Oct. 2, 1962 T. F. McGINLEY 3,056,430

ROTARY WEAVING AND SPINNING MACHINE

Filed Aug. 27, 1957 5 Sheets-Sheet 1

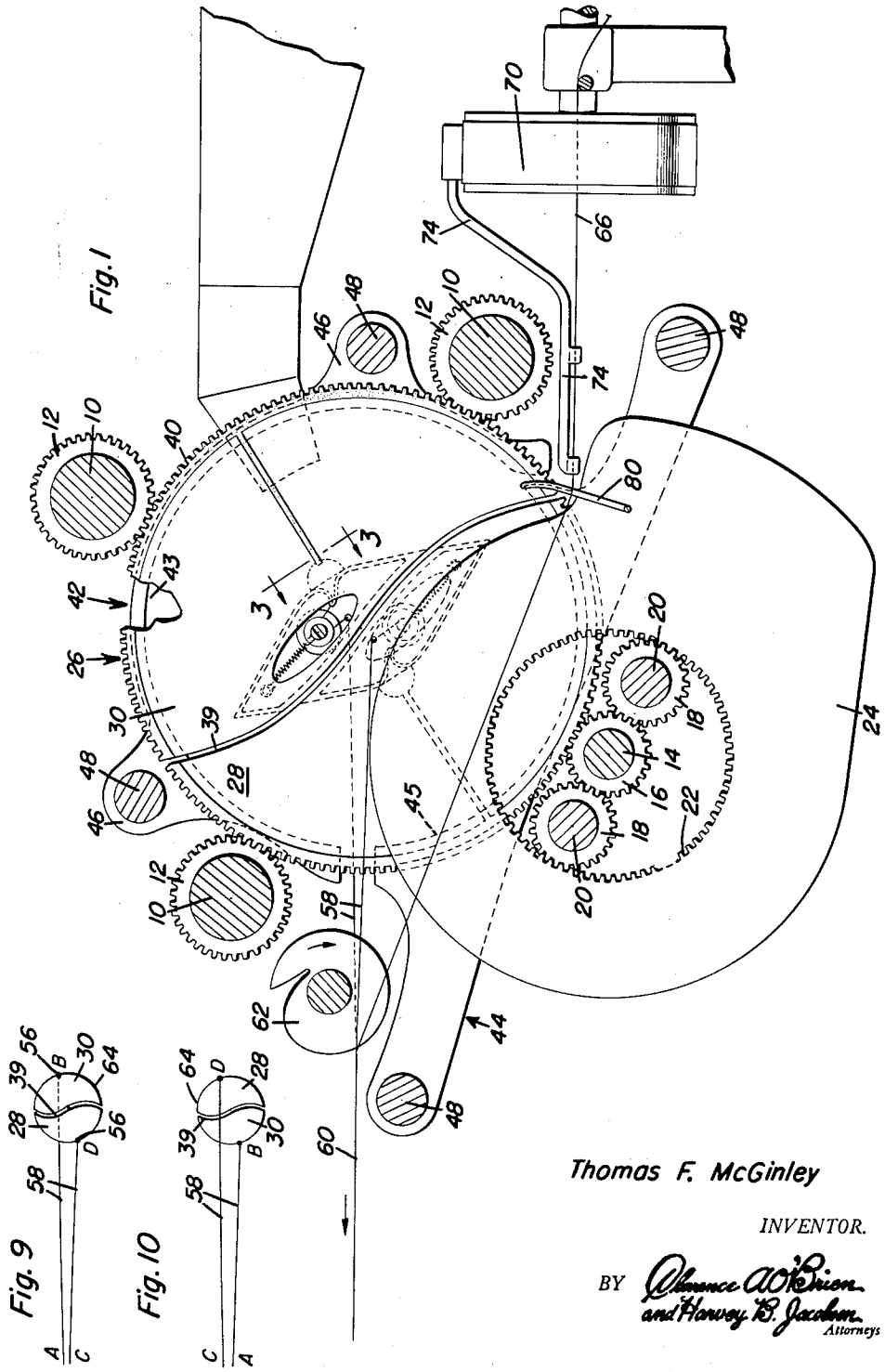


Fig. 1

Fig. 9

Fig. 10

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ROTARY WEAVING AND SPINNING MACHINE

