

May 22, 1945.

E. CLARK

2,376,661

CARDING MACHINE

Filed Jan. 21, 1943

4 Sheets-Sheet 1

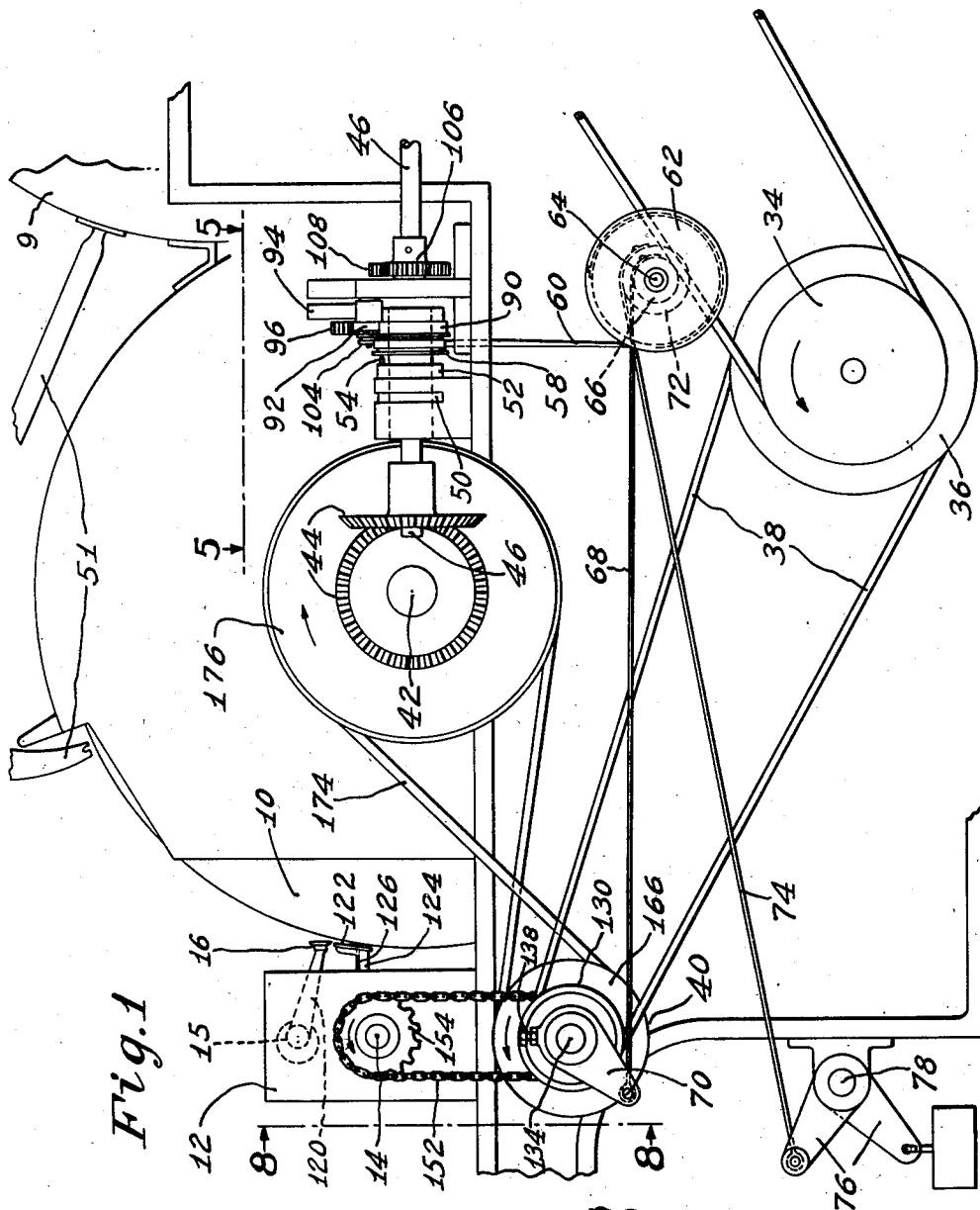
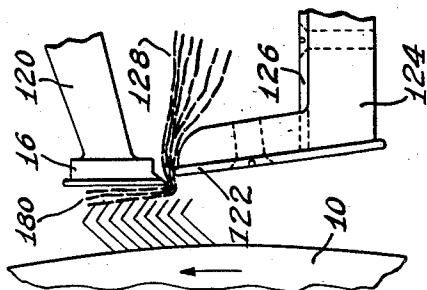


