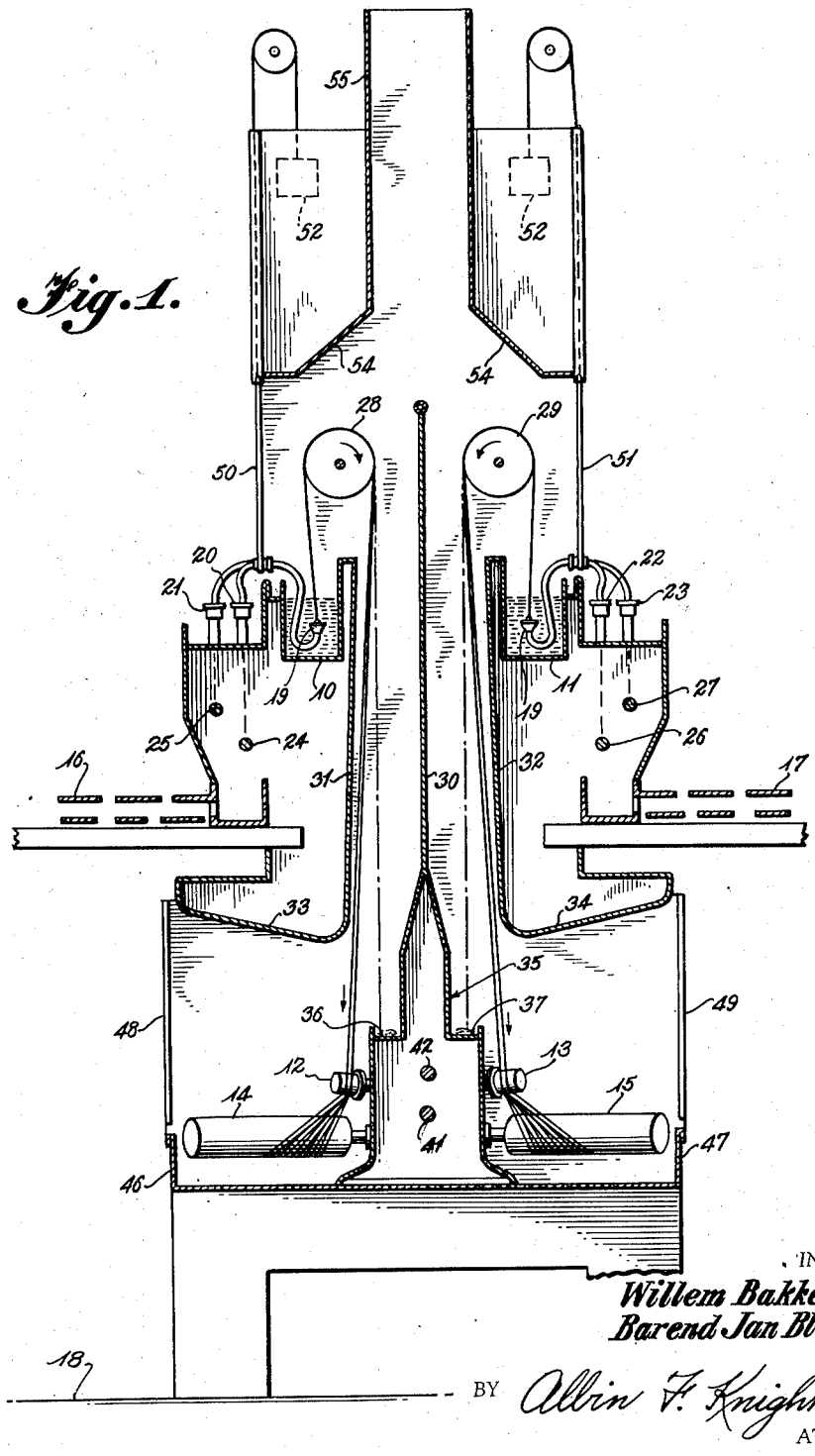
Sept. 4, 1951 W. BAKKER ET AL 2,566,438

CONTINUOUS SPINNING APPARATUS

Filed Aug. 31, 1950 2 Sheets-Sheet 1

Fig. 1.