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Fig. 2

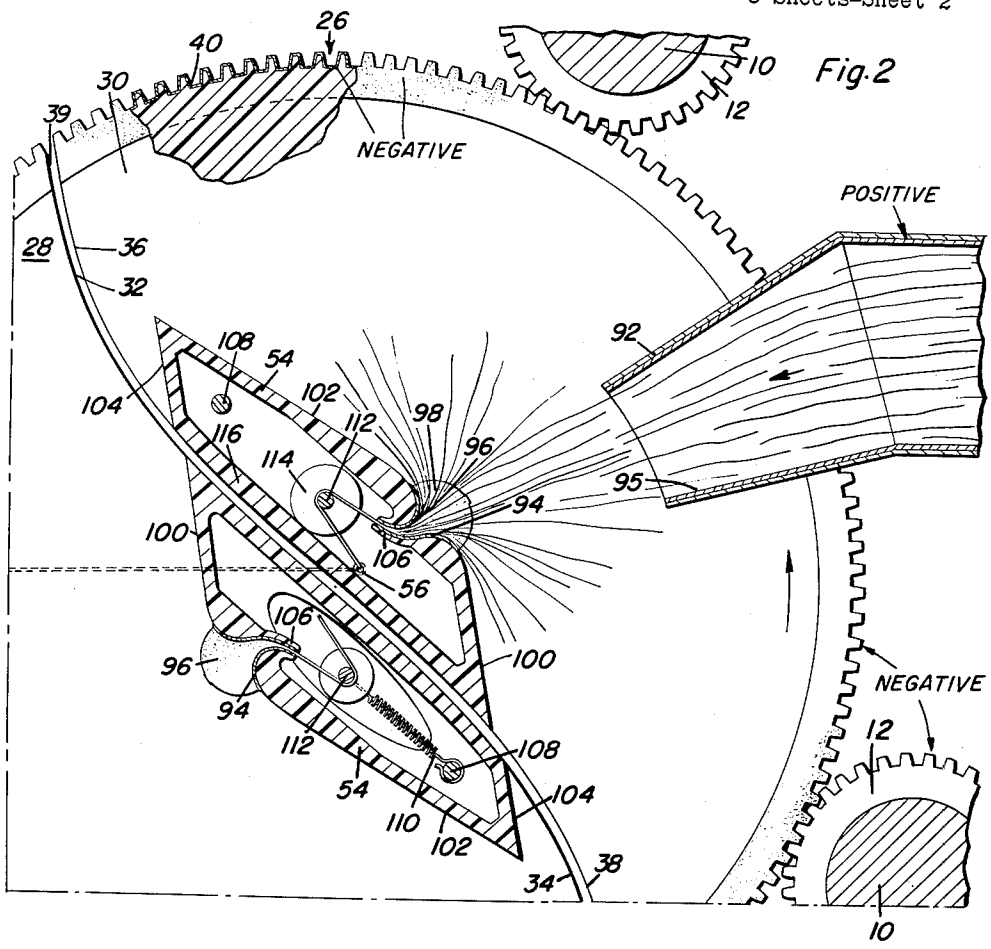


Fig. 4

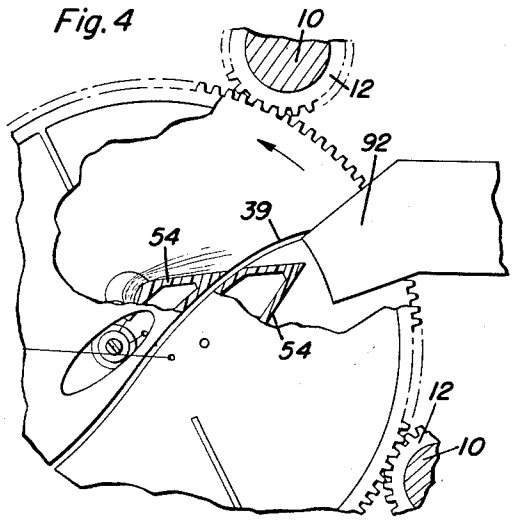
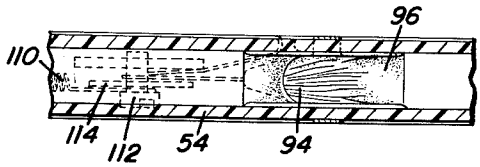


Fig. 3



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ROTARY WEAVING AND SPINNING MACHINE

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Fig. 5

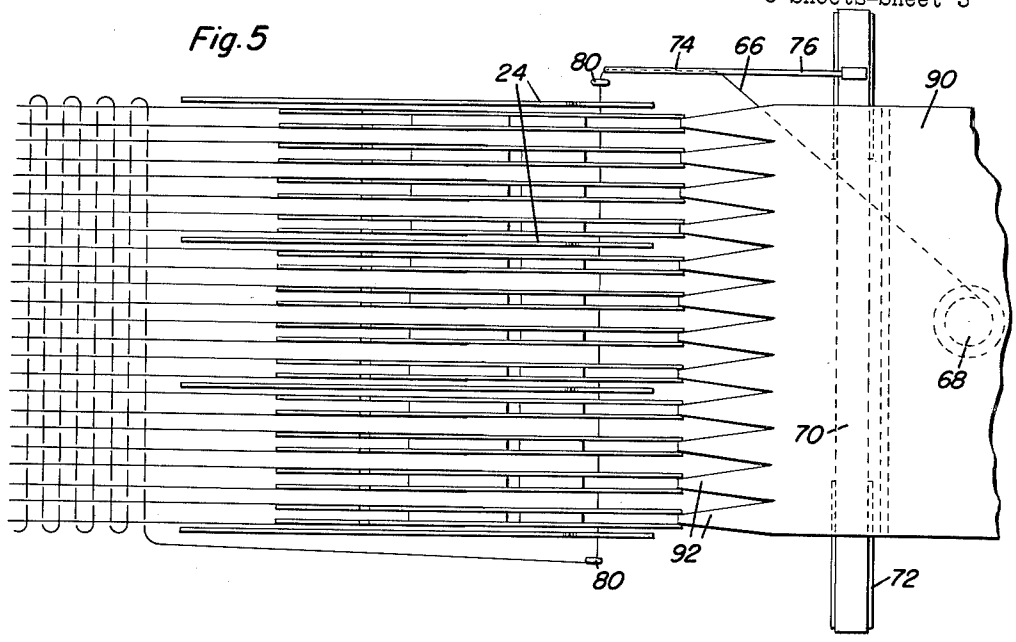
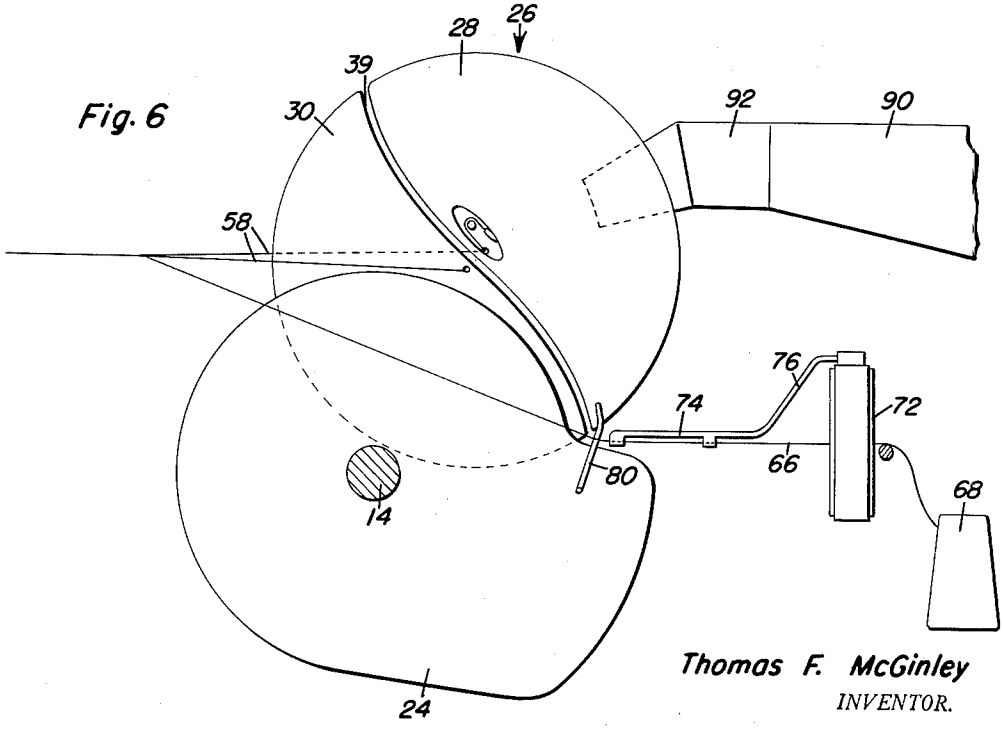


