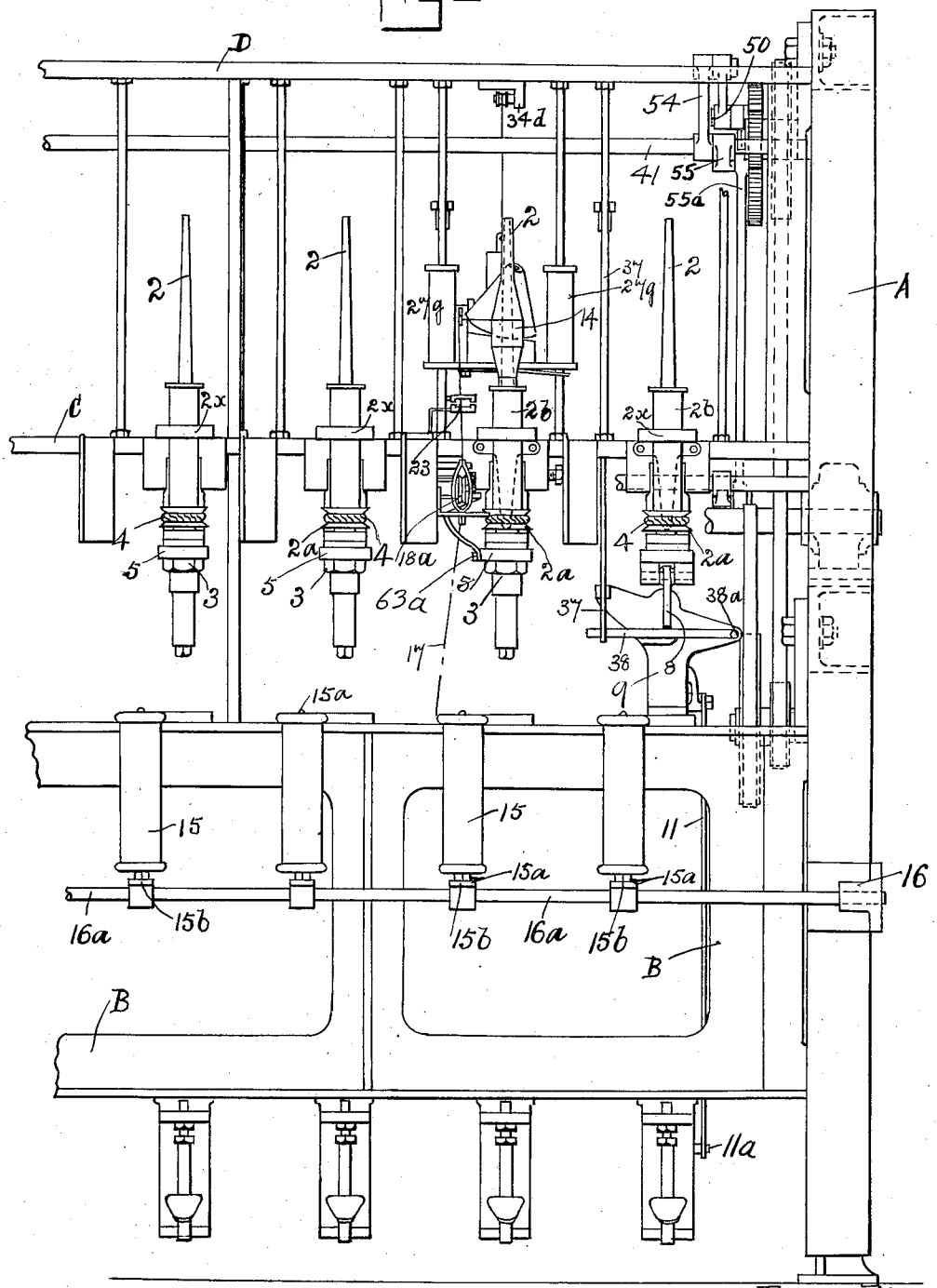
Aug. 13, 1935. N. WALTON ET AL 2,011,429