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Filed Aug. 31, 1950 2 Sheets-Sheet 2

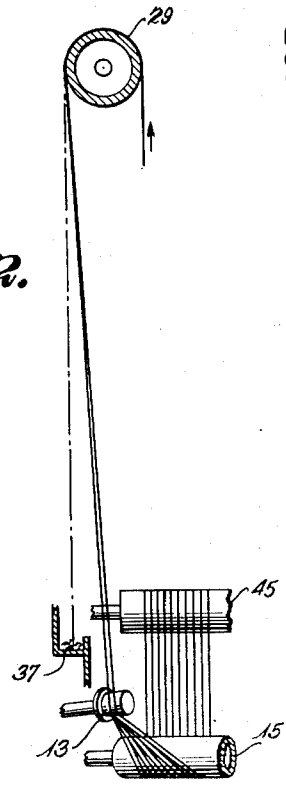

Fig. 2.

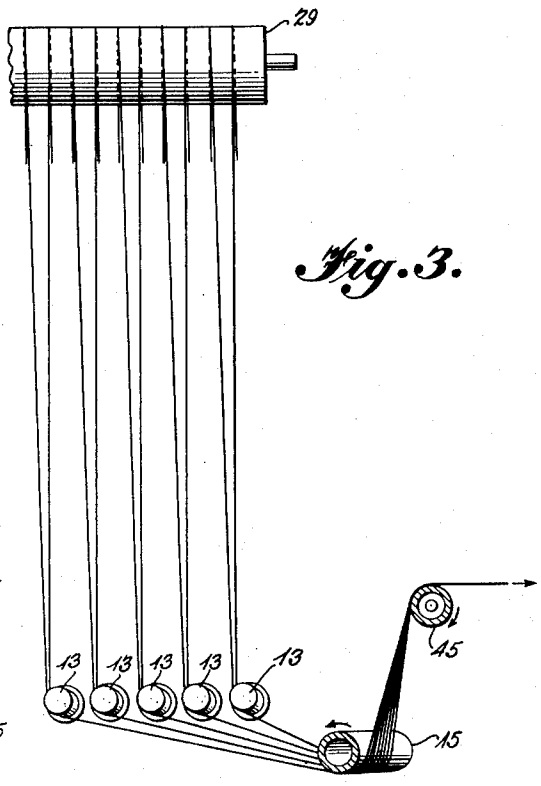

Fig. 3.

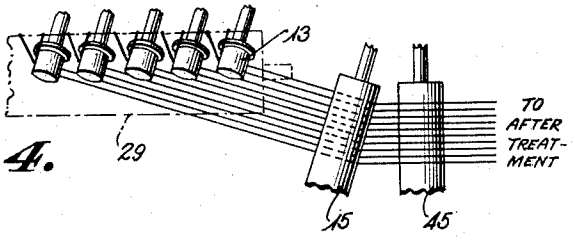

Fig. 4.

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CONTINUOUS SPINNING APPARATUS

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Application August 31, 1950, Serial No. 182,534
In the Netherlands September 23, 1949

6 Claims. (Cl. 18—8)

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This invention relates to the continuous spinning of rayon yarns and is more particularly concerned with apparatus for simultaneously spinning a plurality of yarns and forming the yarns so spun into a sheet of parallel yarns for convenient aftertreatment. It is contemplated according to the present invention that the component yarns of the sheet be spaced apart a distance very much less than the distance between the spinnerets from which they are formed.

According to the aftertreating method disclosed in Heim Patent No. 2,334,325, a plurality of yarns are spun and these yarns are subjected to aftertreatment in the form of a parallel sheet. Once the method of the Heim patent is fully understood, it is appreciated that to take full advantage of the desirable characteristics of the process, it is necessary to consider the arrangement of the components of the system from the point of view of space economy, ease of threading-in, and ease of maintenance.