Fig. 6



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ROTARY WEAVING AND SPINNING MACHINE

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Fig. 7

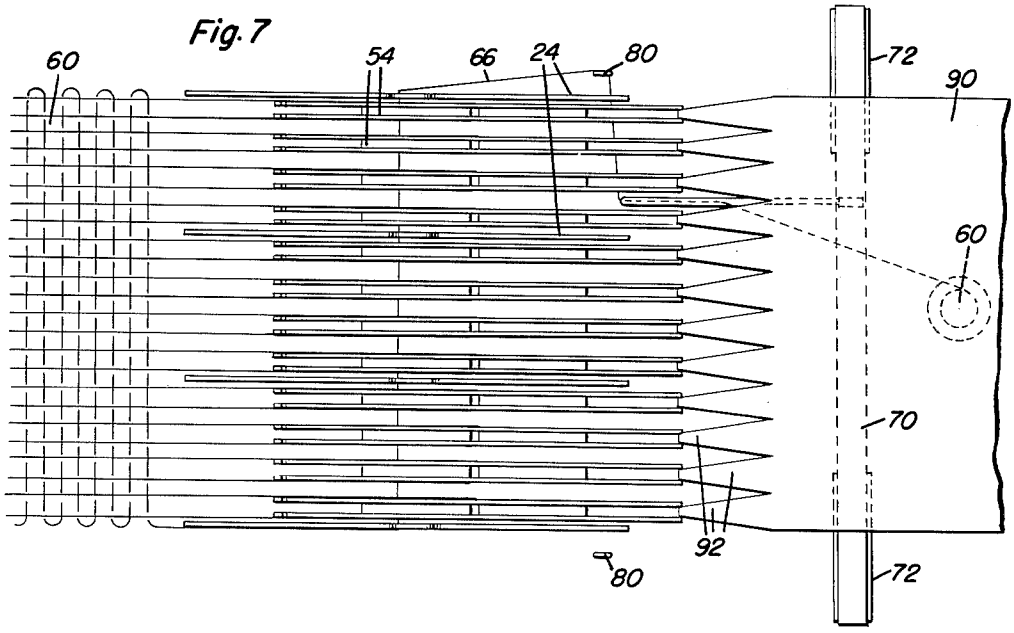
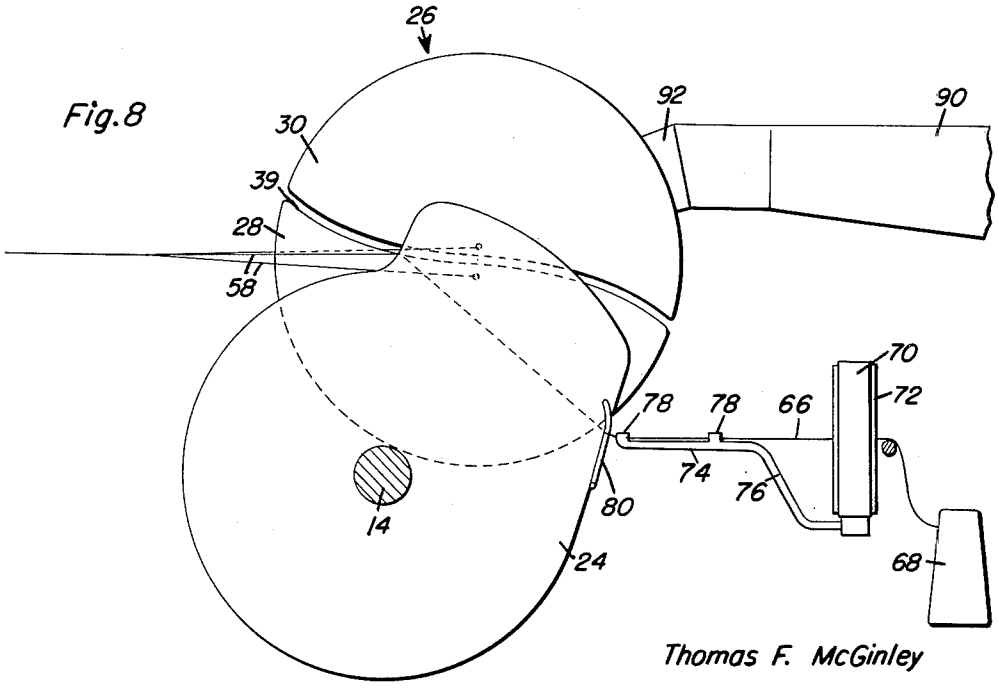


Fig. 8



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ROTARY WEAVING AND SPINNING MACHINE

