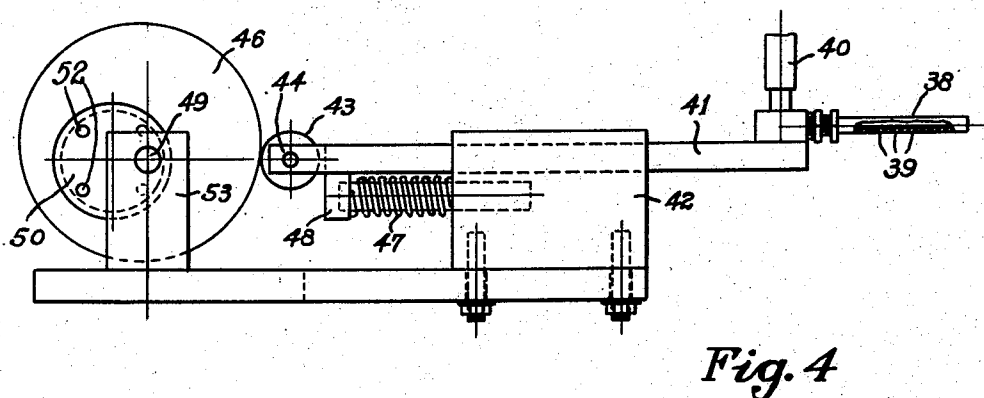
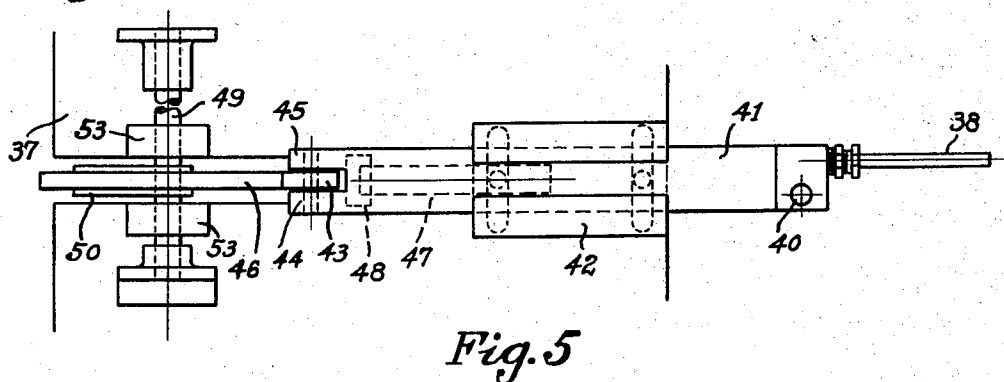
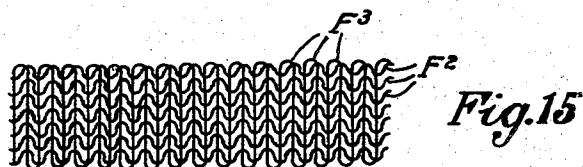
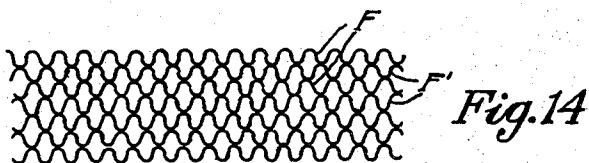
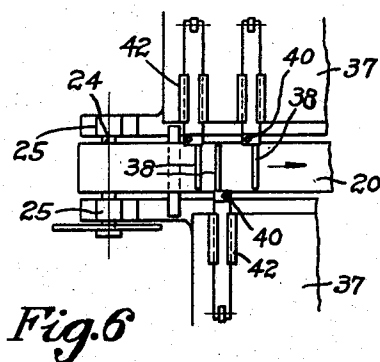
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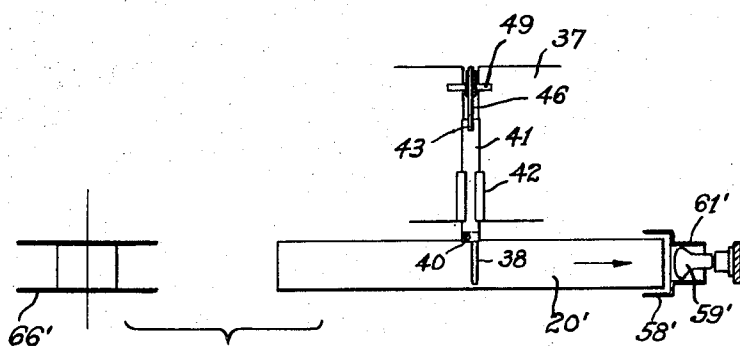


