

Feb. 28, 1933.

E. SCHWEIZER

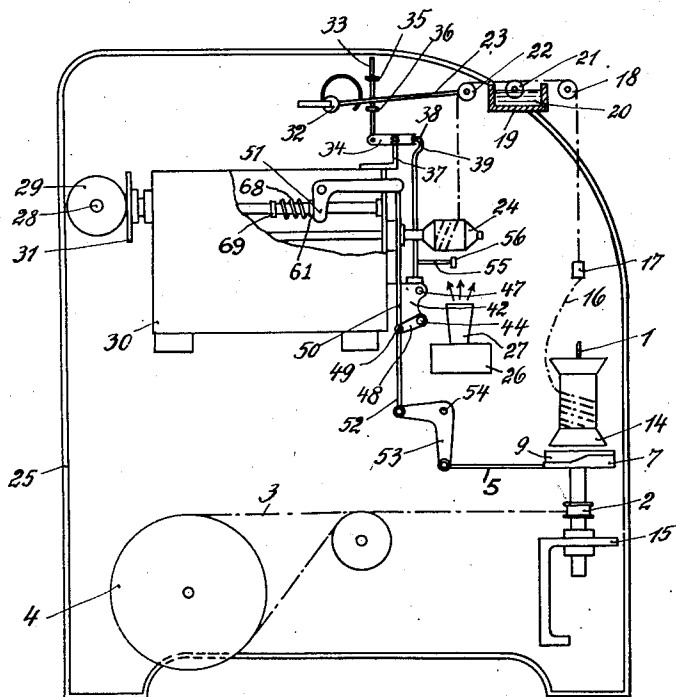
1,899,730

DOUBLING MACHINE AND TWINING SPINDLES IN COMBINATION WITH
BOBBIN WINDERS AND STOP MOTION DEVICES FOR SAME

Filed April 15, 1931

5 Sheets-Sheet 1

Fig. 1.



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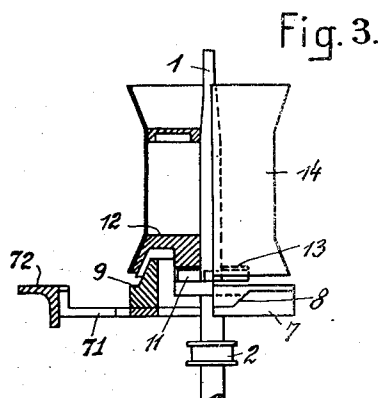
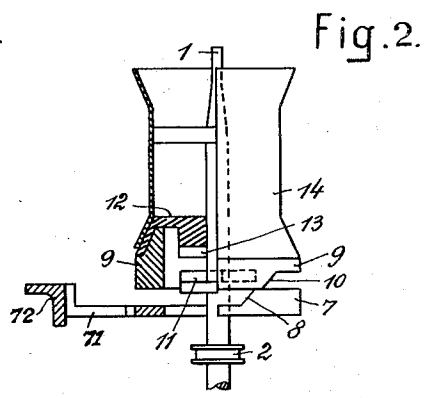
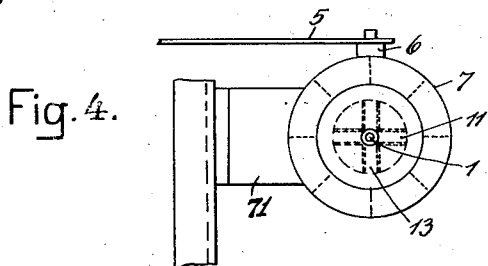
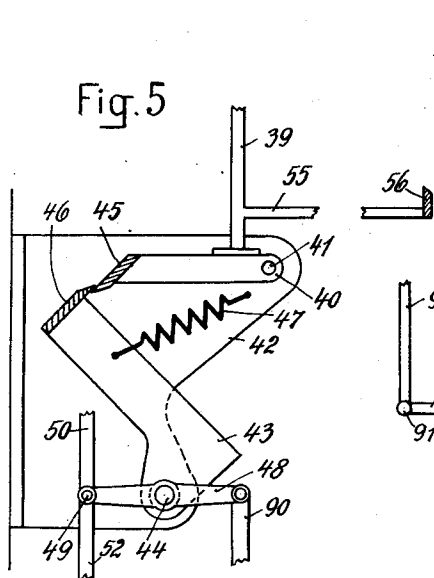
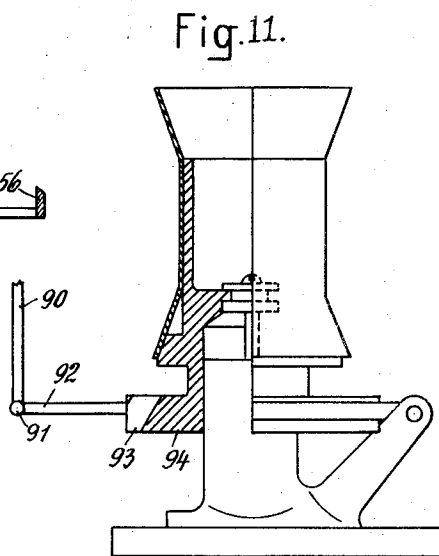
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5 Sheets-Sheet 2