Fig. 1

Fig. 2



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4 Sheets-Sheet 2

Fig. 3

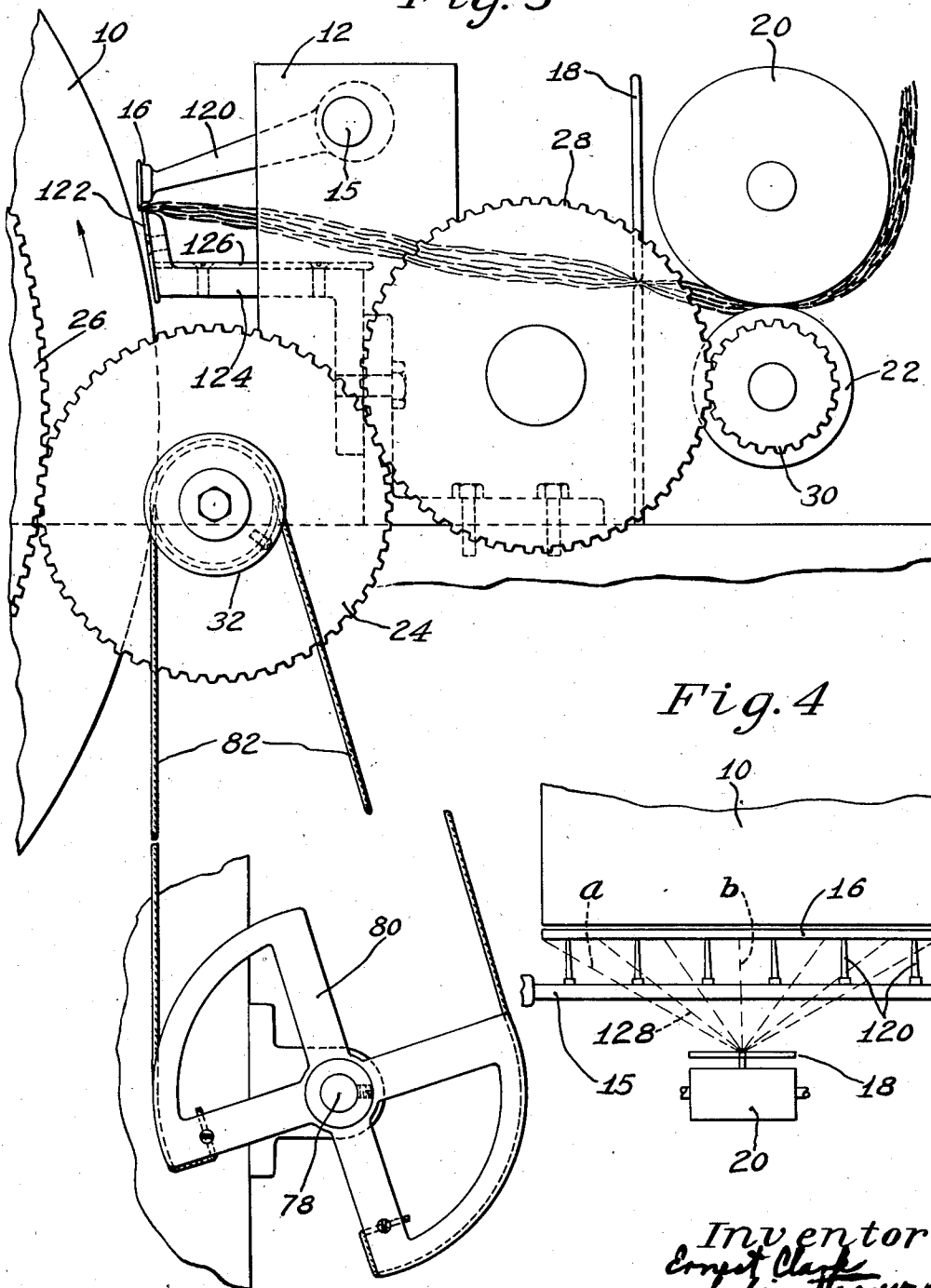
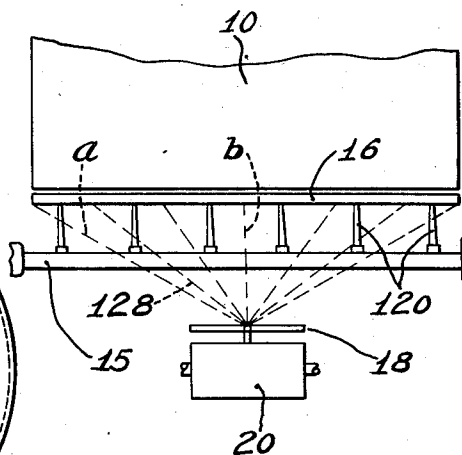