In view of the fact that the spinning pumps and spinning filters occupy considerable space, it is quite apparent that the spinnerets cannot be as close together as it is possible to locate the yarns during the aftertreatment. Thus, one of the problems is to bring together the many freshly spun yarns from a relatively widely-spaced relationship to a relatively closely-spaced relationship. This difficulty is increased because of the fact that the yarns, during this transition from wide spacing to close spacing, must remain individually accessible to the operators for such manipulations as may be required.

Another problem in the commercial adaptation of the system disclosed in Heim Patent No. 2,334,325 resides in the spinning-in of the component yarns of the sheet. If an attempt is made to spin-in all of the yarns simultaneously, a large number of operators are required, resulting in confusion and excessive space in order to give the several operators room in which to do their work.

In view of the fact that yarns may be aftertreated in the form of a sheet, the component yarns of which are spaced apart only about 3.6 ends per inch, it is apparent that the aftertreating machine can be very much narrower than the spinning machine which delivers yarn to it, with the result that the difference in width between the spinning machine and the aftertreating machine is waste space. In an attempt to keep the width of the spinning machine equal to that of the aftertreating machines, efforts have been made to use narrow spinning machines where the plane of the spinning positions is at

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right angles to the direction of the running sheet of yarns. However, in order to obtain the desired space saving, this scheme requires that several rows of spinning positions be placed vertically above one another, and this arrangement introduces very substantial difficulties in respect to the arrangement of the spinning pumps.

It has been proposed to use the normal long spinning machines with a row of spinning positions in a direct line with a sheet of yarns. This can be achieved by guiding the yarns overhead to bring about the spatial relation required in the aftertreating machine. The arrangements heretofore attempted in this regard, however, have been extremely difficult to spin-in and maintenance in cases of yarn breakage has been difficult and costly.

It is an object of this invention to overcome the disadvantages set forth above and to provide methods and apparatus for the continuous spinning of rayon yarns according to the Heim process which are characterized by excellent space economy, ease of maintenance and ease of spinning-in.

It is contemplated according to the present invention to provide a two-level, two-sided spinning machine having an upper level provided with longitudinally extending spin baths and a lower level in which the freshly spun yarns are formed into a sheet and at the same time are changed in direction so as to pass to the aftertreating machine as a sheet of yarns which are properly spaced and which are running parallel to the long axis of the spin bath.

By the use of a two-level arrangement, a very considerable space advantage is achieved due to the fact that the sheet is initially formed underneath the spin bath in which its components are extruded.

A further advantage of the present invention resides in the fact that in spinning-in only two operators are required for a two-sided machine having 120 spinning positions and these two operators can work independently in view of the fact that a fully automatic temporary storage device is provided to accommodate yarns that are being delivered from a spinneret but have not yet been incorporated in the sheet which is delivered to aftertreatment.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof in conjunction with the annexed drawings wherein:

Figure 1 is a view in vertical section taken

transversely of a two-sided spinning machine constructed in accordance with the principles of the present invention;

Figure 2 is a schematic view partly in elevation and partly in section tracing the course of a pair of yarns through their various changes in direction between spinning and incorporation in a sheet for aftertreatment;

Figure 3 is similar to Figure 2 but is taken from a viewpoint 90° away from the view of Figure 2; and,

Figure 4 is a plan illustrating the change in direction which the yarns undergo at the lower level of the machine incident to the formation of the sheet.

Referring now in greater detail to Figure 1, it can be seen that the machine is a double-sided one having two levels or stations, an upper level including the elongated spinning baths 10 and 11 which run for the length of the machine, and a lower level including the rollers 12, 13, 14 and 15, which serve to form the freshly spun yarns into a sheet for aftertreatment. The upper level of the machine is provided with catwalks 16 and 17 on its opposite sides and the operator who is serving the spinnerets walks along these catwalks as he withdraws the yarns from the spin baths. The operator who is serving the lower level of the machine walks along the floor of the building at 18 on one side of the machine and along a similar surface, not shown, at the other side of the machine.