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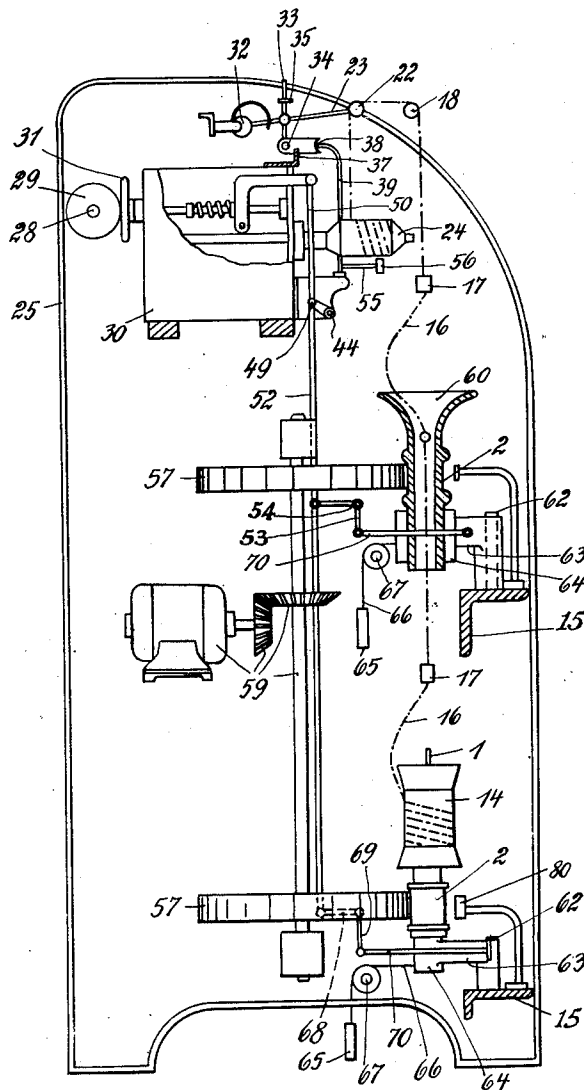
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DOUBLING MACHINE AND TWINING SPINDLES IN COMBINATION WITH
BOBBIN WINDERS AND STOP MOTION DEVICES FOR SAME

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5 Sheets-Sheet 3

Fig. 6.



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DOUBLING MACHINE AND TWINING SPINDLES IN COMBINATION WITH
BOBBIN WINDERS AND STOP MOTION DEVICES FOR SAME

Filed April 15, 1931

5 Sheets-Sheet 4

Fig. 9.

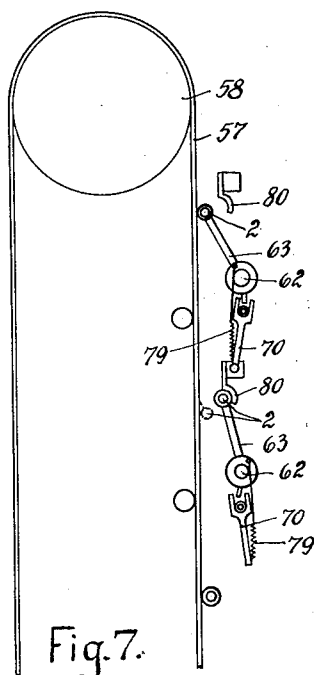


Fig.7.