Fig. 4



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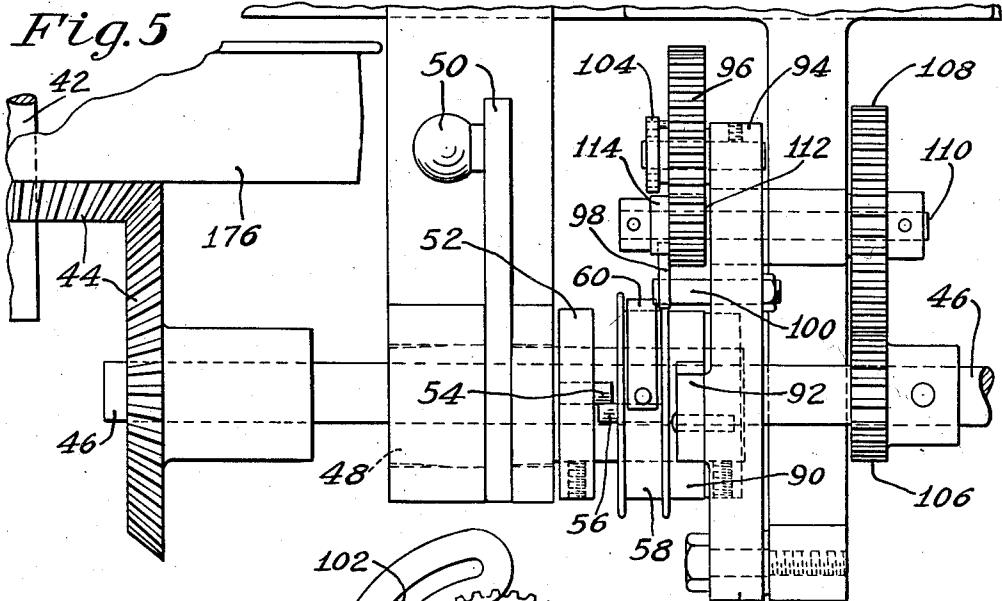
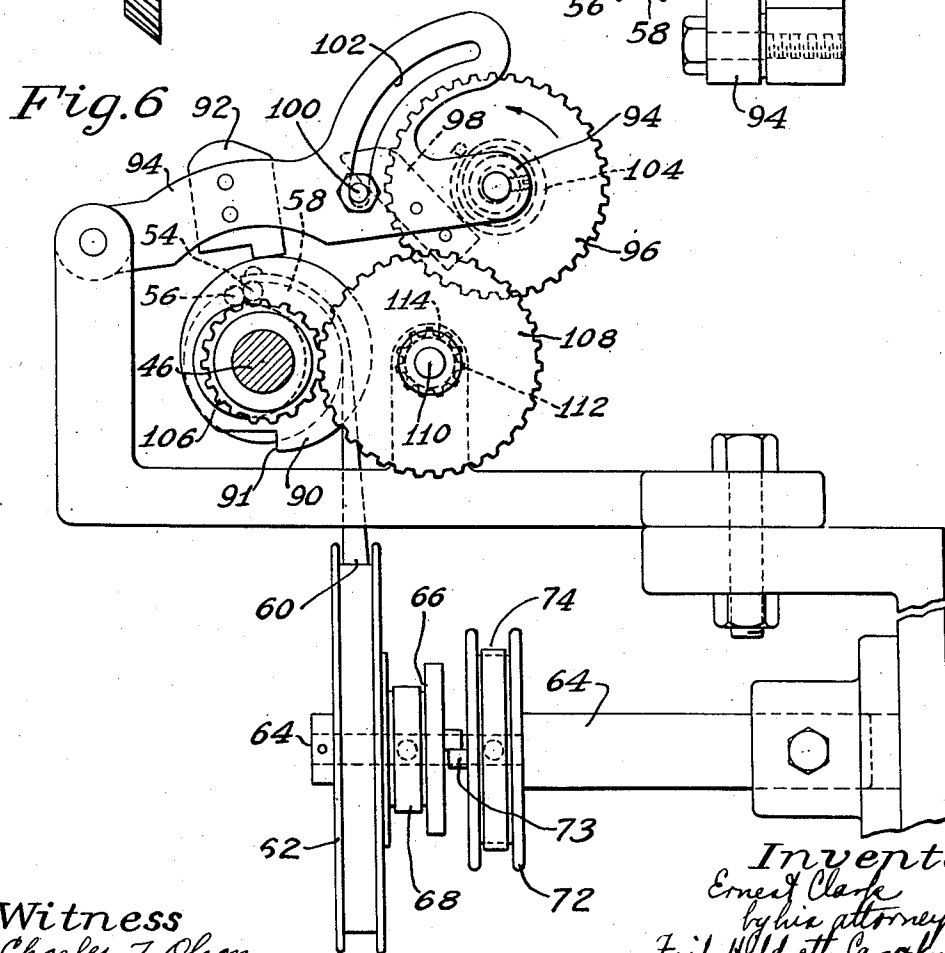
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CARDING MACHINE

