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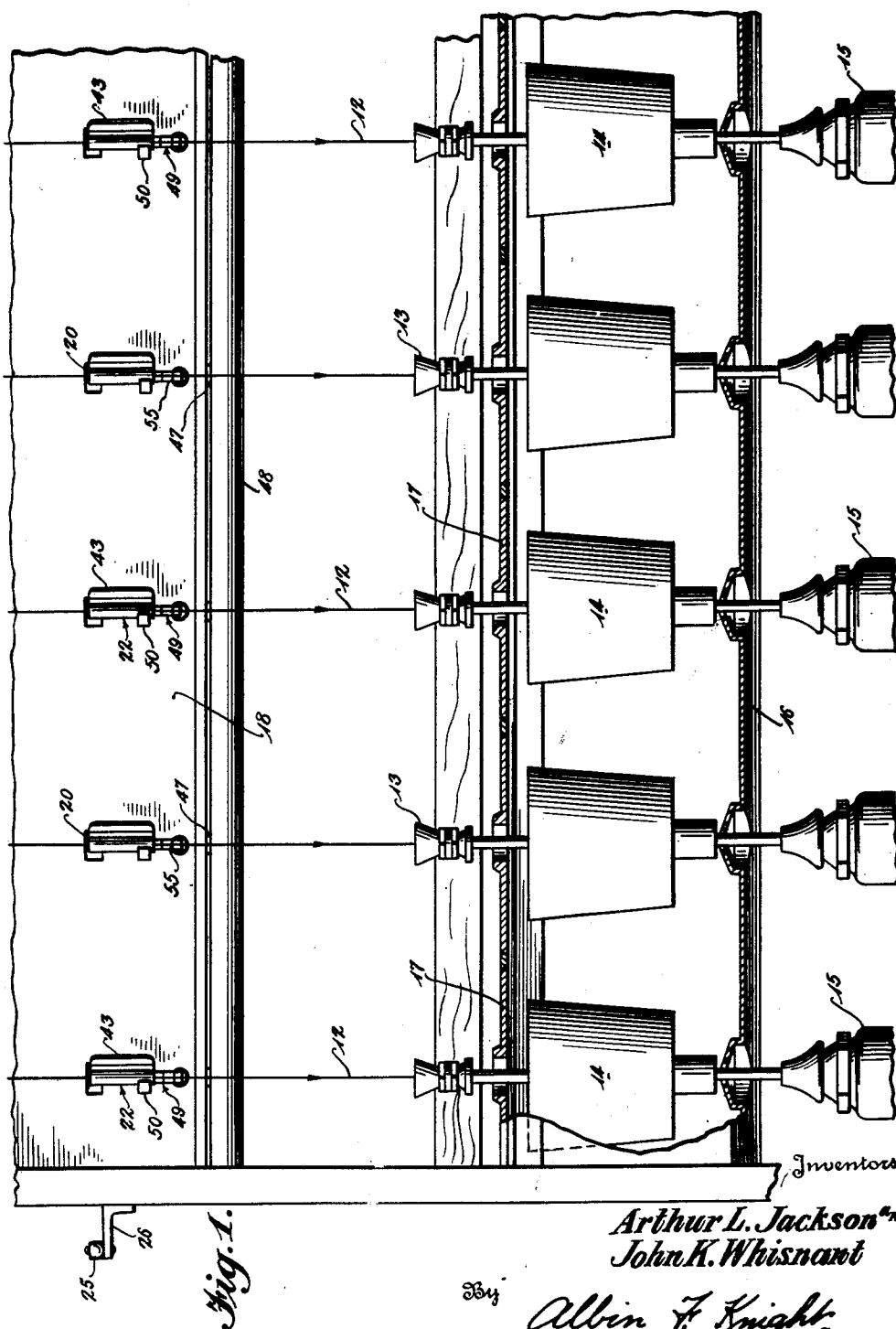
A. L. JACKSON ET AL

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METHOD AND APPARATUS FOR USE IN THE MANUFACTURE OF SYNTHETIC THREADS