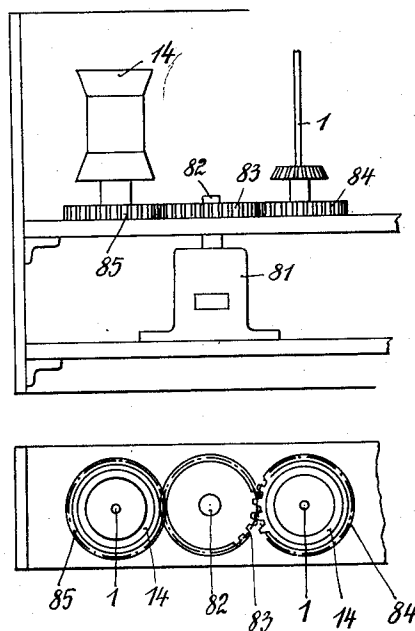
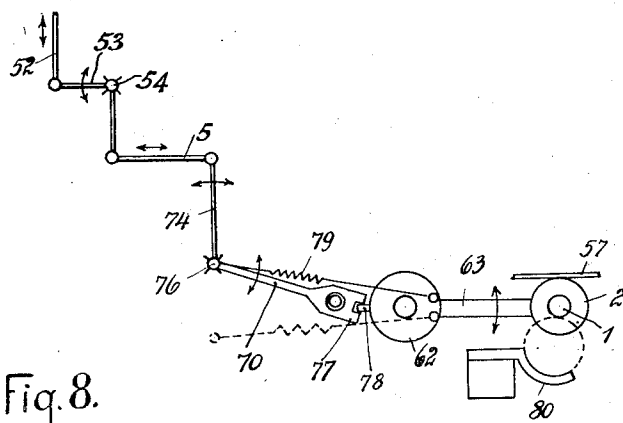


Fig. 8.

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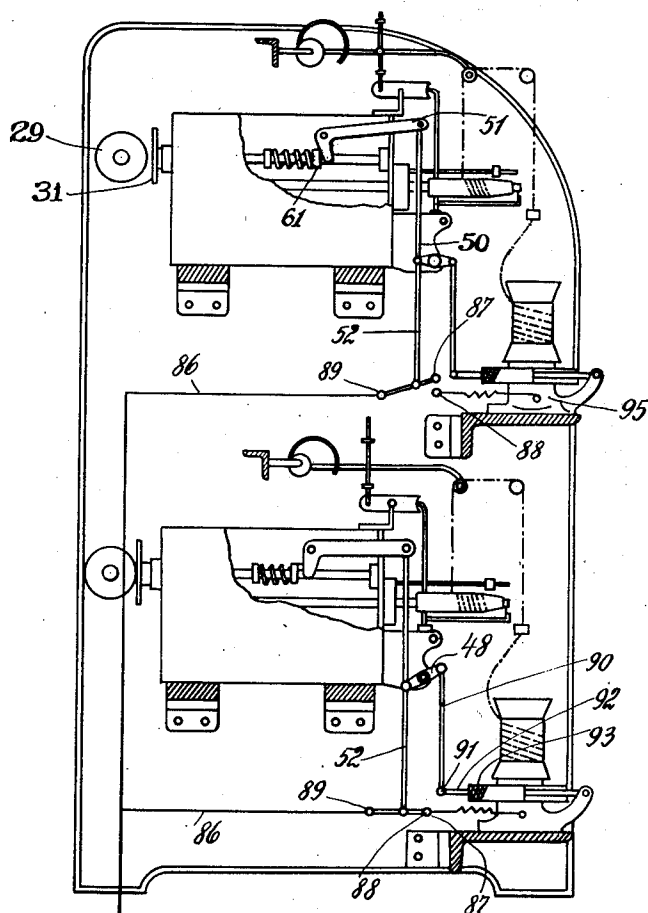
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DOUBLING MACHINE AND TWINING SPINDLES IN COMBINATION WITH
BOBBIN WINDERS AND STOP MOTION DEVICES FOR SAME

Filed April 15, 1931

5 Sheets-Sheet 5

Fig. 10.



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UNITED STATES PATENT OFFICE

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DOUBLING MACHINE AND TWINING SPINDLES IN COMBINATION WITH BOBBIN-WINDERS AND STOP MOTION DEVICES FOR SAME

Application filed April 15, 1931, Serial No. 530,352, and in Switzerland November 17, 1929.

This invention relates to thread doubling and winding machines, and more particularly to machines including winding means having at least one bobbin shaft positively driven with variable rotational velocity to ensure constant draft of the thread.