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4 Sheets-Sheet 3



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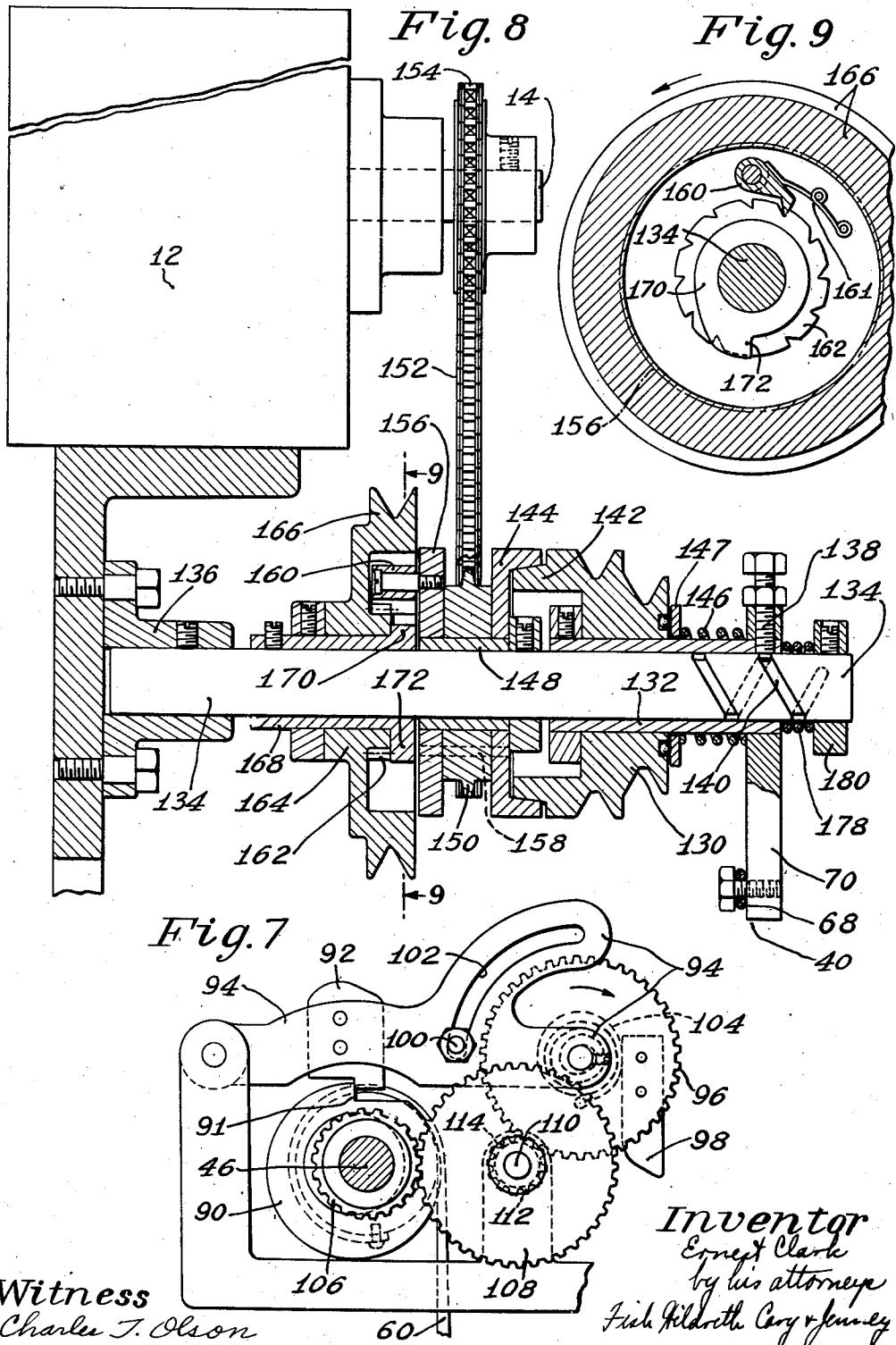
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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,376,661

CARDING MACHINE

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Application January 21, 1943, Serial No. 473,105

22 Claims. (Cl. 19—106)

The present invention relates to carding machines.

In carding machine operation, it is necessary to stop productive carding at intervals in order that the cylinders may be stripped. According to the usual method, when stripping is called for, the feed is thrown out and the calender rolls are stopped. The cylinders are then stripped preferably by pneumatic means. Thereafter the feed is restored. A substantial time is required for the fibers to build up on the doffer, and during that time an underweight sliver is taken off by the comb. When the sliver eventually builds up to weight, the operator must discard the underweight sliver formed in the build-up interval and then piece the new sliver to the old end. This operation calls for considerable judgment and skill, and in any event is unsatisfactory because it forms a portion of excess weight at the point where the piecing operation takes place.

The object of the present invention is to provide a carding machine in which the sliver which is newly formed on resumption of the carding is automatically pieced to the previously formed sliver, whereby a continuous sliver of substantially uniform weight is formed.

To this end, one feature of the present invention comprises means to grip and hold the previously formed sliver during the stripping interval. In the preferred form of the invention, this gripping means includes the comb itself, which is stopped substantially at its lowermost position and held motionless throughout the period of interruption of carding.

Another feature of the invention comprises means operating upon resumption of the carding operation to permit the fibers to build up on the doffer to the required weight before being combed off. This preferably comprises a timing means which prevents the comb from being restarted until the doffer has made a predetermined number of revolutions. At the conclusion of the timing cycle, the comb operates to comb off the fibers from the doffer, which fibers join with the fibers of the previously formed web in such a manner as to produce a continuous sliver of uniform weight.

Other features of the invention consist in certain novel features of construction, combinations and arrangements of parts hereinafter described and particularly defined in the claims.

In the accompanying drawings, Fig. 1 is a side elevation of a portion of a card with the apparatus of the present invention applied thereto; Fig. 2 is a detail view illustrating a portion of the

comb; Fig. 3 is a side view of the calender roll gearing; Fig. 4 is a diagram illustrating the piecing operation; Fig. 5 is a detail plan view of the control mechanism; Fig. 6 is a detail view of certain of the control apparatus shown in Fig. 5; Fig. 7 is a view similar to Fig. 6 showing the apparatus in a different position; Fig. 8 is a sectional view of the comb clutch as viewed in the direction indicated at 8—8 in Fig. 1; and Fig. 9 is a section on the line 9—9 of Fig. 8.

In the drawings the control apparatus of the present invention is shown as applied to a Whitin card. The card itself is of conventional form and comprises a card-clothed main cylinder 9, a card-clothed doffer cylinder 10, a comb box 12, a comb shaft 14 and a comb eccentric shaft 15 to operate a comb 16. The card also has a trumpet 18, through which sliver passes to the calender rolls 20 and 22. The calender rolls are driven by gearing, including a disengaging gear 24 meshing with a large gear 26 rotating with the doffer, an intermediate gear 28, and a gear 30 on the shaft of the calender roll 22. The disengaging gear 24 may be disengaged from the gear 26 by a device 32, which includes the conventional bush and threaded stud acting to move the gear 24 axially.