MACHINE FOR WINDING PIRNS OR SPOOLS OF YARNS OR THREADS

Filed March 21, 1934 4 Sheets-Sheet 1

FIG 1



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MACHINE FOR WINDING PIRNS OR SPOOLS OF YARNS OR THREADS

Filed March 21, 1934 4 Sheets-Sheet 2

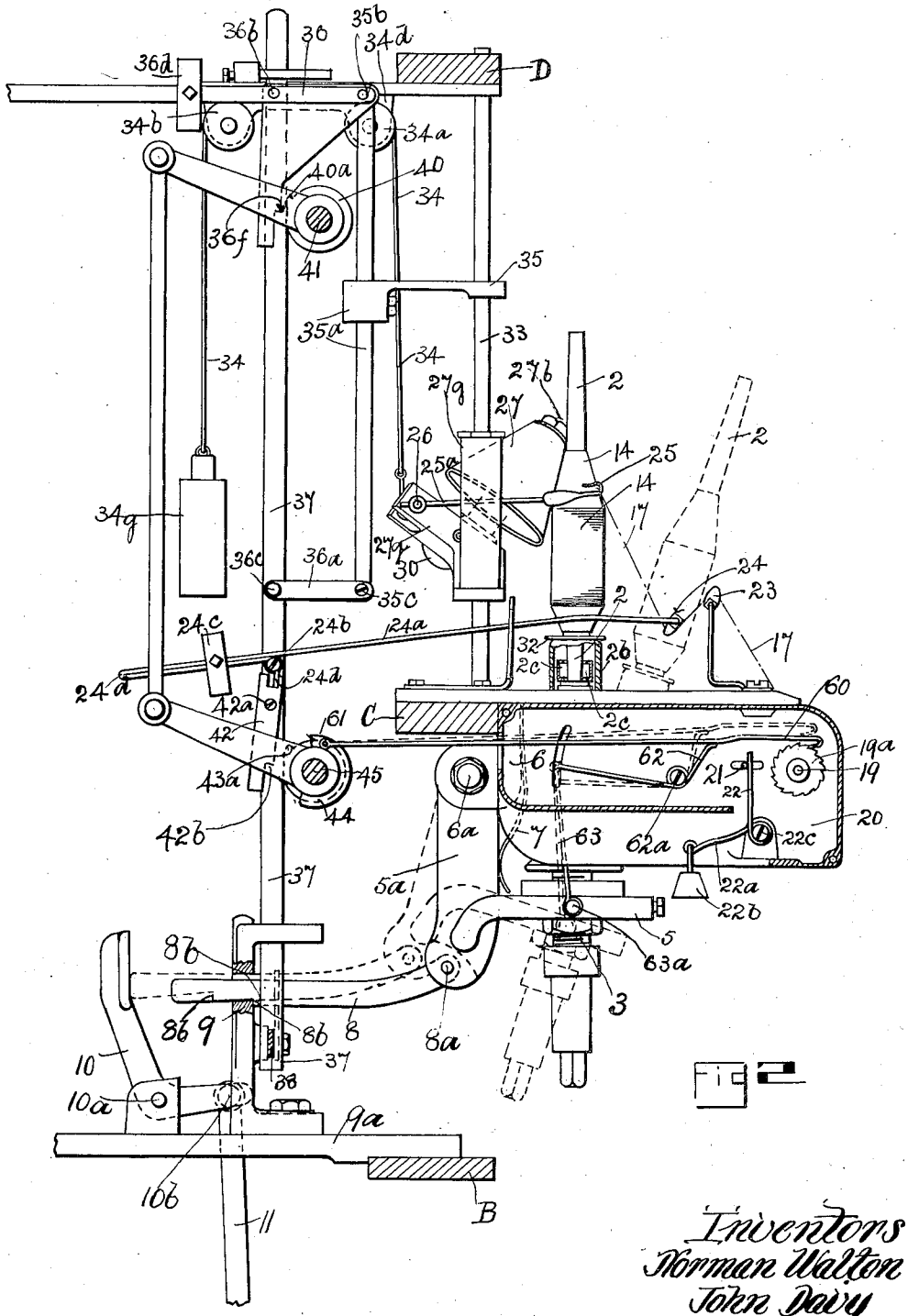


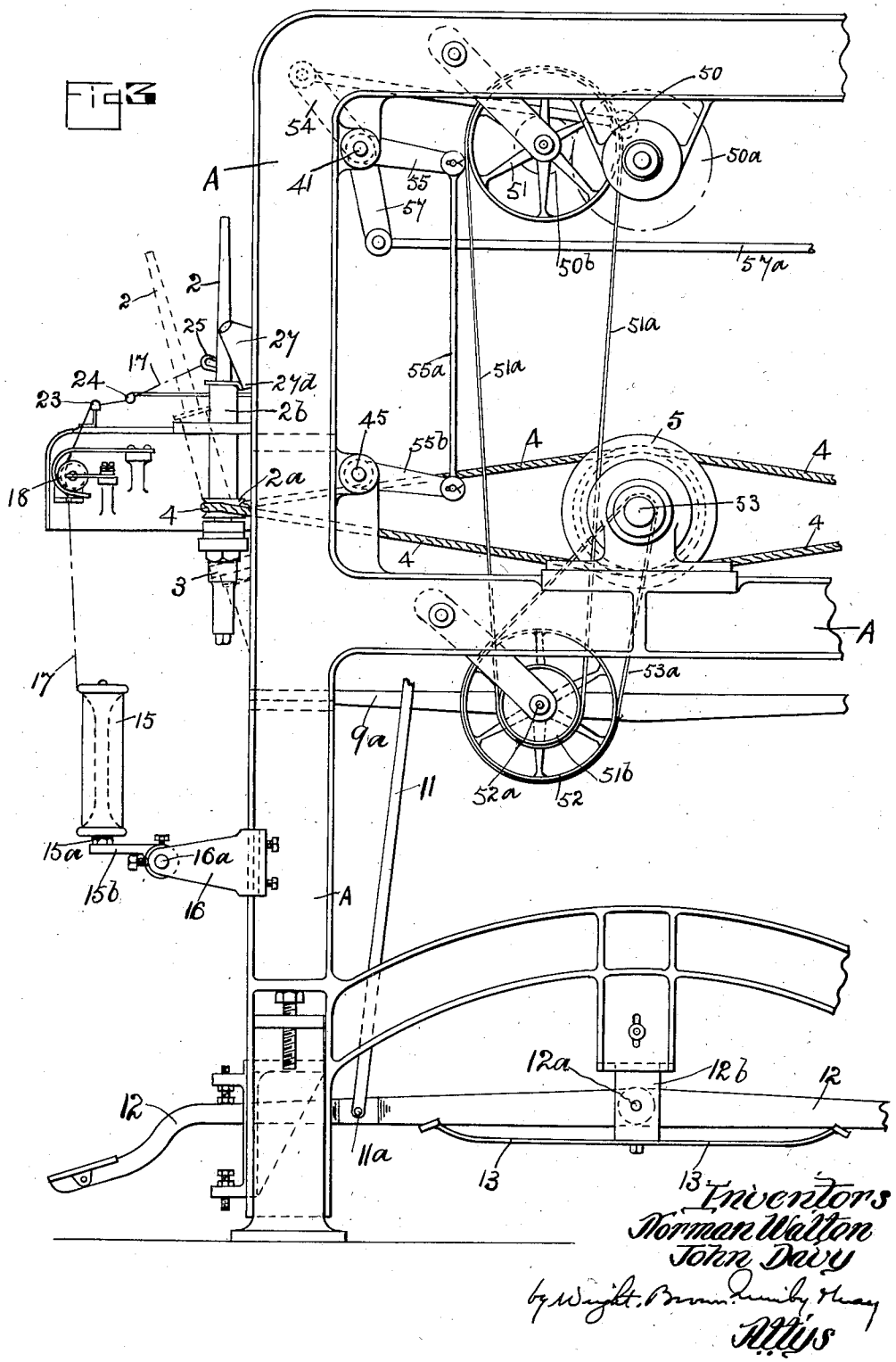
Fig 2

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MACHINE FOR WINDING PIRNS OR SPOOLS OF YARNS OR THREADS

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MACHINE FOR WINDING PIRNS OR SPOOLS OF YARNS OR THREADS

Filed March 21, 1934 4 Sheets-Sheet 4

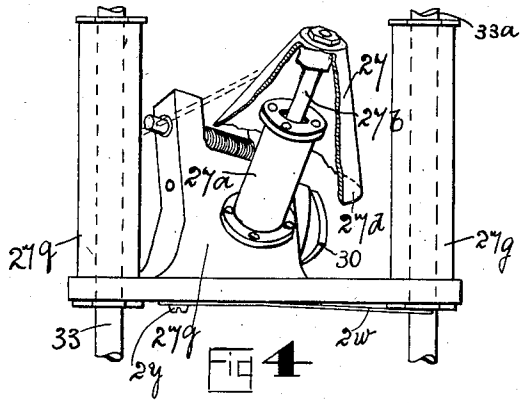


Fig 4

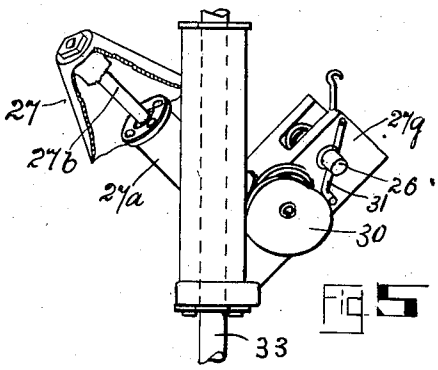


Fig 5

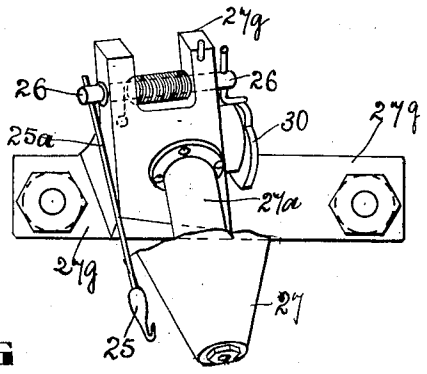


Fig 6

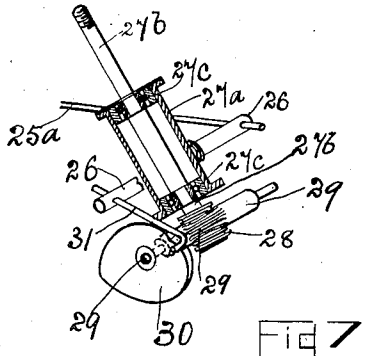


Fig 7

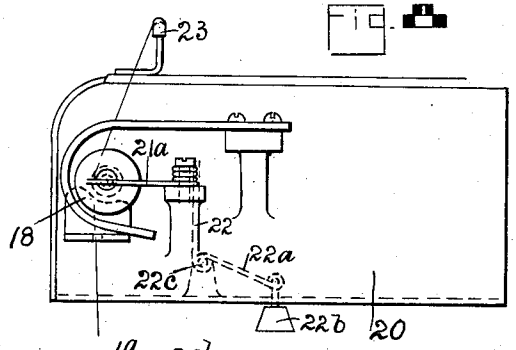


Fig 8

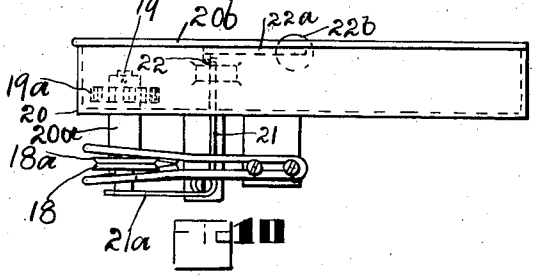


Fig 10

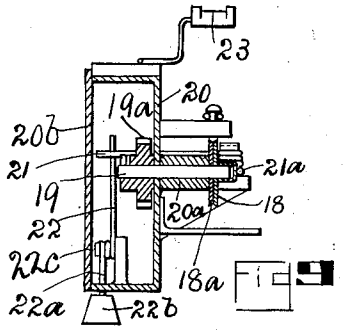


Fig 9

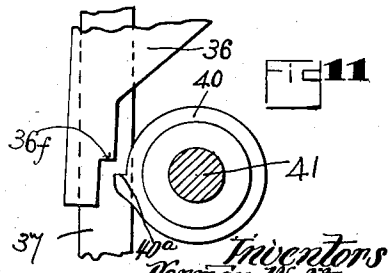


Fig 11

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UNITED STATES PATENT OFFICE

2,011,429

MACHINE FOR WINDING PIRNS OR SPOOLS OF YARNS OR THREADS

Norman Walton, Pudsey, near Leeds, and John Davy, Haworth, near Keighley, England

Application March 21, 1934, Serial No. 716,658
In Great Britain March 22, 1933

8 Claims. (Cl. 242—27)

This invention relates to machines for winding yarns or threads upon paper or other tubes to produce pirns or spools or to wind same to produce cops without the use of tubes; and our present invention consists in the construction and arrangement of spindle devices and their co-operating members whereby