In the winding of cylindrical bobbins, there have heretofore been employed driving means for the bobbin comprising a roller engaging the outer layer of the winding on the bobbin and turning the bobbin by friction with this winding. The effect aimed at in the employment of this drive is constant draft of the thread which is being wound, it being thought that if the driving roller rotates at constant angular velocity, the thread is drawn on to the bobbin at a similar velocity regardless of the increase in diameter of the winding. However, such friction roller drive has definite disadvantages, the chief of which are slip between the bobbin and the driving roller and the consequent chafing of the thread. This is particularly noticeable in the winding of fine and delicate threads, such as artificial silk of less than 120 denier. Furthermore, the drive is unsuitable for conical or bottle bobbins, since it cannot compensate for the variation in diameter of the winding throughout each stroke of the thread guide in bobbins of these kinds. Various proposals have therefore been made to eliminate the friction roller drive by mounting the winding bobbin on a driven shaft, compensating means being provided for varying the rotational velocity of the shaft so that the instantaneous peripheral speed of the bobbin shall be constant in the locus of application of the thread. For example, in the best embodiments of this principle, in the winding of a cylindrical bobbin the compensating means is adjusted to effect an intermittent decrease of the rotational velocity of the bobbin shaft on the completion of each layer of the winding; in the case of a bottle bobbin the compensating means is adjusted to vary the rotational speed of the bobbin shaft throughout the stroke, the shaft being turned more slowly when the thread is being applied at the larger end of the layer and more quickly when the thread is being applied at the

smaller end of the layer; and in the case of a conical bobbin the compensating means effect a combination of the said two adjustments in accordance with the changing diameter of each layer at the point of application of the thread and the gradually increasing mean diameter of the successive layers. By the employment of a driven bobbin shaft with compensating means of this type, carefully designed to effect the adjustments in strict accordance with the count of the thread being wound, great precision in the formation of bobbins of all kinds is obtained with increase in the speed of winding and absolute uniformity in the construction and density of the wound bobbins.

An object of the present invention is to provide in conjunction with a doubling and winding machine having winding means including a bobbin shaft driven as above described, means serving to prevent simultaneously continued rotation of the bobbin shaft and of supply means (which may comprises twining bobbins, or alternatively a ball of spun artificial filaments) whereby, in the event of thread breakage, or exhaustion of the supply, or jamming of the thread, or completion of a bobbin, the prevention of over-running is ensured. With the increased winding speed attained, as mentioned above, it is necessary not only that a stop motion device should be extremely sensitive to any irregularity, but also that it should act simultaneously upon all the rotating parts of the machine.

A further object of my invention is to provide in a doubling and winding machine of the kind referred to the combination of rotatable mounting means for thread supply means, means for driving the bobbin shaft, means for twisting the thread in its passage from the supply means to the winding means, a thread feeler, a bobbin feeler, and means for stopping simultaneously the bobbin shaft and the mounting means on actuation of the thread feeler by breakage or exhaustion of the thread or by jamming of the thread or on actuation of the bobbin feeler by a completed bobbin.

Other and further objects of my invention will be apparent from the following descrip-

tion with reference to the accompanying drawings wherein some embodiments of the invention are shown by way of example.

Fig. 1 shows a doubling and winding machine according to the invention;

Fig. 2 shows in detail supporting means for a thread supply bobbin in an inoperative position;

Fig. 3 shows the same means in an operative position;

Fig. 4 is a plan view of the same means;

Fig. 5 shows a detail of the stop motion;

Fig. 6 shows a doubling and winding machine modified in detail;

Fig. 7 shows in detail the rotating means for the thread supply supporting means in the machine shown in Fig. 6;

Fig. 8 shows details of the stop motion applied to the same machine;

Fig. 9 shows a modified form of rotating means for the thread supply supporting means;

Fig. 10 shows a two-deck doubling and winding machine with modified braking means for the thread supply supporting means; and

Fig. 11 shows in detail the thread supply supporting means according to Figs. 9 and 10.

In my copending application, Serial No. 516,427, filed Feb. 17, 1931, there is fully described a machine for winding weft or bottle bobbins, the said machine including means for positively varying the rotational speed of the bobbin shaft throughout each stroke of the thread guide, and adjustable, positively-actuated means for imparting to the said thread guide a forward feed whereby the layers of the bobbin are successively built up. This machine may be taken as typical of the winding means 30 illustrated in Figs. 1, 6 and 10 of the accompanying drawings, and for the purposes of this application it is therefore necessary only to refer to the parts of the winding machines relevant to the present invention.