A pulley 34, driven by a belt connection from the main cylinder, drives a pulley 36 having a belt connection 38 with the comb operating mechanism. Instead of the conventional connection to the comb shaft 14, however, the connection 38 is through a comb drive 40 to be described later in detail.

The doffer shaft 42, which is driven by conventional means, is connected through miter gears 44 with a feed shaft 46 connecting in the usual manner with the feed mechanism. The shaft passes through an eccentric bush 48 provided with a throw handle 50 by which the shaft 46 may be moved laterally to disconnect the miter gears and thereby stop the feed. The card is provided with suction stripping devices, indicated by the nozzles 51, said devices preferably of the general type described in my Patent No. 1,905,265, dated April 25, 1933.

The parts thus far described, except as otherwise specifically noted, are conventional. In ordinary operation, when stripping is called for, the operator throws out the feed by means of the handle 50 and stops the calender rolls by means of the disengaging device 32, after which the stripping mechanism is put into operation. At the conclusion of the stripping operation, the operator restores the feed by throwing the handle

50 in the opposite direction and at an appropriate time engages the calender roll gearing. The starting of the new sliver, together with the operation of piecing it to the old end, is accomplished manually.

According to the present invention, the operation of throwing out the feed, also automatically causes disengagement of the calender roll gearing and stops the comb at a definite position to grip or hold the previously formed web, as will hereinafter be described. After completion of the stripping operation, the feed is restored, but resumption of comb and calendar operation is delayed until the fibers have built up to proper weight. This preferably is accomplished by a timing mechanism. When comb operation is restored, the new web removed from the doffer automatically pieces on to the old web, without wastage.

Referring to Fig. 5, the eccentric bush 48 carries a throw collar 52 having a pin 54 which normally engages a pin 56 on a pulley 58. Connected to the pulley is a flexible strap or chain 60, which is secured at its other end to a pulley 62. The pulley 62 turns on a shaft 64, and is attached to a pulley 66 having a chain pull 68 to an arm 70 forming a part of the comb drive 40. A third pulley 72 on the shaft 64 is driven by a pin clutch 73 from the pulley 66 and is connected by a chain pull 74 with a counterweighted arm 76 on a shaft 78 which extends across the machine to a pulley 80 having a cable connection 82 with the clutch 32 of the calender disengaging gear 24. Upon throwing the handle 50 outwardly, therefore, the miter gears 44 are disconnected, thereby shutting off the feed, and the pulley 62 is turned, thereby operating the chain pulls 68 and 74 to release the comb drive 40 and the disengaging gear 24 of the calender roll drive. The purpose of the pin clutch 73 will be explained later.

Before describing the comb drive, further details associated with the feed throw-out will be described. These are shown in Figs. 5, 6 and 7, and are particularly constructed to form a timing mechanism whereby the comb and calender rolls are not restored to operation until a certain definite time after the feed has been restored.

Mounted on the pulley 58 is an eccentric cam 90 provided with a latching shoulder 91. The cam normally supports a dog 92 secured to a pivoted arm 94. The arm 94 carries at its outer end a timing gear 96, which carries a knock-off member 98. As shown in Fig. 6, the end of the knock-off member extends beyond the periphery of the timing gear 96 and normally engages an adjustable stop 100 secured in a slot 102 in a portion of the arm 94. A torsion spring 104 urges the gear 96 into a direction to hold the knock-off against the stop. The feed shaft 46 is provided with a gear 106 normally meshing with an idler 108 mounted on a shaft 110 which carries a small gear 112.

When the handle 50 is thrown out to disengage the feed, the eccentric 90 is rotated in a counterclockwise direction, as viewed in Fig. 6, so that the dog 92 drops and latches at the shoulder 91 of the eccentric. At the same time, the feed shaft gear 106 is disengaged from the idler 108. The arm 94 drops sufficiently to allow the timing gear 96 to engage with the small gear 112. While the handle 50 is thrown out, the timing gear 96 does not revolve, because the miter gears are disconnected and also because the gears 106 and 108 are disengaged.

At the conclusion of the stripping operation,

when normal carding is to be resumed, the operator throws the handle 50 back to its original position, as shown in Fig. 5, thereby reengaging the miter gears 44 as well as the gears 106 and 108. The eccentric 90 remains latched, as shown in Fig. 7, so that the operation of the comb and calender rolls is not immediately resumed when the feed is restored. The rotation of the feed shaft causes rotation of the timing gear in a clockwise direction. After an interval determined by the initial setting of the knock-off stop 100 the knock-off 98 engages a roller 114 mounted on the end of the idler gear shaft 110, thereby first lifting the dog 92 out of the latch 91 and causing the eccentric to be turned in a clockwise direction back to its original position by the downward pull on the chain 60. It will be noted from Fig. 7 that the high part of the eccentric engages the dog after release of the latter, thereby further lifting the arm 94 and insuring disengagement of the timing gear 96 from the gear 112. As soon as this disengagement takes place, the gear 96 is turned in a counterclockwise direction by the spring 104 until the knock-off engages the stop 100.