the winding actions of the yarns or threads, when being carried out to produce the forms or shapes (that is of pirns, spools or cops) as stated, are also employed as the means for controlling and operating the travelling actions of the yarn to give shape as to the nose, shoulder and body part of each cop, pirn or spool as is or may be required, by which means we are enabled to produce same of a firm and solid character and at a greater speed than heretofore; while the construction and arrangement of the said devices also enable each winding spindle to be operated so as to be put out of action or into action independently of its neighbouring spindles, either by the attendant or by indicating devices operated on the breakage or failing of the yarn or by devices which arrest the motions of the winding operations when the desired length of cop, pirn or the like has been produced.

In the accompanying sheets of drawings which are illustrative of our invention, and to which reference is made in the following description:—

Fig. 1 is a front elevation showing a number of spindles, one of which is provided with the devices operating in connection with it, while the others are not so fully shown, but form part of the drawings in order to illustrate the relative positions of the series of spindles on one side of the machine, although only one of said spindles and its appurtenances is hereinafter described.

Fig. 2 is an end elevation of the operating devices shown by Fig. 1 as seen looking from left to right of said figure, and the end frame and certain of other parts of the framework are omitted in order that the operating parts may be more readily understood.

Fig. 3 is an end elevation of the devices shown by Fig. 1 as seen from right to left of said figure.

Fig. 4 is a front elevation of the cop or pirn-shaping member which is of conical shape and is mounted on its supports hereinafter described, so that the building of the threads of yarn on the spindle contact with same for the purpose of effecting its adjustment.

Fig. 5 is a side elevation of the devices shown by Fig. 4 as seen from right to left of said figure.

Fig. 6 is a plan of the devices shown by Figs. 4 and 5.

In each of the Figures 4, 5 and 6 the cone is partly shown in section and otherwise mutilated in order to more clearly illustrate its construction.

Fig. 7 is a sectional elevation of the spindle upon which the cone is fixed, and the bearings for said spindle, in order to show how the same is enabled to transmit motion to the cam action which operates the thread-guiding devices.

Fig. 8 is a side elevation illustrating the devices for applying drag or tension to the thread of yarn while being wound.

Fig. 9 is a sectional end elevation showing the devices illustrated by Fig. 8.

Fig. 10 is a plan of the devices shown by Figs. 8 and 9.

Fig. 11 is a sectional elevation of devices whereby a fully wound pirn brings about a stoppage of the rotary motions of the spindle.

A indicates the end frames of the machine, B a longitudinal binding rail between said two end frames A and at the lower part thereof (one of each being situated at the outer edges of the said two end frames A), and C and D two separate rails situated above the rail B on each side of the machine also.