Fig. 8

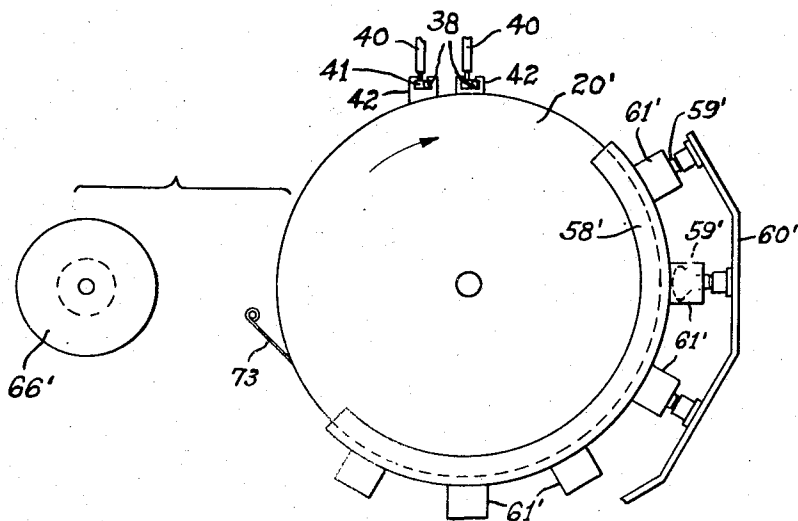


Fig. 7

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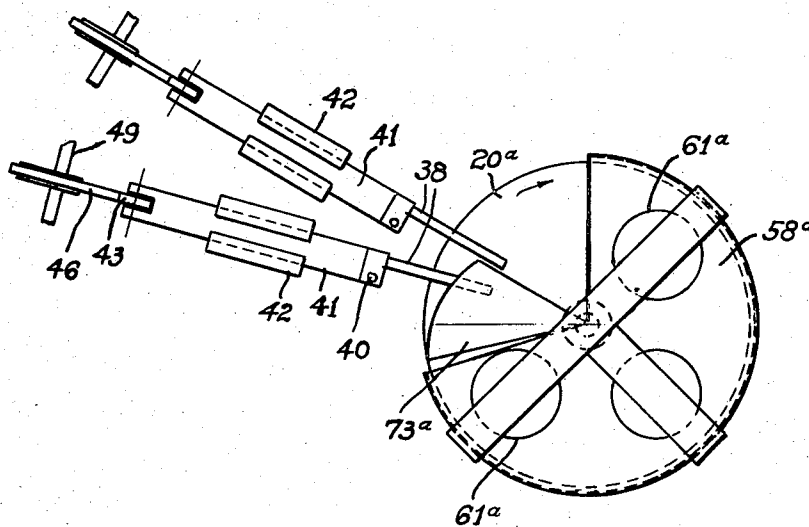


