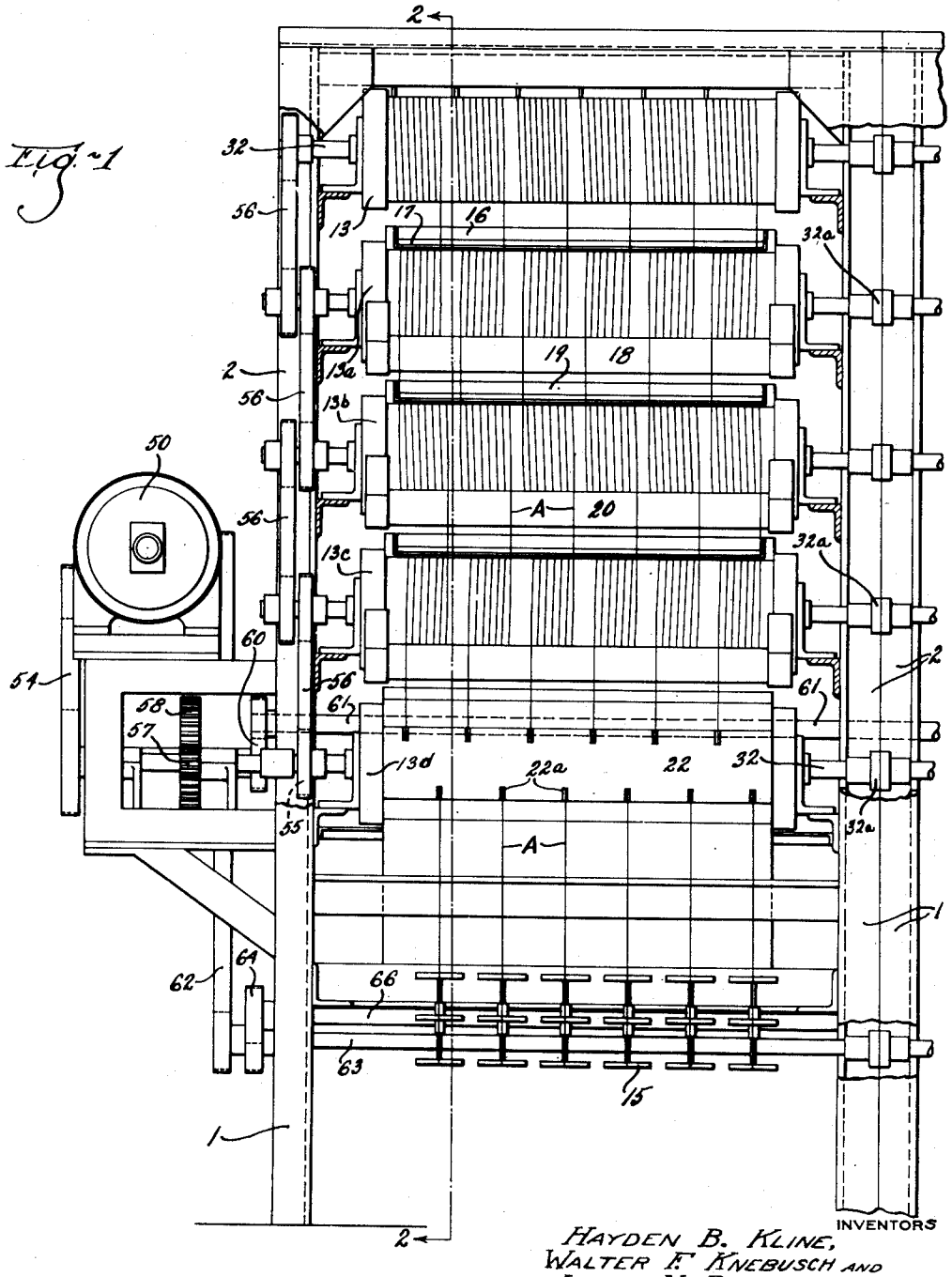
Dec. 24, 1940. H. B. KLINE ET AL 2,225,640