Figs. 4 to 11 are drawn to an enlarged scale as compared with the other figures.

To attain the object of our invention we construct and arrange each spindle **2** so that it may be rotated upon its bearings **3** by the usual tape or cord **4** which passes around the driving drum **5**, the said driving drum **5** being common to the two series of driving cords **4**, one reaching to the spindles **2** on one side of the end frames A, while the other reaches to the other spindle on the other side of said end frames A, somewhat as is shown by Fig. 3.

The bearings for the spindle **2** are of a type well known as "Rabbeth" spindles, and these bearings extend vertically from the driving wheel or whorl **2a** thereon so that a sleeve **2b** may support said spindle **2** at its lower end by same contacting with antifriction roller bearings **2c** shown by the part **2b**, being cut away or in section in Fig. 2. This arrangement of the spindle, which is well known, is the type which we preferably employ for the sake of steadiness and firmness of support when in operation.

The lower bearing members **3** of the spindles **2** are fixed in the usual manner to the horizontal arm **5** of a bell crank lever **5a**. The vertical arm **5a** of the bell crank lever is pivoted at **6a** upon a

bracket 6 fixed to the rail C of the machine, and this lever 5a is acted upon by a flat spring 7, which is fixed upon a bracket 6, so as to always tend to force the lever 5a rearwardly.

Pivoted at 8a upon the lever arm 5a is a holding catch 8 which extends horizontally so that its notch 8b may engage with the front edge of a slotted bracket 9 fixed upon a support 9a extending from the upper edge of the rail B in order that the outer end on said catch 8 might abut against the front surface of a bell crank lever 10 pivoted at 10a so that said lever 10 may operate said catch 8 and therefore the lever 5a which supports the spindle 2 as is hereinafter described.

Pivoted at 10b on the lever 10 is a vertically extending rod 11 which reaches so that its lower end may be pivoted at 11a to a pedal lever 12 that is pivoted at 12a to a bracket 12b by which the pivotal pin 12a is supported, and said pin 12a acts as the fulcrum for the lever 12 which reaches from it, in one case to one side of the machine and in the other case to the other side of the machine as shown by Fig. 3.

The levers 12 are maintained in their normal horizontal positions by springs 13 which are fixed to the same bracket 12b in each case, and by these levers 12 being adjusted in their normal positions the rods 11 extending from them will adjust the levers 10 also in their normal positions where they do not press upon the ends of the catches 8, but which will operate said catches as is hereinafter described.

The yarns or threads 17 which are to be wound upon the spindles 2 to form the cops 14 of the shape or formation shown by Fig. 2 are supplied or withdrawn from bobbins 15 which are mounted to revolve freely upon their pegs or fixed spindles 15a supported by brackets 15b which are fixed on a rod 16a supported by a bracket 16 that is fixed to the end frame A of the machine.

The bobbins shown by Figs. 1 and 3 are of a shape having flanges at their outer ends, in which case the winding of the yarn or thread upon the barrel of the bobbin necessitates the ends of the barrels being of a somewhat conical shape in order to facilitate the withdrawal of said threads as is well known, and although we have shown the bobbins of this shape it is well known that we can withdraw the threads from larger formed bundles of threads mounted on spindles with their outer ends of taper or conical formation, somewhat of the character of those of the cops or pins 14, or we might withdraw the threads from conical bundles of yarns or from other bundles of yarns known as "cheeses".

These threads 17 are arranged to pass between the known form of drag or friction exerting sheet metal washers 18 and 18a, and according to our invention we now arrange the drag washer 18 to be loose upon the spindle 19 upon which a ratchet wheel 19a is fixed, and this spindle 19 extends through bearings 20, 20a formed upon the supporting enclosing members 20 and 20b, which members 20 and 20b form a kind of box or enclosing casing for the parts hereinafter described.

The friction washer 18a is fixed upon the spindle 19, but the friction washer 18 has a hollow hub formed upon it to take over the spindle 19 so that the friction washer 18 may loosely slide for a space over said spindle 19 in order that the arm 21a of a lever 21, which is pivoted at 21b, may press against said hub of the washer 18 to force it against the other washer 18a fixed upon the spindle 19. The end of the lever 21 extends horizontally so that it may be engaged with the arm of a weighted bell crank lever 22 from the other arm 22a of which a weight 22b is suspended; while the lever 22 is pivoted at 22c upon a bracket fixed to the bearing 20. Thus the weight 22b will exercise its influence over the actions of the washer 18 in order to press more firmly upon the thread when such thread is required to have its tension increased, or less firmly by substituting a lighter weight in order to reduce said pressure as circumstances require. Instead of substituting a lighter weight for a heavier weight 22b, the arm 22a of the lever may extend horizontally and have notches formed in it along which the ordinary adjustable weight may be carried for the said purpose of increasing or decreasing the pressure on the yarn or thread.