Fig. 10

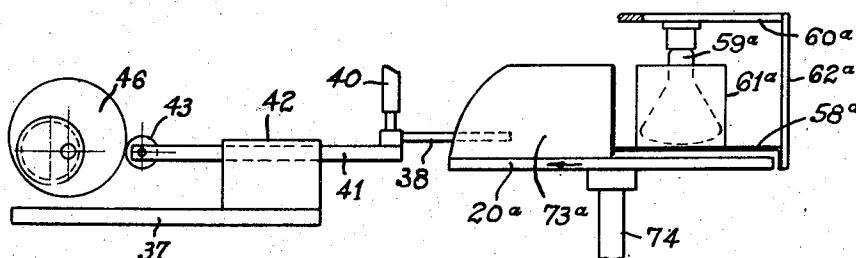


Fig. 9

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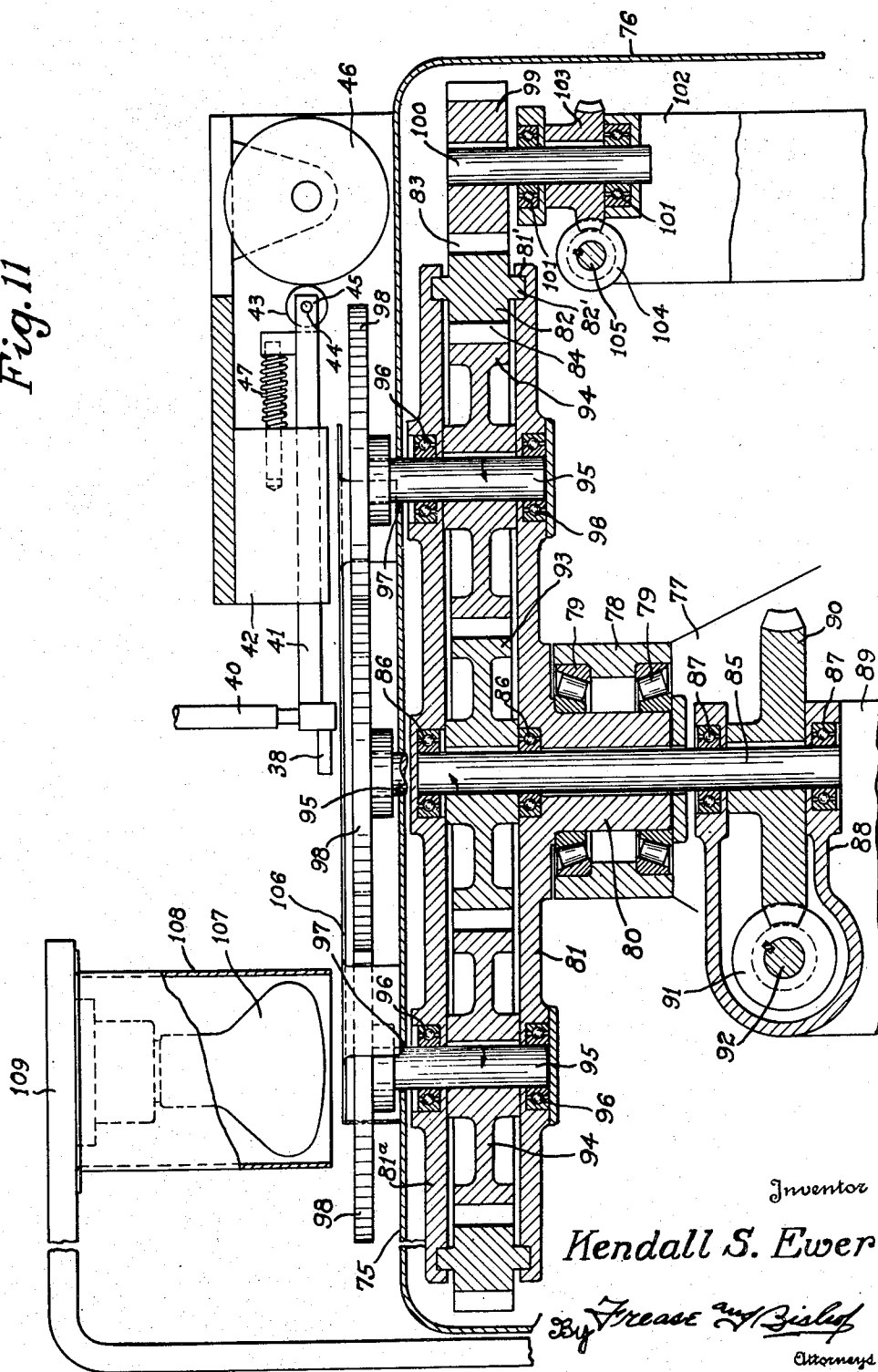
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Fig. 11



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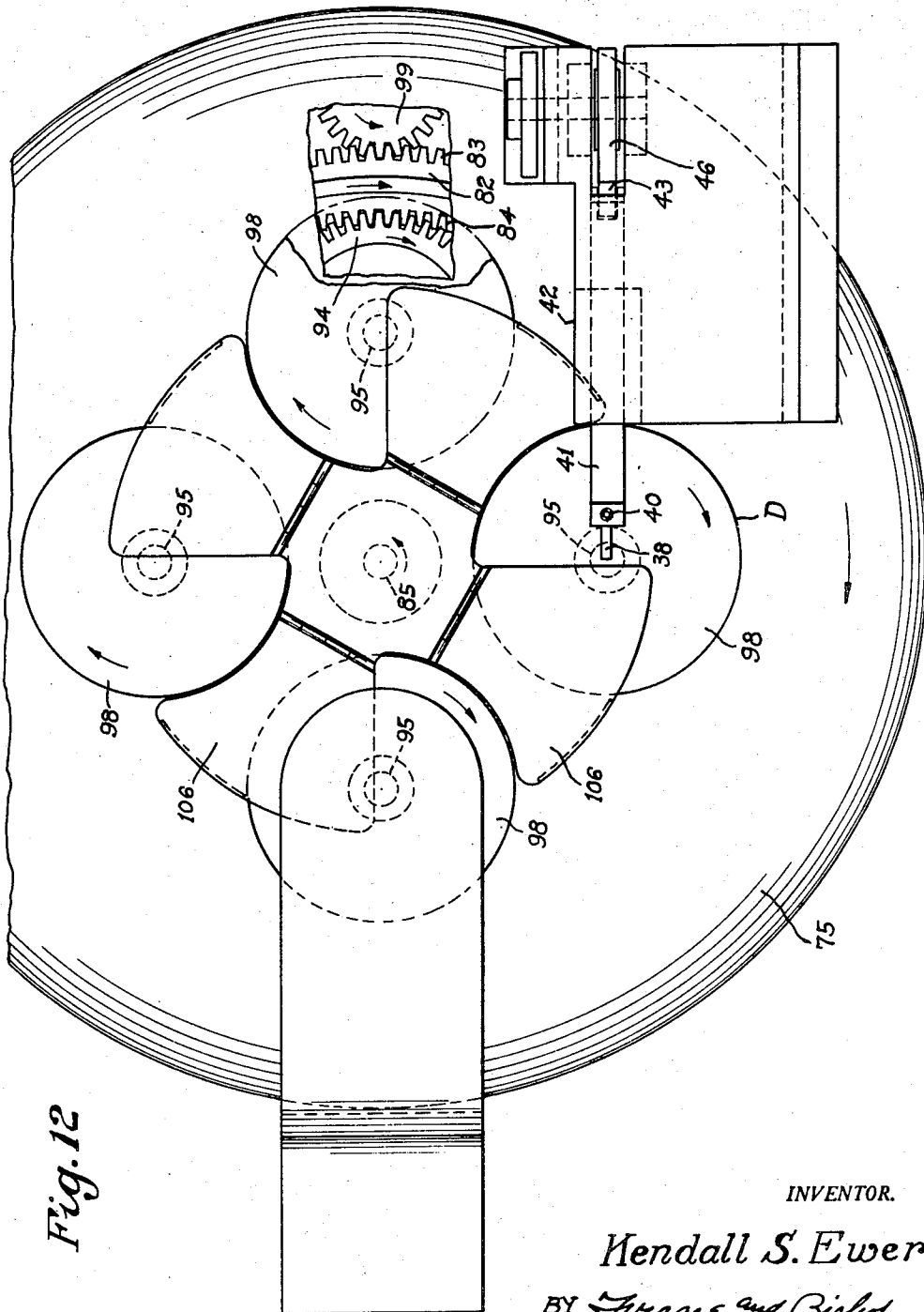