The comb operating mechanism will now be described. The comb 16 is of conventional form, and as diagrammatically illustrated in Fig. 4, is connected by struts 120 with the comb eccentric shaft 15. This shaft is oscillated by mechanism enclosed in the comb box 12. As shown in Fig. 2, the comb is substantially at the lowest part of its movement, and this is the position at which the comb is brought to rest after operation of the throw-out. Means are provided for engaging and firmly holding the web when the comb is stopped. This means comprises the comb itself operating in conjunction with a plate 122 which may be termed a web holder and which extends in a nearly vertical plane across the doffer cylinder and immediately below and in front of the comb when the latter is at its lowermost position. The plate 122 is attached to a bracket 124 which, as shown in Fig. 3, is secured to a fixed part of the machine. On the upper surface of the bracket there is attached a smooth plate 126 forming a sliver tray for holding the web during the period when the card is stopped for stripping purposes.

The comb drive 40, which is shown in detail in Fig. 8, is constructed to stop the comb in the position of Fig. 2, whereby the previously formed web, indicated at 128, is held between the comb and the plate 122. To accomplish this result the drive is constructed as follows: The belt 38 drives a pulley 130 mounted for sliding movement on a sleeve 132, which in turn is supported on a fixed shaft 134 secured in a bracket 136 attached to the frame below the comb box. The arm 70 to which the pull chain 68 is connected is mounted on the sleeve 132 and carries a screw 138, the end of which passes through a hole in the sleeve to engage in a helical groove 140 in the shaft 134. The pulley 130 is provided with a cone clutch member 142 engaging a second clutch member 144, and normally held in engagement therewith by a spring 146 between the arm 70 and a thrust bearing 147.

The clutch member 144 is mounted on a sleeve 148 which is freely rotatable on the shaft 134. A sprocket 150 is mounted on the sleeve 148 and is connected by a chain 152 with a sprocket 154 on the comb shaft 14. A disk 156 is also mounted on the sleeve 148. The clutch member 144, the gear

150 and the disk 156 are secured together by a pin 158.

Mounted on the disk 156 is a pawl 160 pressed by a spring 161 toward engagement with a ratchet 162, the teeth of which are formed on an internal shoulder 164 of a pulley 166 mounted for free rotation on a sleeve 168 secured to the shaft 134. As shown in Figs. 8 and 9, the sleeve 168 is provided at its end with a cam 170 having a pawl-lifting surface 172. The pulley 166 is driven at slow speed by means of a belt connection 174 with a pulley 176 on the doffer shaft.

A compression spring 178 between the arm 70 and a fixed collar 180 normally holds the arm 70 in the position shown in Fig. 8. The pulley 130 is driven at high speed by the belt 38 and the pulley 166 is driven at slow speed by the belt 174. The pawl and ratchet form an overrunning connection whereby the comb shaft is driven at high speed during the normal carding operation. During such normal operation, the pawl is held out of engagement with the ratchet by centrifugal force. When stopping of the comb is called for by operation of the pull chain 68, the arm 70, operating in the groove 140, moves the sleeve 132 to the right, thereby disengaging the clutch members 142, 144. As the gear 150 and the disk 156 slow down, the pawl 160 is pressed by the spring 161 into engagement with the ratchet 162. The disk 156 is carried around by the ratchet until the pawl is lifted out of the ratchet by the lifter 172. The lifter 172 is placed in a proper position to insure that the comb stops in exact relation to the holding plate 122, as shown in Fig. 2. It will be noted that if through inertia the pawl should be carried past the lifter 172 on one revolution, it will reengage with the ratchet and be carried around so that it can be properly lifted out on the next revolution. The purpose of the chain drive 152 rather than a belt drive is to insure a positive connection so that the comb will stop at the correct position determined by the setting of the lifter 172.

To restore operation, the throw-out handle 50 is moved back to its original position, thereby immediately reengaging the feed gears. The timing mechanism then assumes the position shown in Fig. 7. After a time determined by the motion of the knock-off 98 from the stop 100 to the roller 114, the latch is released. The comb is restored to operation by the action of the compression spring 178 reengaging the clutch 142, 144, thereby operating the high-speed drive. Also the counterweighted arm 76 drops, thereby causing reengagement of the calender roll intermediate gear 24 to start the calender rolls. These actions restore the pulleys 62, 66 and 72 and also the eccentric 90 to their original positions shown in Fig. 6.

The purpose of the pin clutch 73 will now be apparent. As soon as the teeth of the gear 24 engage the teeth of the gear 26, and even before full axial movement of the gear 24 is completed, the calender rolls will start. The pin clutch 73 allows the comb to start immediately under the action of the compression spring 178, without being delayed by the time necessary for the complete re-engaging movement of the gear 24 which is accomplished by the counterweighted arm 76. Thus there is no danger of starting the calender rolls ahead of the comb in such a way as to stretch or break the web. If meshing of gears 24 and 26 is delayed slightly, the comb will start first, but this results only in a little temporary

slackness of the web, which is sufficiently supported by the tray 126.

The general operation of the machine will now be briefly reviewed. When the machine is to be stripped, the feed is thrown out by means of the handle 50 and this also stops the comb and calender roll. The comb is stopped in substantially its lowermost position, as shown in Fig. 2, and grips the end of the previously formed web 128 which extends over the sliver tray 126 to the calender rolls. The operator then sets the nozzle 51 to start its traverse across the cylinder. At the completion of the stripping operation, the suction may be cut off either manually or automatically.