The doubling and winding machine shown in Fig. 1 of the drawings has mounted between end frames 25 one or more mounting means or twiner spindles 1 for supporting thread supply means in the form of bobbins 14, the said spindles being carried by a frame member 15. Corresponding to each spindle or group of spindles is a winding machine 30 having at least one shaft for a bobbin 24 driven by a friction wheel 29 mounted upon a main drive shaft 28 and engaged by a driven friction disc 31. Each of the twiner spindles 1 has a wharve 2 round which passes a cord whereby the spindle is driven from a drum 4. During the operation of the machine the shaft of the bobbin 24 and the twiner spindle 1 are simultaneously rotated at corresponding speeds so that the thread is wound upon the bobbin 24 as it is released from the bobbin 14. In its passage the

thread passes first through a twining or doubling member 17 and over a roller 18 to a thread sizing device, which comprises a trough 19 holding a sizing medium 20, which is applied to the thread in its passage by a roller 21 engaging the thread and dipping into said medium. Thereafter the thread passes over a roller 22 supported by an arm 23 to the bobbin 24 and in this part of its passage is surrounded by a stream of hot air directed over it from a conduit 26 by a nozzle 27.

The machine is provided with a stop motion adapted to disconnect the drives to the bobbin shaft and the twiner spindle simultaneously and thereafter to brake the supply bobbin for the immediate prevention of rotation on the occurrence of an irregularity in the thread tension or on the completion of a bobbin. This stop motion comprises the arm 23 supporting the roller 22 over which the thread passes, as above described. This arm 23 is supported by spring means 32 adjacent a vertical rod 33 and between stops 35 and 36 secured to the said rod, which is connected to one end of a cam member 34 pivoted on a bracket 37 secured to the winding machine 30. The cam face 38 of the member 34 is engaged by a lever 39 pivoted at 47 to a bracket 42 on the winding machine 30. The lever 39 also carries a crank arm 55 in the vicinity of a bobbin and this arm supports a roller 56 acting as a bobbin feeler.

Details of the latch mechanism of the stop motion means are shown in Fig. 5, from which it may be seen that the pivoting of the lever 39 is achieved by securing it to a latch member 40 pivoted at 41 to the bracket 42. This latch carries a detent 45 engaging a corresponding detent 46 carried by a member 43 secured to a rotatable pin 44 mounted in the bracket 42. The member 43 is urged upwards by a spring 47 so that the detents normally engage. There is also secured to the pin 44 a lever 48. In Fig. 1 this lever 48 has a single arm to which are attached an upwardly directed rod 50 and a downwardly directed rod 52. In Fig. 5 the member 48 is modified and has two arms, the second arm having pivoted to its end a downwardly directed rod 90, which is employed in the modified embodiment hereinafter to be described with reference to Fig. 10.

Referring again to Fig. 1, the upwardly directed rod 50 of the stop motion engages the horizontal arm of a bell crank lever 51 pivoted in the winding machine 30 with its other arm depending adjacent the shaft of the driven friction wheel 31. The depending arm engages a thrust collar 61 secured to the shaft of the wheel 31, about which is disposed a coil spring 68 abutting the said collar 61 and a fixed abutment 69. The downwardly directed rod 52 is pivoted to one end of a bell crank lever 53 mounted at 54 on the

frame 25, the other end of this lever being connected to a rod 5 actuating braking mechanism 7, 9 for the twiner spindle 1 which is illustrated in detail in Figs. 2, 3 and 4.

Referring to these figures, the member 7, which is connected to the rod 5 by a pivot 6 is supported on a bracket 71 carried by an angle member 72 supported in the frame members 25. The member 7 has a ramp 8, and the brake member 9, supported non-rotatably, has a corresponding ramp 10. The spindle 1 has fixed thereto a dog clutch member 11 and a conical bobbin carrier 12, loosely mounted on the spindle 1, has a corresponding dog clutch member 13. The members 9 and 12 also have coacting conical faces.

The operation of the stop motion device is as follows:—

The thread feeler 23 in the event of jamming of the thread in its passage from the supply bobbin 14 is pulled downwards and engages the stop 36 thereby tilting the cam member 34. The same feeler is also urged upwards by the spring 32 and engages the stop 35 in the event of the thread breaking or the supply bobbin becoming exhausted. In either case the tilting of the cam member 34 turns the lever 39 outwards about the pivot 47. On the completion of a bobbin the bobbin feeler 56 carried by the crank arm 55 is also actuated to turn the lever 39 through a similar movement. As will be evident from Fig. 5 the turning of the lever 39 raises the latch member 40 and disengages the detents 45, 46 whereafter the spring 47 can act to turn the member 43 in a clockwise direction about the pivot 44. The arm 48 is similarly turned and thus the rods 50, 52 are both raised. By the raising of the rod 50 the bell crank lever 51 (Fig. 1) is turned in an anti-clockwise direction permitting the spring 68 to move the collar 61 and the shaft upon which it is fixed, thereby disengaging the friction disc 31 from the driving wheel 29. At the same time, the upward movement of the rod 52 turns the bell crank lever 53 in a clockwise direction and this lever exerts a pull on the rod 5 and the member 7 so that by means of the ramps 8 and 10 the member 9 is raised. The bobbin carrier 12 is thus moved from the position shown in Fig. 3 to that shown in Fig. 2 where the dog clutch members 11 and 13 are disengaged and the conical surfaces of the carrier 12 and the brake member 9 coact, so that the said carrier is disconnected from the driven spindle 1 and prevented from further rotation, simultaneously with the braking of the winding mechanism.