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Fig.12

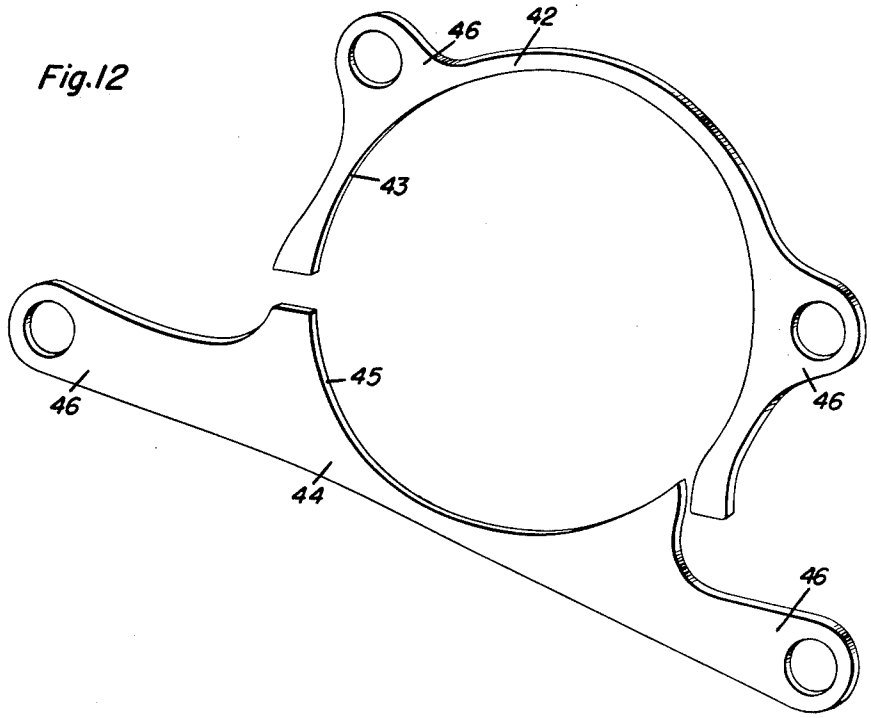
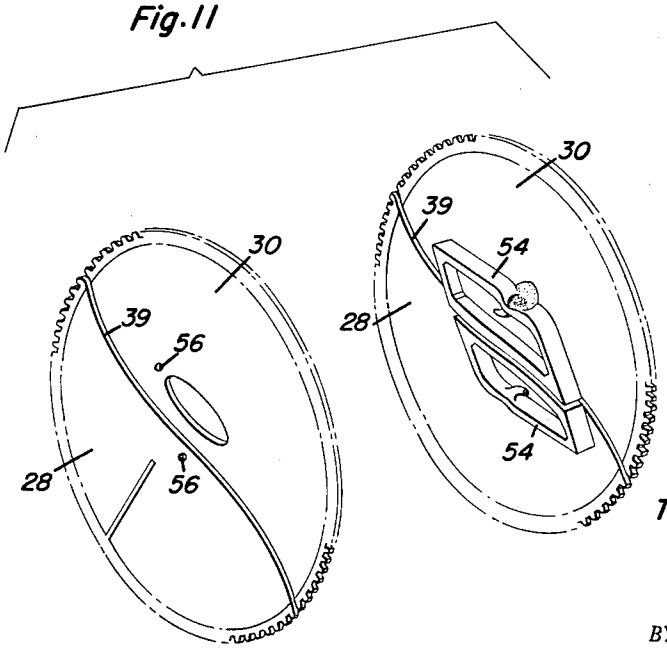


Fig.11



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3,056,430

ROTARY WEAVING AND SPINNING MACHINE

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Filed Aug. 27, 1957, Ser. No. 680,478
38 Claims. (Cl. 139—11)

This invention comprises a novel and useful rotary weaving and spinning machine and more specifically relates to a loom wherein the warp threads are continuously formed as they are woven into the fell, spun by a means which is carried by rotatable carriers while a single and continuous weft thread is dispensed and is passed by novel mechanism into and through a shed formed by the warp threads as their spinners are continuously rotated by the carriers.

In conventional looms, the warp threads are initially wound upon the warp beam, being dispensed under tension to the weaving instrumentalities of the loom. The initial placing and subsequent replacement of the warp threads upon the beam is a time consuming operation, as is the repair of any broken warp thread during the loom operation.

The filler threads are woven into the warp threads of conventional looms by vertically displacing selected sets of warp threads to form a shed through which the filler thread is carried by a spool or a bobbin or a shuttle, the latter being hurled from one side of the loom to the other. The reciprocating movements of the shuttle actuating mechanism, the accelerating forces acting upon the shuttle and filler thread or weft and the lack of control of the shuttle during its travel are all fruitful sources of wear of the associated elements and a prolific source of breakage of the parts and of damage to the material being woven. Further, it is obvious that the length of a warp thread being handled by the loom, in such types of apparatus, is necessarily limited owing to the necessity for winding the same upon the warp beam prior to the placing of the latter in the loom and the initiation of the weaving operation.

It is a general purpose of this invention to provide an apparatus and a method of simultaneously spinning warp threads, and of weaving wherein the above disadvantages may be obviated.

The principal object of this invention is to provide a weaving machine which will eliminate the customary various reciprocating motions of the elements of conventional looms, and will replace them, insofar as possible, with continuous rotating motions.

Another object of the invention is to provide an improved loom in which a much smaller movement of the warp threads in forming the shed is possible, to thereby minimize danger of breaking or of non-uniformly tensioning such threads, and yet wherein the weft or filling thread is passed into and through the shed in the weaving operation with a much greater certainty of operation and in a much more rapid manner than is possible in conventional looms.

An additional object of the invention is to provide a loom wherein the weaving operation may be effected with a much faster operation and with a greater number of picks per minute than is possible in a conventional loom.

A further object of the invention is to provide a loom wherein the necessity for a prearranged supply of warp threads is completely eliminated by the continuous spinning of the warp threads in the loom as the same are woven into the fabric.

A still further object of the invention is to provide a means and a method whereby a continuously flowing stream of airborne fibers may be intermittently and successively supplied to a plurality of spinners carried by a

single revolving carrier and without interrupting the continuous spinning of a warp thread by each spinner.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a somewhat diagrammatic view in longitudinal vertical section through a portion of the rotary weaving and spinning machine in accordance with this invention;

FIGURE 2 is a view in vertical section of a portion of FIGURE 1 but upon an enlarged scale, parts being broken away, and showing the manner in which a warp thread is spun or formed in a rotatable warp thread carrier plate of the machine during the combined spinning and weaving operation;

FIGURE 3 is a detail view taken on an enlarged scale substantially upon the plane indicated by the section line 3—3 of FIGURE 1 and indicating more clearly the manner in which a warp thread is spun or formed and is then tensioned and dispensed from the carrier plate during the weaving operation;

FIGURE 4 is a view similar to FIGURE 2 but showing another position of the parts during the spinning or forming of a warp thread, during which position the continuously flowing stream of thread forming material is being shifted from one spinner mounted on the carrier plate to another spinner thereon;

FIGURE 5 is a fragmentary top plan view illustrating the manner in which the filler thread is simultaneously advanced into and passed through the shed of all of the warp threads during the weaving operation;

FIGURE 6 is an elevational view of the arrangement and in the position of FIGURE 5 during one pick of the apparatus;

FIGURE 7 is a view similar to FIGURE 5 but showing the position of the parts during the succeeding pick to that of FIGURES 5 and 6 during the weaving operation;

FIGURE 8 is an elevational view of the parts in the position of FIGURE 7;

FIGURES 9 and 10 are diagrammatic views illustrating the manner in which rotation of each one of the carrier plates serves to provide alternate sheds of the warp threads during the weaving operation;

FIGURE 11 is a group perspective view of a pair of rotary carrier plates, showing opposite sides of the same, and indicating the segmental construction of the carrier plates; and

FIGURE 12 is a group perspective view of one of the spacer assemblies which are interposed between adjacent carrier plates.