APPARATUS FOR MANUFACTURING THREAD OR THE LIKE

Filed Jan. 12, 1933 3 Sheets-Sheet 1

Fig. 1



INVENTORS

HAYDEN B. KLINE,
WALTER F. KNEBUSCH AND
ALDEN H. BURKHOLDER

BY

Brockett, Hyde, Higley & Meyer

ATTORNEYS

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APPARATUS FOR MANUFACTURING THREAD OR THE LIKE

Filed Jan. 12, 1933 3 Sheets-Sheet 2

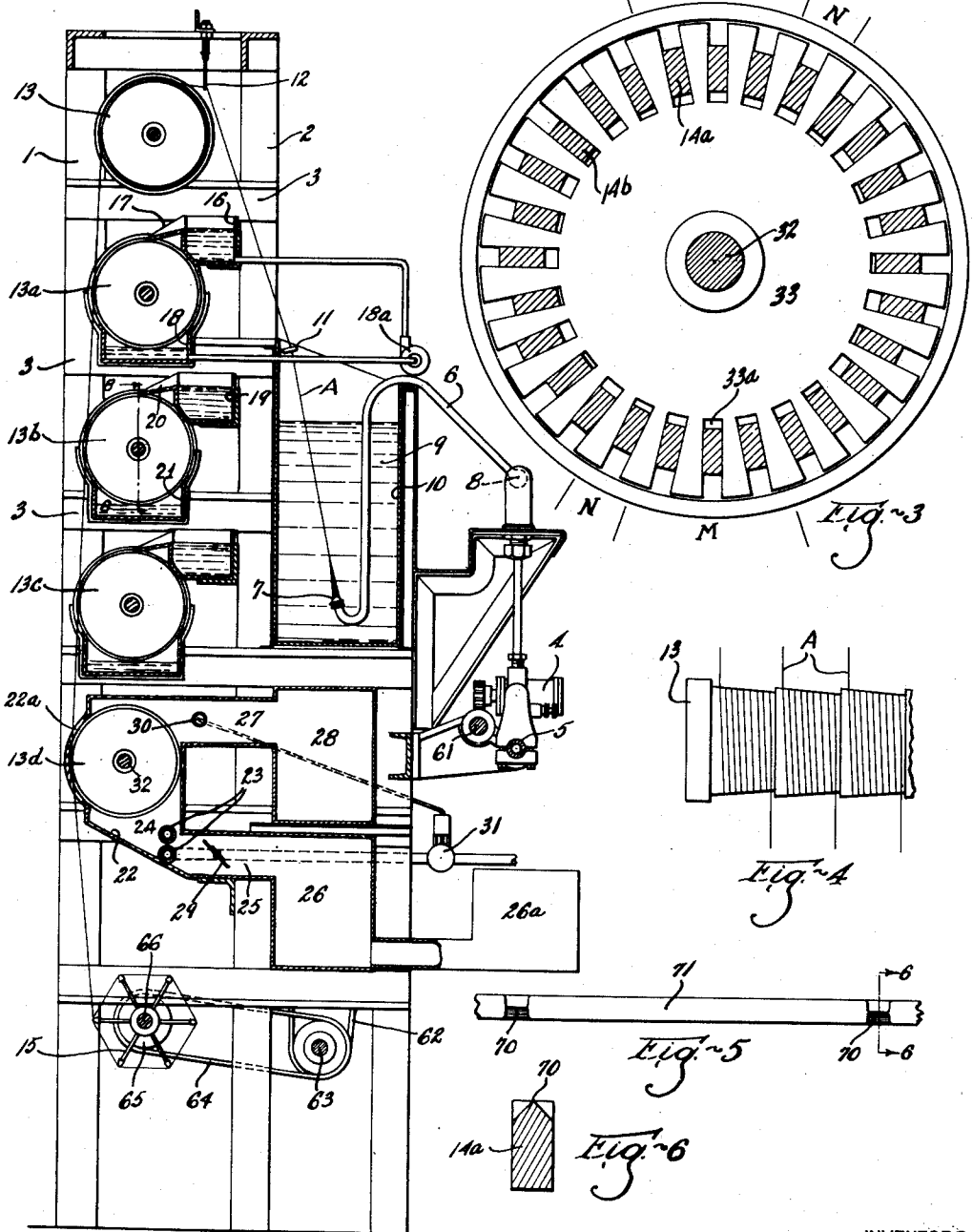


Fig. 2.