The two elongated spin bath tanks 10 and 11 each may accommodate a row of sixty spinnerets 19 arranged in aligned spaced relation. Each spinneret 19 is connected to a pair of spinning filters, the heads of which show at 20—21 and 22—23 in Figure 1. Each spinneret is also associated with pumps of conventional design, not shown. These pumps are driven from shafts 24 and 25 on the left side of the machine as it is shown in Figure 1 and from corresponding shafts 26 and 27 on the right side of the machine. By providing two pump drive shafts on each side of the machine the number of spinning positions that can be accommodated per unit length of spin bath trough is increased. The arrangement, as can be seen in Figure 1, involves drive shafts at different levels so that alternate pumps are driven from shafts 24—26 and the intervening pumps are driven from shafts 25—27. Thus, the pumps of one row are placed zigzag with respect to the pumps of the other row and space is saved in the longitudinal dimension of the machine. The spinning filters 20, 21, 22 and 23 are also placed zigzag as can be seen in Figure 1. The shafts 24 to 27, inclusive, run for the length of the machine and are driven by suitable means, not shown.

The machine is provided with two long cylindrical draw-off rollers 28 and 29 which are located above the spin baths 10 and 11, respectively. The freshly spun yarns are led upwardly over the appropriate roller 28 or 29 and around it with 180° of wrap. Because the rollers 28 and 29 have substantial diameter and because their axes lie above the back walls of the respective spin baths 10 and 11, the yarn goes onto the rollers 28 and 29 tangentially at a point directly above the spinneret and goes off tangentially at a point lying in a vertical plane behind the rear wall of the spin bath tank. Thus, the rollers 28 and 29 not only serve to draw off the yarns from the spinnerets, but also to transfer the yarns laterally to a plane lying rearwardly of the spin bath so

that they may fall freely to the lower level of the machine through a space defined by the central partition 30, the backs of the spin bath tanks 10 and 11 and lead lined or lead protecting walls 31 and 32. The protective walls 31 and 32 extend, at their respective lower ends 33 and 34, over the working space of the lower level of the machine so as to isolate it from the upper level insofar as leakage or spillage of liquids is concerned.

Below the central partition 30 there is located a housing 35 for accommodating driving shafts and gears to be hereinafter more fully described. The housing 35 is symmetrical below the partition 30 and defines two troughs 36 and 37 which lie respectively vertically below the points of tangential discharge from rollers 28 and 29 so that yarn discharged from the rollers 28 and 29 will fall directly into the appropriate trough 36 or 37 until it is guided away from its normal vertical path of fall. It has been found that the adhesion of the yarn after it has been laid over the rollers 28 and 29 is such that, even though the running end of yarn is falling free to a trough 36 or 37, little slippage occurs. However, if difficulty were encountered, resort may be had to additional wrap.

Now referring to the apparatus at the lower level of the machine, it will be observed that the rollers 12 and 13 are cantilever supported and are driven from conventional shafts (not shown), which through suitable gearing derive their power from a longitudinal shaft 41 which extends for the full length of the machine through the housing 35.

The number of rollers 12 and 13 is equal to half the number of spinning positions with which the machine is provided and, since this description is concerned with a machine having sixty spinning positions per side, there are thirty rollers 12 at the left side of the machine as it is viewed in Figure 1 and thirty rollers 13 at the right side of the machine. Each roller 12 is inclined upwardly from the horizontal at an angle which is equal to the angle defined between a vertical tangent to the rear face of the roller 28 and a straight line between the point of tangential discharge of the yarn from the roller 28 and the point of tangential reception of the yarn on the roller 12. Thus, the yarns reach the small rollers 12 at right angles to the long axes of said rollers 12 and the position of the yarns on the roller 12 is therefore stable. This is of importance since two yarns are handled by each roller 12 and the stability of the position of each yarn on the roller 12 is necessary to prevent movement of the yarns toward or away from one another, which might result in sticking or in one of the yarns running off the roller entirely. The arrangement described above in respect to rollers 12 and 28 is duplicated on the opposite side of the machine as between rollers 13 and 29.