Filed July 12, 1944

5 Sheets-Sheet 1



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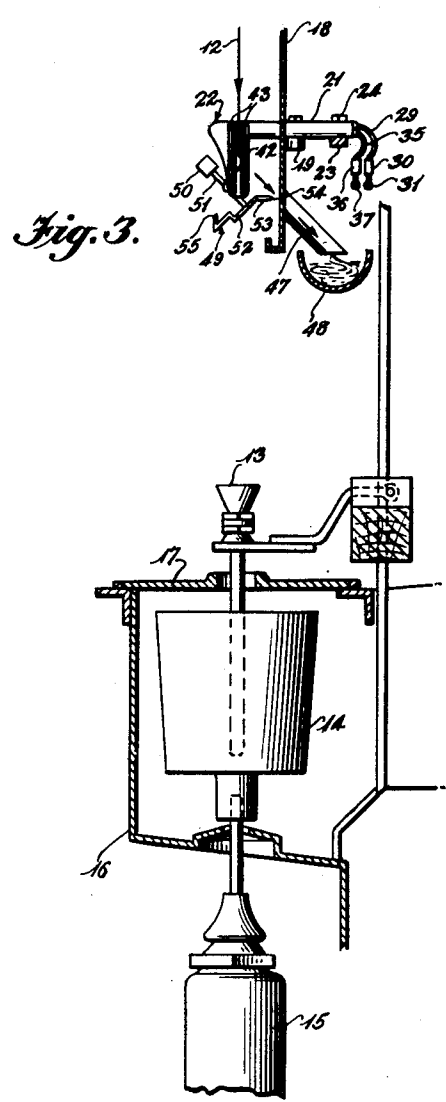
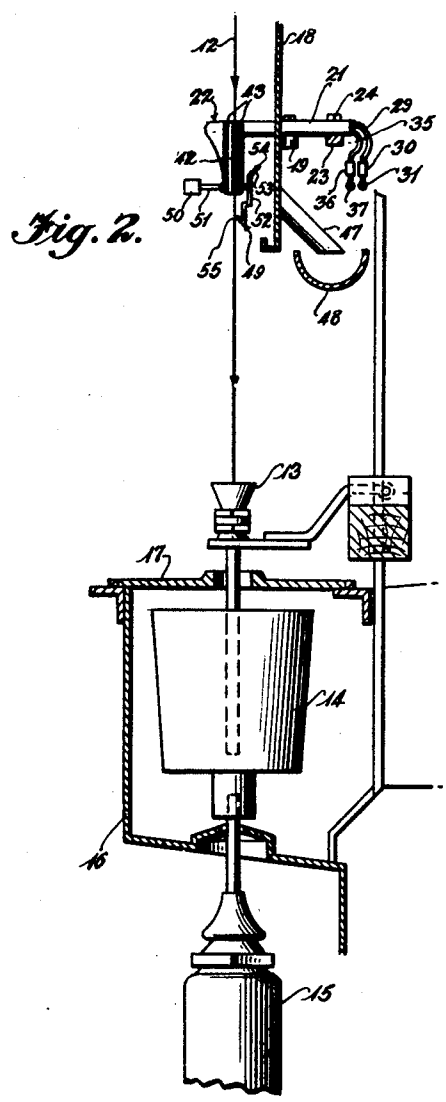
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5 Sheets-Sheet 2



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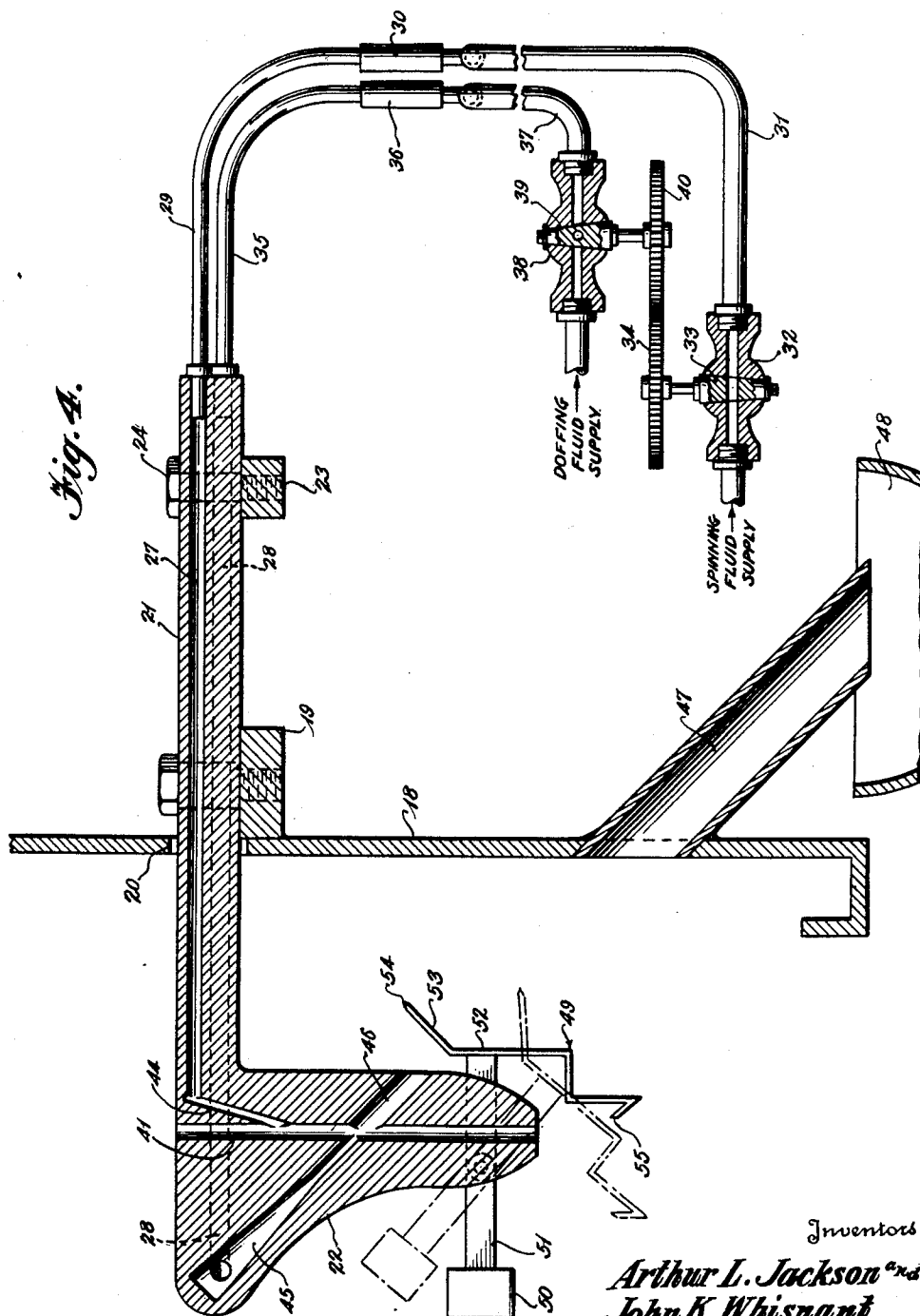
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5 Sheets-Sheet 3