During the actions of the machine the thread 17 is taken from the supply 15 and is carried to pass over the spindle 19 and between the friction discs 18 and 18a where it is pressed sufficiently to retard its action, so that it is given the desired tension for the operations in the ordinary manner. From the discs 18 and 18a it passes over a thread-guide 23 which is fixed on the bracket carried upon the framework of the machine, and from this thread guide 23 it passes under a detector 24 (hereinafter described) so that it may extend forward through the hook of the oscillating thread carrier 25. This thread carrier reaches from being fixed upon a shaft 26 so that when oscillating thereon its outer hooked end will carry the thread 17 in a sinuous path vertically during the rotary motions of the spindle 2 to form the cop 14 as is hereinafter fully explained. The peripheral surface of the spindle 2 with the coils of yarn wound thereon rests against the peripheral surface of a rotary cone 27, and this cone 27 is arranged upon its spindle 27b to rotate freely upon bearings 27a, and by the assistance of anti-friction bearings 27c the rotary motions of the spindle and the coils of yarn or thread thereon are sufficient to rotate the cone 27 by frictional contact with it, and this cone is arranged to operate as is hereinafter described. The spindle 27b for the cone 27 extends through the bearings 27a to have a worm 28 fixed upon it, and this worm meshes with the teeth of a pinion wheel formed in the spindle 29, so that as the worm 28 revolves by meshing with the teeth in the spindle 29, said spindle is rotated and by its rotations it carries with it the building cam 30 which is fixed upon its outer end as shown by Figs. 4 to 7.

As the cam 30 revolves it operates the outer end of an arm 31 which is fixed upon the outer end of the shaft 26 that takes through the bearings 27g as shown by Figs. 4 to 7 so that on the opposite end of the shaft or spindle 26 the arm 25a of the reciprocating thread guide 25 is fixed. Consequently the rotary motions of the spindle 2 transmitted through the cone 27 to the cam 30, as is hereinbefore described, effects the rising and falling movements of the said thread guide 25.

In commencing the winding operations the cone 27 will have the periphery of its lower edge 27d (see Fig. 3) in contact with a disc or washer 32 made of india rubber, leather or other frictional material and fixed upon the upper end of the sleeve 2b supporting the spindle 2, said sleeve having the whorl or driving pulley 2a fixed at its lower end. Thus rotary motion is transmitted from the sleeve 2b, through the washer 32 to the cone 27. This rotary motion of the cone 27 continues to be transmitted to it for relatively a considerable period or until the coils of yarn on the lower end of the spindle 2 and above the posi-

tion thereon where the washer 32 is fixed have received sufficient of the coils of said yarn to form the heel of the cop which will therefore only be of the short taper formation shown by Fig. 2. This tapering formation is produced by reason of the relative diameter of the washer 32 to the largest diameter of the periphery of the cone near its lower edge 27d causing said cone 27 to be rotated thereby at the same surface speed as said lower end of the cop will effect, and as the increasing in diameter of said heel of the cop 2 commences to spread over the peripheral surface of the cone 27 from this lower edge 27d, the speed of said cone will increase, since its diameter will gradually become less where it is in contact with the surface of the building of the cop.

During the building of the coils of yarn on the spindle to form the cop as described, the cone 27 will continue with its periphery in contact with said coils of yarn on the spindle and will gradually rise carrying with it all its bearings 27a as same slide over the vertical guiding rods 33 and 33a, each of said bearings 27g having its respective guiding rod 33a extending from the rail C to the rail D as is shown by Fig. 1.

To assist the raising of the bearings 27g and the cone 27 with the other fittings mounted upon said bearings 27g to be easily effected without too great pressure vertically upon the spindle 2 and its coils of yarn thereon, a cord or other flexible connection 34 has one end fixed to the bearings 27g from which it extends over guiding pulleys 34a and 34b which are pivoted upon brackets 34d fixed upon the rail D in order that the other end of the cord 34 may have a counterbalancing weight 34g fixed upon it.

As is hereinbefore stated, the rotary motions of the cone 27 are derived by it from the coils of yarn forming the cop 14 upon the spindle 2 contacting with it as said coils of yarn and spindle 2 are being rotated, and during said rotary motions of the cone 27 it transmits rotary motion through its cam 30 to the thread guide 25, in this manner enabling said thread guide to carry the thread from encircling the shoulder of the cop to encircle the nose of said cop, and gradually, as the diameters of the coils increase, so is the cone 27 caused to rise over its guiding bars 33, 33a as is hereinbefore described. These rising actions are carried out until the desired length of cop has been produced, at which time the upper end of the sliding members 27g, which travel over the guiding rods 33, 33a, will be in contact with the arm 35 which spans one of said rods and which is fixed upon a vertical connecting rod 35a, said rod being pivoted at its upper and lower ends 35b and 35c to a three-armed lever 36 and a simple arm 36a respectively, and the said lever 36 and the arm 36a are respectively pivoted at 36b and 36c to the vertically sliding rod 37 in order that as the rod 35 moves vertically so will it operate the lever 36 as is hereinafter explained.