In my co-pending application, Serial No. 465,617, filed October 29, 1954, now U. S. Patent 2,862,525 for Rotary Weaving Machine, there is disclosed a generally similar type of a rotary loom incorporating therein the basic principles of this invention as regards weaving fabric by means of sheds formed by rotating one end of each of the warp threads while passing a continuous filler thread through alternate sheds by movement of the filler thread longitudinally of the warp threads. The rotary weaving and spinning machine of the present application incorporates therein many of the basic principles of the apparatus of my above-mentioned prior co-pending application. Consequently, since many of the novel features of construction and operation of the rotary weaving machine are disclosed in detail and are claimed in said prior co-pending application, reference is made thereto for a full understanding of the structural and operational details of

the same, while making only a general reference thereto as deemed to be necessary in the present application for purposes of understanding the construction and operation of the invention disclosed and claimed herein.

Apparatus for Rotary Weaving

Briefly, the apparatus of the present invention consists of a suitable stationary supporting framework, not shown, but upon which is journaled a plurality of parallel axles or shafts **10**, each of which is provided with an elongated drum gear **12**. These drum gears extend across the entire width of the machine as set forth hereinafter.

It will be understood that any suitable number of shafts **10** and gears **12** will be provided for a purpose to be subsequently set forth, for convenience of illustration only, three such shafts being shown in FIGURE 1. In addition to the shafts **10** there is a further parallel shaft **14** which may be of lesser diameter and which has an elongated drum gear **16** which in turn drives a pair of planetary gears **18** carried by stationary shafts **20**, these planet gears being constantly in mesh with an internal gear **22** carried by each of a plurality of cam members **24** constituting picker arms for the weaving machine as set forth hereinafter.

As disclosed and claimed in my above-identified co-pending application, a single continuous weft thread **66**, which may be fed from a spool as at **68**, see FIGURES 5–8, is laid across the face of the machine, is then lifted by the picker cams **24** and is simultaneously passed upwardly and through the aligned reversely curved slots **39** of all of the carriers being passed through the shed, previously mentioned, and thereafter is beaten by the rotary reed **62** into the fell **60** being woven by the machine. The means for laying the filler thread across the machine, as disclosed in my identified application may conveniently comprise a continuous belt **70**, having a horizontal upper flight extending across the entire carrier assembly and entrained over a pair of pulleys **72** operated in any suitable manner. Secured to this belt is an arm **74** which is connected to the belt as by an offset portion **76** whereby the arm will be caused to travel in a plane lying within the axes of rotation of the two pulleys. This arm is provided with suitable eyes **78** through which the filler thread **66** passes. A pair of guide arms **80** suitably secured to the frame of the machine at opposite sides of the carrier assembly assist in positioning the thread in a straight line therebetween whereby the thread may be picked up by the picker arms or picker cams **24** and thus pushed through the slots **39**.

As so far described above, the weaving machine is of the same general construction and method of operation as that disclosed and claimed in my above mentioned co-pending application. It is to this type of weaving machine that the invention described hereinafter and claimed herein is particularly applicable.

Disposed between and rotatably journaled by the series of drum gears **12** and **16** is a carrier assembly comprising a plurality of rotary carrier plates upon each of which one end of one or more warp threads are formed and are secured, and tensioned, each carrier plate illustrated herein being designated generally by the numeral **26** and being of circular configuration and composed of a pair of generally semi-circular carrier plate segments **28** and **30**. From an inspection of FIGURES 1, 2 and 11 in particular, it will be seen that the two segments of each carrier plate have their adjacent diametrically extending edges shaped in complementary reverse curves. Thus the segment **28** has at one side thereof a concave edge portion **32** which extends through the center of the carrier and at its other end is formed with a reversely curved or convex edge portion **34**. Similarly, the segment **30** is provided with a convex edge portion **36** which is complementary to the edge portion **32** and is disposed in closely spaced relation thereto, while at its other end this segment terminates in a reversely curved concave edge portion **38** complementary to and disposed in closely spaced relation to the edge portion **34**. The reversely curved edges of the two segments thus constitute a slot **39** which extends with a reverse curvature substantially along a diameter of the carrier plate and through the center of rotation thereof whereby the two segments are spaced from each other at all times by the slot opening therethrough for a purpose to be subsequently set forth.

The elongated drums **12** and **16** constitute the sole means for supporting, rotating and retaining in fixed relation the two segments of each carrier plate **26**, by the engagement of the teeth of the drum gears **12** and **16** with the external gear teeth **40** upon the peripheries of the two segments of each carrier plate. By means of this geared engagement the two segments of each carrier plate are supported for rotation, are maintained in a relatively fixed and spaced relation, and all of the carrier plates are retained with all of their reversely curving diametrical slots being disposed in transverse or axial alignment with each other.

Suitable spacer collars, not shown, or any suitable width, are interposed between the lugs **46** on the rods **48** whereby to prevent binding of the spacer assembly against the sides of the carrier plates.

The carrier plates **26** are spaced from each other by the spacer assembly shown more clearly in FIGURE 12. The spacer assembly includes an upper member **42** having an arcuate surface **43** and a lower member **44** with the complementary arcuate surface **45**. Apertured lugs **46** on the members **42** and **44** are carried by support rods **48** which are secured to suitable portions of the framework of the apparatus, not shown, whereby the two components **42**, **44** of the spacer assembly mounted between the carrier plates and the latter are maintained in proper axially spaced relation with respect to each other.

As will be observed from FIGURES 1 and 12, the two ends of the member **42** are spaced from those of the member **44** to provide a pair of slots between the same, which slots are positioned for successive registration with the ends of the reversely curved slot **39** between the segments of the carrier plates during rotation of the latter. It may be here noted that the arrangement of slots through the carrier plates and the successively registering slots of the spacer members are intended to permit a filler thread which extends across the entire axial length of the carrier assembly to be passed through this reversely curved diametrically extending slot **39** by the picker arms during rotation of the carrier assembly and arms as set forth hereinafter.