Fig. 12

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UNITED STATES PATENT OFFICE

2,502,514

APPARATUS FOR LAMINATING STRANDS TO
FORM A CIRCULAR FABRIC

Kendall S. Ewer, Cape May, N. J.

Application October 2, 1945, Serial No. 619,879

8 Claims. (Cl. 154—1.76)

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The invention relates to the manufacture of woven fabric and more particularly to the combined spinning and weaving of fabric from any material which is capable of being reduced to a liquid or semi-liquid state and extruded in filaments which may be dried by evaporation, air, heat, cold or other drying agent.

Unlike the conventional methods now in use for weaving fabric wherein the filaments are formed, twisted and drawn into threads and then fed upon looms or the like for weaving, the present invention contemplates performing all of these functions continuously and in a single operation.

The material employed to form the filaments from which the fabric is woven may be any of the so-called plastics such as are now commonly used for weaving fabrics such as hosiery and the like or glass, wood pulp or other fibers capable of being reduced to a state in which it may be extruded in filaments.

The fabrics which may be woven by the method and apparatus forming the invention are too numerous and diversified in character to be classified in such categories as tulle, gauze, crepe, muslins and the like but embrace also such fabrics as webbing, sheeting, lace, cloth mesh, horsehair braid, burlap, carpeting, canvas, rickrack, mats and doilies and in fact all styles and patterns of weaving as now known, together with many new styles and patterns which may be obtained through the manipulation of adjustments as hereinafter described.

The material in plastic condition is extruded through orifices in nozzles or tubes producing filaments which are deposited upon a traveling belt, drum, turntable, disc or other support movable relative to the orificed nozzles or tubes and preferably at a speed less than the speed at which the filaments are extruded from the orifices, the nozzles or tubes being either stationary or movable in variable strokes to produce a great variety of patterns and styles in the woven material.

As an alternative the nozzles or tubes from which the filaments are extruded may be stationary and the belt or other support may be reciprocated transversely in order to produce a zig zag pattern of each filament upon the support.

The woven plastic fabric travels upon the belt or other conveying means a sufficient distance to permit evaporation, air drying, cooling or other setting up of the plastic material to take place after which it is removed from the conveyor, either by a reel or otherwise as desired, in the form of the finished product.

It is, therefore an object of the present invention to provide a novel method and apparatus for extruding plastic filaments upon a carrier, the relative movement of the carrier and extruding means being such as to produce the desired pat-

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tern or style of fabric as the extruded filaments are deposited upon the carrier or conveyor.

Another object of the invention is the provision of means for reciprocating the extruding means transversely of the path of the conveyor or carrier so as to deposit the extruded filaments upon the conveyor in what might be described as zig zag lines.

It is a further object to provide means for reciprocating the conveyor transversely of the path of its movement, while the extruding means remains stationary, whereby the extruded filaments may be deposited in zig zag lines upon the conveyor.

Still another object is the provision of means for varying the reciprocating strokes of the extruding means so as to produce various patterns in the finished fabric.

A further object is the provision of means by which a portion of the extruding means may remain stationary while the carrier is moved relative thereto at a speed less than the speed at which the filaments are extruded from the orifices of the extruding means whereby each filament will form a continuous series of loops or eyes upon the conveyor.

A still further object is to provide means for extruding a plastic material by use of air, hydraulic or other pressure through orifices of variable diameter located at variable distances in line, in nozzles, tubes or other hollow devices through which the semi-liquid or plastic material flows under pressure.

It is another object of the invention to provide a variable arrangement whereby these lines of orifices may be so spaced that the extruded plastic filaments may fall or be dropped upon a conveyor or movable support at pre-determined places to form any desired pattern, or style of weaving.

It is also an object of the invention to provide for regulating the speed or "take away" or travel of the conveyor belt, drum, disc, turntable or other movable support for conveying the formed fabric away from the point of extrusion.

A further object is to provide means for regulating the intensity of the heat, air or cold blown, focused, or otherwise directed or made available around, or directly upon or adjacent to the woven plastic fabric while it travels away from the extruding means.

A still further object is to provide means for regulating the speed of the belt, drum, disc or other conveyor or movable support upon which the plastic fabric is deposited and to operate the same either continuously or intermittently.