The lower end of the bar 37 has a slot formed in it for the end of a lever 38 to pass through, as is shown in Fig. 1, portions in front of the first spindle in which are omitted from the drawings to show this lever 38 at the rear thereof, and said lever 38 is retained in its horizontal position shown by Fig. 1 by resting upon a projection extending laterally from the bracket 9 in order that the vertically sliding rod may normally occupy the position shown by Fig. 2 in which position it also retains the varied articles of devices which are connected to it also in their normal positions.

The raising of the arm 35 operates the lever 36 assisted by the weight 36d, so that a notch 36f in said arm will pass over and into the path of motion of a projection 40a on a disc 40 which is fixed upon a horizontal shaft 41 that extends lengthwise the machine, in order that said projection may engage with the notch 36f and raise the bar 37 so that it will lift the horizontal catch 8 out of engagement with the face of the bracket 9 and permit it to be moved rearwardly as is hereinbefore described under other conditions. Up to now the actions of the fully produced cop have been to move the several parts so that by moving the catch 8 out of engagement, the spindle 2 is brought into the position shown by broken lines in Fig. 2 where its motion is arrested by reason of its driving band 4 being slackened.

In order to bring about the arresting of the spindle when the detector 24 moves on the breakage or failing of the yarn or thread 17, the detector 24 has its arm pivoted at 24b upon the vertically sliding rod 37, while an adjustable weight 24c, which may be regulated so as to relieve the weight of the detector or increase the weight of the detector 24 upon the yarn or thread 17, is mounted on the extending end of the lever 24a, another arm 24d extends laterally from the arm 24a to take into a notch in the end of a lever 42 pivoted at 42a upon the vertical bar 37 so that its notch 42b may engage with a projection 43a from a disc 44 which is mounted upon a continuously oscillating shaft 45 extending lengthwise the machine in order that said notch 42b, by its engagement with the projection 43a, may be raised to raise the bar 37 so that it will disengage the catch 8 from its retaining bracket 9 in the manner and with the result hereinbefore described of displacing the spindle 2 from its operative position into its inoperative position to arrest its motion in order to enable the attendant to repair the broken thread in manner well known.

When the spindle 2 carries the cop 14 from its building position shown in full lines Fig. 2 to its inoperative position shown in broken lines of the same figure, the body 2b of the spindle 2 (which is of larger diameter) comes into contact with a fixed brake shoe 2x so that its rotary motion is more quickly arrested.

When the spindle 2 is withdrawn from contacting with the cone 27 which it operates into the position shown in broken lines where it engages with the brake shoe 2x, the said cone 27 and all the parts carried by same during its vertical movements are prevented from descending by reason of a flat spring 2w, which is fixed by the screw 2y to the base of the bearings 27a, having its free end of a bifurcated form so as to span and press against the rod 33 as is shown by Fig. 1. This contacting of the spring with said guiding rod has the effect of forcing all the bearing 27a laterally, and therefore said bearing 27a is held from descending by its frictional contact with the guiding rods 33. On the other hand, on account of said spring 2w being of a comparatively flexible light character, when the bearings upon which it is mounted are rising, their rising movements are freely permitted, since the spring simply yields and slides loosely over the surface of the guiding spindle 33 as desired.

The shafts 41 and 45 hereinbefore referred to derive their oscillatory motions from a crank pin 50 which is fixed in the face of a wheel 50a rotated by gearing with the wheel 50b. This wheel 50b is fixed to the arms of the pulley 51 so that

the rotary motions transmitted to said pulley by the driving belt 51*a* taking over a driving pulley 51*b* that is fixed upon the shaft 52*a* upon which the driving pulley 52 is fixed, will operate the crank pin 50 as desired, and these motions are derived from the main shaft 53 of the machine operating a belt 53*a* which rotates the pulley 52.

The reciprocating motions of the crank pin 50 oscillate the lever 54 which is fixed upon the shaft 41, so that said shaft 41 may oscillate a lever arm 55, and this arm 55, by the rod 55*a*, will reciprocate an arm 55*b* that is fixed upon the shaft 45. Thus reciprocatory motion is given to the two shafts 41 and 45 upon which the disc 40 carrying a projection 40*a* and a disc 44 carrying a notch 43*a* are fixed. Motion is secured for said discs and their projections to raise the bar 37 in the manner and under the conditions hereinbefore explained.

It may be observed that the shafts 41 and 45 are mounted on one side of the end frame A to operate the devices in connection with the spindles 2 on said side of the frame. Similar shafts on the opposite side of the frame are employed for operating in the identical manner and for identical purposes, and the motions are transmitted to these oscillating shafts from the oscillating shaft 41 by an arm 57 and its connecting rod 57*a* being coupled to a similar arm and similar shafts on the opposite side of the machine.