Fig. 3

Fig. 4

Fig. 5

Fig. 6

INVENTORS

HAYDEN B. KLINE,
WALTER F. KNEBUSCH AND
ALDEN H. BURKHOLDER

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ATTORNEYS

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APPARATUS FOR MANUFACTURING THREAD OR THE LIKE

Filed Jan. 12, 1933 3 Sheets-Sheet 3

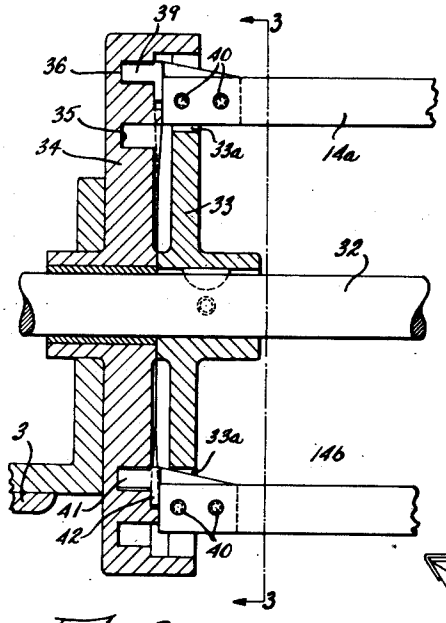


Fig. 8.

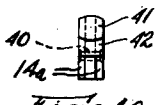


Fig. 10

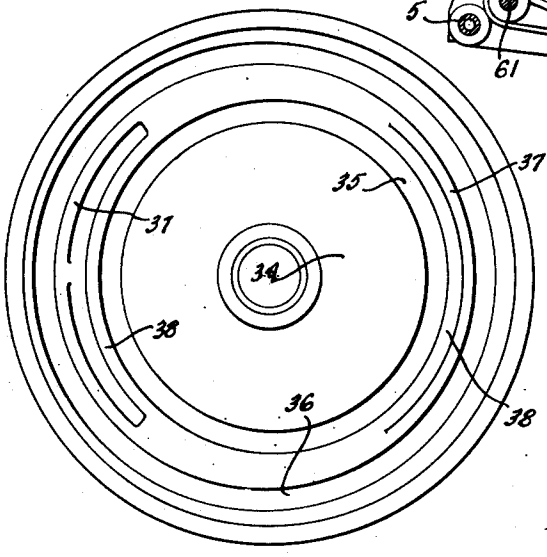


Fig. 9.

Fig. 7

INVENTORS

HAYDEN B. KLINE,
WALTER F. KNEBUSCH AND
ALDEN H. BURKHOLDER.

BY

Brockett, Hyde, Higley & Meyer

ATTORNEYS

Patented Dec. 24, 1940 2,225,640

UNITED STATES PATENT OFFICE

2,225,640

APPARATUS FOR MANUFACTURING THREAD OR THE LIKE

Hayden B. Kline, Cleveland, Walter F. Knebusch, Fairview Village, and Alden H. Burkholder, Lakewood, Ohio, assignors to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Application January 12, 1933, Serial No. 651,404

7 Claims. (Cl. 18—8)

This invention relates broadly to the manufacture of thread or the like. More particularly, it relates to the production, manipulation and processing, especially by a continuous method, of thread or the like, as, for example, multiple filament artificial silk thread. The invention aims to provide process and apparatus by which, in a single machine, the thread or the like may, if desired, be produced, processed in various ways, dried, and taken up or wound in finished or semi-finished package form ready for shipment, distribution, fabric manufacture, or the like. The invention further aims to provide process and apparatus permitting a closer degree of control in the manufacture of the thread or the like, with the consequent advantage of greater uniformity of the product.

One object of the invention is to provide method and apparatus by which any number of process steps can be performed on the thread or the like while it is in continuous motion, as from the source to the collecting device, but nevertheless in a manner to avoid contamination of one bath by another, or, in other words, with complete separation of the various process steps and baths from each other. A further object is to provide apparatus which is exceedingly compact, occupying little, if any, more floor area than the ordinary artificial silk spinning machine, in which all parts of the thread or the like are readily accessible and in which the machine as a whole is of convenient form for any necessary adjustment, replacement or repair. Still a further object is to provide improved multiple form continuous processing apparatus capable of being built in units placed end to end, with the several steps of the process performed on devices vertically spaced from each other, for the purpose of economizing space and affording convenient access to the thread or the like.

Other objects of the invention in part are obvious and in part will appear more in detail hereinafter.

In the drawings, Fig. 1 is a front elevation of a portion of one form of apparatus embodying the invention; Fig. 2 is a sectional elevation on the line 2—2, Fig. 1, looking in the direction of the arrows, parts being omitted for simplicity of illustration; Fig. 3 is a detail cross section, on the line 3—3, Fig. 8; Fig. 4 is a diagram, in elevation, showing a modification; Fig. 5 is an enlarged plan of a portion of one of the bars; Fig. 6 is a cross section on the line 6—6, Fig. 5; Fig. 7 is an end view from the left in Fig. 1; Fig. 8 is a detail sectional elevation on the line 8—8, Fig. 2, through one end portion of one of the winding reels, all bars beyond the plane of section being omitted for clearness of illustration; Fig. 9 is a detail end elevation of one of the controlling cams; and Fig. 10 is a detail end view of one of the reel bars.