Another object is to provide novel means for winding or reeling the completed fabric as it is removed from the moving support or conveyor.

Still another object is to provide means for

forming circular or disc-shaped woven fabric articles.

The above objects together with others which will be apparent from the drawings and following description, or which may be later referred to, may be attained by carrying out the improved method with apparatus such as illustrated in the accompanying drawings, in which;

Figure 1 is a diagrammatic top plan view of liquid weaving machine constructed in accordance with the invention, showing an endless belt for receiving and supporting the woven material;

Fig. 2 a side elevation of the forward or weaving end of the machine shown in Fig. 1;

Fig. 3 a side elevation of the discharge or delivery end of the machine;

Fig. 4 an enlarged, detail elevation of the cam means for reciprocating the nozzles;

Fig. 5 a top plan view of the reciprocating means shown in Fig. 4;

Fig. 6 a fragmentary top plan view showing one of the many arrangements and combinations of nozzles which may be provided for producing a great variety of effects in the woven products, which may be obtained by the improved process and apparatus;

Fig. 7 a diagrammatic side elevation of a form of the apparatus in which a revolving drum or wheel is employed to receive and support the woven material;

Fig. 8 a top plan view of the apparatus shown in Fig. 7;

Fig. 9 a side elevation, partly in section, of another form of the apparatus in which the woven material is deposited and supported upon a rotatable table;

Fig. 10 a top plan sectional view of the form of apparatus shown in Fig. 9;

Fig. 11 a vertical, sectional view of another form of the apparatus in which circular woven articles may be formed upon rotating discs mounted upon a turntable;

Fig. 12 a top plan view of the apparatus shown in Fig. 11, parts being broken away for the purpose of illustration;

Fig. 13 a diagrammatic, plan view of the forward or weaving end of a form of the machine in which the belt or conveyor is reciprocated transversely;

Figs. 14, 15 and 16 are fragmentary portions of ribbons or strips of various designs which may be woven by varying the strokes of the nozzles, and;

Fig. 17 a plan view of a circular mat or similar article which may be woven upon the form of apparatus shown in Figs. 11 and 12.

Referring first to Figs. 1 to 6 inclusive, one form of apparatus for carrying out the invention is disclosed in which the plastic filaments are deposited in a pattern upon a moving support or conveyor in the form of a traveling belt indicated generally at 20 located over the drive pulley 21 and idler pulley 22 at opposite ends of the table or platform 23 over which the upper course of the belt is arranged to travel in the direction of the arrows shown on Figs. 1 and 6.

The drive pulley 21 is fixed upon a drive shaft 24 journaled in bearings 25 mounted upon the uprights 26 by means of which the drive pulley 21 may be located at any desired distance above the floor to accommodate the belt 20 traveling over the table 23 at the desired height.

The idler pulley 22 at the other end of the belt is mounted upon a shaft 27 journaled in bearings 28 mounted upon the uprights 29 mounted

upon the floor and locating the idler pulley 22 at the discharge end of the table 23, which table may be inclined toward the discharge or delivery end of the apparatus.

The table 23 may be supported at opposite ends by the uprights 26 and 29 having suitable means at their upper ends for supporting the end portions of the table.

A reversing, variable speed motor 32, or similar prime mover, may be provided for driving the belt 20 and may be operatively connected to the drive shaft 24 in any usual and well known manner. For the purpose of illustration in the drawings, this driving means is shown as comprising a drive pulley 33 upon the shaft 34 of the motor, said pulley being operatively connected as by the belt 35, to a pulley 36 fixed upon the drive shaft 24 of the belt.

The desired reduced speed between the motor 32 and the belt 20 may be attained through the relative sizes of the pulleys 33 and 36. Further the speed of the belt may be regulated to accommodate varying conditions by varying the speed of the variable speed motor 32.

The extruding means for forming the plastic filaments and depositing them in desired patterns upon the conveyor belt, may be mounted upon a shelf or support 37 located at one side of the belt 20 and comprises one or more nozzles, tubes or hollow bodies 38 each of which is provided in its under side with one or any desired plurality of orifices 39 which may be of variable size, number and spacings, as may be required in the pattern to be produced.

Each nozzle 38 is connected to a flexible tube or pipe 40 leading from a source of supply of fluid or semi-fluid material such as so-called plastic material, molten glass, wood pulp or other fibres in water suspension, or any other material capable of being reduced to liquid or plastic state and extruded in filaments to produce a fabric pattern and then dried for use. This liquid or plastic material may be fed from the source of supply through the tube 40 and extruded through the orifices of the nozzles by the use of air, hydraulic or other pressure.

For the purpose of producing various patterns at least some of the nozzles or tubes 38 are preferably reciprocated transversely of the path of the belt 20. For this purpose the nozzle or nozzles which are to be reciprocated may be mounted upon blocks or slides 41 which are slidably mounted within the guides 42 mounted upon the shelf or support 37.

Any suitable means may be provided for reciprocating the nozzle 38, a preferred mechanism being shown in detail in Figs. 4 and 5. For this purpose a roller cam follower 43 is journaled as at 44 in the bifurcated end 45 of the slide 41.