Carried on opposite sides of each of the carrier plates **26**, and disposed one upon each segment of the same adjacent their complementary reversely curved edges is a pair of warp thread spinners comprising diamond-shaped housings or casings **54** which form the chambers in which the warp threads of the loom are formed. Each warp thread after being formed therein, is dispensed from its chamber through an aperture **56** in each of the carrier plate segments which latter constitute a wall of a housing **54**. As will be observed from FIGURE 11, the dispensing apertures **56** for each of the segments are very closely adjacent but upon opposite sides of the reversely curved diametrically extending slot **39** between the segments, and are spaced diametrically from each other by a distance which may be about one-quarter of an inch. For all practical purposes, in the weaving operation, the apertures **56** may be considered as the terminals or origin of the warp threads of the loom. Each of these warp threads is indicated by the numeral **58**. The weft or filler thread **66** is beat into the fell **60** by any suitable means, such as by the operation of the rotating reed **62**, in a manner set forth in my above-identified co-pending application.

At this point it should be understood that each segment of each carrier plate dispenses a single warp thread through its aperture **56**, and the warp threads of the seg-

ments 28 and 30 are dispensed from opposite sides of the same carrier plate.

As above mentioned, the threads are partially formed in the housings 54 from an airborne stream of fibers fed into the housings, but the twisting of the partially formed thread to produce the complete thread is effected by the rotation of the carrier plates and the thread issuing therefrom through the apertures 56. The rotation of the thread at its place of emergence from the housing 56 produces a twisting which travels also up the partially formed thread into the housing and in varying degree past the thread tensioning device therein to the place of origin of the thread.

From the diagrammatic views of FIGURES 9 and 10 it will be seen that the opening and closing of the sheds of the warp threads originating from the carrier plate segments is effected as follows. In these diagrammatic views, there is disclosed a pair of warp threads 58 which originate from the two segments of a single carrier plate but on opposite sides of the latter, there being a thread AB originating from the aperture 56 of the carrier plate segment 30 while the warp thread CD originates from the aperture 56 of the carrier plate segment 28. During rotation of the carrier plate segments, these apertures 56 traverse the circle indicated at 64. In the position of FIGURE 9 it is seen that the warp thread AB is disposed above the thread CD with the shed lying between the vertically spaced apertures 56 of the segments 30 and 28. However, after 180° of rotation of the carrier plate segments, the thread CD will be disposed above the thread AB, and the shed will be reversed with a new shed lying between the vertically elevated aperture 56 of the segment 28 with respect to the aperture and the segment 30. Thus, during continuous rotation of the carrier plates the dispensing apertures 56 rotate about each other to thus form alternate sheds of the warp threads.

Apparatus and Method for Spinning Warp Threads During Weaving

Staple fibers consisting of organic derivatives of cellulose such as cellulose acetate or any fibers natural or synthetic possessing dielectric properties may be polarized and oriented and parallelized in an electrostatic field of sufficient force in a direction determined by the lines of force in the field. Use is made of this principle of the apparatus and method of the present invention to form a thread.

Attention is next directed more specifically to FIGURES 1, 2–4 for an understanding of the manner in which the warp threads are formed in the housings 54 mounted upon the carrier plate segments. Synthetic fibers form a suitable molten plastic material, provided from any suitable source, not shown, or any natural or synthetic fibers are employed by this apparatus and method. These fibers are airborne and are delivered to the carrier assembly, and more specifically, to the casings 54 provided upon the segments thereof.

As illustrated in FIGURES 3, 5, 7 and 11, each carrier comprises a pair of parallel coextensive carrier plates, divided each into segments by the previously mentioned groove 39, and which pair of carrier plates are rigidly secured together to act as a unitary assembly by the housings 54. As shown in FIGURE 11, each of the two housings 54 of a given carrier is carried by a segment of one plate of the carrier, while the other carrier plate has its segments constituting the other walls thereof.

Referring to FIGURES 5 and 7 there is disclosed a manifold or header 90 which constitutes a source from which the airborne fibers are to be supplied to the spinner housings 54, and this header terminates in a plurality of nozzles 92 one or more of which lies between the pair of adjacent carrier plates comprising a single carrier and is directed towards the axis of rotation thereof. Each of the casings 54 is preferably of a suitable dielectric material as indicated in FIGURE 2, and is provided with a funnel-shaped inlet opening 94 therein which is adapted to receive airborne fibers discharged by the adjacent nozzle 92 when the opening moves into proximity to the path of travel of the fibers. Owing to the electrostatic field of the carriers the fibers will travel from the nozzles to the inlet opening 94 at the opposite electrode of the field.

In order to insure entry of the fibers into the casing through the funnel shaped inlet opening 94 even though the latter is not aligned with the fiber path of travel, it is preferred to electrically charge the nozzles 92 with a positive electrical charge, while a negative charge may be applied to the sides of the adjacent carrier plates to the funnel shaped inlet openings and to the surface of the latter. For this purpose, metallic coatings 95 may be provided for the interior surface of the nozzle 92 to facilitate the imparting of a positive charge to the airborne fibers, while negatively charged metallic coatings or linings 96 may be applied to the funnel-shaped inlet openings 94, and to the adjacent area 98 on the sides of the carrier plates.

It will be observed from FIGURE 2 that each of the casings 54 is provided with an inclined flat edge or surface 100 and which continues to the adjacent concave edge portions 32 or 38 of its carrier segment, and which merges with the funnel-shaped inlet opening 96. Each casing is further provided with a second inclined surface 102 which extends from the other side of the funnel-shaped inlet opening 94, and which joins with a re-entrant inclined surface 104, the latter merging with the convex edge portions 34 or 36 of the two segments and in substantial alignment with the surfaces 100 of the other segment. It will be further noted that the funnel-shaped opening 94 is at the apex or junction of the relatively inclined surfaces 100 and 102.

The particular arrangement of the funnel-shaped inlet openings 94 and of the inclined surfaces 100, 102 and 104 serves a very important purpose to be now described.