While the invention is, among other things, adapted to use in connection with any process of making artificial silk thread, such, for example, as the cuprammonium, cellulose nitrate, cellulose acetate, and viscose processes, for convenience but in no sense of limitation it has been illustrated and will be described only in connection with the manufacture of artificial silk thread by the viscose process. The purpose of the invention is, among other things, to provide a method and apparatus by which viscose artificial silk thread may be withdrawn in any convenient manner from its source and then led in turn to various devices for subjecting it to the appropriate method steps. The invention further has for its purpose to provide means for delivering the thread so processed in finished or partly finished form, preferably dry, wound or otherwise collected in package form convenient for handling or shipment. In these respects the invention is, of course, no less applicable to various other processes of manufacturing thread or the like.

In the viscose process, generally speaking, a suitable sodium cellulose xanthate solution is extruded into an acid coagulating bath. The thread so formed is collected either upon bobbins in a bobbin spinning machine or in the form of cakes in a centrifugal spinning machine, after which the thread, upon the bobbins or in cake form, is subjected to various treatments, such as washing, desulfurizing, bleaching, souring, drying and the like. Some of these steps may be omitted or other or additional method steps may be performed upon thread, as will be readily understood. According to the present invention, any or all of these various method steps may be performed upon the thread during continuous thread motion from the point of spinning to the device upon which it is finally collected. The drawings for convenience show only a few such steps, but they may be multiplied indefinitely, as will appear.

Referring first to Figs. 1, 2 and 7, the machine illustrated as embodying the invention comprises a suitable frame including front and rear uprights 1, 2 connected by horizontal cross braces 3 designed to support the parts for the different steps of the process. The frame, and indeed the

machine as a whole, is readily fabricated in unit form with the ability to attach to each other, in regular order, any number of such units, so as to multiply to any desired degree the number of threads which may be produced in a given multiple machine. For example, as many as one or two hundred complete sets of thread forming devices may be readily included in a single machine and be operated by the same source of power, the several sets of devices being disposed in alignment. For simplicity of illustration, there has been shown but a single multiple unit equipped to form six threads, although the number formed in each unit may be more or less than six.

At the back of the frame are mounted the necessary devices for spinning the thread, such as the pumps 4 supplied by a mass distributing conduit 5, each of which pumps delivers its quota of viscose to the usual swinging arm 6 terminating in a spinneret 7. Arms 6 are hinged to turn about an axis at the point 8 for the purpose of swinging the spinnerets into or out of the coagulating bath, as is usual. In operation the spinneret is immersed beneath the acid coagulating bath 9 in a trough 10. Thread A is led from the spinneret through the bath over or through suitable guides 11, 12 to the first of a series of winding devices, five being shown in the drawings, marked respectively 13, 13*a*, 13*b*, 13*c*, 13*d*. Except for differences in the baths used with them, the process steps in which they are used, their diameters, and the direction of thread lead, these devices are alike in construction and manner of operation, so that detailed description of one will suffice for all.

Generally speaking, each of the winding devices 13, 13*a*, etc., may be any form of device upon which the thread may be continuously wound upon which it may be stored in relatively long length and from which it may be continuously unwound. In other words, the device is preferably so constructed and so operated as to enable the thread to be simultaneously wound upon it and unwound from it. At the same time, the device preferably has the capacity to store an appreciable length of the thread while exposing its entire length to treatment by processing reagents. Successive turns of the thread may, if desired, but preferably should not be permitted to contact with each other and the thread should not be subjected to undue strain or rough handling. Various devices of the nature of thread-storage, thread-advancing reels, one form of which will be described more in detail hereinafter, are suitable for the purpose.

In the arrangement shown in the drawings, each reel is of generally cylindrical form. Each reel includes two sets of bars 14*a*, 14*b* of rectangular cross section disposed parallel to each other and arranged to form the elements of a cylinder. Taken together, the bars constitute a hollow cage-like thread-handling device upon which the thread is wound in generally helical form. The reel is provided with means for operating the bars, individually and as groups, so as to cause thread wound upon it to assume such helical form and to cause the thread to progress bodily along the length of the reel from the point where it is wound thereupon to a discharge point. At such discharge point the thread is unwound from the reel and led to the next reel. The reels illustrated are long enough to take care of a plurality of threads, six being shown in the drawings. In other words, each reel is divided into six zones arranged end to end. In each zone the reel carries a large number of substantially helical turns of thread, as many as from fifty to two hundred turns of thread, although the turns are shown more widely spaced for clearness of illustration. The number of threads handled by a single reel may, of course, be more or less than six, as may be desired.