The roller cam follower 43 may be held in contact with the periphery of the cam wheel or ring 46 as by means of the coil spring 47 located between the guide member 42 and the lug 48 upon the slide 41.

The cam ring or wheel 46 is adapted to be adjusted upon the cam shaft 49 by means of the eccentric cam 50 which is fixed upon the cam shaft 49 and around which the cam ring 46 may be adjusted and fixed in adjusted position as by the screws 52.

The cam shaft is journaled in suitable bearings 53 mounted upon the support or shelf 37 and is adapted to be driven through any usual and well known drive connection from a variable speed motor 54 which is shown as provided with a pulley

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55 connected by a belt 56 with a pulley 57 upon the cam shaft.

Any combinations, number or arrangement of orificed nozzles or tubes may be provided with various adjustments for the strokes of different nozzles or if desired certain of the nozzles may be held stationary to produce certain patterns or designs. The nozzles may all be located on one side of the belt as shown in Fig. 1, or upon both sides of the belt as shown in Fig. 6.

By operating the belt at a speed less than the speed at which the filaments or plastic material are extruded from the orifices and by reciprocating the nozzle, each orifice will deposit substantially zig zag filaments upon the belt such as indicated at F in Figs. 14, 15 and 16. These zig zag filaments may be varied in design by varying the stroke of the nozzle. By providing two oppositely reciprocating nozzles one forming the filaments F and the other forming oppositely disposed zig zag filaments F', a design such as shown in Fig. 14 may be produced.

In Fig. 15 another illustration of one of the many designs which may be produced by forming the zig zag filaments F² with one nozzle having a plurality of openings and forming across the same another substantially zig zag filament F³ by means of one nozzle having a single orifice and operating at a much longer stroke.

By holding one nozzle in stationary position and extruding filaments from the orifices thereof at a greater speed than the speed of the belt 20, a filament such as indicated at F⁴ in Fig. 16 is extruded from each orifice and comprises a continuous series of loops or eyes.

By mixing different color ingredients or pigments with the plastic material before extrusion or forming of the filaments, a great variety of color schemes and combinations may be obtained in the finished fabrics.

As the extruded filaments are deposited upon the traveling belt in the desired fabric design, they are carried away from the extrusion mechanism and toward the right as viewed in Figs. 1, 2, and 3 and the fabric may either be dried by atmospheric air where this is sufficient with the material being used, or may be carried through a drying tunnel surrounding the belt and indicated generally at 58, within which hot or cold air may be blown, focused, or otherwise directed or made present around, or directly upon, or adjacent to the plastic fabric for properly drying or setting up the fabric, any suitable means being provided for regulating the intensity of the air pressure or temperature.

For the purpose of illustration the tunnel 52 is shown as heated by a plurality of heat lamps 59 suspended from the support 60 and located within the cylindrical guards 61 communicating with the tunnel 58.

The tunnel is also suspended from the support 60 as by the members 62 and the entire support, tunnel and heat means may be adjusted vertically relative to the belt as by means of the rod 63 carried by the support 60 and mounted within the slots 64 upon the upright extensions 65 on the uprights 29 at the delivery end of the belt.

The finished fabric may be removed from the belt at the delivery end thereof either by hand or by means of a reel indicated generally at 66, the shaft 67 thereof being journaled in bearings 68 mounted upon the standards 29.

This reel may be driven by any suitable means and for the purpose of illustration, it is shown as driven from the belt 20 by means of a pulley 70

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located upon the shaft 67 and connected as by the belt 71 with a pulley 72 upon the idler pulley shaft 27.

In Figs. 7 and 8 is shown a form of the invention in which the moving support or conveyor upon which the extruded filaments are deposited is in the form of a drum, cylinder or wheel 20' arranged to be rotated in the direction of the arrows shown on said figures. The nozzles 38 and their associated parts may all be identically the same as shown in Figs. 1 to 6 inclusive and the same reference numerals are applied thereto in Figs. 7 and 8 as previously referred to with reference to Figs. 1 to 6.

The operation of the nozzles may be the same in this form of the invention as above described and as the plastic filaments are deposited upon the peripheries of the drum or cylinder 20', in the desired fabric design or pattern, the fabric being continuously carried away from the extrusion point by rotation of the drum 20'.

The drying or setting up tunnel 58' is of arcuate shape so as to fit around a portion of the periphery of the drum or cylinder but is otherwise the same as the tunnel shown and described upon the form of the invention illustrated in Figs. 1 to 6 and is shown as provided with the heat lamps 59' located within the guards 61', the lamps and tunnels being suspended from the support 60'.

After the fabric has been dried or set up and passes out of the tunnel 58', it may be removed from the surface of the drum or cylinder as by a scraper 73 and the finished fabric may then be reeled upon the reel indicated generally at 66'. The drum or cylinder 20' and the reel 66' may be rotated by any usual and well known mechanism, not shown, the drum being preferably rotated at a speed slower than the speed at which the filaments are extruded from the nozzles 38.