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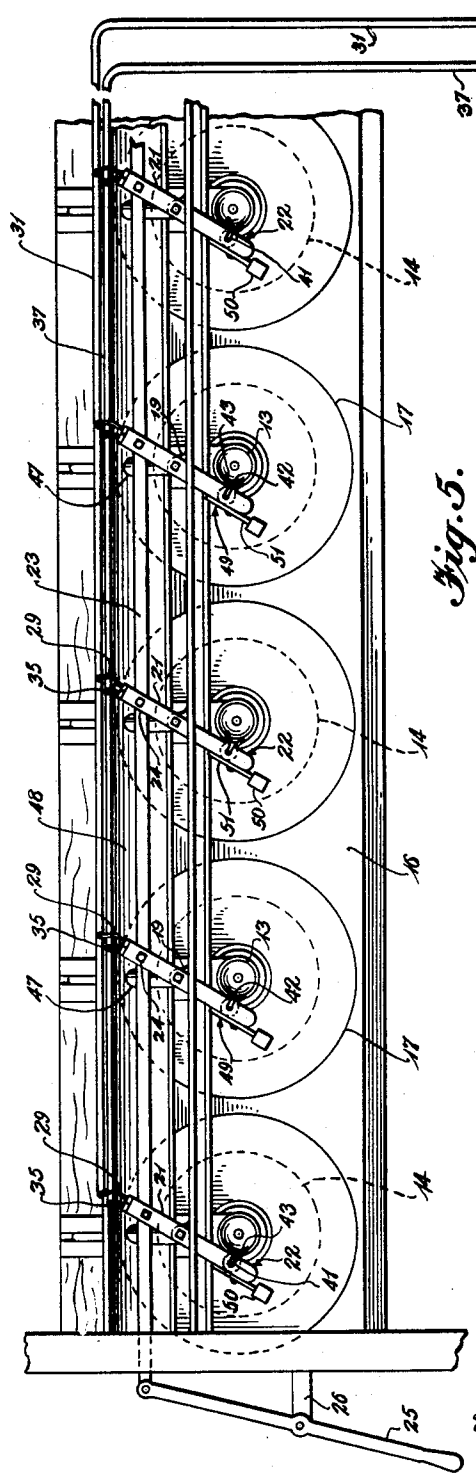


Fig. 5.

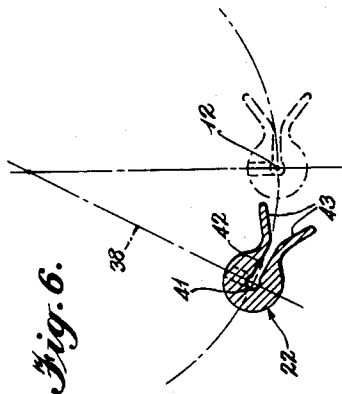
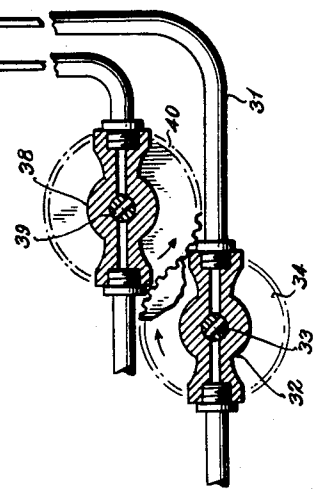


Fig. 6.