Considering now FIGURES 2 and 4, and assuming that the carriers rotate in a counterclockwise direction as indicated by the arrow therein, it will be observed that in FIGURE 2 the airborne fibers are directly discharged into the funnel-shaped opening 94 and will thus pass directly into the same. As the rotation continues, and the opening 94 of the casing upon the carrier segment 30 moves away or to the left from the nozzle 92 the airborne stream of fibers will be now directed upon the surface 100 and subsequently the surface 104, but because of the opposite charges of the fibers and of the coating or lining 96 and 98 be drawn or attracted towards, and will thus continue to enter this opening. However, as the junction of the surfaces 104 and 102 of the carrier segment 28 begin to move into alignment with the nozzle 92, as shown in FIGURE 4, the airborne stream of fibers begins to divide with the flow to the nozzle in the segment 28 increasing, while the flow to the nozzle in the segment 30 begins to decrease, as suggested in FIGURE 4, with the fibers now beginning to strike the surface 102 of the segment 28, beginning to move down the inclined surfaces 102 and to be attracted to the coatings 98 and 96 of the opening 94 of the segment 28.

It will thus be observed that as rotation continues, the continuous stream of fibers from the nozzle 92 will be alternately and intermittently discharged into the funnel inlet openings of the two segments 30 and 28, to be formed into a warp thread in the casing of the segments and be subsequently discharged therefrom through the dispensing openings 56.

Referring now more particularly to FIGURE 2 in conjunction with FIGURES 3 and 4, it will be seen that the funnel-shaped inlet opening 94 has a narrowing tubular projection 106 which is of such size and shape that the

mass of airborne fibers passing therethrough is grouped or pressed into a strand or thread.

A tension device for the warp thread thus formed in the casing **54** is provided. This tension device includes an anchor pin **108**, to which one end of a tension spring **110** is secured, the other end of the spring being engaged with the axle **112** of a roller **114** which is free to roll upon what may be termed the bottom wall or inner wall **116** of the casing or housing **54**. The thread emerging from the tubular projection **106** passes about the axle **112** and from thence is dispensed to the previously mentioned opening **56**. It will thus be observed that the spring tension means takes up slack and maintains a constant tension upon the warp threads to permit the slight movement of threads required for the rotation of the ends of the same and for the openings of the sheds previously described.

As previously set forth, the rotation of the carriers, and of the thread ends issuing therefrom twists the thread to complete the latter by spinning the same, this twisting action progressing up the thread and into the housing **54**.

The rate of feed of the threads **58** from the opening **56** is sufficiently slow that the intermittent supply of fibers to the funnel-opening **94** is adequate to form the warp thread as fast as it is dispensed by the weaving operation of the machine.

In the apparatus illustrated, each rotation of the carriers and the thread forming housings **54** thereof results in the addition of an increment of length upon the end of the thread. Owing to the relatively slow rate of feed from the housings **54** into the fell of the fabric, which rate of feed varies with the number of picks per minute, there will be many rotations of the carriers for each inch of thread fed into the fell. The successive deposits of parallelized groups of fibers into the housings **54** will combine in overlapping rotation to create the partially formed thread resulting in a very uniform diameter of thread.

Although but one nozzle **94** has been shown for each housing, it is apparent that two or more could be provided, each producing a thread which plurality of threads would then be combined with a composite thread of larger size by the above mentioned spinning operation. Obviously suitable controls, not shown, may be applied to the manifold **90** and/or the nozzles **92** to restrict the flow of fibers to the rate at which the warp thread is dispensed.

As above mentioned, the flow of fibers from the nozzles **92** is continuous, being periodically or alternately shifted to the housing **54** and the segments **28** and **30**. However, it is within the purview of this invention to discharge fibers intermittently from the nozzles **92** by any suitable valve and valve tensioning means in properly timed relation to the position of a funnel-opening **94** with respect to the direction of travel of the fibers.

Further, although but one nozzle **92** has been illustrated, it is within the scope of this invention to provide two or more nozzles disposed in circumferentially displaced positions for each discharging a stream of airborne fibers to the housings **54** of one carrier.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A method of weaving comprising individually supporting and rotating a plurality of warp threads at one end of each about a common axis extending transversely of the warp threads and producing thereby a reciprocating shed, continuously replenishing said ends of said warp threads by forming the thread from a stream of fibers, passing a filling thread through the reciprocating shed.

2. A method of weaving comprising individually supporting and rotating a plurality of warp threads at one end of each about a common axis extending transversely of the warp threads and producing thereby a reciprocating shed, continuously replenishing said ends of said warp threads by forming the thread from a stream of fibers, passing a single continuous filling thread through successive sheds to form successive courses of weaving.

3. A method of weaving comprising continuously spinning a warp thread in a loom and simultaneous with said spinning weaving said warp thread into the fell of a fabric.

4. A method of weaving comprising forming a plurality of warp threads and passing said threads through the weaving instrumentalities of a loom and weaving a fabric therefrom, rotating the ends of said warp threads at their place of forming to provide alternate sheds, passing a filling thread through said sheds.

5. A method of weaving comprising forming a pair of warp threads in a pair of spinners while simultaneously weaving said warp threads into a fabric in a loom, said step of forming comprising alternately directing a stream of airborne fibers from a single source to said pair of spinners.

6. A weaving and spinning machine comprising a plurality of spinners each producing and supporting at one end thereof a warp thread for a fabric being woven in a loom, supports for said spinners, means mounting said supports for rotation about a common axis, said spinners being positioned in sets on opposite sides of said common axis of rotation whereby provide alternate sheds, means for passing a filling thread through said sheds for weaving into the fell of a fabric.

7. A weaving and spinning machine comprising a plurality of spinners each producing and supporting at one end thereof a warp thread for a fabric being woven in a loom, supports for said spinners, means mounting said supports for rotation about a common axis, said spinners being positioned in sets on opposite sides of said common axis of rotation whereby provide alternate sheds, means for passing a single filling thread through said sheds for weaving successive courses into the fell of a fabric.

8. The combination of claim 6 wherein said supports comprise circular carriers, a spinner of each set being disposed upon each carrier.

9. The combination of claim 6 wherein said supports comprise circular carriers, a spinner of each set being disposed upon each carrier, and on opposite sides thereof.

10. The combination of claim 6 wherein said supports comprise circular carriers, a spinner of each set being disposed upon each carrier, each carrier comprising a pair of circular segments with a slot extending entirely through the carrier between said segments, a spinner on each segment adjacent said slot, said last mentioned menas passing a filling thread through said slot and through said sheds.

11. The combination of claim 10 wherein said spinners are disposed on opposite sides of said carriers.

12. A weaving and spinning machine comprising a plurality of spinners each continuously producing a warp thread and supporting one end thereof, means for supporting said spinners in pairs on opposite sides of an axis of rotation, said pairs of spinners being disposed in axially spaced relation along said axis of rotation, means for causing rotation of said spinners about said axis of rotation for providing alternate sheds being the spinners in each pair, means for passing a filling thread through said sheds.

13. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communi-

cating with said source and directing a stream of airborne fibers between a pair of adjacent support means.

14. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communicating with said source and directing a stream of airborne fibers between a pair of adjacent support means, means associated with each spinner in a pair of spinners for directing said stream of fibers therein during a portion of the rotation of said spinners.

15. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communicating with said source and directing a stream of airborne fibers between a pair of adjacent support means, each pair of spinners including a pair of housings mounted on a side of said support means, each housing having a funnel-shaped inlet opening for receiving said stream and spinning a thread therefrom, means in each housing for discharging said thread therefrom.

16. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communicating with said source and directing a stream of airborne fibers between a pair of adjacent support means, each pair of spinners including a pair of housings mounted on a side of said support means, each housing having a funnel-shaped inlet opening for receiving said stream and spinning a thread therefrom, means in each housing for discharging said thread therefrom, said last means for said pair of housings being disposed on opposite sides of said support means.

17. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communicating with said source and directing a stream of airborne fibers between a pair of adjacent support means, each pair of spinners including a pair of housings mounted on a side of said support means, each housing having a funnel-shaped inlet opening for receiving said stream and spinning a thread therefrom, means in each housing for discharging said thread therefrom, thread tensioning means disposed in each housing.

18. The combination of claim 12 including a source of airborne fibers, a plurality of nozzles each communicating with said source and directing a stream of airborne fibers between a pair of adjacent support means, each pair of spinners including a pair of housings mounted on a side of said support means, each housing having a funnel-shaped inlet opening for receiving said stream and spinning a thread therefrom, means in each housing for discharging said thread therefrom, means associated with said pair of housings for alternately shifting said stream of fibers from the inlet opening of one housing to that of the other.

19. A weaving and spinning machine comprising means for supporting and rotating about a common axis one end of each of a plurality of warp threads on a loom whereby to provide alternate sheds and means on said first mentioned means for continuously forming the warp thread carried thereby.

20. The method of claim 1 wherein the step of continuously replenishing the ends of the warp threads is effected by depositing fibers by a conveying air stream to form a sliver and twisting the latter by said rotating of the warp threads to form the thread.

21. A method of weaving comprising continuously forming in a loom all of the warp threads in properly spaced relation to weave a fabric and simultaneously with said forming of the warp threads weaving a weft thread into the fell of a fabric.

22. A method of weaving comprising continuously forming in a loom a warp thread from a stream of airborne fibers and simultaneously with said forming weaving said warp thread into the fell of a fabric.

23. A method of weaving in a loom a fabric having warp and weft threads comprising continuously forming at least one of said warp threads in a loom from an airborne stream of fibers and simultaneously with said forming weaving the formed warp threads into the fell of a fabric.

24. A method of weaving in a loom a fabric having warp and weft threads which comprises continuously forming in said loom at least one of said warp threads and weaving the formed warp thread into the fell of a fabric.

25. A method of weaving comprising spinning a warp thread in a loom and simultaneously with said spinning weaving said thread into a fabric.

26. A method of weaving comprising continuously forming fibers into a warp thread in a loom and simultaneously with said forming weaving said warp thread into a fabric.

27. A method of weaving comprising continuously forming a warp thread in a loom from unoriented fibers and simultaneously with said forming weaving said warp thread into a fabric.

28. A method of weaving which comprises forming a pair of continuous threads from a stream of airborne fibers and simultaneously with said forming causing said threads to provide alternate sheds, passing a filling thread through said sheds and thereby weaving a fabric.

29. A method of weaving comprising spinning a plurality of warp threads and passing said warp threads through the weaving instrumentalities of a loom, rotating the ends of said warp threads at their place of spinning about an axis extending transverse said threads to provide alternate sheds and passing a filling thread through said sheds.

30. A method of weaving comprising forming fibers into a plurality of warp threads and passing said threads through the weaving instrumentalities of a loom, rotating the ends of said warp threads at their place of formation about an axis lying transversely of said warp threads to provide alternate sheds, passing a filling thread through said sheds.

31. A method of weaving comprising spinning in a loom all of the warp threads in properly spaced relation to weave a fabric and simultaneously with the spinning of the warp threads, weaving a weft thread into the fell of a fabric.

32. A method of weaving comprising continuously forming in a loom from a stream of discrete fibers all of the warp threads in properly spaced relation to weave a fabric and simultaneously with said forming of the warp threads weaving a weft thread into the warp threads to form the fell of a fabric.

33. A method of weaving in a loom a fabric having warp and weft threads with at least one of said warp threads being continuous throughout the fabric which comprises forming in said loom said continuous warp thread by causing a stream of discrete fibers to assume a generally parallel and contacting relation to each other, twisting said parallel and contacting fibers into a warp thread and simultaneously with said forming weaving the said warp thread into a fabric.

34. In a loom, means for continuously forming from a stream of discrete fibers a continuous warp thread and means operable simultaneously with the forming of said continuous warp thread for weaving the latter into a fabric.

35. In a loom, means for continuously spinning from a stream of airborne fibers a continuous warp thread and means simultaneously operable with the spinning of said warp thread for weaving the latter into a fabric.

36. A method of weaving comprising forming a plurality of warp threads and passing said threads through the weaving instrumentalities of a loom and weaving a fabric therefrom, rotating the ends of said warp threads

at their place of forming to provide alternate sheds, passing a filling thread through said sheds, said step of forming comprising spinning fibers into a thread.

37. A method of weaving comprising continuously forming in a loom all of the warp threads in properly spaced relation to weave a fabric and simultaneously with said forming of the warp threads weaving a weft thread into the fell of a fabric, said step of forming comprising spinning fibers into a thread.

38. The method of claim 24 wherein the steps of forming comprises spinning fibers into a warp thread.

References Cited in the file of this patent

UNITED STATES PATENTS

427,105	Morris	May 6, 1890
1,515,595	Friend	Nov. 18, 1924
2,169,886	Shaw	Aug. 15, 1939
2,239,514	Astley	Apr. 22, 1941
2,285,385	Astley	June 9, 1942
2,373,091	Astley	Apr. 10, 1945
2,867,077	Wilkie	Jan. 6, 1959
2,904,953	Groombridge et al.	Sept. 22, 1959