When the stripping is completed, the handle 50 is thrown back to its original position as shown in Fig. 5. This is usually done manually but may be done automatically, as described in my Patent No. 2,281,268, or the patent to White, No. 2,281,384, both dated April 28, 1942. The restoration of the handle 50 to its original position reengages the feed gears, whereby the lap is fed to the lick-in and the carding operation progresses with the building up of fibers on the main cylinder and the doffer cylinder.

When the fibers are built up on the doffer cylinder to the desired weight, the comb and calender rolls are again started. This control of weight is determined by the setting of the stop 100. Generally the stop is set so that the doffer makes five to seven revolutions after resumption of the feed before the comb and calender rolls are again started. In any event, the setting of the stop 100 is determined by such factors as the speed of the machine and the character of the material.

As indicated in Fig. 2, the previously formed web has left a few fibers 180 between the comb and the wires of the doffer. When the comb is in its lowermost position, its teeth are below the line connecting the axes of the doffer shaft 42 and the comb eccentric shaft 15. Hence the teeth are not then in the position of closest proximity to the doffer wires, and there is adequate space for the fibers 180 without being pulled off by the doffer wires. After the build-up period, newly carded fibers accumulate at the outer ends of the wires in proximity to the fibers 180. When the comb resumes operation, the first upward movement about the axis of the shaft 15 carries the comb teeth through a position slightly closer to the doffer wires, thereby intermingling the new and old fibers. On the downward motion of the comb, the new fibers are combed off, thus forming a web which pieces on to the old web.

The intertwining of the fibers continues during the motion of the web from the comb to the trumpet. It will be seen from Fig. 4 that various portions of the web must travel varying distances from the comb to the trumpet. The linear speed of all fibers is substantially the same, since the fibers are being combed off all portions of the doffer at the same rate. Thus there is an intermingling of new and old fibers over a distance equal to the difference between the distance a at the edge of the web and the distance b at the center. This contributes to the self-supporting characteristics of the web. Furthermore, if any slight unevenness exists at the junction, it is distributed over such a length of sliver as to be entirely inconsequential.

The present invention is advantageous not only in relieving the operator of a difficult and time-consuming task, but also in promoting economy

in the operation of the machine. The productive carding operation is interrupted for only the minimum of time essential for stripping. Furthermore, there is no wastage of material and an improved product of exceptionally uniform weight is obtained.

Having thus described my invention, I claim:

1. In a carding machine having feed control means, calender rolls and a comb, throw-out means for stopping the feed control means and the calender rolls, means under control of said throw-out means for stopping the comb in a predetermined position to hold the previously formed web, and means operated upon restoration of the feed for delaying resumption of operation of the calender rolls and comb for a predetermined time.

2. In a carding machine having a comb and driving means therefor, stopping means for the comb having provision for stopping the comb at substantially its lowermost position, and a holding plate cooperating with the comb to hold a previously formed web during the period of comb stoppage.

3. In a carding machine having a comb and driving means therefor, stopping means for the comb having provision for stopping the comb at substantially its lowermost position, a holding plate cooperating with the comb to hold a previously formed web during the period of comb stoppage, and a sliver tray extending forwardly from said plate to support the web.

4. Comb operating means for a carding machine comprising high-speed driving means, low-speed driving means, an overrunning device to permit normal high-speed operation, a device to cause operation at low speed, and means for disconnecting the low-speed driving means at a predetermined position in order to stop the comb at substantially a predetermined point in its cycle.

5. Comb operating means for a carding machine comprising high-speed driving means, low-speed driving means, an overrunning device to permit normal high-speed operation, a clutch device to disconnect the high-speed driving means, and means for subsequently disconnecting the low-speed driving means to stop the comb at a predetermined position.

6. Comb operating means for a carding machine comprising high-speed driving means, low-speed driving means, an overrunning device to permit normal high-speed operation, said device including a pawl and ratchet, a clutch device to disconnect the high-speed driving means to cause operation at low speed, and a pawl lifter to disconnect said low-speed driving means at a predetermined position.

7. In a carding machine having a doffer, a comb and feed control means, the combination of means for stopping carding for a stripping operation while the doffer continues to run, said means including a feed control throw-out, connections to stop the comb at substantially its lowermost position, means including the comb for holding the previously formed web, and means for subsequently restoring operation of the comb to form a new web which is formed as a continuation of the previously formed web.

8. In a carding machine having a doffer, a comb and feed control means, the combination of means for stopping carding for a stripping operation while the doffer continues to run, said means including a feed control throw-out, connections to stop the comb at substantially its lowermost position, means including the comb

for holding the previously formed web, and means operated upon subsequent restoration of the feed for delaying resumption of operation of the comb for a sufficient period to permit fibers to build up on the doffer.

9. In a carding machine having a doffer, a comb and a comb driving means normally operating to comb fibers from the doffer to form a web, means for stopping the combing operation during an interruption of carding while the doffer continues to run, means for holding the previously formed web during the period of interruption, and means for resuming the combing operation to cause the newly carded fibers to piece on to the previously formed web to form a continuous sliver.

10. In a carding machine having a doffer, a comb and a comb driving means normally operating to comb fibers from the doffer to form a web, means for stopping the combing operation during an interruption of carding while the doffer continues to run, means for holding the previously formed web during the period of interruption, said means having provision for maintaining some of the fibers thereof in proximity to the doffer, whereby on resumption of the combing operation the newly carded fibers are pieced on to the fibers of the previously formed web.