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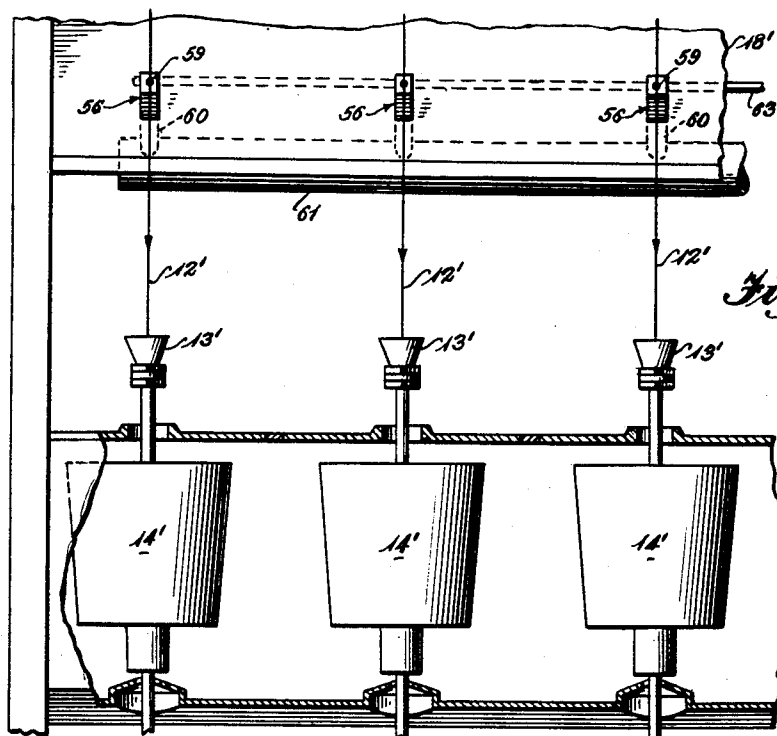


Fig. 7.

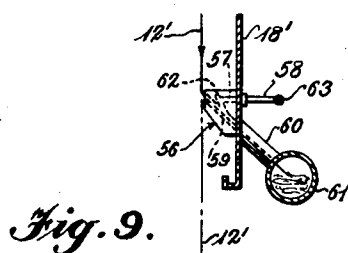


Fig. 9.

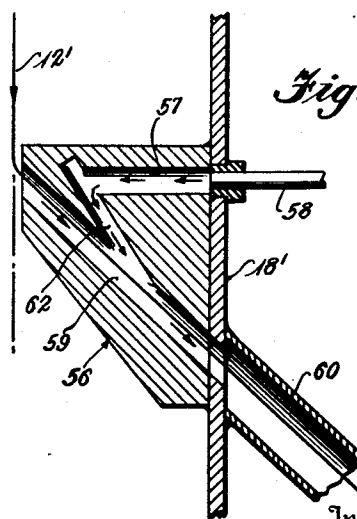
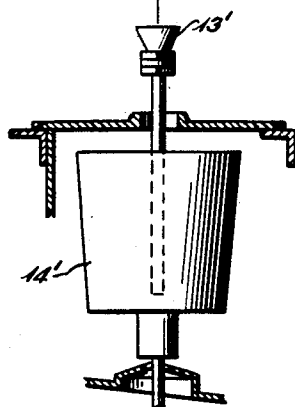


Fig. 8.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR USE IN THE MANUFACTURE OF SYNTHETIC THREADS

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17 Claims. (Cl. 57—34.5)

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The present invention relates to thread or yarn handling and more particularly to the spinning-in and doffing operations involved in the manufacture of rayon.

In the manufacture of rayon, freshly spun filaments are collected or wound in the form of a cake in a rapidly rotating pot or bucket, or the filaments are collected on a bobbin or reel. The spinning solution such as viscose is extruded continuously into a coagulating bath and when a predetermined amount of the thread or yarn composed of the bundle of filaments has been collected in either cake form or in one of the other package forms, a doffing operation is effected. The doffing operation involves, for example, in the centrifugal pot process, the removal of the bucket with the cake therein and the replacing of the same with an empty bucket so that the operation may be continued. Normally the machines for producing rayon have a plurality of spinning positions and a common coagulating bath trough. A corresponding number of collecting devices are utilized. During the doffing period it is customary to manually break several of the adjacent bundles of filaments or threads travelling in parallel and to group and lead the loose ends of the same to a temporary collecting device such as a bobbin or godet, superimposed temporarily on one of the usual godets forming a part of the machine. By such handling of the thread, the succeeding portions thereof coming from the coagulating bath, which is continuous due to the continuous operation of the spinning pumps, are collected as waste thread. The threads are not permitted in any way to become entangled or haphazardly deposited upon the machine. During the period of collection of the waste thread in the usual manner the filled pots are replaced by empty pots whereupon the operator again manually breaks each of the threads and directs the same into its respective empty pot. The doffing and spinning-in operations manually controlled as referred to are time-consuming and inefficient.

It is an object of the present invention to overcome the difficulties heretofore encountered in the doffing step and the spinning-in step involved in the manufacture of rayon. The invention contemplates mechanism by which the mere setting thereof by an operator will effect the delivery of waste thread during the doffing period to a waste thread receiver as a result of the action of fluid current upon the thread.

In general the invention has as an object the handling of thread in which a continuous feed

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is involved for the winding of packages and in which the thread continuously passing is mechanically diverted to a waste collector while the collecting equipment is made ready for the winding of a new package.