In the modification shown in Figs. 6, 7 and 8, each twiner spindle 1 has mounted above it a spinning bowl 60. This permits the doubling and winding of artificial threads from supply means consisting of spun balls. Alternatively when the supply means consists

of bobbins the thread may be passed through the spinning bowl 60 and through the twisting or doubling member above it, whereby the doubling effect is increased, as, for instance, in the winding of crepe yarn. The machine is also arranged so that a plurality of twiner spindles are rotated by a single belt (shown in plan in Fig. 7) a corresponding number of spinning bowls being similarly rotated by another belt, and the stop motion means being arranged to simultaneously disconnect and brake a twiner spindle with its coacting spinning bowl. The belts 57 driving the spindles and bowls pass round pulleys 58 rotated by driving means 59. Each spindle or bowl is mounted on an arm 63 pivoted on a pin 62 carried by frame members 15. Each arm has a weight 65 connected to it by a wire 66 passing over a pulley 67, whereby the wharve 2 of the spindle or bowl is pressed against the driving belt. Each of the arms 63 has a projection 78 engaged by a fork 77 formed in the end of one arm 70 of a horizontal bell crank lever pivoted at 76 (see Fig. 8). The other arm 74 of this lever is connected by means of rod 5 to the vertical bell crank lever 53 of the stop motion device. On the actuation of the stop motion device the vertical rod 52 therefore serves, through the lever 53 and the rod 5 to turn the bell crank lever 74, 70, and by means of the fork 77 the arm 63 is moved to bring the wharve 2 out of engagement with the driving belt 57 and against a brake member 80, whereby the rotation of the bobbin 14 or the spinning bowl 60 is immediately stopped. The ends of a tension spring 79 are respectively connected to the lever 70 and the arm 63 so as to retain the wharve 2 in engagement with the belt 57 or the brake member 80 and prevent it from assuming an intermediate position.

Fig. 9 shows a modification of the drive for twiner spindles in a machine according to Fig. 1, these spindles being rotated by an electric motor 81 through gearing 82, 83, 84, 85. Inasmuch as the motor 81 is electrically connected for continuous rotation the disconnecting and braking device employed is that shown in Figs. 2, 3 and 4.

A further modification employing an electric drive for the driving spindles is shown in Figs. 10 and 11, each spindle being driven by an independent electric motor 95 mounted in the base of the spindle supporting means. The machine shown in Fig. 10 has doubling and winding means arranged in two decks in a single frame structure, the upper deck being shown in the braked position, and the lower deck in the running position. In this modification braking is effected by means of a rod 90 connected to the stop motion mechanism as hereinbefore described, this rod pressing downwards, when the stop motion means is actuated, upon a lever 92, whereby a non-rotating conical brake member 93 is

brought into engagement with a conical flange 94 of the bobbin carrier. Simultaneously the rod 52 is utilized to switch off the driving motor, being connected to a switch arm connected with a supply main 86, the switch-arm carrying a contact 87 which engages a fixed contact 88 during the running of the machine. When the stop motion mechanism is actuated the rod 52 lifts the switch arm and disconnects the electric motor 95.

I claim:—

1. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of rotatable mounting means for thread supply means, means for driving the bobbin shaft, means for rotating the mounting means, means for twisting the thread in its passage from the supply means to the winding means, a thread feeler, a bobbin feeler, and means for stopping simultaneously the bobbin shaft and the mounting means on actuation of the thread feeler by breakage or exhaustion of the thread or jamming of the thread or on actuation of the bobbin feeler on completion of a bobbin.

2. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of rotatable mounting means for thread supply means, means for driving the bobbin shaft, means for rotating the mounting means, means for twisting the thread in its passage from the supply means to the winding means, a thread feeler, a bobbin feeler, a latch member, lever means imparting to the latch member similar movements on actuation of the thread feeler by breakage or exhaustion of the thread or jamming of the thread or on actuation of the bobbin feeler on completion of a bobbin, and means released by movement of the latch member to disconnect simultaneously the driving means and the rotating means and brake the bobbin shaft and the mounting means.

3. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of rotatable mounting means for thread supply means, means for driving the bobbin shaft, means for rotating the mounting means, means for twisting the thread in its passage from the supply means to the winding means, a thread feeler, a pivoted latch member, a crank arm turnable with the latch member, a bobbin feeler carried by the crank arm, a cam member oscillated by the thread feeler, an arm on the latch member engaging the cam surface of the cam member, and means released by turning of the latch member to disconnect simultaneously the driving means and the rotating means

and brake the bobbin shaft and the mounting means.

4. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of at least one rotatable spindle for a thread supply bobbin, means for driving the bobbin shaft, means for driving the spindle, means for twisting the thread in its passage from the supply bobbin to the winding means, a thread feeler, a bobbin feeler, and means for disconnecting and stopping simultaneously the bobbin shaft and the spindle on actuation of the thread feeler by breakage or exhaustion of the thread or jamming of the thread on actuation of the bobbin feeler on completion of a bobbin.

5. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of at least one rotatable spindle for a thread supply bobbin, means for driving the bobbin shaft, a wharve on the spindle, a driving belt, means continuously turning the belt, means urging the wharve into contact with the belt, a fixed brake member adjacent the wharve, means for twisting the thread in its passage from the supply bobbin to the winding means, a thread feeler, a pivoted latch member, a crank arm turnable with the latch member, a bobbin feeler carried by the crank arm, a cam member oscillated by the thread feeler, an arm on the latch member engaging the cam surface of the cam member, and means released by turning of the latch member to disconnect the driving means and brake the bobbin shaft and simultaneously urge the wharve away from the belt and against the brake member.

6. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the combination of at least one rotatable spindle for a thread supply bobbin, a twining member above the spindle, at least one spinning bowl and a second twining member above the bowl for twisting the thread in its passage from the supply bobbins to the winding means, means for driving the bobbin shaft, means for simultaneously driving the spindle and the spinning bowl, a thread feeler, a bobbin feeler, and means for stopping simultaneously the bobbin shaft, the spindle and the spinning bowl on actuation of the thread feeler by the breakage or exhaustion of the thread or jamming of the thread or on actuation of the bobbin feeler on completion of a bobbin.

7. In a doubling and winding machine including winding means having a bobbin shaft driven with variable rotational velocity to ensure constant draft of the thread, the com-

5 bination of at least one rotatable spindle
for a thread supply bobbin, a twining mem-
ber above the spindle, at least one spinning
bowl and a second twining member above
10 the bowl for twisting the thread in its pas-
sage from the supply bobbin to the winding
means, means for driving the bobbin shaft,
a wharve on the spindle, a wharve on the
spinning bowl, two driving belts, means con-
15 tinuously turning the belts, means urging the
wharves into contact with the belts, fixed
brake members adjacent the wharves, a
thread feeler, a pivoted latch member, a
crank arm turnable with the latch member,
20 a bobbin feeler carried by the crank arm, a
cam member oscillated by the thread feeler,
an arm on the latch member engaging the
cam surface of the cam member, and means
released by turning of the latch member to
25 disconnect the driving means and brake the
bobbin shaft and simultaneously urge the
wharves away from the belts and against
the brake members.

8. In a doubling and winding machine in-
cluding winding means having a bobbin
shaft driven with variable rotational veloc-
ity to ensure constant draft of the thread,
the combination of a rotatable spindle for
30 a thread supply bobbin, means for driving
the bobbin shaft, an electric motor for con-
tinuously rotating the spindle, a bobbin car-
rier loosely mounted on the spindle, clutch
means connecting the carrier and the spin-
35 dle, means for twisting the thread in its pas-
sage from the supply bobbin to the winding
means, a thread feeler, a bobbin feeler, and
means for disconnecting the driving means
and braking the bobbin shaft and simultane-
40 ously disconnecting the clutch means and
braking the carrier on actuation of the thread
feeler by breakage or exhaustion of the thread
or jamming of the thread or on actuation of
the bobbin feeler on completion of a bobbin.