The yarns leaving the respective rollers 12 and 13 pass to rollers 14 and 15. The roller 14 serves the entire left side of the machine as it is viewed in Figure 1 and the roller 15 serves the entire right side of the machine. These rollers are cylindrical and are of sufficient length to accommodate a sheet of sixty yarns. The axes of the rollers 14 and 15 are horizontal and these rollers are cantilever supported on shafts (not shown), which, through suitable gearing, are driven from main drive shaft 42.

It will be observed that rollers 14 and 15 turn about horizontal axes, and that the axes of the rollers 12 and 13 slope upwardly somewhat from

the horizontal, while the rollers 12, 13, 14 and 15 are all inclined with respect to a plane at right angles to the axis of the machine. This inclination can best be understood by reference to Figure 4 in which a fragment of the right hand side of the Figure 1 machine is shown in plan.

After leaving the roller 15, the yarns pass across another roller 45 which is at right angles to the long axis of the machine and which delivers the yarns to aftertreatment. The roller 45 is shown in Figures 2, 3 and 4, but is not shown in Figure 1, although its position with respect to that figure is easily understood by reference to Figure 2.

On the left side of the machine as it is viewed in Figure 1, the yarns after leaving the roller 14 pass across another roller equivalent to the roller 45 which lies at right angles to the long axis of the machine and which delivers the yarns to aftertreatment.

It will be apparent that the deviation of the axes of the rollers 12—14 and 13—15 from a position at right angles to the longitudinal direction of the machine is small. It will likewise be appreciated that the relative angular dispositions of the rollers 12—14 and 13—15 with respect to the roller 45 and its unnumbered equivalent on the left side of the machine will control the spatial relation which the threads assume on and after the roller 45 and its equivalent on the left side of the machine. The rollers 12 and 13 as well as the rollers 14 and 15, are angularly adjustable so that the spatial relation which the threads can assume can be varied within a reasonable range. The mechanism for making angular adjustments of the several rollers is well known and alone forms no part of this invention. A typical adjustment mechanism is shown in detail in Patent No. 2,129,284 in the name of Uytenbogaart et al.

In Figure 2 the roller 13 which is illustrated is intended to be the same roller as that shown at the extreme left of Figure 3. Thus, while only a pair of yarns are delivered by that particular roller 13, the roller 15 accommodates a number of yarns which in Figure 2 are shown as emanating from behind the roller 13.

It will be observed that no thread guides are provided between the roller 28 and the rollers 12 or between the roller 29 and the rollers 13, the guides being unnecessary in view of the inclination of the rollers which results in stabilizing the position of each yarn accommodated by a roller 12 or 13. However, it is possible to provide guides in the yarn path between the rollers 28—12 and 29—13 which do not touch the yarn as it is following its normal course, but which would serve to keep it in its normal path in the event of disturbances such as might be caused by a draft.

In view of the fact that the yarns passing over the rollers 12, 13 and 14 and 15 are still wet with spin bath liquid, drain shields 46 and 47 are provided at the lower level of the machine. The lower sides are shielded by horizontally movable sash windows 48 and 49 which are diagrammatically indicated in Figure 1. The two sides of the upper level of the machine can be closed and yet made accessible by sash windows 50 and 51 which are balanced by counter weights 52 and 53, respectively. The machine can be ventilated in an upward direction by means of a common cap 54 and suction tube 55.

It can now be appreciated that the machine described in Figures 1 to 4, inclusive, is relatively long in the direction of the sheet of threads but rather narrow at right angles to the length of the sheet, so that the width of the spinning machine is just about equal to the width of the after-treated sheet, which results in very substantial space saving. In Figure 1, cylindrical draw-off rollers 28 and 29 are shown as extending for the full length of the machine. It is understood that these rollers may be replaced by various types of take-up devices known to the art such as the provision of an individual godet for each spinning position. The preferred draw-off roller for use in the position shown for the roller 28 and 29 is described in application Serial No. 159,628, filed May 2, 1950, and assigned to the same assignee as the present application.

Whereas the process and apparatus of the present invention may be used in the production of rayon threads and the like according to the wet spinning process in general, it has particular utility in the manufacture of viscose rayon threads.