A more specific object of the present invention is directed to the manufacture of viscose rayon by the pot spinning procedure in which the thread or filaments passing from a coagulating bath are directed into a position for the production of a cake and in which, upon the completion of the cake, the thread is severed and directed by a fluid current to a waste collector until an empty pot is made ready for the production of a new cake, whereupon the thread being directed to the waste collector is mechanically severed and again directed to a position for the production of a cake within the pot as a result of the action of a fluid current. The invention further contemplates an apparatus in which the referred-to method may be practiced.

Other objects and advantages of this invention will be apparent from the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 illustrates a portion of a rayon pot spinning machine with thread controlling mechanism formed in accordance with this invention attached thereto;

Figure 2 is a sectional view through a portion of the machine illustrated in Figure 1 showing the thread being directed to a centrifugal pot for the production of a cake therein;

Figure 3 is a view similar to Figure 2 in which the thread is shown as having been severed by the severing mechanism with the continuously delivered thread being passed into a waste thread container;

Figure 4 is a detailed sectional view through one of the thread directing and severing members formed in accordance with the preferred embodiment of the invention including a diagrammatic illustration of the fluid controlled mechanism;

Figure 5 is a partial plan view of the pot spinning machine illustrated in Figure 1 including the means for controlling the fluid to the thread severing and directing members;

Figure 6 is a detailed sectional view through the head of one of said thread severing and directing members;

Figure 7 is a partial view in elevation of a pot spinning machine illustrating a modified form of waste thread directing element applied to the machine;

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Figure 8 is a sectional view through one of the waste thread directing elements illustrated in Figure 7; and

Figure 9 is a sectional view on line 9—9 of Figure 7.

In referring specifically to the drawings and more particularly to Figures 1-6, inclusive, part of a pot spinning machine is illustrated in which a series of threads 12 are continuously supplied or fed from a suitable source. Although the source is not shown, it may be a viscose solution which has been extruded through an acid bath to form a plurality of bundles of filaments which are drawn from the coagulating bath as threads 12. Each thread 12 is propelled by the usual godets (not shown) and is thereafter directed downwardly through a funnel 13 which is reciprocated for laying up convolutions of the thread within centrifugal pot 14 propelled at high rotary speed by a motor 15.

Pots 14 are normally retained within the housing 16 and each pot has a cover 17 overlying the same for the purpose of preventing the coagulating bath carried with threads 12 from being thrown outwardly upon the surrounding portion of the machine.

A wall 18 having its lower end terminating in spaced relation to the covers 17 is provided with a series of lugs 19 adjacent slots 20 arranged within the wall. A stem 21 is pivoted to each of the lugs 19, the stems extending through corresponding slots 20 and mounted to swing in a restricted arc in a horizontal plane, and each having its end at the front face of the wall 18 formed into a head 22. Stems 21 and heads 22 are acid resistant and made of a suitable metal, hard rubber or synthetic resin. A connecting bar 23 supported by pivotal connections to the stems 21 by means of bolts 24 extends parallel to the wall 18 and is connected to a handle 25 arranged at one end of the machine. Handle 25 is pivoted near its center to a bracket 26. The movement of the handle 25 will cause the pivoting of each of the stems 21 in a horizontal plane and in unison. Each of the stems 21 is provided with two ducts 27 and 28, respectively. A flexible tube 29 is secured within the end of duct 27 and the end of tube 29 through the medium of a sleeve 30 is connected with a conduit 31 which is in turn connected to a valve 32. Valve plug 33 has a gear 34 fixed to its stem. Fluid under pressure from a source (not shown) is adapted to be admitted through valve 32 and passed through a conduit 31, sleeve 30 and tube 29 into duct 27. Similar means for supplying fluid under pressure are provided for duct 28. This means comprises a flexible tube 35, a sleeve 36, a conduit 37 and valve 38. Valve 38 has a plug 39 and a gear 40 is fixed to its stem, which gear 40 is in constant mesh with gear 34 of valve 32.

The heads 22 are each provided with a vertical passageway 41 which is open at its side as at 42 and is provided with angularly disposed guide wings 43 in order that the movement of the stems 21 as a result of the manipulation of handle 25 will cause the respective heads 22 to move into alignment with the corresponding threads 12. During such movement of the heads, the threads are guided into position within the respective slots 41 by means of the wings 43. Each of the heads 22 is provided with a duct 44 in communication with duct 27, which duct 44 is of reduced diameter and is connected into vertical passageway 41 at an angle to cause a jet of fluid to pass

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downwardly and out of the lower end of passageway 41 when fluid under pressure is admitted into duct 27 as a result of the opening of valve 32. Each duct 28 is connected to a fluid conical-shaped passageway 45 in the respective head 22 and the lower end of the passageway 45 is of reduced diameter to cause a jet of fluid to be projected across passageway 41 which it intersects and out through a passageway portion 46 of increased diameter.

Adjacent each head 22 a waste thread tube 47 is angularly connected to wall 18 at the rear thereof and extended down to a waste thread collector 48. Upon the opening of valve 38 and the closing of valve 32 fluid under pressure is admitted into duct 28 from which it passes into passageway 45 and outwardly through the portion 46 where it is directed into tube 47.