In order to prevent the friction discs 18 and 18*a* being worn by remaining constantly in one position, so that the threads or yarns passing between them are rubbing in one position upon their surfaces, we arrange said discs to be rotated by means of the ratchet wheel 19*a* which is fixed upon the spindle 19 upon which the discs 18 and 18*a* are carried. This ratchet wheel 19*a* is intermittently reciprocated by a pawl 60 which extends horizontally to be pivotally connected to a disc 61 fixed upon the oscillating shaft 45 so that as said oscillating shaft is oscillated under the conditions hereinbefore described, the reciprocating motions will give a step by step slowly moving action to the wheel 19*a* and therefore to the discs mounted thereon, and by arranging the horizontal part of the pawl 60 to overhang a projection from one arm of a bell crank lever 62 which is pivoted at 62*a*, when said arm 62 of the lever is operated by the connecting rod 63 pivoted at 63*a* to the horizontal arm 5 of the lever 5*a*, said arm 62 of the bell crank lever will raise the pawl 60 out of engagement with said wheel as is shown in broken lines Fig. 2. Thus the motions of the discs will be arrested simultaneously with the arresting of the motions of the spindle and its dislodgment from its operating position to the position shown in broken lines of the same figure. Such being the nature of our said invention, what we claim is:—

1. In a machine for winding a thread or yarn to form a pirn, cop or the like, a rotary spindle, adjustable bearings for said spindle, devices for adjusting said bearings to enable the spindle to contact with a loosely revolving cone, said cone, a spindle upon which the cone is fixed, slidable bearings for said spindle, devices carried by the cop-forming-spindle to rotate the cone, a rotary shaft mounted upon the bearings which support the cone, gearing for transmitting the rotary motion of the cone to the shaft mounted on its bearings, a cam fixed upon said cone driven shaft, lever devices operated by said cam to give oscillatory motion to a thread guiding member, bearings for said member fixed upon the sliding bearings which carry the cone and guiding rods upon which said bearings slide.

2. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, hinged bearings for said spindle, an engaging catch for retaining the hinged bearings during the rotations of the spindle, means for disengaging said catch when the desired length of cop is reached, a cone for the cop-spindle to contact with, devices actuated by said cone for operating a thread guiding member, slidable bearings for the said cone and the members which it operates, adjustable devices which the said bearings contact with when the desired length of cop has been wound and means for enabling said adjustable devices to dislodge the engaging catch so that the bearings for the cop spindle may move to arrest the motion of said spindle.

3. In a machine for winding a thread or yarn to form a cop or pirn, a rotary spindle, a driving cord or tape for rotating said spindle, hinged bearings for said spindle, a disc of frictional material fixed on said spindle to contact with and rotate a cone at the commencement of the thread winding operations on the spindle, bearings for said cone, cam and thread guiding levers operated by the cone, sliding bearings for the cone and the guiding levers, guiding rods for said sliding bearings, a lever actuated catch member brought into action by the sliding bearings on the guiding rods, an oscillating disc having a projection for engaging the said catch, connecting devices for enabling the catch to release the hinged spindle bearings, and a brake shoe for said spindle to contact with when released.

4. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, driving gear for said spindle, bearings for supporting said spindle, means whereby the rotary spindle transmits its motion to a loosely mounted cone, devices actuated by the rotary cone, a guide for conducting the thread on to the spindle to form the cop, an engaging catch, and means whereby on the breakage or failing of the thread said catch is brought into action to release the bearings which support the cop forming spindle.

5. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, driving gear for rotating said spindle, bearings for said spindle, a rotary cone for the cop formed on the spindle to contact with a thread guide for conducting the thread on to the spindle, means whereby the rotary motions of the cone effect the operating of the thread guide, adjustable friction discs for applying drag to the thread before it reaches its guiding member, and supports for said discs which permit their drag applying actions to be regulated.

6. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, driving gear for rotating said spindle, bearings for said spindle, a rotary cone for the cop formed on the spindle to contact with, a thread guide for conducting the thread on to the spindle, means whereby the rotary motions of the cone effect the operating of the thread guide, adjustable friction discs for applying drag to the thread as it travels to its oscillating guide, means for intermittently rotating the discs to prevent uneven wear of their surfaces, and means whereby said rotation of the discs is arrested on the breakage or failing of the yarn or thread.

7. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, driving gear for said spindle, bearings for supporting said

spindle, means whereby the rotary spindle transmits its motion to a loosely mounted cone, devices actuated by the rotary cone, a guide for conducting the thread on to the spindle to form the cop, a catch, means whereby on the breakage or failing of the thread said catch is brought into action to release the bearings which support the cop forming spindle so that its rotary motions are arrested, a manually operated pedal lever, and devices operated thereby for re-adjusting the spindle and its supporting parts in position after the operator repairs the thread.

8. In a machine for winding a thread or yarn to form a pirn or cop, a rotary spindle, driving gear for said spindle, bearings for supporting said spindle, means whereby the rotary spindle transmits its motion to a loosely mounted cone, devices actuated by the rotary cone, a guide for conducting the thread on to the spindle to form the cop, a catch, an oscillating member, means whereby on the breakage or failing of the thread said catch is brought into the path of said oscillating member, a shaft on which said oscillating member is mounted, and crank mechanisms operating lever devices for effecting the said oscillations of the shaft.

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