What is claimed is:

1. A rayon spinning machine including an upper operating station and a lower operating station, a spin bath container located at the upper operating station of the machine, spinnerets in said container, a trough at the lower level of the machine, driven thread guiding members also at the lower level of the machine for receiving a plurality of yarns and guiding them into parallel relationship to form a sheet, said trough and said guiding members being somewhat horizontally offset and draw-off means at the upper level of the machine for withdrawing freshly spun yarns from the spin bath container and delivering them substantially vertically downwardly toward said trough to be received therein pending manual transfer to the guiding members.

2. A rayon spinning machine including an upper operating station and a lower operating station, an elongated spin bath container located at the upper operating station of the machine, spinnerets in said container, a plurality of cantilever supported thread receiving and propelling rollers at the lower level of the machine extending somewhat rearwardly of a plane at right angles to the long axis of the spin bath and somewhat upwardly from a horizontal plane at the supported end, a single cantilever supported driven roller for receiving the threads propelled by a plurality of said receiving and propelling rollers and draw-off means at the upper level of the machine for withdrawing freshly spun yarns from the spin bath container and delivering them to said thread receiving and propelling rollers.

3. A rayon spinning machine including an upper operating station and a lower operating station, an elongated spin bath container located at the upper operating station of the machine, spinnerets in said container, a plurality of angularly adjustable cantilever supported thread receiving and propelling rollers at the lower level of the machine extending somewhat rearwardly of a plane at right angles to the long axis of the spin bath and somewhat upwardly from a horizontal plane at the supported end, a single cantilever supported driven roller for receiving the threads propelled by a plurality of said receiving and propelling rollers and draw-off means at the upper level of the machine for withdrawing freshly spun yarns from the spin bath container and delivering them to said thread receiving and propelling rollers.

4. A rayon spinning machine including an upper operating station and a lower operating station, an elongated spin bath container located at the upper operating station of the machine, spin-

nerets in said container, a plurality of cantilever supported thread receiving and propelling rollers at the lower level of the machine extending somewhat rearwardly of a plane at right angles to the long axis of the spin bath and somewhat upwardly from a horizontal plane at the supported end, a single cantilever supported angularly adjustable driven roller for receiving the threads propelled by a plurality of said receiving and propelling rollers and draw-off means at the upper level of the machine for withdrawing freshly spun yarns from the spin bath container and delivering them to said receiving and propelling rollers.

5. A rayon spinning machine including an upper operating station and a lower operating station, a spin bath container located at the upper operating station of the machine, spinnerets in said container, a trough at the lower level of the machine, driven thread guiding members also at the lower level of the machine for receiving a plurality of yarns and guiding them into parallel relationship to form a sheet, means driving all of said thread guiding members from a single shaft, said trough and said guiding members being somewhat horizontally offset and draw-off means at the upper level of the machine for withdrawing freshly spun yarns from the spin bath container and delivering them vertically downwardly toward said trough to be received therein pending manual transfer to the guiding members.

6. A two-sided rayon spinning machine including an upper operating station and a lower operating station, a central partition subdividing said machine lengthwise of both stations, a housing at the bottom of said partition, elongated spin bath containers, one located on each side of the partition and both located at the upper operating station of the machine, spinnerets in said containers, a plurality of thread receiving and propelling rollers at the lower level of the machine, means supporting said rollers cantilever fashion from opposite sides of said housing with their axes extending somewhat rearwardly of a plane at right angles to the partition and somewhat upwardly from a horizontal plane at the supported end, a single driven roller on each side of the housing for receiving the thread propelled by the receiving and propelling rollers on that side of the housing, means extending from the housing to support said single rollers cantilever fashion, a trough on each side of the partition on top of the housing but adjacent the bottom of the partition, and draw-off rollers at the upper level of the machine both extending lengthwise of the partition but on opposite sides thereof, the point of discharge of each draw-off roller lying vertically above the respective troughs so that the draw-off rollers may draw off freshly spun yarns from the respective spin bath containers and deliver them vertically downwardly to the trough from which an operator may thread-in individual threads on the thread receiving and propelling rollers.

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