A knife member 49 pivoted to each head and provided with a counter-weight 50 normally rests in the position shown in full lines in Figure 4. A bar 51 to which the counter-weight is attached has mounted on its inner end a knife and vane member 52. Vane 53 overlies the exit end of passageway portion 46 and is provided at 54 with a sharpened edge. At the end of member 52 remote from edge 54 is an angularly disposed knife 55. As shown in Figure 4, knife 55 normally lies adjacent to the plane of passageway 41 below the lower end thereof but it is adapted to intersect the plane of passageway 41 when a jet of fluid is directed upon vane 53 as a result of the opening of valve 38. Upon the discontinuance of the jet through passageway portion 46 weight 50 will cause knife member 49 to pivot to its normal position and as a result move knife 55 out of the plane of passageway 41 while at the same time causing knife edge 54 to intersect the plane of passageway 45.

In operation of the machine illustrated in Figures 1-6, inclusive, the threads 12 are supplied continuously from a normal source and are directed downwardly through funnels 13 and into pots 14 where, due to the centrifugal force set up by the rotation of the pot, cakes are laid up therein. The funnels 13 are reciprocated in the normal manner during this operation. After the cakes in the respective pots become built up to the desired size, a doffing operation is necessary. Since one of the normal sources is a spinning solution wherein a viscose solution is extruded continuously the threads 12 must be permitted to waste during the doffing period. This involves the movement of funnels 13 to positions where they will not interfere with the removal of pots 14. Covers 17 and the pot 14 are then removed, whereupon the cakes are taken from the pots and the pots again replaced for the next spinning-in operation or other empty pots are placed in operative positions.

In order to effect the mechanical severance of each thread for the doffing operation and the collection of the waste thread in a receptacle so as to avoid the improper accumulation of waste upon the machine, handle 25 is moved so as to cause connecting bar 23 to pivot each of the stems 21 to a position where the respective threads 12 pass downwardly through passageways 41 in the heads 22. During the operation as thus far described both valves 32 and 38 have been maintained closed. The valve plugs are provided with passageways as is indicated in Figure 5 and the rotation of the gears 34 and 40 by means of a rack bar or other operating device actuated from the end of the machine will cause valve

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38 to open while valve 32 remains closed. Supply of fluid such as water, steam or air under pressure is then admitted through valve 38 and the connecting conduits into bore 28 of the respective stem and the fluid is then discharged into passageway 45 where it is projected through passageway portion 46 against vane 53 to cause the knife and vane member 52 to be moved whereupon knife 55 severs the thread 12. Thereupon the extending portion of the thread, and the thread as fed is forced out through opening 46 into tube 47, and into receptacle 48. As long as the fluid is thus forced through passageway portion 46 the vane 53 is held downwardly so as to permit direct passage of the thread from the passageway portion 46 into tube 47.

During the period that the threads are thus collected in the waste receptacle 48 the centrifugal pots are removed and emptied and empty pots placed in operative position. The doffing having been completed gears 34 and 40 are then rotated so that valve 38 is closed and valve 32 is opened. Spinning-in fluid is then passed through the conduits into passageway 27 of each of the stems 21, and a jet of fluid is projected downwardly through passageway 41. Since the fluid impinging upon vane 53 has been discontinued by the closing of valve 38, vane and knife member 52 is caused to move by weight 50, and as knife edge 54 passes through the plane of passageway portion 46, the thread, being delivered to the waste receptacle, is severed by the knife edge. The jet of fluid entering passageway 41 through bore 44 engages thread 12 and causes the end thereof and the thread as it is continued to be fed into passageway 41 to pass outwardly through the lower end of passageway 41 whereupon it is delivered into the upper end of funnel 13 and then into the pot 14 which has been set in motion for laying up the thread in the usual manner.

After the spinning-in step, handle 25 is moved in the opposite direction in order to cause the heads of each of the stems to move out of the plane of the respective threads 12 and gears 34 and 40 are rotated to cause the valve plugs to assume the position illustrated in Figure 5 which results in the closing of both valves so that no fluid is flowing in either of the passageways 27 or 28 of the respective stems.

In the preferred form of this invention excellent results can be attained by utilization of an air or other gas for doffing the thread and the utilization of a liquid such as water for redirecting the thread into the spinning bucket.

A modified form of apparatus is illustrated in Figures 7-9, inclusive. The spinning machine is of the same construction as that illustrated in Figures 1-6, inclusive. However, in the modified form the board 18' has permanently fixed to the front face thereof a member 56 above each of the pots 14'. Members 56 have passageways 57 in communication with a source of air or other gas under pressure by means of pipes 58. A passageway 59 angularly disposed in a downward direction is provided in each member 56 and it communicates with tubes 60 secured to the back of wall 18'. The tubes 60 are each connected to a waste collector 61. Bores 57 each have a branch bore 62 of reduced diameter arranged at an acute angle thereto. Branch bores 62 enter passageways 59 at an angle and cause the air passing through pipes 58, bores 57, and branch bores 62, to be projected downwardly through pas-

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sageways 59 through tubes 60 and into waste collector 61.