Any number of said reels may be mounted in vertically spaced relation, five being shown in the drawings. The mechanism of successive reels 13, 13*a*, 13*b*, etc., is so arranged as to produce travel of the turns of threads along the reels in one direction on the first reel, along the reel in the opposite direction on the next reel, and so on. In other words, and as shown in Fig. 1, the turns of thread progress bodily from left to right on reel 13, from right to left on reel 13*a*, from left to right on reel 13*b*, and so on, so that each thread travels through from reel to reel in this manner clear to the bottom of the machine. The thread passes from the last reel, 13*d*, to a device conventionally shown at 15 and adapted to collect the thread in any suitable package form, such as in the form of a cone, hank, or the like. The thread is led from reel to reel in such manner that the transfer or carry over of the thread from reel to reel is at the front or working face of the machine, as shown in Fig. 2.

In the machine shown in the drawings, the upper reel 13 is a holding or set-up reel upon which coagulation is allowed to proceed to completion. The thread upon it is shown as not subjected to any bath, although it may be, if desired, according to the requirements of a particular process. Guides 11 and 12 serve as wipers to turn back toward the trough 10 surplus bath liquor clinging to and carried up by the thread. The thread is wound upon the upper reel 13 in wet or moist condition. The entire time necessary for the thread to pass to the feeding on point and progress along reel 13 to the place of discharge therefrom is utilized to permit substantially complete regeneration of the sodium cellulose xanthate to cellulose.

The drawings show the second stage of the machine as utilized for a washing step, such as washing with hot water to remove acid coming from the coagulating bath or with hot water containing a small amount of sodium bicarbonate, soda ash or other reagent, for neutralizing remaining traces of acid from the coagulating bath. In this stage, the reel 13*a* is provided with suitable means for supplying wash liquor to the thread upon the reel, such as a supply trough 16 mounted in the frame from which wash liquor is delivered to the thread upon the reel either by suitable spray nozzles above it or, in the manner shown, by flowing over a horizontal weir notch 17 with its outlet above the reel axis. This weir notch extends the full length of the reels and supplies wash liquor for all the threads being wound upon it.

The wash liquor of course showers down upon the thread, subjecting every portion of the thread upon the reel to flowing wash liquor. The length of each thread, taking into consideration the speed of thread travel, is sufficient so that by the time the thread leaves reel 13*a* it is completely washed. The wash water drains from reel 13*a* into a collecting trough 18 beneath it, from which it may be discharged to the sewer or be recirculated to the supply trough 16 by any suitable device, such as the pump 18*a*, conventionally shown.

In like manner the thread on the third reel, 13*b*, may be subjected to a desulfurizing process, such as by treating it with a solution of an alkali sul-

phide distributed over the thread from a trough 19 by a weir notch 20 and collected by a receiving trough 21, from which the solution may be returned to the supply trough 19.

Likewise, in the fourth stage, at reel 13c, the thread may be subjected to another washing step, with clear water, which is either circulated over and over again or discharged to the sewer.

Other reels may be provided for additional steps, such as bleaching, further washing, etc., but for simplicity of illustration the reels, liquor supply devices, collecting and circulating troughs and pumps for such steps have been omitted.

Finally, the thread is led to the last reel 13d, where it is subjected to a drying operation. Reel 13d is enclosed within a drying chamber 24 in a hollow casing 22 of sheet metal or the like, only enough of the reel projecting beyond the casing to enable the thread to be led to and from it, as will be readily understood. The projecting portion of the reel may be practically covered with sheet metal, the several threads passing to and from said reel through very narrow slots or openings 22a. In the casing 22 are finned heating coils 23, heated by steam or the like. The drying chamber 24 of said casing communicates by a passage 25 with a chamber 26 supplied by a fan or the like with a supply of air pre-conditioned as to moisture content, as by passing it through a suitable air conditioning apparatus conventionally shown at 26a. The chamber 24 also communicates by passage 27 with an outlet passage 28. An adjustable damper 29 may be provided for regulating the quantity of the air supply.