Another modification of the invention is shown in Figs. 9 and 10 in which the moving conveyor or support upon which the extruded filament fabric is deposited, is in the form of a rotatable table 20a mounted upon the shaft 74 which may be rotated by any usual and well known drive means to rotate the table 20a in the direction of the arrows shown on Figs. 9 and 10.

The nozzles 38 and their associated parts may be of the same construction as previously illustrated and described and the same reference numerals are used thereon. The drying or setting up tunnel 58a is located over a portion of the top of the table 20a, starting and terminating at points spaced from the extruding nozzles 38 and may be provided with the guards 61a within which may be located heat lamps 59a, cooling device, fans or the like, suspended from the support 60a from which the tunnel may also be suspended as by the members 62a.

A scraper 73a is adapted to contact the upper surface of the rotatable table at a point adjacent to the exit end of the tunnel 58a for removing the finished fabric from the table after setting up, where it may be reeled upon any suitable reel if desired.

Another modification of the invention is shown in Figs. 11 and 12 in which a plurality of rotatable discs are independently rotatably mounted upon a turntable for forming circular articles such as generally indicated at C in Fig. 17.

In this form of the invention the turntable 75 may be provided with a depending peripheral flange 76 forming a housing for the gearing by means of which the turntable and discs are ro-

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tated in the directions and at the speeds as will be hereinafter described.

Within the housing thus formed is located a stationary support, indicated generally at 77, upon which is fixed a bearing member 78 within which may be located any suitable anti-friction bearing device such as the roller bearings 79 within which is journaled the hub 80 of the lower disc plate 81.

This disc plate is rotatable relative to the ring gear 82 by means of the annular groove 81' in the disc plate and the annular rib 82' in the ring gear. The ring gear 82 is provided around its periphery with the external gear teeth 83 and around its inner perimeter with the internal gear teeth 84, an upper disc plate 81a being rotatable relative to the ring gear 82.

A central, vertical shaft 85 is journaled in ball bearings 86 in the upper and lower disc plates, and in ball bearings 87 in the worm gear housing 88, which is mounted upon any suitable stationary support within the gear housing 76 as indicated at 89.

A worm wheel 90 is keyed upon the lower end portion of the vertical shaft 85 and meshes with the worm screw 91 fixed upon the shaft 92 adapted to be operatively connected to a variable speed motor (not shown).

A pinion 93 is keyed upon the upper portion of the vertical shaft 85, between the upper and lower disc plates, and meshes with four similar pinions 94, each of which is keyed upon a shaft 95 journaled in ball bearings 96 carried by the lower and upper disc plates 81 and 81a respectively.

Each of the shafts 95 extends upward through a suitable aperture 97 in the turntable 75 and has a disc 98 fixed upon its upper end above said turntable. A pinion 99 is keyed upon a vertical shaft 100 journaled in anti-friction bearings 101, carried by any suitable stationary support 102, within the gear housing 76.

A worm gear 103 is keyed upon the lower portion of the shaft 100 and meshes with a worm screw 104 fixed upon a shaft 105 which may be operatively connected to a variable speed motor (not shown).

The extruding means for forming the plastic filaments may be of the same general construction and arrangement as hereinbefore illustrated and described and the same reference numerals are applied thereto as previously used in other figures of the drawings.

Any suitable guard or tunnel arrangement may be provided over the discs 98, as indicated generally at 106, and any heating or cooling means or fan or the like may be provided at one point, as indicated by the heat lamp 107 located within the guard 108 mounted upon the support 109.

In the operation of this form of the invention, the shaft 85 is rotated through the worm gearing by means of the variable speed motor (not shown) connected to the worm shaft 92 so as to rotate the shaft 85 at the desired speed and in the direction of the arrow shown in Fig. 11 or counterclockwise as viewed in Fig. 12. Through the pinions 93 and 94 all of the discs 98 will be rotated in a clockwise direction as viewed in Fig. 12, as indicated by the arrows upon said discs.

Assuming that the ring gear 82 were to be held stationary this clockwise direction of the pinions 94 would cause the disc plates 81 and 81a and the turntable or gear housing 75 to rotate in a counterclockwise direction.

However in order to accomplish the purpose of

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the invention the pinion 99, driven in a counterclockwise direction through the worm gears 103 and 104 and variable speed motor (not shown) which is operatively connected to the worm shaft 105, drives the ring gear in a clockwise direction as viewed in Fig. 12 and at a sufficient speed to slowly rotate the turntable 75 in a clockwise direction as viewed in said figure.

The speed of the movement of the ring gear in this direction is preferably such as to cause the center of each disc shaft 95 to travel about one-half inch in a clockwise direction for each rotation of the disc 98 fixed upon said shaft.

In operating the device as each disc 98 reaches the position indicated at D in Fig. 12 with the center of the disc substantially at the end of the nozzle 38, the extrusion means will be operated to cause a plurality of filaments to be extruded from the nozzle upon the disc, these filaments being of zig zag form due to the reciprocation of the nozzle as above described. As the disc at this point is rotating in a clockwise direction and at the same time moving in a clockwise direction away from the nozzle, the zig zag filaments will be deposited in spiral form upon the disc from the center toward the periphery thereof forming the article indicated at C in Fig. 17.