9. In a doubling and winding machine in-
cluding winding means having a bobbin shaft
driven with variable rotational velocity to en-
sure constant draft of the thread, the combi-
nation of a plurality of rotatable spindles,
50 carriers for thread supply bobbins loosely
mounted on the spindles, means for driving
the shaft, a continuously energized electric
motor, gear means connecting the motor and
the spindles, clutch means connecting the
55 spindles and the carriers, means for twisting
the thread in its passage from the supply bob-
bins to the winding means, a thread feeler, a
pivoted latch member, a crank arm turnable
with the latch member, a bobbin feeler car-
60 ried by the crank arm, a cam member oscil-
lated by the thread feeler, an arm on the
latch member engaging the cam surface of
the cam member, and means released by turn-
ing of the latch member to disconnect the
65 driving means and brake the bobbin shaft and

simultaneously disconnect the clutch means
and brake the bobbin carriers.

10. In a doubling and winding machine in-
cluding winding means having a bobbin shaft
driven with variable rotational velocity to
70 ensure constant draft of the thread, the com-
bination of rotatable mounting means for
thread supply means, means for driving the
bobbin shaft, means for rotating the mount-
ing means, means for twisting the thread in its
75 passage from the supply means to the winding
means, means for sizing the thread and means
for drying the sized thread in its passage
from the twisting means to the winding
means, a thread feeler, a bobbin feeler, and
80 means for stopping simultaneously the bobbin
shaft and the mounting means on actuation
of the thread feeler by breakage or exhaus-
tion of the thread or jamming of the thread
or on actuation of the bobbin feeler on com-
85 pletion of a bobbin.

11. In a doubling and winding machine
including winding means having a bobbin
shaft driven with variable rotational velocity
90 to ensure constant draft of the thread, the
combination of means for driving the bobbin
shaft, at least one rotatable spindle for thread
supply bobbins, a twining member above the
spindle, at least one spinning bowl and a
95 second twining member above the bowl for
twisting the thread in its passage from the
supply bobbins to the winding means, means
for sizing the thread and means for drying
the sized thread in its passage from the spin-
100 ning bowl to the winding means, a wharve
on the spindle, a wharve on the spinning bowl,
two driving belts, means continuously driv-
ing the belts, means urging the wharves into
contact with the belts, fixed brake members
105 adjacent the wharves, a thread feeler, a piv-
oted latch member, a crank arm turnable with
the latch member, a bobbin feeler carried by
the crank arm, a cam member oscillated by
the thread feeler, an arm on the latch mem-
ber engaging the cam surface of the cam mem-
110 ber, and means released by turning of the
latch member to disconnect the driving means
and brake the bobbin shaft and simultane-
ously urge the wharves away from the belts and
against the brake members. 115

12. In a doubling and winding machine
including winding means having a bobbin
shaft driven with variable rotational velocity
to ensure constant draft of the thread, the
combination of rotatable mounting means for
120 thread supply means, comprising at least one
vertical spindle, a bobbin carrier loosely
mounted on the spindle, an axially-movable
brake member concentric with the carrier, a
laterally-movable yoke member, coacting
125 clutch members on the spindle and the carrier,
coacting brake surfaces on the brake member
and the carrier, and coacting ramps on the
yoke and brake members, means for driving
the bobbin shaft, declutching and braking 130

means associated with the driving means,
means for continuously rotating the spindle,
means for twisting the thread in its passage
from the supply bobbins to the winding bob-
5 bin, a thread feeler, a pivoted latch member,
a crank arm turnable with the latch member,
a bobbin feeler carried by the crank arm, a
cam member oscillated by the thread feeler,
an arm on the latch member engaging the cam
10 surface of the cam member, and lever means
released by turning of the latch member on
actuation of the thread feeler by breakage
or exhaustion of the thread or jamming of
the thread or on actuation of the bobbin feeler
15 on completion of a bobbin, said lever means
simultaneously actuating the declutching and
braking means for stopping the bobbin shaft
and moving the yoke member laterally to
raise the brake member and thereby disengage
20 the clutch members and engage the brake sur-
faces, for stopping the supply bobbin.

13. In a doubling and winding machine in-
cluding winding means having a bobbin shaft
driven with variable rotational velocity to en-
25 sure constant draft of the thread, the combi-
nation of rotatable mounting means for
thread supply means, means for driving the
bobbin shaft, an electric motor for rotating
the mounting means, means for twisting the
30 thread in its passage from the supply means
to the winding means, a thread feeler, a bob-
bin feeler, a latch member, lever means im-
parting to the latch member similar move-
ments on actuation of the thread feeler by
35 breakage or exhaustion of the thread or jam-
ming of the thread or on actuation of the
bobbin feeler on completion of a bobbin, and
means released by movement of the latch
member simultaneously to disconnect the
40 driving means, open the motor circuit and
brake the bobbin shaft and the mounting
means.

In testimony whereof I affix my signature.
ERNST SCHWEIZER.

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