In the operation of the structure illustrated in Figures 7-9, inclusive, when it becomes desirable to doff, the operator manually breaks the threads 12' and since the air has been caused to flow through pipes 58, bores 57 and branch bores 62 and thence downwardly through passageways 59, suction is created at the entrance of each passageway 59 which causes the threads to be drawn into the passageways and for the threads as they are continuously fed to be passed into the waste collector 61 until the doffing is completed and the spinning-in operation is to begin, whereupon the threads are severed by the operator from their portions passing to the waste collector and the threads are permitted to pass through funnel 13'. Pipes 58 are connected to the gas supply line 63 which in turn is connected to a suitable source of gas under pressure (not shown).

The structure illustrated in Figures 7-9, inclusive, involving the modified form may be readily employed in various types of operations. This structure is very well suited for employment in thread collection such as the bobbin spinning process and in operations involving the twisting of thread where the thread is fed to the collection apparatus in a continuous manner.

What is claimed is:

1. In a process of collecting rayon the steps which comprise continuously feeding the rayon into a centrifugal pot, establishing a current of fluid, severing the freshly formed thread after a predetermined period of delivery into said pot by impinging the current of fluid upon an element to effect operation of severing means, subjecting the thread to the action of said fluid current for directing the thread to a waste collecting zone, providing a pot for initiating a further collecting operation, severing the thread from that portion collected in the waste zone by effecting actuation of said severing means upon the discontinuance of the current of fluid, and directing the severed end of the thread into a position for again initiating the continuous passage of the thread into the last mentioned pot by establishing another current of fluid and impinging the same upon the thread.

2. A process of collecting freshly formed rayon thread comprising delivering the thread continuously to a normal collection zone, establishing a current of air, severing the freshly formed thread after a predetermined period of collection by impinging the current of air upon an element to effect operation of severing means, subjecting the remaining thread as it is continued to be delivered to the action of said air current for directing the thread into a waste collection zone, preparing the normal collection zone for a further collecting operation, severing the thread from that collected in the waste zone and directing the severed end of the thread into a position for again initiating the continuous passage of the thread into the normal collection zone by contacting the thread with a current of liquid.

3. A process of collecting freshly formed rayon thread comprising delivering the thread continuously to a collection device, establishing a current of fluid, severing the freshly formed thread after a predetermined period of collection by impinging the current of fluid upon an element to effect operation of severing means, subjecting the remaining thread as it is continued to be delivered to the action of said fluid current moving

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in a direction for causing the thread to pass into a waste collection zone, preparing a collection device for a further collecting operation, effecting severance of the thread from that collected in the waste zone by actuating said severing means upon the discontinuance of said current of fluid and directing the severed end of the thread into a position for again initiating the continuous passage of the thread to the last mentioned collection device by establishing another current of fluid directed toward said collection device and impinging the same upon the thread.

4. A process for handling thread comprising delivering thread continuously to a normal collection zone, establishing a current of fluid, severing the thread after a predetermined period of collection by impinging the current of fluid upon an element to effect operation of a severing means, subjecting the remaining thread as it is continued to be delivered to the action of said fluid current for directing the thread into a waste collection zone, preparing the normal collecting zone for a further collecting operation, severing the thread from that collected in the waste zone and directing the severed end thereof into a position for again initiating the continuous passage of the thread into the normal collecting zone by contacting the thread with a current of fluid.

5. A process for handling thread comprising delivering thread continuously to a normal collection zone, establishing a current of fluid, severing the thread after a predetermined period of collection by impinging the current of fluid upon an element to effect operation of severing means, subjecting the remaining thread as it is continued to be delivered to the action of said fluid current for directing the thread into a waste collection zone, preparing the normal collection zone for a further collecting operation, effecting severance of the thread from that collected in the waste zone by actuating said severing means upon the discontinuance of said current of fluid and directing the severed end thereof into a position for again initiating the continuous passage of the severed thread into the normal collection zone by establishing another current of fluid and impinging the same upon the thread.

6. In apparatus for the collection of thread, a rotatable bucket, a funnel mounted for reciprocation within the bucket for feeding a thread into the same to form a cake, vertically fixed fluid controlling means independent and separate from the funnel to automatically divert the thread from the bucket when the cake is complete and vertically fixed fluid controlling means independent and separate from the funnel for automatically redirecting the thread into an empty bucket when it is in position.

7. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, means for guiding and feeding the thread to the collection device, waste thread collection means and vertically fixed means in the path of travel of the thread preceding the guiding and feeding means for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said thread directing means having a bore through which a current of fluid is directed for propelling the continuously delivered thread to the waste collection means.

8. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, means for guiding and feeding the thread to the collection device, waste

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thread collection means, a back board, and means supported by the back board in the path of travel of the thread preceding the guiding and feeding means for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said thread directing means having a bore through which a current of fluid is directed for propelling the continuously delivered thread through said bore to the waste collection means.

9. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, means for guiding and feeding the thread to the collection device, a back board, waste thread collection means having a guide secured to the back of the board, and means supported by the board in the path of travel preceding the guiding and feeding means for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said thread directing means having a bore through which a current of fluid is directed for propelling the continuously delivered thread through said bore and through said guide to the waste collection means.

10. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means having a guide secured to the back of the board, a stem pivoted to the board above the guide of the waste collection means and a head on the stem in the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a bore through which a current of fluid is directed for propelling the continuously delivered thread through said bore and through said guide to the waste collection means.

11. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a stem pivoted to the board above the waste collecting means, and a head on the stem adapted to be moved into the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a vertical bore through which the thread is adapted to pass when the head is moved to a position in alignment with the thread prior to severance thereof and having a transverse bore through which a current of fluid is directed for propelling the continuously delivered thread after severance through said last mentioned bore to the waste collection means.

12. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means having a guide secured to the back of the board, a stem pivoted to the board having a passageway for fluid therein and a head on the stem adapted to be moved into the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a vertical bore formed with an open side through which bore the thread is adapted to pass when the head is moved into alignment with the thread prior to severance thereof and having a transverse bore

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in communication with the passageway in the stem through which a current of fluid is directed for propelling the continuously delivered thread after severance through said last mentioned bore and through said guide to the waste collection means.

13. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a stem pivoted to the board above the waste collecting means, and a head on the stem adapted to be moved into the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a vertical bore through which the thread is adapted to pass when the head is moved to a position in alignment with the thread prior to severance thereof and having a transverse bore through which a current of fluid is directed for propelling the continuously delivered thread after severance through said last mentioned bore to the waste collection means, the head being further provided with a cutting mechanism having a vane normally overlying the end of the transverse bore and a cutting element connected thereto normally lying adjacent the lower end of the vertical bore, which cutting element is adapted to sever the thread upon being moved across the plane of the vertical bore as the result of the current of fluid from the transverse bore forcing the vane from the position overlying its end.

14. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a stem pivoted to the board above the waste collecting means, and a head on the stem adapted to be moved into the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a vertical bore through which the thread is adapted to pass when the head is moved to a position in alignment with the thread prior to severance thereof and having a transverse bore through which a current of fluid is directed for propelling the continuously delivered thread after severance through said bore to the waste collection means, the head being further provided with a cutting mechanism having a vane normally overlying the end of the transverse bore and having a cutting edge, said cutting mechanism also having a cutting element connected thereto normally lying adjacent to the lower end of the vertical bore, which cutting element is adapted to sever the thread upon being moved across the plane of the vertical bore as the result of the current of fluid from the transverse bore forcing the vane from the position overlying its end and the cutting edge on the vane being adapted to move across the end of the transverse bore to sever the thread passing to the waste collection means when the current of fluid in the transverse bore is interrupted.

15. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a stem pivoted to the board above the waste collecting means, said stem having two longitudinal passageways there-

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in, a head on the stem adapted to be moved into the path of travel of the thread preceding the normal collection device for directing the thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, said head having a vertical bore through which the thread is adapted to pass when the head is moved to a position in alignment with the thread prior to severance thereof and having a transverse bore through which a current of fluid is directed for propelling the continuously delivered thread after severance through said last mentioned bore to the waste collection means, the said bores in the head each being in communication with one of the respective passageways in the stem, flexible conduits connecting each of the passageways to means for supplying fluid under pressure thereto, and interconnected valve means for admitting fluid to the respective passageways as selected and for concurrently interrupting the admission of fluid thereto.

16. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a series of stems pivoted to the board each having a passageway for fluid therein and a head, the head on each stem being adapted to be moved into the path of travel of one of the threads preceding each corresponding normal collection device for directing the particular thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, each of said heads having a vertical bore formed with an open side in which bore the corresponding thread is adapted to pass when the head is moved into alignment therewith prior to its severance, each head also having a transverse bore in communication with the passageway in its stem through which a current of fluid is directed for propelling the continuously delivered corresponding thread after severance through said bore and through said guide to the waste collection means, and common means for moving each head into and out of operative position.

17. Apparatus for the collection of rayon comprising normal collection devices for thread supplied continuously thereto, a back board, waste thread collection means, a series of stems pivoted to the board each having two passageways for fluid therein and a head, the head on each stem being adapted to be moved into the path of travel of one of the threads preceding each corresponding normal collection device for directing the particular thread to the waste collection means upon severance of the thread at the end of a spinning period and during doffing, each of said heads having a vertical bore formed with an open side in which bore the corresponding thread is adapted to pass when the head is moved into alignment therewith prior to its severance, each head also having a transverse bore, common means for moving the stem into and out of operative position, the bores of each head being in communication with one of the passageways in their corresponding stems, flexible conduits connecting the respective passageways in the stems to fluid pressure sources, and valve means for admitting fluid under pressure to one of the passageways of each stem as selected and for discontinuing the admission of fluid thereto simultaneously.

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