In the form of the invention illustrated in Fig. 13, the nozzle 38 may be stationary and the endless belt 20b is driven in the direction of the arrow by means of the drive pulley 21b. In order to get the zig zag formation of the filaments extruded from the nozzle 38, upon the belt 20b, the belt may be reciprocated transversely of its path of movement and this may be accomplished by reciprocating the drive pulley 21b through its bearings 25b by means of an eccentric 110.

This form of apparatus is especially adapted for use in connection with materials which may require stretch spinning of the filaments to give them strength. For this purpose the nozzle 38 may be located at any desired height above the conveyor belt 20b, so that the stretch spinning of the extruded filaments may be accomplished between the time that they are extruded from the nozzle and the time that they are deposited upon the conveyor.

From the above, it will be obvious that fabric articles of a great diversity of pattern, design, color combinations and shapes may be formed continuously from the extruded filaments of various materials capable of being reduced to a plastic state and extruded through the orifices of the nozzles, the fabric material or articles being continuously formed, set up and removed from the moving support or conveyor.

The adjustable features of the various parts of the mechanism provide for the filaments to be laid on the conveyor in a great variety of patterns or designs and if desired, subsequent filaments may be laid over or beside the first pattern in any desired thickness, pattern, number or color until the desired form, shape, pattern, design or end product is obtained.

I claim:

1. Apparatus for forming a circular fabric article of a viscous material comprising a turntable, means for rotating the turntable, a plurality of rotatable discs journaled upon the turntable, a nozzle having orifices therein and located above the turntable, means for rotating each disc as it reaches a point beneath the nozzle, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and

means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating disc.

2. Apparatus for forming a circular fabric article of a viscous material comprising a turntable, means for rotating the turntable, a plurality of rotatable discs journaled upon the turntable, a nozzle having orifices therein and located above the turntable, means for rotating each disc in the same direction as the turntable as it reaches a point beneath the nozzle, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating disc.

3. Apparatus for forming a circular fabric article of a viscous material comprising a turntable, means for rotating the turntable, a plurality of rotatable discs journaled upon the turntable, a nozzle having orifices therein and located above the turntable, means for rotating each disc at a considerably greater speed than the turntable as it reaches a point beneath the nozzle, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating disc.

4. Apparatus for forming a circular fabric article of a viscous material comprising a turntable, means for rotating the turntable, a plurality of rotatable discs journaled upon the turntable, a nozzle having orifices therein and located above the turntable, means for rotating each disc at a considerably greater speed and in the same direction as the turntable as it reaches a point beneath the nozzle, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating disc.

5. Apparatus for forming a circular fabric article of a viscous material comprising a turntable, means for rotating the turntable, a plurality of rotatable discs journaled upon the turntable, a nozzle having orifices therein and located above the turntable, means for rotating each disc as it reaches a point beneath the nozzle, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating disc, and means for setting up the viscous fabric upon the disc.

6. Apparatus for forming a circular fabric article of viscous material comprising a turntable, a spaced pair of disc plates located below the turntable, a central drive shaft journaled in the disc plates, a drive pinion upon the drive shaft and located between the disc plates, a plurality of disc shafts journaled through the disc plates and through the turntable, pinions on the disc shafts meshing with said drive pinion, discs fixed upon the upper ends of the disc shafts above the

turntable, means for rotating the turntable, a nozzle having orifices therein and located above the discs, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating discs as they reach a point beneath the nozzle.

7. Apparatus for forming a circular fabric article of viscous material comprising a turntable, a spaced pair of disc plates located below the turntable, a central drive shaft journaled in the disc plates, a drive pinion upon the drive shaft and located between the disc plates, a plurality of disc shafts journaled through the disc plates and through the turntable, pinions on the disc shafts meshing with said drive pinion, discs fixed upon the upper ends of the disc shafts above the turntable, a ring gear journaled between the disc plates and meshing with the pinions upon the disc shafts, and means for rotating said ring gear for rotating the turntable, a nozzle having orifices therein and located above the discs, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating discs as they reach a point beneath the nozzle.

8. Apparatus for forming a circular fabric article of viscous material comprising a turntable, a spaced pair of disc plates located below the turntable, a central drive shaft journaled in the disc plates, a drive pinion upon the drive shaft and located between the disc plates, a plurality of disc shafts journaled through the disc plates and through the turntable, pinions on the disc shafts meshing with said drive pinion, discs fixed upon the upper ends of the disc shafts above the turntable, a ring gear journaled between the disc plates and meshing with the pinions upon the disc shafts, and means for rotating said ring gear in the same direction as said discs for rotating the turntable, a nozzle having orifices therein and located above the discs, means for passing viscous material under pressure through the nozzle and extruding filaments of the viscous material from the orifices of the nozzle and means for reciprocating the nozzle whereby a circular fabric article comprising a concentric series of zig-zag filaments is deposited upon the rotating discs as they reach a point beneath the nozzle.

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