11. In a carding machine having a doffer, a comb, and comb-operating means including a shaft for oscillating the comb, the comb at its lowest position being below the line connecting the axes of the doffer and said shaft, the combination of means for stopping the combing operation, means for gripping and holding the previously formed web in a position corresponding to the lowermost position of comb movement during an interruption of carding while the doffer continues to run, and means for resuming the combing operation to cause newly carded fibers to intermingle with fibers of the previously formed web.

12. In a carding machine having feed control means, a doffer, combing mechanism to comb fibers from the doffer to form a web, and stripping devices, the combination of feed throw-out means, means for stopping the combing operation during a period of stripping, means for holding the previously formed web during the stripping operation while the doffer continues to run, and means for operating the feed control means and the combing mechanism to resume carding after the stripping operation, said means including devices to delay resumption of combing after resumption of the feed to permit build-up of fibers on the doffer and thereafter to cause the newly carded fibers to join the previously formed web.

13. In a carding machine having a doffer, feed control means, stripping means, a comb and driving means therefor, stopping means for the comb having provision for stopping the comb at substantially its lowermost position, means cooperating with the comb to hold the previously formed web during a stripping operation while the doffer continues to run, and means for resuming comb operation following the stripping operation to join newly carded fibers to the previously formed web.

14. In a carding machine having a doffer, feed control means, stripping means, a comb and driving means therefor, throw-out means for stopping the feed control means during a stripping operation, means for stopping the comb in substantially its lowermost position to hold the pre-

viously formed web while the doffer continues to run, and means for resuming operation of the feed control means and comb following a stripping operation, including a timing mechanism for delaying resumption of comb operation for a predetermined time after resumption of the feed.

15. In a carding machine having a doffer, calender rolls, a comb and feed control means, the combination of means for stopping carding for a stripping operation, said means including a feed control throw-out, means for stopping the calender rolls and comb, including devices for stopping the comb at substantially its lowermost position, means including the comb for holding the previously formed web, and means operated upon subsequent restoration of the feed for delaying resumption of operation of the comb and calender rolls for a sufficient period to permit fibers to build up on the doffer.

16. In a carding machine having a doffer, feed control means, calender rolls, stripping means, a comb and driving means therefor, means for stopping the comb and for rendering the calender rolls ineffective during an interruption of carding for a stripping operation, said means acting to stop the comb in a predetermined position to hold the previously formed web, and timing means for delaying resumption of operation of the comb and calender rolls following resumption of the carding operation.

17. In a carding machine having feed control means, a comb, calender rolls, throw-out means for stopping the feed control means, connections from the feed throw-out means to the comb and calender rolls to stop the comb and to render the calender rolls ineffective, devices acting to cause the comb to stop in a predetermined position to hold a previously formed web, and timing means to delay operation of said connections and thus to delay resumption of comb operation and restoration of effective operation of the calender rolls for a predetermined build-up interval after resumption of the operation of the feed control means.

18. In a carding machine having feed control means, a comb, calender rolls, throw-out means for stopping the feed control means, connections from the feed throw-out means to the comb and calender rolls to stop the comb and to render the calender rolls ineffective, devices acting to cause the comb to stop in a predetermined position to hold a previously formed web, and timing means to delay operation of said connections and thus to delay resumption of comb operation and restoration of effective operation of the calender rolls for a predetermined build-up interval after resumption of the operation of the feed control means, said connections including inde-

pendent devices to permit resumption of comb operation immediately at the conclusion of the build-up interval and without being affected by the time necessary for resuming effective operation of the calender rolls.

19. In a carding machine having feed control gears, a comb, calender rolls, a feed throw-out having an eccentric to disengage the feed control gears, connections from said eccentric to stop the comb and to stop the calender rolls, and a timing device acting to prevent immediate operation of said connections when the throw-out is operated to re-engage the gears, and to cause operation of said connections to resume comb and calender roll operation at a predetermined time after re-engagement of said gears.

20. In a carding machine having feed control gears, a comb, calender rolls, a feed throw-out having an eccentric to disengage the feed control gears, connections from said eccentric to stop the comb and to stop the calender rolls, and a timing device acting to prevent immediate operation of said connections when the throw-out is operated to re-engage the gears, and to cause operation of said connections to resume comb and calender roll operation at a predetermined time after re-engagement of said gears, the timing device including a latch to hold said connections, and an adjustable member rotated from said gears to trip the latch.

21. In a carding machine having a card-clothed cylinder and combing means normally operating to remove a continuous web from the cylinder, the combination of means to render the combing means ineffective to remove material from the cylinder during an interruption of carding while the cylinder continues to run, means for holding a previously formed web during said interruption, and means for resuming operation of the combing means to cause the newly carded fibers to piece on to the previously formed web.

22. In a carding machine having a card-clothed cylinder, combing means normally operating to remove a continuous web from the cylinder and feed throw-out means, the combination of connections from the feed throw-out means to the combing means to render the combing means ineffective to remove material from the cylinder during an interruption of carding for a stripping operation while the cylinder continues to run, means for holding a previously formed web during the period of interruption with some of its fibers in proximity to the cylinder, and means operated on subsequent restoration of the feed for delaying resumption of operation of the combing means for a period to permit build-up of fibers on the cylinder.

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