In the air conditioning device 26a the air is subjected to the action of a simple dehumidifier so as to fix its moisture content at a known amount. As it passes the heating coils 23, its temperature is raised to a point where it will leave a predetermined amount of moisture in the thread. Temperature control alone is sufficient to maintain uniform drying conditions in chamber 24. As a result, a control bulb 30 is placed in the discharge air passage and said bulb is adjustably associated with and is utilized to control a valve 31 in the steam supply line for the coils 23. The drying mechanism will accordingly automatically maintain uniform drying conditions and deliver the thread to the collecting device with any desirable maximum moisture content.

In a given machine multiplied as to units by placing units end to end as shown in Fig. 1, the supply and collecting devices for each stage, as well as the troughs 10, may be interconnected with each other across the full length of the machine. In other words, a single trough 10 for the coagulating bath will extend down the full length of the machine with a single supply and a single discharge for bath circulating purposes. Likewise, each of the supply and collecting troughs 16, 18, etc., will preferably extend down the full length of the machine. If, however, such troughs are built in unit form with one trough length for each unit, the trough lengths for corresponding stages of adjacent units will be connected together by conduits so as in effect to constitute a single trough across the full length of the machine. In this manner only one pump is required to circulate the coagulating bath, one pump for the wash bath, one pump for the desulfurizing bath, etc., so that all threads receive like treatments. The various treatments and operations are accordingly synchronized according to prearranged conditions.

Figs. 3 to 6, 8 and 9 illustrate in detail one of the reel mechanisms.

Each reel includes a central rotatable shaft 32 having keyed to it at each end of the reel a spider-like end head 33 having a series of radial notches 33a in which the rectangular bars 14a, 14b are mounted. Each of the end heads 33 rotates adjacent to a stationary cam disc 34 rigidly mounted and supported upon one of the cross frame members 3. Each cam member 34 is provided with two cam grooves 35, 36 and with two end face cams 37, 38. Each bar is provided at each of its ends with an operating member 39 fastened to it by rivets 40 or the like and including an end arm 41 entering one of the grooves 35, 36 and a shoulder 42 abutting one of the end cams 37, 38. The arrangements at the two ends of the reel are alike in the sense that the end grooves 35, 36 in one cam member 34 are reversed duplicates of those in the other, while the end cams 37, 38 on the two cam members are oppositely acting or the reverse of each other. End arms 41 on the bars of one group, such as the bars 14a, are offset from said bars radially outwardly, while the end arms 41 on the bars of the other group are offset radially inwardly, as shown in Fig. 8.

The end cams 37, 38 produce longitudinal reciprocation of the bars 14a, 14b, whereas the groove cams 35, 36 produce radial motion of said bars, or, in other words, motion of said bars toward and from the central axis. As the shaft 32 rotates, it carries with it the two end heads 33 and causes the bars to move around like those of a squirrel cage. In the course of the movement thus imposed on the bars, their arms 41 and shoulders 42 travel in the cam grooves and along the end cams, causing the bars to reciprocate back and forth endwise and also to move in and out radially. The motion of said bars is diagrammatically illustrated but greatly exaggerated in Fig. 3.

Generally speaking, the two cam grooves 35, 36 are circles slightly eccentric to each other and to the central axis, say by one-sixteenth of an inch in a seven inch diameter reel. They are not true circles, however. Considering the full 360° of the cage, there are two diametrically opposite zones M, Fig. 3, each of about 30° circumferential extent, where neighboring bars of the two groups are simultaneously in contact with the thread turns, and beyond these 30° zones M there are two very short zones N where the two sets of bars quickly change their relative radial positions, one group of the reel bars 14a moving inwardly and the group of bars 14b moving outwardly in one zone N, with the reverse action occurring in zone N on the opposite side of the reel.

During travel through these zones M, N, while both sets of bars are in contact with the thread, and while they are rapidly changing their relative radial positions, the shoulders 42 are moving along flat portions of the end cams 37, 38 so that both groups of bars have no longitudinal motion in either direction. When the bars have changed their relative radial positions, one group moving inwardly and the other outwardly, so that the turns of the threads are supported on one group of the bars alone, then the end cams 37, 38 begin to produce longitudinal bar motion, that group of bars in contact with the thread turns moving forward to advance the thread and

that group out of contact with the thread turns moving backwardly or retreating to be ready for the next advance movement, and so on. From the practical standpoint, in the arrangement shown, thread advance occurs through approximately 270° of full rotation.

Speaking generally, the reel as a whole is of substantially the same effective diameter from end to end in the sense that while it is not a true cylinder it is very nearly such, and its effective circumference is the same from end to end . As a consequence, while the same reel may be made to support and take care of a plurality of threads, such as six in the form shown, the rate of advance of each of the threads along the cylinder is the same at every point. However, if desired, the several separate thread carrying parts of each reel, six such parts on reel in the form shown, may be made each generally conical or with more or less of a taper from end to end or along any portion thereof. In this manner it is possible to compensate for shrinkage of the thread or the like as it moves along the reel, as will be readily understood. Such an arrangement is diagrammatically shown in Fig. 4.

End cams 37, 38 may vary in different reels, so as to provide different rates of progression or travel of the thread turns along different reels.

The operating mechanism may take any suitable form. Figs. 1 and 7 illustrate the machine as driven by an electric motor 50 which, through a coupling 51 and reducing gearing 52, drives a jack shaft 53 connected by a chain, belt or the like, designated 54, with the shaft 32 of the lowermost reel 13*d*. Said shaft is provided with a pulley 55 from which a belt 56 passes to a similar pulley on the shaft 32 of the next higher reel. The drive is then from reel to reel by successive belts 56 and proper pulleys, as shown in Fig. 1. The shaft 32 also carries a small pinion 57 meshing with a large gear 58 on a jack shaft 59 connected by a belt 60 to the pump operating shaft 61. Shaft 53 is also connected by a belt 62 with a horizontal main line shaft 63 which, by belt 64, drives a pulley 65 on the shaft 66 of the collecting device 15.

It will be understood that the same motor 52 may be used for driving any number of units such as those shown in Fig. 1. The motor may be placed at one end of the bank of units with drive entirely from one end or it may be placed at the middle of the bank so that the drive is in opposite directions. Shaft 63, for example, may extend down the full length of the machine, in which case it may be used as the drive shaft for a series of units by making each unit self-contained with its own gears, belts, pulleys etc. In such case, each unit may be provided with a separate clutch controlled power take-off from shaft 63. This arrangement has the advantage that the units are independent of each other, whereby any one may be stopped and started for threading up, repairs, or the like, without affecting others. For convenience in illustration, however, the drawings show an arrangement in which the pumps are driven by a single shaft 61 extending down the full length of the machine, in which the alined reel shafts 32 of adjoining units are connected by universal joints 32*a*, and in which shaft 63 is utilized only for driving the various collecting devices.

Of course, the several reels of a given unit, or, in other words, those reels traversed in order by a single thread from the spinneret to the collecting device, should be so proportioned to each other as to operate in harmony without detrimental effect upon the thread. Indeed, this is true throughout a multiple machine as a whole. In other words, there must be an organized timed relation between reels and other devices of a single unit and the same timed relation should persist throughout all the units of a single machine. Consequently, not only is a common drive or power source desirable for the reels of a single unit, but the same common drive should preferably be employed for all units, so that all threads will receive like treatment.

In addition, the reels of a given unit should bear proper relation to each other, particularly as to their relative circumferential dimensions. If it is assumed that the angular speeds of the reels are the same and that there is no longitudinal stretch or shrinkage in the thread as it progresses through the unit, the effective circumferential dimensions of all of the reels should be identical; in any event, care should be taken to see that no reel has an effective circumferential dimension less than that of its predecessor. Otherwise, slack in the thread would be produced between the two reels with probable thread entanglement as a result of accumulation of slack.

Preferably, each reel has an effective circumference very slightly greater, if anything, than the circumference of its predecessor, so as to insure absence of slack in the carry-over portion of the thread from reel to reel; but, if desired, any definite amount of stretch may be put into the thread between successive reels by making the following reel slightly greater in circumference than its predecessor. The differences in circumference, however, usually should be very slight, being measured in hundredths of an inch when the reel diameter is seven inches, as assumed, unless it is desired to impart considerable stretch to the thread, when any desirable differences in diameter may be resorted to. A similar effect may be accomplished by so arranging the driving mechanism as to drive different angular reels at different speeds. An increase in angular speed of a following reel obviously effects a stretching of the thread.

The apparatus should also be arranged for convenience in threading up, for which purpose successive reels are offset horizontally relative to each other, as shown in Figs. 2 and 7. In other words, while the axes of the reels are parallel to each other, each reel mounted a little nearer to the front of the machine than the reel next above it. The thread is wound upon the reels so that the leading and following portions of the thread, where the thread passes from reel to reel, are tangent to the reels at the front of the machine, but are not truly vertical. As a consequence, when the machine is threaded up, the free end of the thread is applied to one of the bars on the upper reel while it is rotating. The thread is then wound by the reeling operation upon the first or uppermost reel, the helical turns progressing bodily toward the right, Fig. 1, until the discharge point is reached. The leading end of the thread is then picked off and is led down to the next reel, with similar operations at each of the successive reels, and thence to the final collecting device.

If desired, the reels may be provided with means to cause the leading end of the thread to pass from reel to reel, so as to thread up the entire machine automatically. Each of the bars is of generally rectangular cross section and the turns of thread lie upon the narrower surface of the

bar at the periphery of the cylinder as a whole. These bars, for example, may be half an inch wide. The thread is wet during the entire time of its passage along each reel and the leading end of the thread, and indeed, all parts of the thread, tend to cling or adhere to the flat surface of the bars. To cause the leading end of the thread to leave the bar to which it adheres, when the end of the operating zone is reached, the bars are preferably cut away at the end of each operating zone in the manner shown in Fig. 6, to form a very narrow ridge or edge portion 70, as a consequence of which each bar presents outwardly a series of flat feeding portions 71 separated by relatively narrow transfer edges 70.

In operation, as the turns of the thread progress along an operating zone of the reel, the leading end finally reaches the narrow transfer edge 70 and the reduction in adhesion as the result of narrowing of the bar is sufficient to cause the leading end of the thread to drop away from the bar and to fall by gravity directly to the surface of the next reel beneath it, which is offset toward the front of the machine so that contact will be insured. The thread then progresses along the operating zone of the next reel and when it reaches the transfer point automatically drops away and descends by gravity to the next reel.

It is obvious that various changes may be made in the number, nature, and arrangement of the parts of the apparatus without in any way departing from the spirit of the invention. Thus in lieu of the reels shown and described may be employed other thread-handling devices by means of which the thread or the like may be advanced in generally helical form or, if desired, other rotary thread-storage devices upon which the thread may be subjected to appropriate processing operations. While a generally descending thread path is regarded as preferable, it will be understood that the thread may take any other path compatible with disposition of the thread-handling devices in generally superposed or other vertically spaced arrangement, whether or not stepped. It is intended that the patent shall cover, by suitable expression in the appended claims or in the claims of divisional applications based hereon, whatever features of patentable novelty reside in the invention.

What we claim is:

1. Apparatus comprising a source of thread or the like; a plurality of spaced, generally superposed thread-storage devices upon each of which the thread or the like describes an approximately helical path; and a collecting device upon which the thread or the like is gathered after having completed a course extending from said source to the uppermost thread-storage device, thence to the other thread-storage devices, and finally to said collecting device.

2. Apparatus of the character defined in claim 1 in which said thread-storage devices are spaced vertically from each other.

3. Apparatus of the character defined in claim 1 in which said thread-storage devices are offset bodily from each other.

4. Apparatus of the character defined in claim 1 in which successive thread-storage devices project beyond their predecessors in the series.

5. Apparatus comprising a source of thread or the like; a plurality of spaced, generally superposed thread-advancing reels upon each of which the thread or the like describes an approximately helical path, each of said thread-advancing reels other than the uppermost projecting beyond the one immediately above it and a collecting device upon which the thread or the like is gathered after having completed a course extending from said source to the uppermost thread advancing reel, thence to the other thread-advancing reels, and finally to said collecting device.

6. Apparatus comprising a source of thread or the like; a plurality of spaced, generally superposed thread-advancing reels upon each of which the thread or the like describes an approximately helical path, each of said thread-advancing reels other than the uppermost being offset bodily from the one immediately above it; and a collecting device upon which the thread or the like is gathered after having completed a course extending from said source to the uppermost thread-advancing reel, thence to the other thread-advancing reels, and finally to said collecting device.

7. Apparatus comprising, in combination, a common coagulating bath; a series of units each of which embodies means for forming thread or the like, a plurality of like thread-storage devices on which the thread or the like is advanced in generally helical form, and means for collecting the thread or the like; interconnecting means for supplying treating fluid to corresponding thread-storage devices of all units; interconnecting means for collecting treating fluid from corresponding thread-storage devices of all units; and means for operating corresponding thread-storage devices of all units in synchronism, thereby minimizing unit-to-unit variation in the properties of the thread or the like.

HAYDEN B. KLINE.
WALTER F. KNEBUSCH.
ALDEN H. BURKHOLDER.

CERTIFICATE OF CORRECTION.

Patent No. 2,225,640. December 24, 1940.

HAYDEN B. KLINE, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 60, for the word "reels" read --reel--; page 4, first column, line 18, after "on" insert --each--; line 19, strike out "each"; same page, second column, line 43, strike out "angular" and insert the same after "different" in line 44; line 52, after "reel" insert --is--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of March, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.